COMPARISON OF CARDIOVASCULAR RISK SCREENING METHODS AND MORTALITY DATA AMONG HUNGARIAN PRIMARY CARE POPULATION: PRELIMINARY RESULTS OF THE FIRST GOVERNMENT-FINANCED MANAGED CARE PROGRAM

PRIMERJAVA METOD PRESEJANJA OGROŽENOSTI SRČNO-ŽILNEGA SISTEMA IN PODATKOV O SMRTNOSTI MADŽARSKEGA PREBIVALSTVA Z OSNOVNO ZDRAVSTVENO OSKRBO: PREDHODNI REZULTATI PRVEGA PROGRAMA VODENE OSKRBE, KI GA JE FINANCIRALA VLADA

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ABSTRACT

Introduction. Besides participation in the primary prevention, screening as secondary prevention is an important requirement for primary care services. The effect of this work is influenced by the characteristics of individual primary care practices and doctors' screening habits, as well as by the regulation of screening processes and available financial resources. Between 1999 and 2009, a managed care program was introduced and carried out in Hungary, financed by the government. This financial support and motivation gave the opportunity to increase the number of screenings.

Method. 4,462 patients of 40 primary care practices were screened on the basis of SCORE risk assessment. The results of the screening were compared on the basis of two groups of patients, namely: those who had been pre-screened (pre-screening method) for known risk factors in their medical history (smoking, BMI, age, family cardiovascular history), and those randomly screened. The authors also compared the mortality data of participating primary care practices with the regional and national data.

Results. The average score was significantly higher in the pre-screened group of patients, regardless of whether the risk factors were considered one by one or in combination. Mortality was significantly lower in the participating primary practices than had been expected on the basis of the national mortality data.

Conclusion. This government-financed program was a big step forward to establish a proper screening method within Hungarian primary care. Performing cardiovascular screening of a selected target group is presumably more appropriate than screening within a randomly selected population. Both methods resulted in a visible improvement in regional mortality data, though it is very likely that with pre-screening a more cost-effective selection for screening may be obtained.

Keywords:
cardiovascular screening, mortality, Hungary, managed care, primary health care

IZVLEČEK

***Uvod**. Poleg primarne preventive je presejanje kot sekundarna preventiva pomemben člen pri storitvah osnovnega zdravstvenega varstva. Na uspešnost tovrstnega dela vplivajo značilnosti posameznih splošnih ambulant varstva in pripravljenost zdravnikov za izvajanje presejalnih pregledov kot tudi ureditev procesov presejanja in razpoložljivih finančnih virov. Med leti 1999 in 2009 je bil v Madžarski uveden in izpeljan program vodene oskrbe, ki ga je financirala vlada. Ta finančna podpora in spodbuda je omogočila priložnost za povečanje števila presejalnih pregledov.*

***Metode**. 4462 pacientov iz 40 splošnih ambulant je bilo vključenih v presejalni pregled v sklopu ocene tveganja SCORE. Rezultate presejanja se je primerjalo na podlagi dveh skupin pacientov, in sicer tistih, ki so bili predhodno presejani (metoda predhodnega presejanja) za znane dejavnike tveganja v njihovi zdravstveni anamnezi (kajenje, indeks telesne mase, starost, zgodovina srčno-žilnih obolenj) ter tistih, ki so bili presejani naključno. Avtorji so primerjali tudi podatke sodelujočih splošnih ambulant o smrtnosti z regionalnimi in nacionalnimi podatki.*

***Rezultati**. Povprečen rezultat je bil bistveno višji v predhodno presejani skupini pacientov, ne glede na to, ali so bili dejavniki tveganja upoštevani posamično ali v kombinaciji. Smrtnost je bila bistveno nižja pri sodelujočih splošnih ambulantah, kot je bilo pričakovati na podlagi nacionalnih podatkov o smrtnosti.*

***Zaključek**. Ta program, ki ga je financirala država, je pomenil velik korak naprej k ustanovitvi ustrezne metode presejanja znotraj madžarskega sistema osnovne zdravstvene oskrbe. Izvajanje presejanja za ogroženost srčno-žilnega sistema pri izbrani skupini je očitno bolj primerno od naključnih pregledov. Obe metodi sta vidno prispevali k izboljšanju regionalnih podatkov o smrtnosti, čeprav je precej verjetno, da se s predhodnim presejanjem doseže bolj stroškovno učinkovita izbira presejanj.*

***Ključne besede**:*
presejanje za srčno-žilno ogroženost, smrtnost, Madžarska, vodena oskrba, osnovno zdravstveno varstvo

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1 BACKGROUND

Cardiovascular diseases are among the leading causes of death worldwide. In Hungary, they are responsible for more than 60,000 cases of death annually (1). Screening can help detect patients with a high cardiovascular risk. Screening itself may not be enough; patients should also be informed and taught how to lead a healthier lifestyle. It is also necessary to treat them and provide follow-up (2).

Over previous decades, a number of methods for cardiovascular risk evaluation have been developed. EuroSCORE is the most accepted system in Europe and in Hungary. The SCORE system predicts the probability of a patient's cardiovascular mortality within ten years (3).

National cardiovascular screening programs usually focus on the whole population within selected age-categories. An example of this is the UK government's recommended national strategy to screen all adults aged 40–74 for cardiovascular risks. However, the financial demand of cardiovascular screening is huge, therefore, it is essential to find the appropriate method to choose the target population. One way focuses on a probably high-risk population (for example, smokers, obese people, etc.), which is identified by different pre-screening methods, such as using questionnaires (e.g. the Findrisc-questionnaire), or the data of patients' medical records (4).

Screening for cardiovascular diseases is usually the task of general practitioners on the basis of definite protocols, and it is financed by health insurance agencies or governments. As an initiative, between 1999 and 2009, a government-financed managed care project was introduced and carried out in Hungary (5). A part of this project included complex screening programs to improve morbidity and mortality of the population of participating regions.

1.1 Aims

- The main scope of this paper is to describe the cardiovascular screening program which was organized in Bács-Kiskun County, Central-Eastern Hungary, including the implementation and the appraisal of the project.

Other goals:

- Evaluation and comparison of the outcomes of the two different screening methods with a pre-screened and randomly selected population.
- Comparison of practice-based and regional/national mortality data.

2 SUBJECTS AND METHODS

2.1 Selection of Participants

The managed health care system (MHCS) was introduced and applied in Hungary between 1999 and 2009. The gradually expanding system finally covered 22% of the population and included the full spectrum of curative-preventive health care. To join the MHCS, general practitioners had to submit an application to the National Health Insurance Fund Administration (NHIFA). If the NHIFA accepted it, the patients belonging to each general practitioner got into the system automatically. The main points of acceptance were the public health status of a given region of the country and the rate of risk adjusted quote of a given region. Other key persons of the MHCS were case managers, who were interested in the optimization of patient paths. Case managers accomplished a provider and financing function. Case managers of Bács-Kiskun County worked in Kecskemét.

As mentioned above, each case manager had to organize a complex public health prevention program. Our program, which focused on screening and preventing cardiovascular diseases, was started in Bács-Kiskun County involving 4,462 patients of 40 primary care practices. Between 2006 and 2009, participants were recruited from three different sites; the city of Kecskemét (county seat), and from smaller towns and villages of the neighbouring area.

2.2. Inclusion Criteria

General criteria: persons without any known cardiovascular disease and without any medication were applicable for both methods.

Pre-screened patients were selected from the following groups:

- Patients who have not visited their general practitioners for more than two years and whose medical history contained at least one of the following:

- male over 55 years of age,
- female over 65 years of age,
- cardiovascular event (acute myocardial infarction or stroke) in the family medical history,
- smoker,
- body mass index (BMI) > 25 kg/m2 (measured during previous encounters).

Family doctors were authorized to involve randomly selected patients without any known cardiovascular disease and who did not meet the other specific criteria mentioned above.

2.3 Exclusion Criteria

- under 18 years of age,
- pregnancy.

Patients who met the inclusion criteria were called in by mail.

2.4 Screening Procedures

A data sheet was filled in with the following data:

- personal medical history coded according to the International Classification of Diseases 10th version (ICD-10) (6),
- cardiovascular diseases and/or diabetes mellitus in the family medical history,
- questions about the patient's lifestyle: smoking, alcohol consumption, amount of physical activity,
- anthropometric measurements (body height and weight, calculation of BMI, waist circumference),
- laboratory tests (fasting blood glucose, triglyceride, total-cholesterol, high and low density lipoproteins, high sensitivity C-reactive protein (hs-CRP) level).

Special questions were focused on the eating habits of patients, applicable for the Hungarian circumstances.

Patients were asked to sign the Informed Consent Form.

2.5 Intervention

The intervention depended on patients' cardiovascular risk status, and it consisted of the following points:

- if any cardiovascular disease or diabetes mellitus was diagnosed, the patient's family doctor started treating it on the basis of national guidelines,
- high risk patients were initiated follow-ups based on the guidelines of the 5th Hungarian Cardiovascular Consensus Conference (7),
- each patient received personal information about a healthy life style.

The patients' follow-ups were tailored by the above mentioned guidelines.

2.6 Mortality Data

After finishing the program, the benefits of screening for the local population were estimated by the comparison of the mortality data of participating family practices and the regional and national mortality trends based on the data of the national census of 2011 (1).

2.7 Informatics Support Available for the Program

An electronic medical sheet and a questionnaire about eating habits were integrated into general practitioners' computer program. Program users could download patients' laboratory results from the server of the central laboratory. SCORE points were calculated and recommended changes in lifestyle were generated by software for each patient, and a follow-up plan was established for medical teams on the basis of two data sources and current protocols.

2.8 Statistics

Before statistical data processing, the database was checked accurately. The questionable data were revised based on the participating general practitioners' databases, and were corrected or deleted. The outcome of the groups was compared with the Student's t-test, which required p values of less than 0.05.

Besides the crude mortality ratio (death / 1000 people), standardized mortality ratios were calculated with regards to the number of observed deaths as opposed to the expected number of deaths in the given population. For calculating the expected number of deaths, we used Hungarian age- and gender-specific mortality data. The basic year was 2011.

2.9 Ethics

The study was previously approved by the Regional Ethical Committee.

3 RESULTS

3.1 Results of Cardiovascular Screening Program

3.1.1 Characteristics of Population

Altogether 4,462 patients were screened, 1,977 men and 2,485 women. The average age in total was 47.4 years (median: 49 years), 47.9 for men and 47.1 for women.

Table 1 shows the distribution of the study population by gender, age, family medical history, BMI, presence of metabolic syndrome (8), alcohol consumption, regular physical activity and smoking. The anthropometric characteristics of the sample and the results of laboratory tests are presented in Table 2.

Table 1. Distribution of the study population by gender, age, family medical history, BMI, metabolic syndrome, alcohol consumption, regular physical activity and smoking.

	Men		Women	
	N	[%]	N	[%]
Gender	1,977	*44.3*	2,485	*56.7*
Distribution of age-groups				
w18-19 [year]	9	*0.5*	19	*0.8*
20-29	121	*6.1*	205	*8.3*
30-39	259	*13.1*	337	*13.6*
40-49	653	*33.1*	771	*31.1*
50-59	666	*33.7*	813	*32.8*
60-69	266	*13.5*	335	*13.5*
70-80	2	*0.1*	2	*0.8*
Family medical history				
Acute myocardial infarction	17	*0.8*	24	*0.9*
Stroke	5	*0.2*	7	*0.2*
BMI categories[kg/m2]				
underweight (BMI<18.5)	9	*0.5*	47	*1.9*
normal (BMI:18.5-24.9)	481	*24.3*	987	*39.8*
overweight (BMI: 25-29.9)	904	*45.8*	863	*34.8*
obese (BMI:30-39.9)	534	*27.0*	522	*21.0*
severe obese (BMI>40)	48	*2.4*	63	*2.5*
Metabolic syndrome	389	*19.7*	467	*18.8*
Alcohol consumption*	895	*45*	253	*10*
Regular physical activity **	648	*32*	730	*29*
Smokers	395	*20*	266	*10.7*

*women: more than 2 dl beer or 1 dl wine or 3 cl spirits/day, men: more than 5 dl beer or 2 dl wine or 3 cl spirits/day

**weekly at least 3x 30 min. dynamic sport activity

Table 2. Results of anthropometric measurements and laboratory tests.

Anthropometric and laboratory data	Men		Women		All	
	avg	SD	avg	SD	avg	SD
Diastolic Blood pressure [Hgmm]	83.1	19.5	81.4	28.3	82.2	24.8
Systolic Blood pressure [Hgmm]	133.8	16.4	128.4	16.4	130.8	16.6
Total serum cholesterol [mmol/l]	5.5	1.3	5.5	2.1	5.5	1.8
High density lipoprotein [mmol/l]	1.5	0.4	1.7	4.5	1.6	3.4
Triglyceride [mmol/l]	2.0	5.8	1.4	0.9	1.7	3.9
Fasting blood glucose [mmol/l]	5.4	1.3	5.1	1.0	5.2	1.2
hs-CRP [mg/l]	4.2	7.7	4.1	0.1	4.2	7.6
Weight [kg]	85.5	16.4	71.6	15.4	77.8	17.3
Waist circumference [cm]	99.1	15.3	91.8	33.9	95.0	13.5

The appraisal of patients with high cardiovascular risk was based on the criteria of the 5th Hungarian Cardiovascular Consensus Conference (7).

3.1.2 SCORE Risk Assessment

Table 3 shows the distribution of the screened patients on the basis of SCORE assessment.

266 patients were classified into high cardiovascular risk group on the basis of SCORE assessment (cardiovascular risk 5% or more). There were more men (252) in the high risk group than women (14).

Table 3. Patients' distribution on basis of SCORE assessment.

SCORE categories	men	%	women	%	total	%
<1%	493	24.9	1,556	62.7	2049	46.0
1%	637	32.2	619	24.9	1256	28.0
2%	269	13.6	221	8.9	490	11.0
3-4%	326	16.5	72	2.9	398	8.9
5-9%	227	11.5	14	0.6	241	5.4
10-14%	21	1.1	0	0	21	0.5
>15%	4	0.2	0	0	4	0.1

A further 78 patients with cardiovascular risk below 5% can be assessed into the high cardiovascular risk group: 3 patients' total cholesterol level was more than 8 mmol/l, one patient's systolic blood pressure was higher than 180 mmHg, 66 patients were seriously obese (BMI>40 kg/m2) and 9 patients had early cardiovascular event in their family medical history.

3.2 Results of the Modelling to Differentiate the Efficacy of the Two Screening Models (Population Based vs. Pre-Screened)

3,420 patients (1,518 men and 1,902 women) were initiated to the study of the pre-screened group. The second group (1,042 patients) was initiated randomly. Table 4. shows the main characteristics of the two groups.

Table 4. Characteristics of the two screening model groups by gender, number, age, anthropometric, and laboratory data.

	Pre-screened group mean(SD)	Randomly initiated group	p value	Pre-screened group mean(SD)	Randomly initiated group	p value
	men	men		women	women	
N	1.528	465		1.902	577	
age [year]	48.9 (9.8)	40.9 (9.6)	< 0.001	53.6 (11.3)	45.5 (10.2)	< 0.001
diastolic blood pressure [mmHg]	83.1(8.9)	83.3(47.9)	0.846	81.8 (33.7)	81.3 (27.0)	0.432
systolic blood pressure [mmHg]	135.0 (16.5)	126.4 (13.3)	< 0.001	132.0 (17.6)	127.5 (15.9)	< 0.001
cholesterol [mmol/l]	5.6 (1.4)	5.1 (1.1)	< 0.001	5.7 (1.1)	5.5 (2.3)	< 0.001
HDL [mmol/l]	1.5 (0.4)	1.5 (0.5)	0.34	1.6 (0.4)	1.7 (0.5)	0.18
triglicerid [mmol/l]	2.1(6.2)	1.5 (1.4)	0.112	1.6 (0.9)	1.4 (0.8)	0.088
blood glucose [mmol/l]	5.4 (0.7)	5.1 (0.7)	< 0.001	5.2 (0.8)	5.1 (1.0)	< 0.001
hs-CRP [mg/l]	4.3 (1.3)	3.4 (5.8)	0.07	4.3 (1.0)	4.1 (1.0)	0.173
weight [kg]	87.5 (8.0)	72.5 (15.7)	< 0.001	73.6 (14.6)	71.1 (15.6)	< 0.001
waist circumference [cm]	100.9 (13.0)	87.7 (10.7)	< 0.001	94.0 (15.7)	91.2 15.2)	0.189
LDL-cholesterol [mmol/l]	3.1 (1.22)	2.9 (0.9)	=0.001	3.2 (1.0)	3.0 (1.1)	< 0.001
BMI [kg/m2]	28.9 (4.6)	23.1 (1.6)	< 0.001	28.0 (5.4)	26.5(5.2)	0.049

The mean SCORE point was 1.82 in the pre-screened group and 0.55 in the random screened group (difference: 1.27, p< 0,001). The distribution of the two groups of patients was different based on SCORE categories. Most of the patients in the randomly screened population belonged to the low risk categories and only three (0.29%) high risk patients were found. However, there were 274 (8.0%) high risk patients in the pre-screened population. Table 5 shows in details the distribution of the two groups on the basis of SCORE points.

Table 5. Distribution of pre-screened and random initiated groups on basis of SCORE categories.

SCORE categories	Pre-screened group				Random initiated group			
	men		women		men		women	
	N	%	N	%	N	%	N	%
<1%	295	*19.4*	622	*32.7*	281	*60.4*	404	*70.0*
1%	496	*32.7*	398	*21.0*	137	*29.5*	150	*26.0*
2%	218	*14.4*	595	*31.3*	40	*8.6*	19	*3.3*
3-4%	286	*18.8*	236	*12.4*	5	*1.1*	3	*0.5*
5-9%	200	*13.2*	51	*2.7*	2	*0.4*	1	*0.2*
10-14%	19	*1.2*	0	*0*	0	*0*	0	*0*
>15%	4	*0.3*	0	*0*	0	*0*	0	*0*

3.3 Retrospective Aggregate Mortality Data

Aggregated mortality data were collected from the practices after the program had been completed. The average follow-up was 7.15 years. Data contain all causes of mortality and cardiovascular mortality separately.

We had information on 4,182 patients of the 4,461 screened patients. The total number of deaths: 158, mortality 5.7‰ (national: 12.0), cardiovascular death: 46 patients, 1.3‰ (national: 6.4). Table 6 shows mortality data divided by participating settlements.

Table 6. Comparison of the mortality data of participating settlements and participating practices.

	General		Participating practices		Cardiovascular mortality		Participating practices	
	crude (death/1000)	SMR (%)	crude (death/1000)	SMR (%)	crude (death/1000)	SMR (%)	crude (death/1000)	SMR (%)
Hungary	12.0	100.0	-	-	6.9	100	-	-
Kecske-mét	11.0	63.9	3.4	22.2	5.3	47.3	1.4	27.0
Lajosmi-zse	15.2	94.2	3.6	23.3	7.7	80.1	0.7	14.0
Kiskőrös	14.0	81.4	4.5	24.0	6.7	76.7	1.6	33.4
Szabad-szállás	17.3	100.7	3.0	19.4	8.6	88.4	0.0	0.0
Balló-szög	14.9	86.6	6.9	45.0	6.2	36.8	2.0	39.4
Harta	15.8	91.8	5.4	35.0	7.9	81.6	1.5	30.6
Tiszaal-pár	19.3	112.3	13.3	87.2	9.8	104.0	2.4	47.8
Fülöphá-za	14.6	84.9	3.2	25.8	6.1	57.1	1.6	31.2
Helvécia	16.2	94.2	7.9	50.0	3.6	49.7	0.0	0.0
All practices	-	-	5.7	32	-	-	1.3	28.8

SMR: standardised mortality ratio. SMR was calculated based on Hungarian sex- and age-specific mortality rates in 2011 (9).

4 DISCUSSION

Besides participation in the primary prevention, screening as secondary prevention is an important requirement for primary care services (10–12). Opportunistic screening is usually conducted in the daily practice, while programmes for screening the whole population require comprehensive governmental or public health support, including financial coverage (13).

The Hungarian government decided to launch a program (Managed Care System), in which participating general practitioners were authorized to follow up their patients at the other two levels of the health care system (outpatient's services, provided by specialists, and inpatient services delivered in hospitals). The description of this wider context of collaboration was beyond the scope of this paper. One of the goals of the managed care system of the NHIFA between 1999 and 2009 was that health case managers were expected to organize public health programs for their patients (14). Within the framework of the Managed Care System we focused on screening for cardiovascular diseases in Kecskemét and its region. Our

main aim was to identify patients who had high risk for a cardiovascular disease without any symptoms. We can say, based on our results, that the basis of an effective cardiovascular prevention should be a well-organized, controlled and sufficiently funded screening programme.

Risk score assessments can help us to identify high risk patients, but we have to conduct numerous examinations with negative results to identify the patients at high risk (15). We compared the outcomes of the pre-screened and randomly screened population in terms of the achieved average risk points. The average scores were significantly higher in the case of the 'pre-screening approach.' We found many more high risk patients in the pre-screened group compared with the randomly screened population (17.4 versus 0.6%), which means that, following the opportunistic screening method, we should screen roughly ten times more people to get similar results.

Mortality was significantly lower in the participating primary care practices than expected on the basis of national mortality data.

4.1 Limitation

Unfortunately, we were unable to assess cardiovascular morbidity and mortality more precisely, because the program budget did not allow a longer follow-up period. The data presented in this paper only predict trends without statistical significance and individual follow up.

We concluded that the screening for cardiovascular diseases can find patients with high risk in an early phase. While screening programs focus on whole populations, only a few individuals will benefit from them, so we should narrow the target population by using pre-screening on the basis of the main risk factors. The tight follow-up of patients can reduce the mortality among the screened population.

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CONFLICTS OF INTEREST

The authors declare that no conflicts of interest exist.

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ETHICAL APPROVAL

The study was previously approved by the Regional Ethical Committee.

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SCREENING AND REGISTERING PATIENTS WITH ASTHMA AND COPD IN SLOVENIAN PRIMARY CARE: FIRST RESULTS

PRESEJANJE IN REGISTRIRANJE BOLNIKOV Z ASTMO IN KOPB V REFERENČNIH AMBULANTAH DRUŽINSKE MEDICINE: PRVI REZULTATI

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ABSTRACT

Aim. This study aimed to evaluate a new project of the Slovene Ministry of Health – the Family Medicine Model Practices (MPs) Project in Slovenia, and to show its effectiveness in the management of asthma and COPD by family medicine practice teams, consisting of a family physician, a nurse practitioner and a practice nurse.

Methods. A total of 107 family practices with 203122 patients joined the project during the first year of its initiation. The effectiveness of the program in disease management was analysed in two phases according to the registration of family practices. The number of patients registered and the number of asthma and COPD patients (existing and newly detected) by model practice teams were being reported. Descriptive analyses were used to describe the study populations. Prevalence by diseases and phases was established after the initial round of data collection. Chi square (x^2) test was used to analyse the difference between the phases.

Results. The frequency of asthma was 2.12%, while the frequency of COPD was 1.15% throughout the study period. For both diseases, more than 30% of patients were newly diagnosed.

Conclusions. The project of implementing Family Medicine MPs in the area of COPD has given first positive results and the project is still ongoing to its full implementation.

Keywords:
primary health care, model practices, family practice, nurse practitioner, asthma, COPD, Slovenia

IZVLEČEK

***Uvod**. Namen študije je predstaviti projekt Ministrstva za zdravje, referenčne ambulante, ki poteka v Sloveniji, in prikazati rezultate obravnave bolnikov z astmo in KOPB s strani tima, ki je dopolnjen in ga sestavljajo zdravnik, diplomirana medicinska sestra in zdravstveni tehnik.*

***Metode**. V prvem letu je bilo v projekt vključenih 107 ambulant z 203.122 opredeljenimi pacienti (glavarina). Uspešnost programa obravnave pacientov je bila analizirana dvofazno, ob prvi in naslednji vključitvi ambulant v projekt. Vse referenčne ambulante so poročale o številu opredeljenih bolnikov (glavarina) in o številu bolnikov z astmo in KOPB (že obstoječih in med presejanjem novo odkritih bolnikov). Deskriptivna analiza je bila uporabljena za opis obravnavane populacije. Prevalenca po boleznih je bila prikazana ločeno v prvi in drugi fazi analize. Test hi-kvadrat je prikazal razlike med obema fazama raziskave.*

***Rezultati**. V opazovanem obdobju je bila pogostnost astme med opazovano populacijo 2,12%, pogostnost KOPB pa 1,15%. Tako med bolniki z astmo kot med bolniki s KOPB je bila bolezen novo odkrita pri več kot 30% bolnikov.*

***Zaključek**. Projekt implementacije referenčnih ambulant, ki je še v razvoju, je na področju obravnave bolnikov s KOPB in astmo pokazal prve pozitivne rezultate.*

Ključne besede:
primarno zdravstveno varstvo, referenčne ambulante, ambulanta družinske medicine, diplomirane medicinske sestre, astma, KOPB, Slovenija

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1 INTRODUCTION

The diseases of the respiratory system are an important public health burden. They present the third most common cause of death in Slovenia, where 6.0% of the population has been reported to suffer from asthma (1). Hospitalisations from these diseases have been increasing since 2003 and 2009. Only limited data exist regarding their prevalence in the population and in primary care, where most of these cases are being treated (1). Among the respiratory diseases, the chronic diseases of the respiratory system are particularly important.

Previous studies have reported that many patients with asthma and COPD (Chronic Obstructive Pulmonary Disease) remain uncontrolled or not adequately controlled (2, 3). Although the management of non-communicable chronic diseases has become one of the most important tasks of primary care, it is generally seen that their management in this setting does not fulfil its full potential. There are many reasons for that, one of the more important ones is inadequate organisation of services, where doctors still take on the vast majority of patient care, which leads to increasing workload of the family physicians (4).

Slovenia has a health care system where primary care is largely organised around public non-for-profit health centres (5). A typical family practice team in Slovenia consisted of a family practitioner and a practice nurse with a bachelor degree (6). This system has remained relatively unchanged for a long period and, lately, there have been calls that a change is necessary. An additional problem is that the number of primary care teams and family physicians has not changed significantly in the last two decades, leaving the country well below the European Union 27 Member States (EU 27) average (7), in spite of a growing number of elderly population. Management of non-communicable chronic diseases has gone through fundamental changes resulting in different disease management programmes all over the world. One of the possible solutions to this challenge can be a change in the composition of the teams, especially by introduction of higher trained nurses - nurse practitioners (NPs). Instead of screening only for cardio-vascular diseases (CVD), an introduction of screening for several non-communicable chronic diseases (NCD) for people aged 30 and olderhas been implemented. Therefore, a development of registers of chronic diseases started at the same time.

There is ample evidence proving that involvement of multidisciplinary teams decreases the workload of family physicians without compromising the quality of care (8). NPs have a unique position as frontline caregivers and patient educators in recognizing, assessing and effectively treating the widespread problem of uncontrolled diseases (9), and supplement for the care provided by thefamily practitioners (10). They can undertake much of the health promotion workload of the family physicians and have a leading role in the routine management of adequately treated chronic diseases (10).

The aim of this study was to assess the programme of Family Medicine MPs in Slovenia, which was developed along the above-mentioned principles, and to describe the recruitment of patients with asthma and COPD in the project.

2 METHODS

2.1 Setting

The Family Medicine MPs program was introduced by the Slovenian Ministry of Health with the aim of improving the management of chronic diseases, including asthma and COPD in primary care by introducing NPs as new members of the team. Their tasks included prevention in patients aged 30 and older, and routine management of all registered patients with stable chronic diseases.

The team was thus extended by 0.5 full-time equivalent (FTE) nurse (11). The project was initiated in 2011. Every team had to make a registry of asthma and COPD cases in their practice and to manage these diseases according to a detailed protocol (12), based upon clinical evidence agreed between experts in family medicine, clinicians and nurses. The role of nurses in asthma and COPD was to create a registry of these patients and to manage the stable ones according to the protocol. Following this protocol, the NPs systematically reviewed the history details by using questionnaires (e.g. Asthma Control test, COPD Assessment Test) and by posing other relevant questions. They examined the patients according to their competence, and provided education with counselling, oriented toward life-style improvement and focusing on problems related to COPD/asthma. Specifically, the NPs controlled the treatment compliance and skills for appropriate use of inhalers, the skills and results of patient Peak Expiratory Flow (PEF) measurements as well as performed spirometry.

The project was performed in accordance with the Declaration of Helsinki (1975) and was approved by the National Ethical Committee of Slovenia in September, 2012.

2.2 Data Sources

The data were collected from the national database that was established especially for the purpose of this project. The sources of data were obligatory reports from practices that were delivered monthly. Data collection began in June 2011. In the report, the practices had to state the number of patients registered and the number of cases (existing cases and newly detected cases during the screening of patients aged 30 years and

older) of asthma and COPD that were identified. The study population included all those registered with the participating practices. Potential cases were patients who had been reported to have asthma and COPD by their family physicians using the ICD10 Codes. The diagnoses of asthma and COPD were based on the criteria of the World Health Organization (WHO) and were confirmed either by a clinical specialist or spirometry. The source population of the study consisted of patients registered at one of the participating 107 Model Practices (31 December 2011).

2.3 Data Analysis

The analysis of the initial results was implemented in two phases. The first phase included a group of MPs and cases of asthma/COPD that were detected from the beginning of the project in April 2011 (started with reports in June), until September 2011, while the second phase included those MPs that joined the project in September 2011, and lasted until December 2011. The differences noted between the two phases were registered in the data management system. The starting data were used to compare the presence of existing and newly reported cases in a 4-monthly period with the expectation that the second phase would involve better data management, since more training and experience would have accumulated during the first phase.

The statistical analysis was based on the data from June 2011, until December 2011. Simple descriptive analysis was used to describe the study populations. Prevalence sorted by diseases and phases was established after the initial round of data collection. Chi square (x2) test was used to analyse the difference between the two phases. $P<0.05$ was considered statistically significant.

The tendency of the data management was investigated in two phases: those who started the project in June 2011, and those in September 2011. A comparison analysis of the data was used for the first 4 months.

3 RESULTS

3.1 Study Population

The distribution of patients and practices is shown in the Table 1. During the first phase, which began in June 2011, 60 family practices joined the project, with 114819 patients on the patient list. This number grew slightly to 116612 patients in September 2011. During the second phase, which began in September 2011, additional 47 practices joined the project. The number of patients included during this phase was 71976, while by the end of the year 2011 it increased to 86510 patients.

A total of 107 practices with an overall 203122 subjects were included into the project during the two phases (Table 1). The frequency of MPs and patients was the highest in Zasavska/Notranjsko-Kraška/Osrednjeslovenska regions (MPs: 29.91%; patients (Phase 1/Phase 2): 25.91/38.02%), in the Podravska region (MPs: 16.82%; patients (Phase1/Phase 2): 16.50/17.56%) and in the Gorenjska region (MPs: 14.95; patients (Phase 1/Phase 2): 13.22/18.57%) (Table 1).

Table 1. Regional distribution of population and family practices involved in the Family Medicine Model Practices (MPs) Project in December, 2011.

	Percentage and number of patients in the Family Medicine MPs Project (n=203122)		Percentage and number of Family Medicine MPs
	Phase 1 (n=116612)	Phase 2 (n=86510)	
Regions	x(%) (n=116612)	x(%) (n=86510)	x(%) (n=107)
Pomurska	4.90% (5709)	6.63% (5736)	5.61% (6)
Podravska	16.50% (19252)	17.56% (15189)	16.82% (18)
Koroska	2.82% (3289)	NPR	1.89% (2)
Savinjska	10.88% (12690)	6.25% (5407)	9.35% (10)
Zasavska Notranjsko-Kraska Osrednjeslovenska	25.91% (30211)	38.02% (32890)*	29.91% (32)
Spodnjeposavska	4.97% (5798)	NPR	2.80% (3)
Jugovzhodna Slovenija	6.41% (7478)	4.03% (3486)	5.61% (6)
Gorenjska	13.22% (15415)	18.57% (16068)	14.95% (16)
Goriska	11.09%(12933)	3.75%(3246)	8.41% (9)
Obalno-Kraska	3.29% (3837)	5.19% (4488)	4.67% (5)

n= number of subjects; NPR: no patients were registered; Phase 1: four-month period, from June until September 2011; Phase 2: four-month period, from September until December 2011. *No patients were registered from the Zasavska region.

3.2 Prevalence of Asthma and COPD

The number of registered patients with asthma increased in the first phase. Among those who started the project in June 2011, it increased from 1.62% (1855 persons) to 2.15% (2512 persons) by September 2011. Out of them, 1.99% (2307 persons) had already confirmed asthma (prevalent cases), while in 0.16% (205 patients) the condition was newly diagnosed in September 2011. The frequency of the latter patients showed a decreasing tendency from 0.22% (265 persons) in July 2011, to 0.16% (205 persons) in September 2011. In the first three-month period, a total of 2512 persons were reported to have asthma, out of which 657 persons (26.15%) were newly diagnosed.

In the second phase of the project, the frequency of registered asthma patients continued to grow from 1.52% (1093 persons) in September 2011, to 2.09% (1803 persons) in December 2011. Out of them, 1.89% (1569 persons) had been diagnosed previously in December 2011, while 0.20% (234 persons) were newly diagnosed. The frequency of the latter patients was 0.24% (315 persons) in October 2011, and then it decreased to 0.13% (161 persons) in November 2011, only to increase again to 0.20% (234 persons) in December 2011. Altogether, 1803 persons were reported of having asthma in the second three-month period, out of which 710 persons (39.38%) were newly diagnosed. There were no significant differences based upon the growth of registered patients in the two phases (P=0.9) (Figures 1, 3, 4).

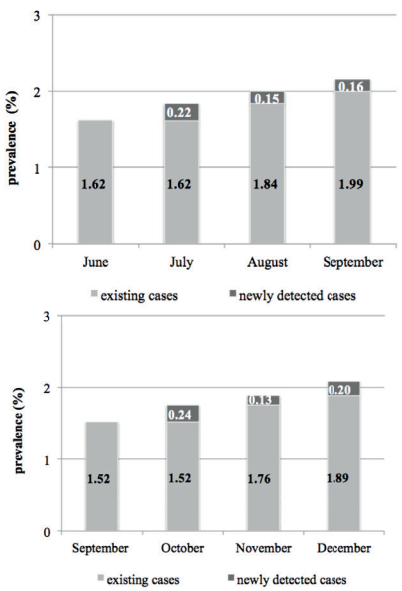

Figure 1. The frequency of the existing and newly detected asthma in the two phases of the study*.

*There were no significant differences based upon the growth of registered patients in the two phases (P=0.9).

Phase 1: A four-month period, from June until September 2011.

Phase 2: A four-month period, from September until December 2011

The number of patients registered as COPD in the first phase (those who started the project in June 2011), showed an increasing tendency from 0.88% (1006 persons) at the beginning, to 1.19% (1383 persons) in September 2011. Out of them, 1.09% (1261 persons) had been diagnosed previously, while 0.10% (122 persons) were newly diagnosed. The frequency of the latter showed a decreasing tendency in the first three-month period, from 0.13% (160 persons) in July 2011 to 0.10% (122 persons) in September 2011. Altogether, 1383 persons were reported of having COPD in the first phase, out of which 377 persons (27.26%) were newly diagnosed. In the second phase of the study, the frequency of COPD also followed an increasing tendency from 0.78% (558 persons) at the beginning to 1.11% (963 persons) in December 2011. Out of them, 1.05% (879 persons) had been diagnosed previously, while 0.06% (84 persons) was newly diagnosed. The frequency of the latter showed a decreasing tendency from 0.16% (191 persons) in October 2011 to 0.06% (84 persons) in December 2011. Altogether, 963 persons were reported of having a disease in the second phase, out of them 405 persons (42.06%) were newly diagnosed. There were no significant differences between the two phases (P=0.9) (Figures 2, 3, 4).

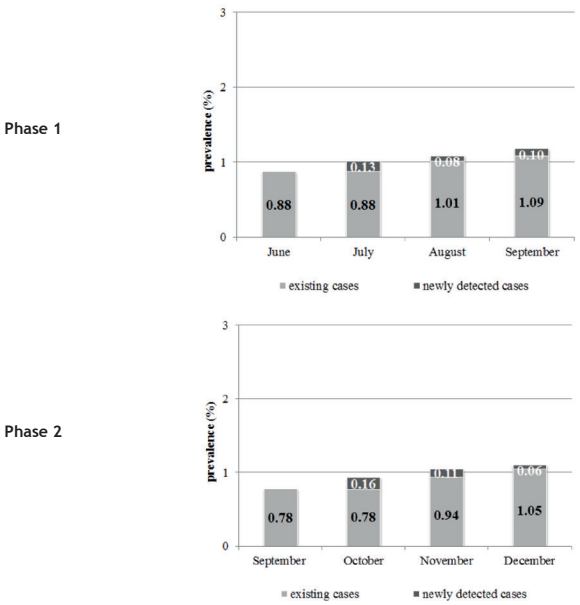

Figure 2. The frequency of the existing and newly detected COPD in the two phases of the study**.

**There were no significant differences between the two phases (P=0.9).

Phase 1: A four-month period, from June until September 2011.

Phase 2: A four-month period, from September until December 2011.

In both phases, a total of 4315 persons (2.12%) were reported of having asthma in the four-month study period, out of which 1367 persons (31.68%) were newly diagnosed. Similarly for COPD, a total of 2346 persons (1.15%) were reported of having the disease in the same observational period, out of which 782 persons (33.33%) were newly diagnosed (Figure 4). Overall, there was a relatively high proportion of newly diagnosed cases (more than 30 % for both diseases).

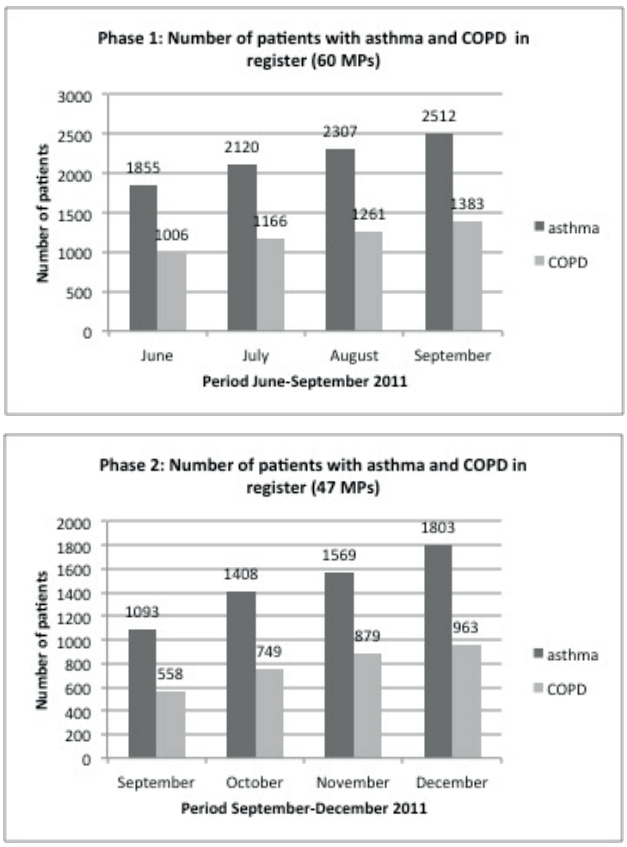

Figure 3. The number of patients with asthma and COPD in the register in Phase 1 and Phase 2.

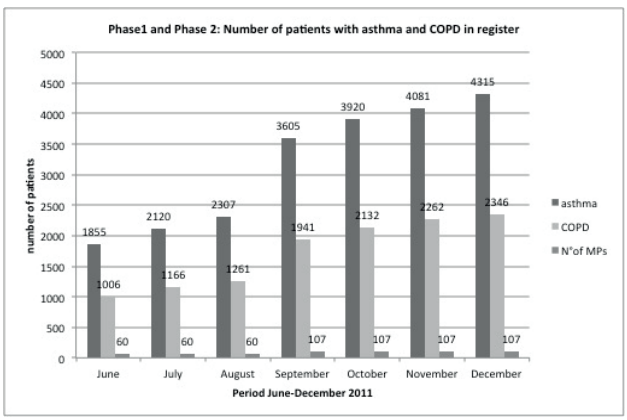

Figure 4. A total number of patients with asthma and COPD in the register.

4 DISCUSSION

In the first and second phase of introducing Family Medicine MPs, the physicians were highly motivated and wanted to improve or upgrade the patients' care. The NPs were also very interested to contribute to the teamwork, because they found new challenges in family medicine which they had not experienced before. Probably, these are the reasons for a rather intensive screening and registering of patients with asthma and COPD in the very first month, in which the NPs wanted to present their role as important. Patients in the registers have to be managed according to the protocols (exactly defined measures, frequencies of visits and way of treatment).

Although we expected more experienced teams and better data management in the second phase of the project, this turned out not to be possible. There was no transfer of experience to the new teams from the previously included ones, probably due to geographical dispersal and allocation of practices and a short duration of the project. Therefore, more training and experience could have been accumulated and disseminated to the new MPs after the analysis of the data performed regularly at the end of each year.

The advantage of this simple methodology is to enable the gathering of data regarding the prevalence of asthma/COPD, and to establish an epidemiological overview that can result in achieving organised public approach. The disadvantage of the methodology is not being able to follow the different indicators of chronic illnesses that are tracked and followed for every individual patient.

The regional distribution of the population and practices involved in the Family Medicine MPs project resembles the distribution of risk factors in Slovene primary health care attenders (13). The highest percentage and number of patients visiting MPs, as well as the highest number of MPs in the last 3 years, has been in the central Slovene region (Ljubljana).

The data in this study is based on the first two groups of Family Medicine MPs established; therefore, it cannot claim to be representative of the whole country, even if the Ministry took care of an even distribution of the practices. The bias in the recruitment phase is likely to be due to the fact that MPs first had to apply for the project, and was then selected from the pool of applicants as being the most ambitious and fulfilling the inclusion criteria of achieved quality of care. Nevertheless, the regional distribution of practices was well-balanced.

The prevalence of asthma in the analysed (four month) periods was around 2% in the two phases. According to the OECD report, the self-reported asthma in 2008 in the population aged 15 and older, was around 3.5% in Slovenia (14), while in the computer assisted survey, 6.0%

of citizens reported asthma (1), but the World Health Survey, performed between 2002 and2003, reported the prevalence of self-reported doctor-diagnosed asthma of around 8.7% (15). The prevalence of the existing COPD was around 1% in the study period. The OECD 2012 report, in this case, described the prevalence of self-reported COPD in 2008 in the population aged 15 and older, of around 3.1% in Slovenia (14). The frequency of asthma and COPD in both phases of our study had a slowly increasing trend. There were no significant differences between the two groups based upon the data management and registration.

The most important finding in this study is that the introduction of new Family Medicine MPs resulted in the identification of chronically ill patients and management of these patients by standard protocols (a structured way of patients' treatment) (12), which were followed in 4315 patients with asthma and 2346 patients with COPD (Figure 4). This is a strong message to policy makers to continue with the project, which will eventually end up introducing NPs in every family practice within the next 4 years. Although a survey of satisfaction of patients was not a part of this study, the project is supported by high levels of patient satisfaction with NPs, where a mean total score on the newly developed questionnaire was 87.9 ± 12.4 points, and the mean percentage of respondents with answers 4 or 5 on the five-point Likert scale of all items was 92.2% (16).

Another important aspect of this analysis relates to the number of undiagnosed patients, which is a serious problem in chronic disease management in primary care. Since 2002, when the National preventive program for CVD started (17–21), patients have not been screened for asthma and COPD and, after the implementation of this screening in April 2011, more and more patients were identified, so the number of patients with these two diseases has been continuously growing. Moreover, protocols (12) for the management of patients with asthma/COPD have been introduced, and they improved the process of care. We could demonstrate that there was a relatively high percentage of newly diagnosed or previously non-identified patients in both phases and diseases, which was around 30%. Partly, this could be due to unconfirmed existing working diagnosis for asthma/COPD in the past (22–24). In a study done in Poland, this percentage for COPD was even higher (almost 50%) (25); in a country with a well-established primary care, the proportion was similar (26).

We could also show some geographical inequality in the distribution of these patients, similar to the distribution in the 'Register of high-risk patients for cardiovascular disease.' This may reflect the well-known East-West gradient of health inequalities in the country. In the Register of lifestyle risk factors from January 2002 until September2009, the most harmful alcohol drinking was presented in Murska Sobota region and the lowest rate of physical activity (less than once per week) was stated by people in Maribor region. The prevalence of BMI > 25kg/m^2, hypertension and hypercholesterolemia, were the highest in Krško region. In the results of the National preventive program for CVD started in year 2001, Ljubljana region had low prevalence of risk factors for chronic non-communicable diseases, indicating the preventive orientation of the capital.

On the other hand, the inequalities in health care remained the same for nearly 20 years: the Eastern parts of Slovenia always had higher prevalence of risk factors and chronic diseases compared to the South-Western parts of the country (13). This aspect of the study clearly sends an important message that by introducing a systematic approach to primary care, the level of medical care improves (23, 21).

An increase in the number of Family Medicine MPs resulted, as expected, in an increase in the number of patients diagnosed with asthma and COPD. The results are somewhat expected since they come from the implementation of a systematic screening approach which included more and more patients among a growing number of capitations in MPs.

5 CONCLUSIONS

The implementation of Family Medicine MPs in Slovenia represents new challenges in the task distribution within the primary care team, which is expanded with a nurse practitioner. The number of patients with asthma/COPD will probably rise in the next months because new patients will be involved in the permanent screening. After the screening of the patients included in the study, the prevalence of asthma/COPD will become steady, and for the first time, the epidemiological data on asthma/COPD will be known.

So far, we can only presume that the quality of treatment of patients with asthma and COPD in MPs is better because it is more systematic than in other family practices. Various quality indicators have been developed and will be collected within the protocols of disease management. The data from the disease management protocols has not been systematically collected on the national level yet, so we still wait for the ultimate proof of clinical quality improvement.

Overall, it is obvious that the project of implementing Family Medicine MPs in the area of chronic respiratory diseases already shows positive results; the project is an on-going one, but still far from its full implementation.

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CONFLICTS OF INTEREST

Our research represents original, unpublished material. It does not overlap or duplicate other manuscripts that are under review, in press or published. We have not submitted this manuscript elsewhere for publication. We have no financial or other contractual agreements that might cause conflicts of interest, or be perceived as discoursing conflicts of interest. There are no company products associated with this research; hence, there are no existing financial arrangements between any of the authors and a company.

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ETHICAL APPROVAL

Not required.

AUTHORS' CONTRIBUTION

IS oversaw the design of the study, BEP analysed the data. All authors were involved in the development of the project, study design, data collection and its interpretation. All authors contributed to the preparation of the manuscript and approved the final version of the text.

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PHYSICAL ACTIVITY, SEDENTARY BEHAVIOR AND SUBSTANCE USE AMONG ADOLESCENTS IN SLOVENIAN URBAN AREA

TELESNA AKTIVNOST, OBLIKE SEDEČEGA VEDENJA IN UŽIVANJE PSIHOAKTIVNIH SNOVI MED MLADOSTNIKI V SLOVENSKEM URBANEM OKOLJU

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ABSTRACT

Background. Studies of the relationship between leisure time physical activity, sedentary behaviour and substance use among adolescents report contradictory results. The aim of our study was to examine the association between self-reported leisure time physical activity, sedentary behaviour and alcohol, tobacco and cannabis use among adolescents in Slovenia.

Methods. Subjects consisted of 822 school children aged from 14 to 16 years, living in urban area of Ljubljana and Maribor. The data was collected using the EURO URHIS 2 survey. Logistic regressions were conducted to assess the correlation between the independent variables of physical activity; time spent watching television and using the computer, and each of the five substance use dependent variables.

Results. Frequency of daily smoking was significantly associated with leisure time physical activity, while alcohol and cannabis use were not. Watching TV ≥ 2 hours per day was associated with heavy episodic drinking in the past month, no associations were found for smoking and cannabis use. Using the computer ≥ 2 hours per day was positively associated with daily smoking, drinking alcohol in the past month, heavy episodic drinking in the past month and ever being intoxicated, while cannabis use was not.

Conclusions. These findings suggest that leisure time physical activity is associated with daily cigarette smoking, and leisure time sedentary behaviour is associated with alcohol and tobacco use among adolescents. The results of our study show the need for the formation of suitable preventive measures concerning reduced sitting time as well as leisure time physical activity targeted to adolescents.

Keywords:
alcohol, tobacco, marijuana, adolescents, computer use, watching television

IZVLEČEK

***Izhodišča**. Podatki iz do sedaj znanih študij, ki opisujejo povezavo med telesno aktivnostjo v prostem času, oblikami sedečega vedenja ter uživanjem psihoaktivnih snovi med mladostniki, so si nasprotujoči. Namen študije je bil preučiti povezanost med samoocenjeno telesno aktivnostjo in oblikami sedečega vedenja (uporaba računalnika, gledanje televizije) v prostem času ter uporabo alkohola, tobaka in marihuane med mladostniki v Sloveniji.*

***Metode**. Podatki so bili zbrani v okviru presečne pregledne raziskave o zdravju mladostnikov EUROURHIS 2. Sodelovalo je 822 srednješolcev, ki živijo v urbanem okolju Ljubljane in Maribora, starih od 14 do 16 let. Z logistično regresijo smo ocenili korelacijo med neodvisnimi spremenljivkami telesne aktivnosti in časa, porabljenega za gledanje televizije in uporabo računalnika, ter vsako od petih odvisnih spremenljivk uživanja psihoaktivnih snovi.*

***Rezultati**. Telesna aktivnost v prostem času je statistično pomembno povezana s pogostostjo dnevnega kajenja, medtem ko povezave z uživanjem alkohola in uporabo marihuane nismo dokazali. Gledanje televizije dve uri ali več na običajen šolski dan je statistično pomembno povezano z občasnim čezmernim pitjem v zadnjem mesecu, povezava s kajenjem tobaka in marihuane ni ugotovljena. Uporaba računalnika dve uri ali več na običajen šolski dan je statistično pomembno povezana z dnevnim kajenjem tobaka, uživanjem alkohola v zadnjem mesecu, občasnim čezmernim pitjem v zadnjem mesecu in opitostjo vsaj enkrat v življenju, povezave z uporabo marihuane nismo dokazali.*

***Zaključek**. Med mladostniki je telesna aktivnost v prostem času povezana z dnevnim kajenjem tobaka, oblike sedečega vedenja pa z uživanjem alkohola in kajenjem tobaka. Rezultati raziskave kažejo na potrebo po pripravi ustreznega preventivnega programa, s katerim bi sočasno spodbujali telesno aktivnost in omejevali oblike sedečega vedenja.*

***Ključne besede**:*
alkohol, tobak, marihuana, mladostniki, uporaba računalnika, gledanje televizije

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1 INTRODUCTION

Despite the health risks associated with alcohol consumption, tobacco and marijuana use (1), the abuse of these substances remains common in Slovenia. According to the 2010 survey among Slovenian students aged 15 years, 40,7 % were drunk at least twice in their life, 23,2 % reported using marijuana at least once, and 13,9 % were daily smokers (2).

Regular physical activity in childhood and adolescence improves strength and endurance, helps build muscles and bones, helps control weight, reduces stress and anxiety, increases self-esteem, and may improve blood pressure and cholesterol levels (3). Physical activity declines and sedentary behaviour becomes more common during adolescence (4), as well as substance use (2). A number of cross-sectional studies found an association between physical inactivity and substance use – smoking, other tobacco use and alcohol consumption in the previous 30 days (5), alcohol consumption (6), initiation of cigarette smoking and alcohol use (7), cigarette smoking and marijuana use (8). There is also evidence that adolescent physical activity may have a protective effect against subsequent adult alcohol use (9) and progression to other illicit drugs (10). However, sport participation has been associated with a greater use of alcohol (11, 12), heavy episodic drinking of five or more units of alcohol on one occasion (13), and getting drunk (12) among adolescents. In addition, studies have examined gender differences between sport participants and those not participating. Males participating in sports were less likely to use cigarettes, cocaine and other drugs compared with males not participating in sports (8). Male sports participants have been found to be more likely users of alcohol (7) and cannabis (14) than nonparticipants. Females participating in sports have been found to be less likely users of cigarettes (7) and cannabis (14) than those not participating in sports. Longitudinal studies among adolescents found an association between physical inactivity and substance use later in life, resulting in excess alcohol use, illicit drug use (15), and adult smoking (16).

A longitudinal study found that adolescents, aged from 10 to 15 years, who watched more than five hours of television (TV) per day, had significantly higher odds of smoking initiation during the follow-up than those who watched less than two hours of TV per day (17). A study found that elementary school pupils who were watching ≥ 3 hours of TV/video games were significantly more likely to drink alcohol compared with those who watched TV/video games ≤ 2 hours (18), while another study found that adolescents who indicated they play computer games reported significantly less substance abuse than those who indicated not playing computer games (19). A study found that video and computer game use in adolescents was not associated with the onset of drinking, in contrast to the baseline TV viewing hours, which were associated with it (20). According to Krčmar and Greene, children who watch violent television are more likely to use/abuse substances; among adolescents, there is a link between an exposure to violent TV and risk-taking behaviour (e.g., drug abuse, drinking and driving) (21). Furthermore, a higher daily screen-based media use is associated with more frequent reports of alcohol use and illicit drug use (22).

For children and youth, physical activity includes playing, games, sports, transportation, chores, recreation, physical education, or planned exercise. They should accumulate at least 60 minutes of physical activity daily (23). The American Academy of Pediatrics recommendation set a time limit on the amount of total media time for children and adolescents to no more than 2 hours per day (24).

There is not enough data about the correlation between physical activity and substance use among youth in Slovenia. Therefore, the aim of this study was to examine the correlation between self-reported leisure time physical activity, sedentary behaviour and alcohol, tobacco and cannabis use among adolescents in Slovenia.

2 METHODS

2.1 Study Design

We analysed data from the European Urban Health Indicators System Part 2 study (EURO-URHIS 2), an international cross-sectional survey, conducted in 2010. EURO-URHIS 2 aimed to develop methodology and validate tools useful to policy makers to make health gains via evidence-based policy decisions for urban populations. It gathered information by collecting data from routinely available registration data, and by conducting youth (14–16 years old) and adult (19–64 and 65+ years old) survey in 26 urban areas in Europe. The sampling frame was all secondary schools within Ljubljana and Maribor, selected to provide the representative sample of pupils aged from 14 to 16 years. A sample size of 10 schools (with 2 classrooms from each) was acquired following a stratified random sampling approach. The study was approved by the Medical Ethics Commission of the Republic of Slovenia, No. 105/06/10. The participation was anonymous and voluntary. The participants were minors, hence informed written consent of their parents was obtained.

2.2 Measures

All pupils completed an international standardized questionnaire, comprised of 40 questions that retrieved information about age, gender, alcohol and drug consumption, smoking behaviour, sedentary behaviour, physical activity, and other health behaviour. The

questionnaire was standardised, translated into Slovenian language, and for validation purposes, translated back into English. In further analysis, the physical activity variable was recoded in two variables: at least 60 minutes of physical activity per day over the past week (1=0 days to 8=7 days), and participating in vigorous physical activity for two or more hours per week in free time (0=no, 1=yes). The sedentary behaviour variable was recoded in two variables: watching TV ≥ 2 hours per day on an average school day (0=no, 1=yes), and using computer ≥ 2 hours per day on an average school day (0=no, 1=yes). Smoking behaviour was recoded as daily smoking (0=no, 1=yes). Alcohol use was measured with three variables: drinking alcohol over the last 30 days in a pub, bar, restaurant or disco (0=0 days, 1=1 to 20 days or more), heavy episodic drinking over the last 30 days (0=0 times, 1= 1 to 10 or more times), and being intoxicated during lifetime (0 = 0 times, 1 = 1 to 40 or more times). Respondents were also asked of lifetime use of cannabis (no=0, yes=1).

2.3 Statistical Analysis

Descriptive statistics conducted included frequencies, means and standard deviations. A logistic regression model was used to examine and identify associations between the independent variables of physical activity and sedentary behaviour, and each of the five dependent variables of substance use. We used a significance level of 0,05 for all statistical tests. The data was weighted by gender. All analyses were conducted by using SPSS, Release 20.

3 RESULTS

Out of 978 respondents (499 in Ljubljana, 479 in Maribor), 822 (84 %) returned a complete questionnaire that was included in the database. School respond rate was 100 %. Just over half of the pupils participating in the study were female (55,7 %). Most of the participating youth was 15 years old (mean = 14,81, standard deviation = 0,53). Of all the students who completed the questionnaire, 12,2 % reported they were daily smokers, 15,0 % reported they had used cannabis, 56,1 % reported drinking alcohol over the last 30 days in a pub, bar, restaurant or disco, 37,5 % reported heavy episodic drinking in the past month, and 37,8 % reported being intoxicated during lifetime. Only 17.2 % of the youth reported being physically active for at least 60 minutes per day every day in the past week. Vigorous physical activity ≥ 2 hours per week in leisure time was reported by 52,2 % of adolescents. 42,2 % of participants reported watching TV ≥ 2 hours per day on an average school day, while 52,1 % of participants reported using the computer ≥ 2 hours per day on an average school day (Table 1). 25,5 % of males reported being physically active for at least 60 minutes per day every day in the past week, whilst vigorous physical activity ≥ 2 hours per week in leisure time was reported by 65,6 % of males. Females reported being physically active for at least 60 minutes per day every day in the past week in 11,4 %, while vigorous physical activity ≥ 2 hours per week in leisure time was reported by 43,1 % of females.

Table 1. The prevalence of substance use by demographic categories, sedentary behaviour and physical activity among high school students (EURO-URHIS 2, 2010) .

	Daily smoking %	Ever used cannabis %	Drinking alcohol over the last 30 days in a bar %	Heavy episodic drinking in the past month %	Intoxicated during lifetime %
Gender					
male	10,8	17,0	63,4	41,9	43,3
female	13,3	14,5	53,0	36,0	38,9
Chi sq (P value)	(0,281)	(0,341)	(0,003)	(0,085)	(0,219)
Age					
14 years	0	9,1	40,0	18,2	14,3
15 years	9,4	13,8	57,0	37,3	39,7
16 years	43,1	33,8	68,1	58,5	61,3
Chi sq (P value)	(0,000)	(0,000)	(0,009)	(0,001)	(0,000)
Television hours					
>2 hours	13,3	15,9	62,1	44,3	41,6
<2 hours	10,6	14,9	55,2	34,6	40,2
Chi sq (P value)	(0,252)	(0,718)	(0,055)	(0,006)	(0,707)
Computer use					
>2 hours	15,4	19,1	63,4	43,6	44,4
<2 hours	8,2	10,5	51,5	32,7	36,6
Chi sq (P value)	(0,002)	(0,001)	(0,001)	(0,002)	(0,029)

	Daily smoking %	Ever used cannabis %	Drinking alcohol over the last 30 days in a bar %	Heavy episodic drinking in the past month %	Intoxicated during lifetime %
Vigorous physical activity					
>2 hours	9,6	15,8	57,4	38,4	41,4
<2 hours	15,3	15,1	58,6	39,2	40,6
Chi sq (P value)	(0,012)	(0,136)	(0,719)	(0,826)	(0,840)
Physically active >1h/day in past week					
0	2,4	5,8	2,7	2,1	2,5
1	5,1	10,0	3,9	5,8	5,0
2	11,8	10,0	15,2	13,5	13,7
3	17,8	13,3	17,6	17,3	16,0
4	17,4	17,5	16,7	16,2	18,3
5	16,5	12,5	14,5	15,2	14,8
6	11,1	8,3	12,7	12,1	12,8
7	17,9	22,5	16,7	17,7	16,9
Chi sq (P value)	(0,000)	(0,100)	(0,017)	(0,102)	(0,015)

Females were significantly less likely to drink alcohol in the past month than males. It can also be noted that older students were significantly more likely to smoke daily ($p < 0,005$), drink alcohol in the past month ($p < 0,05$), indulge in heavy episodic drinking in the past month ($p < 0,005$), and being intoxicated during lifetime ($p < 0,005$). Students watching TV ≥ 2 hours per day were significantly more likely to conform to heavy episodic drinking in the past month ($p < 0,05$) than students watching TV less than 2 hours per day. Pupils using computer ≥ 2 hours per day were significantly more likely to smoke daily ($p < 0,005$), drink alcohol in the past month ($p < 0,005$), indulge in heavy episodic drinking in the past month ($p < 0,005$), and being intoxicated during lifetime ($p < 0,05$) than those using the computer less than 2 hours per day. Students that participate in vigorous physical activity ≥ 2 hours per week in their leisure time were significantly less likely to smoke daily ($p < 0,05$) than students participating in less vigorous physical activity. Students that reported being physically active for at least 60 minutes per day, every day in the past week, are significantly less likely to smoke daily than students that reported less physical activity ($p < 0,005$).

Logistic regressions were conducted for females for each of the five substance use measures. Older female students were significantly more likely, than students aged 14 years, to smoke daily ($p < 0,005$) and ever use cannabis ($p < 0,05$). Female pupils watching TV ≥ 2 hours per day on an average school day were significantly more likely to smoke daily ($p < 0,05$) than pupils watching less TV. Female adolescents using computer ≥ 2 hours per day were significantly more likely to smoke daily ($p < 0,005$), drink alcohol in the past month ($p < 0,005$), indulge in heavy episodic drinking in the past month ($p < 0,005$), and being intoxicated during lifetime ($p < 0,05$) than their peers. Females that participate in vigorous physical activity ≥ 2 hours per week in leisure time were significantly less likely to smoke daily ($p < 0,05$) than those participating less. Females that reported being physically active for at least 60 minutes per day, every day in the past week, are significantly less likely to smoke daily ($p < 0,005$), ever use cannabis ($p < 0,05$), and being intoxicated during lifetime ($p < 0,05$) than those that reported less physical activity.
Logistic regressions were also conducted for males for each of the five substance use measures to examine which behaviours might predict use. Older male students were significantly more likely, than students aged 14 years, to smoke daily ($p< 0,005$), drink alcohol in the past month ($p < 0,05$), participate in heavy episodic drinking ($p < 0,005$), and being intoxicated during lifetime ($p < 0,005$). Male adolescents using computer ≥ 2 hours per day were significantly more likely to ever use cannabis ($p < 0,005$). In the males-only analyses, watching television and participating in vigorous physical activity were not significantly associated with any of the five substances.

There are some differences between health risk behaviours in Ljubljana and Maribor (Table 2). Logistic regressions were conducted for each city separately. Youth from Ljubljana using computer ≥ 2 hours per day, were significantly more likely to smoke daily ($p < 0,05$) and to ever use cannabis ($p < 0,005$) than those using computer less. Youth from Maribor watching TV ≥ 2 hours per day on an average school day were significantly more likely to drink alcohol in the past month ($p < 0,05$), to indulge in heavy episodic drinking in the past month ($p < 0,005$) and being intoxicated during lifetime ($p < 0,05$) than pupils watching less TV. Also, students from Maribor using the computer ≥ 2 hours per day were significantly

more likely to drink alcohol in the past month ($p < 0,005$), indulge in heavy episodic drinking in the past month ($p < 0,005$) and being intoxicated during lifetime ($p < 0,05$) than those using less computer.

Table 2. The prevalence of lifestyle factors among high school students from Ljubljana and Maribor (EURO-URHIS 2, 2010).

	Ljubljana %	Maribor %
vigorous physical activity ≥ 2 hours per week	60	53
television hours ≥ 2 hours	41	47
daily smoking	13	12
ever used cannabis	19	14
heavy episodic drinking in the past month	40	40

4 DISCUSSION

The survey explores leisure time physical activity and sedentary behaviour and its relation to substance use among in-school adolescents from Slovenia. Our findings suggest that tobacco, alcohol and cannabis are used by a substantial number of youth in Slovenia, despite age and legal regulations prohibiting their use (25), and that adolescents who are physically less active have greater odds for daily cigarette smoking, students who watch more TV have greater odds for heavy episodic drinking, and students who use the computer more have greater odds for smoking daily and alcohol use.

The study found that the frequency of daily smoking was significantly associated with leisure time physical activity. This finding seems to concur with other studies (5, 8, 14, 15, 26). Females participating in sports have been found to be less likely to smoke daily than nonparticipants, a relationship that has been reported in previous studies (5, 20). Tobacco use among males was not associated with physical activity, while other studies found an association (10, 27). In general, it appears that sport participants are more aware of health effects of smoking, or more affected by the potential performance consequences of smoking. This study found that alcohol and cannabis use were associated with physical activity in females, similar as other studies (5, 6, 8, 15, 28). It seems to be a different combination of intrapersonal factors (e.g., self-esteem, rebelliousness, valuing health, susceptibility to media) and external factors (e.g., peer group social norms, media images) that affect a pupil's desire to participate in sports and to use or not to use a certain substance (29).

Furthermore, this study found that watching TV ≥ 2 hours per day on an average school day was associated with heavy episodic drinking in the past month, which is consistent with some previous research (17, 19), but not with others (30). No associations were found for tobacco and cannabis use. Watching TV for two or more hours per day on an average school day was associated with daily smoking with females, but not with males. Alcohol use is frequently presented as positive in TV, and even in some programming. Though cigarette ads have been removed from TV, smoking is still common in music videos and TV shows. Additionally, cigarette or alcohol beverage billboards, logos, and banners can be seen on TV (18). Using the computer for two or more hours per day was positively associated with daily smoking, drinking alcohol in the past month, heavy episodic drinking in the past month and being intoxicated during lifetime – a relationship that has been reported in some previous studies (31), but not in others (30). Using the computer for two or more hours per day with females was positively associated with daily smoking, drinking alcohol in the past month, heavy episodic drinking in the past month and being intoxicated during lifetime, but not with males. Using the computer for two or more hours per day on an average school day was associated with cannabis use with males, which is consistent with results from the previous study (32). Consistent with findings from previous studies (33, 34), we found that those who use the computer excessively compared to their peers were seen to be at an increased risk of substance use: alcohol, tobacco and cannabis. There are several possible mechanisms explaining this association. Computer use, eating and gambling may share the same neurobiological mechanism with substance dependence and can be named 'behavioural addiction' (35). Thus, if the computer usage or television watching had the potential to be addictive, adolescents with vulnerability to drug use would be vulnerable to excessive computer use. Alternatively, the co-occurrence of excessive computer use and drug use may also be due to shared risk factors, such as neurobehavioral disinhibition, high novelty-seeking (34), low life satisfaction, and low self-esteem (36). It is also possible that one behaviour may cause the other.

Alcohol was the most prevalent substance used by youth. This is consistent with the previous research from Slovenia's Health Behaviour in School-Aged Children (HBSC) study from 2010 (37), and European School Survey Project on Alcohol and Other Drugs (ESPAD) from 2011 (38). Percentages are higher for all three variables of alcohol consumption in ESPDAD survey (58 % of youth reported drinking alcohol over the last 30 days in a bar or pub, while heavy episodic drinking in the past month was reported by 53 %, and lifetime intoxication by 56 %), compared to our results. Daily smoking was reported more frequently in HBSC study (13,9 %) than in the present study. Reported lifetime use of cannabis was higher in the ESPAD survey (23 %) and the HBSC survey (23,2 %), compared to our

results. The differences could be attributed to a smaller sample size of our study and, consequently, understated results.

Slovenia is an example of a typical wet culture where alcohol is cheap, easy to come by, and frequently used by everybody. To limit the availability of alcohol, especially among youth, the Act Restricting the Use of Alcohol (Zakon O Omejevanju Porabe Alkohola, ZOPA) was approved in 2003. It includes restrictions about alcohol content labelling on the package, a warning that the product is not suitable for children, and a ban on the sale and supply of alcoholic drinks and beverages with added alcohol to persons under the age of 18 years and those who show obvious signs of intoxication from alcohol. Also, the following policy tools and legislation are important: the Act Restricting the Use of Alcohol (2003); the Act Regulating the Sanitary Suitability of food and goods and substances which come into contact with food (2000); the Media Act (2001). Advertising of alcohol selling is also restricted; there are regulations on alcohol advertising and on alcohol sponsorship as well as on sales promotion. But it must be mentioned that despite the laws, in many ways the advertising of alcoholic beverages (beer and wine) is permitted (39). Nine Slovenian municipalities have banned drinking in public places, where it is also prohibited to disperse alcoholic beverages (40).

Physical inactivity and sedentary lifestyle are associated with being overweight in children and adults (41). Decreasing sedentary behaviours and increasing physical activity participation should be the focus of strategies aimed at preventing and treating overweight and obese youth (42). Key legislative measures for preventing or reducing risk behaviours in Slovenian adolescents are: increasing the taxation (prices) of alcohol beverages and tobacco products; banning marketing activities in the field of alcohol and tobacco industries; introducing pictorial health warnings on tobacco products; further measures to reduce the attractiveness of tobacco products; limiting and regulating the sale of cannabis products. All measures need to be strictly monitored (43).

The findings of this study are subject to several limitations. Firstly, the data are cross-sectional, therefore causation cannot be implied. Secondly, this data apply only to youths who attend school and are therefore not representative of all persons in this age group. Thirdly, the data were self-reported, increasing the chance of under-reporting or over-reporting. Although gender was accounted for in the analysis, there are many other potentially contributing factors for substance use, i.e. socioeconomic status, intensity of sport participation, different types of sport, parental monitoring, teasing at school (14).

Despite these limitations, our study indicates that excessive time spent behind the monitor is common among Slovenian adolescents, and that duration of TV and computer use was significantly associated with smoking tobacco and alcohol use. Many of them are inadequately active, though physical activity was significantly associated with smoking tobacco. Further research is necessary to describe the link between physical activity and sedentary behaviour and their influence on substance use more clearly; it is critical that future research includes longitudinal studies that can investigate the underlying causal mechanisms.

5 CONCLUSION

This study indicates that high school children who are physically less active have greater odds of reporting daily cigarette smoking. Students who watch TV more have greater odds of reporting heavy episodic drinking in the past month. In addition, students who use the computer more have greater odds of reporting daily smoking and alcohol use.

Many health outcomes associated with sedentary behaviour occur independent of physical activity. It is important that health promotion seeks to increase physical activity and decrease time spent in sedentary behaviour, because these are independent, rather than mutually exclusive,behaviours.

CONFLICTS OF INTEREST

The authors declare that no conflicts of interest exist.

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ETHICAL APPROVAL

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THE INFLUENCE OF WORKERS' HEALTH STATUS ON EMPLOYERS' DECISION-MAKING DURING PERSONNEL RESTRUCTURING IN A TYPICAL PUBLIC LIMITED ENTERPRISE IN SLOVENIA

VPLIV ZDRAVSTVENEGA STANJA DELAVCEV NA ODLOČANJE DELODAJALCA MED PROCESOM KADROVSKEGA PRESTRUKTURIRANJA ZNAČILNE DELNIŠKE DRUŽBE V SLOVENIJI

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ABSTRACT

Keywords:
sick leave, disability category, medical certificates, health selection, personnel restructuring

Objectives. Alongside individual indicators of job performance, even workers' health status could be a criterion for selection. The mechanisms for health selection are a reduction of productivity in relation to illness or certain health behaviour. The aim of the study was to establish how indicators of workers' health status, which are accessible to the employer, influence the employer's decision-making on which workers to retain and which to dismiss during personnel restructuring in the enterprise.

Methods. Due to a planned closure of a plant, the observed company began personnel restructuring which included a strategic decrease in the number of employees and the relocation of workers within the company. Two nested case control studies were conducted. The cases were divided into two groups and defined as follows: employees who were relocated and employees whose employment contract was terminated.

Results. The results show that the disability category and long-time sick leave exert the greatest influence on the employer's decision on the selection of workers. Workers with work-related disability have lower odds to be relocated to a new workplace (OR=0.5; 95% CI 0.2 to 1.1) and higher odds to be dismissed (OR=6.51; 95% CI 3.33 to 12.72). The workers with a history of a long-time sick leave also have lower odds to be relocated (OR=0.31; 95% CI 0.11 to 0.88) and higher odds to be dismissed (OR=4.32; 95% CI 2.08 to 8.96).

Conclusions. Indicators of health which were accessible to the employer actually exerted influence on the employer's decision-making, which could show a direct form of health selection.

IZVLEČEK

Ključne besede:
bolniški stalež, kategorija invalidnosti, zdravniška spričevala, selekcija zaradi zdravstvenega stanja, kadrovsko prestrukturiranje

Izhodišča. *V času gospodarskega prestrukturiranja in krize je veliko delavcev odpuščenih ali premeščenih na nova delovna mesta. Na odločitev delodajalca, koga bo odpustil in koga premestil, lahko vpliva tudi zdravje delavca. Cilj raziskave je ugotoviti, kako objektivni kazalci zdravstvenega stanja delavcev, do katerih ima delodajalec dostop, vplivajo na odločanje, kdo bo premeščen na drugo delovno mesto in kdo odpuščen.*

Metode. *Značilno slovensko podjetje s 1000 zaposlenimi je v letu 2005 začelo kadrovsko prestrukturiranje, ki je vključevalo zmanjševanje števila zaposlenih in premeščanje na druga delovna mesta znotraj podjetja. Narejeni sta bili dve vgnezdeni študiji primerov s kontrolami. Kot primera sta bili definirani dve skupini delavcev: tisti, ki jih je delodajalec v opazovanem obdobju premestil na drugo delovno mesto in tisti, ki jim je odpovedal pogodbo o zaposlitvi iz poslovnega razloga. Kontrole so bili delavci iz preostale kohorte, usklajeni po socialnem statusu, spolu in starosti.*

Rezultati. *Rezultati kažejo, da na odločitev delodajalca o izbiri delavcev najbolj vplivata kategorija invalidnosti in dolgotrajni bolniški stalež. Delovni invalidi imajo manjše obete, da bodo premeščeni na novo delovno mesto (RO=0.5; 95% IZ 0.2-11), in večje, da bodo odpuščeni (RO=6.51; 95% IZ 3.33-12.72). Tudi delavci, ki so bili v bolniškem staležu ≥ 30 dni, imajo manjše obete, da bodo premeščeni (RO=0.31; 95 % IZ 0.11-0.88), in večje, da bodo odpuščeni (RO=4.32; 95% IZ 2.08 - 8.96).*

Zaključek. *V raziskavi smo dokazali, da kazalniki zdravja, do katerih ima dostop delodajalec, vplivajo na odločanje delodajalca v procesu prestrukturiranja podjetja, kar kaže na neposredno obliko selekcije zaradi zdravstvenega stanja.*

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1 INTRODUCTION

The decline in economic activity in Slovenia during the crisis was among the largest in the EU. Several years of unfavourable economic conditions have brought a significant deterioration in the situation on the labour market, which, alongside the cuts in pension and social benefits in 2012, has deepened the decline in disposable income in the last few years and hence the material welfare of households. This situation largely contributed to an increasing unemployment rate.

When deciding which workers could contribute to higher productivity, employers, as a rule, take into consideration individual indicators of job performance, such as education, personal characteristics, experience; this is referred to as the positive selection of workers (1). The question is posed whether the employers' decision on which workers to retain and which to dismiss is based on their health at the time when labour supply exceeds demand. In this case, the workers' health would be the criterion for the selection.

Due to personal data protection, employers usually do not know how healthy or sick the employees are; that is why their decisions are based on the health indicators accessible to them. These are: sick leave, disability category and approved occupational doctor's certificate (medical certificate). The medical certificate is a document with which an occupational doctor confirms whether the worker fulfils special health requirements for the performance of a particular work after s/he has carried out a preventive medical check-up. A worker's workability is assessed as follows: workability without restrictions, workability with a restriction, temporary or permanent incapacity to work. The occupational doctor can also propose in his/her certificate that workability should be assessed by the Invalidity Committee of the Pension and Disability Insurance Institute of Slovenia.

On the basis of these indicators, employers can assess the worker's workability and can presuppose what influence these indicators will have on the operational effectiveness and, indirectly, also on the business results of a company. The indicators of workers' ill health can represent a sign of lower operational effectiveness for the employer, resulting in direct absence from the work process (sick leave) or, indirectly, they can refer to the limitations in the complete performance (disability and restrictions at work), resulting in the absence of achieving the expected goals (2, 3).

As it is presumed that, in the course of restructuring, the decision of management which workers will be relocated to another workplace and which workers will be dismissed, depends on the health status of the employees, the aim of our study was to find out how objective indicators of workers' health status (sick leave, approved medical practitioner's certificate and disability category) influence the employer's decision-making concerning personnel restructuring (the relocation of workers within the company and termination of employment relationship) of a typical Slovene public limited company.

2 METHODS

2.1 Study Population

The observed population consisted of the employees of a typical public limited company with more than 1000 employees, the company belonging to the non-ferrous metal industry. The company has been chosen because one of the researchers (otherwise employed in a public medical centre) is carrying out duty as the occupational doctor for the enterprise. Due to a planned closure of a plant (in 2008), the company began personnel restructuring as early as 2005, the restructuring which included a strategic decrease in the number of employees and the relocation to other workplaces within the company. The peak was reached in 2009, with the occurrence of the economic crisis. The initial observed population is comprised of 885 workers who were employed in the observed company on a permanent basis on January 1, 2005, for at least a year. The workers whose employment contract was suspended or terminated on fault-based grounds were excluded from the observed population. The observed period was from January 1, 2005, to December 31, 2010. The data were abstracted from administrative records. Ethical approval for the study was obtained from the Republic of Slovenia National Medical Ethics Committee, Ljubljana.

2.2 Study Design

Two nested case control studies were carried out.

The first case control study: Relocation to a different workplace

- The cases are defined as employees who were relocated to a different workplace by the employer in the observed period.
- For one case of a relocated worker, two controls were chosen, which were matched by sex, age, position in the workplace (blue and white collar workers), and were employed at the time when the relocation of the case took place.

The second case control study: Termination of employment relationship

- The cases are defined as employees whose employment contract was terminated for business purposes.
- For one case of a dismissed worker, four controls were chosen, which were matched by sex, age, position in the workplace (blue and white collar workers), and

were employed at the time when the dismissal of the case took place.

In both case control studies, the same outcomes were observed: sick leave and approved medical certificate (the limitation of workability and proposal for the assessment of the remaining workability at the Invalidity Committee) and the already recognized disability category.

We wanted to establish how the employer's decision was influenced by the frequency, duration and seriousness of sick leave in the year prior to the change in the employment relationship. The frequency of sick leave was defined as the number of cases of sick leave per person, the duration of sick leave as the number of days of sick leave per person, and seriousness was defined as the number of days of sick leave per one case of sick leave. Sick leave was divided into three classes depending on its duration, namely: total sick leave (all cases of sick leave independent of the duration of (an) individual case); sick leave ≤ 5 days (only those cases of sick leave that lasted equal to or fewer than five days), and sick leave ≥ 30 days (only those cases of sick leave that lasted for thirty days or more). For each class, the percentage, frequency, duration and seriousness of sick leave were calculated.

The results of the medical certificate were divided into two groups: workers without restrictions of workability and workers with a restricted workability. The group of workers with a restricted workability also included workers with an established temporary or permanent incapacity to perform current work.

In Slovenia, workers with work-related disability were eligible for disability pension benefits which were granted by the Pension and Disability Insurance Institute of Slovenia. The disability is classified into three categories. The first category means disability retirement (loss of work capacity). The second and third disability categories mean that a worker can still work with some limitation. The second disability category includes insured persons whose work capacity for their own profession is reduced by 50 per cent or more, and the third disability category includes insured persons who, with or without professional rehabilitation, are no longer capable of a full-time work, but can perform certain work at least part-time, or whose work capacity for their own profession is reduced by less than 50 per cent, or who can still work in their profession full-time, but cannot perform the work to which they are assigned.

When assessing the influence of the disability pension, only the second and the third disability categories were taken into consideration, the categories obtained prior to the change in the employment relationship (relocation/dismissal). All test subjects falling within the second and third disability categories were treated as one group.

As confounders, the following was taken into consideration: the level of education, smoking, diagnoses related to alcohol abuse and body mass index.

2.3 Data Collection

The data on the employees who represented the initial observed population (n = 885) were obtained for each year separately (2005–2010), from two databases at the human resources department of the company. Data collection was exactly the same in both case control studies, which were checked manually for each year separately. The workers left the company for different reasons: death, retirement at retirement age, disability retirement, dismissal by mutual agreement, employment contract was suspended or terminated on fault-based grounds.

For each case and control, the data was collected on sick leave for each month separately, 12 months prior to the change regarding the date of the change in the employment contract. The month prior to the change in the employment relationship was excluded because this is the time usually needed for the administrative procedures necessary for the relocation of a worker. The duration of sick leave is presented in working days and is calculated on the basis of man-hours. If the absence from work did not exceed four hours, it was not taken into consideration. Regarding the length of sick leave expressed in working days, sick leave was divided into three classes, according to the method of the organization of health insurance in the case of sick leave, duration of the working week (40 hours/week), and our presupposition that a longer sick leave would be a better indicator of ill health or illness, while non-medical (social and personal) circumstances exert a greater influence on shorter sick leave (fewer than 5 days) (4–10).

The occupational medicine health record served as the basis for obtaining a medical certificate with the assessment of fulfilling special health demands after the performed preventive medical check-up needed for a particular workplace and the medical practitioner's proposal for the assessment of the remaining workability by the Invalidity Committee. The assessments of the last preventive medical check-up prior to the change in the employment relationship were taken into consideration. The occupational medicine health record also served as a basis for the smoking status, diagnoses related to alcohol abuse and body mass index at the time of the last check-up for all the cases and controls.

2.4 Data Analysis

Data analysis was exactly the same in both case control studies. All analyses were performed with IBM SPSS Statistics 21.0. package. Standard descriptive statistics

was followed by the calculation of differences in the frequency of values of variables or differences in mean values between the cases (relocated, dismissed) and controls using the t-test and Chi-square test. Differences in the share, frequency, duration and seriousness of sick leave (total sick leave, sick leave ≤ 5 days and sick leave ≥ 30 days), in the restrictions of workability, proposals for the assessment of the remaining workability by the Invalidity Committee, as well as disability categories were tested. A further analysis focused on the connection between an individual variable and the possibility that a worker would be relocated or dismissed. Univariate logistic analysis was followed by multivariate logistic analysis, or the formation of models for testing the hypothesis about the causal association between the relocation or dismissal (dependent variable) and independent variables. Conditional logistic regression was used in the calculation. The causal relationship was defined as the likelihood (OR; 95% CI) that the employer decides for the relocation of a worker to a new workplace, or for the termination of the employment relationship.

3 RESULTS

From the initial population (n = 885), 231 cases and 602 controls were chosen. In the initial population, 90% were men, 69% of them were blue collar workers, who were 43 years old on average and had been employed for 23 years (20 years in the observed public limited company). In the observed period from January 1, 2005, to December 31, 2010, 161 workers were relocated, most of them in 2009 (29%). In the same period, 70 workers were dismissed, most of them in 2010 (44%) (Table 1). The majority of the relocated (78%) and dismissed (80%) workers were male production workers. The majority of the workers employed in the company were male (85%), 73% of them being blue collar workers.[1]

Table 1. Relocated and dismissed workers from 2005 to 2010.

OBSERVED PERIOD	RELOCATED (n = 161)	DISMISSED (n = 70)
January 1, 2005 – December 31, 2005	10	2
January 1, 2006 – December 31, 2006	37	2
January 1, 2007 – December 31, 2007	23	8
January 1, 2008 – December 31, 2008	31	23
January 1, 2009 – December 31, 2009	47	4
January 1, 2010 – December 31, 2010	13	31

In comparison to the relocated workers, a significantly longer duration (p=0.032) and greater seriousness of total sick leave (p<0.001) can be observed in dismissed workers: they have significantly more (p<0.001) long-time sick leave (sick leave ≥ 30 days), restrictions of workability (p<0.001), proposals for the assessment of the remaining workability (p<0.001), as well as the disability category (p<0.001) (Table 2).

Table 2. Cases (relocated and dismissed workers) by percentage of sick leave, restriction of workability, proposal for the assessment of the remaining workability and disability category.

	RELOCATED (n = 161)		DISMISSED (n = 70)		
VARIABLE	*n*	%	*n*	%	*p Value*
Sick leave	100	62.1	44	62.9	0.914
Restriction of workability	27	16.8	37	52.9	< 0.001
Proposal for the assessment of workability	6	3.7	22	31.5	< 0.001
Disability category	8	4.96	30	42.8	< 0.001

3.1 The First Case Control Study: Relocation to a Different Workplace

3.1.1 Descriptive Statistics

The average age of the relocated workers (cases) was 41, and the average employment period is 20 years, almost 19, in the company. At the time of the relocation of the cases, the average employment period of the controls was 21 years, and the average duration of the employment in the company amounted to 18 years.

In the observed period, 62% of the relocated workers and 61% of the controls were on sick leave. There are no significant differences between the relocated workers and controls in the share of workers who were on sick leave (Table 3), in the frequency, duration and seriousness of total sick leave.

[1] The data of the personnel department from January 1, 2005.

Table 3. Cases (relocated workers) and controls by percentage of sick leave, restriction of workability, proposal for the assessment of the remaining workability and disability category.

	RELOCATED (n = 161)		DISMISSED (n = 322)		
VARIABLE	*n*	%	*n*	%	*p Value*
Sick leave	100	62.1	195	60.6	0.741
Restriction of workability	27	16.8	51	15.8	0.793
Proposal for the assessment of workability	6	3.7	14	4.3	0.747
Disability category	8	4.96	30	9	0.094

In comparison to the controls, a significantly lower (p=0.028) share of the relocated workers were on long-time sick leave (sick leave ≥ 30 days). There were no significant differences in the frequency, duration and seriousness of short-time sick leave (sick leave ≤ 5 days) between the relocated workers and controls. The frequency (p=0.029) and duration (p=0.027) of long-time sick leave (sick leave ≥ 30 days) were significantly lower in the group of relocated workers.

There were no significant differences between the relocated workers and controls in the number of restrictions of workability, proposals for the assessment of the remaining workability and the number of recognized disability categories (Table 3).

3.1.2 Univariate Logistic Analysis

As expected, the results of univariate logistic analysis show that the odds for the relocation were lower in workers with a recognized disability category (OR=0.5; 95% CI 0.2 to 1.1) than in those without a disability category, and in those who were on long-time sick leave (sick leave ≥ 30 days: OR=0.31; 95% CI 0.11 to 0.88), in comparison with the workers without long-time sick leave.

3.2 The Second Case Control Study: Termination of Employment Relationship

3.2.1 Descriptive Statistics

The average age of the dismissed workers (cases) was 51, and the average employment period was 31 years, almost 27 years in the company. At the time of the termination of the employment contract, the average employment period of the controls of the dismissed workers was almost 32 years, and the average duration of the employment in the company was almost 26 years.

In the observed period, 63% of the dismissed workers and 68% of the controls were on sick leave. There are no significant differences between the dismissed workers and controls in the share of workers who were on sick leave (Table 4) and in the frequency and duration of total sick leave. On the contrary, the level of seriousness of total sick leave is significantly (p<0.001) higher in dismissed workers, and the same holds true for the share of workers who were on long-time sick leave (sick leave ≥ 30 days) (p<0.001).

Table 4. Cases (dismissed workers) and controls by percentage of sick leave restriction of workability, proposal for the assessment of the remaining workability and disability category.

	RELOCATED (n = 70)		DISMISSED (n = 280)		
VARIABLE	*n*	%	*n*	%	*p Value*
Sick leave	44	62.9	191	68.2	0.393
Restriction of workability	37	52.9	71	25.4	<0.001
Proposal for the assessment of workability	22	31.5	9	3.2	<0.001
Disability category	30	42.9	33	11.8	<0.001

There are no significant differences between the dismissed workers and the controls in the frequency, duration and seriousness of sick leave ≤ 5 days. In comparison to the controls, a significantly higher frequency and duration of sick leave ≥ 30 days can be observed in the dismissed workers (p<0.001).

In the dismissed workers, the restrictions of workability, proposals for the assessment of the remaining workability and the already recognized disability category are significantly higher (p<0.001) (Table 4).

3.2.2 Univariate Logistic Regression Analysis

The results of univariate logistic analysis show that the risk for the termination of the employment was more than 4 times greater in workers on long-time sick leave (sick leave ≥ 30 days), compared to those without sick leave ≥ 30 days; more than 3 times higher in workers with limited workability, compared to those without restriction of workability; and more than 6 times greater in workers with disability category than in those without disability category. The highest risk for the termination of the employment relationship was faced by the workers with a proposal for the assessment of the remaining workability (OR=15.77; 95% CI 5.94 to 41.88) in comparison to the workers without a proposal for the assessment of the remaining workability (Table 5).

Table 5. Odds ratio (OR; 95% CI) for the termination of employment relationship in dismissed workers, univariate logistic analysis.

	OR	95% CI	p Value
Sick leave	0.79	0.45 to 1.36	0.390
Sick leave ≤ 5 days†	0.62	0.36 to 1.04	0.070
Sick leave ≥ 30 days‡	4.32	2.08 to 8.96	< 0.001
Restriction of workability	3.51	1.99 to 6.20	< 0.001
Proposal for the assessment of workability	15.77	5.94 to 41.88	< 0.001
Disability category	6.51	3.33 to 12.72	< 0.001
Frequency of sick leave ≤ 5 days	1.05	0.94 to 1.18	0.421
Duration of sick leave ≤ 5 days	1.02	0.95 to 1.08	0.636
Seriousness of sick leave ≤ 5 days	0.86	0.59 to 1.29	0.465
Frequency of sick leave ≥ 30 days	3.42	1.85 to 6.34	< 0.001
Duration of sick leave ≥ 30 days	1.01	1.00 to 1.02	< 0.001
Seriousness of sick leave ≥ 30 days	1.00	0.99 to 1.01	0.914

†Sick leave ≤ 5 days: cases of sick leave that lasted equal to, or fewer than, five days
‡Sick leave ≥ 30 days: cases of sick leave that lasted for thirty days or more

3.2.3 Multivariate Logistic Regression Analysis

Further data processing was aimed at establishing the mutual influence of variables on the odds for the termination of the employment relationship. In the analyses, the effect was adjusted for the termination of employment in multivariate models, adding independent variables (sick leave ≤ 5 days, sick leave ≥ 30 days, restriction of workability, proposal for the assessment of workability, disability category and frequency of sick leave ≥ 30 days) separately in the subsequent models, and finally, the full model including all independent variables and age. The odds for the termination of the employment is best described by the reduced model with two variables (sick leave ≥ 30 days and the restriction of workability): workers who are on sick leave ≥ 30 days have four times higher odds to be dismissed than those without long-time sick leave, if the occupational doctor has proposed the restriction of workability (OR=4.16; 95% CI 1.91 to 9.07) (Table 6).

Table 6. Odds ratio (OR; 95% CI) for the termination of employment relationship in dismissed workers, multivariate logistic analysis.

	OR	95% CI	p Value
Sick leave ≥ 30 days			
No	1.00		
Yes	4.16	1.91 to 9.07	< 0.001
Restriction of workability			
No	1.00		
Yes	3.37	1.87 to 6.09	< 0.001

Sick leave ≥ 30 days: cases of sick leave that lasted for thirty days or more
The introduction of dummy variables did not yield better results.

4 DISCUSSION

The majority of the workers in the study were relocated to new workplaces in 2009, which coincided with the emergence of recession and with the closure of the plant (December 31, 2008). The majority of the workers were dismissed in 2010, which was a consequence of the planned restructuring of the company (January 1, 2011) as well as of the planned pension scheme reform in 2011 (Table 1).

The results show that of all the observed indicators of workers' health, long-time sick leave (sick leave ≥ 30 days) and disability category exert the greatest influence on the employer's decision concerning the choice of workers (relocation or dismissal). Workers who were on sick leave ≥ 30 days, as well as those with a recognized disability category, have lower odds to be relocated to a new workplace and higher odds to be dismissed. The results support the findings that long-time sick leave increases the risk for job termination, short- and long-term unemployment, and that longer sick leave in the period before the restructuring of a company, affects the dismissal of workers (11–16).

The decision about relocation of workers to new workplaces is affected only by long-time sick leave (sick leave ≥ 30 days), whereas the dismissal is also influenced by the frequency and duration of sick leave ≥ 30 days. The more frequent long time sick leave, the higher the odds that the worker will be dismissed. The results support the findings that frequent absences amounting to 6 weeks or more represent a risk for involuntary job termination (17). Despite that, the seriousness of an individual case

of sick leave ≥ 30 days does not influence the employer's decision about the relocation and dismissal of workers. The results show that in cases of long uninterrupted sick leave, which is the result of an important damage to health, and which is best described by the seriousness of sick leave, the employer does not decide for the change in the employment relationship. In the case of seriously ill workers, this means that in comparison with those who are not ill, they are not exposed to greater risks of being dismissed. The fact that longer sick leave in the case of a serious disease does not increase the risk for dismissal is also confirmed by the study carried out by Magee (18). Sick leave longer than 30 days is paid by the Health Insurance Institute of Slovenia, rather than by the employer, and is quite similar to disability.

Our results confirm the finding that disabled persons are often the first to lose the job in a company that is undergoing the process of restructuring, and are the last to be re-employed when the company is back on track (19, 20).

The results show that other indicators of workers' health (restriction of workability, proposal for the assessment of workability) exert influence only on the dismissal of workers, while they are not supposed to have influence on the relocation. There are several presuppositions as to why this claim was not confirmed. One of them is that the employer's decision is most certainly affected by other factors that have not been researched in our study and are unknown to us.

Long-time sick leave (sick leave ≥ 30 days), restrictions of workability, proposal for the assessment of the remaining workability and the disability category represent risk factors for the termination of the employment relationship. Calculations show that the odds for the dismissal of a worker are the highest if the worker is on sick leave for more than 30 days, and if the occupational doctor has written a proposal for the assessment of workability by the Invalidity Committee.

The results of the study show that an occupational doctor's opinion primarily affects the dismissal rather than the relocation of workers, which is reflected in the withdrawal of a worker with restrictions from the labour market and a reduction of his/her employment possibilities. The adoption of a new pension scheme reform, which has prolonged the working life, only adds to the problem of the employment of workers with medical restrictions. It is a well-known fact that older workers suffer from more chronic diseases, which can exert an important influence on workability, and demand certain health restrictions at work. The increase in the number of older workers with health restrictions could be reflected in the increase in unemployment, which is already very high in the population aged 50 or more, and which increases social vulnerability and exclusion of the older population (21).

The study therefore shows that the indicators of a health status exert influence on the employer's decision-making in the process of the restructuring of a company, which indicates the selection of workers according to their health status. This is a direct form of health selection caused by the presence of a disease (and/or its consequences) which prevents the performance of the same work (1, 22–24).
The selection on the basis of a health status can be discriminatory when an individual is treated less favourably independently of his/her productivity due to a certain unfavourable and/or undesired characteristic (among them being disease and disability) (25).

4.1 Strengths and Limitations

The strengths of this study are: the size of the enterprise, the number of the participants and the well-documented data.

This is the first study evaluating the effect of the approved occupational doctor's certificate (medical certificate) on the employer's decision-making (relocation/dismissal) during personnel restructuring in the enterprise, and testing the combination of the observed indicators of workers' health on it. The originality of the study also lies in the fact that, in the group of 'survivors of a restructuring programme,' we observe and recognize how the employer's decision to relocate someone was influenced by their health.

The study has a special value due to its performance in the ongoing financial crisis, in which dealing with the market makes employers less sensitive to workplace discrimination.

The limits of our study pertain to the fact that other circumstances also have an influence on the decision about the relocation or dismissal of workers. Presumably, the dismissal also greatly depends on the subjective decision of an employer. Those factors have not been researched. Neither have we investigated whether the workers have any influence on the outcome of the personnel restructuring. These circumstances cannot possibly be measured objectively, and it is likely that they affect the final results. If this be so, this influence is undifferentiated and, as such, it should not have a directing effect on the results gained.

Despite the fact that the lists of relocated workers were checked in cooperation with the human resources department, it is possible that we did not take into consideration the 'real' relocation of those workers who had been relocated several times. It is believed that the influence of a possible error relating to the classification is restricted as the same workers are studied, and only the observed period changes. If such an error had an actual effect, this effect could be limited to the calculation of sick leave.

We estimated that the selection of a typical public limited company is not biased and does not have influence on the limitations of the study. Researchers are not employed in that enterprise, and the enterprise is representative of a typical public limited company in Slovenia with more than 1000 employees.

Further research is needed to determine more objective prognostic indicators which influence the relocation and the dismissal of workers, and to find out how those indicators affect employees in a small to medium-sized enterprise. A smaller number of employees mean that the employer has fewer opportunities to consider health limitations of workability.

5 CONCLUSIONS

The aim of the study was to find out how health indicators accessible to the employer influence the employer's decision concerning the selection of workers (relocation of the workers and dismissal for business purposes) during personnel restructuring in the enterprise.

The study was based on researching workers' health status as a possible criterion for the selection. The mechanism for health selection is a reduction of productivity in relation to illness (direct selection) or certain health behaviour (indirect selection) (1).

The study proves that those objective indicators of workers' health which are accessible to the employer (sick leave, approved occupational doctor's opinion and disability category) are important criteria for direct health selection and a basis for the discrimination in the workplace during personnel restructuring in the enterprise.

Despite the differences between sickness benefit, estimation of health-related workability and work-related disability, we believe that the results of the study will gain recognition regarding the influence of workers' health on their socio-economic status.

The value of the study for occupational medicine is in that it is raising the awareness of discriminatory issues in medical certification after preventive medical check-ups, and in that it represents a starting point for avoiding that. According to the present legislation, occupational doctors are experts in the area of the assessment of workability. The employers choose them themselves and sign contracts with them. Such a position most certainly does not encourage expert independence of occupational doctors, since they are available 'on the market' and compete for services. If the results of the study were added which would indicate discriminatory effects of an authorized doctor's opinion on the employment status, we could understand what kind of ethical dilemmas occupational doctors are faced with on a daily basis when reaching decisions on workability.

In the future, it would be sensible to settle the status of occupational doctors, primarily in terms of their economic independence from the employers (workers' insurance company).

The results of the study might also interest the doctors (general practitioners and doctors employed in The Health Insurance Institute of Slovenia) who have authority to issue sickness certificates.

To conclude, our findings might be of importance for those who monitor discrimination in the workplace on the basis of an employee's health, and for all policy stakeholders interested in employing people with disability and retirement planning policy.

CONTRIBUTORS

AM and MDF designed the hypothesis, analysed the data and wrote the paper.

CONFLICTS OF INTEREST

The authors declare that no conflicts of interest exist.

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Not required.

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NEONATAL PROPHYLAXIS: PREVENTION OF VITAMIN K DEFICIENCY HAEMORRHAGE AND NEONATAL OPHTHALMIA

NEONATALNA PROFILAKSA: PREPREČEVANJE KRVAVITEV ZARADI POMANJKANJA VITAMINA K IN NEONATALNE OFTALMIJE

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ABSTRACT

Introduction. The aim of the study was to explore two aspects of neonatal prophylaxis: the application of the vitamin K injection to the newborns and the prophylaxis against chlamydial and gonococcal eye infections, comparing Slovenian and Croatian practices.

Methods. A causal non-experimental method of quantitative empirical approach was used. The data was collected by means of predesigned questionnaires. The questionnaires were sent to 14 Slovenian and 32 Croatian birth hospitals. The data wasanalysed with descriptive statistics and the Kullback test.

Results. Vitamin K is applied to all newborns in 9 (out of 14) Slovene and 22 (out of 32) Croatian birth hospitals that returned the questionnaire. The prophylaxis against chlamydial gonococcal eye infections is applied to all newborns in 9 Slovene and 16 Croatian birth hospitals that offered answers to the questionnaire. The majority of Slovene and Croatian birth hospitals perform these procedures in the first hour after birth. The majority of Slovene birth hospitals still apply vitamin K in the gluteal muscle, whereas the majority of Croatian birth hospitals usually use the thigh as an injection site.

In Slovenia, 1 % Targesin is used for the prophylaxis against chlamydial and gonococcal eye infections, whereas in Croatia the prevailing medicine is Erythromycin.

Conclusions. The possibility of oral vitamin K application should be offered to parents, and pain management in practice should be discussed. The form of written informed consent could be offered to parents. Health professionals should provide intimacy and exclude routine procedures in the first couple of hours after birth. However, more research is needed as delayed administration might be related to lower efficacy and, as a consequence of that, the safety of newborns is questionable.

Keywords:
neonatal prophylaxis, vitamin K, newborn, ophtalmia, postpartum care

IZVLEČEK

***Uvod**. Namen opisane raziskave je bil proučiti določene vidike neonatalne profilakse: prakso aplikacije vitamina K novorojenčkom in profilakse proti klamidijski in gonokokni okužbi oči v slovenskih in hrvaških porodnišnicah.*

***Metode**. V raziskavi je bila uporabljena kavzalna neeksperimentalna metoda kvantitativnega empiričnega načina raziskovanja. Podatki so bili pridobljeni z vnaprej pripravljenimi vprašalniki, ki so bili razdeljeni v 14 slovenskih in 32 hrvaških porodnišnicah. Analiza podatkov je potekala z uporabo deskriptivne statistike in Kullbackovega preizkusa.*

***Rezultati**. Ugotovili smo, da se praksa v slovenskih in hrvaških porodnišnicah glede raziskovanih parametrov neonatalne profilakse razlikuje. Devet slovenskih porodnišnic (od vseh 14) in 22 hrvaških (od vseh 32), ki so sodelovale v raziskavi, aplicira vitamin K vsem novorojenčkom. Profilaktično zaščito proti klamidijskim ali gonokoknim očesnim okužbam pa izvajajo v 9 slovenskih in 16 hrvaških porodnišnicah (od vseh sodelujočih v raziskavi). Večina slovenskih in hrvaških porodnišnic opravi oba posega v prvi uri po rojstvu. Večina slovenskih porodnišnic aplicira vitamin K v glutealno mišico, medtem ko je na Hrvaškem pogostejša aplikacija v stegensko mišico. V slovenskih porodnišnicah pri apliciranju profilakse proti klamidijskim in gonokoknim okužbam oči prevladuje 1-odstotni Targezin, v hrvaških pa Eritromicin.*

***Zaključek**. Staršem je treba ponuditi možnost oralne aplikacije vitamina K. Dobro bi bilo spregovoriti o lajšanju bolečine ob tovrstnem posegu ter hkrati starše spodbuditi, da pisno in informirano privolijo v poseg. Naloga zdravstvenih delavcev je, da družini v prvih urah po porodu zagotovijo intimnost ter v tem času poskusijo odložiti rutinske postopke. Za slednje pa so potrebne dodatne raziskave, saj lahko kasnejša administracija vodi v manjšo učinkovitost profilakse in hkrati zmanjšuje varnost novorojenčkov.*

***Ključne besede**:*
neonatana profilaksa, vitamin K, novorojenčki, oftalmija, nega postpartum

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1 INTRODUCTION

Neonatal prophylaxis or prevention of neonatal diseases is an important contribution to the health condition of the general population and, consequently, reduces the costs of health services (1). In Slovenia, the routine first care of a newborn consists also of the neonatal eye prophylaxis, which usually includes the administration of eye drops. Apart from that, vitamin K is administered to newborns as a prophylaxis of haemorrhagic disease of the newborn, which has been carried out in Slovenia since 1987 (2). Both methods of neonatal prophylaxis are legally defined and mandatory in Slovenia (3), while, in Croatia, there is no formal regulation. Despite the evidence speaking in favour of the medicines used for neonatal prophylaxis, there are still certain disadvantages that can have an influence on the health and development of newborn children.

1.1 Neonatal Ophthalmia

Neonatal ophthalmia (NO), also known as conjunctivitis of the newborn, is the most common eye infection that usually occurs in the first 28 days of newborn life (4, 5). In the past, the term NO was used merely for the infections with Neisseria gonorrhoea, whereas today a number of other pathogens can be the cause of neonatal conjunctivitis (4). Neonatal prophylaxis was first mentioned around 1800 by a German obstetrician Carl Créde, who first described the prophylaxis of NO with silver nitrate and reported a dramatic decrease of gonococcal NO (8-10). Together with their development, silver nitrate was replaced by other antibiotics. However, the term 'Créde's prophylaxis' maintained in the literature (10).

1.1.1 Aetiology and Incidence

The causes of NO may be infective or non-infective (e.g. chemical, mechanical).The infective causes can be a consequence of sexually or non-sexually transmitted bacteria or viruses and can be seen more frequently in developing countries (11). The commonest bacterial sexually transmitted infections are caused by Neisseria gonorrhea and Chlamidia trachomatis (11, 12). The progress of chlamydial infections is much slower and rarely leaves serious consequences to newborns when compared to gonococcal infections (13). Apart from that, chlamydial infections are the most common bacterial sexually transmitted infections in the world (9). Cervical chlamydia in pregnancy can increase the risk of preterm birth and preterm rupture of membranes. A transmission of infect from a mother to a newborn child can occur during a vaginal labour, and can result as NO or pneumonitis in the newborn. In the case of a mother, it can also induce postpartum endometritis (14). The infection with Neisseria gonorrhoea can cause corneal ulcers and, consequently, lead towards blindness (4, 7). Despite a relatively high prevalence of prophylaxis throughout the world, NO can still be problematic since its incidence varies from 2-23 % in different countries (12).

1.1.2 Prophylaxis

Due to complications, such as visual loss, that result from Chlamydia trachomatis and Neisseria gonorrhoea infections, many countries are practising routine ocular prophylaxis in newborns with different agents (12).

Silver Nitrate

A solution of 1% silver nitrate has presented a very efficient prophylactic method for reducing gonococcal NO. However, its effect against chlamydial infections is very limited (5-6, 9) and it does not protect from all gonococcal infections (4).

Targesin

Targesin® is a farmaceutic name for silver proteinacetyltannate, which contains organically bound silver. It has an antiseptic effect that is similar to silver nitrate together with its mode of action (15).

Macrolides

Macrolides are bacteriostatic, broad-spectrum ophthalmic antibiotics, binding with bacterial ribosomes to inhibit protein synthesis (16). Erythromycin, as the prototype of this class, is used in some European countries (16), and is highly practised in United States of America (USA) and Canada as a method of neonatal eye prophylaxis (7,17). In comparison with silver nitrate, erythromycin and povidone-iodine are more efficient agents for the prophylaxis of NO caused by chlamydia (13). Azithromycin as one of the most recently approved ophthalmic antibiotics with a broad spectrum is particularly suited to ocular infections due to its unique pharmacokinetic profile allowing rapid tissue distribution, high tissue bioavailability and potent anti-inflammatory activities (16).

Tetracycline

1% tetracycline ointment with antimicrobial effect was the only available topical treatment for many years (16). Tetracycline is an efficient prophylaxis against gonococcal infections and is active against Staphylococcus, Streptococcus and Pseudomonas. Moreover, it reduces the incidence of NO in the case of chlamydial infection, but does not prevent chlamydial colonisation in the nose and throat (5).

Povidone-iodine

A solution of 2.5% povidone-iodine is a non-toxic and inexpensive preparation. Apart from that, Meyer (18)

outlines many advantages of this agent, including its positive effect against a number of microbes and the absence of antibiotic activity. However, it has to be acknowledged that its effect is still under research investigation in several studies (6).

Fusidic Acid

Fusidic acid is a bacteriostatic antibiotic that affects against N. Gonorrhoeae as well as against C. Trachomatis. It is a considerably recent agent in terms of neonatal eye prophylaxis, and its effect has to be further investigated in clinical trials (5).

1.1.3 Global Guidelines and Situation in Slovenia and Croatia

Neonatal eye prophylaxis is a mandatory procedure in Canada and most of the USA countries. Health professionals are legally obligated to perform the neonatal eye prophylaxis, and parents as citizens of these countries do not have the legal right to refuse this procedure. Therefore, certain authors emphasize that neonatal prophylaxis should be looked carefully in terms of ethics (7). A routine neonatal eye prophylaxis has been abandoned a few decades ago in numerous European countries, including United Kingdom, Sweden, Norway and Denmark (7, 13).

In accordance with the Slovenian Rules, amending the Rules on carrying out preventive health care at the primary level (3), neonatal eye prophylaxis is a mandatory intervention for all newborns in Slovenia. It has to be performed in the first 3 hours after birth with the application of 1% Targesin eye drops. In comparison, Croatia does not have the rules or the national guidelines on this specific procedure.

1.2 Prevention of Vitamin K Deficiency Bleeding

On the initiative of a number of authors, a disease formerly known as 'Haemorrhagic Disease of the Newborn (HDN)' has been renamed into a more precise term –'Vitamin K Deficiency Bleeding (VKDB)' (19-20). In the period from 1960 to 1980, most of the European countries initiated the intramuscular application of vitamin K to all newborns for prevention of VKDB (21). More than two decades ago, a controversial study came out in the United Kingdom, where intramuscular application of vitamin K was connected with a higher risk for the occurrence of childhood cancer, especially leukaemia (22). The study had a strong impact on Europe, as well as the whole world. The following papers showed the safety of vitamin K (23), but certain doubts regarding the intramuscular application of vitamin K remain.

1.2.1 Aetiology

The literature reports on three forms of VKDB: early, classic and late. Early VKDB occurs in the first 24 hours after birth, while classic VKDB can be seen between 1 and 7 days after birth. Late VKDB occurs from 2nd to 12th week after birth, with a bleeding into intracranial space, skin, intestines, and is seen almost exclusively at breastfed babies (24, 25). VKDB occurs as a result of low levels of vitamin K-dependent clotting factors and prothrombin, since it plays an essential role in the synthesis of certain blood clotting factors (factor II, VII, IX, X) (24, 25).

1.2.2 Prophylaxis with Vitamin K

Vitamin K is fat-soluble and can only be absorbed with the presence of bile salts (24). In adults, most of the vitamin K is absorbed from food and intestines, where intestinal bacteria are synthesizing vitamin K (26, 27). The absorption of vitamin K is increased when an individual eats food that is rich with fat (28). Newborns have limited reserves of vitamin K and the passage of vitamin K through the placenta is minimal. Furthermore, intestines of a newborn are still sterile and do not synthesize vitamin K. This means that the only source of vitamin K for newborns is mothers' milk, which contains very low levels of the vitamin in comparison to formula milk. Therefore, the risk for VKDB is higher in breastfed newborns (24, 29, 30). There are two options for vitamin K application, including intramuscular and oral administration. Intramuscular application presents an invasive and painful method, which can induce muscular haematoma (24), osteomyelitis and abscess (31). It has to be acknowledged that pain can have long term consequences on neurological and cognitive development of newborns (32, 33). Although the oral application is a non-invasive method, the absorption of vitamin K can be reduced if a newborn is vomiting or expressing regurgitation after consuming vitamin K (24). Most of the authors who support the oral application advise several applications of vitamin K in lower doses (34, 35). Khambalia et al. (36) emphasize that doctors and midwives should leave the decision of the method of administration of vitamin K to the parents.

1.2.3 Global Guidelines and Situation in Slovenia and Croatia

Countries, such as New Zealand, United Kingdom and Ireland, recommend routine application of vitamin K to newborns, although there is no common agreement regarding the application and frequency of oral vitamin K administration (28, 37). The National Institute for Health and Care Excellence [NICE] (38) and the Department of Health (39) recommend intramuscular application of

vitamin K for all newborns. In the case where parents refuse intramuscular application, the oral application should be suggested (38, 39). In accordance with the Slovenian Rules, amending the Rules on carrying out preventive health care at the primary level (3), prophylaxis of haemorrhagic disease has to be performed in the first 3 hours after birth with the application of 1 mg intramuscular vitamin K. The republic of Croatia does not have any national guidelines for application of vitamin K to newborns.

This article presents results of the study that aimed to audit the current existing practice of vitamin K application to newborns after birth and neonatal eye prophylaxis. Slovenian and Croatian birth hospitals were studied with the assessment by clinical leaders of perinatal wards.

The authors were particularly interested in statistically significant differences between the countries. The questions of interest were:

1. How and when is the application performed?
2. Which newborns obtain the prophylaxis?
3. How are parents informed about the application?

2 METHODS

In this study, a causal non-experimental method of quantitative empirical approach was used. The data was collected by means of pre-designed questionnaires that were tested on a pilot sample of 15 people who were not included in the main study. By this, the understanding of the questions was tested. The survey was being performed from March to May 2013. The questionnaire consisted of 11 questions related to the previously outlined research questions. Factor analysis was used for determining the validity (% of explained variance with the first factor) and reliability (% of explained variance with common factors). It showed that our research instrument is in the limits of acceptable validity (the first factor explained 22.4 % of variance) and reliability (the result of factor analysis revealed 3 factors that, all together, explain 60.1 % of the variance).

The questionnaire was sent to 14 Slovenian (Kranj, Ljubljana, Jesenice, Trbovlje, Celje, Novo mesto, Maribor, Brežice, Šempeter, SlovenjGradec, Izola, MurskaSobota, Postojna, Ptuj) and 32 Croatian (Bjelovar, Čakovec, Đakovo, Dubrovnik, Gospić, Imotski, Karlovac, Knin, Koprivnica, Makarska, Metković, Našice, Nova Gradiška, Osijek, Ogulin, Pakrac, Požega, Pula, Rijeka, Sinj, Sisak, SlavonskiBrod, Split, Šibenik, Varaždin, Zadar, Vinkovci, Virovitica, Vukovar, Zabuk, Zadar, Zagreb) labour ward clinical leaders. The response rate was 71 % in Slovenia (10 returned and completed questionnaires) and 72 % in Croatia (23 returned and valid questionnaires). The pattern was purposive. The participants were ensured a completely voluntary cooperation and anonymity. The study was approved by the Department of Midwifery on the Faculty of Health Sciences, University of Ljubljana. The data analysis was performed with the use of descriptive statistics, where Kullback 2Î test was used for assessing the differences. The differences between the countries were accepted as statistically significant when the value p was less or equal to 0.05.

3 RESULTS

9 (90 %) Slovenian and 22 (95.7 %) Croatian maternity hospitals apply vitamin K to all newborns (Table 1). Prophylaxis against chlamydial and gonococcal eye infections is applied to all newborns in at least 10 Slovenian (100 %) and 16 Croatian (69.9 %) maternity hospitals. 5 (21.7 %) Croatian maternity hospitals, estimated by the heads of birth hospital departments, do not apply prophylaxis against chlamydial and gonococcal eye infections to any newborn (Table 2). Despite the differences, which can detect the frequency distribution of data, statistical differences between Slovenia and Croatia were not traced in any of those variables.

Table 1. The application of vitamin K.

To which newborns do you apply vitamin K?		All	Other*	Total
Slovenia	f	9	1	10
	f (%)	90.0	10.0	100.0
Croatia	f	22	1	23
	f (%)	95.7	4.3	100.0
Total	f	31	2	33
	f (%)	93.9	6.1	100.0
Kullback 2Î test (2Î = 0.361, g = 1, p = 0.548)				

Legend: g - degrees of freedom, p - value of statistical significance, f - frequency, f(%) – percentage,
* If parents of the newborn did not agree and did not sign an informed consent, the newborn did not get vitamin K application.

Table 2. The application of prophylaxis against chlamydial and gonococcal eye infections.

To which newborns do you apply prophylaxis against chlamydial and gonococcal eye infections?		All	Risk	None	Other*	Total
Slovenia	f	10	0	0	0	10
	f (%)	100.0	0.0	0.0	0.0	100.0
Croatia	f	16	1	5	1	23
	f (%)	69.6	4.3	21.7	4.3	100.0
Total	f	26	1	5	1	33
	f (%)	78.8	3.0	15.2	3.0	100.0
Kullback 2Î test	(2Î= 5,839, g = 3, p = 0,120)					

Legend: g - degrees of freedom, p - value of statistical significance, f - frequency, f(%) – percentage
* Stands for all newborns, unless parents explicitly did not allow the application.

4 (40 %) birth hospitals in Slovenia and 10 (43.5 %) birth hospitals in Croatia, estimated by the heads of birth hospital departments, apply vitamin K in the first hour after birth. 4 (40 %) birth hospitals in Slovenia and 12 (52.2 %) birth hospitals in Croatia apply vitamin K from one to three hours after birth, 1 birth hospital in Slovenia (10 %) and 1 in Croatia (4.3 %) apply vitamin K from three to 24 hours after birth (Table 3). Prophylaxis against chlamydial and gonococcal infections of the eye during the first hour after birth is applied by 4 (40 %) Slovenian and 9 (60 %) Croatian birth hospitals, while the prophylaxis of the 6 birth hospitals in Slovenia (60 %) and 6 birth hospitals in Croatia (40 %) is applied from one to three hours after birth (Table 4). These results do not show any statistically significant differences between Slovenia and Croatia.

Table 3. When do you apply vitamin K?

When do you apply the vitamin K?		In the first hour after birth	From one to three hours after birth	From three to 24 hours after birth	Other*	Total
Slovenia	f	4	4	1	1	10
	f (%)	40.0	40.0	10.0	10.0	100.0
Croatia	f	10	12	1	0	23
	f (%)	43.5	52.2	4.3	0	100.0
Total	f	14	16	2	1	33
	f (%)	42.4	48.5	6.1	3.0	100.0
Kullback 2Î test	(2Î = 2.966, g = 3, p = 0.407)					

Legend: g - degrees of freedom, p - value of statistical significance, f - frequency, f(%) – percentage
* After a ceasarean section, or in case of complications during the first hour after birth, or the next morning, if the baby was born at night.

Table 4. When do you apply the prophylaxis against chlamydial and gonococcal eye infections?

When do you apply the prophylaxis against chlamydial and gonococcal eye infections?		In the first hour after birth	From one to three hour after birth	Total
Slovenia	f	4	6	10
	f (%)	40.0	60.0	100.0
Croatia	f	9	6	23
	f (%)	60	40	100.0
Total	f	13	12	33
	f (%)	52	48	100.0
Kullback 2Î test	(2Î = 0.967, g = 1, p = 0.325)			

Legend: g – degrees of freedom, p – value of statistical significance, f – frequency, f(%) – percentage

In the case of intramuscular application of vitamin K, the pain is relieved in 1 (10 %) birth hospital in Slovenia (with breastfeeding) and 5 (21.7 %) birth hospitals in Croatia (3 with breastfeeding, 1 with glucose, 1 with dressing). 9 (90 %) birth hospitals in Slovenia and 18 (78.3 %) in Croatia do not pay attention to the management of pain (Table 5). In the case of intramuscular application, 8 (80%) Slovenian birth hospitals apply vitamin K in the gluteal muscle, while most of the Croatian birth hospitals (12, 52.5 %) apply vitamin K in the thigh muscle (Table 6).

Table 5. Pain management in the case of intramuscular application.

Do you manage the pain in the case of intramuscular application?		No	Yes	Total
Slovenia	f	9	1	10
	f (%)	90.0	10.0	100.0
Croatia	f	18	5	23
	f (%)	78.3	21.7	100.0
Total	f	27	6	33
	f (%)	81.8	18.2	100.0

Kullback 2Î test (2Î = 0.707, g = 1, p = 0.401)

Legend: g - degrees of freedom, p - value of statistical significance, f - frequency, f(%) - percentage

Table 6. The place for the vitamin K application (i.m. application).

The place for the vitamin K application		Thigh muscle	Gluteal muscle	Total
Slovenia	f	2	8	10
	f (%)	20.0	80.0	100.0
Croatia	f	12	11	23
	f (%)	52.2	47.8	100.0
Total	f	14	19	33
	f (%)	42.4	57.6	100.0

Kullback 2Î test (2Î = 3.138, g = 3, p = 0.076)

Legend: g - degrees of freedom, p - value of statistical significance, f - frequency, f(%) - percentage

A half (of all 10) Slovenian birth hospitals (5, 55.6 %) and the maximum of Croatian birth hospitals (18, 85.7 %) do not apply vitamin K per os (Table 7). In Croatia (23, 100 %), in all birth hospitals, parents can choose between intramuscular and oral application. In Slovenia, this is possible only in 4 (40 %) birth hospitals (Table 8). Between Slovenia and Croatia we traced a statistically significant difference in the regime of the oral vitamin K application (2Î = 8.068, g = 3, p = 0.045) and also in the method of the application (2Î = 10.916, g = 1, p = 0.001).

Table 7. The regime of the oral vitamin K application.

What is in your birth hospital the regime of the oral vitamin K application per os?		We do not apply the vitamin K per os	In a single dose of 1 mg immediately after birth	1 mg immediately after birth and the same dose one week after birth	Other*	Total
Slovenia	f	5	1	2	1	9
	f (%)	55.6	11.1	22.2	11.1	100.0
Croatia	f	18	3	0	0	21
	f (%)	85.7	14.3	0	0	100.0
Total	f	23	4	2	1	30
	f (%)	76.7	13.3	6.7	3.3	100.0

Kullback 2Î test (2Î = 8.068, g = 3, p = 0.045)

Legend: g - degrees of freedom, p - value of statistical significance, f - frequency, f(%) - percentage
* Meaning 0.2 mg orally in the first three hours after birth.

Table 8. Parents choosing the way of the application.

Can parents choose between intramuscular and oral application?		Yes	No	Total
Slovenia	f	4	6	10
	f (%)	40.0	60.0	100.0
Croatia	f	0	23	23
	f (%)	0	100.0	100.0
Total	f	4	29	33
	f (%)	12.1	87.9	100.0
Kullback 2Î test	(2Î = 10.916, g = 1, p = 0.001)			

Legend: g - degrees of freedom, p - value of statistical significance, f - frequency, f(%) - percentage

Statistically significant differences between the two countries were also found in the sort of a medicine used against gonococcal and chlamydial infection in a newborn (2Î = 11.816, g = 3, p = 0.008). In 8 Slovenian birth hospitals (80%), the targesin drops are dominating (Targezin). In 3 Croatian birth hospitals (21.4%), Erythromycin dominates (Table 9).

Table 9. The medicine used against gonococcal and chlamydial infection in newborns.

Which sort of a medicine do you use against gonococcal and chlamydial infection in newborns?		Targesin	Erythro-mycin	Tetra-cycline	Other*	Total
Slovenia	f	8	1	0	1	10
	f (%)	80.0	10.0	0.0	10.0	100.0
Croatia	f	2	3	1	8	14
	f (%)	14.3	21.4	7.1	57.1	100.0
Total	f	10	1	5	1	24
	f (%)	41.7	16.7	4.2	37.5	100.0
Kullback 2Î test	(2Î = 11.816, g = 3, p = 0.008)					

Legend: g - degrees of freedom, p - value of statistical significance, f - frequency, f(%) - percentage
* Tobrex, sulfonamide preparation.

In most of Slovenian birth hospitals (6, 66.7 %) and most of Croatian birth hospitals (9, 39.1 %), parents are informed about the procedure of the vitamin K application, but only 1 (11.1%) birth hospital in Slovenia and 3 (13.0%) birth hospitals in Croatia obtain the written consent from parents (Table 10). Providing parents with the information about the application of medicaments against gonococcal and chlamydial eye infection is a situation which is quite similar in both countries – in 60 % only, birth hospitals inform parents about the intervention, in Croatia even less frequently (Table 11).

Table 10. Informing parents about the vitamin K application.

Do you inform parents about the vitamin K application?		Parents are informed and they signed a consent	Parents are informed and they gave an oral consent	Parents are informed	None of the above	Total
Slovenia	f	1	2	6	0	9
	f (%)	11.1	22.2	66.7	0.0	100.0
Croatia	f	3	4	9	7	23
	f (%)	13.0	17.4	39.1	30.4	100.0
Total	f	4	6	15	7	32
	f (%)	12.5	18.8	46.9	21.9	100.0
Kullback 2Î test	(2Î = 5.697, g = 3, p = 0.127)					

Legend: g - degrees of freedom, p - value of statistical significance, f - frequency, f(%) - percentage

Table 11. Informing parents about the medicine aplication against gonococcal and chlamydial eye infection.

Do you inform parents about the medicine aplication against gonococcal and chlamydial eye infection?		Parents are informed and they signed a consent	Parents are informed and they gave an oral consent	Parents are informed	None of the above	Total
Slovenia	f	2	2	6	0	0
	f (%)	20.0	20.0	60.0	0.0	0.0
Croatia	f	2	2	6	6	6
	f (%)	12.5	12.5	37.5	37.5	37.5
Total	f	4	4	12	6	6
	f (%)	15.4	15.4	46.2	23.1	23.1
Kullback 2Î test (2Î = 6.921, g = 3, p = 0.074)						

Legend: g - degrees of freedom, p - value of statistical significance, f - frequency, f(%) - percentage

4 DISCUSSION

The results of our study showed that there are some differences regarding the prophylaxis of haemorrhagic disease and neonatal ophthalmia between Slovenian and Croatian birth hospitals. A relatively high percentage of Croatian birth hospitals does not perform the prophylaxis against neonatal ophthalmia to newborns. However, the foreign literature is not unified about this procedure. According to Darling (7), many European countries gave up the neonatal eye prophylaxis decades ago. It is well known that preparations used for the neonatal eye prophylaxis are aggressive (6, 7). The Canadian paediatric society (4) estimates that silver nitrate causes chemical conjunctivitis in 50-90 %, and can, therefore, make the first contact and attachment between a mother and a child more difficult (40, 41). Another disadvantage of antibiotic medicines (Erythromycin, Tetracycline) is early exposure of newborns to antibiotics, which can lead to allergic reactions. The widespread use of antibiotics can lead to resistance (7) and to chemical conjunctivitis (11). Despite that, some authors claim that neonatal eye prophylaxis should become a worldwide routine procedure (42). The plausible explanation for this is probably the fact that the occurrence of these infections is not stable, but rather increasing (43, 44).

In the case of intramuscular application, the majority of Slovenian birth hospitals apply vitamin K in the gluteal muscle. Although gluteal injections should be avoided in Slovenian birth hospitals, the change in practice has not been adapted by the time of the questionnaire administration. Some authors emphasize that thigh muscle is more appropriate for administering intramuscular vitamin K to newborns (45). Moreover, the majority of Slovenian birth hospitals do not relieve newborns of the pain before the intramuscular vitamin K administration. Croatian birth hospitals relieve pain before the procedure to more children that the Slovenian ones, which is also in accordance with the latest guidelines of Italian association of neonatologists for proceduring pain in the newborn. The use of preparations for pain relievement is considerably restricted in newborns. When choosing a non-pharmacological preparation, a dermal anaesthetic ointment is recommended (33). It has to be acknowledged that pain can present a great stress for a newborn (46, 47).

In Croatia, parents can choose between intramuscular and oral application of vitamin K for their newborns in birth hospitals. This is in accordance with some authors that emphasize the informed decision regarding the vitamin K administration should be undertaken by parents (36). On the other hand, NICE (38) and Department of Health (39) recommend intramuscular application of vitamin K, but allow free choice for the oral administration. Despite that, Italian Association of Neonatologists recommends the oral administration of vitamin K to all exclusively breastfed newborns (48). It should also be outlined that both of the methods improve the status of coagulation in the newborn (24). Several small amounts of oral vitamin K application should successfully substitute the intramuscular application (49). There are certain individuals that advocate the meaning of physiological management of the third stage of labour together with late cord clamping. According to this theory, a newborn receives an increased blood volume and, by that, higher level of clotting factors (28). On the other hand, it is highly unlikely that this single procedure, by itself, would help raise vitamin K levels enough to prevent VKDB (19). The American Academy of Pediatrics recommends a single intramuscular dose of vitamin K and allows a delayed administration (50, 51). According to Dekker (52), vitamin K should be given after the first feeding is completed, but it should be administered within 6 hours after birth.

The situations in Slovenia and Croatia are similar regarding the application of the medicines against gonococcal and chlamydial eye infection. The results show low parental involvement in decision-making regarding the procedures of neonatal prophylaxis. Most of the procedures are still performed without a real informed consent. Due to the overloaded health professionals on the labour wards, parents could get more information about the prophylactic procedures of their newborn in pregnancy. This could also be provided by means of suitable information leaflets (28). By this, parents could get more time to make an informed consent and to seek for additional information. The majority of Slovenian and Croatian birth hospitals apply the prophylaxis in the first hour after birth, although this time should be dedicated exclusively to parents and their newborns, to establish the first contact in the first two hours after birth (53). Therefore, some procedures of the administration of the newborn could be postponed and performed after the first 'golden' hour after birth. However, the delay should be first evaluated from the aspect of the safety of the newborn, as delayed administration might be related to lower efficacy.

5 CONCLUSION

The results of this study show the situation in Slovenian birth hospitals related to the practice at the time of the distribution of the questionnaire. Due to updated recommendations of the Paediatric Association of Slovenia, recent deviations could be seen in the current practice. However, the study showed that the majority of Slovenian birth hospitals do not offer the possibility of oral vitamin K application, whereas this is possible in Croatia. By that, the differences of the incidence of VKDB should be researched, as well as the possibility of oral vitamin K application offered to parents. Pain management in the intramuscular vitamin K application is rare and it should be discussed in practice. On the other hand, the prophylaxis against NO is more frequent in Slovenia than Croatia, but, in Croatia, antibiotic medicines are used more frequently. Parents are informed about the procedures both in Slovenia and Croatia, but the written informed consent is still rare. The form of written informed consent would be a sensible decision. A relatively high percentage of newborns obtain the prophylaxis in the first one, or in the first three, hours after birth. Health professionals should provide intimacy for the new family and exclude routine procedures of the first care of the healthy, mature newborn, in the first couple of hours after birth. However, more research is needed, as delayed administration might be related to lower efficacy, which questions the safety of the newborn.

CONFLICTS OF INTEREST

The authors declare that no conflicts of interest exist. The work is original; it has not been previously published in print or electronic format, and it is not under consideration by another publisher or electronic medium; it has not been previously transferred, assigned, or otherwise encumbered; and the authors have full power to grant such rights. With respect to the results of this work, the manuscript of this, or substantially similar, content will not be submitted to any other journal until the review process in your journal has been officially completed.

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ETHICAL APPROVAL

Authors confirm that the procedures followed in the manuscript were in accordance with the ethical standards of the journal and responsible institution in which scientists work.

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DRINKING WATER QUALITY AND THE GEOSPATIAL DISTRIBUTION OF NOTIFIED GASTRO-INTESTINAL INFECTIONS

KVALITETA PITNE VODE IN GEOPROSTORSKA PORAZDELITEV PRIJAVLJENIH ČREVESNIH OKUŽB

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ABSTRACT

Introduction. Even brief episodes of fecal contamination of drinking water can lead directly to illness in the consumers. In water-borne outbreaks, the connection between poor microbial water quality and disease can be quickly identified. The impact of non-compliant drinking water samples due to *E. coli* taken for regular monitoring on the incidence of notified acute gastrointestinal infections has not yet been studied.

Methods. The objective of this study was to analyse the geographical distribution of notified acute gastrointestinal infections (AGI) in Slovenia in 2010, with hotspot identification. The second aim of the study was to correlate the fecal contamination of water supply system on the settlement level with the distribution of notified AGI cases. Spatial analysis using geo-information technology and other methods were used.

Results. Hot spots with the highest proportion of notified AGI cases were mainly identified in areas with small supply zones. The risk for getting AGI was drinking water contaminated with *E. coli* from supply zones with 50-1000 users: RR was 1.25 and significantly greater than one (p-value less than 0.001).

Conclusion. This study showed the correlation between the frequency of notified AGI cases and non-compliant results in drinking water monitoring.

Keywords:
acute gastrointestinal infections, surveillance, drinking water monitoring, quality of drinking water, fecal pollution of drinking water, GIS

IZVLEČEK

***Uvod**. Tudi kratkotrajna obdobja fekalne kontaminacije pitne vode lahko pri uporabnikih povzročijo bolezen. Povezavo med slabo mikrobiološko kvaliteto pitne vode in boleznijo lahko hitro odkrijemo med hidričnimi izbruhi. Vpliv zaradi prisotnosti E.coli neskladnih vodnih vzorcev, odvzetih v okviru rednega monitoringa, na incidence akutnih gastroenterokolitisov še ni raziskan.*

***Metode**. Cilj raziskave je bil analizirati geografsko razporeditev prijavljenih akutnih gastroenterokolitisov (AGI) v Sloveniji v letu 2010 in določiti mesta, kjer se ti kopičijo. Drugi cilj raziskave je bil ugotoviti, ali obstaja korelacija med fekalno kontaminacijo vodnih virov in porazdelitvijo prijavljenih primerov AGI. V ta namen smo naredili prostorsko analizo ter uporabili geoinformacijsko tehnologijo in druge metode.*

***Rezultati**. Mesta kopičenja z najvišjim deležem prijavljenih primerov AGI so na območjih z majhnimi vodooskrbnimi sistemi. Tveganje, da zbolimo za AGI, če smo pili vodo, kontaminirano z E.coli, na vodooskrbnih območjih s 50-1000 uporabniki, je znašalo 1,25 in je bilo signifikantno višje od 1 (p ≤ 0,001).*

***Zaključek**. Raziskava je pokazala korelacijo med pogostostjo prijavljenih primerov AGI in neskladnimi vzorci pitne vode v okviru monitoringa pitne vode.*

***Ključne besede**:*
akutne črevesne okužbe, spremljanje, monitoring pitne vode, kvaliteta pitne vode, fekalna kontaminacija pitne vode, GIS

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1 INTRODUCTION

Acute diarrhea is characterised by changed stool consistency (soft, liquid), increased frequency – more than three times a day –and increased volume (1). It is one of the most common disorders for which the patients seek medical help (1). Diarrhea in children remains a common reason for hospitalisation (1). Over 90% of all cases of acute infectious diarrhea are caused by enteropathogenic bacteria, viruses and parasites (1). The latter are transmitted by fecal oral route, which means that pathogens from the patient or carrier are introduced into the oral cavity of another potential host. The process of transmission may be simple, or it may involve multiple steps, namely:

- The ingestion of (untreated) water that has come in contact with feces;
- the ingestion of food that has been prepared in the presence of fecal matter;
- disease vectors, such as house flies, rats, mice, spreading contamination from inadequate fecal disposal;
- a poor or absent cleaning after handling feces, etc.

The burden of diseases caused by food-borne and water-borne pathogens remains largely unknown globally, but it is probably high. For example, diarrhea associated with infections resulting from oral-fecal contamination is the second leading cause of death in children under 5 years of age, primarily in Africa and South Asia (2). A number of diarrhea studies have been carried out in different countries. For instance, in Germany, a nationwide representative cross-sectional telephone survey of 21262 adults over a 12-month period during 2008 and 2009, was conducted. Participants were asked if they had had either AGI-related diarrhea or vomiting in a 4-week recall period. The burden of diarrhea was estimated to be quite high: 0.95 episodes/person per year (95% confidence interval 0·90–0·99) (3). In Slovenia, a population-based self-reported acute gastrointestinal infection (AGI) cross sectional study was carried out in June 2011. The comparison of the incidence of AGI-based on notification in June 2011, and incidence-based on the results of the study showed that the latter incidence was 56 times higher than the first one. The burden of AGI among population of Slovenia is quite high. The cross sectional study should be repeated and laboratory analysis of acute AGI cases added to get a better insight of epidemiological situation (4).

One of several risk factors for diarrhea is unsafe drinking water. Microbiologically contaminated drinking water has the potential to cause extensive outbreaks of illness due to the size of the populations served by the distribution system (5, 6).

People can catch waterborne diseases from contamination of both natural and man-made environments with human and animal feces (7). Diarrheal disease due to contaminated food and water, as a cause of death, is declining worldwide (8). Halving a number of people without sustainable access to safe drinking water had an enormous impact on decreasing the incidence of diarrheal diseases (9). A comprehensive literature review identifies 1415 species of infectious organisms known to be pathogenic to humans, including 217 viruses and prions, 538 bacteria and rickettsia, 307 fungi, 66 protozoa and 287 helminths. Out of these, 868 (61%) are zoonotic, that is, they can be transmitted between humans and animals (10). Some pathogens are transmitted by water. For example, viruses that are potentially transmitted by water are: norovirus, enterovirus, hepatitis A and E virus, adenovirus, coronavirus, influenza A virus, polyoma virus, pikobirna virus, etc. (11).

Hygienic measures, socio-economic changes and climatic changes have a significant impact on the emergence and spread of water-associated microorganisms. The occurrence of some has gradually been reduced, e.g. typhoid fever, while the incidence of others has risen: *Campylobacter, E. coli O157:H7, noroviruses, Cryptosporidium* and *Giardia* (12). Some new pathogens include environmental bacteria and viruses that are highly capable of surviving and proliferating in water distribution systems. Moreover, they are highly resistant to chemical disinfecting procedures (12). Waterborne viruses are gaining in importance as etiological agents of acute gastroenteritis. In children, they cause mixed viral infections with a severe clinical picture (12).

In some countries, such as Finland, the finding that noroviruses frequently cause waterborne outbreaks has led to the authorities' increased awareness of viral risks. As a consequence, laboratory techniques have been improved and the capacity for analysing environmental samples, especially water, has increased (13).

Drinking-water supply surveillance contributes to protecting public health by promoting the improvement of the quality, quantity, accessibility, coverage, affordability and continuity of water supplies, and it is complementary to the quality control function of the drinking-water supplier (14). Since 2004, the monitoring in Slovenia completely complies with Council Directive 98/83/EC (15). The drinking water monitoring in Slovenia is determined by the Rules on drinking water (Official Gazette of the Republic Slovenia. Nr. 19/2004, 35/2004, 26/2006, 92/2006 and 25/2009).

It has been repeatedly discovered that the quality of drinking water in some small supply zones in Slovenia (providing drinking water to 50-1000 inhabitants) does not comply with the standards – the indicators of fecal contamination were identified in the water samples (16). Small supply zones are supplied by surface water, or they are in contact with the surface. The small supply zones

are facing a number of problems, which have an impact on the quality of drinking water, e.g.:

- unprotected catchment areas of water sources,
- no water treatment or disinfection – especially at water sources that are, or were connected with, surface water, and for all water sources in the area of Karst aquifers,
- inadequate sampling points and/or sampling time (such as only temporary use of sampling),
- the consequences of unexpected events, such as flooding and extended rainfall, for the water sources with a present or past contact with the surface water,
- the lack of financial resources in small supply zones – the costs of repair are often too high to be covered by providers.

There are several different ways to acquire AGI – through contaminated food, directly from a patient, or indirectly through soiled fomites. Last but not least, AGI is water-borne.

Acute gastrointestinal infections (AGI) are still the cause of a considerable burden of disease in Slovenia. There were from 15 000 to 22 000 (with the incidence rate from 750 to 1100 per 100 000 inhabitants) of AGI cases notified per year in the last decade (17). However, the incidence is calculated according to notified cases. As only a fraction of overall cases appear as notifications, the real burden of AGI is expected to be much higher. Among microbiologically confirmed notified AGI cases, the most frequent ones were noroviral (the incidence rate in 2010 was 21/100 000) and rotaviral infections (the incidence rate 78/100 000). Viral gastrointestinal infections are followed by AGI, caused by *Campylobacter*, *Salmonella* and *E. coli*. The epidemiological situation in EU countries is similar: *Campylobacter* infections are the most frequently reported bacterial gastrointestinal infections. In 2010, the total EU incidence was 57/100 000 inhabitants. Reported rates are increasing; most cases are sporadic, with high seasonal peaks in the summer, but multinational outbreaks are infrequent. *Salmonella* infection remains the second most commonly identified gastrointestinal disease across EU, with the total incidence of 21/100 000 inhabitants in 2010. The reported incidence of *Salmonella* infection has been declining steadily since 2004, partly due to EU control programmes in poultry farms. However, *Salmonella* continues to be the source of many outbreaks, both within and between countries (18). The data for incidences of viral gastroenterocolitis are not available.

The objective of this study was to analyse the patterns of the geographical distribution of notified AGI in Slovenia in 2010, and to identify potential hotspots.

2 MATERIALS AND METHODS

2.1 Notified Cases

The surveillance of AGI in Slovenia is based on the Law on Communicable Diseases (Official Gazette Republic of Slovenia, No 33/06) and the Act on Registration (Official Gazette Republic of Slovenia, No 16/99). According to the Law, a case of AGI has to be notified by the treating physician using a standard notification form. The data collected on the notification form include: a name, surname, date of birth, permanent address, notification date, and disease code according to the International Classification of Diseases, 10th revision (ICD-10). The data is collected at the regional level, then sent to the National Institute of Public Health and entered into SURVIVAL (the national electronic database of communicable diseases in Slovenia).

Only AGI cases reported in 2010 were included in the study. Patients with the following ICD-10 codes were extracted from the database:

- A02.0 Enteritis, caused by *Salmonella* spp.;
- A03 Enteritis, caused by *Shigella* spp.;
- A04 Infections, caused by Gram negative bacteria (*E. coli*, *Campylobacter*, *Yersinia enterocolitica*, *Clostridium difficile* and other bacterial intestinal infections);
- A 7.1 Giardiasis;
- A08.0 Enteritis, caused by *rotavirus*;
- A08.1 Acute gastroenteropathy, caused by Norwalk virus;
- A09 Gastro-enterocolitisacuta of presumed infectious origin.

The notified cases coded as bacterial food-borne intoxications (ICD-10 code A05) were not included in the analysis. Cryptosporidiosis and amoebiasis were not included, as there were only seven and eight notified cases in 2010, respectively. There were two cases of typhoid fever and one case of cholera – all three patients acquired the infection abroad. In total, 18 070 patients were included in the analysis.

For geographical analysis, the data at the settlement level was used.

2.2 Regular Monitoring of Drinking Water

The surveillance of drinking water in Slovenia is based on the Rules on drinking water (Official Gazette Republic of Slovenia, No 19/04, 35/04, 26/06, 92/06, 25/09). According to the Rules, the monitoring of drinking water quality is carried out by the supplier (an internal control) and by the Ministry of Health (19). The monitoring of drinking water quality is carried out in order to make

sure that the water available to consumers meets the requirements of the Rules, and, in particular, the limit values of the parameters set in the Rules.

A supply zone is a geographically defined area within which the water intended for human consumption comes from one or more sources, and within which the water quality may be considered as being approximately uniform (15). The samples collected for monitoring should be taken so that they are representative of the quality of the water consumed throughout the year (15). The sampling for monitoring has to be carried out at the point of compliance – from the taps of users (Official Gazette Republic of Slovenia, No 19/04, 35/04, 26/06, 92/06, 25/09) (15). The sampling points are determined by the supplier, in collaboration with the regional unit of the National Institute of Public Health (NIJZ). The relevant requirements for the parameters of the Check and Audit monitoring, the minimum frequency of sampling and analyses are set out in Annex II of the Rules (Official Gazette Republic of Slovenia, No 19/04, 35/04, 26/06, 92/06, 25/09) and in accordance with the Monitoring programme.

The results of the regular drinking water monitoring intended for human consumption was collected from the Database of Drinking Water Systems and of the compliance of drinking water for 2010.

For analytical purposes, the drinking water supply zones were grouped into three categories, according to the number of users, namely: small (50-1000 users), medium (1001 to 10 000 users) and large (> 10 000 users). There were 1-2 and 4 samples taken in small and medium supply zones, respectively, in the year 2010.The microbiological controls applied to drinking water rely on the analysis of fecal pollution indicators. However, the use of these indicators may be substituted by the direct detection of pathogenic microorganisms, e.g., in the case of pathogenic viruses (20).

2.3 Geographical Analysis of the Notified AGI Cases and Drinking Water Monitoring

The spatial distribution of AGI was compared to the water quality in the water supplying zones. We set the hypothesis that at least a part of AGI could be correlated to microbiologically contaminated drinking water.

The permanent addresses of 18 070 notified AGI cases were available from the national electronic database of communicable diseases. In some cases, old municipal names or settlement names were used instead of the official names maintained in the Registry of spatial units (The Surveying and Mapping Authority of the Republic of Slovenia), available at: http://e-prostor.gov.si/index.php?id=416 . Wrong names were entered in the database, or local names were used for few notified cases which prevented appropriate geolocation. In the first step, 402 (2.8 %) notified AGI cases that could not be appropriately spatially located were excluded from the study, as shown in the flowchart (Figure 1). In the next step, notified AGI cases were aggregated to the settlement level.

17 672 notified AGI cases resided in 3204 settlements. Approximately one third of the AGI patients resided in settlements that have an individual drinking water supply system. These systems are not under regular monitoring control of drinking water quality and, therefore, these patients were excluded as well. Finally (as shown in Figure 1), it was possible to link

11 638 notified AGI cases with the monitoring of the drinking water.

Supply zones could not be geolocated as polygons; instead, the geographical coordinates of the sampling points were used in the presented analysis. Some records in the drinking-water supply surveillance (monitoring) sample point dataset had wrong coordinates of the surveillance location or sampling point. Most of these discrepancies could be solved manually. Unresolved cases were excluded from the analysis. Geolocating the supply zones could not be implemented fully. For the present analysis, the geographical coordinates of the sampling points were used. In the last step of data preparation, both AGI cases and supply zones were attributed to the settlements. The data on the case level was analysed, and relative risks by the size of the drinking water supply zones were calculated for users who were supplied with *E.coli* contaminated water. The assumption was made that persons diagnosed with AGI were drinking water from the supply zone attributed to the same settlement. For each supply zone, the data on the results of the monitoring of drinking water quality and the total number of users were available.

The geographical analysis and data preparation were processed using ArcGIS 10 and Oracle 11g relation database geo-information technology. The spatial datasets of municipal and settlements areas were recovered from the Registry of Spatial Units, which is maintained by The Surveying and Mapping Authority of the Republic of Slovenia.

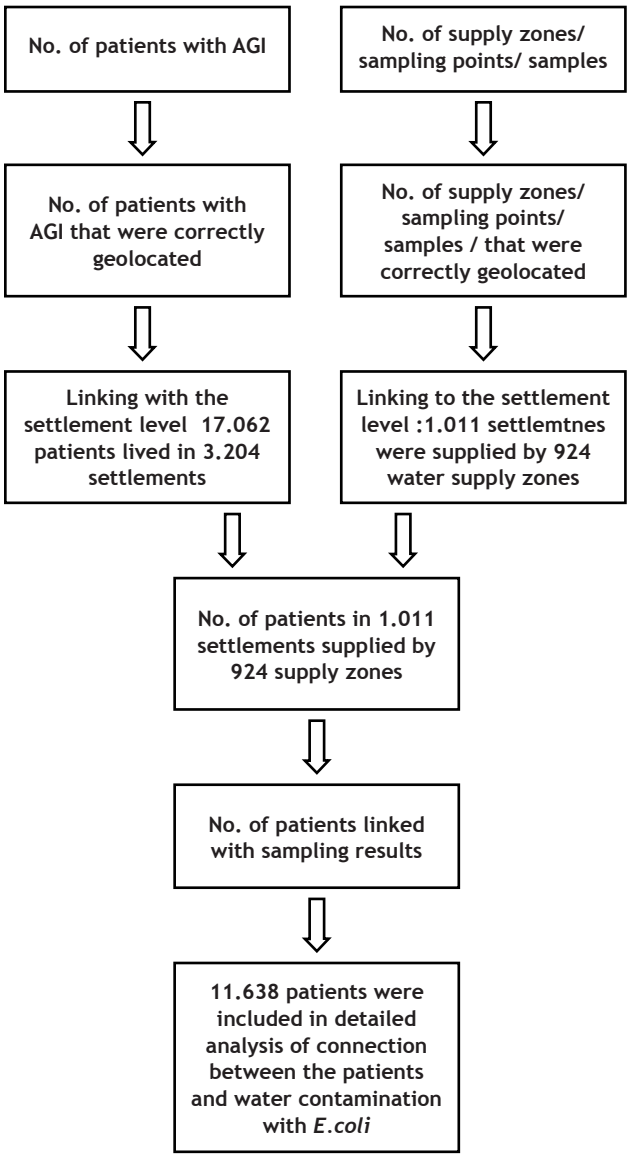


Figure 1. The flowchart of the data (notified acute gastro-intestinal infection cases and the results of drinking water monitoring) exclusion and linking.

* Patients living in a settlement not linked to a supply zone are supplied with the drinking water from an individual water supply system serving less than 50 users, and, therefore, they were not included in the analysis. However, there is the possibility of a supply zone having users in more than one village, and there is not a sampling point in all villages. The available data does not provide adequate information to link a supply zone to such a village. The Register of public water supply systems could not be used to more precisely determine the residence of the remaining patients from the first note, and, thus, we were unable to link them to the supply zones. Such a procedure could not be automated, and it requires a lot of manual work due to the non-connectivity of the databases.

** For 17 out of 1204 patients with AGI who were checked manually to identify the supply zone, the zone could not be recognized, and they were, therefore, excluded from the analysis.

3 RESULTS

3.1 Notified Cases

In the year 2010, the National Institute of Public Health received app. 20 000 AGI notifications including infections and intoxications. After excluding bacterial intoxications, 18 070 AGI cases were considered for the analysis. Most of the notified cases (about 70%) were not confirmed microbiologically – the diagnosis of AGI relied on clinical symptoms alone (Table 1). Viruses, such as noroviruses and rotaviruses, were the second and third most common cause of AGI, followed by *Campylobacter spp.* with 999 cases in the year 2010.The reported incidence of *Salmonella* infections has been declining since 2004, associated, at least in part, with successful infection control programmes in poultry farming and industry (the data is not shown).

Table 1. Notified AGI cases included in the spatial analysis in Slovenia in 2010 (16).

Diagnosis	Notifications
Gastroenterocolitis acuta (aetiology unknown)	12 189
Campylobacter enteritis	999
Salmonella enteritis	347
Other bacterial acute gastrointestinal infections	1820
Rotavirosis	1593
Norovirosis	2102
Lambliasis	19

3.2 The Results of Drinking Water Monitoring

There were 968 drinking water supply zones, supplying 50 or more users in Slovenia, providing 1 820 000 (89%) residents with public water in 2010 (Table 2). These supply zones were regularly monitored. Therefore, microbiological (check monitoring) and chemical (audit monitoring) data on water quality was available. 68% of the population has been covered by 78 supply zones (8 % of the total), serving more than 5000 consumers. Almost 800 small water supply zones serve only a small proportion of the population (9%).

The rest of the Slovenian population (app. 230 000 inhabitants, 11%) is served by an individual supply of drinking water. These individual supply systems each serve less than 50 individuals and are not covered by the water quality monitoring programme.

Table 2. The number of water supply zones, the number of users, the percentage of users in each supply zone class and the percentage of non-compliant *E. coli* samples in Slovenia in 2010.

The size of the water supply zones (Minimal and maximal number of consumers)	The number of water supply zones	The percentage of non-compliant *E. coli* samples (%)	The number of users	The percentage of users (%)
Small (50-1000)	782	18,9	184 022	9,0
Medium (1001-10,000)	140	3,7	460 030	22,4
Large (> 10,000)	46	0,5	1 179303	57,5
Total	**968**	**9.0**	**1 823 355**	**89,0**
Inhabitants without regular monitoring of drinking water			225 906	11,0
Total population, Slovenia			**2 049 261**	**100,0**

We determined more than 10% of non-compliant samples containing *E. coli* as contaminated supply zones, whereas other supply zones are considered uncontaminated. The proportion of non-compliant samples significantly decreased as the size of the water supply zone increased: the percentages of non-compliant samples due to the presence of *E. coli* in small, medium and large supply zones were 18.9%, 3,7% and 0.5%, respectively.

Another fact is that the burden of coliform bacteria in small supply zones was above 1000/100 ml. The burden of coliform bacteria in larger supply zones was significantly smaller, less than 10/100 ml (the data is not shown).

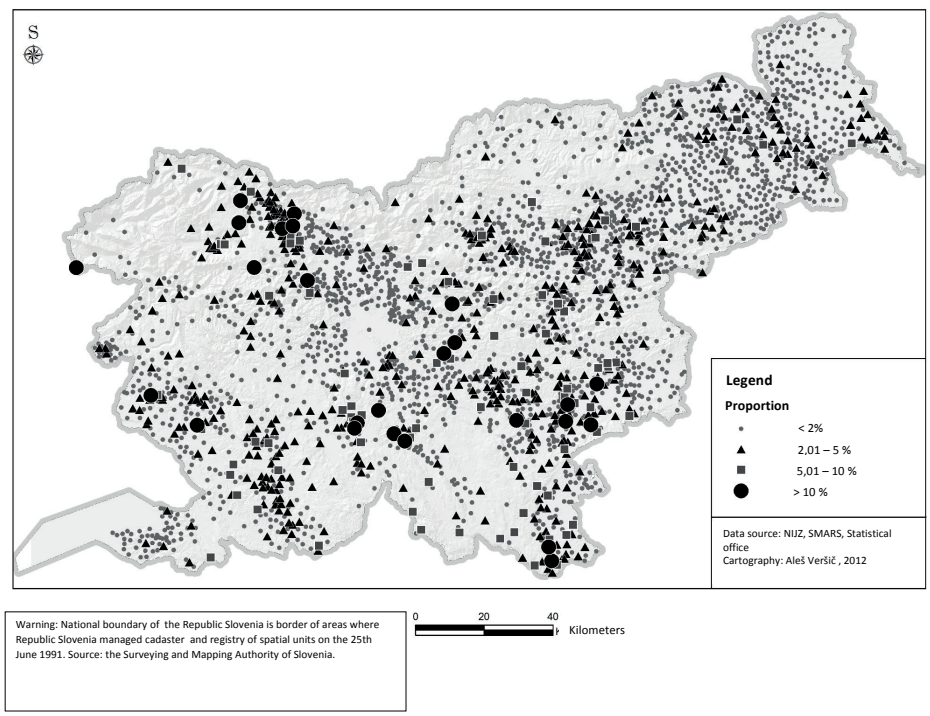
3.3 The Geographical Distribution of Notified AGI Cases

Map 1 illustrates the geographical distribution of 18 070 notified AGI cases. The biggest circles on the map denote the highest percentage of inhabitants in a settlement that developed AGI severe enough to visit their doctor's office in 2010.

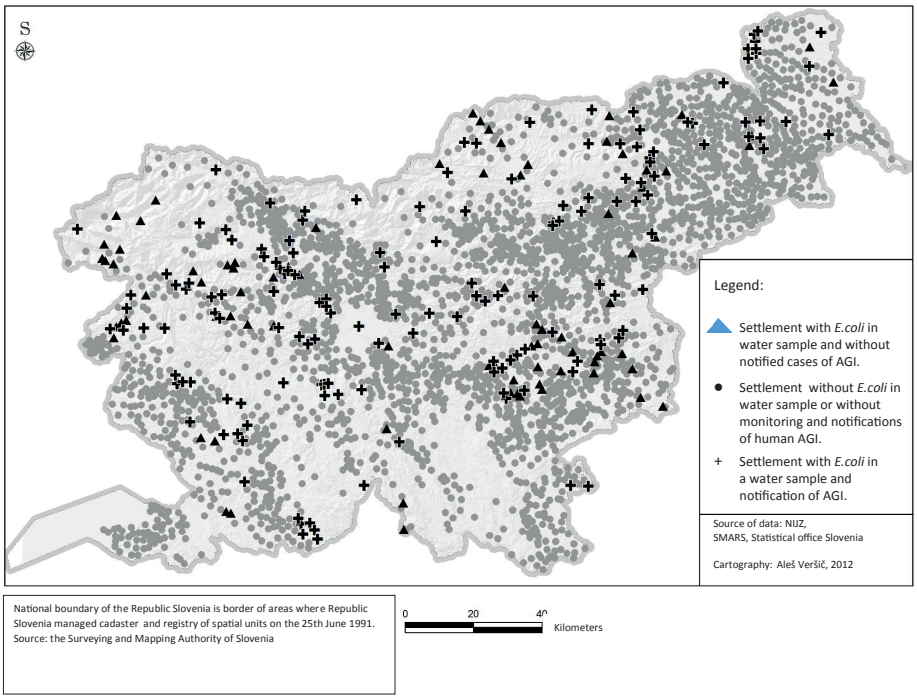
Though the notified AGI cases were distributed all over Slovenia, some areas had a much higher proportion of the population affected than others. Higher AGI incidences were observed in settlements that are located in the Southern (around Ilirska Bistrica) and South-Eastern part of the country (from Črnomelj to Brežice) (Map 1).

The alpine region of Slovenia (the North-Western part) from Kranj to Jesenice is also a part of the country where high AGI incidence settlements were located. These settlements are mainly small in size and drinking water is mainly provided from small supply zones.

The data from the regular monitoring of drinking water quality in 2010 was added to the geographical distribution of notified AGI cases on the settlement level, as shown on Map 2. The quality of drinking water in the Koroška region was not compliant in quite a few sampling points, but the number of notified AGI cases coming from this region was low.



Map 1. The spatial distribution of notified AGI cases (the proportion of inhabitants with AGI per settlement) in 2010 in Slovenia.



Map 2. The results of the monitoring of drinking water quality and the geographical distribution of notified AGI cases.

The relative risk for users of small, medium and large supply zones contaminated with *E. coli* is presented in Table 3. The relative risk for users drinking contaminated water in the smallest supply zones to have AGI was 1.25 (95 % CI 1.12 - 1.40). Attributable risk for water-borne AGI in these areas was 5.57 % (95 % confidence interval 2.52 % - 8.54 %). There was no increased risk for users supplied by medium supply zones (RR 0.92, 95 % CI 0.80 - 1.06). For the users in the largest supply zones contaminated with *E. coli* (supplying >10 000 of customers), the RR to get AGI was 0.51 (95 % CI 0.37 – 0.71).

Table 3. The relative risk for AGI between the users using the water contaminated with *E. coli* and those using uncontaminated water for the three sizes of water supply zones.

The supply zone	*E. coli* positive samples	The no. of AGI patients	The no. of residents with no AGI notified	The relative risk (confidence interval)
≥ 10,000	yes	35	10 297	0.51 (0.37-0.71)
	no	7724	1 161 247	
1000-10,000	yes	221	53 572	0.92 (0.80-1.06)
	no	1786	399 445	
50-1000	yes	400	41 699	1.25 (1.12-1.40)
	no	1041	136 048	

4 DISCUSSION

There was no prior study in Slovenia in which the surveillance data of acute gastrointestinal infections has been linked to *E. coli* findings from the regular monitoring of drinking water quality. Even though a high incidence of diarrheal diseases could be a logical consequence of poor water quality and has been confirmed in many water-borne outbreak situations (22), the benefit of a compulsory notification system for waterborne outbreaks is proved to be an effective tool for gathering information and increasing the awareness of possible problems related to the quality of drinking water (23). But the impact of microbiologically contaminated water on AGI incidence confirmed by the link between the non-compliant results of water quality monitoring due to *E. coli* and AGI incidence, has not yet been studied.

The data derived from the surveillance of communicable diseases showed that acute gastrointestinal infections cause a considerable burden in Slovenia. In 2010, the incidence rate of notified cases with gastrointestinal communicable disease was app. 1000 per 100 000 inhabitants (21). The real burden is probably much higher as many patients with acute gastroenterocolitis do not seek medical help, as vomiting or diarrhoea are mostly self-limiting and of short duration. Even when the patient consults the doctor – e.g. suffering from a more severe disease, or simply in need of the certificate for a sick-leave – the obligation to notify is probably often overlooked by the physician. Children younger than four years of age account for more than half of all the notified cases. Babies and toddlers with vomiting and/or diarrhoea are prone to dehydrate quickly and their parents are thus more eager to visit the doctor's office.

The overall incidence rate of the notified acute gastrointestinal infections (AGI) increased by more than 60% between 1999 and 2010 in Slovenia (24). The number of notified viral AGI stepped up for app. 400% and the numbers of 'gastroenterocolitis acuta with an unknown agent' (coded as A0.9, ICD-10) nearly doubled. The reason for that is, on one hand, the rise of viral enteritis cases (mostly norovirus and rotavirus) and, on the other hand, the drop of laboratory confirmed cases of AGI due to lack of financial resources. In that way, many viral enteritis cases, probably norovirus and rotavirus one, are notified

as gastroenterocolitis acuta with an unknown agent. A substantial increase in viral gastrointestinal diseases is probably partly due to improved laboratory diagnostics. A downward trend has been observed for salmonellosis and shigellosis, but not for campylobacteriosis (24).

Mapping the notified cases of AGI in 2010 (Map 1), showed that in the North-Western area (from Kranj to Jesenice) and around Nova Gorica, the South-Eastern and Southern part of the country (especially near Ilirska Bistrica and from Črnomelj in the South, to Brežice in the South-East), there were settlements with a high incidence of AGI. The main driving force behind the differences observed might be that some physicians are keen to notify and others are not. A less plausible explanation is that patients with AGI consult more frequently in one county than in another. Further, the differences in the geographical distribution of food-borne outbreaks in 2010, would clarify the uneven distribution of AGI cases. There were 57 outbreaks reported, caused by enteral pathogens (only one was waterborne) in 2010, which were relatively uniformly distributed throughout the country (the data is not shown) (16), and which, therefore, cannot explain the difference.

The quality of drinking water might, at least partially, be an explanatory variable for the geographical differences in the incidence of AGI in 2010. Notified water-borne outbreaks (WBOs) are rare in Slovenia – there were 86 WBOs registered between 1981 and 2010 (21). *Shigella flexneri* and *sonnei* were the predominant pathogens in the first decade, causing half of the WBOs. The number of notified WBOs has declined in recent years and the aetiology has changed (25). There were only one to two WBOs per year in the last ten years, and most of them were caused by viruses (most often noroviruses) (21). Noroviruses were identified as an important cause of outbreaks in different settings, including WBOs also in Sweden (26). Craun and co-workers (2010) comprehensively described outbreaks associated with drinking water in the US from 1971 to 2006. A drop in the number of notified outbreaks related to drinking water has been observed as well, especially in public systems. The decline was attributed to improved infrastructure and the impact of national regulations (27). Individual water systems and systems supplied by ground water were more at risk of contamination (27). A high prevalence of enteric viruses has been found in untreated individual drinking water sources in Slovenia as well (28). Drinking water quality in Slovenia is generally good, especially in large water supply zones, but it is not of the same quality in all parts of the country: microbiological problems are found in small water supply zones in rural areas, and contamination with nitrates and pesticides in some areas with extensive agriculture (the North-Eastern part of the country). Without doubt, it has not been significantly improved in the 2004-2010 period (16).

According to the results of our study, water contamination with *E. coli* primarily affected users of small supply zones, serving between 50 and 1000 users in rural areas, as they were 1.25 times more likely to get sick, compared with those who use safe water. The supply zones with more than 10 000 users are less often contaminated, and, if they are, *E. coli* was found in less than 10% of the water samples taken. The risk for AGI in the larger supply zones was lower for those users who were supplied with contaminated water – an unexpected finding which is difficult to interpret. It may be that users in large supply zones (mainly in bigger cities) are inclined to drink bottled water and, therefore, the temporary contamination does not have an augmenting effect on AGI. Another possible explanation might be that larger water supply systems are better controlled, that any change in water quality is detected immediately, and that consumers are instructed not to use water for drinking/cooking without boiling.

Nevertheless, the result supports the hypothesis that microbiologically contaminated water proved by *E. coli* non-compliant results in drinking water has an impact on public health, especially in small supply zones. Microbiological quality is strongly associated with the size of the supply zone – in large and medium-sized supply zones the drinking water is mostly of good quality.

We believe that the small supply zone systems should be properly regulated. Small supply zones often have deficiencies in their management plans, reflecting in the poor quality of the water. Only 1-2 samples per year taken in the smallest supply zone systems do not fully show the quality of the drinking water, and they could even be misleading.

The limitation of the study was that a part of the notified AGI cases that were correlated with the results of the drinking water monitoring were probably food-borne, and that a part of notified cases acquired AGI by a direct contact with a patient at a workplace, school, kindergarten, or indirectly through contaminated fomites. The study was performed under the assumption that acute gastrointestinal infections, transmitted directly or indirectly, are uniformly distributed across the country, as there was no major food-borne outbreak affecting one region only. Under ideal conditions, only water-borne AGI cases should be included in the study and compared to microbiology, especially the faecal contamination of drinking water samples taken at approximately the same time as the illness occurred. To conduct a study under these ideal conditions is practically an unreachable goal.

In most of the cases (outside of outbreak situations), patients are not able to identify the source of the infection, and they are not aware of the fact that the pathogen causing the diarrhoea and/or vomiting was water-borne. The sample points for the monitoring of

drinking water do not include the individual supply zones that supply less than 50 users. Therefore, AGI cases residing in settlements with small supply zones (less than 50 users) were not included in the analysis. It would be very interesting to do a study comparing the incidence of AGI in users of the above mentioned supply zones and the microbiological results of drinking water. The recent study showed that enteric viruses were more frequently found in individual water systems compared to public water systems in Slovenia (28).

The second limitation of the study is that the real burden of AGI, like in most countries, is expected to be much higher than the one based on notifications. The estimated risk ratio for AGI in microbiologically contaminated areas is probably lower than the one with the data from the real burden would have been, but just when the unnotified cases are unevenly distributed between those water sources that are microbiologically contaminated and those that are not.

The last limitation of the study remains the universal, global use of bacterial indicators of fecal contamination of water. Good environmental survival of important waterborne viruses and protozoa raised serious questions about the suitability of the reliance on relatively short-lived coliforms as indicators of the microbiological quality of water. That is, while the presence of coliforms could still be taken as a sign of fecal contamination, the absence of coliforms could no longer be taken as a guarantee that water was uncontaminated. Thus, existing bacterial indicators and indicator approaches do not, in all circumstances, identify all potential waterborne pathogens; their presence in water is also "underreported". Indeed, no single indicator organism, or a small set of indicators, can successfully identify or predict the presence, let alone the source, of all classes of potential pathogens – especially emerging microorganisms (20).

But indicator approaches will still be required for the foreseeable future, since it is not practical or feasible to monitor the complete spectrum of microorganisms that may occur in water, and as many known pathogens are difficult to detect directly and reliably in water samples. The shortcoming of bacterial indicators to predict parasites and viruses, which can be more resistant to disinfection, and the fact that information derived from the microbiological analysis is not immediate (neither is obtained in a continuous manner), have motivated the development of more preventive approaches, like the Water Safety Plans proposed by the WHO (20).

Despite the limitations of the study, we believe that the ecological study showed the impact of non-compliant drinking water due to *E. coli* on the incidence of acute gastrointestinal infections, especially in highly contaminated small supply zones.

5 CONCLUSIONS

This ecological study showed the correlation between the frequency of notified AGI and non-compliant fecal results of drinking water quality monitoring, especially in small water supply zones. From the public health aspect, the small water systems must comply with all the professional structural and operational demands, otherwise it is better to arrange the supply in a different way – for example, through larger systems.

CONFLICTS OF INTEREST

The authors declare that no conflicts of interest exist.

FUNDING

The study was funded by internal financial resources of the National Institute of Public Health, Slovenia.

ETHICAL APPROVAL

No ethical approval was necessary, as the data for the study was drawn from the national register of communicable diseases, and no human samples for laboratory analysis were included.

The data was used in an aggregated form, no personal identification is possible.

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THE IMPACT OF PATIENT'S SOCIO-DEMOGRAPHIC CHARACTERICTICS, COMORBIDITIES AND ATTITUDES ON FLU VACCINATION UPTAKE IN FAMILY PRACTICE SETTINGS

VPLIV BOLNIKOVIH PSIHOSOCIALNIH ZNAČILNOSTI, KOMORBIDNOSTI IN STALIŠČ NA ODLOČITEV O CEPLJENJU PROTI GRIPI V AMBULANTAH DRUŽINSKE MEDICINE

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ABSTRACT

Objectives. In Slovenia, the role of family physicians in primary care and preventive procedures is very important. Influenza vaccination rates in Slovenia are low. The reasons for low vaccination rates in Slovenia were not clear. We suppose that patient's beliefs and attitudes are important factors. We assessed patients' opinions regarding the acceptance of flu vaccination by their family physicians and their beliefs and attitudes about flu and vaccination. The aim was to check out factors that influence the decision to take the vaccine in family physician offices.

Methods. This was a cross-sectional, multicenter, observational study in the Styria region in Slovenia. We included patients from seven family physicians during regular office visits. They filled in a questionnaire about their general demographic data and attitudes regarding influenza and vaccination. The main outcome was the decision to be vaccinated.

Results. The logistic regression model identified five predictors for influenza vaccination, namely: heart disease, previous vaccination, an agreement with the beliefs 'the vaccination is an efficient measure to prevent influenza', 'after the vaccination there are usually no important side effects' and 'the vaccination is also recommended for a healthy adult person'. The belief that vaccinations harm the immune system is negatively associated with vaccination.

Conclusions. Patients' beliefs are an important factor to decide for vaccination or not. Family physician teams should discuss with patients their beliefs and concerns about vaccination.

Keywords:
vaccination, influenza, family practice, attitudes, chronic diseases

IZVLEČEK

***Uvod**. V Sloveniji ima zdravnik družinske medicine pomembno vlogo pri izvajanju preventive. Delež cepljenih proti gripi je v Sloveniji nizek. Razlogi za to niso povsem jasni. Preučevali smo mnenje bolnikov glede cepljenja proti gripi pri njihovem družinskem zdravniku ter njihova stališča in prepričanja o gripi in cepljenju. Cilj naloge je bil odkriti dejavnike, ki vplivajo na odločitev o cepljenju v ambulanti družinske medicine.*

***Metode**. Raziskava je bila presečna multicentrična opazovalna. Vključili smo bolnike iz 7 ambulant družinske medicine na Štajerskem v Sloveniji. Vzorec je zajemal bolnike, ki so prišli v ambulanto. Izpolnili so vprašalnik z demografskimi podatki ter stališči o gripi in cepljenju. Glavni opazovani dogodek je bil odločitev za cepljenje.*

***Rezultati**. V logističnem regresijskem modelu so bili najpomembnejši napovedni dejavniki odločitve za cepljenje srčna bolezen, cepljenje v preteklosti, strinjanje, da je cepljenje najbolj učinkovit ukrep proti gripi, strinjanje, da cepljenje običajno nima pomembnih stranskih učinkov, in strinjanje, da je cepljenje priporočljivo tudi za odraslo zdravo osebo. Prepričanje, da cepljenje škodi imunskemu sistemu, je negativni napovedni dejavnik odločitve za cepljenje.*

***Zaključki**. Stališča bolnikov so pomemben dejavnik pri odločitvi za cepljenje. V ambulantah družinske medicine bi se morali z bolniki več pogovarjati o njihovih stališčih in pomislekih o cepljenju.*

Ključne besede:
cepljenje, gripa, družinska medicina, stališča, kronične bolezni

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1 INTRODUCTION

Influenza is still an important acute infectious disease. It increases morbidity and mortality during winter every year, especially during pandemic influenza. Adults older than 75 years are at the highest risk for mortality. The mortality risk is higher when circulatory and respiratory diseases are present, and also underlying cancer, diabetes, renal disease and Alzheimer disease have a contribution (1). Influenza vaccination has been shown to be cost-effective in reducing morbidity and mortality in the older adult population and in decreasing morbidity, lost work days and the use of health care resources (2). The studies of working age groups reported reductions of 34%-44% in physician visits, 25% in antibiotic use for influenza-associated illnesses, and 32–45% in lost workdays for those vaccinated (2, 3). Estimated costs among healthy persons aged 18-64 years were calculated between $60 and $4000 per illness (4).

There are huge differences in seasonal flu vaccination rates between different countries and regions, and there are also differences every year (5-8). The decision to be vaccinated against seasonal influenza depends on different factors. A higher age, chronic health conditions and previous hospitalizations are important predictors of flu vaccination (5, 9). In addition, socio-demographic characteristics, cultural differences, economic status and education level are important in the decision-making process (10, 11). Patients' beliefs regarding influenza infection, a perceived influenza risk, vaccine effectiveness, and likelihood of vaccine side effects, as well as a confidence in a good health status and distrust of modern medicine are important predictors regardless of age, job or socioeconomic status (9). Influenza vaccine uptake in the previous years was one of most important predictors (10). In addition, being married, drinking alcohol, smoking and engaging in regular exercise are all factors associated with flu vaccination uptake (11). Also, media coverage of vaccine-related issues, social group norms about health behavior and peer group influences may play a role (12, 13). Many studies found an important role of physicians. Physicians' recommendations are usually important facilitators for vaccine uptake. On the other hand, low vaccination rates can also be explained by physicians' failure to strongly recommend influenza vaccination to their elderly and high risk patients (14).

In Slovenia, the National Institute of Public Health every year publishes a vaccination program and practical recommendations, including seasonal flu vaccination (15, 16). According to this program, the vaccination against seasonal influenza is recommended for children, for elderly people aged 65 years or more, for pregnant women and for patients with chronic health conditions. Flu vaccination is also recommended for people who are at a high risk of influenza because of their job (e.g. health care workers, veterinaries, workers in chicken farms…) and for students who work in health institutions during flu season. Nevertheless, the adherence to vaccination varies widely.

In Slovenia, people have an opportunity to be vaccinated in primary health centers by their family physicians, or in regional departments of the National Institute of Public Health. The service of vaccination and flu vaccine is not covered by national health insurance. Only vaccines for patients in risk groups are paid by national health insurance. The cost of flu vaccination, however, is very low, especially for elderly people and patients with chronic illnesses. Some companies also decide to offer free flu vaccination to their workers by a vaccination team that comes to them. Despite that, flu vaccination rate in Slovenia is low. The overall vaccination rate against seasonal influenza was 7.3% in 2008. Last year, the overall vaccination rate was only 4.4 % and 16.8 % for people aged 65 or more (17). According to legislation, in Slovenia, the advertisement of the names of vaccines is not allowed, but we can promote protection against infections. Media can have a strong influence on deciding whether or not to be vaccinated. A negative media effect was spread during 2009 influenza pandemic caused by the influenza A (H1N1) 2009 virus (18).

In Slovenia, the role of family physicians in primary care and preventive procedures is very important. The factors influencing patients' decision on taking flu vaccines by their family physicians in Slovenia have not been analyzed yet. This study was designed to find out patients' opinions and attitudes about flu and vaccination, to find out which sources of information are important for patients, and to check if patients feel it is important to take flu vaccinations by their own family physicians. The second goal was to discover possible associations between a decision to take or not to take seasonal flu vaccine with patients' characteristics, and to determine predictors on taking flu vaccinations by their family physicians.

2 PATIENTS AND METHODS

2.1 Study Design

This was a cross-sectional, multicenter, observational study in Styria region in Slovenia. We included patients who came during our regular family practice visits because of different health problems or the request for flu vaccination. The inclusion criterion was the age of 18 years or more. Patients with acute illnesses were not included in the study. Seven family practice teams from three different primary health centers in Styria region in Slovenia were asked to participate in the study. The patients were asked if they wanted to be vaccinated

against seasonal influenza. Then, the office nurse or family physician asked them to fulfill a questionnaire about their general data and attitudes regarding influenza and vaccination. The patients were asked to fulfill the data about chronic health conditions, about the source of information about flu and vaccination, and about confidence to take the vaccine by their family physician. Each patient was informed about the survey and had an opportunity to ask more questions. Then he/she gave an informed consent to participate. Patients fulfilled questionnaires after the visit or at home and put them into the box. Each family practice team delivered the same number of questionnaires both for patients that accepted the vaccine and for those that refused it. The questionnaires for both groups of patients were labeled according to the acceptance or refusal of vaccination. We planned to deliver 400 questionnaires to patients from October to November 2009. The questionnaires were delivered during consecutive days to the first five eligible patients to take a flu vaccination until all questionnaires were used.

2.2 The Questionnaire

The questionnaire had three parts. In the first part, there were questions about the age, gender, marital and employment status, home location (rural, urban), level of education, socioeconomic status and chronic health conditions (pulmonary and heart disease, diabetes mellitus, rheumatologic and kidney disease, immune system disorders and cancer).

The second part of the questionnaire checked their beliefs and knowledge about influenza and vaccination, their perception of possible side effects, safety and efficacy of influenza vaccination, benefits of vaccination for healthy adults, elderly people or those with chronic health conditions, for workers under risk for virus contact, for companies, about their previous influenza vaccination and possible side effects, and about their trust in pharmaceutical companies producing vaccines.

In last part of the questionnaire, patients reported if anybody recommended influenza vaccination to them, and chose their most important source of information about influenza and vaccination. Patients who accepted vaccination also answered the question as to why they had decided to take the vaccine by their family physicians. Those who had refused vaccination specified reasons for refusal.

2.3 Statistics

Continuous data was presented as mean and standard deviation (SD), and compared using the t-test. Categorical data was presented as percentages and frequencies, and differences between proportions were compared using the chi-square test. We calculated Cronbach's alpha coefficient for the second part of the questionnaire as a measure of internal consistency.

We assessed the differences between two groups (vaccinated, not vaccinated) in terms of demographic and socioeconomic data, chronic health conditions and beliefs. For all tests, $p < 0.5$ (2-sided) was considered significant. Logistic regression was performed to find out the most important predictors for the acceptance of influenza vaccination. All analyses were performed using a commercially available software program (SPSS-15.0 statistical software; SPSS Inc, Chicago).

3 RESULTS

All family practice teams delivered 400 questionnaires, 200 for each group. The delivery and collection of questionnaires was done in October and November 2009. Out of 400 delivered questionnaires, 300 patients returned them; the response rate was 75 %. One questionnaire was not filled in correctly. Therefore, we analyzed 299 questionnaires, 151 from vaccinated patients and 148 from not-vaccinated patients. Table 1 presents age, gender, economic, marital and other socio-demographic characteristics and differences between vaccinated and not-vaccinated patients regarding these characteristics.

Table 1. The differences between vaccinated and not-vaccinated patients regarding age, gender, economic, marital and other socio-demographic characteristics.

Diagnosis	Vaccinated N=151 (%)	Not-vaccinated N=148 (%)	All N=299	p
Gender				0.331
Male	55 (47 %)	62 (53 %)	117	
Female	95 (52.8 %)	85 (47.2 %)	180	
Marital status				0.068
Married	104(53.6 %)	90 (46.4 %)	194	
Single	41(42.3 %)	56 (57.7 %)	97	
Employment status				0.011
Employed	63 (41 %)	91 (59 %)	154	
Jobless	7 (43.7 %)	9 (56.3 %)	16	
Self-employed	6 (66.7 %)	3 (33.3 %)	9	
Retired	67 (62.6 %)	40 (37.4 %)	107	
Pupil, student	4 (50 %)	4 (50 %)	8	
Residence location				0.002
Rural	95 (45 %)	116 (55 %)	21	
Urban	54 (65.1 %)	29 (34.9 %)	83	
Educational status				0.288
Primary school	30 (61.2 %)	19 (38.8 %)	49	
Secondary school	83 (51.2 %)	79 (48.8 %)	162	
Pre-tertiary education	12 (40 %)	18 (60 %)	30	
Tertiary education	23 (43.4 %)	30 (56.6 %)	53	
Socioeconomic status				0.616
Very bad	2 (33.3 %)	4 (66.7 %)	6	
Poor	10 (66.7 %)	5 (33.3 %)	15	
Medium	76 (48.1 %)	82 (51.9 %)	158	
Good	51 (51 %)	49 (49 %)	100	
Excellent	9 (52.9 %)	8 (47.1 %)	17	
Age (years: mean + SD)	54.1 ± 18.1	46.9 ± 16.7	50.5 ± 17.8	<0.001

SD = standard deviation

It is evident that elderly, self employed and retired people decided to uptake flu vaccine more often (Table 1). Also, patients living in urban areas were more inclined to vaccination. The differences in demographic data, educational status and socioeconomic status regarding the decision to be vaccinated have not reached a statistical importance.

Table 2. The differences between vaccinated and not-vaccinated patients regarding chronic health conditions.

Chronic health condition	Vaccinated N=151(%)	Not-vaccinated N=148 (%)	All N=299	p
Pulmonary disease	20 (69 %)	9 (31 %)	29	0.024
Heart disease	43 (71.7 %)	17 (28.3 %)	60	<0.001
Diabetes mellitus	22 (58.6 %)	6 (21.4 %)	28	0.001
Kidney disease	3 (37.5 %)	5 (62.5 %)	8	0.512
Rheumatologic disease	23 (71.9 %)	9 (28.1 %)	32	0.008
Immunodeficiency	7 (63.6 %)	4 (36.3 %)	11	0.307
Cancer	11 (52.4 %)	10 (47.6 %)	21	0.715

We found some chronic health conditions (heart disease, pulmonary disease, rheumatologic disease and diabetes) to be important reasons for patients to be vaccinated (Table 2). Pertaining to patients with kidney disease, immunodeficiency or cancer, there was not much difference between the vaccinated and non-vaccinated groups.

Table 3. Differences between vaccinated and not-vaccinated patients regarding different beliefs, attitudes and previous vaccinations or side effects.

The agreement with beliefs and attitudes	Vaccinated N=151 (%)	Not-vaccinated N=148 (%)	All N=299	p
I have enough information about influenza	89 (53.3 %)	78 (46.7 %)	167	0.020
I have enough information about vaccine safety	84 (62.7 %)	50 (37.3 %)	134	<0.001
I have enough information about vaccine efficiency	83 (66.9 %)	41 (33.1 %)	124	<0.001
I have enough information about possible side-effects	79 (67.5 %)	38 (32.5 %)	117	<0.001
Vaccination is an efficient measure to prevent influenza	96 (75 %)	32 (25 %)	128	<0.001
Vaccination is safe	100 (74.1 %)	35 (25.9 %)	135	<0.001
After vaccination there are usually NO important side-effects	70 (76.1 %)	22 (23.9 %)	92	<0.001
Vaccination can cause many severe diseases	6 (17.6 %)	28 (82.4 %)	34	<0.001
Vaccination harms the immune system	5 (13.9 %)	31 (86.1 %)	36	<0.001
Vaccination is promoted predominantly because of manufacturers' profit	8 (19.5 %)	33 (80.5 %)	41	<0.001
Vaccination is also recommended for a healthy adult person	118 (73.3 %)	43 (26.7 %)	161	<0.001
Vaccination is reasonable for chronically ill and elderly people	123 (62.4 %)	74 (37.6 %)	197	<0.001
Vaccination is reasonable for persons in higher risk because of more contacts with other people	119 (60.1 %)	77 (39.3 %)	196	<0.001
Vaccination is good for companies because it reduces sick-leave absence	99 (78 %)	58 (22 %)	157	<0.001
I have been vaccinated before against influenza	110 (76.4 %)	31 (23.1 %)	141	<0.001
I have already had side effects after vaccination	25 (52.1 %)	23 (47.9 %)	48	0.797

Vaccinated patients had more information about influenza as well as efficacy and safety of vaccination (Table 3). Also, other beliefs and attitudes regarding efficacy, safety, side effects and recommendation for vaccination differed between the groups. Vaccinated and not-vaccinated patients had side effects after previous vaccinations.

We tested the questions regarding beliefs, attitudes and previous vaccinations or side effects for internal consistency. Cronbach's alpha coefficient was 0.66.

Table 4. The logistic regression model which predicts vaccination. N=299.

Predictors	Chi-square	Impact factor	95 % Confidence interval	p
Heart disease	11.4	13.52	2.98-61.25	0.001
Belief: Vaccination is an efficient measure to prevent influenza.	11.0	4.27	1.81-10.07	0.001
Belief: After vaccination, there are usually NO important side-effects.	6.0	3.19	1.26-8.09	0.014
Belief: Vaccination does harm to the immune system.	7.0	0.13	0.03-0.60	0.008
Belief: Vaccination is also recommended for a healthy adult person.	7.2	3.43	1.39-8.43	0.007
I have been vaccinated before against influenza.	20.9	6.54	2.92-14.62	<0.001

Dependent variable: 1= vaccinated patients, 0= not-vaccinated patients.

Logistic regression model identified the most important predictors for influenza vaccination uptake (Table 4), namely: heart disease, previous vaccination and an agreement with the belief that vaccination is an efficient measure to prevent influenza. The statistical model reached sensitivity of 87.0% and specificity of 78.4%.

Table 5. The differences between groups in terms of the persons who encouraged flu vaccination.

Predictors	Vaccinated n=146 (%)	Not-vaccinated n=129 (%)	All n=275
Family physician	70 (50 %)	70 (50 %)	140
Other physician	7 (50 %)	7 (50 %)	14
Other health care workers	3 (42.9 %)	4 (57.1 %)	7
Family, friends, neighbours	5 (26.3 %)	14 (73.7 %)	19
Patient's own decision	57 (81.4 %)	13 (18.6 %)	70
Company	3 (33.3 %)	6 (66.7 %)	9
Other	1 (6.3 %)	15 (93.7 %)	16

Chi-square: $p < 0.001$

Patient's own decision was important in decision making (Table 5). Family physician most commonly promoted flu vaccination, but there was no difference between groups. 47.9 % of vaccinated patients and 54.3 % of not-vaccinated patients reported that their family physician encouraged them to take the flu vaccine. A lot of not-vaccinated patients did not take the flu vaccine in spite of the encouragements from family physicians. Patients' family and friends were less important. Also, other doctors and health care workers did not significantly influence patients' decisions. Multiple answers were possible.

Most patients obtained information about vaccination from their family physicians (45 %), media (29 %) and family, friends or neighbors (29 %). Other health workers were a source of information for 13 % of patients. Most vaccinated patients got the information from their family physicians (56 %), whereas most not-vaccinated patiens got it from media (44 %). The difference was statistically significant (Chi-square: $p < 0.001$).

About 75 % of vaccinated patients answered that it is important for them to be vaccinated by their family physician. The main reasons included: the best knowledge of patient's medical problems and trust between a patient and family doctor. Safety and the quality of procedures were not among very important reasons. Only vaccinated patients were asked to answer this question.

Not-vaccinated patients were asked about reasons for the refusal of vaccination. The most common reasons were good health condition (31 %) and fear of side-effects (26 %). Many patients generally did not support vaccination (17 %). Some believed that vaccination is not effective (8 %) and a few that the cost of vaccination is too high. Some patients wrote also other reasons.

4 DISCUSSION

Our study found out that heart disease and certain patients' beliefs are the most important predictors to take flu vaccinations by their family physicians. Family physicians recommended vaccination to 50.9 % of their patients.

Vaccinated patients trusted their family physicians and perceived their recommendations as important sources of information regarding flu and vaccination. The media is the most important source of information for not-vaccinated patients.

In our study, several factors were associated with influenza vaccination. We found that elderly and retired people decided to uptake influenza vaccination more often than younger or employed people. This is a well known fact also from other studies (5, 8, 18, 19). This effect is not specific only to influenza vaccination. Elderly people are also more inclined to pneumococcal vaccination (20, 21). People with chronic health conditions decided to take the vaccine more often. Chronic heart disease was the most important predictor for vaccination. In addition, patients with chronic pulmonary disease, diabetes mellitus and rheumatologic disease were more inclined to vaccination. Almost the same conclusions were drawn in the study including Native American elderly people (22). We can find such an effect also in other studies. Chronic health conditions, the number of medications or previous hospitalizations are usually important predictors for the acceptance vaccination (5, 10, 19, 22-24).

Beliefs and attitudes regarding influenza and flu vaccination were important in the decision-making process. Vaccinated patients more frequently answered that they had enough information about influenza compared to not-vaccinated patients. They believed more in the safety and efficacy of the vaccine and less in the potential side-effects of vaccination. They also believed more in the effectiveness of vaccination in elderly people, people with chronic health condition, and even in healthy adults. Furthermore, other studies found some beliefs to be important in the decision-making process (25). Vaccine effectiveness and safety are often found to be important predictors (26). In healthy elderly people, the fear of side-effects of influenza vaccination and a perceived good health seem to be the main factors leading to noncompliance (27). Patients with chronic health conditions are less influenced by the fear of side effects (10). Not-vaccinated patients also showed a higher level of distrust in modern medicine and pharmaceutical companies. This mistrust in medicine and vaccination was partly associated with the coexisting pandemic caused by the influenza A (H1N1) and numerous media critiques of the recommendations of our health authorities (17). The perceived risk for influenza facilitated the decision of the vaccine uptake (18, 28, 29).

Our final model identified heart diseases, trust in the efficacy of the vaccine and its safety, and the belief that vaccination is effective also for healthy adults, to be important predictors of vaccination. The most powerful predictor for vaccination was vaccination in previous years. Furthermore, in other studies, past behavior is one of the most powerful predictors of the decision-making process (30).

The recommendation by a family physician was perceived as the major encouraging factor for vaccination, especially for elderly patients (23, 31, 32). In our study, family physicians recommended flu vaccination to 50.9 % of patients. Many patients decided to take vaccine on their own. In this study, family physicians' advice has been shown to be less important, but still more important than patients' families or other factors for vaccination. 74.8% of vaccinated patients answered that it is important to take vaccination by their family physicians, and that the main reason is because their family physicians know all their health conditions. On the other hand, not-vaccinated patients reported two main reasons for such a decision: the perception of their good health and fear of side effects.

4.1 The Limitations of the Study

Our study has two limitations. The first limitation is the coexistence of influenza A (H1N1) pandemic during the collection of the data. The patients' attitudes were changed during influenza pandemic also in other countries (33, 34). The second limitation is that we cannot generalize the data and results to the national level because the sample of patients was limited only to one region in Slovenia. However, a large sample, good response rate and concordance with the results of other studies assure the validity of our results, which should be replicated in further studies.

5 CONCLUSIONS

Family physicians in Slovenia often recommend flu vaccination. Patients in general decided for flu vaccination by themselves. Their family physicians proved to be less important in the decision-making process. Vaccinated patients valued family physicians as most important sources of information. On the other hand, media was the most important source of information for not-vaccinated patients. A lot of vaccinated patients said that it was important to be vaccinated by their family physicians and they had confidence in them. Therefore, family physicians should take more time and put in more effort to recommend flu vaccination to their patients and discuss the safety, efficacy and other issues regarding vaccination with them. There are data to promote flu vaccination because of its direct and indirect benefits (35).

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CONFLICTS OF INTERESTS

The authors had no conflicts of interest to declare in relation to this article.

ETHICAL APPROVAL

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A COMPARISON OF DIETARY HABITS BETWEEN RECREATIONAL RUNNERS AND A RANDOMLY SELECTED ADULT POPULATION IN SLOVENIA

PRIMERJAVA PREHRANSKIH NAVAD REKREATIVNIH TEKAČEV IN NAKLJUČNO IZBRANIH ODRASLIH LJUDI V SLOVENIJI

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ABSTRACT

Introduction. The aim of the study was to compare the dietary habits of recreational runners with those of a random sample of the general population. We also wanted to determine the influence of gender, age and sports performance of recreational runners on their basic diet and compliance with recommendations in sports nutrition.

Methods. The study population consisted of 1,212 adult Slovenian recreational runners and 774 randomly selected residents of Slovenia between the ages of 18 and 65 years. The data on the dietary habits of our subjects was gathered by means of two questionnaires. The following parameters were evaluated: the type of diet, a food pattern, and the frequency of consumption of individual food groups, the use of dietary supplements, fluid intake, and alcohol consumption.

Results. Recreational runners had better compliance with recommendations for healthy nutrition than the general population. This pattern increased with the runner's age and performance level. Compared to male runners, female runners ate more regularly and had a more frequent consumption of food groups associated with a healthy diet (fruit, vegetables, whole grain foods, and low-fat dairy products). The consumption of simple sugars and use of nutritional supplements by well-trained runners was inadequate with values recommended for physically active individuals.

Conclusion. Recreational runners are an exemplary population group that actively seeks to adopt a healthier lifestyle.

Keywords:
dietary habits, healthy nutrition, recreational runners, adult population

IZVLEČEK

***Namen**. Spoznati prehranske navade rekreativnih tekačev in jih primerjati s prehranskimi navadami vzorca naključno izbranega dela populacije. Ugotoviti smo želeli tudi vpliv spola, starosti in tekmovalne uspešnosti/stopnje treniranosti rekreativnih tekačev na njihovo osnovno prehranjevanje in upoštevanje prehranskih priporočil pri rekreativnem športu.*

***Metode**. Vzorec preiskovancev je sestavljalo 1212 odraslih slovenskih rekreativnih tekačev in 774 naključno izbranih prebivalcev Slovenije v starosti med 18 in 65 leti. Za ugotavljanje prehranskih navad v vzorcu vključenih posameznikov smo uporabili metodo anketiranja. Analizirali smo naslednje parametre prehranskih navad: način prehranjevanja, ritem prehranjevanja, pogostost uživanja posameznih skupin živil, uporabo prehranskih dopolnil, vnos tekočin in pitje alkoholnih pijač.*

***Rezultati**. Prehrana rekreativnih tekačev bolj ustreza priporočilom za zdravo prehrano kot prehrana v vzorcu populacije. Prehranski vzorec se izboljšuje s starostjo tekačev in z njihovo tekmovalno uspešnostjo/stopnjo njihove treniranosti. Tekačice se bolj redno prehranjujejo kot tekači in pogosteje uživajo živila iz določenih skupin živil, ki jih povezujemo z zdravim prehranjevanjem (sadje, zelenjava, polnozrnata živila, ribe in manj mastni mlečni izdelki). Rezultati tudi kažejo, da uspešnejši - bolje trenirani tekači - zaužijejo manj enostavnih ogljikovih hidratov, kar je lahko v nasprotju s priporočili za vnos energetskih substratov pri telesni vadbi. Neustrezen je tudi vnos prehranskih dodatkov glede na športno aktivnost.*

***Zaključek**. Vsekakor so rekreativni tekači del populacije, ki si aktivno prizadeva za bolj zdrav način življenja.*

Ključne besede:
prehranske navade, zdrava prehrana, rekreativni tekači, odrasla populacija

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1 INTRODUCTION

A balanced diet promotes energy balance and provides nutritional and metabolic support for the maintenance and preservation of health (1). Together with physical activity, a balanced diet has a beneficial influence on health (2, 3). In epidemiological studies (SENECA study, HALE project), a healthy diet and physical activity are two positive components of lifestyle that affect health and life expectancy (4-6). On the other hand, poor eating habits, especially in combination with other unhealthy behaviours, are an important factor in the majority of chronic non-communicable diseases (CNDs), such as cardiovascular disease, some types of cancer, and diabetes (7). In the presence of a poor and/or inadequate dietary energy and nutrients intake, physical activity also cannot have its optimal health effects. Consequently, people with an active lifestyle require, in addition to a basic diet complying with the criteria of healthy nutrition, additional intake of nutrients to meet the metabolic requirements of their individual physical activity (8). The elements of a health-protecting and health-promoting diet include: food frequency, mode of distribution of daily energy requirements in individual meals (food pattern), macro- and micronutrient composition of food, and food preparation and food consumption patterns (9-11).

Results of studies in Slovenia show that an unhealthy basic dietary pattern is a serious problem, which significantly contributes to a growing prevalence of CNDs (12-16). Studies on the dietary pattern in Slovenia indicate that the basic diet is unhealthy not only on account of its composition but also with regard to food preparation patterns and the timing of food intake. According to data from a national study entitled Health-Related Lifestyle, conducted in 2004, no more than 22.9% of adults in Slovenia consume a healthy or mostly healthy diet (12). Special risk groups are men, people from lower social strata, people with a low level of education, residents of rural areas, especially in the eastern part of the country, and people aged from 25 to 49 years (12, 14, 17).

Nutritional patterns are closely connected with the socio-economic status of people, their cultural environment, beliefs and values, psychological response to various stressful situations, and other elements of lifestyle, such as smoking, alcohol consumption, the level and regularity of physical activity, and mental health (12, 18, 19). Recreational running is a popular sport in Slovenia, and its popularity continues to increase (20, 21). Since lifestyle factors are very closely interconnected and intertwined, the physically active lifestyle of recreational runners may be expected to influence also their diets. Therefore, the aim of our study was to acquire data on the basic and exercise-related dietary habits of recreational runners, and determine if the dietary pattern of physically active individuals in Slovenia is more appropriate, from the point of view of their health, compared to the dietary habits of the general adult population. We also wished to evaluate the influence of gender, age and training level of recreational runners on the quality of their diet.

2 METHODS

2.1 Study Group: Sample of Recreational Runners

The study group included 1,212 adult recreational runners aged from 18 to 65 years (51.2% women, 48.8% men) who fully completed the survey questionnaire.

For the needs of the study, the runners were divided into three age groups:

- 18 to 25 years; n = 154
- 26 to 45 years; n = 745
- 46 to 65 years; n = 313

The runners were also divided into three groups according to their running performance. The first group of runners (n = 230) comprised runners whose best time in a 10- or 21-km run would place them among the first fourth of competitors in their age group successfully completing the Ljubljana Marathon race (well-trained runners). The second group of runners (n = 546) included runners whose best running times were comparable to those of the second and third fourths of participants at the Ljubljana Marathon (moderately trained runners), and the third group of runners (n = 436) consisted of runners with running times comparable to the results of the last fourth of participants at the Ljubljana Marathon (less trained runners).

Reference group

The reference group comprised 774 adult residents of Slovenia (50% male, 50% female) aged 39 ± 13.7 years, selected randomly from the Central Population Register. The group was stratified with respect to Slovenian regions, age and gender. The sampling was done at the Centre for Psychodiagnostic Tools in Ljubljana. All subjects participated in the survey on a volunteer basis.

2.2 Description of the Questionnaires Used and the Survey Procedure

Two questionnaires were used in the study.

The questionnaire used for the runners, entitled Life, Training and Health of Runners, was prepared in electronic form. The link to the questionnaire was sent to 5,700 electronic addresses of Slovenian runners registered for the 2010 Ljubljana Marathon.

The questionnaire used for the reference group, entitled Values, Lifestyle and Health of Slovenians, is a modification

of the above questionnaire. Data were gathered by personal interviews. The selection and training of the interviewers were carefully planned.

For the needs of the study, only those sections of the questionnaires dealing with socio-demographic data, lifestyle and dietary habits were selected. On the basis of equal or similar questions in both questionnaires, we wished to compare the results for both groups of respondents.

To allow comparability with other studies, above all, a study investigating the dietary habits of the adult population of Slovenia from the point of view of health protection performed in 2009, the selected food groups, frequencies of intake of selected foods, and units of measurement were similar or the same as in the study above (9). Moreover, some questions about food frequency were also similar or the same.

2.3 A Sample of Selected Variables

2.3.1 Biological Variables

For each subject, we recorded gender, age and three body measurements: body height (BH), body weight (BW) and body mass index (BMI = kg/m2). On the basis of the BMI values, we divided the survey participants into four groups (12, 14):

- underweight (BMI <18.5 kg/m^2)
- normal weight (BMI 18.5 – 24.9 kg/m^2)
- overweight (BMI 25 – 29.9 kg/m^2)
- obesity (BMI over 30 kg/m^2)

2.3.2 Socio-demographic Variables

The following socio-demographic variables were included in the survey: educational level, economic status (net personal income) and living environment.

2.3.3. Selected Lifestyle Factors

Sports activity. This was defined with the frequency and duration of any type of sports activity pursued by the subject; its quantity was expressed in hours per week.

2.3.4 Variables Concerning Dietary Habits

2.3.4.1 Type of Diet

The survey participants described their diets as: varied, vegetarian or vegan.

2.3.4.2 Dietary Pattern

The subjects were asked about the number and type of meals that they normally ate during the day.

2.3.4.3 Frequency of Intake of Individual Food Groups

The subjects were asked how often they consumed the following foods: fruit, vegetables, whole grain foods, white starchy foods, low-fat dairy products, whole milk products, red meat, white meat, fish and seafood, and sweets (see Table 3). For each food group, they selected one of the following answers:

1 – At least once a day
2 – 4 to 6 times a week
3 – 1 to 4 times a week
4 – a few times per month or less frequently

2.3.4.4 Food Supplements

The subjects were asked if they used dietary supplements; if the answer was yes, they were asked to indicate in a list of 18 supplements those that they normally used.

2.3.4.5 Fluid Intake

We inquired about the daily intake of different beverages. From this information the total daily intake of fluids was calculated.

2.3.4.6 Use of Alcohol

For this variable, the subjects indicated the frequency of drinking alcoholic beverages.

2.3.5 Fulfilment of the Criteria of a Healthy Diet

Fulfilment of the criteria of a healthy diet by the runners and reference subjects was evaluated on the basis of selected parameters from the general model of healthy nutrition (7, 14, 17, 22). The following parameters were selected: dietary pattern, appropriate consumption of fruit and vegetables, appropriate food composition, intake of fluids, and alcohol consumption (see Table 8).

2.4 Statistical Analysis

Data from the questionnaires were analysed with the SPSS programme (18.0). When assessing the statistical significance of differences between individual groups of subjects, Pearson's Chi square test was used for variables with ordinal data, while t-test for independent samples and variance analysis (ANOVA) was used for variables on a linear numerical scale. Difference testing was done at a risk level $\alpha = 5\%$.

3 RESULTS

3.1 Basic Biological Characteristics

The female runners participating in the survey had an average age of 37.7 ± 10.5 years, an average height of 166.9 ± 6.9 cm, and an average weight of 62.1 ± 8.8 kg.

They were on average 1 cm taller ($p < 0.05$) and 4.4 kg lighter ($p < 0.001$) than the women in the reference group, who had an average age of 39.1 ± 13.8 years.

The male runners were aged on average 38.4 ± 19.9 years, had an average height of 179.9 ± 9.7 cm and an average weight of 79.2 ± 9.7 kg. They were 1.3 cm taller ($p < 0.05$) and 4.5 kg lighter ($p < 0.001$) than the men in the reference group, who were on average a year older than the runners.

The nutritional status of the subjects in both groups is presented in Table 1.

Table 1. Nutritional status of subjects (in %) in the study group (n = 1,212) and the reference group (n = 774) expressed as body mass index (BMI) (12, 14).

Nutritional status (kg / m^2)	Runners (%)	Reference group (%)	Cramer's V	p
Underweight (BMI <18.5)	1.9	1.4	0.048	0.088
Normal weight (BMI 18.5 to 24.9)	72.8	50.8	0.456	0.000
Overweight (BMI 25 to 29.9)	23.5	37.2	0.257	0.000
Obesity (BMI >30)	1.8	10.6	0.598	0.000

The proportion of subjects with a normal body weight was significantly higher ($p < 0.001$) among the runners, whereas the proportion of overweight and obese individuals was significantly higher in the reference group ($p < 0.001$).

3.2 Socio-demographic Data and Economic Status

The runners had a significantly higher ($p < 0.001$) educational level than the reference subjects.

As many as 68.1% of the runners and only 17% of the reference subjects were university educated (college diploma, bachelor's, master's or doctoral degree). Personal income was also higher in the study group than in the reference group ($p < 0.001$). Only 25.4% of the runners and as many as 67% of the reference subjects had a net monthly income of less than 900 EUR. The two groups also differed significantly with respect to their living environment ($p < 0.001$). Nearly half (47.7%) of the recreational runners included in the survey came from major urban centres, whereas most reference subjects (49.1%) lived in rural areas.

3.3 Sports Activity

As expected, the runners were significantly more active physically ($p < 0.001$) than the reference subjects.
The runners engaged in sports activities on average 3.6 ± 1.5 times a week for a total of 6.0 ± 3.1 hours a week, whereas the reference subjects practiced sports on average 2.5 ± 2.0 times a week for a total of 3.8 ± 3.9 hours a week.

3.4 Adherence to the General Principles of a Healthy Diet

3.4.1 Type of Diet

The great majority of runners (89.6% female and 95.6% male) and reference subjects (97.6% male and 94.3% female) consumed a mixed diet. In both groups, there were significantly more vegetarians ($p < 0.001$) among the women than among the men. Among the runners, there were 7.2% of vegetarians (9.9% female and 4.4% male), compared to 2.6% of vegetarians (4.6% female and 0.5% male) in the reference group. Vegans constituted 0.2% of the study group and 0.3% of the reference group.

Diet type did not vary with the runners' performance or age.

3.4.2 Dietary Pattern

The runners divided their daily food intake into significantly more meals than the reference subjects ($p < 0.001$). The runners mostly ate four meals a day (most frequent answer), while the reference subjects mostly ate three meals a day.

Nearly two thirds of the runners (58.7%) and less than half of the reference subjects (46.8% divided their daily food intake into four or more meals. A very irregular eating schedule (two or only one meal a day) was reported by 6.9% of the runners and 13.7% of the reference subjects.
In the study group, women reported eating significantly more meals ($p < 0.01$) than men (Figure 1 left). The number of daily meals increased with age ($p < 0.05$), and well-trained runners ate more daily meals ($p < 0.05$) than less trained individuals (Figure 1 right).

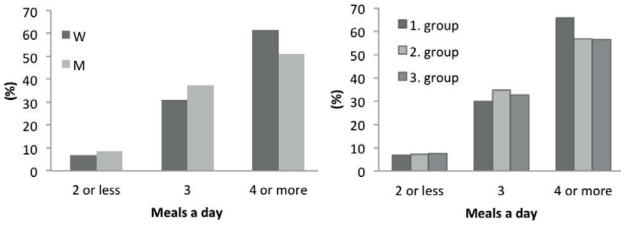

Figure 1. Consumption (in %) of main meals by runners according to gender (left; W = women; M = men) and running performance level (right; 1 = well-trained runners, 2 = moderately trained runners, 3 = less trained runners).

3.4.3 Eating Three Main Meals

Breakfast was eaten regularly by 87.6% of the runners and 65.7% of the reference subjects ($p < 0.001$) (see Table 2).

Table 2. Consumption of main meals by the runners and the reference group (in %).

	Runners (%)	Reference group (%)	Cramer's V	p
I eat breakfast daily	87.6	65.7	0.276	0.000
I eat lunch daily	94.1	92.2	0.085	0.047
I eat dinner daily	77.1	78.9	0.021	0.885
I eat all three main meals daily	62.1	50.6	0.112	0.002

Three main meals a day were eaten by 66.4% of female runners, which was significantly above ($p < 0.001$) the proportion of male runners eating three main meals a day (57.9%). Similarly, three main meals were eaten by a greater proportion of well-trained runners ($p < 0.05$), compared to less trained runners.

3.4.4 Frequency of Eating Different Foods

Table 3. Food frequency data for the runners (study group, S) and the reference group (R) (in %).

Food group	Frequency of intake							
	At least once a day		4-6 times per week		1-3 times per week		Several times a month or never	
	S	R	S	R	S	R	S	R
Fruit	60.1	48.3	29.3	21.2	9.5	27.7	0.9	2.8
Vegetables	61.5	52.1	28.1	23.1	8.8	23.9	1.2	2.3
Whole grain foods	33.7	9.6	34.3	11.4	21.7	35.8	10.2	43.2
White starchy foods	4.7	12.3	22.6	26.8	59.1	57.3	13.6	3.6
Low-fat dairy products	18.9	10.9	23.2	14.1	30.8	39.0	26.9	36.0
Whole milk products	5.4	11.8	9.4	15.4	46.2	47.7	39.1	25.1
Fish and seafood	1.8	1.4	14.6	2.4	66.2	49.4	17.4	46.8
Red meat	2.3	7.6	10.9	14.2	57.9	61.5	29.0	16.7
White meat	2.8	5.0	24.0	15.7	63.5	68.7	9.9	10.6
Sweets and pastry	9.7	8.4	15.0	12.7	41.1	36.5	34.2	43.4

The runners consumed fruit and vegetables, whole grain foods, fish, white meat and low-fat dairy products significantly more frequently ($p < 0.001$) than the reference group, whereas their consumption of white starchy foods, red meat, and whole milk products was significantly less frequent than ($p < 0.001$) in the reference group.

Female runners consumed fruit and vegetables, whole grain foods, low-fat milk, low-fat dairy products, fish and white meat significantly ($p < 0.001$) more often than male runners. By contrast, female runners reported significantly ($p < 0.001$) less frequent consumption of red meat, white starchy food, and whole milk products than men.

The results also revealed considerable differences in diet between individual age groups of runners. Compared to younger subjects, runners aged over 45 years consumed significantly less sweets ($p < 0.05$), less meat – both red ($p < 0.05$) and white ($p < 0.001$), and less whole milk products ($p < 0.001$), but they ate more fruit and vegetables ($p < 0.05$) and more fish ($p = 0.051$). With improving running performance, the runners' consumption of rapidly degradable carbohydrates (foods made from white flour and starch) and white meat decreased in frequency ($p < 0.05$), while their consumption of whole grain cereals increased ($p < 0.05$). For all other selected foods, there were no significant differences in the frequency of consumption between groups of runners with a different training status.

3.4.5 Nutritional Supplements

More runners (54.3%) than the reference subjects (29.4%) ($p< 0.001$) reported supplementing their diet with an additional intake of vitamins, minerals and other food supplements. The most frequently used nutritional supplements are presented in Table 4.

Table 4. The use of food supplements by the runners and the reference subjects, in %.

Food supplement	Runners (%)	Reference group (%)	Cramer's V	p
Multivitamin tablets	29.1	14.6	0.167	0.000
Vitamin C	14.6	9.2	0.123	0.000
Magnesium	24.9	8.1	0.201	0.000
Omega 3 fats	13.4	6.2	0.109	0.000
Iron	10.1	4.8	0.124	0.000
Calcium	11.8	7.3	0.089	0.002
Group B vitamins	5.8	3.8	0.078	0.034

Compared to male runners, female runners were significantly more likely ($p < 0.01$) to use dietary supplements (Table 5).

Table 5. The use of food supplements by male and female runners, in %.

Food supplement	Male runners (%)	Female runners (%)	Cramer's V	p
Multivitamin tablets	29.2	28.9	0.004	0.892
Vitamin C	14.5	14.7	0.003	0.922
Group B vitamins	5.1	6.4	0.028	0.306
Magnesium	24.4	25.4	0.012	0.670
BCAA	5.1	1.5	0.101	0.000
Omega 3 fats	15.0	11.9	0.045	0.098
Iron	7.2	14.1	0.115	0.000
Glutamine	5.3	1.8	0.099	0.000
Calcium	9.6	15.9	0.087	0.002

Female runners differed from the males in their intake of iron (14.1% vs. 7.2; $p < 0.001$) and calcium (15.9% vs. 9.6%; $p < 0.001$). By contrast, male runners were significantly more likely than the females to supplement their diet with branched chain amino acids (BCAA) (5.5% vs. 1.5 %; $p < 0.001$) and glutamine (5.3% vs. 1.8%; $p < 0.01$).

The results also showed that well-trained runners were significantly ($p < 0.001$) more likely to use nutritional supplements than less trained runners. Differences between well-trained and less trained runners in the use of food supplements are presented in Table 6.

Table 6. The use of food supplements by the runners according to running performance/ training status, in %.

Food supplement	Well-trained runners (%)	Moderately trained runners (%)	Less trained runners (%)	Cramer's V	p
Multivitamin tablets	39.1	36.3	30.6	0.066	0.161
Vitamin C	21.3	17.1	13.3	0.073	0.108
Group B vitamins	10.3	5.9	4.7	0.078	0.077
Magnesium	38.2	31.6	22.3	0.123	0.002
BCAA	10.3	3.5	1.4	0.152	0.000
Omega 3 fats	23.5	16.2	9.7	0.130	0.001
Calcium	15.4	14.5	11.5	0.045	0.423
Iron	25.0	9.8	5.0	0.215	0.000
Glutamin	11.0	4.4	2.2	0.139	0.000

3.4.6 Fluid Intake

Daily fluid intake did not differ ($p > 0.05$) between the group of runners (2.09 L) and the reference group (2.13 L), but there were statistically significant differences in the types of fluid consumed. The runners drank more water ($p < 0.05$) and tea ($p < 0.001$), but significantly less ($p < 0.001$) coffee, sweet beverages and other fluids (especially beer and other alcoholic beverages).

Fluid intake among the runners differed according to age ($p < 0.001$). The highest fluid intake was recorded for runners under 25 years of age (2.26 ± 0.97 L), and the lowest for runners aged over 45 years (1.96 ± 0.89 L).

Daily fluid intake also differed significantly ($p < 0.001$) with regard to the runners' performance. The highest daily fluid intake (2.39 ± 1.06 L) was recorded for well-trained runners (group 1) and the lowest for less trained runners (group 3)(1.97 ± 0.88 L).

Daily fluid intake did not differ between the genders, but there were statistically significant differences ($p < 0.001$) in the types of fluid ingested. Male runners drank more sweet beverages, milk and other fluids (especially beer and other alcoholic beverages), whereas female runners preferred coffee, tea and water.

3.4.7 Consumption of Alcoholic Beverages

The runners drank alcoholic beverages less frequently ($p < 0.001$) than the reference group (see Table 7). Very frequent alcohol consumption (once a week or more frequently) was less common among the runners than among the reference subjects (36% vs. 45.7%). By contrast, the proportion of subjects who reported drinking alcohol rarely was significantly higher ($p < 0.001$) in the group of runners than in the reference group (42.4% vs. 32.7%).

Table 7. Alcohol use by the runners and the reference group, in %.

Frequency of drinking alcohol	Runners (%)	Reference group (%)	Cramer's V	p
Daily	3.5	6.6	0.063	0.005
Two to 3 times a week	14.0	16.7	0.035	0.124
Once a week	18.5	22.4	0.051	0.025
Less than once a week and more than once a month	42.4	32.7	0.095	0.000
Never	21.6	21.7	0.000	0.993

Alcohol drinking is significantly more frequent ($p < 0.001$) among men than among women. Regular drinking of alcohol (3 times a week or more often) was reported by 24.1 % of male runners and 11.9 % of female runners.

Runners over 45 years of age consumed alcohol significantly more frequently ($p < 0.001$) than younger runners, but there were no significant differences in alcohol consumption between groups of runners grouped according to running performance.

3.5 The Fulfillment of the Criteria of a Healthy Diet

The runners' diet was more in line with the selected criteria of healthy nutrition ($p< 0.001$) than the diet of the reference group.

Table 8. The proportion (%) of runners and reference subjects complying with selected criteria for healthy nutrition (adapted from 12, 14, 17, 22).

	Criteria of healthy nutrition	Runners (%)	Reference group (%)	p
Dietary pattern:	Number of daily meals (3 to 5)	58.8	46.8	0.000
	Breakfast (daily)	87.6	65.7	0.000
	Number of main meals (3)	62.4	50.6	0.000
Consumption of fruit	Vegetables (daily)	61.5	52.1	0.000
and vegetables:	Fruit (daily)	60.1	48.3	0.000
Appropriate food	Whole grain foods (4-6 times a week or more often)	68.0	21.0	0.000
composition:	White OH (less than once a week)	13.6	3.6	0.000
	Low-fat dairy products (4-6 times a week or more often)	42.2	25.0	0.000
	Whole-milk products (less than once a week)	39.0	25.2	0.000
	Red meat (less than 1-3 times a week)	86.9	78.2	0.002
	Fish and seafood (more than 3 times a week)	14.6	2.4	0.000
	Sweets and pastry (less than once a week)	34.2	43.4	0.004
Intake of fluids:	Adequate (more than 2 L a day)	85.1	82.2	0,267
	Sweet beverages (never)	44.4	41.8	0.066
Alcohol consumption:	Less than once a week	54.3	64.1	0.003

4 DISCUSSION

The paper presents the results of the first study in Slovenia that compared the nutritional habits of physically active subjects with those of a general population sample. The results show that the runners' diet was more in line with the general criteria of healthy nutrition (see Table 8) than the diet of the reference group.

The majority of runners as well as the majority of reference subjects consumed a varied diet.

A vegetarian diet was significantly more common among the runners than in the reference group ($p > 0.001$). It was especially frequent among female runners, every tenth woman in this group (9.9%) being vegetarian. By contrast, only 4.6% of women in the reference group followed a vegetarian diet, which is in agreement with findings from population studies in Slovenia (9, 12, 14).

Our results suggest that the number and distribution of daily meals in Slovenian recreational runners are in line with recommendations for healthy nutrition and more appropriate than in average adults in Slovenia. Two thirds of the runners participating in the study divided their daily food intake into three to five meals. The majority ate regularly breakfast and lunch, and two thirds ate all three main daily meals. This is not important only from the point of view of healthy eating habits, but is of vital importance also for adequate energy support to the regular training process in physically active individuals.

The key problems in the field of dietary habits, which are related to the frequency of consumption of individual food groups (inadequate intake of fruit and vegetables, excessive use of fatty meat and meat products, frequent consumption of fried food, and excessive use of refined cereals), were much less pronounced among the runners compared to the reference population or to the data from previous studies performed in Slovenia (Table 3) (9, 12, 14, 17).

A distinct feature of the runners' diet was an emphasis on foods rich in slowly degradable carbohydrates. Runners showed a marked preference for whole grain cereal products over products made of rapidly degradable carbohydrates (white flour, starch). This trend increased with the runners' training level and was more pronounced in female runners. Slowly degradable carbohydrates have an important place in a healthy basic diet, but according to recommendations for sports nutrition, they are less suitable as an additional energy substrate around physical exercise (8, 23).

The frequency of consumption of foods rich in carbohydrates was significantly higher among the runners than in the reference group (see Table 2). These results suggest that the relative contribution of carbohydrates

to the daily energy intake of a Slovenian runner is considerably above values reported for the general adult population (46.9%) (9), and may well fall in the range from 50% to 70% recommended for physically active individuals (23).

Close to half the runners in our study (49.2%) consumed low fat dairy products much more often than whole milk products, and restricted their consumption of meat. Compared to the reference subjects, the runners more often substituted red meat with fish and poultry. These findings suggest that the contribution of fats (especially unsaturated and trans fatty acids) in a runner's diet is below the level reported for the general adult population (38.7%) (9). The comparatively frequent use of fish in the daily nutrition and omega 3 fats as a nutritional supplement also indicates that the intake of unsaturated fats among runners is more favourable that in the general adult population of Slovenia.

The nutritional habits and physical activity level of the subjects in our study were reflected in their nutritional status. The proportion of runners with normal weight was significantly higher ($p < 0.001$) in comparison to the reference group, whereas the proportion of overweight and obese persons was higher ($p < 0.001$) in the reference group (Table 1).

The recreational runners in our study used more nutritional supplements than the reference subjects. On the other hand, the proportion of reference subjects who reported using food supplements was significantly higher than in previous studies (9). According to nutritional recommendations, food supplements should be used only when a person's basic diet does not meet their energy and nutrient requirements (24). Thus, the decision to use a food supplement must be based on an analysis of the dietary intake. There is no firm scientific evidence that additional intake of vitamin C, multivitamins and magnesium, commonly used by runners, actually has favourable effects. While these supplements were used widely also by our runners, BCAA, a supplement recommended for sports nutrition, was used by only 10% of them.

Ribič and Kranjc (2014) have established that adults in Slovenia with a low level of formal education and, consequently, a low economic status have poor eating habits. These authors also report that people in urban centres have a healthier dietary pattern than people living in rural areas. Our results fully confirm the strong influence of socio-demographic factors (education, socio-economic status, living environment) on dietary habits in adults, observed also in other domestic and foreign studies (17, 25).

The runners in our study represent a very specific group that differs markedly from average adult Slovenians in all selected socio-demographic parameters. They had better education (68.1% were university educated, compared to only 17% in the reference group) and a higher economic status, and they lived mostly in urban centres. Such superior education and the resulting higher level of knowledge and awareness, as well as better opportunities due to a higher economic status, are inter-related factors, allowing an individual to adopt a healthier lifestyle (25).

The results of this study clearly show that the concern for healthy nutrition among runners increases with running performance and training level. Successful runners, who normally also train more intensely, have a more regular dietary pattern, they eat more daily meals and are more likely to consume all three main meals than less successful runners. Runners who train more pay greater attention to the type of carbohydrates they consume, giving marked preference to slowly degradable carbohydrates. They also eat more fish and use more dietary supplements. This might be an additional factor for better running performance and is in line with nutritional guidelines for physical activity (8).

As in other similar studies (9, 12), the present results confirm that women are more rigorous than men in following the guidelines for healthy eating, regarding both the organization (meal timing, food preparation) as well as composition and energy content of their diet (appropriate food choices). Men are generally less willing to follow recommendations and are traditionally inclined to less healthy behaviour patterns, also in the field of nutrition (26, 27).

Furthermore, our results confirm that nutrition in older age groups of runners is more in line with recommendations for healthy eating than that of younger runners. The period between 18 and 45 years of age is a work-intensive period of life, characterized by stress and mobility, which often result in less healthy eating (11). With advancing age, health becomes an increasingly important value, and healthy eating also receives more attention.

5 CONCLUSION

The diet of recreational runners is in closer agreement with recommendations for healthy eating than the diet of an average adult resident of Slovenia. Runners' eating habits improve with age and training level. Female runners eat more regularly than males and more frequently consume food groups associated with a healthy diet (fruit, vegetables, whole grain foods and low fat milk products). The fact that runners have better eating habits than the general population is related to their better education, higher income, and life in urban centres. However, their eating habits still fall short of dietary recommendations for adult recreational and competitive sports.

Since the results of this study suggest that runners are an exemplary population group who actively strive for a healthier lifestyle, providing additional educational support for this population segment, aimed at further improving their dietary habits, is a rational and probably also economically justified public health measure. Further research in this field would be beneficial.

CONFLICTS OF INTEREST

The authors declare that no conflicts of interest exist.

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ETHICAL APPROVAL

Not required.

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ANXIETY, SELF-ESTEEM AND COPING WITH STRESS IN SECONDARY SCHOOL STUDENTS IN RELATION TO INVOLVEMENT IN ORGANIZED SPORTS

ANKSIOZNOST, SAMOSPOŠTOVANJE IN SPOPRIJEMANJE S STRESOM PRI SREDNJEŠOLCIH V POVEZAVI Z VKLJUČENOSTJO V ORGANIZIRANO ŠPORTNO AKTIVNOST

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ABSTRACT

Keywords:
mental health, coping with stress, adolescents, sports

Aim. The objective of the study was to examine self-esteem, anxiety level and coping strategies among secondary school students in relation to their involvement in organized sports.

Methods. The sample included 280 Slovenian male and female secondary school students aged between 15 and 19 years. The participants completed The Adolescent Coping Scale, the Spielberger State-Trait Anxiety Inventory, and the PSDQ Selfesteem Scale.

Results. Participants engaged in organized sports exhibited higher self-esteem scores and lower anxiety scores in comparison to non-sport participants. Differences between the two groups have also been identified with respect to the use of certain coping strategies. Sport participants reported more productive coping than non-sport participants, which represents an active and problem-focused approach to dealing with everyday problems. Gender differences in the referred variables have also been studied, with female athletes exhibiting higher levels of anxiety than male athletes. Female participants were also found to use more non-productive coping than males, focused mainly on reducing emotional effects of stress.

Conclusions. Organized youth sports have an important role in improving and maintaining a favorable sense of self-worth, reducing anxiety, and promoting productive coping strategies in adolescents when dealing with everyday problems.

IZVLEČEK

Ključne besede:
psihično zdravje, spoprijemanje s stresom, mladostniki, šport

***Cilj**. Namen raziskave je bil preučiti raven samospoštovanja in anksioznosti ter uporabo različnih strategij spoprijemanja s stresom pri srednješolskih mladostnikih v povezavi z vključenostjo v redno in organizirano športno vadbo.*

***Metode**. Vzorec je obsegal 280 slovenskih srednješolcev in srednješolk od 15. do 19. leta. Udeleženci so izpolnili vprašalnik spoprijemanja s težavami za mladostnike, lestvico anksioznosti in lestvico samospoštovanja.*

***Rezultati**. Pri mladostnikih, ki se organizirano ukvarjajo s športom, smo ugotovili višje vrednosti na lestvici samospoštovanja in nižjo stopnjo anksioznosti v primerjavi z njihovimi športno neaktivnimi vrstniki. Razlike med skupinama so se pokazale tudi v uporabi nekaterih spoprijemalnih strategij: športno aktivni mladostniki so se v splošnem posluževali več na problem usmerjenih strategij spoprijemanja v primerjavi z nešportniki, kar kaže na bolj aktiven in konstruktiven pristop k reševanju vsakodnevnih težav. Razlike po spolu so pokazale, da športnice izražajo več anksioznega doživljanja kot športniki. Na področju soočanja s stresom smo ugotovili razlike v nekaterih spoprijemalnih strategijah tako v skupini športnikov kot v skupini nešportnikov: dekleta so v primerjavi s fanti izražala več nekonstruktivnega spoprijemanja, usmerjenega predvsem v blaženje učinkov čustvene napetosti v stresnih situacijah.*

***Zaključek**. Predpostavimo lahko, da ima organizirana športna aktivnost pomembno vlogo pri razvijanju in ohranjanju ugodnega občutka lastne vrednosti, zmanjševanju negativnih učinkov stresa ter spodbujanju uporabe aktivnih in konstruktivnih strategij spoprijemanja s težavami v mladostništvu.*

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1 INTRODUCTION

Numerous studies have confirmed that daily physical activity (PA) is important to improve health and protect against a variety of physical and psychological conditions in young people (1). Regular PA has numerous short- and long-term benefits, which are reflected in improved physical fitness, reduced risk of overweight and obesity, enhanced bone health, and decreased health risk factors for cardiovascular disease and metabolic syndrome (2). Appropriate amount of PA is not only imperative for good physical health, but it has a significant influence on adolescent's psychological well-being (3).

In the last fifteen years, many sudies have focused on the psychological and social health benefits of sport participation in children and adolescents (4). Sport is viewed as one of the most popular leisure-time activities, and it is often organized in the form of sports clubs or extracurricular PA in schools (5). Some longitudinal studies have shown that participation in youth sport, and persitent participation, in particular, significantly predict adult PA (6).

Several studies have found that participation in PA and sports is associated with increased sense of self-worth (7), better physical self-concept and overall self-esteem of adolescents (8, 9). Donaldson and Ronan examined the relationship between participation in organized sport practice and emotional and social adjustment in early adolescence. They found that adolescents participating in more formal sports exhibited less emotional and behavioral problems compared to those participating in fewer formal sports (10). Similarly, a study conducted on a sample of 16–20-year-old adolescents showed that individuals with greater frequency of sports participation (at least twice a week) reported better feelings of well-being compared to those who participated less than once a week (11). In a three-year longitudinal study of club sport participation during adolescence, Brettschneider concluded that adolescents in sports clubs had a more positive self-concept when compared to their non-member peers (12). Snyder and collegues examined health-related quality of life measures of students in relation to club sports participation: athletes reported higher scores on physical functioning, general health, social functioning and mental health scales than non-athletes (13). Hansen, Larson and Dworkin emphasizedthe importance of structured sports activity in the acquisition of some relevant skills and experiences for adolescents: setting achievable, realistic goals, improving time management skills, which are associated with planning their own activities, regulation and control of PA, learning about their own resources and limitation, improving problem-solving and decision-making skills (14). Research also suggested that organized youth sports can be an arena for social skills development, such as cooperation, empathy and self-control, positive peer relation, responsibility and leadership skills (15). In the study conducted by Mahoney and Stattin, organized youth sports were linked to lower levels of antisocial behavior (16).

Besides all the the positive benefits of sports, there are also some negative outcomes, expecially in highly competitive sports. Excessive physical activity can lead to many sport-related injuries and health problems among athletes (17). Fraser-Thomas and Côte indicate an important link between elite youth sport, eating disorders and pressure to win (18). These authors also point to the fact that youth sports today are more than ever characterized by early specialization, focusing on competition at earlier ages and earlier selection (19).

Adolescence represents an important developmental transition from childhood to adulthood that involves numerous physiological, psychological and social changes (20). This period brings a variety of potential stressors, such as changes in responsibilities, higher academic requirements, different interpersonal relationships, including peers and friends, parents and romantic relations, and also concerns about one's future (21). At the same time, adolescence is crucial in developing a repertoire of effective coping strategies. Coping is defined as 'the cognitive, behavioral efforts to manage particular external and/or internal demands that are appraised as taxing or exceeding resources of a person (22). It is a complex and multidimensional process that is sensitive to both the environment and personality of an individual (23). Characteristics of coping behavior in adolescents are reflected in their ways of dealing with stress in later life. Numerous studies have emphasized that knowledge and use of constructive coping have a significant influence on various dimensions of psychological adaptation and well-being in adolescents (24). Some research findings have indicated that PA and physical fitness are viable means of reducing stress among secondary school students (25). In a cross-sectional study of Greek late adolescents, positive correlations were found between proactive coping strategies, moderate PA and self-efficacy (26).

However, less research has been done on psychological and social benefits of regular sport involvement among Slovenian adolescents, particuarly in terms of sports club participation. Furthermore, there is a lack of research focusing on coping with stress in relation to sport practice in adolescents. Thus, the study aimed to examine anxiety, self-esteem and coping strategies among secondary school students in relation to their involvement in organized sports activities. Also gender differences in the psychological variables were tested, specifically in sport and non-sport participants. Moreover, the relationship between coping, anxiety and self-esteem was determined.

2 METHODS

2.1 Participants

Participants in this study were 280 secondary school students aged 15–19 years (140 males, 140 females) from Slovenian urban areas. The inclusion criteria were the absence of serious health problems and chronic diseases, as well as of physical disabilities and the problems related to them. Two groups were created: athletes (n = 140; age M = 16.6, SD = 1.1) and non-athletes (n = 140; age M = 16.7, SD = 1.2). The group of athletes (70 males, 70 females) included those adolescents, who were regularly engaged in organized sports in sports clubs over the past twelve months. Among them, there were 76 team-sport athletes (basketball, volleyball, soccer, handball) and 64 individual-sport athletes (athletics, swimming, rowing, gymnastics, sailing, archery, cycling). The frequency of exercise trainig among athletes ranged from two times per week to six times per week. The group of non-athletes consisted of adolescents that did not actively participate in sports and were not members of a sports club. In order to equalize the groups according to relevant characteristics (age, gender, school education level), the non-athletes group was selected on the basis of the characteristics of each member of the athlete group using the equivalent-groups method (27). All participants attended the gymnasium and had the same number of physical education classes. There was no age difference ($t = -1.02$; $p = .31$) between athletes and non-athletes.

2.2 Instruments

The Slovenian version of the Adolescent Coping Scale (ACS) was used to determine coping behavior among adolescents (28). The ACS scale, developed originally by Frydenberg and Lewis, is a self-report instrument that includes 79 items (29). Adolescents were asked to report how frequently they used any of the 18 coping strategies on a 5-point scale (from 1 – doesn't apply or don't do it, to 5 – used a great deal). According to the Slovenian adaptation of the ACS coping, strategies are classified in two main coping styles. The first one is productive coping,which represents functional strategies, such as direct attempts to confront the problem with or without reference to others. The second style can be seen as non-productive coping, as it includes mostly dysfunctional strategies that relate primarily to relieving negative feelings when faced with a stressful situation (e.g. avoidance, self-blame, ignoring, wishful thinking). In this study, a general form of the instrument was used; participants were asked to respond based on their coping with everyday difficulties and problems (e.g. with family, school, friends). The evidence of adequate reliability and validity of the ACS has been reported (28).

State Trait Anxiety Inventory (STAI) was used to determine the anxiety level among participants (30). STAI is a well standarized, self-report instrument, designed to measure both state and trait anxiety. For the purpose of the study, only the part of the instrument that relates to trait anxiety (STAI-X2) was assessed. The STAI-X2 includes 20 descriptive statements, on the basis of which participants express the way they feel in general on a 4-point scale (from 1 – never, to 4 – almost all the time). Trait anxiety refers to relatively stable individual differences manifested in the tendency to react to situations perceived as threatening with an increase in state anxiety. Values range from 20 to 80, with higher score indicating greater anxiety level. The inventory is among the most widely used measures of general anxiety. Content validity of the Slovenian version of the STAI was determined on the basis of strong associations with other anxiety measures ($r = 0.80$ between the STAI and the Manifest Anxiety Scale), and the internal consistency was very high, $\alpha = 0.88$ (30).

The Self-esteem Scale from the Physical Self-Description Questionnaire (PSDQ) was used to assess overall self-esteem of adolescents (31). Participants were asked to answer to eight items (e.g. 'I have a lot to be proud of.') on 6-point scale (1 – false, 2 – mostly false, 3 – more false than true, 4 – more true than false, 5 – mostly true, 6 – true). The scores are computed by averaging the responses to all the scale items, where higher values indicate a higher self-esteem. In evaluating the psychometric properties of the original instrument, good validity and reliability were demonstrated (31).

2.3 Procedure

Prior to data collection, the permission to conduct the study was obtained from school heads. The purpose of the study and the procedures were explained to the participating students and a written informed consent was obtained from their parents. Participants completed the instuments at school, during physical education classes in the presence of the author of this study. All data were kept anonymous to assure confidentiality. The study was aproved by the Ethics Committee for Sport at the Faculty of Sport, University of Ljubljana.

2.4 Statistical Analysis

In addition to descriptive statistics, Cronbach's alpha was calculated to assess internal consistency of the instruments. Mann-Whitney test was used to determine differences between the groups (athletes vs. non-athletes, males vs. females). The Spearman coefficient was used to calculate correlations between coping, anxiety, and self-esteem. Multiple regression analysis was conducted to assess whether the variables above significantly predicted coping behavior in adolescents. The significance level was set at $p<.05$.

3 RESULTS

3.1 Internal Consistency

Alpha coefficients of the STAI-X2 and the PSDQ Self-esteem Scale were 0.89 and 0.86, respectively, indicating good internal consistency. Coefficients alpha for 14 of the 18 ACS subscales were considered acceptable; however, because the Tension Reduction, Seek to Belong, Relaxing Diversion and Social Action subscales had poor internal consistency (e.g., α = 0.57), they were excluded from further analysis.

3.2 Descriptive Statistics

Participants have above-average score on the PSDQ self-esteem scale and low anxiety score measured by the STAI-X2. According to the ACS, the coping strategies most frequently used were Solving the Problem, Seek Social Support, Work Hard, Invest in Close Friends, Wishful Thinking, and Worry. The least common strategies used by students were Seek Spiritual Support and Seek Professional Help (Table 1).

Table 1. Descriptive statistics (M, SD) of STAI-X2, PSDQ Self-esteem Scale and ACS subscales (N =280).

	M	*SD*	*Skewness*	*Kurtoisis*
STAI-X2	39.73	8.74	0.370	-0.265
PSDQ Self-esteem Scale	38.20	5.81	-0.635	0.146
ACS subscales				
Seek Social Support	16.13	3.07	-0.280	-0.015
Solving the Problem	18.45	2.56	-0.238	-0.212
Work Hard	17.93	2.55	-0.120	0.954
Worry	15.12	3.51	0.002	-0.311
Invest in Close Friends	14.94	3.23	-0.049	-0.213
Wishful Thinking	15.82	3.22	0.093	-0.316
Not Coping	11.22	3.04	0.529	0.431
Ignore the Problem	8.63	2.38	0.098	-0.369
Self-blame	11.45	2.79	-0.002	0.037
Keep to Yourself	10.04	2.72	0.270	0.416
Seek Spiritual Support	6.83	3.38	1.240	0.700
Focus on the Positive	13.21	2.55	-0.395	0.415
Seek Professional Help	7.01	2.88	0.951	0.242
Physical Recreation	11.9	3.12	-0.520	-0.607

3.3 Differences in Psychological Measures between Groups

Since the Kolmogorov-Smirnov test revealed that most of the data did not follow normal distribution, the Mann-Whitney test was used to determine differences in psychological variables between athlete and non-athlete groups. The results are presented in Table 2. Athletes scored significantly higher on self-esteem ($p<.001$) and lower on trait anxiety scale ($p<.01$) compared to non-athletes. With respect to coping behavior, assessed by the ACS, athletes applied considerably more the strategies Physical Recreation ($p<.001$), Invest in Close Friends ($p<.01$), Focus on the Positive ($p<.01$), Seek Professional Help ($p<.01$) compared to non-athletes, who reported higher scores on the strategies Not Coping ($p<.05$) and Worry ($p<.05$) than athletes.

Table 2. Differences between adolescent athletes and non-athletes in psychological measures.

	Athletes Mean rank	*Non-athletes Mean rank*	*U*	*p*
STAI-X2	126.54	154.46	7845.5	.004
PSDQ Self-esteem Scale	159.75	121.25	7105.5	.000
ACS subscales				
Seek Social Support	143.89	137.11	9325.0	.481
Solving the Problem	139.30	141.70	9632.5	.803
Work Hard	146.79	134.21	8203.5	.190
Worry	129.09	151.91	8203.0	.018
Invest in Close Friends	156.23	124.77	7597.5	.001
Wishful Thinking	138.23	142.78	9481.5	.637
Not Coping	128.10	152.90	8045.5	.010
Ignore the Problem	143.55	136.47	9236.0	.460
Self-blame	139.70	141.30	9688.5	.868
Keep to Yourself	138.54	142.46	9525.0	.683
Seek Spiritual Support	139.09	141.91	9602.5	.764
Focus on the Positive	154.74	126.26	7806.5	.003
Seek Professional Help	154.89	126.11	7785.0	.003
Physical Recreation	197.52	83.48	1817.0	.000

Gender differences in the studied psychological variables were also determined. No differences were found in self-esteem, whereas females scored significantly higher on anxiety scale compared to males, but only in the group of athletes ($U = 1806.5$, $p = .007$). According to coping

strategies in the group of athletes, females showed greater use of Seek Social Support (U = 1473, p = .000), Self-blame (U = 1731.5, p = .002), Not Coping (U = 1762.5, p = .004), and Wishful Thinking (U = 1852, p = .012) than males, whereas males exhibited greater use of Seek Professional Help (U = 1520.5, p = .000) and Ignore the Problem (U = 1922, p = .036). In non-athletes, gender differences were very similar to those in athletes. Female non-athletes showed greater use of Seek Social Support (U = 1593, p = .000), Not Coping (U = 1785, p = .009), and Self-blame (U = 1850, p = .012) compared to male non-athletes; the letter showed more frequent use of Seek Professional Help (U = 1632, p = .000) and Ignore the Problem (U = 1798, p = .006) than female non-athletes.

3.4 Relationship among Psychological Variables

In both athlete and non-athlete students, self-esteem score was negatively correlated with trait anxiety and a non-productive coping style, and positively correlated with a productive coping style. Trait anxiety was positively correlated with non-productive coping and negatively correlated with productive coping (Table 3).

Table 3. The correlation between anxiety (STAI-X2), self-esteem (PSDQ) and coping styles (ACS) for athletes (below the diagonal) and for non-athletes (above the diagonal).

	1	2	3	4
STAI-X2		-.62***	-.26**	.58***
PSDQ Self-esteem Scale	-.56***		.42***	-.39***
ACS – Productive coping	-.21*	.32***		-.03
ACS – Non-productive coping	.35***	-.20*	.05	

In order to establish whether anxiety and self-esteem predicted the coping styles used, two regressions were conducted. The first regression included psychological variables and productive coping. The results indicated that anxiety and self-esteem together accounted for 13 % of variance (F = 10.46, p = .000) in athletes and 19 % of variance (F = 16.45, p = .000) in non-athletes. Only self-esteem significantly predicted productive coping in both athletes (β = 0.34, p = .000) and non-athletes (β = 0.50, p = .000). The second regression included psychological variables and non-productive coping. Anxiety and self-esteem together accounted for 13 % of variance (F = 10.35, p = .000) in athletes, and 32 % of variance (F = 31.99, p = .000) in non-athletes. Only anxiety significantly predicted non-productive coping in both athletes (β = 0.38, p = .000) and non-athletes (β = 0.53, p = .000).

4 DISCUSSION

In the study, we focused on the examination of coping with stress in secondary school adolescents in relation to involvement in organized sport practice. The study aimed to determine the relationship between self-esteem, anxiety and ways of coping with stress in adolescents. With regards to daily problems as a source of stress, adolescents use different coping strategies, which points to a high degree of flexibility in responding to problems and thus to better adaptation capacities (32). In general, adolescents avail themselves of predominantly positive and constructive ways of coping with problem situations, including social support seeking, which is consistent with the findings of previous studies (33). In spite of some similarities in the use of coping strategies in the group of athletes and non-athletes, there are also some significant differences between them. In comparison with non-athletes, athletes indicated sports activities that support maintainance of physical fitness as a way of coping with stress much more often. In comparison with non-athletes, athletes, expressed more intensive orientation into establishing and maintaining friendship relations and readiness to accept professional help in problem situations. Adolescent athletes are faced with similar everyday stressing situations as other peers and, in addition, also with specific requirements related to sport. Active involvement in sport activity that assumes organized and systematic training and includes various pre-competition and competition situations, can mean more expressed need for connecting and co-operating with coaches, with other professionals in the field of sport as well as with other athletes. Such 'turning to others' certainly has a positive sign as it shows that in 'faced with a problem' situations, an individual is more receptive to information and support from others, mainly from professionally qualified persons. In managing difficulties, athletes demonstrated a more serene and optimistic life orientation than non-athletes. The latter can be related to the findings of a study on secondary school population in which a positive correlation between optimism and engagement in sport was reported (34). On the other hand, adolescents who were not regularly involved in sports activities adopted more emotion-focused coping strategies: they expressed more concern about their present and future, and more insecurity and psychosomatic symptoms in relation to problems they have to cope with, when compared to active sport participants.

The obtained results are consistent with the findings of Kamtios and Filaktakidou who report positive correlations between proactive coping, moderate physical activity, and self-efficiency of adolescents (26). In the study of Smojver-Ažić and colleagues, however, no significant differences were found in problem-focused coping between adolescent athletes and non-athletes (35). It

can be concluded that regular sports activities play an important role in reducing psychological burden, and contribute to develop more effective skills for coping with problems in adolescents. In our research, we found out that young athletes use more constructive ways of dealing with problems than their peers who are not involved in sports on a regular basis. This may mean that there are also differences in experiencing stress, or differences in the evaluation of stressful situations between the two groups. Based on the results, we see that athletically active adolescents showed higher self-esteem and lower trait-anxiety, which could affect the fact that they experienced more control over stressful situations, or that they experienced those situations as less threatening. In addition, other studies indicated that young athletes had higher scores in self-esteem compared to their peers with dominant leisure-time sedentary behavior (36), and that participation in organized sports was associated with a reduction of anxiety among adolescents (37). A recent research conducted on elementary school children showed that participants involved in sport activities, in out-of school time, reported higher levels of self-perceived sport competence and greater self-esteem compared to students not engaged in sport activities (38).

When compared with female athletes, male athletes showed lower levels of anxiety. Previous research (39) also confirmed significant differences in trait and state anxiety between sportsmen and sportswomen. In a more recent study, which examined the level of anxiety, assessment of stress and coping strategies among young sport participants, girls expressed a higher level of anxiety, perceived more situations as threatening and more often used emotion-focused coping strategies compared with boys (40). Our data are largely consistent with the findings of other studies, linking stronger feelings of tension and worry in girls with their greater susceptibility to a variety of stressful events, compared with boys (41).

The differences between girls and boys were examined in the ways of coping for athletes and non-athletes. Gender differences in both groups showed similar results: girls more likely than boys stated the use of certain strategies related to the mitigation of emotions, such as the inability to deal with a problem, self-blame and withdrawal from problem situations, while boys used more frequently some other strategies, such as ignoring the problem and mental distancing. Furthermore, the girls showed a greater need for support from other people, while, in difficult situations, boys more frequently reached for professional help. The results were also comparable with many previous studies, which reported that, compared with boys, girls have more pronounced emotion-focused coping, and seek more for social support (42, 43). From our results it is clear that 'reference to others' is also present in boys, but it appears that, when they search for social support, it has a particularly instrumental function (resulting in a significantly higher expression of the search of technical assistance), while, with girls, social support has a more emotional function (the search for contact with others, expressing feelings, a relief through conversation). The reasons for these gender differences in coping behavior are many and varied. One possible explanation is certainly the emergence of differences in the socialization process, as a result of gender role stereotypes and expectations that are conveyed through social environment. Some authors point out that the differences in coping behavior reflect differences in the assessment of stress among male and female adolescents. The results of various studies show quite unanimously that female adolescents assess stressful situations as more negative (24) and, compared with males, report experiencing higher numbers of different stressful events (44).

Based on determining the relationship between self-esteem, anxiety and coping, we found that the adolescents who showed more anxiety and tension, expressed an increased use of strategies aimed at mitigating emotions when faced with a stressful situation, and less use of problem-focused strategies (e.g., planning, taking action, seeking assistance). Furthermore, a number of other studies on coping in adolescents report that problem-focused coping is associated with lower levels of anxiety and, conversely, that emotion-focused coping (e.g., wishful thinking, self-blame) is associated with higher levels of neuroticism (42). As expected, there is a strong negative correlation between anxiety and self-esteem: the adolescents who highly appreciate and accept themselves as they are usually show a lower level of anxiety. Many previous studies have also shown a significant negative correlation between general self-esteem and the level of anxiety in adolescents (45). Furthermore, the regression analysis showed that anxiety is more important in predicting emotion-focused coping, while self-esteem significantly predicts problem-focused coping among adolescents. In the models of stress, trait anxiety represents a significant predictor variable, so it can be assumed that a higher level of anxiety affects the perception of stress as more threatening, which will result in a more defensive response, primarily focused on the reduction of emotional tension due to the stressful situation (46). Self-esteem has a greater role in assessing control of a situation. Stable personal characteristics, such as optimism, personal mastery and high self-esteem, promote effective coping with stress and have direct effects on mental and physical health (47).

5 CONCLUSION

Based on the results of the study, it can be reasonably

assumed that regular and organized sports activity is an important factor that contributes to reducing the negative effects of stress, as reflected in a lower anxiety level, and that it promotes the use of active and constructive strategies of coping with stress in adolescents.

The present study has important implications for adolescent health promotion. Research findings can encourage critical reflection on, and concrete action towards creating appropriate and accessible sport progammes, which would allow the development and maintainance of favorable self-esteem and effective coping strategies among adolescents. The results should serve all who, working with young people, are responsible for the promotion of healthy lifestyles and advocate increased leisure time physical activity for children and adolescents.

It should be noted, though, that the findings cannot be generalized to the entire Slovenian secondary school population, because the sample was restriced to adolescents attending gymnasiums in three major Slovenian cities. Thus, future research should include also adolescents from rural areas in order to achieve a greater generalizability of the results.

The relationship between psychological well-being and sports activity certainly deserves further in-depth research. Longitudinal and intervention studies are also needed to determine the causal direction of the associations between sport involvement and the examined psychological variables. Namely, it would be necessary to investigate whether the significant differences between the studied groups are really the result of participation in sports, or whether the athletes remain and persit in sports because they have inherently greater capacity to cope with stress and higher self-esteem.

CONFLICTS OF INTEREST

Tha author declare that no conflicts of interest exist.

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ETHICAL APPROVAL

Ethical aproval was received form the Ethics Committee for Sport of the Faculty of Sport, University of Ljubljana.

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THE EFFECT OF EDUCATIONAL INTERVENTION ON THE PATIENT'S WILLINGNESS TO CARRY OUT THE IMMUNOCHEMICAL FAECAL OCCULT BLOOD TEST FOR COLORECTAL CANCER

VPLIV IZOBRAŽEVALNEGA UKREPA NA PACIENTOVO PRIPRAVLJENOST ZA IZVEDBO IMUNOKEMIČNEGA TESTA ZA DOLOČANJE OKULTNE KRVI V BLATU ZA RAKA DEBELEGA ČREVESA IN DANKE

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ABSTRACT

Background. There is now compelling evidence that screening for colorectal cancer may result in significantly reduced mortality. Screening tests for colorectal cancer are not systematically performed in Bulgaria.

Aim. This article explores the effect of an educational intervention on the willingness of patients to participate in the screening for colorectal cancer with the immunochemical faecal occult blood test in the home setting.

Materials and methods. A before-after design study of the effects of educational intervention comprising distribution of a brochure and one-to-one discussion with a GP. A self-administered, original questionnaire was administered before and after the intervention to 600 randomly selected patients in 40 general practices (15 patients per practice) in Plovdiv district.

Results. The intervention led to an increase with >20% of the patient's knowledge of the importance of the test and on how to carry out the test. Statistical analysis indicated that there was an increase in knowledge after the educational intervention about the usefulness of the test (24.8% in males, 18.3% in females) and its performance (22.7% in males, 25.4% in females).

Conclusion. The educational intervention has significantly influenced the patient's awareness about the test's usefulness and its self-administration. It improved the awareness by providing an easy access to information, thus fostering the active involvement of the patients. A strength of the intervention was the patient-centered approach in providing additional information through one-to-one discussions, and it ensured a higher quality of the preventive screening in the general practice.

Keywords:
screening, colorectal cancer, immunochemical faecal occult blood test, general practitioner

IZVLEČEK

Uvod. *Sedaj obstajajo prepričljivi dokazi, da presejanje za raka debelega črevesa in danke lahko bistveno zniža stopnjo smrtnosti. Presejalni testi za raka debelega črevesa in danke se v Bolgariji ne izvajajo sistematično.*

Cilj. *Članek raziskuje učinek izobraževalnega ukrepa na pripravljenost pacientov za presejanje za raka debelega črevesa in danke z imunokemičnim testom na domu za določanje okultne krvi v blatu.*

Metode. *Študija "prej in potem" učinka izobraževalnega ukrepa, ki vključuje razdeljevanje brošure in osebni pogovor s splošnim zdravnikom. Prvotni vprašalnik je bil pred in po ukrepu razdeljen 600 naključno izbranim pacientom in 40 splošnim ambulantam (15 pacientov na ambulanto) v okraju Plovdiv.*

Rezultati. *Ukrep je prinesel več kot 20 % povečanje zavedanja pacientov o pomenu testa in o načinu njegove izvedbe. Statistična analiza je pokazala, da po izobraževalnem ukrepu obstaja porast znanja o uporabnosti testa (24,8 % pri moških, 18,3 pri ženskah) in njegovem delovanju (22,7 % pri moških, 25,4 % pri ženskah).*

Zaključek. *Izobraževalni ukrep je bistveno vplival na pacientovo zavedanje o uporabnosti testa in njegovi izvedbi. Povečal je zavedanje z zagotavljanjem enostavnega dostopa do informacij in s tem spodbudil aktivno udeležbo pacientov. Ukrep je bil uspešen zaradi pristopa, usmerjenega k pacientu, pri zagotavljanju dodatnih informacij prek osebnih pogovorov in je prinesel višjo kakovost preventivnega presejanja v splošnih ambulantah.*

Ključne besede:
presejanje, rak debelega črevesa in danke, imunokemični test za določanje okultne krvi v blatu, splošni zdravnik

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1 INTRODUCTION

Compelling evidence exists from randomised controlled trials that screening for colorectal cancer (CRC), using faecal occult blood tests (FOBT), may result in significantly reduced incidence and death rates from CRC (1). The Council's recommendation on cancer screening (2003/878/EC) encourages EU Member States to develop appropriate actions and measures in implementing national cancer screening programs with a population-based approach. However, by the end of 2007, only few EU Member States have organized widespread mass screening with this test (2). National programs and guidelines for CRC screening in different countries have made recommendations based on the following finding from a number of randomised clinical trials: FOBT may be carried out with equal success both at home and in outpatient practice or physicians' offices (3-9). It has been shown that patients use a home-based FOBT more commonly than an office-based FOBT (2). The good practice, or 'the gold standard' adopted worldwide, requires that, in cases of positive screening test results for occult blood loss, a further diagnostic evaluation by colonoscopy and active follow-up are performed (1, 9, 10).

The involvement of a physician, especially GPs, in CRC screening can be very effective in improving compliance, according to the findings of several studies from different countries (11-14). However, organisational measures should be implemented and primary health care providers, including general practitioners (GPs), should be adequately trained in order to ensure that they are able to deliver high quality screening (2, 14, 15). Increasing knowledge and awareness of healthy individuals were associated with higher intentions to participate in colorectal cancer screening (12, 16). Unlike other countries, where FOBT is a part of organized screening programs, currently no systematic population-based screening for CRC is performed in Bulgaria (1-5, 8, 11). The Bulgarian National Centre on Health Information and Analysis provides data on the prevailing tendency of increasing morbidity and mortality rates due to CRC (17, 18). The Bulgarian healthcare system is designed as a three-stage model, with GPs as gate keepers. GPs are financed per capita and some additional payments for prophylactic activities not including CRC screening. However, by 2009 the screening for CRC with gFOBT was non-population-based and conducted with the assistance of GPs. This was discontinued due to poor compliance between GPs and health insured persons. The present study was inspired by the evidence from different countries across the world, that performance of the iFOBT in the home setting stimulated patient involvement and improved efficiency and effectiveness of CRC screening (2, 14, 19, 20). To date, there are no published studies of patients' views about CRC screening with iFOBT in Bulgaria.

The aim of this study was to explore the effect of an educational intervention on the willingness of patients to participate in the screening for CRC by the immunochemical faecal occult blood test in a home setting.

2 METHODS

2.1 Study Design

This before-after design study is part of a University Research Project № 06/2011, entitled: 'Patient-centred approach to increase promotional activity and screening for CRC in general practice' (http://meduniversity-plovdiv.bg/bg/nauchna_dejnost/menu vup/1664-vup2).

The current study evaluated the intervention effect on patients' willingness to participate in the screening for CRC. The study took place in the period from June to September 2011 in the practices of the participating GPs. The effect of the educational intervention was studied by two anonymous and self-administered questionnaires (pre-coded for identification) completed before and after the administration at a single visit to the GP practices. After being informed and instructed, consenting patients completed the first questionnaire in a waiting room, and returned it prior to receiving a brochure and a one-to-one discussion delivered by the GP. After the patients saw their GP and had time to read the brochure, they were asked to complete the second questionnaire (identical to the first one) and return it to the GP office. If reminders were needed, the patients were asked to return the completed questionnaire to the GP office in one week.

2.2 Ethics

The overall design of the study, interventions, tools and informed consent forms were approved by the Ethics Committee of the Medical University of Plovdiv, Protocol №2/24.03.2011.

2.3 Recruitment

The estimated minimum sample size of patients was 384, based on the results from a pilot study of proportions of studied variables – the importance of the test and sufficiency of information and an error of 5%. Since the expected percentage of non-response to questionnaire surveys is very high in Bulgaria, considering the probability of missing data or participation drop-out, this number was increased to 600.

Inclusion criteria: health-insured at an average risk for CRC (asymptomatic individuals aged over 45 years) who had had at least one consultation with a GP in the previous 12 months.

Exclusion criteria: people with previous colorectal cancer, adenomas, inflammatory bowel disease, a recent (≤ 2 years) colorectal endoscopy, or two first-degree relatives with colorectal cancer were excluded.

A two-stage sampling technique was used to recruit the participants. In the first stage: Through the coordinator of the local association of GPs and personal e-mails, 100 GPs were invited (50% sample of all GPs from the Plovdiv municipality), of which 40 GPs responded. In the second stage: 15 health-insured individuals were recruited from each GP practice - a total of 600. Eligible subjects were randomly selected using a lottery method, within the roster of their general practitioner.

2.4 Intervention

The adopted approach aimed at supporting an active involvement of patients in the decision-making about their health, their engagement and empowerment by purposeful education and encouragement of good compliance with GPs (21).

The educational intervention was designed and implemented to influence the willingness of patients to participate in CRC screening. A specially designed information brochure was given to the patients and additional information concerning CRC screening was provided through one-to-one discussion with their GP.

The brochure contained illustrations and concise information on CRC prevalence and risk factors, screening target populations, a description of potential benefits and harm or risk of the screening, the essence of the test and instructions for its application in a home setting. The brochure is available from the corresponding author upon request.

The distribution of the brochure was intended to facilitate a direct effect with the opportunity for later reference at home. The use of one-to-one discussions in our study is consistent with the recommendations from updated systematic reviews about various interventions to increase the participation in the screening for CRCs with FOBT (14, 22).

2.5 Questionnaire and Measures

The questionnaire was developed on the basis of preliminary conceptual model for patient education. Tools used in other screening studies in Bulgaria were also explored (23). The initial version of the questionnaire was discussed with GPs, surgeons and gastroenterologists, then revised and piloted in the study of 60 patients.

The questionnaire included 10 questions and was administered twice (before and after the intervention), and it consisted of a single choice closed and semi-open ended questions in several panels: The first panel included demographics (gender, age, level of education), i.e. explanatory phenomena (EP); the second panel – observed outcomes (OO): significance and usefulness of the test – OO(1); personal interest and readiness to perform the test at home – OO(2); preferred sources of receiving additional health information – OO(3); preferred method to obtain health information – OO (4). The answers of semi-open questions were to be submitted for additional analysis and classification before the final data processing. However, none of the respondents used the option for semi-open questions.

The results indicated that the original anonymous questionnaire had sufficient face and construct validity and reliability. Cronbach's Alpha (α) was from 0.81 to 0.86 for the results concerning changes in awareness and willingness of patients to perform iFOBT.

2.6 Statistical Analysis

The data is presented as mean and standard deviation (± SD) or number (percentage), as appropriate. All percentages were computed on the basis of all 499 respondents, both before and after the educational intervention, unless stated otherwise. The following statistical analyses were used:

- descriptive statistics presents the frequency distribution, mean and standard deviation;
- non-parametric analyses (x^2 test - testing of hypotheses between categorical variables; Wilcoxon signed-rank test - it tests the hypotheses of differences between two related samples; Mann-Whitney test - it tests the hypothesis of differences between two independent samples).
- logistic regression analysis (0 – not readiness and not willingness, 1 – readiness and willingness) is used to determine which factors exert influence on the readiness of the respondents to perform the test.

A two-sided significance level of 0.05 was applied. The data was elaborated and analysed using the software package SPSS version 17.0.

3 RESULTS

3.1 Patient Characteristics

The response rate was 83.2% (499 patients from the initially approached 600), based on the number of patients who returned and correctly completed both parts of the questionnaire (before and after the educational intervention).

The analysis of socio-demographic characteristics (gender, age and education) between the study participants and non-participating patients, according to the GPs, showed

no significant differences (P=0.086), which allowed us to accept these results as representative of the surveyed population.

The mean age of respondents was 54.9±9.8 years. Socio-demographic characteristics of patients are presented in Table 1.

Table 1. Socio-demographic characteristics of patients.

Parameters	N (%)
Gender	
Male	145 (29.1%)
Female	354 (70.9%)
Age	
≤ 50	203 (40.8%)
51-60	166 (33.4%)
61-70	89 (17.8%)
≥71	40 (8.0%)
Level of education	
High	236 (47.3%)
Medium	228 (45.7%)
Low	35 (7.0%)

3.2 Willingness to Participate in CRC Screening

The proportion of the surveyed group who was ready and willing to carry out the CRC test before and after the education was relatively high - 85.8% and 87.3%, respectively. The results showed that, after the intervention, the awareness and knowledge of the target group significantly increased (Table 2).

Table 2. Patients' opinions on the importance, usefulness and procedures for the performance of iFOBT.

Questions	Answers	Before education* N (%)	After education* N (%)	P-value
Is it important for you to take this test?	Yes / Yes, I do	369 (78.5)	403 (80.9)	P=0.502
	No (not entirely or not at all)	56 (11.9)	50 (10.1)	
	I cannot answer	45 (9.6)	45 (9.0)	
Do you have enough information about the usefulness of the test?	Yes / Yes, I do	248 (50.3)	347 (70.4)	P=0.001
	No (not entirely or not at all)	245 (49.7)	146 (29.6)	
	I cannot answer	-	-	
Do you have enough information on how to carry out the test?	Yes / Yes, I do	229 (46.4)	353 (71.7)	P=0.001
	No (not entirely or not at all)	265 (53.6)	139 (28.3)	
	I cannot answer	-	-	

*Note: All numbers (percentages) are computed out of all respondents with valid answers (out of all 499 respondents).

The analysis confirmed the usefulness of educational materials. After having read the brochure and the discussion with a GP, the proportion of those who needed more information about iFOBT significantly decreased by 26.0% (124) (P=0.005).

When asked 'In your opinion, who may inform you best on the test?' the respondents rated as first their general practitioner, followed by other physicians. Having a discussion with a physician, regardless of his/her specialty, was considered the best way to get informed on the screening and on early diagnosis of malignancies of the digestive system, which confirmed the general confidence patients had in physicians (Table 3).

Table 3. The influence of gender on the measured indicators before and after education.

Questions	Before education†			After education†		
	Male, N (%)	Female*, N (%)	P value	Male, N (%)	Female*, N (%)	P value
Readiness to perform the test						
Yes, I am willing	111 (80.3)	307 (88.2)		115 (81.6)	317 (89.8)	
No	17 (12.0)	21 (6.0)	P=0.049	22 (15.6)	25 (7.1)	P=0.014
I cannot answer	11 (7.7)	20 (5.8)		4 (2.8)	11 (3.1)	
Preferred sources for obtaining health information						
General Practitioner	85 (59.4)	307 (88.2)		85 (59.4)	174 (49.3)	
Other specialty physician	56 (39.2)	21 (6.0)	P=0.427	56 (39.2)	178 (50.4)	P=0.040
Other (relative/friend)	2 (1.4)	20 (5.8)		2 (1.4)	1 (0.3)	
Preferred method to obtain health information on early diagnosis of digestive system diseases††						
Discussion with the GP	98 (68.5)	198(56.3)	P=0.015	93 (65.0)	196 (55.5)	P=0.050
Discussion with other specialty physician	77 (55.8)	201 (56.9)	P=0.529	80 (55.9)	207 (58.6)	P=0.582
Reading printed materials	39 (27.3)	112 (31.8)	P=0.319	35 (24.5)	110 (31.3)	P=0.133
Searching Internet	26 (18.3)	80 (22.7)	P=0.279	24 (16.8)	80 (22.7)	P=0.145
Via the media (radio or TV)	23 (16.1)	43 (12.3)	P=0.256	20 (14.0)	39 (11.0)	P=0.360

† All numbers (percentages) are computed out of all respondents with valid answers (out of all 499 respondents)

* Male vs female

†† The total percentage exceeds 100%, due to the possibility for indicated of more than one answer.

3.3 Comparative Analyses of Significant Differences by Demographic Characteristics

The results revealed that the demographic characteristics of respondents - gender, age and level of education - affect their motivation and understanding of the usefulness and procedures of iFOBT.

The female respondents in 88.2% (312) showed greater motivation to perform iFOBT before (P=0.049) and after the educational intervention (P=0.014). The level of education influenced attitudes and motivation of respondents to perform iFOBT. University and college graduates expressed higher motivation to perform the test than those with less than a college educational degree (P=0.001). With the help of binary multiple logistic regression an assessment of the influence of socio-demographic factors on the readiness of the respondents to perform the test before and after the training was made. Before training women (OR: 1,752; 95% Cl: 1,019-3,010) and respondents with higher education (OR: 1,676; 95% Cl: 1,286-2,183) display higher willingness to perform the test. The model with 2 variables (gender and attained degree of education) accounts for only 7% of readiness. Following education, the only determinant is gender, and

again women are more willing to perform the test (OR: 1,907; 95% Cl: 1,096-3,316).

Statistical analysis indicated that there was an increase in knowledge after education about the usefulness of the test (24.8% in males, 18.3% in females) and its performance (22.7% in males, 25.4% in females). Respondents with advanced level of education (College and University) were better informed about the usefulness of the test (P=0.011) and how to perform the test (P=0.004) after the health education in comparison to those with lower educational level. People up to 60 years of age (356 (71%)), assessed the materials provided as 'definitely sufficient', they were more aware of the usefulness of the test (P=0.003) and how to perform it at home (P=0.004), compared to the older participants.

There was, however, a significant difference in preferences of female and male respondents on sources and ways of obtaining information related to prevention and early diagnosis. About 60 % (85) of male and 49.3% (174) of female participants preferred GPs as a source of information (P=0.040) and a discussion with him/her about the early diagnosis of different intestinal tract diseases (P=0.015) (Table 3). Persons with less than college level education tended to and preferred discussing the early diagnosis of digestive system diseases with a narrow specialty physician (P=0.037), than discussing it with their GP, which may suggest less confidence in their GPs.

Respondents over 71 years of age preferred to be informed on the early diagnosis of various intestinal tract diseases by different broadcast media (radio, TV programs) (P=0.009). Participants with advanced level of education showed a tendency to use more often the Internet as a source of information on the early diagnosis of different diseases of the gastrointestinal tract than other respondents (P=0.005). No significant gender differences were established in the preferences of other information methods and sources - printed materials, followed by the Internet, media etc.

4 DISCUSSION

4.1 Main Findings

The majority of the respondents believed that iFOBT was very important for them and they were willing to perform it at home. A significant increase of patients' knowledge about the utility of the test and the way of performing it showed effectiveness of the educational intervention. Referring to sources of information, the respondents showed no significant preference (before and after education) of GPs to other specialists, which confirmed general confidence patients had in physicians. The study revealed that patients' preferred way of receiving information on early diagnosis was primarily one-to-one discussion with physicians, regardless of their specialty; this was followed by printed media, the Internet and other media. The reduction in patient's confidence in GPs following intervention on account of another medical specialist might be explained with the fact that, in Bulgaria, GPs are still not sufficiently trained to carry out activities related to health promotion – health education and oncological disease screening (25, 26).

We speculate that GPs should be effective mediators and coordinators of health promotion activities, and that they can play an important role in the implementation of a patient-centred approach.

The respondents with an advanced level of education expressed a greater willingness to perform iFOBT, higher trust in GPs and more frequent use of the Internet than those with a lower educational level. The younger respondents found the educational brochures more useful, while elderly people indicated broadcasting media, such as radio and TV, as their preferred source of health-related information.

4.2 Other Findings

The data consistently indicates that the lack of awareness of CRC represents one of the main determinants of the low rate of participation in screening. Provision of information is necessary to enable subjects to make an informed choice, but it is not sufficient to enhance participation (2).

Previous studies have found improved compliance of the surveyed target group in the performance of gFOBT after participation in educational programs. Face-to-face education (with nurse and/or GP) was clearly useful in improving knowledge, helping patients to make informed decisions and increasing CRC screening participation rates (14, 22, 24). Other authors reported increased use of iFOBT, which was consistently higher among women than men (5). Brawarsky and Brooks found that the level of education was not associated with adherence to testing. Furthermore, while men and women were equally likely to have a test recommendation, men were more likely to adhere and more likely to be currently tested (13).

Remuneration is one of GP's reasons for promoting CRC screening in both our studies and in the study of Berchi et al. (12). Other factors influencing GPs' screening practice were the effectiveness of the screening programme and, particularly, the sensitivity of FOBT.

Most GPs approve of their participation in such programs and think that this is particularly important in the prevention of cancer (11).

The study of Brawarsky and Brooks confirmed the role of physicians and reported a strong positive association between having a primary doctor, receiving a CRC recommendation and having a test (13). Previously,

our research implied that GPs were more likely to have negative attitudes towards gFOBT (25). General practitioners in Bulgaria do not perform group education and other interventions, described in similar studies, due to various factors (individual practices, the shortage of staff, administrative tasks overload) (21, 23, 25, 26). We could assume that, if provided with adequate incentives, GPs would increase their motivation and performance in future population-based CRC screening programmes, as in other countries (12).

4.3 Strengths and Limitations of the Study

This is the first survey of its kind in Bulgaria, with a high response rate. To avoid the influence of confounding factors, we conducted both surveys within a single visit to a GP immediately before and after the educational intervention.

The higher proportion of respondents with higher education in this study compared with the general population may be associated with the fact that the persons recruited were health-insured and over 45 years of age, suggesting that they may have had a better socio-economic status (27). Another limitation is a higher proportion of females in the sample. We also acknowledge that the study is limited by subjective assessments of the target group that may have potentially produced biased results, since the authors could not refer to the respondents' actual experience in carrying out iFOBT and further research is needed, in this regard.

4.4 Implications of the Study Results for Public Health

Implications of the population-based screening for primary care should be considered and further studied.

4.5 Possibilities for Future Research in the Field

Research is necessary, to understand the actual accomplishment of iFOBT from the target population after proper educational interventions. However, we believe that the results might be of relevance to countries facing similar challenges as Bulgaria, such as the former socialist countries and countries in the Balkan region.

5 CONCLUSION

Significant effect of educational intervention was established. The education led to increased patients' knowledge of the importance of the test and the mode if its application. Patients' gender and education level were identified as potential factors of the willingness to carry out the test. GPs were seen as a valuable and preferred source of information concerning health promotion. These results could serve as a basis for further research to examine iFOBT acceptability by studying actual performance in the home setting. The educational brochure proved to be effective and may be used in future educational programmes and in the development of on-line tools.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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ETHICAL APPROVAL

The overall design of the study, interventions, tools and informed consent forms were approved by the Ethics Committee of the Medical University of Plovdiv.

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GENETIC VULNERABILITY AS A DISTAL RISK FACTOR FOR SUICIDAL BEHAVIOUR: HISTORICAL PERSPECTIVE AND CURRENT KNOWLEDGE

GENETSKA RANLJIVOST KOT ODDALJEN DEJAVNIK TVEGANJA ZA SAMOMORILNO VEDENJE: ZGODOVINSKI VIDIK IN ZNANJE DANES

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ABSTRACT

Introduction. Suicide is a multidimensional problem. Observations of family history of suicide suggest the existence of a genetic vulnerability to suicidal behaviour.

Aim. Starting with a historical perspective, the article reviews current knowledge of a genetic vulnerability to suicidal behaviour, distinct from the genetic vulnerability to psychiatric disorders, focused on clinical and population-based studies, and findings from recent molecular genetics association studies.

Method. The review includes peer-reviewed research articles and review papers from the professional literature in English language, retrieved from PubMed/Medline and PsycINFO.

Results. The research literature confirms a existence of a genetic vulnerability to suicidal behaviour. Even though the results of individual studies are difficult to compare, genetic influences could explain up to half of the variance of the occurrence of suicide.

Conclusion. Genetic vulnerability could be a distal risk factor for suicide, which helps us to understand the occurrence of suicide among vulnerable people. Ethical implications of such vulnerability are highlighted.

Keywords:
suicide, suicidal behaviour, genetics, vulnerability, families, probands, offsprings, review, ethical considerations

IZVLEČEK

***Uvod**. Samomor je večrazsežnostni problem. S študijami družinskih anamnez samomorilnega vedenja je bilo ugotovljeno, da bi genetska komponenta lahko vplivala na občutljivost za samomorilno vedenje.*

***Namen**. Članek skozi zgodovinski vidik proučuje današnje poznavanje genetske ranljivosti za samomorilno vedenje, ki se razlikuje od genetske ranljivosti za psihiatrične motnje v kliničnih in populacijskih študijah ter prikazuje ugotovitve zadnjih študij molekularno genetskih raziskav.*

***Metoda**. Strokovni pregled vključuje raziskovalne članke in poročila iz strokovne literature v angleškem jeziku, pridobljene iz PubMed/Medine in PsycINFO.*

***Rezultati**. Pregled obstoječe strokovne literature kaže na prisotnost genetske komponente kot dejavnika tveganja za samomorilno vedenje. Čeprav je rezultate posameznih študij težko primerjati, pa lahko genetski vplivi pojasnijo tudi do polovico različnih pojavov samomorilnega vedenja.*

***Zaključek**. Genetska ranljivost bi lahko bila distalni dejavnik tveganja za samomor, kar nam pomaga razumeti pojav samomora med osebami s tveganjem za samomorilno vedenje. S tega pogleda so zajeta tudi etična vprašanja.*

Ključne besede:
samomor, samomorilno vedenje, genetika, ranljivost, družine, preiskovanci, potomci, pregledni članki, etična vprašanja

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1 INTRODUCTION

Suicide is a multidimensional event. It is the result of a process with risk and protective factors in the cultural, social, psychological, psychiatric and biological fields. A risk factor is represented by a measurable characteristic that precedes an outcome in time, and it increases the probability of the outcome. Moscicki suggested distinguishing between proximal and distal risk factors. Distal risk factors represent a 'foundation,' they are 'necessary but not sufficient' for suicide, while proximal risk factors (precipitating events) are neither necessary nor sufficient (1). Suicide is not a result of the effect of one single risk factor, but rather of an interaction of factors that lead to the necessary and sufficient conditions for suicide (1). Genetic vulnerability for suicidal behaviour could be considered as a distal risk factor.

1.1 A Historical Perspective

Motto argued that 'history can provide a valuable perspective on contemporary questions' (2). 'The prevalent attitude of a society to suicide is shaped and fashioned from time to time by the beliefs of its people in the different periods of its history' (3). As such, nowadays experts are the heirs of the 19th century psychosocial tradition (4). In addition to centuries of philosophical and moral writings, Fedden noticed new perspectives emerging in the 19th century (5).

Indeed, observations suggested that there could be a genetic heredity of suicide (6- 8). Falret, a student of Pinel and Esquirol, who became the head of the clinic 'la Salpêtrière' in Paris, was amongst the first to apply statistical data. In his book 'De l'hypochondrie et du suicide,' he pointed at the interaction of causal risk factors, which he grouped into four categories, namely: predisposing factors including heredity; accidental direct factors, such as passions; accidental indirect factors, such as pain or illness; and civilization including religious fanaticism (9-10). Winslow stressed the impact of heredity further on: 'It is not necessary that the disposition to suicide should manifest itself in every generation; it often passes over one, and appears in the next, like insanity unattended with this propensity.' And: 'the suicidal tendency descending from one generation to another […] has been observed much more among insane persons, who have committed self-destruction, than among the sane' (11), thus Bucknill & Tuke who also discussed the heredity of mental illnesses (12). Masaryk completed a sociological monograph on suicide.[1] Taking into consideration social factors and mental illnesses regarding suicidal heredity, he concluded: 'Obviously, psychical inheritance occurs indirectly in a physiological, morphological and pathological way, but how we are to conceive of this no one yet perceives' (13). Almost simultaneously, Morselli reflected further on the complex and interacting causality of suicide, incorporating both environmental and heritable aspects: '[I]f it were possible to know exactly the physiological temperament of all self-destroyers, and, above all, the hereditary transmission, direct or indirect, of the morbid germs, we should be able to trace back the fatal determination of their last act to its true and efficient cause' (14).

The historical perspective of the question of heredity of suicidal behaviour could be expanded by many more, such as Moore, Burrows, Westcott, Tuke and Savage, Durkheim, as presented by Goldney and Schioldann (8). In addition, Motto's review of the 19th century editions of the American Journal of Insanity (later renamed as the American Journal of Psychiatry) (2) and the presentations by Berrios and Mohanna (15) and Berrios are interesting windows to that period (16).

However, early contemporary research, such as the observation of Ringel, saw that suicidal behaviour was transmitted at least partly independent from psychiatric disorders (17). The psychological autopsy study by Farberow and Simon conducted on two samples of fifty suicides in two cities, found three parental suicides in each group – a rate 88 times higher than the expected rate (18). More sceptical regarding a genetic influence was Baechler: 'It is clear that one does not inherit a solution [suicide] but at most a disposition to consider a solution of this nature' (19). Exploring causal pathways to suicide, Maris compared a sample of 266 suicides with suicide attempts and natural deaths by means of psychological autopsies. He found that suicides were distinguished from natural deaths by increased levels of a wish to die, seeing death as an escape from pain, not wanting to change things regarding the past life, hopelessness, no social participation, dissatisfaction with life, and suicide in the history of first-degree relatives (0% for the natural deaths vs. 11% for the suicides) (20). Murphy and Wetzel interviewed 127 patients who were hospitalised after a suicide attempt. A family history of suicide, attempted suicide, and suicide threats was found in 14%, 24% and 6% of the patients, respectively. Suicidal behaviour was found in 36% of the study group, with the highest rates in the subgroups with personality disorders (including addictions) and primary affective disorders. As an explanation, the authors stated that they were 'not bound to a genetic, or even to a familial, hypothesis.' They rather adhered to the hypothesis of 'assortative association' and 'shared deviance' (21). Mitterauer presented results from five studies (two population and three clinical studies) focusing on suicide of one specific

[1] But with due impediments, he was appointed as a lecturer at the Viennese Faculty of Philosophy (Austria), since sociology was not yet recognised as a scientific discipline. Masaryk would became the founder, and from 1918, the first president of Czechoslovakia.

area, Salzburg in Austria. At the population level, 49.6% of the suicides had a family history of suicide, compared with as much as 69.7% of the suicidal mental health patients. These high figures resulted from gathering the information from general practitioners, elders, clergy, etc. Indeed, only 39% of the suicide positive families had been reported by the relatives. Findings from the two studies, on bipolar mood disorder and suicide, and on psychosis and suicide, indicated the existence of an independent vulnerability to suicide. However, he was cautious, contending that 'not every case of suicide must have a genetic disposition.' Rather, it is 'a matter of finding the appropriate role that each of the three factors - the genetic disposition, the life history and the socio-cultural situation – plays in suicide' (22), a statement that could be equal to the current 'interplay between genes and environment' (23-24).

1.2 The Clinical Perspective versus the Population Perspective

Suicide prevention strategies can be developed from the health-care / clinical perspective focused on high risk groups, and the public health perspective focused on the general population (25). The same distinction can be made regarding the research on genetic vulnerability.

The reviews of Bondy et al. (26), Brent and Mann (27), Pedersen and Fiske (28), Roy (29), Roy et al. (30) and Rujescu et al. (31) looked at clinical, twin, adoption and genetic studies, and concluded that there is a genetic aspect that manifests itself when a person experiences major stress or a psychiatric disorder. In the same line, the reviews of Träskman-Bendz and Mann (32), Mann et al. (33) and Van Heeringen (34) on the biological processes in suicidal behaviour concluded that there probably exists a genetic influence on suicide risk independent of the genetic risk of psychiatric disorders. Wasserman stated that genetic inheritance does not equal 'predestination.' The biological vulnerability will be activated through life conditions and experiences, which may lead to stress, hopelessness and psychiatric conditions (25).

When investigating genetic contributions to suicidal behavior, one should not overlook family studies. In these, the risk for suicidal behaviour among family members of those who have already expressed suicidal behaviour is compared with the same risks among relatives of those who have not expressed suicidal behaviour. Many studies have been reported in reviews so far, but Baldessarini and Hennen aggregated the risk estimates from almost all these family-study reports, and reported the overall risk ratio of almost 3 (35). So-called natural experiments of natural clones (monozygotic twins who share 100% of their genes) and adoption studies have the potential to disentangle genetic familial contribution from environmental familial contributions (e.g., raising children, role models, etc.). These have already been extensively and profoundly reviewed by the above mentioned authors, as well as in a recent systematic review (36) and a meta-analysis (37).

2 AIM

Starting with a historical perspective, this paper reviews current knowledge of a genetic vulnerability to suicidal behaviour, distinct from the genetic vulnerability to psychiatric disorders, with the focus on clinical and population-based studies, and recent findings from molecular genetics association studies.

3 METHOD

Databases PubMed/Medline and PsycINFO were searched with the following search words: gene, meta-analysis, offspring, proband, suicide, and suicidal behavi*, to retrieve peer-reviewed research articles and review papers from the professional literature in English language. With no restriction for publication dates, the search identified 208 papers. Studies not related to genetic aspects of suicide were excluded. The references of relevant papers were checked.

4 RESULTS

4.1 Genetic Studies Based on Clinical Samples

Looking for biological markers of depression, Åsberg and colleagues focused on the serotonin metabolite 5-hydroxyindolacetic acid (5-HIAA) in cerebrospinal fluid (CSF). Almost by coincidence, they found that forty percent of the subgroup with low 5-HIAA had attempted suicide compared to fifteen percent in the subgroup without suicide attempt. Since their first publication in 1976, the serotonergic system has been studied extensively across psychiatric disorders both with living subjects and post mortem (32-34, 42-43).

The research that led to the formulation of the stress-diathesis model confirmed the genetic transmission of aggression. According to this model, certain people are more vulnerable to suicidal behaviour due to a predisposition for strong feelings and cognitions of hopelessness and suicidal ideation on the one hand (state), and aggression and impulsivity on the other hand (trait), when they suffer from stress and adverse life conditions (38).

The cognitive and behavioural components of the diathesis are related with neurochemistry, more specifically with the serotonergic and noradrenergic neurotransmitter systems (34, 38- 42, 44-45). The potential role of the dopaminergic system is not clear, since this has received only little research attention (25, 41). The neurobiology

is mostly genetically determined, but early childhood experiences and head injuries may alter this (25, 33, 40-41).

It was proposed that impulsivity and aggression correlate with a dysfunction of the serotonergic system, and that hopelessness correlates with a dysfunction of the noradrenergic system (40, 41). Further, it was found that the biological correlates of suicidal behaviour differ from the biological correlates of major psychiatric disorders (24, 32-33, 39, 41, 43, 45-47).

Clinical studies are summarized in Table 1.

Table 1. Clinical studies of suicidal probands: the risk of offspring suicidal behaviour.

Author	Year	Proband	Risk	Co-transmission
Brent et al. (48)	2002	Mood-disordered suicide attempters (n=81) vs. mood disordered non-attempters (n=55).	Offspring of attempters had a 6-fold increased risk for suicide attempt vs. offspring of non-attempters: 12% vs. 2% (p = 0.008).	Mood disorders; Sexual abuse and impulsive aggression.
Brent et al. (49)	2003	Mood-disordered suicide attempters: - group 1 - with siblings who attempted suicide (n=19), - group 2 - with non-attempted suicide siblings (n=73). Non-suicide attempters with non-suicide attempting siblings (group 3, n=73).	Attempted suicide risk: - in group 1: 18.8%, - in group 2: 8.5%, - in group 3: 4.2%. (p = 0.0005)	Impulsive aggression (and not mood disorder) predicted an earlier age of the onset of suicidal behaviour in the offspring of group 1, compared with the offspring of groups 2 and 3.
Burke et al. (50)	2010	Parents (n=255) with lifetime history of mood disorder (major depression, depression not otherwise specified, dysthymic disorder, or bipolar disorder) vs. offspring (n=449) over the age of 10.	Offspring (n=212) exposed to suicide attempt were 4 times more likely to report a lifetime suicide attempt compared with unexposed offspring (n=237).	Increased odds of suicide attempt.
Cheng et al. (51)	2000	Suicides (n=113) vs. living community controls (n=226).	Independent risk factors: - major depressive episode (p < 0.001), - substance use disorder (p = 0.05), - emotionally unstable disorder (p = 0.034), - loss events (p = 0.001), - suicidal behaviour in first-degree relatives (p = 0.022)	Depressive disorders.
Farmer et al. (52)	2001	Depressed subjects (n=108) with suicidal ideation (without attempts) and nearest age siblings, and healthy controls (n=105) and nearest-age siblings.	The study did not find a family risk for suicidal ideation.	Suicidal ideation was associated with life events, and with levels of neuroticism and psychoticism.
Klimes-Dougan et al. (53)	2008	Probands with mood disorders aged 17 years and older (n=457). 51.9% of probands had attempted suicide.	Significant predictors of suicide attempt in first-degree relatives of mood disordered probands: - mood disorder in first-degree relative ($p < 0.0001$); - proband history of abuse ($p < 0.02$).	Early onset of depression. Aggressive/impulsive traits may be related to childhood abuse.
Roy (55)	2000	Alcohol-dependent subjects (n=333) with and without suicide attempts.	Family loading of suicidal behaviour among suicide attempters vs. non-suicide attempters: 15.3% vs. 4.3% ($p < 0.001$).	Not reported.

Author	Year	Proband	Risk	Co-transmission
Stenager & Qin (56)	2008	Suicide victims under 35 years of age (n=4,142) vs. matched living controls (n=82,840)	Personal history of psychiatric hospitalization (OR (males) = 13.5, OR (females) = 38.9); risk for suicide with peak immediately after admission or discharge. Parental history of admission to a psychiatric hospital. Risk increased progressively with numbers of psychiatric admission. The highest risk for schizophrenia spectrum disorders, affective disorders or substance abuse.	Parental psychiatric history.
Trémeau et al. (57)	2005	Three psychiatric populations with: unipolar depression (n=160), schizophrenia (n=160), and opioid- dependence (n=160).	Family history of suicide increased the risk of attempted suicide: OR= 2.4 (p = 0.001), with no significant differences between the three groups.	Early onset: 60% of the suicide attempts occurred before the age of 25.

Brent and co-workers studied mood disordered suicide attempters in two relatively small samples (48-49). The first study found a statistically significant elevated risk for attempted suicide in the offspring of people with a mood disorder who had attempted suicide, when compared with offspring of people with mood disorders who had not attempted suicide. The majority of the attempts occurred in the context of a mood disorder; and the transmission of suicidal behaviour was related to the trans-generational transmission of sexual abuse (an original finding), and to increased aggression. On the other hand, there was no evidence of time clustering between parent and child suicide attempts, counter speaking the hypothesis of transmission through the role models in the family (48). The second study (49) compared the offspring of three groups of adults with mood disorders: 1) suicide attempters with siblings concordant for suicidal behaviour, 2) suicide attempters with siblings discordant for suicidal behaviour and 3) suicide attempters with siblings concordant for no suicidal behaviour. The study found that suicide attempts in the parents not only increased the risk of suicide attempts and impulsive aggression in the offspring, but also lowered the age of the first suicidal behaviour (49). The strongest predictor of attempted suicide in parents and offspring, and early first attempt in offspring, was impulsive aggression, thus confirming other studies that had identified this trait as being part of a diathesis for suicidal behaviour. Family loading of mood disorders was not related with early first attempt, contrary to the history of physical and sexual abuse of offspring.

The third study of the same researchers (54) looked at a large sample of mood-disordered probands, and focussed on suicidal behaviour and mood disorders among their first-degree relatives. They found that 23.2% of the attempted suicide probands had a first-degree relative who had attempted suicide, compared with 13.2% of the probands without an attempt. 30.8% of the relatives with mood disorders had developed suicidal behaviour, compared with 6.6% of the relatives without mood disorders. But the incidence of mood disorders in first-degree relatives was similar in probands with and without the history of suicide attempt, 50.6% vs. 48.1%, respectively. Childhood abuse and aggression (26.1% vs. 14.1%) were higher in probands with suicide attempts and with family loading of suicidal behaviour. And early age of onset of proband mood disorders was associated with aggression, childhood abuse, mood disorders and suicidal behaviour in relatives. The authors concluded that mood disorders only do not explain the occurrence of suicidal behaviour, and that genetic vulnerability as described in the stress-diathesis model should be considered. In addition, as in the previous studies (48-49), childhood abuse and sexual abuse seem to be independent risk factors for suicidal behaviour. The interaction between abuse, aggression (as a cause and as a result of abuse), mood disorders and suicidal behaviour needs to be studied. The prevention of abuse and treatment of victims had the potential to prevent suicidal behaviour. Common limitations for all three studies were that they involved an inpatient population, mostly females with mood disorders, and studies focused on attempted suicide, not on suicide.

Farmer et al. (52), Burke et al. (50), and Klimes-Dougan et al. (53) specifically studied depressed probands. Farmer et al. found that 66% of the depressed probands reported to have experienced suicidal ideation in the previous week, while the control probands and their siblings reported 5% and 7%, respectively. The occurrence of suicidal ideation was related to personality measures of neuroticism and psychoticism, and to having experienced severe threatening life events (the article did not specify what events were involved). The authors concluded that ideation probably is a state, rather than a partly genetic determined trait related to suicide (52). However, the study did not include the link between ideation and, for instance, impulsivity and aggression. In the study of Burke et al., almost half (47%) of the offspring were exposed to suicidal behaviour, and the proband diagnosis was not related to offspring exposure or suicidal attempt. The exposed offspring were more likely to report lifetime suicide attempt than the unexposed offspring, and neither timing, degree nor the number of exposures were associated with the risk for suicide attempt. The results of their study therefore do not support the causal pathway of imitation or modelling explanation (exposure prior to suicide attempt), but they suggest that individuals with a higher risk of suicidal behaviour may show a tendency for aggregation (51).

Klimes-Dougan et al. in a longitudinal study, from childhood through adolescence, followed depressed mothers, and compared their offspring to the offspring of mothers without psychiatric diagnosis. The study demonstrated that the offspring of mothers with a major depressive disorder had an earlier onset and a more persistent suicidality than the offspring of mothers with bipolar disorder and mothers without psychiatric diagnosis (53). Therefore, this offspring represents an important vulnerable group for preventive interventions.

Trémeau et al. studied the family history (up to third-degree relatives) of suicide and attempted suicide in three different groups of psychiatric disorders, namely: inpatients with depression, schizophrenia, and opioid dependent patients. Family history of suicidal behaviour significantly increased the risk of suicide attempt. Family history was also a risk factor for multiple suicide attempts and for the use of highly lethal methods (1 in 4 of the depressed group, and in more than half of the two other groups). Almost 60% of the suicide attempts in this population occurred before the age of 25. On the other hand, there were no relations with the age of the first attempt, with receiving mental health care in the period before the first attempt, or with the diagnostic group (57). However, the findings point to a need to better detect, treat, and assess suicide risk at an early age.

Studying family history of suicidal behaviour and alcohol dependence, Roy determined that both, suicide and suicide attempt in the family history, were significantly more often present in subjects who attempted suicide than among those who did not attempt suicide (29.8% and 11.5%, respectively) (55).

By means of psychological autopsies, Cheng et al. examined psychosocial and psychiatric risk factors in suicides and community controls in Taiwan. The suicides had higher rates of previous suicide attempts, more early parental deprivation, and more first-degree relatives with suicide, attempted suicide, depression, and emotionally unstable personality disorder, but not more substance abuse. The latter could be explained by high alcohol consumption in general in Taiwan. The effect of family history of suicidal behaviour was independent of demographic, psychosocial and psychiatric factors, and of environmental factors, such as parental deprivation or family history of psychopathology. Other independent factors were depression, substance abuse, unstable personality disorder, and loss events. The authors concluded that the independent factors influence or cause psychosocial factors, and that genetic vulnerability could increase due to these factors. Effective intervention should focus on loss events and major depression among emotionally unstable people with a family history of suicidal behaviour and substance abuse (51).

A nested-case control study on suicide victims and their psychiatric history was performed by Stenager and Qin. They investigated psychiatric hospitalisation as a risk factor for completed suicide in adolescents and young adults under 35 years of age in Denmark between 1981 and 1997. They demonstrated that a diagnosis of schizophrenia was a strong risk factor for completed suicide, which peaked immediately after admission to, or discharge from, psychiatric hospital. In addition, paternal history of admission to a psychiatric hospital represented a strong predictor for suicide, being more pronounced for mothers than fathers and female than male group of suicide victims (56).

4.2 Population-Based Studies

Table 2. Population-based studies of suicidal probands: the risk of offspring suicidal behaviour.

Author	Year	Proband	Risk	Co-transmission
Agerbo et al. (58)	2002	Young people (<21 years old) suicides (n=496) vs. community controls (n=24,800).	Percentage-attributable risk (PAR) of father suicide (1.1) and admission for mental disorders (3.9). PAR of mother suicide (1.4) and mental hospital admission (6.4). PAR subject individual admission: 15.0.	Psychiatric disorders
Brent et al. (59)	1998	Adolescent suicides (n=58) vs. community controls (n=55)	Increased rates of suicide attempts and completions (and not of suicidal ideation) in first-degree relatives of suicide probands vs. controls after controlling for psychiatric disorders (OR = 4.3).	Aggression
Goodwin et al. (60)	2004	National US representative sample (n=8,098), aged 15-54 years.	After controlling for psychiatric disorders, parental suicidal ideation was related with offspring ideation (OR = 1.7), and parental suicide attempt was associated with offspring ideation (OR = 2.0) and offspring attempt (OR = 2.2.). All: $p < 0.05$.	Not reported
Kim et al. (61)	2005	Male suicides (n=25) and their relatives (n=247) vs. community controls (n=25) and their relatives (n=171).	After controlling for psychopathology, relatives of male suicides were more likely to complete or attempt suicide: OR = 10.62 ($p < 0.05$). Past or present suicide ideation did not differ in the two groups of relatives, but the level of suicidal ideation was higher among the relatives who committed suicide ($p = 0.008$).	Not reported
Lieb et al. (62)	2005	933 adolescents whose biological mothers had participated in the parent survey.	Increased suicidal ideation in the offspring of mothers with suicide attempts vs. mothers without suicidality: OR = 5.1. Increased suicide attempts in this offspring: OR = 9.0 ($p > 0.05$). Differences remained significant after controlling for socio-demographic factors, and psychopathology.	Earlier onset of suicidal behaviour. Impulsivity and aggression. Irritabilities in families directed inward or outward, stable over time and generations.
Mittendorfer-Rutz et al. (63)	2008	Hospitalised suicide attempters (n=14,440) vs. community controls (n=144,400).	The strongest independent familial risk factor for youth suicide attempt were siblings' (OR = 3.4), maternal (OR = 2.7) and paternal (OR = 1.9) suicide attempts, and paternal (OR = 1.9) and maternal (OR = 1.8) suicide completion.	Familial personality and substance abuse disorders.
Qin et al. (64)	2002	Suicides between the ages of 9 and 45 (n=4,262) vs. community controls (n=80,238).	Family history of suicide (OR = 2.58) and family history of psychiatric disorder (OR = 1.31) independently increased suicide risk in relatives ($p < 0.01$). A suicide risk was increased after a suicide death of a mother, father and sibling, but not after non-suicide deaths.	Not reported.

Author	Year	Proband	Risk	Co-transmission
Qin et al. (65)	2003	Suicides between the ages of 9 and 103 (n=21,169) vs. population controls (n=423,128).	Psychiatric admission increased the suicide risk in males: OR = 28.23, and in females: OR = 77.77 ($p < 0.01$). A suicide risk was highest soon after discharge (<8 days) in males: OR=137.48, and in females: OR = 493.45 ($p < 0.01$). The history of first-degree relative suicide in male subjects: OR = 1.90, and in female subjects: OR = 2.95 ($p < 0.01$).	Protective effect of parenthood for fathers with a child < 2 years old, and for mothers with a child up to 6 years old.
Runeson (66)	1998	58 consecutive suicides, between the ages of 15 and 29.	An early onset (< 20 years old) for males in families with a history of mental disorders vs. families without such a history (p = 0.03). Longer duration of the suicidal process (> 2 years), and several suicide attempts.	Possibly: - mental disorders, - substance abuse, - personality traits.
Runeson & Åsberg (67)	2003	First-degree relatives (n=33,173) of suicide victims (n=8,396) vs. controls who died from other causes (n=7,568) and their first-degree relatives (n=28,945).	The history of psychiatric care and of suicide was higher among the relatives sof suicide victims vs. relatives of controls ($p < 0.001$).	Possibly: - aggressive/impulsive behaviour, - social learning.
Tidemalm et al. (68)	2011	Suicide among family members of suicides (n=83,951) vs. suicides among relatives in population controls	Patterns of familial aggregation of suicide among relatives to suicide decedents suggested genetic influences on suicide risk; the risk among full siblings (OR = 3.1, 95% CI 2.8-3.5,), maternal half-siblings (OR = 1.7, 95% CI 1.1-2.7), despite similar environmental exposure. Shared (familial) environmental influences were also indicated; siblings to suicide decedents had a higher risk than offspring (OR = 3.1, 95% CI 2.8-3.5 vs. OR = 2.0, 95% CI 1.9-2.2.	Not reported
Waern (69)	2005	Elderly suicide victims (> 65 years old) with (n=13) and without (n=72) family member suicide.	Elderly with family member suicide had more previous suicidal behaviour: 100% vs. 65% ($p < 0.01$).	All elderly suicides with offspring suicide had a substance use disorder (correlation).

Goodwin et al. studied associations between parental and offspring suicidal ideation and suicide attempts among adult offspring in community samples. All participants were examined for psychiatric disorders, suicidal ideation and suicide attempt, as well as for family history of suicidal ideation and suicide behaviour. The lifetime prevalence of suicidal ideation in the cohort was 13.5% and the history of suicide attempt was 4.6%. The results showed that parental suicidal ideation and attempt was associated with a significantly increased likelihood of suicidal ideation and suicide attempt among offspring. Co-morbid mental disorders contributed to the strength of associations, but the significance remained after adjustment. In this study, suicidal ideation and behaviour were assessed each with only one question. As such, as authors proposed, a more extensive evaluation of suicide ideation and suicidal behaviour would be needed (60).

Mittendorfer-Rutz et al. focussed on suicide attempts. They analysed a large record-linkage database with the data from hospitalized youth suicide attempters, and matched community controls for gender, month of birth and county. Among the cases, 12% had a history of suicide attempt in the family and 2% of suicide in the family. The strongest independent familial risk factors for youth suicide attempt were siblings', maternal and paternal suicide attempt, and paternal and maternal suicide completion. The boys were more prone to attempting suicide when having a family member who died by suicide than girls. Although the study avoided common research limitations, like recall and selection bias, the study was not able to include suicide attempts when individuals were not hospitalised (63).

Runeson and Åsberg compared suicide rates of people bereaved by suicide with those bereaved after other

causes of death. The data was collected from the Swedish death register. The authors found 9.4% and 4.6% suicides in both groups of relatives, respectively. Previous psychiatric treatment and family history of suicide had the strongest predictive value for suicide, with the latter as an independent factor. No gender difference was found. The study showed that the bereaved by suicide are a risk group for suicide (67). The finding was extended by results of the first total population study that provided estimates for familial suicide risk in relatives with varying genetic and environmental backgrounds (68). Tidemalm et al. compared relatives of suicides (from 1952 to 2003) with relatives of community controls. They revealed patterns of familial aggregation of suicide: the risk for suicide was higher in the population of first-degree relatives of suicide probands, which was also higher in the group of maternal siblings. Furthermore, they determined that siblings and offspring of suicide victims had a high risk for suicide, but it was more pronounced in the first group (68).

Qin et al. studied suicides between 1981 and 1997, and matched living controls, regarding family history of suicide and psychiatric illness, and socioeconomic, demographic, and psychiatric data (64, 65). Major findings were that both, family history of suicide and psychiatric disorder, significantly and independently increased the suicide risk (64, 65). Furthermore, a history of psychiatric hospitalisation was the strongest risk factor for suicide, and more in females than in males. Suicide risk was highest shortly after discharging from hospital. Single marital status and being an age pensioner were the two next important factors. Economic stressors, such as unemployment and low income, increased suicide risk in males more than in females. Being a parent of a young child was a protective factor. The authors reported the finding of family clustering of suicidal behaviour which would not be explained by familial loading of mental disorders. Lastly, living in urban areas decreased the suicide risk for males, but increased the risk for females (65). This finding was replicated in the study on suicide risk in relation to the level of urbanicity by Qin (70).

Agerbo et al. retrieved data from several population and hospital registers of young people who had died by suicide between 1981 and 1997. They found that mental disorders of a young person (measured by psychiatric admission, 15% of suicide cases), and suicide or mental disorder of a parent were the most important risk factor for youth suicide. After controlling for these factors, the importance of socioeconomic factors, such as unemployment, low income, poor schooling, etc., decreased. As such, the authors recommended early recognition and treatment of mental disorders in young people as an important prevention strategy. The study confirmed clinical findings of the importance of mental disorders and suicidal behaviour in first degree relatives as risk factors (58).

Strengths of these studies (58, 64, 65) were a case-control study design based on a huge database, and focused on suicide as the outcome. Important findings were the gender differences regarding risk and protective factors. A shortcoming was that the data on previous suicide attempts as a major risk factor for suicide was not available in the databases. However, as mentioned by Goldney, the population attributable risk (PAR) assessment allows us to weight different risk factors, and may thus help us to target prevention efforts (71).

Lieb and co-workers performed a four-year follow-up study on maternal transmission of suicidality on the adolescents and young adults born from 1970 to 1981 (62). About one-third of the mothers reported lifetime suicidal ideation and 2.3% reported suicide attempts. In comparison, about one-third of the study subjects reported suicidal ideation in their lifetimes and 5% reported suicide attempts. Suicidal ideation and suicide attempts were more common in female offspring than in male (OR = 1.7 and OR = 2.5, respectively). The odds for suicidal ideation and the odds for suicide attempts were higher in the offspring of the mothers who had ever attempted suicide compared to the offspring of the mothers without any suicidality. The results remained after control for psychopathology of the mothers. The authors concluded that familial risk acts similarly in females and males, but that an earlier onset of the first suicide attempt in the offspring tends to be predicted by maternal history of suicide attempts. However, the manifestation of suicidality has to be understood as a complex interplay of multiple factors, with maternal suicidality being just one of the risk factors (62).

In the family study by Kim et al., the majority (80%) of the suicide completers was diagnosed with a major axis I disorder (alcohol or drug abuse or dependence, depressive disorder) and 56% was diagnosed with an axis II personality disorder, while 4% of the control subjects was diagnosed with the latter. The study found a significant difference in the presence of aggressive behaviour in first-degree relatives of suicide completers (OR = 3.97). Moreover, the relatives of suicide victims were more likely to attempt or complete suicide than the relatives of comparison subjects after controlling for psychopathology. The study findings confirmed the existence of a strong familial component of suicidal behaviour, and that aggressive behaviour with severe suicidal ideation might be implicated in familial transmission of suicidal behaviour (61).

Waern conducted a pioneer study regarding the family history of suicide among elderly suicides, by means of psychological autopsies and data from health care facilities. The subgroup of elderly suicides with offspring suicide had more substance abuse, and contrary to sibling/parent suicide, offspring suicide could have played a role in the elderly suicide (69). This study highlighted

a few interesting questions, such as the specificity of offspring suicide, the role of bereavement, and the role of substance abuse in a diathesis for suicidal behaviour. Limitations of the study were the use of a small sample size and non-consideration of attempted suicide in the family history.

A quite different approach to the study on population level was provided by Marušič and Farmer (72) and Marušič (73). They observed a geographical area in a 'J-shaped curve' from Finland in the north of Europe, to Austria and Slovenia in the south. These were the European countries with suicide rates above 20/100,000. A shared genetic background/history would at least partly account for the shared high suicide rates, in interaction with environmental aspects. The authors concluded that prevention in vulnerable populations would require a combination of medical, psychosocial and environmental strategies.

4.3 Molecular Genetic Association Studies

More straightforward information on the role of a genetic background of suicidal behaviour could be found in studies of different candidate genes that were proposed to be involved in various behavioural disorders.

So far, the most comprehensive study has been performed by Schild et al., who analysed all meta-analyses in the field of single nucleotide polymorphisms (SNPs) and suicidal behaviour published by May 2012 (74). Based on their results and on even more recently published meta-analyses the study findings point at several genes that show association with suicidal behaviour and are involved in the serotonergic neurotransmission. Also other genes, whose protein products, like the brain-derived neurothropic factor (BDNF), are closely linked to the serotonergic function. The first and probably the most extensively studied gene in the field of psychiatric genetics is the serotonin transporter gene (*SLC6A4*). Clayden et al. (75) conducted the largest meta-analysis of 44-base pairs long insertion (L) or deletion (S) polymorphism in the promoter region of *SCL6A4* (5-HTTLPR), and found an association with attempted suicide (OR = 1.13, 95% CI 1.05-1.21). When studies on completed suicide were analysed, there was no statistically significant association. Another gene, also often studied, is the gene coding for tryptophan hydroxylase 1 (*TPH1*). The protein, TPH1, namely, plays a very important role in the serotonin synthesis, since it catalyses the first and the rate-limiting step. Positive association was, again, determined by Clayden et al. (75) for the polymorphism A218C and attempted suicide, but not for completed suicide. In an even more recent study of González-Castro et al. (76), the locus A218C/A779C has been associated with suicidal behaviour at a clinical level. The association was confirmed based on fixed effects model, and also separately on Asian and Caucasian populations (76). For the neuronal isoform of TPH, designated as TPH2, there are fewer studies interrogating its polymorphisms in association with suicidal behaviour, and only two meta-analyses conducted by González-Castro et al. (76) and Choong et al. (77). The association of two polymorphisms, rs7305115 and 1386486, with suicidal behaviour has been determined by the latter; however, there was a high heterogeneity among the included studies (77). The genetic polymorphisms of the gene of one of the key enzymes for degradation of catecholamines, catechol-o-methyl transferase (COMT), were investigated in few meta-analyses. First results indicated an association of the substitution of amino acid valine to methionine on the position 158 (78). However, the latest and even more comprehensive meta-analysis of this polymorphism, and also other polymorphisms, by Clayden et al. (75) and Calati et al. (79), failed to confirm the association. Nevertheless, they found an association with particular personality traits, like angry reaction and irritability (79), which are also important when considering suicidal behaviour. So far, there is only one meta-analysis on the polymorphisms of the monoamine oxidase A gene (*MAOA*), whose protein product deaminates neurotransmitters noradrenaline, adrenaline, dopamine and serotonin. It has been previously associated with the pathogenesis of suicidal behaviour, but the results of the meta-analysis on the most extensively studied polymorphism in the promoter region, uVNTR, could not confirm its implication in suicide attempt, either among psychiatric patients or when stratified for psychiatric diagnosis (80).

Beside the relatively large number of studies on genes of serotonergic system, other genes are not as extensively investigated. Currently, only studies of an important protein that regulates neuronal growth, plasticity, and also effects mood, cognition, behaviour, and stress response, the neurotrophin BDNF, seem to offer promising results. For the *BDNF* gene, Zai et al. (81) in their meta-analysis, reported association of methionine allele on position 66 with suicide (OR = 1.16, 95% CI 1.01-1.32), and also with the history of suicide attempt.

The accumulating results of case-control studies of serotonergic as well as of other genes are quite inconclusive, and there are only a few more polymorphisms that were included in meta-analyses. In general, the differences between study designs, particularly in the sample characteristics, contribute substantially to the heterogeneity. It has been determined that suicide attempts and completions should be considered separately, as two phenotypes, and that adjustment for psychiatric comorbidities is necessary (75).

Beside the hypothesis-driven approach of case-control studies of existing candidate genes, the development of technology now offers the possibility of genome screening.

The microarray technology and next generation sequencing are probably the best ways for the determination of SNPs, RNA expression and epigenetic patterns, in order to identify new candidate genes and pathways that may be involved in the suicidal process. One particular way of such hypothesis-generating approach represents genome-wide association studies (GWAS). There are three types of GWAS, namely: SNP-by-SNP, gene-wide GWAS, and pathway/network GWAS, which enable either identification of significant SNP-associations, or selection of most significant SNP(s) that is (are) in the linkage disequilibrium of a gene, or grouping of SNPs that are known to belong to the same pathway and/or protein-protein interaction networks (82). As determined in the review of Sokolowski et al. (82), so far, eight GWAS studies, where suicidal behaviour has been included in the analysis, exist. The results show that there are only a few findings that could be genome-wide significant; however, the replication of results needs further attention. It is of particular importance to stress that none of these studies was initially designed to study suicidal behaviour, but psychiatric disorders. The studies differ among each other also in the sample sizes, study designs and definitions, psychiatric diagnoses, analysis methods, and also in the techniques used for the SNPs interrogation (82). Due to all these differences, it is not possible to conclude that there are any important already discerned findings in the narrow field of suicide research. However, the potential of GWAS studies is big and more studies are needed. With a growing number of genetic/epigenetic studies of suicidal behaviour, and with the development of modern bioinformatic approaches that would enable disentangling the vast spectrum of accumulated data, one could expect the next step in the understanding of biological aspects of suicidal behaviour. However, the translation of the results into suicide prevention and management still seems rather farfetched.

5 ETHICAL CONSEQUENCES

It is very likely that, in the future, evidence will confirm some genetic risk factors for suicidal behaviour, most probably a small, additive effect. In such case, being able to identify people who may be at a higher risk for suicidal ideation and/or behaviour will have several implications. In particular, as argued by Marušič and McGuffin, and Marušič and Swapp, a number of ethical public policy issues will be raised (24, 83).

As with any other research in mental health and in genetics, it must be guaranteed that potential subjects in genetic research are asked to provide informed consent. They have to be informed that their participation is voluntary and that they may withdraw at any time. The risks and benefits of the study must be clearly stated, and alternatives to the study should be made available to the participants. It is also important to protect the confidentiality of the data of individuals, both suicidal cases and their controls, from whom the material for molecular genetics research of suicidal behaviour has been taken (24, 83).

Furthermore, if genetic testing for suicidal behaviour once becomes possible, the question of who (suicidal subjects, their relatives…), when (are results valid enough?), and how (after genetic counselling) to present information will have to be addressed (24, 83). Given the recent developments of genetic research in suicidology and neighbouring fields, the importance of a possible impact should not be underestimated. One needs to plan strategically in advance for the challenges that undoubtedly lie ahead.

Lastly, the bridge between the study of genetics and suicide researchers will have to be built. One way forward would be to improve the awareness and knowledge of genetics among suicidologists, and vice versa. A review as the present one definitively presents an attempt to build such a bridge.

6 CONCLUSION

The overview of the clinical, population and genetic studies clearly shows that there are many differences across the studies, regarding the aims, study groups, methods and outcome measurements. Despite these limitations, there are plausible indications for the existence of a genetic vulnerability to suicidal behaviour that could be transmitted independently from psychiatric or other risk factors. At the aggregate level, surviving relatives, after a suicide, have an increased risk for suicide. The assessment of suicide risk should routinely include the family history of suicidal behaviour. Individual risk increases when there is co-morbidity or interaction with psychiatric problems, environmental stressors, such as sexual abuse, and impulsive aggression. Possibly, there could be also certain gender differences. Currently, it is not yet decided what genes, of the estimated 20,000 that are involved in the functioning of the brain, specifically are involved, but the research tends to focus on the tryptophan hydroxylase, the serotonin transporter and receptor genes (30, 33-34, 46-47). In fact, McGuffin et al. estimated that approximately 43% of the variance of the occurrence of suicide could be attributed to genetic influences (47), a figure almost identical with the 45% found in a major twin study regarding suicidal thoughts and behaviour (84). However, the presence of genetic vulnerability would be one (of many) distal risk factor only.

'Suppose we take Jeff, a lad of 18 years, and suppose his family background is marked with depression [let us add also a genetic vulnerability to suicide]; he is isolated; his pain is unbearable; and he sees no escape from his malaise, but suicide. Suppose that 70% of such young adults, having a similar background, become suicidal. Does that mean that Jeff himself has a 70% chance of killing himself? …The answer is – not at all. Jeff is a unique being' (85).

It's important to keep this in mind for any either aggregate or individual prevention strategy. Morselli, already in 1881, warned against the ecological fallacy, saying that 'statistics cannot presume to learn the true mental state' or the psychic process that precedes suicide (14).

Given the fact that the vulnerability to suicide is multifactorial, future research should integrate biological, clinical and population aspects to better understand the protective and risk factors in the diathesis. As knowledge increases, important ethical questions, as mentioned above, need to be addressed.

CONFLICTS OF INTEREST

The authors declare that no conflicts of interest exist.

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ETHICAL APPROVAL

Not applicable.

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Abstract and Key Words

The abstract of the scientific article should be structured and of no more than 250 words (Slovenian language abstracts are limited to 400 words), the abstracts of other articles should be unstructured and of no more than 150 words. The abstract should summarize the content and not only enumerate the essential parts of the work. Avoid abbreviations. Abstract should be written in third person. The abstract of a scientific article should state the purpose of the investigation, basic procedures, main findings together with their statistical significance, and principal conclusions. 3 - 10 key words should be cited for the purpose of indexing. Terms from the MeSH - Medical Subject Headings listed in Index Medicus should be used. The abstract should

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Examples for literature citation:

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Type on the place in the text where they belong. Tables should be composed by lines and columns which intersect in fields. Number tables consecutively. Each table should be cited in the text and supplied with a brief title. Explain all the abbreviations and non-standard units in the table.

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Illustrations should be professionally drawn. When preparing the illustrations consider the black-and-white print. Illustration material should be prepared in black-and-white (not in color!). Surfaces should have no tone-fills, hatchings should be chosen instead (in case of bar-charts, so called pie-charts or maps). In linear graphs the individual lines should also be separated by various kinds of hatching or by different markers (triangles, asterisks…), but not by color. Graphs should have white background (i. e. without background).

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Units of Measurement

Should be in accordance with International System of Units (SI).

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Avoid abbreviations, with the exception of internationally valid signs for units of measurement. Avoid abbreviations in the title and abstract. The full term for which an abbreviation stands should precede its first use in the text, abbreviation used in further text should be cited in parentheses.

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Uredništvo sprejema v obdelavo samo članke s širšo javnozdravstveno tematiko, ki še niso bili in ne bodo objavljeni drugje. Dele članka, ki so povzeti po drugi literaturi (predvsem slike in tabele), mora spremljati dovoljenje avtorja in založnika prispevka, da dovoli naši reviji reprodukcijo.

Oddan rokopis morajo prebrati vsi avtorji in se z njegovo vsebino strinjati.

Raziskave na ljudeh (vključno s človeškimi materiali in osebnimi podatki) morajo biti izpeljane v skladu s Helsinško deklaracijo in potrjene s strani nacionalne etične komisije. V poglavju o metodah morajo avtorji podati izjavo o etiki raziskav na ljudeh, ki mora vsebovati ime etične komisije in referenčno številko obravnave. Poročanje o raziskavah na ljudeh brez potrdila etične komisije zahteva dodatno razlago v poglavju o metodah dela. Na zahtevo Uredništva je avtor dolžan predložiti vso dokumentacijo o obravnavi raziskovalne etike njegovega rokopisa. Uredništvo si pridržuje pravico, da kontaktira etično komisijo.

Prav tako morajo avtorji, ki poročajo o ljudeh ali posredujejo javnosti njihovo slikovno gradivo, pridobiti dovoljenja vseh sodelujočih, da se z vključitvijo v raziskavo strinjajo (v primeru otrok so to starši ali skrbniki). Izjavo o pridobitvi teh dovoljenj morajo avtorji podati v poglavju o metodah dela. Uredništvo si pridržuje pravico vpogleda v to dokumentacijo.

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CONFLICTS OF INTEREST (The authors declare that no conflicts of interest exist.)

FUNDING (The study was financed by…)

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V spletno uredniško aplikacijo se prijavite kot avtor. Prva prijava zahteva vnos podatkov o avtorju, vse naslednje prijave pa le še vnos podatkov za prijavo, ki jih na svoj elektronski naslov prejmete po prvi prijavi v sistem.

Po uspešni prijavi izpolnite vsa zahtevana strukturirana polja. Potrdite izjavo, da vaš prispevek še ni bil objavljen ali poslan v objavo kakšni drugi reviji, da so prispevek prebrali in se z njim strinjajo vsi avtorji, da so raziskave na ljudeh oz. živalih opravljene v skladu z načeli Helsinško-Tokijske deklaracije oz. v skladu z etičnimi načeli.

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Podatke o avtorju in soavtorjih vnesite kar se da natančno in popolno. Naveden naj bo odgovorni avtor (s polnim naslovom, telefonsko številko in elektronskim naslovom), ki bo skrbel za komunikacijo z uredništvom in ostalimi avtorji.

Jezik prispevka je angleščina. Objavljamo izvirne znanstvene članke, pregledne znanstvene članke, uvodnike, pisma uredništvu in recenzije knjig. Pri izvirnih in preglednih znanstvenih prispevkih morajo biti naslov, izvleček in ključne besede prevedeni tudi v slovenščino.

Naslov, ključne besede in izvleček se oddajajo dvojezično v angleščini in v slovenščini v strukturirana polja. Posebno polje za zapis v drugem jeziku obstaja le za izvleček, preostale podatke vnesite v obeh jezikih v ustrezno isto polje. Prvi izvleček je vselej v angleškem jeziku (do 250 besed - sistem vam besede sproti šteje), drugi pa v slovenskem jeziku (razširjen izvleček – do 400 besed).

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Pri oddaji sledite napotkom, ki vam jih ponuja sistem, pomagate pa si lahko tudi z 'Editorial Manager's Tutorial for Autors'.

Sistem najbolje deluje, če uporabljate zadnjo različico Acrobata.

Če pri oddajanju rokopisa naletite na nepremostljive težave, se za pomoč obrnite na naslov uredništva: zdrav. var@nijz.si.

V nadaljevanju podajamo še nekaj natančnejših napotkov.

ROKOPIS

Besedila naj bodo napisana z urejevalnikom Word for Windows. Robovi naj bodo široki najmanj 25 mm. Znanstveni članki naj imajo naslednja poglavja: uvod, metode, rezultati, razpravljanje in zaključek. Ostale oblike člankov in pregledni članki so lahko zasnovani drugače, vendar naj bo razdelitev na poglavja in podpoglavja jasno razvidna iz velikosti črk naslovov. Poglavja in podpoglavja naj bodo številčena dekadno po standardu SIST ISO 2145 in SIST ISO 690 (npr. 1, 1.1, 1.1.1 itd.).

Priporočljiva dolžina prispevka je za uvodnik od 250 do 700 besed; za pismo uredništvu do 1500 besed, za recenzije knjig do 500 besed; za znanstveni članek od 2000 do 4500 besed z razpredelnicami in literaturo vred.

Naslov in avtorstvo

Naslov v angleškem in slovenskem jeziku naj bo kratek in natančen, opisen in ne trdilen (povedi v naslovih niso dopustne). Navedena naj bodo imena piscev z natančnimi akademskimi in strokovnimi naslovi ter popoln naslov ustanove, inštituta ali klinike, kjer je delo nastalo. Avtorji morajo izpolnjevati pogoje za avtorstvo. Prispevati morajo k zasnovi in oblikovanju oz. analizi in interpretaciji podatkov, članek morajo intelektualno zasnovati oz. ga kritično pregledati, strinjati se morajo s končno različico članka. Samo zbiranje podatkov ne zadostuje za avtorstvo.

Izvleček in ključne besede

Izvleček v angleškem in slovenskem jeziku naj bo pri znanstvenem članku strukturiran in naj ne bo daljši od 250 besed v angleščini in 400 besed v slovenščini, izvlečki ostalih člankov so lahko nestrukturirani in naj ne presegajo 150 besed. Izvleček naj vsebinsko povzema in ne le našteva bistvene vsebine dela. Izogibajte se kraticam in okrajšavam. Napisan naj bo v 3. osebi.

Izvleček znanstvenega članka naj povzema namen dela, osnovne metode, glavne izsledke in njihovo statistično pomembnost ter poglavitne sklepe (struktura IMRC – Introduction, Methods, Results, Conclusions).

Navedenih naj bo 3-10 ključnih besed, ki nam bodo v pomoč pri indeksiranju. Uporabljajte izraze iz MeSH - Medical Subject Headings, ki jih navaja Index Medicus.

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Kategorijo prispevka predlaga z vnosov v ustrezno polje avtor sam, končno odločitev pa sprejme urednik na osnovi predlogov recenzentov. Objavljamo izvirne znanstvene članke, pregledne znanstvene članke, uvodnike, pisma uredništvu in recenzije knjig.

Reference

Vsako navajanje trditev ali dognanj drugih morate podpreti z referenco. Reference naj bodo v besedilu navedene po vrstnem redu, tako kot se pojavljajo. Referenca naj bo navedena na koncu citirane trditve. Reference v besedilu, slikah in tabelah navedite v oklepaju z arabskimi številkami. Reference, ki se pojavljajo samo v tabelah ali slikah, naj bodo oštevilčene tako, kot se bodo pojavile v besedilu. Kot referenc ne navajajte izvlečkov in osebnih dogovorov (slednje je lahko navedeno v besedilu). Seznam citirane literature dodajte na koncu prispevka. Literaturo citirajte po priloženih navodilih, ki so v skladu s tistimi, ki jih uporablja ameriška National Library of Medicine v Index Medicus. Uporabljajte numerično citiranje. Imena revij krajšajte tako, kot določa Index Medicus (popoln seznam na naslovu URL: http://www.nlm.nih.gov).

Navedite imena vseh avtorjev, v primeru, da je avtorjev šest ali več, navedite prvih šest avtorjev in dodajte et al.

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Premik M. Uvod v epidemiologijo. Ljubljana: Medicinska fakulteta, 1998.

Mahy BWJ. A dictionary of virology. 2nd ed. San Diego: Academic Press, 1997.

primer za poglavje iz knjige:

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Tabele v angleškem jeziku naj bodo v besedilu prispevka na mestu, kamor sodijo. Tabele naj sestavljajo vrstice in stolpci, ki se sekajo v poljih. Tabele oštevilčite po vrstnem redu, vsaka tabela mora biti citirana v besedilu. Tabela naj bo opremljena s kratkim angleškim naslovom. V legendi naj bodo pojasnjene vse kratice, okrajšave in nestandardne enote, ki se pojavljajo v tabeli.

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- v grafih naj bo ozadje belo (tj. brez ozadja).

Črke, številke ali simboli na sliki morajo biti jasni, enotni in dovolj veliki, da so berljivi tudi na pomanjšani sliki. Ročno ali na pisalni stroj izpisano besedilo v sliki je nedopustno.

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Kraticam in okrajšavam se izogibajte, izjema so mednarodno veljavne oznake merskih enot. V naslovih in izvlečku naj ne bo kratic. Na mestu, kjer se kratica prvič pojavi v besedilu, naj bo izraz, ki ga nadomešča, polno izpisan, v nadaljnjem besedilu uporabljano kratico navajajte v oklepaju.

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Prispelo gradivo z javnozdravstveno tematiko posreduje uredništvo po tehnični brezhibnosti v strokovno recenzijo trem mednarodno priznanim strokovnjakom. Recenzijski postopek je dvojno slep. Po končanem uredniškem delu vrnemo prispevek korespondenčnemu avtorju, da

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Prispevkov ne honoriramo. Avtor dobi le izvod revije, v kateri je objavljen njegov članek.