SELF – REPORTED DEPRESSION, ANXIETY AND EVALUATION OF OWN PAIN IN CLINICAL SAMPLE OF PATIENTS WITH DIFFERENT LOCATION OF CHRONIC PAIN

SAMOOCENJENA DEPRESIVNOST IN ANKSIOZNOST TER EVALVACIJA LASTNE BOLEČINE V KLINIČNEM VZORCU PACIENTOV Z RAZLIČNO LOKACIJO KRONIČNE BOLEČINE

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ABSTRACT

Keywords:
chronic pain, anxiety, depression, location of pain, back pain

Background. Depression, anxiety and chronic pain are frequent co-occurrent disorders. Patients with these mental disorders experience more intense pain that lasts for a longer time.

Method. Questionnaire with 228 variables was applied to 109 randomly chosen patients that were treated at an outpatient clinic for treatment of chronic pain of the University Clinical Centre Ljubljana from March to June 2013. 87 patients responded to the questionnaire (79.8%). Location of pain considering diagnosis was the criterion in the discriminant analysis (soft tissue disorders; headache; symptoms not elsewhere classified; back pain) and following summative scores as predictors: level of depression and anxiety (The Zung Self-Rating Depression/Anxiety Scale), evaluation of pain and perceptions of being threatened in social relations.

Results. Average age of participants was M = 52.7 years (SD 13.9), with 70.9% female, 29.1% male participants. 63% of respondents achieved clinically important level of depression and 54% clinically important level of anxiety. On univariate level, the highest level of depression and anxiety was found for back pain and the lowest for headache. No significant difference was found in evaluation of pain and perceptions of being threatened in social relations regarding location of pain. Self-evaluation of depression has, in the framework of discriminant analysis, the largest weight for prediction of differentiation between different locations of pain.

Conclusion. Different locations of pain have different connections with mood levels. The results of research on a preliminary level indicate the need to consider mental experience in the treatment of chronic pain.

IZVLEČEK

Ključne besede:
kronična bolečina, anksioznost, depresivnost, lokacija bolečine, bolečina v hrbtu

Izhodišče. Depresija in anksioznost sta pogosti sočasni duševni motnji s kronično bolečino. Bolniki s tema motnjama doživljajo intenzivnejšo bolečino, ki traja dlje časa. Obstajajo tudi socialno-kontekstualni dejavniki bolečine, kot so spremenjena socialna vloga človeka s kronično bolečino oziroma socialna izločenost.

Metoda. Vprašalnike z 228 spremenljivkami smo aplicirali na 109 naključno izbranih bolnikov, ki so se zdravili v Ambulanti za zdravljenje bolečine Kliničnega centra Ljubljana od marca do junija 2013. 87 bolnikov je izpolnilo vprašalnik (79,8 %). V diskriminantni analizi je bil kriterij lokacija bolečine glede na diagnozo (motnja mehkih tkiv; glavobol in živčni pleteži; nespecifični simptomi; bolezni hrbta), kot prediktorji pa seštevne vrednosti depresivnosti (Zungova samoocenjevalna lestvica depresivnosti), anksioznosti (Zungova samoocenjevalna lestvica anksioznosti), evalvacije bolečine in zaznave lastne ogroženosti v socialnih odnosih zaradi bolečine.

Rezultati. Povprečna starost udeležencev je bila 52,7 leta (SD 13,9), 70,9 % žensk in 29,1 % moških. 63 % jih je doseglo klinično pomembno raven depresivnosti in 54 % klinično pomembno raven anksioznosti. Na univariatni ravni smo ugotavljali najvišjo raven depresivnosti in anksioznosti pri lokaciji bolečine v hrbtu, najnižjo pri glavobolu. Med prediktorji diskriminantne analize ima za napoved razlikovanja med bolečinskimi lokacijami izrazito največjo težo samoocena depresivnosti. Gre za zelo visoko korelacijo (0,93). Raven depresivnosti v naturalističnem vzorcu protibolečinske ambulante najbolje napoveduje lokacijo/diagnozo bolečine. Če so udeleženci ocenjevali raven svoje depresivnosti kot visoko, so sodili v skupino z diagnozo bolečine v hrbtu. Udeleženci z diagnozo bolečine v hrbtu tudi v pomembno večjem številu še vedno prebolevajo resne stresorje iz preteklega leta kot udeleženci z drugimi lokacijami bolečine. Udeleženci z lokacijo bolečine glavobol se glede raziskovanih spremenljivk (depresivnost, anksioznost, evalvacija bolečine, zaznava lastne ogroženosti v socialnih odnosih zaradi bolečine) najbolj razlikujejo od udeležencev z drugimi tremi lokacijami bolečine; najbolj so si podobni udeleženci z lokacijo mehkih tkiv in diagnozo nespecifičnih simptomov. Udeleženci pa se glede na lokacijo bolečine niso razlikovali med seboj glede tega, kako škodljivo doživljajo bolečino in kako prizadete se počutijo zaradi bolečine v svojih socialnih odnosih.

Zaključek. Različne lokacije bolečine se na različen način povezujejo z različno ravnijo razpoloženja. V raziskovanem vzorcu je ocena ravni lastne depresivnosti ekskluzivni napovedovalec lokacije bolečine. Rezultati raziskave na preliminarni ravni kažejo potrebo po upoštevanju duševnega doživljanja pri obravnavi bolnikov s kronično bolečino.

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1 INTRODUCTION

Chronic pain is regarded as a growing public health problem; it causes individuals' suffering, affects interpersonal relations and presents a great expense in medical care (1, 2). A study, which included 15 European countries, has determined that pain of mild to serious intensity is present in 19% of residents and that it gravely influences their social and work life (3). Pain becomes chronic when it lasts for longer than the normal time of tissue healing and does not reach an adequate state of relief despite various interventions; it should last for a period of at least six months (4). 23% of interviewed people in the Slovenian study reported chronic pain (5). Chronic pain in the lower back is the most common reason for work related disability in people under the age of 45 years (6).

Increasingly better knowledge of the pain's biological basis is of the utmost importance but on its own not sufficient enough to control the pain if we aren't also acquainted with the psychosocial factors that are involved in determination of the intensity of pain and the result of treatment (7). That is why pain has been understood as a multifactorial illness with bio-psycho-social components (8). The experience of pain consists of the bodily sensation (sensory component) and the negative/aversive emotion or mood. Subjective experience of pain is formed by the combination of information from the discriminatory/thalamocortical and limbic pathway; the latter is responsible for the emotional component of pain (9). The main emotional-aversive aspects of pain are mediated through the anterior cingulate cortex, which also has a role in memory, since the transient information during the processing of pain is stored in this area (10). The other essential part of the limbic pathway, which is involved in the emotional/mood component of pain, is the central part of the amygdale. It participates in the integration of the physical and mental component of the stress response, especially when generating anxiety and fear. The serotonergic and noradrenergic neurotransmitter system presents the joint neurotransmitter system for pain, cognitive and mood pathways (11).

Depression and anxiety are common co-occurrent mental mood disorders with chronic pain: patients with these two simultaneous disorders have experienced more intense pain that lasted for a longer duration, and the presence of pain has negatively affected recognition and treatment of the co-occurrent depression (12). A high rate of co-occurrent depression (59%) and anxiety (55%) has been identified among patients at pain clinics (13). For example: along with the controlled characteristics of rheumatoid arthritis, a typically higher self-evaluation of pain has been determined amongst patients that have had simultaneous states of anxiety and depression (14). It is common for people with chronic pain to be worried and anxious, especially if their symptoms aren't clearly explainable, which is a frequent experience with chronic states of pain (15). A stronger connection of pain with anxiety, rather than depression, has been established for rheumatic, bone and joint pain; chronic pain is generally tied to a spectrum of mental disorders and not exclusively to de-

pression (16). Important positive correlations between pain and mood disorders, especially panic disorder and posttraumatic stress disorder, have been established in an American epidemiological study in the last 12 months (17). Posttraumatic stress disorder has been discovered in 10-15% of patients with chronic pain (18).

There are also social – contextual factors of pain that are relatively poorly researched (19). For example, the social role of a person with chronic pain may be changed, there is an uncertainty about his/her contribution to the family and other people may perceive and value him differently. It has not been until relatively recently that the social influence and communication about pain have been emphasised and researched (20). Recent investigations showed that so-called social pain (perception and experience during social detachment, alienation, even the experience of personal jeopardy as a consequence of characteristic activity during the manifestation of chronic pain) may have partly the same neurobiological substrate as physical pain (anterior cingulate cortex) (21). Social processes such as social alienation and lack of support may contribute to mutual sensitisation and contribute to more intense pain and vice versa. Such social processes may be frequently experienced by chronic pain patients, e.g. rejection from the side of interpersonal relations; they may also have problems with intimate or family relations (22, 23). Craig's opinion was that pain (as a phenomenon, which is expressed on numerous levels and in various aspects) remains unrecognised, poorly evaluated, underestimated and inappropriately treated (19). He was also of the opinion that a constant tendency of underestimating the pain of others exists. Comparison of self-evaluation of pain and evaluation of pain as seen by parents and medical workers, who have been importantly involved in the process of pain relief, has shown a systematic underestimation of the patient's pain in the eyes of people involved with the suffering person's treatment. It can be rightly presumed that because of the incompatibility of the different perceptions, the expression of pain signifies something that can make the patient perceive himself/herself not only as inadequately treated but at times even endangered in social relations in everyday life situations. Pain or the perception of pain mostly can't be measured directly, since it has always been also a subjective experience. That's why it's important how the suffering person manages to communicate his/her pain, so that he/she can receive appropriate help (15), or that helpers can approach the treatment of chronic pain with an understanding of the influence of emotions and mood.

Since pain is not only a somatic problem but is always conceptualised as a subjective phenomenon or emotion/mood (9) that also influences interpersonal relations, there are additional insufficiently recognised and utilised means of intervention when it comes to pain modulation on the level of mental processes in medicine (24). It should also be stressed that the relationship between the objective – somatic and mental factors isn't a one way cause – effect affair but is, at least to a degree, also circular (mutual influence). Co-occurrent emotional states or mood disorders can be a cause but also a variously in-

tense consequence of the same pain problem. Anxiety and depression stand out when it comes to the circular connection with chronic pain in the area of mental disorders (25). In addition to emotions, an individual's experience of pain is also accompanied by social perceptions of social consequences that are part of the individual's experience of being a victim of his/her life situation. Meta-perceptions are especially important: how someone perceives that he/she is being perceived by others (significant relatives, other social environments) (26). In regard to pain perception, it's also important to not overlook how the pain has been evaluated and which functions are being attributed to it (27). Suffering "with a cause" may be more tolerable than suffering with pain of an unknown origin. Evaluative – subjective components of pain can also be as important as the somatic aspects of pain signal transmission (28). Among the relatively common sources of pain stimuli and experiences are, for example, diseases of musculoskeletal system and connective tissue, disorders of soft tissues (e.g. fibromyalgia) and headaches; there are even cases that are hard to associate with a precisely located and classified source.

In the following paper, the preliminary results will be presented (through an appropriate research plan) from a naturalistic clinical sample of patients and can be reasonably used to understand the nature of patients' suffering and to plan their treatment. The presented results are established using a statistical terminology that may be complex for a clinician, however along with the presentation of results and in the discussion, they will also be explained in applicative clinical terminology.

1.1 Problem and goals

On the basis of the previously explained/ presented, the problem of our actual research could be defined as the following question: can we predict, taking into account particular predictors, the body-source of the perceived pain (M79X: Soft tissue disorders; G43X, 44X, G 50-59: Migraine, Headache, Nerve, nerve root and plexus disorders; RXXX: Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified; M480-M54X: Dorsopathies). The following variables are treated a/ as a set of predictors in multivariate discriminant analysis and b/ as single dependent variables in the framework of a univariate analysis: self – perceived depression, self – perceived anxiety, evaluation of own pain and perception of being socially menaced in different social relations because of own public and manifest expression of pain related behaviour. Secondly, we are also interested into question does significant differences could be found in particular single variables, treated as dependent ones, regarding the four possible sources of perceived pain stimuli.

Taking into account the content and statistical definition of the problem, the actual contribution also has some mutually inter-connected goals: the construction goal is supposed to be obtained through a metrically correct way of the new instruments' construction, which is needed to answer the problem questions. Two new instruments

with psychological scaling of summative type (semantic differential) try to measure two variables that are, in the existent literature, almost non-elaborated (perception of being, from different points of view, socially menaced because of the manifestation of own pain) or the variables are not elaborated in the same way as conceived in the actual contribution (evaluation of own pain). The study also has a very important applicative goal: to take the first steps towards introducing the obtained findings into everyday clinical work.

We expect that the body source of the pain stimuli could be, with suitable probability, predicted on the basis of the set of four predictors (perception of own depression and anxiety, evaluation of own pain and perception that particular own social relations are menaced because of public manifestation of the own pain) on the level of at least the first one of the three possible discriminant functions. Simultaneously, we expect significant differences in each of single variables (a, b, c, d) regarding the four possible sources of pain stimuli.

2 METHODS

2.1 Participants in the research

Questionnaires have been completed by n = 109 randomly chosen patients treated in the outpatient pain clinic of Ljubljana University Medical Centre in spring 2013. N = 87 patients answered the questionnaire and returned it to the interviewer (79.8%). The study included a completely random selection from the naturalistic clinical population. Patients who consecutively visited the clinic were invited to participate in the study on days when a medical student - the interviewer was present. He/she had no influence on the ordering of patients. All patients were invited to complete the questionnaire, except patients who could not complete the questionnaire alone according to clinical cognitive impression (e.g. cognitive compromised elderly patients with relatives who communicated with medical personnel). Questionnaires were offered after the analgesic treatment. The participation was entirely voluntary and questionnaires were anonymised. The interviewer acquired medical data from medical documentation (patients' number identification, diagnosis, medications, specialists involved in treatment). Participants were able to refuse participation at any time without any consequences for treatment. Participants in the study did not receive any monetary compensation. The study was approved by the Medical Ethics Commission of the Republic of Slovenia, No. 166/07/13.

Average age of the participants was M = 52.7 years (SD = 13.9). 70.9% were female (with average age M = 54.0 years, SD = 13.2) and 29.1% were male (average age M = 49.4 years, SD = 15.8 years).

2.2 Instruments

For this paper, only part of the questionnaire has been presented, but for informational purposes the whole list

of questions is given: We applied questionnaires with 228 variables, among others questions about personal, demographic, socio-economic and socio-cultural status characteristics such as gender, age, marital status, nationality and number of children. The questionnaire included dependent variables regarding different self-evaluations of pain, level of mood (anxiety, depression), profile of five personal traits BFI – Big Five Inventory (29), self-perception of physiological response to pain and other social-cognitive characteristics of pain perception.

The following variables were exclusively included in the actual contribution/ article:

Zung's Self – rating Depression Scale (30): the instrument contains 20 questions; answers are formulated on a scale of perceived frequency from 1 (never, very rarely) to 4 (always). For clinically applicable evaluation, the summation is divided by 80 and then multiplied by 100 (with values from 25 to 49 points as the normal state, from 50 to 59 points as soft/ mild depression, from 60 to 69 as moderate depression, with 70 points or more as heavy depression). Cronbach alpha of internal consistency = 0.84.

Zung's Self – rating Anxiety Scale (31): the instrument contains 20 questions; answers are formulated on a scale of perceived frequency from 1 (never, very rarely) to 4 (always). For clinically applicable evaluation, the summation is divided by 80 and then multiplied by 100 (with values from 25 to 49 points as the normal state, from 50 to 59 points as soft/ mild anxiety, from 60 to 69 as moderate anxiety, with 70 points or more as heavy anxiety). Cronbach alpha of internal consistency = 0.86.

Perception of being menaced in different social relations (from the social environment because of manifestation of feeling of own pain): evaluation of the degree to which the perceptions of various other players menace different own social relations and characteristics of self – perception. ("To what degree do you think that your pain experience, as perceived from the side of various other people/ environment, menaces your (with single answers from 1 (does not menace at all), ..., to 5 (menaces very much)): ... reputation/self-confidence/self-respect/ acceptance from the side of your family/ of your friends ... The whole scale contains 13 items with answers from 1 to 5, and the whole scale is treated as a summative value with relatively high internal consistency (Cronbach alpha = 0.93 with n = 50 valid cases). Higher summative score means more expressive perceptions (by the participants) that their public manifestation of pain experience/ feelings means also that their social relations and self-concepts are more strongly menaced from the side of the relevant social environment. The final number of items in the scale was chosen from the greater number of the antecedent number of items that had been formulated/ chosen according to typical personal and inter-personal life situations. Further constructional procedure strictly followed the demands of the construction of summative scale, and it represents the suitable analogy of Likert's attitude scale; for each single item its discriminative value was also identified; only those items were selected into the final form that suitably discriminated (positively, significantly (p < 0.05)) and highly correlated with the summative score.

Evaluation of pain, as experienced by the participants in their own actual life situation (all together 15 bipolar continuums from 1 to 7); an example: "The pain is something that is: inutile 1 2 3 4 5 6 7 utile). Internal consistency of the summative scale is high enough (Cronbach alpha = 0, 82). Higher final summative value means more negative evaluation of own pain. Being constructed as semantic differential, the scale is composed of single bipolar continuums (between two attributes/ mostly adjectives with contrasting connotative meaning). Positive respectively negative attributes were positioned at the beginning (number 1) or at the end (number 7) of the continuum randomly. Not only positive or only negative attributes are on the same side of bipolar continuums from 1 to 7. In the framework of statistical analysis, the single continuums (those with positive attributes on their left side) were recorded so they had the same sense – connotative meaning and higher final summative value meant more negative evaluation of own pain. The authors of the article are also the authors of the last two summative type scales.

Diagnostic category of pain, perceived on the side of participants regarding MKB – 10 (32): the participants were a posteriori allocated into one of four diagnostic groups. A diagnosis was, during clinical treatment, attributed to the patients by physicians – specialists from the ambulance for pain treatment of the Clinical centre in Ljubljana (1 = M79X: Soft tissue disorders; 2 =G43X, 44X, G 50-59: Migraine, headache, nerve, nerve root and plexus disorders; 3 = RXXX: Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified; 4 = M480-M54X: Dorsopathies).

Approximate normality of variables' distributions on interval level of measurement, which is a precondition for the applied statistical analysis, was verified with K-S (Kolmogorov – Smirnov) test; approximate normality was assured by almost all dependent variables (predictors), with risk level of K-S coefficient suitably higher than p = 0.05 (> or >> 0.05).

2.3 Research design and statistical elaborations

From the whole study, only one very relevant research aspect is included in the actual presentation. The discriminant analysis, like the multivariate approach, was used to verify the hypothesis regarding whether the four body sources of pain (1/soft tissue disorders; 2/migraine, headache, nerve, nerve root and plexus disorders; 3/ symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified, 4/ dorsopathies) could be suitably predicted (on the level of at least one significant (the first one) from three possible discriminant functions) with the set of four predictors (perception of own anxiety, depression, of own pain and of the degree being socially menaced in different social relations and self - perceptions). We paid attention so as to approximate normal distribution of predictive variables and to demand for homogeneity of covariances, connected with high enough risk level of mentioned covariance testing

(p > or p >> 0.05). In the framework of additional univariate analysis, the same variables were treated as single dependent variables, while possible source (location) of the pain is the independent variable. In the case of the multivariate approach (discriminant analysis), four possible pain locations were treated as classifying variables.

3 RESULTS

3.1 Sample

N = 64 patients answered all 20 items of depression questionnaire for calculation of summative score: 29.8% reached the criterion of mild, 20.4% of moderate and 12.6% of severe depression. N = 81 patients answered all 20 items of anxiety questionnaire for calculation of summative score: 34.6% reached the criterion of mild, 8.6% of moderate and 11.1% of severe anxiety. Levels of depression and anxiety in our sample showed significant and high correlation (r (64) = 0.73, p < 0.001). Experience of intense stressor in last year (yes-no) showed significant correlation with type/location of pain x^2 (3) = 11.75, p = 0.008. The question about intense stressor was formulated as: have you had any difficult experience in the last year that you still remember and that is still psychologically painful to think about? Participants have understood "difficult experience" appropriately, because stressful events have been listed as follows – painful surgical or long painful rehabilitation, financial problems, illness and death of father, family conflict, loss of several teeth, loss of job, car accident – to look into the eyes of death in the presence of children, divorce, division of property, paraplegia after accident, no stable employment, work injury, son's car accident, death of mother, death of father, death of father and simultaneous illness of husband, son's financial problems, fear of former husband, victim of violence. Most frequently, such stressors were experienced by participants with back pain (75.0%), least frequently by those with headache (21.4%). A severe stressor in the last year was experienced by 40.0% of participants with pain in the soft tissues and 42.9% of those with undefined pain.

3.2 The results of the discriminant analysis

Descriptive statistics (summative scores) for variables: level of depression, level of anxiety, evaluation of own pain and perceptions of being threatened in social relations are presented in table 1 (Table 1). Only summative scores with all items answered have been taken into account.

The univariate part of our research design was elaborated with Wilks' test of equality of group means: alternative hypotheses about differences in each single dependent variable regarding the pain location as the independent variable are confirmed in the case of perception of own depression and of own anxiety (Table 2), while the alternative hypotheses were rejected in the case of evaluation of own pain and perception of being socially menaced (because of own manifest pain status) as dependent variables. Results show that participants' perception of own depression and of own anxiety significantly differ regarding their pain diagnosis (pain's location). The highest level of depression and anxiety was self – perceived by the participants with dorsopathy diagnosis and the lowest by the participants with a headache.

Table 1. Descriptive statistics (summative scores) for level of depression, level of anxiety, perceptions of being threatened in social relations (because of pain) and pain evaluation in relation to the diagnosis of pain.

Criterion – diagnosis of pain	Predictors	n	M	SD
M79X: Soft tissue disorders	self – perceived depression	22	44.45	8.72
	self – perceived anxiety	24	39.68	8.19
	evaluation of own pain	24	49.40	18.25
	perceptions of being threatened in social relations	18	31.86	14.23
G43X, 44X, G 50-59: Migraine, Headache, Nerve, nerve root and plexus disorders	self – perceived depression	12	34.41	5.53
	self – perceived anxiety	15	36.25	6.13
	evaluation of own pain	15	39.75	24.19
	perceptions of being threatened in social relations	10	22.83	10.34
RXXX: Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	self – perceived depression	9	44.55	8.26
	self – perceived anxiety	12	40.22	9.88
	evaluation of own pain	12	49.11	22.56
	perceptions of being threatened in social relations	7	31.11	15.79
M480-M54X: Dorsopathies	self – perceived depression	14	48.78	8.19
	self – perceived anxiety	21	46.14	10.15
	evaluation of own pain	21	38.35	25.88
	perceptions of being threatened in social relations	11	34.21	9.98

Note 1:
– Depression = level of depression (Zung's Self – rating Depression Scale) – summative score: higher value means higher level of depression.
– Anxiety = level of anxiety (Zung's Self – rating Anxiety Scale) – summative score: higher value means higher level of anxiety.
– Evaluation of own pain – summative score: higher value means a more negative evaluation of their own pain.
– Perceptions of being threatened in social relations - summative score; higher value means perception of more threatened social relations and self – concepts.
Note 2: variables are treated as predictors in context of discriminant analysis; in context of univariate analysis as dependent variables.

Table 2. Wilks' tests of equality of group means.

	Wilks' Lambda	F	df1	df2	P
self – perceived depression	0.704	7.434	3	53	0.000
self – perceived anxiety	0.854	3.031	3	53	0.037
evaluation of own pain	0.945	1.024	3	53	0.389
perceptions of being threatened in social relations	0.903	1.909	3	53	0.139

Note for explanations of predictors: same as for Table 1.

Test of significance for single discriminant functions showed that only the first function is statistically significant, with eigenvalue = 0.47 and with 80.6% of correspondent explained variance (Wilks' Lambda = 0.611, Chi – sq. (12) = 25.63, p = 0.01; results for the second function: Wilks' Lambda = 0.898, Chi – sq. (6) = 5.57, p = 0.47). It means that in Table 3 only the correlations between the summative scores of manifest variables and the first discriminant function will be interpreted (see first column in Table 3).

Despite of some relatively low frequencies in single cells (for example 7, 9 and 11), the multivariate demand for the homogeneity of covariances was satisfied (Box's M test = 31.47, F = 0.88, p = 0.065).

The structure matrix of correlations between manifest variables (represented with summative scores) as predictors on one side and the first and only significant discriminative function on other side is shown in Table 3, in its first column (Table 3). The highest correlation could be identified between the first discriminant function and summative score that expresses the evaluation of own depression (= 0.93). Almost the same correlation with the first canonical function was found for "evaluation of own pain" and for "perception of threat/ menacing for own social relations because of public manifestation of own pain experience" (= 0.48). It's evident that within the set of four predicting variables, the highest predictive power could be attributed to perception of own depression. From this point of view, respondents with perception of high level of own depression could also be classified into the category of patients with dorsopathy as criterion of classification (with relatively the highest probability level of allocation into one of four possible diagnostic categories).

Table 3. Structure matrix of correlations between manifest variables-predictors and canonical discriminant functions.

	Functions		
	1	2	3
perception of own depression	0.932	-0.320	0.121
perception of own anxiety	0.478	-0.755	0.165
evaluation of own pain	0.107	0.683	0.606
perceptions of being threatened in social relations	0.477	-0.059	-0.699

Note for explanations of predictors: same as for Table 1.

Only the centroids of the first and only significant discriminant function were taken into account. Values of centroids appear on dimension of real numbers with negative and positive values. Centroids could also somehow be explained with analogy of some "common denominator" of all four predictors (perceived own depression and anxiety, evaluation of own pain and of perceived degree of being menaced in different social relations because of manifestation of own pain experience). With their position on dimension of real numbers, the centroids show similarities and differences among four different criterion groups of participants, identified on the basis of their pain allocation diagnosis (body location of pain source). According to the centroids' values of the first and only significant discriminant function (Table 4), the centroid of the group of respondents with the headache expressively and distinctively appears with its negative value; this pain location also differs the most from the centroids' values of the other three criterion categories (sources, allocations of the pain). The relatively most similar were the two groups with diagnosis "pain of soft tissues" and diagnosis "nonspecific symptoms". On the positive continuum of centroid values, those with dorsopathies exceeded others.

Table 4. Discriminant functions at group centroids table.

Criterion – diagnosis of pain	Discriminant function		
	1	2	3
M79X: Soft tissue disorders	0.243	0.295	-0.020
G43X, 44X, G 50-59: Migraine, Headache, Nerve, nerve root and plexus disorders	-1.256	-0.123	-0.001
RXXX: Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	0.219	0.213	0.055
M480-M54X: Dorsopathies	0.554	-0.496	-0.003

Note: Only the first discriminant function is significant (p < 0.05).

4 DISCUSSION

In the actual report, we were interested in the question of whether the type/ source/ allocation of the pain (soft tissues; head; nonspecific; dorsopathies) could be identified (predicted) on the basis of the chosen set of four predictors (perception of own depression, of own anxiety, of own pain and of perception of being menaced in

different social relations because of the public manifestation of own pain experience). Our research hypothesis corresponds with the mentioned problem's aspects, and it was statistically verified with the multivariate approach – discriminant analysis. Almost all statistical demands of such an approach were satisfied (approximate normal distributions of almost all predictive variables, homogeneity of covariances) and we can say that we confirmed (on the level of the first and only significant discriminant canonical function) our research alternative hypothesis.

The by far highest correlation between the first (and only significant) discriminant function and any of the four manifest variables, represented by summative scores, was found for perception of own depression (= 0.93). Perception of being menaced in social relations because of … and perception of own anxiety correlate with the first discriminant function almost 50% less than perceived own depression does. The last variable has, within the set of four predictors, relatively the highest importance for the prediction of pain location (of body source of the pain). Insight into the table of descriptive statistics shows, in comparison to other groups, significantly lower degree of perceived own depression for/by the group with "headaches". From the centroids' aspect, negative centroid by the group 2 (headaches) expressively exceeds, while in the opposite, positive value direction, exceed the participants having the "dorsopathy problems". These two groups also differ not only significantly but also relatively the most in terms of perception of their own depression. Also, according to the experiences and results of our clinical work with the patients in the anti – pain ambulance, who participated in our study, the perception of their own depression best predicts their pain / diagnostic location. On the other side, depression is relatively the most frequent for patients with dorsopathy – with backbone and other back – pains. It is also consistent with the prospective study in which it was found that patients who suffer from severe psychological stress (and where we can expect more of reactive depression) are three times more menaced by the developing of dorsopathy and backbone pain than those who have better and more functional coping mechanisms (33). Also, in our sample the patients with a diagnosis of dorsopathy (with backbone pain included) not only had relatively the highest level of perceived depression but also reported much more frequently about a heavy stressor in the last year than any other group of patients. This could be understood as the additional confirmation that the patients with dorsopathy are simultaneously also the most vulnerable for mood disorders. A greater proportion of the same patients also tried to overcome the negative consequences of a heavy stressor in the last year (but we do not know if the depression is the consequence of these stressors or these stressors are disturbing for the patients just because of their depression). Mental disorders and backbone pain are frequently inter – connected in simultaneous moods; when 17 different states were mutually compared, very similar trends were found, regardless of cultural and economic factors. Depression (but also anxiety and alcohol misuse) was significantly more frequent among people with backbone pain (especially lumbo-sacral) than by the people without

these pains (34). The results of our study are also consistent with findings that the development from acute to chronic pain in the lumbo-sacral zone is best predicted by previous traumatic events and by the characteristics of the depressive feelings (35). Relatively speaking, the highest level of depression is expected in patients with pain in various backbone areas, with dorsopathy. According to the results of some recent researches, only the emotional stress essentially contributes to the outcome of treatment on the lower dorsal area (36). We can say that in our sample the patients with headache differed from the others the most regarding their psychological mood, because we did not identify clinically important/ significant depression (and, in addition, we obtained "only" self – reported results). Most likely, the headaches experienced by these patients are not persistent and there are probably some longer temporal intervals without pain, when such patients spend their working and leisure time without pain.

We did not confirm all the hypotheses of the univariate approach, where single predictors of the discriminant analysis appeared as single dependent variables and location/ source of the pain as the independent variable. In the framework of the univariate approach, the alternative hypothesis was rejected in the case of the evaluation of own pain and in the case of perception of being menaced in social relations because of own manifest pain experience. We did not find significant differences among the groups with four different pain allocations in their evaluation of own pain and in their evaluation of how their pain is harmful for their social relations, including their self – concepts. We may underline that the results of the univariate approach confirm the results of the discriminant analysis; the latter only pays attention to the exclusive predictive value of the perception of own depression by the participants in the research. Taking into account also their centroid values, the "headaches" distinctively appear with their perception of low degree depression level. The centroid of this group/ category of patients is negatively evaluated, while all the centroids of all other groups/ categories are positive. Perception of expressively higher degree of own depression is characteristic for only the mentioned groups, relatively speaking the most for those with diagnosis of dorsopathy. We can assume that the participants who most feel they are in psychological distress most (regarding other diagnoses) feel dorsopathies/ back – pains and vice versa.

Our results are not completely concordant with the results of Rijavec, Novak (37), who found that their patients – participants in the research (150 physically healthy patients, hospitalised with a diagnosis of acute depressive episode) with somatic pain symptoms, among which "headache" was the most frequent, also had more expressed depression. The two groups of patients/participants are probably so different that a comparison perhaps isn't possible. In our study, a primary referral to a pain clinic is somatically based, however the primary referral in the compared study was depressive disorder. One Dutch study is a rare example to research the connection between depression, anxiety and different locations of pain,

which otherwise also can't be directly compared with our study (38). They researched mood disorders at location of pain in sense of migraine and other locations of pain, such as back, neck, orofacial area, abdomen, joints, breasts among 2981 participants of the study about depression and anxiety. Mood disorders have been significantly linked with all locations; however, comorbidity of migraine and other locations of pain have been importantly reduced with reduction of severity of a mood disorder. The same study determined among 614 participants, who previously had no diagnosis of depression or anxiety, that depression and anxiety's development has been significantly linked to the location of pain (head, back, neck, orofacial area, abdomen, joints), to a higher number of pain locations and to higher intensity of pain, but not to the duration of pain. Joint pains and higher number of pain locations have been proven as the highest threat of triggering depression or anxiety (39). Back pain can be variously classified depending on the originating mechanism; another study, which among other things researched depression and anxiety in connection to back pain in 464 patients, found higher grades of depression and anxiety in patients with classified pain as a central sensitisation according to the nociceptive and peripheral neuropathic mechanism of pain than estimated by clinicians. This study supports the idea that, considering the multidimensionality of pain, same location of pain is connected with different expressions of mood disorders, or, according to the results of this study, mechanism of origin might be of greater importance than the location of pain itself (40). A study in primary healthcare involving 500 patients with musculoskeletal pain with depression and without it found more psychosocial stressors and higher anxiety (which were also linked to the intensity of depression) in a subgroup of depressive patients (41). This study has similar conclusions to our study in regard to the connection between psychosocial stressors and depression; however, it did not deal with the location of pain. Regardless of the fact that studies haven't compared mood disorders in relation to various locations of pain, it's still possible to understand the diversity of these studies through the possibility of applying co-occurrence of pain and depression to combined neurobiological and psychological causes (37), but we still don't quite understand the multidimensionality of pain, especially in connection with mood disorders and location of pain, and results may differ. However, it's necessary to keep in mind that these are very different samples of patients and very different contexts in which the patients have been treated. Contexts are also different in regard to entirely probable diverse styles of referrals into subspecialised pain treatment: whether it's primarily concerning patients with a mental disorder or patients with somatic symptoms, whether it's concerning a population study or a sample of patients in treatment. However, it's completely possible that information from all the different primary researches will sooner or later help us as a source of various fragments that will form a mosaic of meta-knowledge, furthering our understanding of the greater picture of connection between location of pain and mood disorders.

Advantages and imperfections of the study: even after a precise and relatively comprehensive examination of scientific literature, we have found that there are a small number of similar studies (connection between location of pain and expression of mood disorder) on the global scale; they are especially rare in the Slovenian research space. Future attempts in a similar direction could differentiate between the various locations (sources, focuses) of pain more comprehensively and more specifically. Of course, we can also point out that the sample could be larger, as could its representativeness, which increases the ecological validity of results that come from characteristics of the research plan or increases their generalisation in the direction of the corresponding target population. At the same time, it's worth mentioning that it's possible to make appropriate conclusions even when the number of participants, as in the specific conditions of our statistical approach, is relatively low, since the homogeneity of covariances is assured in a discriminant analysis. Further studies should offer a more appropriate representativeness of sampling and form a wider multidisciplinary research team.

It seems sensible to consider the status of every patient with chronic pain also in terms of their mood status and in terms of their pattern of thinking and experience about chronic pain. Without understanding and considering psychological and social context, which can be greatly assisted through an interdisciplinary collaboration, chronic pain is, according to the professional literature. difficult to treat for medical personnel, as well as for patient (42), since he/she needs better information about the nature and possible modulation of pain for better control. Patients with chronic pain supposedly need the same amount of time to explain biological, cognitive and behavioural factors that are linked to this state. However, it's probably not necessary to research on a clinical level whether depression or pain was sooner or later developed, since mutual connection and influence between pain and mental state is of the outmost importance in the plan of pain management (43).

5 CONCLUSION

Various locations of pain are connected to mood in different ways according to the results of the study; the highest levels of depression and anxiety were discovered for back pain and the lowest for headache. Perception of own endangerment in social relations and evaluation of pain weren't found to significantly differ between locations of pain. Level of depression is, according to our results, the best predictor of location of pain among patients who have been treated at an outpatient clinic. The results of the study can also signify an additional incentive for interdisciplinary researches on the subject of pain, since it's an area that is too often restricted to separate professional circles due to the separation of professional disciplines.

CONFLICT OF INTEREST

The authors declare that no conflict of interest exists.

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APPENDIX

Appendix 1. Perceptions of being threatened in social relations - summative score.

To what extent do you think that your experience of pain, which is seen by other people, endangers (circle evaluation from 1 to 5)

your reputation, prestige among them:	not at all	1	2	3	4	5	very much
your self-confidence:	not at all	1	2	3	4	5	very much
your self-esteem:	not at all	1	2	3	4	5	very much
your ability to adapt:	not at all	1	2	3	4	5	very much
your self control:	not at all	1	2	3	4	5	very much
your self-regulation:	not at all	1	2	3	4	5	very much
your acceptance by:	not at all	1	2	3	4	5	very much
members of your immediate family:	not at all	1	2	3	4	5	very much
your friends:	not at all	1	2	3	4	5	very much
your colleagues at work:	not at all	1	2	3	4	5	very much
strangers in everyday situations:	not at all	1	2	3	4	5	very much
your quality of life:	not at all	1	2	3	4	5	very much
well-being of your life:	not at all	1	2	3	4	5	very much
your lifestyle:	not at all	1	2	3	4	5	very much
Other – what _____	not at all	1	2	3	4	5	very much

Appendix 2. Evaluation of pain – summative score.

You perceive your pain, which you experience in your life <u>now</u>, as something that is (compare left and right description – circle the number that is the closest to your experience):

useless	1	2	3	4	5	6	7	helpful
nice	1	2	3	4	5	6	7	unpleasant
rough	1	2	3	4	5	6	7	smooth
warm	1	2	3	4	5	6	7	cold
happy	1	2	3	4	5	6	7	sad
dark	1	2	3	4	5	6	7	bright
nonadopted	1	2	3	4	5	6	7	adopted
open	1	2	3	4	5	6	7	closed
pure	1	2	3	4	5	6	7	dirty
necessary	1	2	3	4	5	6	7	non-necessary
just	1	2	3	4	5	6	7	unjust
manageable	1	2	3	4	5	6	7	non-manageable
non-threatening	1	2	3	4	5	6	7	threatening
unacceptable for the environment	1	2	3	4	5	6	7	acceptable for the environment
allows for well-being	1	2	3	4	5	6	7	does not allow for well-being
unobtrusive	1	2	3	4	5	6	7	obtrusive

LEADERSHIP COMPETENCES IN SLOVENIAN HEALTH CARE
VODSTVENE KOMPETENCE V SLOVENSKEM ZDRAVSTVU

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ABSTRACT

Keywords:
leadership, competences,
health care, management,
Slovenia

Background. Leadership competences play an important role for the success of effective leadership. The purpose of this study was to examine leadership competences of managers in the healthcare sector in Slovenia.

Methods. Data were collected in 2008. The research included 265 employees in healthcare and 267 business managers. Respondents assessed their level of 16 leadership relevant competences on a 7-point Likert-type scale.

Results. Test of differences between competences and leader position of health care professionals yielded statistically significant differences between leader and non-leader positions. Leaders gave strongest emphasis to interpersonal and informational competences, while regarding decision making competences, the differences between leaders and other employees are not that significant. When comparing competences of healthcare managers with those of business managers, results show that healthcare managers tend to give weaker emphasis to competences related to all three managerial roles than business managers.

Conclusions. The study showed that in Slovenian health care, leaders distinguish themselves from other employees in some leadership competences. In addition, all three dimensions of leadership competences significantly distinguished the group of healthcare managers from the business managers, which indicates a serious lag in leadership competences among leaders in Slovenian healthcare.

IZVLEČEK

Ključne besede:
vodenje, kompetence,
zdravstvo, menedžment,
Slovenija

Izhodišča. Vodstvene kompetence igrajo pomembno vlogo pri zagotavljanju uspešnega vodenja. Namen obstoječe raziskave je bil preučiti vodstvene kompetence menedžerjev v slovenskem zdravstvu.

Metode. Podatki so bili zbrani leta 2008. V raziskavo je bilo vključenih 265 zaposlenih v zdravstvu in 267 poslovnih menedžerjev. Anketiranci so ocenili svoja raven po 16 različnih vodstvenih kompetencah na 7-stopenjski Likertovi lestvici.

Rezultati. Test razlik med kompetencami in vodstvenim položajem zaposlenih v zdravstvu je pokazal na statistično značilne razlike med vodji in drugimi zaposlenimi. Vodje so bolj poudarili medosebne in informacijske kompetence, medtem ko so razlike med vodji in drugimi zaposlenimi pri odločevalskih kompetencah manj izražene. Primerjava med kompetencami menedžerjev v zdravstvu in poslovnih menedžerjev je pokazala, da imajo menedžerji v zdravstvu manj poudarjene kompetence na vseh treh menedžerskih vlogah.

Zaključki. Raziskava je pokazala, da se vodje v slovenskem zdravstvu od drugih zaposlenih razlikujejo po nekaterih vodstvenih kompetencah. Menedžerji v zdravstvu pa se od poslovnih menedžerjev razlikujejo po vseh treh dimenzijah vodstvenih kompetenc, kar kaže na resno zaostajanje vodstvenih kompetenc menedžerjev v slovenskem zdravstvu.

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1 INTRODUCTION

1.1 Leadership: from attributes to relations

With the rise of the New Public Management (NPM) paradigm in the early 1990s, leadership has become an important issue in the public sector (1). With rising pressures on public spending, political elites have felt increasing urgency to justify the use of public funds for the provision of public goods and services in business terms. The new emphasis on efficiency and effectiveness of public service delivery has led to many structural changes in public organisations modelled on what were believed to be good business practices of commercial companies in the private sector. The transfer of management practices from the private to the public sector became one of the main preoccupations of the NPM. With it came the emphasis on public sector leadership that was required to inspire business like attitudes among the ranks of public employees and their supervisors.

A wide variety of approaches to understanding leadership have been proposed over the past decades (for full review on leadership theories, see 2, 3). Researchers have been interested in distinctive aspects of leadership ranging from personal characteristics of effective leaders and their behaviour, often summarised as leadership styles, to unique impacts of effective leadership such as leaders' capacity to motivate and inspire people to bring about fundamental change in organisations.

Our understanding of leadership follows the prevalent perspectives on leadership-management relationships that understand these two functions as complex, multifaceted, somewhat independent but largely intersecting processes that share considerable competences in common (4). Distinction is primarily one of scope and vision, as leadership emphasises broader meaning and purpose and is a process of motivating people to work together collaboratively to accomplish great things (5). Therefore, it can be conceived of as an interaction between two or more members of a group (2). This suggests that leadership is actually enacted through relationships with others. It has been demonstrated that leaders stimulate emotional responses in employees in work settings (6) and beyond (7). In order to create change in organisations, leaders need to persuade followers and gain their commitment and therefore need good management skills to transform their vision into action.

1.2 Leadership competences

Studies reviewed in Kirkpatrick (8) and Hogan et al (9) point out that leaders do differ from non-leaders in a number of attributes, and that these differences contribute significantly to leader effectiveness. In the 1960s, Katz (10) introduced the idea that managers need to possess sets of skills rather than individual skills for successful performance in organisations. In 1970, competency research and applications that built upon earlier work on skills, abilities, and cognitive intelligence arrived. Competence is defined as "the underlying characteristic of a person that leads to or causes effective and outstanding performance" (11, p. 21). What makes the competency approach particularly useful is the insistence that particular behaviours and individual skills are linked directly to business outcomes. Thus, leadership competences are always viewed in terms of their benefits for the implementation of a specific strategy in a given organisation (12). However, numerous studies have shown that there are clusters of leadership competences that have been proven time and again to lead to greater performance (10, 13-15). These include the competency of vision and goal setting, self-knowledge, interpersonal competency and technical, business specific skills. However, the competency lists can be much more expansive and varied.

Competency frameworks and models have been challenged in the leadership literature during recent years (16, 17). These authors argue for a practice orientated perspective when exploring leadership to better capture the complexity of interaction and interrelation rather than an individualistic perspective, since competences shift the responsibility onto the individual leaders with little concern for the context and relationships in which they find themselves. The emphasis should be given more to reflection, discussion and experience. As we noted above, the importance of the relational concept of leadership is not new to the leadership literature. Bass (18), with his distinction between transactional and transformational leadership, highlights this perspective on leadership. While transactional leadership involves primarily the focus on tasks, transformational leadership is about raising colleagues, subordinates, followers, clients or constituencies to a greater awareness about the issues of consequence. Leaders are identified as uniquely flexible, open minded, team- and growth-oriented and socially astute (21). Since leadership is a process of motivating people to work together collaboratively and leaders work in a complexity of relations, they inevitably need the skills or competences to establish, maintain and manage relations with others.

Competency frameworks are flexible and complex and vary according to the demands of a particular business strategy of an organisation. To link leadership competences with organisational context, it is useful to use Mintzberg's model of managerial roles (19). He proposed that top managers' job can be described in terms of three sets of roles they have to perform in organisations. The three roles - interpersonal roles, informational roles and decisional roles - contribute to integrated job performance. Interpersonal roles involve establishing and maintaining relations with subordinates, liaising with peers and other people outside their chain of command and representing the company to outside constituencies. Informational roles include gathering information and transmitting information throughout the organisation and beyond its boundaries to the external constituencies. Decisional roles involve problem solving, resource allocation and negotiation with internal and external constituencies. Each role requires a set of skills and competences for their effective performance. Mintzberg provided a list of leadership competences (he called them managerial skills) (Table 1). It is interesting to note that in spite of their usefulness, they were used much less than his trio of managerial roles.

Table 1. List of managerial roles and skills.

Roles	Skills
Interpersonal	Motivating subordinates
Figurehead	Developing peer relationships
Leader	
Liaison	
Informational	Establishing information networks
Monitor	Disseminating information
Disseminator	
Spokesperson	
Decisional	Making decisions in conditions of
Entrepreneur	extreme ambiguity
Disturbance handler	Allocating resources
Resource allocator	Resolving conflicts
Negotiator	Carrying out negotiations

Source: derived from Mintzberg

A notable feature of managerial roles is the emphasis on interpersonal and informational roles. It is too often that leadership is associated only with decision making (this is particularly evident in the great men tradition). While leaders are deeply involved in the decision making process, Mintzberg is right to emphasise that their role is not only to make decisions but to organise the decision making process itself by providing and facilitating the flow of information and by motivating, developing and involving the right people within and outside the organisation in the decision making process. Relational and informational roles are increasingly important in modern nonindustrial companies such as professional organisations working in the service sector and knowledge industries that face new levels of business, market and technological uncertainties and have to depart from a classic bureaucratic model toward markets and clans (20). Managers do not give equal attention to each role, but interpersonal, informational and decisional roles still remain inseparable and complementary.

1.3 Leadership competences in healthcare

The importance of leadership in healthcare has come to prominence relatively recently. The emphasis on leadership and the need for training and development of new leaders in healthcare now occupies a prominent position in strategic documents issued by the government departments of health care around the world (21). One of the early examples is the NHS Leadership Qualities Framework issued by the UK Department of Health in 2001. Today, the competences and knowledge sets required for different health professions are more or less well-known. Studies found that competences needed by effective physician-leaders are a combination of general leadership skills and skills that are particularly needed to address the challenges of healthcare. A study of a team of top executives in a highly innovative mental hospital, carried out in 1965, provided a description of an executive role constellation in a US hospital as a "matrix of interpersonal relations, with its specialisation, differentiation, and complementarity of roles" (22, p. 12). Stoller (23) provides an extensive

overview of the surveys on physician-leaders' competences and notices that competences range from very general to much more specialised and have been assessed on different populations both in terms of profession and size. Jennings et al (24) identified 10 managerial competences for nursing leaders: personal qualities, interpersonal skills, thinking skills, setting the vision, communicating, initiating change, developing people, healthcare knowledge and management and business skills. Here we can see that social capacities are of distinctive importance for leadership functioning, as noted by Zaccaro (25), also in the healthcare sector.

Most of the leadership roles in healthcare are occupied by health practitioners who are facing an added challenge in that they are expected to provide leadership to other medical colleagues but are also required to carry out their role as medical professionals. Until the late 1970s, this situation was commonplace throughout the world. Despite the high significance of leadership in healthcare systems, several studies investigating this issue point out that when appointing managers emphasis is still given mostly to clinical expertise. A study in New Zealand hospitals (26) demonstrated that charge nurse managers were appointed into a management role with clinical expertise but without management skills. Several studies, reflecting on the situation in Slovenian healthcare organisations (27-31), provide evidence of the lack of leadership skills. Nursing leaders in the study conducted by (27) reported to be aware that they did not have enough management and leadership knowledge. Most of them had not acquired knowledge before taking up a leadership position, which means that they either acquired it later or that they only improved it with workplace experience. In Slovenian hospitals, education of employees for leadership roles is still not perceived as a necessary investment for improving work processes (29). Evidence from Slovenian studies also point to the problematic issues that stem from a leader-subordinate relationship. A study (32) of head nurses in Slovenian hospitals, primary healthcare centres and social welfare institutions showed that their clearly defined vision was significantly lower than that of the employees' readiness to follow. Nursing leaders in the study conducted by (27) reported not to have good communication skills and showed a lack of concern for good interpersonal relations, although they and the employees both highly valued good interpersonal relations.

The aim of our study was to assess perceived leadership competences of Slovenian healthcare managers. Based on the discussion above, we hypothesise that healthcare managers will emphasise competences that indicate interpersonal and informational skills, while their classical decision making, control and command competences will be less present. Since health care managers face a more complex environment of professionals, they need to build their leadership on relational skills rather than formal authority. We also hypothesise that health care and business managers will differ primarily by the former giving more emphasis to relational competences and the latter to stronger use of decisional competencies.

2 METHODS

Data used in our survey were collected in 2008 as part of a large international study on higher education called Hegesco that was carried out in 4 EU countries and Turkey (for a detailed report on the study, see 38). It was based on a large Reflex project from 2006 that included 14 EU countries and Japan. Results from both studies were reported on different occasions, mainly to present the labour transition of higher education graduates but not in the field of management and organisational behaviour. Participants included in the survey were randomly selected and approached by post.

The response rate for Slovenia was relatively high, with 49% coverage of the total population, which amounted in 2,919 respondents in total. A mailed questionnaire was used that included educational experiences before and during higher education, the transition to the labour market, characteristics of the first job, characteristics of the occupational and labour market career up to the present, characteristics of the current job and current organisation, assessment of skills and evaluation of educational program. Our research explored leadership in the Slovenian healthcare sector and combined two different job segments to illuminate characteristics of leadership in each segment. In our survey, we included data on competences of employees in Slovenia having up to 5 years of working experience (general criteria of survey population).

In order to understand leadership competences in the Slovenian healthcare sector, we explored the competences of healthcare managers and compared them with those of the business managers. We used a comparative approach to consider two different perspectives on leadership competences. The first focused on differences in competences regarding the leader/non-leader position in the healthcare sector. We included in our sample 265 Slovenian employees on the job as health (associate) professionals or nursing (associate) professionals. Each person was assigned to a leader or non-leader position depending on whether they reported to have subordinates or not. We ended up with a sample of 101 leaders in healthcare in Slovenia. Out of those, 84% worked in a public sector organisation. For the second perspective in our study, we included a sample of 267 Slovenian employees on the job as business managers. Here, we wanted to illuminate business managers, i.e. directors, chief executives and other managers that reported to have subordinates and compared them with the leaders from the healthcare sector. All employees on the job as business managers met the leadership criteria and 81% of them worked in a private sector organisation.

In our analysis, we also included some additional countries in order to look at whether we can detect some patterns of leadership competences of healthcare professionals across countries. We included the following countries with representative samples of healthcare sector professionals: Italy, Finland, Norway, Czech Republic, Portugal and Belgium.

The concept of leadership competence was operationalised based on the conceptualisation of managerial skills provided by Mintzberg (19). To comply with Mintzberg's list of skills, we included in our survey 16 management/leadership competences: mastery of own field or discipline; knowledge of other fields or disciplines; analytical thinking; ability to rapidly acquire new knowledge; ability to negotiate effectively; ability to perform well under pressure; alertness to new opportunities; ability to coordinate activities; ability to use time efficiently; ability to work productively with others; ability to mobilise the capacities of others; ability to make meaning clear to others; ability to assert authority; leader as authoritative source of advice; leader keeps professional colleagues informed about new developments in their field of work and leader takes initiative in establishing professional contacts with experts

Table 2. Differences between competences of employees holding non-leader or leader positions in healthcare in Slovenia.

Roles	Competence	t[1]
Interpersonal	I take the initiative in establishing professional contacts with experts outside the organisation	3.501***
	Ability to make your meaning clear to others	.944
	Professional colleagues rely on me as an authoritative source of advice	4.696***
	Ability to mobilise the capacities of others	2.681**
	Ability to negotiate effectively	2.362*
Informational	I keep my professional colleagues informed about new developments in my field of work	3.079**
	Alertness to new opportunities	1.531
	Ability to rapidly acquire new knowledge	.949
	Mastery of your own field or discipline	1.445
	Knowledge of other fields or disciplines	1.073
Decisional	Ability to work productively with others	1.558
	Ability to assert your authority	2.362*
	Ability to coordinate activities	1.752
	Ability to perform well under pressure	1.690
	Ability to use time efficiently	1.679
	Analytical thinking	1.952*

Notes:
Subsample of Slovenian respondents whose Current job = health (associate) professional or nursing (associate) professional.
N=101 (supervisors in health (associate) professional or nursing (associate) professional) and N=164 (non-supervisors in health (associate) professional or nursing (associate) professional)
[1] Independent samples test; Equal variances assumed; *** $p \leq 0.001$; ** $p \leq 0.01$; *$p \leq 0.05$

outside the organisation. In assessing their skills, participants were asked to assess their level of competence on a 7-point Likert-type scale (1= very low – 7 = very high).

3 RESULTS

Starting with the assessments of leadership competences, we found several significant differences in competences between occupants of leadership vs. non-leadership position. Table 2 presents the results of the t-test of differences in emphasis on a particular leadership competence between leader and non-leader positions in healthcare in Slovenia. We find that they differed in 7 out of 16 competences. Differences in the assessment of competences were significant with a low p-value (p≤0.05).

The results show that leaders in healthcare, in comparison with non-leaders, placed stronger emphasis on competences in all three managerial roles, underscoring the idea of their high complementarity. In other words, leaders require competences in all three roles. However, consistent with our hypothesis, the leaders gave strongest emphasis to interpersonal and informational competences while placing a weaker emphasis on decision making competences. The ability to establish professional contacts with experts outside the organisation, being an authoritative source of advice to their colleagues and the ability to mobilise the capacities of others were the three most emphasised relational competences. Keeping professional colleagues informed about new developments in their field of work was the most important informational leadership competence.

To explore to what extent leadership competences of healthcare managers differ from competences of business managers, we compared the two groups of managers. Re-sults of the test of differences are presented in Table 3.

The results show that healthcare managers tend to give weaker emphasis to competences related to all three managerial roles than business managers. Business managers attach significantly higher importance than healthcare managers to the five competences. Among relational competences, two were cited as more important by business managers: taking initiative in establishing contacts with experts outside the organisation and ability to negotiate effectively. Among informational competences, business managers placed a higher value on alertness to new opportunities. Finally, among the decisional competences, business managers emphasised analytical thinking and the ability to coordinate effectively. Healthcare managers emphasised only two competences more strongly than business managers, namely mastery of their field of expertise and the ability to use time efficiently. These results do not confirm our second hypothesis. They indicate that the level of leadership development is lagging behind the standards achieved by business managers. The two competences in which health managers surpass business managers have both an explanation in the fact that Slovenian health managers are appointed to leadership positions in which they continue to practice clinical work.

In order to be able to generalise our results, we looked at the leadership competence assessments across different countries. Based on the correlations between leadership and competences of health professionals from different countries, we could not find any significant distinctions between the countries. Slovenian health professionals showed similarities in the correlations of all relational competences with health professionals from other countries. Furthermore, Slovenian healthcare professionals made similar assessments of informational and decision making competences to professionals from other countries.

Table 3. Differences between competences of healthcare managers and business managers in Slovenia.

Roles	Competence	t[1]
Interpersonal	I take the initiative in establishing professional contacts with experts outside the organisation	-4.444***
	Ability to make your meaning clear to others	.891
	Professional colleagues rely on me as an authoritative source of advice	-1.231
	Ability to mobilise the capacities of others	-.636
	Ability to negotiate effectively	-4.389***
Informational	I keep my professional colleagues informed about new developments in my field of work	-.657
	Alertness to new opportunities	-3.993***
	Ability to rapidly acquire new knowledge	-.418
	Mastery of your own field or discipline	3.466***
	Knowledge of other fields or disciplines	-1.668
Decisional	Ability to work productively with others	1.397
	Ability to assert your authority	-.466
	Ability to coordinate activities	-1.969*
	Ability to perform well under pressure	-.282
	Ability to use time efficiently	2.912**
	Analytical thinking	-3.046**

Notes:
Subsample of Slovenian respondents whose Current job = professional managers or Current job = supervisors in health (associate) professional or nursing (associate) professional
N=101 (supervisors in health (associate) professional or nursing (associate) professional) and N=267 (professional managers)
[1] Independent samples test; Equal variances assumed; *** p ≤ 0.001; ** p ≤ 0.01; *p ≤ 0.05

4 DISCUSSION

Our study provides insights into the leadership competences of healthcare managers in Slovenia. Comparisons of leadership competences among Slovenian healthcare professionals yielded significant results between leaders and non-leaders. Professionals holding a leadership position in Slovenian healthcare organisations were significantly higher in their assessment of leadership competences in all three managerial roles than their medical colleagues. This is in line with the modern conception of leadership with emphases on communicating a vision (informational role), developing relations inside and outside the organisation, motivating people to accomplish organisational goals (relational role) and getting things done (decisional role). The results show that leaders in Slovenian healthcare have stronger interpersonal compared with decision making competencies. Their leadership is built on professional authority rather than on formal roles; they rely on mobilising their colleagues more strongly than on bossing them around; and they provide key knowledge resources by building professional links to experts outside of the organisation. And by virtue of being experts themselves, they also emphasise their informational role by providing their colleagues with information on developments in their field of expertise. Overall, these results indicate that leaders in Slovenian healthcare emphasise leadership competences in all three managerial roles, with strongest emphasis given to relational competences. These results reveal a positive picture of leadership in Slovenian healthcare.

However, when the state of leadership in Slovenian healthcare is benchmarked to the subsample of business managers, a more critical picture emerges. Strong differences found between the business and healthcare mangers indicate that there is little convergence between healthcare and business sectors, a convergence advertised by new public management literature. Furthermore, business managers put stronger emphasis on all three groups of leadership competences: relational, informational and decision making. This indicates that the differences between the business and health sectors are not just a matter of specialisation but rather a matter of the level of leadership development. While Slovenian business managers seem to be aware of the need for balanced leadership development in all three managerial roles, Slovenian health managers seem to lag behind business managers in their assessment of leadership challenge in all three roles.

These results suggest that leadership in Slovenian healthcare is seriously underdeveloped. The key reason for this is delayed professionalisation of health management in Slovenia. As noted by prior research, the recruitment into the leadership ranks in Slovenia is primarily based on medical excellence rather than managerial competence. While this assures professional authority among their colleagues, this practice systematically undermines the development of professional management in Slovenian healthcare. The results suggest the perverse effects of this practice. Health managers lag behind business managers in most leadership competences but stand out in emphasising just two: mastery of their discipline and efficient use of time. Together they illustrate how Slovenian health care leaders perceive the leadership challenge. Promoted to leadership positions by virtue of their medical expertise, they are, more than business managers, concerned with keeping current with their medical field and with trying to find time to both lead their organisations and continue with their medical work.

5 CONCLUSIONS

The results of this study paint a challenging picture of leadership in Slovenian healthcare. The results suggest that while leadership competences within the healthcare sector seem to have been developed in the expected direction, the comparison with the business sector indicates a serious lag in leadership competences among the leaders in Slovenian healthcare.

This situation is most likely the result of the fact that most managers in the Slovenian health system are medical professionals who see their leadership roles of healthcare organisations as a step in their medical careers rather than a departure from medical practice and entry into professional management. This career pattern means that managers need to maintain their medical expertise while acting in leadership roles, because they tend to return to the practice once their leadership mandates run out. As managers they constantly struggle to manage their time effectively, as they need to continue to work with patients in order to retain their excellence in their field of medical specialisation. As a result, leadership of healthcare organisations in Slovenia is highly competent in medical areas but seriously lacking in managerial competences.

Another important challenge for leadership in Slovenian healthcare relates to the complexity of different organisational levels of the healthcare system. Multiple hierarchies of professionals require additional leadership skills for leaders to be able to coordinate activities among different groups and to establish good working relationships with them, the two fields in which business sector managers excel. Both skills would enable Slovenian healthcare managers to integrate internally and to overcome the seemingly chaotic internal coordination of healthcare organisations.

Several countries noticed that insufficient numbers of health managers are graduating from health administration programs, resulting in a shortage of managers whose training and experience would qualify them to assume these positions. In response, countries like Great Britain and Germany have started to improve medical qualifications of different groups of health professionals by supplementing their curricula with managerial areas such as leadership. Lately, these changes became present in many other countries, including Canada, where in 2005 the government updated and simplified the key Leadership Competences Profile that reflects the leadership skills, abilities and characteristics that are needed in the public service by managers at all levels. The challenge of educational institutions to provide health managers with adequate skills is even greater due to the fact that competences needed by an effective physician-leader combine general leader-

ship skills as well as skills that are particularly needed to address the challenges of healthcare.

We recommend that the Slovenian government, which is responsible for the appointment of top leaders of most Slovenian healthcare institutions, should begin to acknowledge the leadership gap in the health sector and launch a serious national leadership development initiative modelled on successful examples of countries such as the UK and Canada. The biggest challenge, however, is not to train doctors in leadership skills. While this effort might lead to quick results, the ambition should be broader, namely to start on the path of professionalisation of health care management. This will require a culture change in Slovenian healthcare. First, the career paths of health care leadership should change. The entry of management professionals into health care is already taking place with small steps. The reverse process of migration of health professionals into leadership ranks should be supported by leadership development programs. Second, culture change requires demonstration of positive effects of implementing managerial practices in health care organisations. This requires the use of consultants that can be instrumental for the transfer of best practices from well managed organisations into Slovenian health care. Third, investment into the development of fully accredited leadership development programs could eventually lead to fully fledged professionalisation of health care management as the legitimacy of management professionals becomes well established and accepted in Slovenian healthcare.

CONFLICT OF INTEREST

The authors declare that no conflict of interest exists.

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QUALITY OF LIFE AND PATIENT SATISFACTION WITH FAMILY PRACTICE CARE IN A ROMA POPULATION WITH CHRONIC CONDITIONS IN NORTHEAST SLOVENIA

KAKOVOST ŽIVLJENJA V POVEZAVI S KRONIČNIMI BOLEZNIMI IN Z ZADOVOLJSTVOM Z OSKRBO ZDRAVNIKA DRUŽINSKE MEDICINE MED ROMSKIM PREBIVALSTVOM V SV SLOVENIJI

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ABSTRACT

Keywords:
Roma, quality of life, patient satisfaction, chronic diseases, mental health

Objectives. Health-related quality of life (HRQoL) measures a patient's subjective experience of his or her health status. We aimed to show how the presence of chronic diseases and satisfaction with family physicians (FPs) were associated with the HRQoL of a Roma population.

Methods. A cross-sectional study was carried out in May 2011 on a representative sample of 650 Roma living in Prekmurje, Slovenia. The EQ-5D questionnaire was used for measuring the HRQoL of the Roma. Demographical data, 12 groups of diseases diagnosed in the last 12 months and satisfaction with FPs were included in the questionnaire.

Results. The response rate was 88.3% (574), of which 56.4% were female, and the average age of the participants had a mean value of 40.2±12.7 years. The presence of cardiovascular problems with risk factors for them or presence of musculoskeletal disorders were strongly associated with the presence of pain (Cramer's V = 0.40 and 0.46 respectively). There was a strong association between the presence of mental disorders and anxiety and depression (Cramer´s V = 0.58). The average satisfaction with the family physician was 3.9 (mean±1.10) on a five-point Likert scale. There was no significant association between HRQoL and satisfaction with the family physician.

Conclusions. Roma with chronic mental health problems had the lowest HRQoL in the Roma population. More attention should be paid to this subgroup of Roma in family medicine, and interventions should be provided. High satisfaction with their FPs is not associated with the observed quality of life variables.

IZVLEČEK

Ključne besede:
Romi, kakovost življenja, zadovoljstvo bolnikov, kronične bolezni, duševno zdravje

Uvod. Z zdravjem povezana kakovost življenja (HRQoL) je odraz pacientove subjektivne ocene lastnega zdravstvenega stanja. V naši raziskavi smo skušali ugotoviti, kakšen je vpliv nekaterih kroničnih bolezni in zadovoljstva z izbranim zdravnikom na HRQoL med romskim prebivalstvom.

Metode. Maja 2011 smo izvedli presečno raziskavo v reprezentativnem vzorcu 650 pomurskih Romov. HRQoL smo merili z vprašalnikom EQ-5D; vključili smo še demografske podatke, zadovoljstvo z izbranim družinskim zdravnikom in 12 bolezenskih stanj, ki so bila diagnosticirana v zadnjih 12 mesecih.

Rezultati. Odzivnost je bila 88,3-odstotna (574), 56,4 % je bilo žensk in povprečna starost sodelujočih je bila 40,2 +/- 12,7 leta. Nizek HRQoL v skupini s srčno-žilnimi boleznimi z dejavniki tveganja zanje in kostno-mišičnimi boleznimi je bil močno povezan s prisotnostjo bolečine (Cramer z V = 0,40 in 0,46). V skupini z duševnimi težavami pa je bila močna povezava nizkega HRQoL s prisotnimi znaki anksioznosti in depresije (Cramer z V = 0,58). Povprečno zadovoljstvo z zdravnikom družinske medicine je bilo 3,9 (mediana +/- 1,10) na pettočkovni Likertovi lestvici. Ni bilo statistične povezave med HRQoL in zadovoljstvom z zdravnikom družinske medicine.

Zaključki. Romi s prisotnostjo duševnih težav imajo najnižji HRQoL v romskem prebivalstvu. Več pozornosti bi v družinski medicini morali posvetiti tej podskupini Romov. Zadovoljstvo z zdravnikom družinske medicine ni povezano z opazovanimi spremenljivkami kakovosti življenja.

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1 INTRODUCTION

The Roma people in Prekmurje are an indigenous ethnic group with specific cultural characteristics, a unique language and ethnic specificities. The Roma face numerous obstacles in accessing healthcare services: these arise from poverty and low income (inability to pay for medical services); the geographical isolation of Roma settlements; the uneven distribution of healthcare institutions and staff; Roma cultural features; and communication problems between Roma and the staff at healthcare institutions (1- 4).

In the last few years, research on Roma has observed that in this population non-communicable diseases are the most common cause of morbidity and mortality (5-9). This means that the increasing CVD, diabetes mellitus, COPD and mental health problems are a big burden on the Roma communities (5-9). Only a few studies have assessed the impact of ethnicity on HRQoL in non-communicable diseases, but these studies indicated that Roma ethnicity is associated with a lower mental as well as physical HRQoL (5, 10-11).

The HRQoL instrument has been developed and validated among majority populations and is not necessarily directly applicable to minorities (12). It represents people's subjective assessment of their sense of well-being and their ability to perform physical, psychological and social functions (13, 14). In the IQOLA study, it was reported that chronic diseases have an important impact on HRQoL (15). Because culture can affect the perception and interpretation of health and illness, we also expect different association between HRQoL and chronic disease in ethnic groups compared to the general population (16-18).

According to the literature, minorities typically also have a lower HRQoL than the general population (13, 17-19), and it has been shown that race and ethnicity may affect an individual's HRQoL (11). Studies conducted among various minority groups (e.g. Native Americans, Afro-Americans, African-Caribbean communities in the UK, Asian and Chinese minority groups, Albanian immigrants in Greece, Roma in Sweden and minorities in the Netherlands) focusing on the relationship between HRQoL and ethnicity indicated that the minority groups usually have a lower HRQoL (12-13, 17-18, 20-22).

In Slovenia, most Roma have chosen an FP as their primary care provider and visit them if they need to. In the past few years, interventions have been developed to increase the availability of FPs (20, 23). Some studies found an important impact of the physician on patient´s HRQoL (24-26). The link between HRQoL and satisfaction with the doctor could be explained by the fact that a good doctor explains the causes of disease and methods of treatment and living with the disease. An empowered patient in this case can more easily and better cope with the disease, which can affect HRQoL (24-27).

In this study, we wanted to assess the self-reported HRQoL of a Roma population group from Prekmurje and investigate the differences between groups of people with the three most common chronic diseases. The chronic disease groups we chose were cardiovascular disease with risk factors for them (CVD), mental disorders and musculoskeletal diseases. We also wanted to determine whether patient satisfaction with their FP was associated with HRQoL. The purpose of our study was to encourage better practices by FPs when they treat Roma patients.

2 METHODS

2.1 Type of study

We performed a cross-sectional study, based on a field survey in May 2012, with cross-sectional data from the Prekmurje Roma population. At the time of the study, there were 3,300 Roma permanently settled in Prekmurje, an undeveloped region in the northeast part of Slovenia (28). According to the statistics in Prekmurje, 49.3% of the Roma are women (29, 30). The most common chronic diseases are: musculoskeletal disease, respiratory disease, cardiovascular disease and mental disorders (29, 30).

2.2 Participants

A representative sample of 650 adults, 18-77 years old, was selected by random sampling of households in Roma settlements, with one adult selected at random per household, alternating men and women. Roma ethnicity was determined based on identification by the interviewed Roma themselves and by a member of the research team. We included 20% of the Prekmurje Roma, proportional to the population size of Roma in Prekmurje.

2.3 Data collection

The HRQoL questionnaire was administered by voluntary face-to-face interview, conducted by trained community nurses. The HRQoL questionnaire is an internationally validated instrument for measurement of health related quality of life (18, 31-32). For the purpose of our study, we used it first in a pilot project in a Prekmurje Roma settlement one year before the original study. The interviews were made in the Roma settlements. The 10 trained field workers were known to the Roma through their previous work in the settlements.

Independent variables

Socio-demographic background was measured by 5 variables: sex (1 = male, 2 = female), age (in years), marital status (1 = married, 2 = single, 3 = divorced, 4 = widowed), educational attainment (1 = basic education, 2 = vocational education, 3 = upper secondary school, 4 = higher education) and activity status (1 = employed or self-employed, 2 = student, 3 = housekeeper, 4 = retired , 5 = unemployed).

Participants groups according to the presence/absence of a disease were formed by questions related to the presence of eight diagnoses or medically treated designated conditions in the past 12 months. Response options covered three conditions: 1 = yes, with drugs, 2 = yes, without drugs and 3 = No. To define focus groups, categories 1

and 2 were joined into only one category indicating presence of observed diagnosis or medically treated designated condition. We defined three main focus groups covering cardiovascular diseases with risk factors for them, diseases of the musculoskeletal system and psychiatric diseases. Cardiovascular diseases covered presence of high blood pressure, high cholesterol, myocardial infarction or chest pain and heart failure; diseases of the musculoskeletal system covered rheumatism, arthritis, low back pain and musculoskeletal diseases; and psychiatric diseases included anxiety (restlessness and depression). Respondent is classified in each group if he/she confirmed the presence of one or more diagnosis or medically treated designated condition. These focus groups are not mutually exclusive as a respondent could confirm the presence of all measured diagnoses or medically treated designated conditions.

Dependent variables

Health Related Quality of Life was measured by five questions related to respondents' mobility (q1), care of the self (q2), difficulty in usual daily activities (3), presence of pain (q4) and presence of anxiety or depression (q5). Response options covered three key conditions: 1 = without problems, 2 = moderate problems and 3 = severe problems.

Satisfaction groups were identified by a multi-item question on satisfaction with doctor in past 12 months. Level of satisfaction was assessed through the following 6 statements: 1. during the visit, doctor gave the feeling that he/she had ample time for the consultation; 2. doctor was interested in your personal situation; 3. doctor helped you to tell him/her about your problems; 4. doctor listened to me; 5. doctor explained the purpose of examinations, investigations and treatment; and 6. doctor gave you enough detail on what you wanted to know about symptoms or disease. Respondents evaluated their level of satisfaction using Likert-type scale ranging from 1 =bad to 5 = excellent. For the 6-item question, a composite score was derived as an average of all six item scores. Prior factor analysis solution without rotation showed that all 6 items are associated to only one concept, with the first factor explaining 92.9% of total variance. In addition, to determine the reliability of the underlying construct, Cronbach's alpha was assessed, indicating excellent internal consistency (0.96). Final group choice criteria was established at mean value of 3 (3.00 or less = unsatisfied group; more than 3.00 = satisfied group).

2.4 Analysis

In the analysis, two cross classification tables with a chi-square test were employed for testing associations between quality of life elements and implications for health conditions and the group variables, based on the data observed. 11.7% of the Roma rejected participation in the study, mostly due to lack of time or lack of interest, according to information received from the community nurses. The demographic data were analysed with basic statistical tools. The null hypothesis (H0) assumed there was no association, while the alternative hypothesis (H1) anticipated that a significant association did exist. The

strength of the relationship was assessed by Cramer's V coefficient, ranging from 0 (no relationship) to 1 (perfect relationship). For interpretation of Cramer's V, varied next values and descriptors were used: 0.00-0.10 (redundant); 0.10-0.20 (weak); 0.20-0.40 (moderate); 0.40-0.60 (strong); 0.60 or higher (very strong). The statistical analysis was carried out with SPSS (Statistical package for the Social Sciences, version 21), and the level of statistical significance (P-value) was set at 0.05. The study was approved by the National Medical Ethics Committee of the Republic of Slovenia, No. 152/03/10.

3 RESULTS

3.1 Demographic characteristics and disease groups

The final sample consisted of 574 respondents (88.3% response rate). This comprises approximately 20% of the Prekmurje Roma population. 96.4% of the Prekmurje Roma in our sample have a chosen FP, and this percentage was mirrored in our study. Respondents were aged between 18 and 77 years; the average age was 40.2±12.1 years. 56.4% of participating Roma were female. In our sample of surveyed Roma, 72.4% were married, 78.0% had basic education and 20.0% were employed or self-employed. Socio-demographic characteristics of Roma respondents are detailed in Table 1.

The majority of Roma in the sample reported having lower back pain and musculoskeletal problems (48.6%), followed by high blood pressure (26.5%), depression (26.1%), chronic bronchitis, asthma or emphysema (26.1%), anxiety (17.4%), high cholesterol (15.3%), gastritis, ulcer (12.7%) and rheumatism, arthritis (12.5%). Considering observed disease groupings, the musculoskeletal disease group prevailed (292, 50.9%), followed by the cardiovascular disease group (203, 35.4%) and the psychiatric disease group (183, 31.9%).

3.2 HRQoL and the presence of CVD with risk factors

Examination of the column percentages and standard residuals in the cardiovascular disease group crosstab (Table 2) shows that the percentage of respondents diagnosed with a cardiovascular disease without mobility problems is substantially lower, at 41.87%, than the overall average (63.41%), while that for other respondents (75.20%) is much higher than average. In addition, the proportion of respondents diagnosed with a cardiovascular disease without self-care problems is lower, at 80.30%, than the overall average (88.50%), whereas that for other respondents without CVD (92.99%) is greater than the average. The percentage of respondents diagnosed with a cardiovascular disease without pain is much lower (12.81%) than the overall average (36.41%), whereas that for those respondents without any cardiovascular disease (49.33%) is considerably above the average.

Looking further, the set of estimated Cramer's V coefficients features the association between presence of pain and the cardiovascular disease group as relatively the strongest, i.e. 0.40, demonstrating a strong association.

Table 1. Socio-demographic profile of respondents.

Socio-demographic characteristics		Total sample (n=574)	Observed disease group		
			Cardiovascular with risk factors (n=203)	Musculoskeletal (n=292)	Mental problems (n=183)
Gender	Male	250 (43.6%)	81 (39.9%)	118 (40.4%)	61 (33.3%)
	Female	324 (56.4%)	122 (60.1%)	174 (59.6%)	122 (66.7%)
Average age (sd)		40.2 (±12.7)	47.9 (±12.1)	44.7 (±12.3)	43.8 (±13.1)
Marital status	Married	414 (72.4%)	150 (73.9%)	222 (76.0%)	132 (72.5%)
	Single	112 (19.6%)	22 (10.8%)	36 (12.3%)	28 (15.4%)
	Divorced	14 (2.4%)	5 (2.5%)	8 (2.7%)	4 (2.2%)
	Widowed	32 (5.6%)	26 (12.8%)	26 (8.9%)	18 (9.9%)
Educational attainment	Basic	447 (78.0%)	174 (85.7%)	245 (83.9%)	157 (86.3%)
	Vocational	55 (9.6%)	14 (6.9%)	27 (9.2%)	8 (4.4%)
	Upper secondary	66 (11.5%)	14 (6.9%)	18 (6.2%)	15 (8.2%)
	Higher	5 (0.9%)	1 (0.5%)	2 (0.7%)	2 (1.1%)
Activity status	Employed or self-employed	115 (20.0%)	28 (13.8%)	56 (19.2%)	20 (10.9%)
	Student	13 (2.3%)	3 (1.5%)	2 (0.7%)	3 (1.6%)
	Housekeeper	104 (18.1%)	41 (20.2%)	50 (17.1%)	36 (19.7%)
	Retired	53 (9.2%)	36 (17.7%)	40 (13.7)	28 (15.3%)
	Unemployed	259 (50.3%)	95 (46.8%)	144 (49.3%)	96 (52.5%)
Presence of disease	High blood pressure	152 (26.5%)	152 (74.9%)	117 (40.1%)	72 (39.3%)
	High cholesterol	88 (15.3%)	88 (43.3%)	75 (25.7%)	42 (23.0%)
	Diabetes mellitus	48 (8.4%)	40 (19.7%)	42 (14.4%)	27 (14.8%)
	Heart attack or chest pain	43 (7.5%)	43 (21.2%)	38 (13.0%)	27 (14.8%)
	Heart failure	51 (8.9%)	51 (25.1%)	46 (15.8%)	30 (16.4%)
	Rheumatic disease	72 (12.5%)	50 (24.6%)	72 (24.7%)	40 (21.9%)
	Lower back pain, musculoskeletal problems	279 (48.6%)	151 (74.4%)	279 (95.5%)	126 (68.9%)
	Chronic bronchitis, asthma or emphysema	150 (26.1%)	81 (39.9%)	123 (42.1%)	77 (42.1%)
	Gastritis, ulcer	73 (12.7%)	42 (20.7%)	61 (20.9%)	41 (22.4%)
	Anxiety	100 (17.4%)	60 (29.6%)	81 (27.7%)	100 (54.6%)
	Depression	150 (26.1%)	76 (37.4%)	101 (34.6%)	150 (82.0%)
	Cancer	16 (2.8%)	9 (4.4%)	12 (4.1%)	9 (4.9%)

Table 2. HRQoL and the cardiovascular disease group with risk factors.

HRQoL	Cardiovascular Disease Group with risk factors		
		YES	TOTAL
MOBILITY			
Without problems	279 (75.20%)	85 (41.87%)	364 (63.41%)
Moderate problems	90 (24.26%)	114 (56.16%)	204 (35.54%)
Severe problems	2 (0.54%)	4 (1.97%)	6 (1.05%)
N	371 (100%)	203 (100%)	574 (100%)
Chi-square=63.12; df=2; p<0.001 Cramer's V=0.33			
SELFCARE			
Without problems	345 (92.99%)	163 (80.30%)	508 (88.50%)
Moderate problems	24 (6.47%)	35 (17.24%)	59 (10.28%)
Severe problems	2 (0.54%)	5 (2.46%)	7 (1.22%)
N	371 (100%)	203 (100%)	574 (100%)
Chi-square=21.19; df=2; p<0.001 Cramer's V=0.19			
PRESENCE OF PAIN			
Without problems	183 (49.33%)	26 (12.81%)	209 (36.41%)
Moderate problems	175 (47.17%)	141 (69.46%)	164 (28.57%)
Severe problems	13 (3.50%)	36 (17.73%)	25 (4.36%)
N	371 (100%)	203 (100%)	574 (100%)
Chi-square=91.02; df=2; p<0.00 Cramer's V=0.40			

HRQoL	Cardiovascular Disease Group with risk factors		
		YES	TOTAL
DIFFICULTIES IN DAILY ACTIVITIES			
Without problems	290 (78.17%)	95 (48.60%)	385 (67.07%)
Moderate problems	68 (18.33%)	96 (47.29%)	164 (28.57%)
Severe problems	13 (3.50%)	12 (5.91%)	25 (4.36%)
N	371 (100%)	203 (100%)	574 (100%)
Chi-square=59.51; df=2; p<0.001 Cramer's V=0.32			
PRESENCE OF ANXIETY AND/OR DEPRESSION			
Without problems	291 (78.17%)	76 (37.44%)	295 (51.39%)
Moderate	131 (18.33%)	100 (49.26%)	231 (40.24%)
Severe problems	21 (3.50%)	27 (13.30%)	48 (8.36%)
N	371 (100%)	203 (100%)	574 (100%)
Chi-square=27.41; df=2; p<0.001 Cramer's V=0.22			

Table 3. HRQoL and the musculoskeletal system disease group.

HRQoL	Musculoskeletal System Disease Group		
	NO	YES	TOTAL
MOBILITY			
Without problems	233 (82.62%)	131 (44.86%)	364 (63.41%)
Moderate problems	49 (17.38%)	155 (53.08%)	204 (35.54%)
Severe problems	0 (0.00%)	6 (2.05%)	6 (1.05%)
N	282 (100%)	292 (100%)	574 (100%)
Chi-square=89.51; df=2; p<0.001 Cramer's V=0.39			
CARE OF SELF			
Without problems	273 (96.81)	235 (80.48%)	508 (88.50%)
Moderate problems	8 (2.84)	51 (17.47%)	59 (10.28%)
Severe problems	1 (0.35)	6 (2.05%)	7 (1.22%)
N	282 (100%)	292 (100%)	574 (100%)
Chi-square=37.59; df=2; p<0.001 Cramer's V=0.26			
PRESENCE OF PAIN			
Without problems	165 (58.51%)	44 (15.07%)	209 (36.41%)
Moderate problems	110 (39.01%)	206 (70.55%)	316 (55.05%)
Severe problems	7 (2.48%)	42 (14.38%)	49 (8.54%)
N	282 (100%)	292 (100.0%)	574 (100%)
Chi-square=124.08; df=2; p<0.001 Cramer's V=0.46			
DIFFICULTY IN EVERYDAY ACTIVITIES			
Without problems	230 (81.56%)	155 (43.08%)	385 (67.07%)
Moderate problems	46 (16.31%)	118 (40.41%)	164 (28.57%)
Severe problems	6 (2.13%)	19 (6.51%)	25 (4.36%)
N	282 (100%)	292 (100%)	574 (100%)
Chi-square=52.82; df=2; p<0.001 Cramer's V=0.30			
PRESENCE OF ANXIETY AND/OR DEPRESSION			
Without problems	176 (62.41%)	119 (40.75%)	295 (51.39%)
Moderate problems	91 (32.27%)	140 (47.95%)	231 (40.24%)
Severe problems	15 (5.32%)	33 (11.30%)	48 (8.36%)
N	282 (100%)	292 (100%)	574 (100%)
Chi-square=27.99; df=2; p<0.001 Cramer's V=0.22			

Table 4. HRQoL and the mental health problem group.

HRQoL	Mental health problem group		
	NO	**YES**	**TOTAL**
MOBILITY			
Without problems	272 (69.57%)	92 (50.27%)	364 (63.41%)
Moderate problems	116 (29.67%)	88 (48.09%)	204 (35.54%)
Severe problems	3 (0.77%)	3 (1.64%)	6 (1.05%)
N	391 (100%)	183 (100%)	574 (100%)
Chi-square=20.12; df=2; p<0.001 Cramer's V=0.19			
CARE OF SELF			
Without problems	362 (92.58%)	146 (79.78%)	508 (88.50%)
Moderate problems	28 (7.16%)	31 (16.94%)	59 (10.28%)
Severe problems	1 (0.26%))	6 (3.28%)	7 (1.22%)
N	391 (100%)	183 (100%)	574 (100%)
Chi-square=23.25; df=2; p<0.001 Cramer's V=0.20			
PRESENCE OF PAIN			
Without problems	169 (43.22%)	40 (21.86%)	209 (36.41%)
Moderate problems	207 (52.94%)	109 (59.56%)	316 (55.05%)
Severe problems	15 (3.84%)	34 (18.58%)	49 (8.54%)
N	391 (100%)	183 (100%)	574 (100%)
Chi-square=48.36; df=2; p<0.001 Cramer's V=0.29			
DIFFICULTY IN EVERYDAY ACTIVITIES			
Without problems	287 (73.40%)	98 (53.55%)	385 (67.07%)
Moderate problems	96 (24.55%)	68 (37.16%)	164 (28.57%)
Severe problems	8 (2.05%)	17 (9.29%)	25 (4.36%)
N	391 (100%)	183 (100%)	574 (100%)
Chi-square=29.27; df=2; p<0.001 Cramer's V=0.23			
PRESENCE OF ANXIETY AND/OR DEPRESSION			
Without problems	275 (70.33%)	20 (10.93%)	295 (51.39%)
Moderate problems	108 (27.62%)	123 (67.21%)	231 (40.24%)
Severe problems	8 (2.05%)	40 (21.86%))	48 (8.36%)
N	391 (100%)	183 (100%)	574 (100%)
Chi-square=192.66; df=2; p<0.001 Cramer's V=0.58			

3.4 HRQoL and the presence of mental health problems

Examination of the percentages and residuals in the mental health problem group crosstab (see Table 4) suggested that the proportion of respondents with a psychiatric disease without mobility problems is substantially lower, at 50.27%, than the overall average (63.41%) compared to the proportion of respondents without such a disease (69.57%). Taking into consideration the presence of pain, difficulties with everyday activities and the presence of anxiety or depression, our sample data shows that in the case of the sub-category without problems, all three health condition items point to a higher proportion of respondents without a psychiatric diagnosis (43.22%; 73.40%; 70.33%) compared to those with such a diagnosis (21.86%; 53.55%; 10.93%). Based on Cramer's V coefficients, the association between the presence of anxiety or depression and the psychiatric disease group is comparatively the strongest, i.e. 0.58, which indicates a strong association.

3.5 Patient satisfaction with family physicians

Patients' satisfaction with their FP proved to be not statistically significant when associated with the observed quality variables (Table 5). Inspection of the column percentages and standard residuals in this crosstab shows that the percentage of satisfied respondents without problems in everyday activities was lower, at 61.0% ,than the overall average (66.7%), whereas that for satisfied respondents (69.3%) was above average. In addition, corresponding Cramer's V coefficients showed that all relationships were negligible.

Table 5. HRQoL and patient/Roma satisfaction with family physicians.

HRQoL	Patient satisfaction with FPs		
	UNSATISFIED	SATISFIED	TOTAL
MOBILITY			
Without problems	113 (63.84%)	243 (62.63%)	356 (63.01%)
Moderate problems	61 (34.46%)	142 (36.60%)	203 (35.93%)
Severe problems	3 (1.69%)	3 (0.77%)	6 (1.06%)
N	177 (100%)	388 (100%)	565 (100%)
Chi-square=1.15; df=2; p=0.56 Cramer's V=0.05			
CARE OF SELF			
Without problems	156 (88.14%)	343 (88.40%)	499 (88.32%)
Moderate problems	17 (9.60)	42 (10.82%)	59 (10.44%)
Severe problems	4 (2.26%)	3 (0.77%)	7 (1.24%)
N	177 (100%)	388 (100%)	565 (100%)
Chi-square=2.34; df=2; p=0.31 Cramer's V=0.06			
PRESENCE OF PAIN			
Without problems	62 (35.03%)	140 (36.08)	202 (35.75%)
Moderate problems	100 (56.50)	214 (55.15)	314 (55.58%)
Severe problems	15 (8.47)	34 (8.76)	49 (8.67%)
N	177 (100%)	388 (100%)	565 (100%)
Chi-square=0.09; df=2; p=0.96 Cramer's V=0.09			
DIFFICULTY IN EVERYDAY ACTIVITIES			
Without problems	108 (61.02%)	269 (69.33%)	377 (66.73%)
Moderate problems	57 (32.20%)	106 (27.32%)	163 (28.85%)
Severe problems	12 (6.78%)	13 (3.35%)	25 (4.42)
N	177 (100%)	388 (100%)	565 (100%)
Chi-square=5.49; df=2; p=0.06 Cramer's V=0.10			
PRESENCE OF ANXIETY AND/OR DEPRESSION			
Without problems	91 (51.41%)	196 (50.52%)	287 (50.80%)
Moderate problems	68 (38.42%)	162 (41.75%)	230 (40.71%)
Severe problems	18 (10.17%)	30 (7.73%)	48 (8.50%)
N	177 (100%)	388 (100%)	565 (100%)
Chi-square=1.20; df=2; p=0.55 Cramer's V=0.05			

4 DISCUSSION

In our sample, we included almost 20% of the Roma in Prekmurje. This is a large proportion, and most Roma studies do not include so many participants; this can be seen as one of the strengths of our study. The results showed that there were statistically significant differences between people with and without chronic diseases in terms of HRQoL for each chronic disease group. The analysis included only the chronic disease groups in which 200 or more Roma reported they have the disease, so the respiratory disease group, with only 126 subjects, was not included and we would like to analyse it separately. In the analysis, we only used data on self-reported diseases, and the community nurses gave exact descriptions of the chronic diseases where necessary, but this was not a problem for the interviewees. Some other studies also led to the conclusion that Roma with chronic diseases experience a significant reduction in HRQoL (21, 33-35). Studies that assessed HRQoL in a population with chronic diseases are sometimes conflicting; for example, in the Makkes study, they did not find any asso-

ciations between HRQoL and cardio-metabolic risk factors (36), and another study researched a multi-ethnic sample of breast cancer survivors where the women reported levels of HRQoL comparable to established norms (37).

In our study, however, we were able to find associations between lower HRQoL and the presence of chronic disease.

Of the chronic diseases studied, we particularly looked at symptoms related to the lowest HRQoL. The presence of pain and problems with mobility in the group with musculoskeletal diseases were two negative factors that had an important role in terms of the patients' quality of life. In the group with mental problems and the lowest HRQoL, the presence of anxiety and depression had the most important negative association on quality of life. That mental status has a large impact on health was also pointed out in Pranesh's study (38). Some other studies reported the important impact of psychological symptoms, life stress and religiosity/spiritualism on HRQoL, but in our study we did not measure those components (39-42). One interesting finding in the study, with an analysis like that, was in

the group with cardiovascular diseases, where problems with pain were significant but not, as expected, problems with anxiety and mobility. Perhaps this can be attributed to the perception of health by the Roma. Most qualitative studies in Roma populations show that for Roma people, health is a life without pain (43-45), so problems with health are usually associated with pain and unhappiness, which may explain our results (43, 46). On the other hand, a small study from the general population in Slovenia also pointed out that the presence of pain, mobility problems and anxiety have a negative impact on HRQoL (47).

If we use our sample as representative of Prekmurje Roma, almost all (96.4%) are registered with an FP. Patients with chronic diseases are frequent attendees at FP clinics and are satisfied with them (11, 48, 49). They have increased anxiety and depression with lower perceived HRQoL (49). In our sample, we did not find any statistically significant associations between satisfaction with FP and HRQoL.

The questions about satisfaction with the FP included 6 items that were related to communication, explanation, time for and interest in the patients' problems. Typically there are communication problems between Roma and medical staff, which can form a barrier towards good relationships (43-45, 50-52). That could also be an explanation for the negligible relationship between satisfaction with FP and HRQoL in our study.

4.1 Limitations of the study

The questionnaire was not translated into the Romani language, and community nurses who usually work in Roma settlements helped in data collection, so we cannot exclude the fact that the Roma want to please and the data could be biased, especially regarding satisfaction. Because of the small sample, only three groups for chronic disease were formed, so we possibly lost some comparisons with other diseases that were not selected. The heterogeneity of CVD with risk factors for them and the lack of the multimorbidity aspect are also limitations of our study. We also did not measure the impact of socioeconomic variables on HRQoL in the chosen instrument. Further studies are needed to develop this topic.

5 CONCLUSION

The presence of pain, anxiety and depression were negatively associated with HRQoL. The lowest HRQoL was found in the group with mental health problems and the presence of anxiety and depression symptoms. This is an important finding that suggests that FPs should pay more attention to the subgroup of the Roma population with mental health problems. Intervention programs that address this will be necessary in future to increase the HRQoL of this group.

CONFLICT OF INTEREST

The authors declare that no conflict of interest exists.

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KEY DETERMINANTS INFLUENCING THE HEALTH LITERACY OF PREGNANT WOMEN IN THE CZECH REPUBLIC

KLJUČNE DETERMINANTE, KI VPLIVAJO NA ZDRAVSTVENO PISMENOST NOSEČNIC NA ČEŠKEM

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ABSTRACT

Keywords:
health literacy, pregnancy, prenatal care, primary prevention, midwife

Background. Health literacy is a critical determinant of women's and children's health and therefore has immense consequences for the health of society as well. Evidence from epidemiological, clinical and experimental studies indicates that unhealthy lifestyles and risky behavioural habits of parents before conception and during pregnancy influence the etiology of various health defects. Decreasing primary risk factors, practicing physical wellness, monitoring physiological markers and preparing for labour, breastfeeding and newborn care should be the main parental responsibilities during the prenatal period.

Methods. Our study focused on specifying the main determinants of health literacy among 360 pregnant Czech women by using an anonymous questionnaire and selected anthropometric data of mothers. The criteria for study participation produced a sample representing 1.41% of Czech women in labour during a given 2012 reference period.

Results. Despite quite adequate knowledge of both risks and supporting factors for pregnancy and foetal development, the lifestyles of a majority of the women surveyed were far from optimum: only 30% reported good dietary and physical activity habits, 24% were active or passive smokers and one third of the women occasionally drank alcohol, more often among those who were university educated.

Conclusion. Our results have confirmed previously published data noting that health literacy and a healthier lifestyle of pregnant women are associated with a higher level of education (except for alcohol drinking) and with contact with a midwife (in some examined parameters) in prenatal courses.

IZVLEČEK

Ključne besede:
zdravstvena pismenost, nosečnost, predporodna nega, primarno preprečevanje, babice

Uvod. Zdravstvena pismenost je ključna determinanta zdravja žensk in otrok, ki ima ogromne posledice tudi na zdravje družbe. Dokazi iz epidemioloških, kliničnih in eksperimentalnih študij kažejo, da nezdravi življenjski slogi ter tvegano vedenje staršev pred zanositvijo in med nosečnostjo vplivajo na etiologijo različnih zdravstvenih okvar. Zmanjševanje dejavnikov tveganja, skrb za fizično dobro počutje, spremljanje fizioloških markerjev ter priprava na porod, dojenje in nego novorojenčka bi morali biti glavna odgovornost staršev v predporodnem obdobju.

Metode. Naša študija je bila namenjena določitvi glavnih determinant zdravstvene pismenosti med 360 češkimi nosečnicami s pomočjo anonimnega vprašalnika in izbranih antropometričnih podatkov o materah. Na podlagi meril za sodelovanje v študiji je bil izbran vzorec, ki je predstavljal 1,41 % nosečih žensk na Češkem v zadevnem obdobju leta 2012.

Rezultati. Kljub dokaj dobremu poznavanju tveganj in podpornih dejavnikov za nosečnost in razvoj zarodka so se življenjski slogi večine žensk, vključenih v raziskavo, močno razlikovali od optimalnih: samo 30 % jih je poročalo o dobrih prehranskih navadah in telesni aktivnosti, 24 % je bilo aktivnih ali pasivnih kadilk, ena tretjina žensk je občasno pila alkohol, pogosteje univerzitetno izobražene.

Zaključki. Naši rezultati so potrdili predhodno objavljene podatke, ki kažejo, da sta zdravstvena pismenost in bolj zdrav življenjski slog nosečnic povezana z višjo stopnjo izobrazbe (razen pitja alkohola) in stikom z babico (pri nekaterih proučenih parametrih) na predporodnih tečajih.

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1 INTRODUCTION

The experience of pregnancy and labour is a significant factor in the global development of both women and children. Recent research results affirm that the future health of an individual is influenced during the early prenatal period. Sources considering epigenetical mechanisms specifically refer to the preconceptional influence resulting from gene environment interactions (1, 2).

Prenatally, a mother positively or negatively determines both the physical and mental health of her child through her decisions and behaviour, which in turn affect her general health conditions later in life. It was recently confirmed that an unfavourable prenatal environment could facilitate vulnerability to cardiovascular and metabolic diseases, which are presently at near epidemic levels among the general population (3, 4).

When efficiently utilised, the health-care system can significantly eliminate risks for the mother and child and encourage practices that protect the woman's health and the child's capacity for development. In the Czech Republic, a long history of high levels of prenatal and neonatal care has resulted in low perinatal mortality and morbidity. On the other hand, the prevalence of low-birth-weight newborns has increased significantly from 5% to 8% (5). The Czech system of preventive observations by obstetricians in physiological pregnancies uses the officially recommended and unified secondary prevention methods at one-month intervals: monitoring of anthropometric parameters, blood pressure and kidney functions and ultrasound examination. Care oriented towards primary prevention is neither adequate nor effective. Current prenatal care recommends extra examinations for women with physiological pregnancy, and it faces the risk of overmedicalisation. Prenatal care provided by a midwife is not covered by any health insurance in the Czech Republic.

Pregnant women can be exposed to many physical and psychological burdens as well as sources of stress, fear and anxiety. Too many women deal with this stress by smoking, consuming alcohol and eating inappropriate foods, which are recognised risk factors for worst-case pregnancy outcomes. Alcohol and smoking are considered to be preventable risk factors for human reproduction with no safe threshold, human neuro-teratogens (6, 7). However, many prenatal care providers in the Czech Republic do not ask about this risk behaviour and some of them even tolerate it. Questions about nutrition, physical activity, stress and occupational hazard exposure are also not included into the routine treatment schedule of many prenatal care providers. They do not offer professional advice for promoting health changes either.

One recommended technique for decreasing the levels of prenatal anxiety and stress is aerobic exercise, which has a wide spectrum of additional benefits: better oxygenation both for mother and foetal tissues, improves mobility and better coordination as a suitable preparation for labour and birth and shortens active phase of labour. Physical activity enhances the capacity to deal with everyday issues related to stress and unexpected situations, and the

risk of depression after delivery is lower (8). Adequate activity has no negative impact on a newborn's weight. Women involved with special pregnancy exercise programs had significantly higher life wellbeing scores (9).

According to the experiences reported in some other countries, a new approach to prenatal care is "Group care pregnancy", where an individual check-up is replaced by a longer group session. The basic prenatal examination is accompanied by education, sharing of personal experiences and discussions with a midwife. The Dutch model incorporates somatical and psycho-social needs, and support involves focused attention on a woman's individuality, and the level of responsibility for women's health is increased (10). This model typifies a complex type of care that, when practiced, supports a healthy pregnancy process (11). In the 1970s, a similar model was successfully implemented in daily practice in Sweden and resulted in positive lifestyle changes for women and an overall improvement of family well-being (12). Attention is currently focused even on the preconceptional period, when the health problems of both potential parents should be identified and treated (13).

This new point of view offers a new role for midwives: they can provide information to expectant parents about a healthy lifestyle and the detrimental factors that could negatively influence healthy foetal development and potential and try to help with changes. The midwives can also prepare the couple for labour, the postnatal period, breastfeeding and parenthood. This new trend includes focus on perinatal outcomes along with the woman's prenatal care and the psychosocial needs of women's and children's health not only during pregnancy but also after delivery and throughout their lifetimes as well (14, 15). Evidence about increased smoking, alcohol consumption, malnutrition and hypoactivity, especially among young women, indicate that primary prevention should be a part of standard prenatal care (16-18). Participation in primary prevention lessons is an opportunity for a woman to deal with the changes associated with her lifestyle and expectations regarding pregnancy, labour and motherhood; all of this can be a potential source of anxiety and stress. Educational intervention should include the documentation of positive experiences, the dissemination of pregnancy-related information (including reproductive process physiology) and the strengthening of faith in individual abilities (19, 20). In many countries, including the Czech Republic, there is an increasing interest in "schools for mothers". Unfortunately, the majority of such lessons are offered as an additional, self-paid service of standard secondary prevention, without officially unified and supervised content. This education is not available for lower-income women, who are usually undereducated and are more likely to have adopted an unhealthy lifestyle. Voluntary courses for pregnant women, managed by midwives, are oriented towards preparation for delivery, breastfeeding and newborn care, but they do not yet include lifestyle factors. The fact that pregnancy may be the new source of stress for some women, who therefore need special psychological support, is also ignored (21, 22).

Our survey goals were to determine the current health literacy of pregnant women (i.e. their awareness of critical and protective procedures, the risk factors in their lifestyles and the changes they made during pregnancy) and to identify the main determining factors of health literacy (education, parity, place of residence and participation in prenatal courses).

2 METHODS AND SAMPLE

A retrospective anonymous questionnaire and a data analysis, collected from July to October 2012, were used. We created a random and proportional sample of women. The primary sample included the 108,000 single babies born in 2011 in Czech hospitals. The second basic sample included the approximately 25,000 single babies born during the quarter when our study was organised. According to these data, the number of participants for our study was established at 540 women (2% of the second basic sample). Five of a total of fourteen Czech districts were chosen by random selection and the particular maternity hospitals in each district were chosen in the same manner. To keep the proportionality of the sample, the number of participating women from each individual clinic was related to the annual/quarterly number of newborns. Women were contacted during the postpartum period. Of the 540 women contacted, a total 393 returned the completed questionnaire (response rate was 72.77%), of which 33 had to be excluded due to incomplete data. The final sample thus consisted of 360 women representing 1.41% of women who had given birth during the study period.

All of the women participating in the study signed an informed consent form and an agreement with the Ethics Committee of University Hospital, Faculty of Medicine, Masaryk University. Fully trained medical staff collected the data.

The main sample characteristics are shown in Table 1. There was a nearly proportional rate of primiparous and multiparous women as well as those with university and high school education; one fifth had only a basic level of education. The level of education was the marker of socioeconomic status. The average age was 30.5 years (median = 31). In terms of parity and age (in comparison with statistical data for the Czech Republic), it is possible to consider the sample as representative. The majority (81%) gave birth vaginally; 19% had a Caesarean section. Twice as many participants lived in towns as in villages.

The structure of the questionnaire was based on the Health Promotion Model (23) and on certain items from the standardised questionnaire used in the ELSPAC (European Longitudinal Study of Pregnancy and Childhood) (24). In addition to demographic data, particular blocks of questions were oriented towards factors important for a woman's health and the healthy development of the foetus during pregnancy. These blocks of questions covered both the woman's knowledge and her behaviour (dietary habits, time and type of active physical exercise, body weight and weight gain during pregnancy, smoking, alcohol consumption, illicit drug use and emotional challenges). A dietary habits index with 10 questions and 32 possible answers (questions focused on the frequency of intake of protective and risk foods) was created, and for each correct answer (according to the food pyramid), one point was counted. Index distribution values ranged from 0 (the worst habits) to 10 (the best habits), index distribution: median = 6. A risk factors awareness index was created with values ranging from 0 to 21, index distribution: median = 18. A Likert scale was used to evaluate the feeling of stress during pregnancy and the postpartum period. Self-reported data were not objectively confirmed, with the exception of BMI and weight gain. The questionnaire was completed with data from obstetrician's protocols and included weight and height before pregnancy, weight gain during pregnancy, the form of delivery and newborn status.

Pearson's x2 (chi-square) test and the ANOVA variance analysis were used to evaluate differences between groups with (a) varied educational levels and (b) frequency of participation in prenatal lessons with midwives; the acceptable value for significance was $p \leq 0.05$, sampling error 5.4%.

Table 1. The characteristic of the sample.

Item		N	%
Number of participants		360	100
Age	Average	30.5 y	
	Median	31 y	
Education	Basic	69	19.1
	High school	145	40.3
	University	146	40.6
Residence	Town	259	71.9
	Village	101	28.1
Parity	Primipara	178	49.4
	Secundipara	146	40.6
	Multipara	36	10.0
Smoking	Never	230	63.6
	Former	109	30.0
	Current	22	6.1
Alcohol in pregnancy (occasionally)		112	31.1
Illicit drugs	Never	299	83.0
	Former	32	8.9
	Current	29	8.1

3 RESULTS

The majority of participants had a revealing family health history. The most frequent disease was hypertension (in 51% of families), 40% had diabetes mellitus in the family, 30% of families had atopy and 60% reported a background of smokers within their family of origin. More than one half of participants (55%) reported positive unhealthy personal histories: allergies, asthma, recurrent urinary tract infections and anaemia were among the most frequent issues. Nearly two thirds (62%) reported gynaecological problems including repeated gynaecological inflammation, spontaneous abortion and menstrual cycle problems. The

interruption of a previous pregnancy was reported by 12%. Nearly two thirds (64%) used hormonal contraception.

The body mass index (BMI) values of the surveyed women at the beginning of pregnancy reflected a Gaussian curve distribution. The average BMI was inversely related to the level of education and place of residence; see Table 2. More participants with the lowest level of education were overweight or obese before pregnancy (BMI 25.0 and higher) compared to those with a university education (40% vs. 24% respectively, p < 0.001). Women living in villages had a BMI of 25.0 and higher more often than women living in towns (35% in villages vs. 24% in towns, p = 0.006).

Table 2. Average BMI before pregnancy.

	N	BMI Mean	Std. deviation
Education:			
Basic	69	24.5	4.6
High school	145	23.2	4.5
University	146	22.8	3.4
Residence:			
Town	259	22.9	4.0
Village	101	24.2	4.5
Total	*360*	*23.3*	*4.2*

The average weight gain was 13.4 kg. The highest prevalence of low, optimal and high weight gain is presented in Table 3. More women with the lowest education had higher (more than 15 kg) weight gain (36% vs. 23% women with university education, p = 0.005). A tendency towards higher weight gain was found among primiparous women (35% vs. 28% multiparous women) and among women living in villages (35% vs. 30% in towns).

BMI and pregnancy weight gain were influenced by dietary habits; better dietary habits (with higher index value) lowered the first-input BMI of women and their pregnancy weight gain to the recommended optimal range (p < 0.001; p = 0.021 respectively).

Half of the participants (50%) reported some preconceptional preparation; 25% six months or more. Preconceptional preparation was reported more often by primiparous and women with higher education than multiparous and women with lower education. A majority of them considered the omission of contraceptive pills to be a type of preparation for pregnancy.

Prenatal preparation lessons were attended by 39% of respondents; 17% attended only a one-time course (focused on information about the labour process and breastfeed-

Table 3. Education, place of residence, parity and weight gain in pregnancy.

	Count	Weight gain			
	Percent*	Suboptimal	Optimal	High	Total
Education:					
Basic	N	12	32	25	69
	%	16.7	47.0	36.4	100.0
High school	N	11	83	51	145
	%	7.6	57.2	35.2	100.0
University	N	20	91	35	146
	%	14.0	62.2	23.8	100.0
Total	*N*	*43*	*207*	*110*	*360*
	%	*11.9*	*57.3*	*30.8*	*100.0*
Residence:					
Town	N	32	152	75	259
	%	12.2	58.8	29.0	100.0
Village	N	11	54	36	101
	%	11.3	53.6	35.1	100.0
Total	*N*	*43*	*206*	*111*	*360*
	%	*11.9*	*57.4*	*30.7*	*100.0*
Parity:					
Primipara	N	21	95	62	178
	%	11.9	53.4	34.7	100.0
Secundipara	N	18	89	39	146
	%	12.5	61.1	26.4	100.0
Multipara	N	3	22	11	36
	%	8.8	61.8	29.4	100.0
Total	*N*	*42*	*206*	*112*	*360*
	%	*11.9*	*57.3*	*30.8*	*100.0*

* Row percentages presented

ing); 21% attended only a couple of theoretical lessons and 62% completed both theory lessons and exercise and practical skills (on average 10 lessons focused on pregnancy, labour, puerperium, infant care and breastfeeding). In most cases, lessons were led by midwives (96%) with a bachelor's education. In 4% of cases, the courses were led by a doula (an informed nonmedical person who accompanies and emotionally supports the pregnant woman but who must not interfere with the competencies of a midwife). Factors determining the participation in prenatal courses attendance were mainly contact with a midwife during previous pregnancy (p < 0.001), preconceptional preparation (p < 0.001), a higher level of education (p < 0.001) and primiparity (p < 0.001). Place of residence was not a determining factor (p = 0.089). Determinants of prenatal course visitation are shown in Table 4.

Table 4. Determinants of prenatal course visitations.

	Count	Attendance of prenatal courses		
	Percent*	Yes	No	Total
Education:				
Basic	N	9	60	69
	%	13.0	87.0	100.0
High school	N	54	91	145
	%	37.2	62.8	100.0
University	N	76	70	146
	%	52.1	47.9	100.0
Total	*N*	*139*	*221*	*360*
	%	*38.6*	*61.4*	*100.0*
Residence:				
Town	N	108	151	259
	%	41.7	58.3	100.0
Village	N	32	69	101
	%	31.3	68.7	100.0
Total	*N*	*140*	*220*	*360*
	%	*38.8*	*61.2*	*100.0*
Parity:				
Primipara	N	95	83	178
	%	53.4	46.6	100.0
Secun-dipara	N	36	110	146
	%	24.7	75.3	100.0
Multipara	N	8	28	36
	%	22.2	77.8	100.0
Total	*N*	*139*	*221*	*360*
	%	*38.6*	*61.4*	*100.0*

* Row percentages presented

According to the respondents' reports, the content of the courses was focused mostly on labour and pain management, breastfeeding information, the postpartum period and infant care. About two-thirds (67%) noted that the obtained information related to healthy lifestyle during pregnancy, and approximately half of them (57%) received information about risk factors affecting healthy foetal development. None of the respondents mentioned any intervention for changing risk factors in the lifestyle. Nevertheless, the majority were satisfied with the lessons.

According to self-reported data, the majority of respondents (85%) were informed about principal risk factors (Table 5 and 6). Their knowledge increased in proportion with educational level (Table 5); almost all differences in the frequency of correct answers between women with basic and university education were significant. Contact with a midwife during pregnancy (Table 6) seems to be very informative, but the imbalance in participation of women with different levels of education is an important confounding factor. The prevalence of those exposed to preventable risk factors was (inversely) associated with the level of education.

The most common source of information for 75% of respondents was the internet, 50% relied on their gynaecologist or special literature and 32% reported friends or mother as a source of information. A prenatal course provided information for 26% of the women. The lowest numbers of women listed school (6%) or doula (3%) as their information source. A majority of respondents (80%) believed that information obtained during prenatal check-ups was sufficient for a healthy pregnancy.

Nearly all participants had been informed about cardinal risk factors: drug abuse, smoking (both active and passive), stress, excessive physical load, alcohol in any amount, high levels of caffeine and malnutrition (Table 5 and 6). A majority (86%) of the respondents were aware of the positive impact of adequate physical activity during low risk pregnancy on both the mother's and infant's health. Unfortunately, 10% believed that physical activity has no impact and another 3% believed that physical activity positively influences only the mother's health while negatively affecting the infant's health; 1% was convinced that physical activity during pregnancy can have a negative impact on both mother and infant.

Regarding the questions about changes to a healthier lifestyle, more than half of the participants (56%) thought they improved their diet in terms of quality and diversity, with 2.5% following a special medical diet. A majority consumed milk products (and occasional junk food) daily (85%), favoured white meat (75%), wholegrain bakery products (73%) and vegetable oils (73%) and ate at least 3 portions of fresh fruit (55%) and fresh or steamed vegetables daily (58%). Nearly three quarters (73%) focused on healthy food shopping and prioritised better methods of cooking (boiling and stewing). Half (43%) consumed fish at least once a week, but 33% stated frequent consumption of smoked meat products. Nearly one third (30%) attained very good dietary habits (index: 8 to 10 points), and 6% of respondents fulfilled all the main dietary recommendations. Nevertheless, one quarter (25%) had an index value of 5 or less. About one third (31%) modified habits before they became pregnant, and another 50% made positive changes during pregnancy. Some women (24%) said that information received from a midwife was an impulse to improve their lifestyle.

A majority (83%) reported multivitamin supplement consumption during the whole pregnancy; 38% daily and 45% occasionally. Almost all of these women (75%) had consulted with a professional about the vitamin supplementation.

Table 5. Awareness of pregnant women of risk factors for healthy infant development (education).

Risk factors	Education						Pearson's x2 test
	Basic		High school		University		
proportion of YES responses	Count	Percent	Count	Percent	Count	Percent	p-value
Large or small weight gain in pregnancy	35	55.6	76	56.3	97	70.8	0.024
Obesity of mother	46	70.8	121	85.2	134	95.7	<0.001
Malnutrition of mother	57	86.4	139	97.2	138	97.2	<0.001
Non-acceptance of pregnancy	45	71.4	118	88.7	124	89.9	<0.001
Smoking during pregnancy	55	84.6	140	97.9	144	99.3	<0.001
Partner's smoking at home	46	73.0	126	90.6	142	98.6	<0.001
Lack of physical activity	38	60.3	88	64.7	109	82.0	<0.001
Huge physical load	55	83.3	130	92.9	133	95.7	0.008
Mother's negative emotions (anger, rage, fear)	50	76.9	119	83.8	118	86.8	0.210
Mother's stress	57	86.4	134	93.7	140	97.9	0.005
Reduction diet or non-consulted vegetarian diet	37	56.1	130	93.5	134	95.0	<0.001
Alcohol consumption (of any amount)	57	86.4	134	94.4	121	88.3	0.105
Higher amount of coffee/caffeine	50	76.9	122	87.8	120	89.6	0.042
Illegal drugs	62	93.9	142	99.3	143	98.6	0.028
Workload, including prolonged standing at work (more than 2 hours)	48	72.7	97	71.3	103	77.4	0.501
Lack of knowledge about risks for infant's development	40	60.6	94	69.1	110	79.7	0.012
Lack of rest and sleep	50	76.9	115	83.9	121	89.0	0.083

Table 6. Awareness of pregnant women of risk factors for healthy infant development (contact with midwife).

Risk factors	Contact with midwife in course				Pearson's x2 test
	Yes		No		
proportion of YES responses	Count	Percent	Count	Percent	p-value
Large or small weight gain in pregnancy	87	62.6	121	54.8	0.309
Obesity of mother	128	92.1	173	78.3	0.034
Malnutrition of mother	139	100.0	195	88.2	0.012
Non-acceptance of pregnancy	125	89.9	162	73.3	0.020
Smoking during pregnancy	139	100.0	200	90.5	<0.001
Partner's smoking at home	136	97.8	178	80.5	0.019
Lack of physical activity	104	78.2	131	59.3	0.015
Huge physical load	134	94.4	184	83.3	0.205
Mother's negative emotions (anger, rage, fear)	126	89.4	161	72.9	0.017
Mother's stress	139	100.0	192	86.9	0.031
Reduction diet or non-consulted vegetarian diet	128	90.8	173	78.3	0.083
Alcohol consumption (of any amount)	131	92.3	181	81.9	0.337
Higher amount of coffee/caffeine	125	89.3	167	75.6	0.192
Illegal drugs	139	100.0	208	94.1	0.136
Workload, including prolonged standing at work (more than 2 hours)	101	75.4	147	66.5	0.647
Lack of knowledge about risks for infant's development	103	74.6	141	63.8	0.331
Lack of rest and sleep	122	89.7	164	74.2	0.033

Inadequate physical activity was a typical phenomenon for most participants; 29% engaged in regular recommended levels before pregnancy; 55% participated in occasional physical activity; and 16% admitted to "no physical activity". During pregnancy, 38% of the women reduced their physical activity; 17% of respondents stated no change and kept good physical habits; 37% had no or insufficient physical activity and 8% enhanced their exercise activities in comparison with the situation before pregnancy.

Patterns of smoking were significantly influenced by educational level: 64% never smoked, out of which 78% were university educated women and 22% had a lower level of education (p < 0.001), while 6% kept smoking even during pregnancy (no university educated women continued to smoke); 4% of the non-smokers were exposed to passive smoking (Table 7). In the whole sample, 24% of foetuses were exposed to cigarette smoke for various lengths of time. These relationships were highly significant (p <

0.001), especially with long term lessons involving skill practice (Table 8). In this survey sample, no relationship was seen between smoking and medical problems during pregnancy and labour. Nearly 10% of respondents had abstained from alcohol throughout their lifetimes; the number of abstained has increased during pregnancy. Nearly 1% drank alcoholic beverages every day. The frequency of alcohol drinkers was significantly higher among university educated women. Neither prenatal lessons attendance nor parity influenced alcohol consumption. A majority (90%) stated they had never tried any illegal drugs; 10% reported elimination of this habit before or during pregnancy (Table 7); and 2.5% of women declined to answer questions regarding drug consumption.

Some stress was very often experienced by 41% of women at the beginning of pregnancy, by 19% during the whole pregnancy and by nearly one half (44%) before labour. Medium and very high levels of stress were experienced by

Table 7. Most critical risk factors based on education level.

Risk factor (smoking, alcohol consumption, drugs)		Education			
		Basic	High school	University	Pearson's x2 test: p-value
Never smoked	Count	14	83	114	
	Percent	20.6	59.7	78.1	
Gave up before pregnancy	Count	14	26	18	
	Percent	20.6	18.7	12.3	
Gave up during pregnancy	Count	19	20	11	<0.001
	Percent	27.9	14.4	7.5	
Current smoker (even during pregnancy)	Count	16	4	0	
	Percent	23.5	2.9	0.0	
Passive smoking during pregnancy	Count	5	6	3	
	Percent	7.4	4.3	2.1	
Never drank alcohol	Count	11	10	6	
	Percent	16.4	7.0	4.1	
Gave up before pregnancy	Count	42	88	86	
	Percent	62.7	62.0	58.9	0.017
Occasionally during pregnancy	Count	14	44	52	
	Percent	20.9	31.0	35.6	
Current alcohol consumption (even during pregnancy)	Count	0	0	2	
	Percent	0.0	0.0	1.4	
Never tried illicit drugs	Count	57	130	129	
	Percent	87.7	92.9	88.4	
Gave up before pregnancy	Count	6	9	17	
	Percent	9.2	6.4	11.6	0.117
Gave up during pregnancy	Count	2	1	0	
	Percent	3.1	0.7	0.0	
Occasionally during pregnancy	Count	0	0	0	
	Percent	0.0	0.0	0.0	

* Column percentages presented

60% of those reporting stress. No stress during pregnancy was reported by 19%. To cope with stress, one third of women used daily relaxation techniques including psycho-hygienic prevention and stress management, and another 50% used these methods occasionally. Participation in prenatal courses had a statistically insignificant effect on stress before labour (Table 8).

Table 8. Influence of prenatal course on lifestyle during pregnancy.

Item		None	One lesson	Theoretical lessons	Whole course	Total
		Participation in prenatal course:
Average index of dietary habit	N	221	24	29	86	360
	Mean	6.19	6.67	6.38	7.27	6.49
	Std. Deviation	1.99	1.66	1.59	1.79	1.94
Index of dietary habit*	Poor	54.5	33.3	41.7	25.5	44.9
	Good	45.5	66.7	58.3	74.5	55.1
	Total	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*
Change of physical activity*	The same	51.0	47.8	53.8	42.2	48.8
	Reduced	45.0	30.4	42.3	37.3	41.9
	Enhanced	4.0	21.7	3.8	20.5	9.3
	Total	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*
Smoking*	Never or quit during planning	69.4	75.0	89.7	89.3	76.2
	Quit during pregnancy	18.5	8.3	6.9	7.1	14.2
	Still smoking (or smoking environment)	12.0	16.7	3.4	3.6	9.6
	Total	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*
Alcohol*	No	70.8	62.5	58.6	67.4	68.5
	Yes	29.2	37.5	41.4	32.6	31.5
	Total	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*
Stress reduction techniques change*	Yes, before the pregnancy	16.3	17.4	22.2	30.5	20.2
	Yes, during the pregnancy	40.2	47.8	33.3	37.8	39.6
	No	43.5	34.8	44.4	31.7	40.2
	Total	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*

* Column percentages presented

4 DISCUSSION

Pregnancy is a very important time for both the mother and the child. A well-planned pregnancy should consider optimal timing according to parental age, health condition, mental maturity, supporting social environment and acceptance of recommendations for healthy lifestyle with necessary supplementation (25). Many contemporary women feel that physical observations by an obstetrician alone are insufficient care and some of them ask for prenatal education that will help them to be prepared for labour and parenthood (26, 27). The best course curriculum should also involve educational lessons, effective interventions for lifestyle change, training methods for coping with stress and anxiety and useful skills during delivery and postnatal care of newborns and infants. Such complex subjects should be prepared by professionals, comprehensively unified and presented by midwives upon completion of their certification. The content of prenatal courses is not yet unified in the Czech Republic and in many other countries. Our study indicates that the largest amount of available

information and skills were related to labour. Since women must pay for course participation, opportunities for this specialised education may be limited or inaccessible for the unemployed or economically-challenged. In our study, determining factors for prenatal course participation were primiparity, previous contact with a midwife and holding a university degree. These conditions result in health education and prenatal behaviour. Women with lower education had poorer health literacy (knowledge and habits) and participated in prenatal courses less often. The most frequent sources of information are mass media and the internet. This should be a signal for health educators to monitor the accuracy of the information available on the internet and to motivate less educated women to attend prenatal courses.

In our entire sample, nearly all of the participants were well informed about critical health risk factors for mother and child: smoking, alcohol, drugs and stress. The knowledge index value increased with higher education and long-term midwife contact in a course, but not with prenatal obstetrician visits. Despite this knowledge, one quarter of the respondents were exposed actively or passively to cigarette smoke during pregnancy. Those women were more frequently less educated and involved with a smoking family. As such exposure represents important risks for pregnancy and the foetus, comprehensive anti-smoking education and intervention must be focused on this vulnerable group of women: younger, less educated with lower social status and low social support, without a partner or with a smoking partner, with many children, living with

stress, experiencing life trauma and lacking love in their lives (28). These conditions restrict access to socially acceptable dopamine resources, minimising participation in pleasant daily events, and these women tend, therefore, to smoke significantly more often during pregnancy (29). Intervention should be oriented towards fathers as well, since their smoking is a source of environmental toxins and can initiate hereditary malformations and reproduction malfunctions (30).

In contrast to pregnant smokers, women consuming alcohol during pregnancy are more often older (>35 years), multiparas and with higher educational levels and socio-economic status (31). Our study confirmed these data. Neither visiting prenatal courses nor parity were significant determinants for alcohol consumption during pregnancy. The most significant determinant was the level of education.

In our sample, knowledge about dietary recommendations and nutritional habits were not optimal. Concordant with foreign studies (32), the obese respondents were usually less educated and smoked. The majority obtained no individual recommendation during early pregnancy for optimal weight gain, although high entry BMI value negatively influences the woman's health and the pregnancy with a higher risk of hypertension, gestational diabetes, preeclampsia, prolonged pregnancy, macrosomia and late foetal death, Caesarean delivery, infectious complications in the postnatal period and obesity and diabetes for both mother and child. It is important to note that imperfect maternal nutrition can be a risk factor even during preimplantation and placental development (33, 34).

We found that age, parity and experience from a previous pregnancy are significant predictors of prenatal stress and anxiety, so very young and less educated primiparas and multiparas with traumatic experiences are at a higher risk of stress, even when their actual pregnancy is physiological. Although the current health care model is not sufficiently developed to identify these at-risk women (35), participation in prenatal lectures during our study reduced the number of anxious mothers before labour. A lower incidence of stress was identified in the group of higher-educated women.

The results of a US study showed that many family doctors and obstetricians are not familiar with the latest recommendations for physical activity during pregnancy. Many women reduce their physical activity during pregnancy, especially in the third trimester when they consider passive relaxation and rest to be more important (36, 37). In our study, the quality of physical activity was higher within the group of highly educated women, findings similar to those of a Swiss survey (38), but in general, exercise during pregnancy did not correspond with the current recommendations for optimal levels.

Special education and training for midwives in consulting, intervention methods and skill training is essential, as it can be the best way for them to become valuable sources of information, motivation and support (39). In the Czech Republic, most prenatal courses are provided by midwives (with certification from the regular educational state system), but they can be provided by almost anybody who arranges a business certificate for educational activities,

which can be obtained without any proof of professional qualifications at the Trade Office. In our sample, only one third (32%) were in long-term contact with a midwife in prenatal courses. These participants reported that they were better prepared overall for labour and birth and felt less stressed at the end of pregnancy; more of them opted for breastfeeding. The feeling of readiness for labour and birth proportionally increased with the length of contact with a midwife, initiated through the women's higher knowledge index value and higher degree of education. These enlightened and well-educated women clearly stated that the information provided to them by midwives helped them to manage the postnatal period, and that they plan to be in contact with midwives during future pregnancies.

A serious limitation of our study is the selection of the subgroup of pregnant women who decided to participate in prenatal courses: the majority of them were university educated and thus of higher social strata. Due to this selection, we were able to describe determinants of their knowledge, behaviour and attendance but not to clearly assess the influence of prenatal courses on pregnancy, labour and early maternal care for newborns. We think it possible that economic barriers are the main reason for this selection, as lectures are offered as paid services, above standard secondary prevention.

5 CONCLUSION

Our results from the sample of pregnant women in the Czech Republic confirmed previously published data noting that health literacy and healthier lifestyle of pregnant women are associated with a higher level of education and long-term contact with a midwife in prenatal courses. Professional intervention and advice on primary prevention topics are necessary in order to achieve the goals of decreasing smoking, alcohol consumption and bad nutritional habits and improving support and skills for coping with stress. Therefore, we recommend improving and unifying the content of prenatal lessons, reviewing lecturers' qualifications and establishing economic conditions that permit all women to participate in prenatal educational programs free of charge with the support of public health insurance companies.

CONFLICT OF INTEREST

The authors declare that no conflict of interest exist.

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INVESTIGATION OF TWO OUTBREAKS OF GASTROENTERITIS IN TRŽIČ IN SEPTEMBER 2011

PREISKAVA DVEH IZBRUHOV GASTROENTERITISA V TRŽIČU V SEPTEMBRU 2011

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ABSTRACT

Keywords:
outbreak, gastroenteritis, *Salmonella* Enteritidis, epidemiology

Background. An outbreak of gastroenteritis of etiologically unspecified origin and an outbreak of Salmonellosis occurred simultaneously in September 2011 in Tržič. The purpose of the investigation of both outbreaks was to identify the most probable source and the mode of transmission and to implement preventive measures.

Methods. In two retrospective case-control studies, the association between gastroenteritis of etiologically unspecified origin or Salmonellosis and food from a restaurant or drinking tap water were tested by univariate and multivariate analysis. The subject in the first study was a sick person with salmonellosis, and the subject in the second study was a resident that developed diarrhoea and/ or vomiting. Cases were reported by doctors, and controls were selected from healthy persons who responded to the questionnaire.

Results. A person exposed to food from the restaurant had a 24.8 times higher odds ratio (univariate analysis OR 24.8, 95% CI 7.5 to 82.3, p <0.05; multivariate analysis OR 14.7, 95% CI 3.5 - 61.3, p <0.05) for salmonellosis than non-exposed. A resident exposed to tap water from specific water source had a 3.4 times higher odds ratio (univariate analysis of OR 3.4, 95% CI 2.2 to 5.1 is p <0.05, multivariate analysis of RO 2.9, 95% CI 1, 7 to 5.3, p <0.05), for gastroenteritis of unspecific etiology than non-exposed. The dose response relationship was also statistically significant.

Conclusion. Analytical cases - controls studies confirmed a causal relationship between salmonellosis and food from the specific restaurant and the causal relationship between gastroenteritis of etiologically unspecified origin and drinking tap water from specific water source. *Salmonella* enteritidis may have entered into the restaurant through tap water.

IZVLEČEK

Ključne besede:
izbruh, gastroenteritis, Salmonella enteritidis, epidemiologija

Uvod. Izbruh gastroenteritisa neopredeljene etiologije in izbruh salmoneloze sta bila hkrati v Tržiču septembra 2011. Namen preiskave izbruhov je bil odkriti izvor in poti prenosa okužbe s ciljem, da se sprejmejo ukrepi za prekinitev širjenja.

Metode. V dveh retrospektivnih študijah primerov in kontrol je bila z univariatnimi in multivariatnimi analizami testirana povezava med gastroenteritisom neopredeljene etiologije oziroma salmonelozo in uživanjem hrane v gostilni ali pitjem vodovodne vode. Primer v prvi študiji je bil oboleli s salmonelozo, primer v drugi študiji pa je bil vsak občan z drisko in/ali bruhanjem. Primere obolelih so prijavili zdravniki; kontrole so bile izbrane med zdravimi osebami, ki so vrnile izpolnjeni vprašalnik.

Rezultati. Osebe, izpostavljene hrani v gostilni, so imele 24,8-krat višje obete za obolevanje za salmonelozo kot neizpostavljeni (univariatna analiza RO 24,8; 95 % IZ 7,5-82,3; p < 0,05; multivariatna analiza RO 14,7; 95% IZ 3,5-61,3, p < 0,05). Občani, ki so pili vodo iz določenega vodnega vira, so imeli 3,4-krat višje obete, da so oboleli za gastroenteritisom neopredeljene etiologije kot neizpostavljeni (univariatna analiza RO 3,4; 95 % IZ je 2,2-5,1; p < 0,05; multivariatni analizi RO 2,9; 95 % IZ 1,7-5,3; p < 0,05). Statistično značilna je bila tudi povezava med obolevanjem in količino popite pitne vode.

Zaključki. Z analitičnima študijama primerov in kontrol smo potrdili vzročno povezanost med salmonelozo in prehranjevanjem v določeni gostilni ter povezanost med gastroenteritisom neopredeljene etiologije in pitjem vodovodne vode iz določenega vodnega vira. Mogoč je vnos Salmonelle enteritidis v gostilno prek vodovodne vode.

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1 INTRODUCTION

Two simultaneous outbreaks occurred in the area of the municipality of Tržič on the first weekend in September 2011; an outbreak of acute gastroenteritis of etiologically unspecified origin (hereinafter GEC) and an outbreak of enteritis caused by *Salmonella* Enteritidis infection (hereinafter Salmonellosis). Family outbreak was part of the Salmonellosis outbreak due to home delivered food from the specific restaurant on Sunday, 4 September 2011.

On Saturday, 3 September 2011, a doctor at the health care centre detected an increase in the number of gastroenteritis cases and notified the operator of the public drinking water supply system (hereinafter DWSS) about a suspected water contamination. The epidemiological investigation began on 6 September 2011, as three persons from the municipality were hospitalised in the district hospital with a severe form of intestinal infectious disease (hereinafter IID). In the course of the epidemiological investigation, it became obvious that there were two outbreaks, the outbreak of GEC and of Salmonellosis. The investigation was conducted in cooperation with The Regional Institute of Public Health Kranj, The Health Care Centre Tržič, The National Institute of Public Health, The Regional Unit of the Health Inspectorate, The Regional Unit of the Veterinary Administration and the municipal company Komunala Tržič.

The residents have been supplied with drinking water mainly from public DWSS (81.6%) and only in a small degree from small village DWSS. The three larger DWSS supplied 74% of all residents. In the year 2010 and until August 2011, here the source of drinking water was untreated groundwater (1).

The Police Station investigated a spillage of a cesspit substance in the area of the municipality but not in proximity of the water source. The geological structure is otherwise variegated, with alternating Triassic limestone and dolomite and also Permian-Carbonaceous slate and sandstone (2).

According to the data of the Statistical Office of the Republic of Slovenia, on the 30 June 2011 there were 15,207 residents living in 5868 households in the municipality area (3).

The World Health Organisation defines "foodborne / waterborne outbreak" as the occurrence of two or more cases of a similar foodborne / waterborne disease resulting from the ingestion of a common food / water (4).

In the period from 2008 – 2010, from 19 to 55 sporadic cases of GEC and from 0 to 11 Salmonellosis cases were reported. In this period, no outbreaks of GEC or Salmonellosis were reported.

The purpose of the investigation of both outbreaks was to identify the most probable source and the mode of transmission and to implement preventive measures.

2 METHODS

2.1 Identification of cases in the outbreak

2.1.1 Preliminary telephone survey

On 6 September 2011, we conducted telephone interviews with 50 randomly selected households in the area of the municipality.

2.1.2 Epidemiologic surveillance

According to the Communicable Diseases Act, all doctors have to report a diagnosed IID to the regional epidemiologist. All doctors were asked for consistent and on time notification of IID and shipment of samples. For the reported cases of IID, a descriptive epidemiologic analysis was conducted.

A case was defined as a resident who sought medical help from 30 August to 20 September 2011 because of IID as well as non-residents who had consumed food in a specific restaurant or had drunk tap water from the water distribution system in the area of the municipality.

2.1.3 Microbiological investigation

Stool samples were cultured for *Shigella*, Campylobacter, Salmonella, E. coli, *Yersinia*. The samples were also tested for norovirus, adenovirus and rotavirus as well as for parasites. The samples were primarily planted on the selective/differential medium *Xylose Lysine Desoxycholate agar (BBL)* and on the selective enrichment medium *Rappaport Vassiliadis Soya buion (Oxoid)*. After the isolation of pure bacteria culture, the subspecies Salmonella enterica subspec. was defined with biochemical tests. The bacteria serotype Salmonella Enteritidis was determined by agglutination. In order to determine the relatedness of the isolated bacteria *Salmonella* Enteritidis, the isolates of 15 sick persons with a severe clinical picture were sent for typing by the method *PFGE (Pulsed-field gel electrophoresis according to Struelens and with Xba I as used restriction enzyme)*. The results of the PFGE method were statistically processed in the program *Gel Compar and the* relatedness *was computed (Dice coefficient, optimisation 1%, tolerance 1%)*.

2.2 Environmental investigation

2.2.1 Drinking water samples

The criteria for parameter evaluation have been derived from the *Rules on drinking water* (indicator presence of *E. Coli*, coliform bacteria and enterococcus) and directed to *Salmonella* spec. The drinking water samples were taken on 5 September 2011 (so-called MSD quick test by the IDEXX COLILERT®-18 test method), 7 September 2011, 8 September 2011 and 9 September 2011 (membrane filtration by the method of SIST EN ISO 9308-1:2001/AC: 2009, and SIST EN ISO 6222:1999 for the presence of *Salmonella* spp. By the method of ISO 19250).

2.2.2 Food

On-site inspection was conducted in the restaurant and at local food producers. Food samples had not been taken. According to the *Rules on health requirements for persons in contact with food at food processing and trade,* all food handlers in the specific restaurant were required to undergo medical examination.

2.3 Analytical studies

2.3.1 Case-control study number 1 (n = 113, Salmonellosis cases = 21, controls = 92)

The aim of the study was to test the hypothesis that the risk factor for the Salmonellosis was exposure to food from the specific restaurant or drinking water from specific DWSS.

A case meant a resident or non-resident who had consumed food in a specific restaurant or had drunk drinking water from a specific DWSS with laboratory-confirmed Salmonellosis from 30 August to 20 September 2011.

On 9 September 2011, a questionnaire was sent by non-addressed mail to approximately 6000 households in the municipality with the aim of acquiring data about the number of the persons affected in outbreak and about common food and waterborne exposure. With this questionnaire, data on gender, age, symptoms of gastroenteritis (temperature above 37.5 °C, abdominal pain, nausea, vomiting and diarrhoea), doctor's visits, providing of stool samples for testing, possible hospitalisation, other sick persons in the same household, food exposure outside the home and home food delivery, including eating in a specific restaurant, buying habits and the kind of food ingested during the time of the outbreak, travelling outside the community and having pets in the household were gathered. For controls in the study, 92 persons were randomly selected from the group of (442) persons that had returned the questionnaire and had not indicated gastroenteritis symptoms (healthy controls). The data have been statistically processed and analysed with the program *Epiinfo 2000*.

The null-hypothesis that the Salmonellosis was not connected with exposure to the food from the specific restaurant and /or to drinking water from specific DWSS was tested with univariate analysis. The statistical test *hi-quadrat* was used for the calculation of the p-value. The relatedness of gender, age, eating in the restaurant and consumption of drinking water to the emergence of infection was also tested by a multivariate analysis (logistic regression).

2.3.2 Case-control study number 2 (n = 442, GEC cases = 151, controls = 291)

The aim of the study was to test the hypothesis that the risk factor for the GEC was exposure to food from the specific restaurant or drinking water from specific DWSS. A case was a person that replied to the questionnaire and had diarrhoea and/or vomiting in the period from 30 August to 20 September 2011. On the base of returned questionnaires (already described in point Methods 2.3.1), 151 persons met the criteria for the case definition. As the control group, 291 persons that had not indicated any symptoms were classified. The data was statistically processed in the same way as described in point Method 2.3.1.

3 RESULTS

3.1 Identification of cases in the outbreak

3.1.1 Preliminary telephone survey

In the preliminary phone survey, 20% of the households reported gastroenteritis in at least one family member.

3.1.2 Epidemiologic surveillance

From 30 August 2011 to 20 September 2011, there were 21 reported cases of Salmonellosis (ICD A02.0) and 69 cases of the GEC (ICD A09.0). The cases presented with diarrhoea, bloody diarrhoea, abdominal pain and general weakness and only a smaller part of them also reported vomiting and temperature above 37.5 °C. The age structure of the cases is presented in Table 1, the date of disease onset in Figure 1.

3.1.3 Human samples

Stool samples were obtained from 22 cases. For 12, stool sample analysis for pathogenic intestinal bacteria (*Shigella*, Campylobacter, Salmonella, E. coli, *Yersinia*), viruses (noroviruses, adenoviruses and rotaviruses) and parasites was performed; for the remaining only the presence of the bacteria *Salmonella* Enteritidis was analysed.

Table 1. Reported cases of IID from 30 August to 20 September 2011.

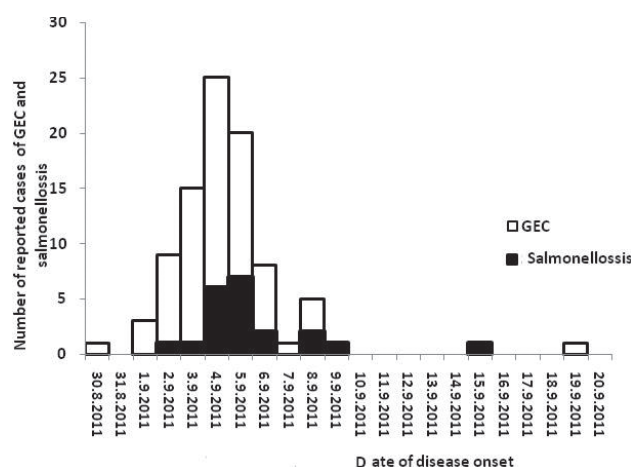| Age distribution (years)	Reported incidence / 10,000 population	Total number of reported IID	Number of reported GEC	Number of hospitalised GEC cases	Number of lab. confirmed cases (*Salmonella* Enteritidis)	Number of hospitalised salmonellosis cases
0 – 14	62.40	13	5	0	8	5
15 - 64	64.25	68	56	0	12	2
65 +	35.44	9	8	0	1	1
All	**59.18**	**90**	**69**	**0**	**21**	**8**

Figure 1. Date of GEC and Salmonellosis onset among reported cases IID (n = 90).

In 21 stool samples, the bacteria *Salmonella* Enteritidis was confirmed. A m*olecular* typing (PFGE) of the 15 sent isolates of the bacteria *Salmonella* Enteritidis showed 99.99% relatedness and confirmed that all isolates belong to the same epidemical strain, which is otherwise the second most common to appear in Slovenia.

The results of all other microbiological tests were negative.

3.2 Environmental investigation

3.2.1 Drinking water samples

Water samples were taken in the period when the number of cases was declining. Samples of drinking water from a specific DWSS, obtained on 5 September 2011, were in 2 cases non-conforming due to the presence of coliform bacteria, in three samples, obtained on 7 September 2011 from the DWSS in households of the diseased, due to the presence of E. coli and coliform bacteria and in one sample due to the presence of E. coli, coliform bacteria and enterococci. The sample obtained on 8 September 2011 was a non-conforming sample due to the presence of E. coli and coliform bacteria and enlarged count of colonies at 36 °C. Both samples obtained on 9 September 2011 were conforming. *Salmonella spp*. was not proven in any of the obtained samples.

3.2.2 Food

The extraordinary on-the-spot inspection on 7 September 2011 revealed a number of non-conformities in a specific

restaurant. The restaurant was very popular in the settlement; they ran a home delivery up to 15 km. The kitchen was planned for far lower capacities compared to the actual number of daily prepared meals. The hygienic situation in the kitchen was bad, the rooms and equipment poorly maintained and the documentation incomplete. Clean and unclean pathways were crossed; temperatures were not suitable. One of the food handlers reported gastroenteritis symptoms but had not ceased to work. In him and another employee, the bacteria *Salmonella Enteritidis* was confirmed to be 99.99% related to the isolates of the other cases in the outbreaks. Drinking water from a specific DWSS, which was analysed in both analytical studies, had been used for the food preparation, as the restaurant was supplied with drinking water from this specific DWSS. Food (two plates with grilled minced meat, fried turkey steaks and steaks in sauce, dumplings, fried potatoes and grilled vegetables) for a family picnic, where 12 of 16 persons got Salmonellosis, was home delivered by this specific restaurant.-

There were no non-conformities with the local food producers.

3.3 Analytical studies

3.3.1 Case-control study number 1 (n = 113, Salmonellosis cases = 21, controls = 92)

Case definition criteria corresponded to 21 of the Salmonellosis cases reported by the doctors. All cases were interviewed by the regional epidemiologist with the same questionnaire as was distributed to the households of the municipality. The onset of Salmonellosis is presented in Figure 2.
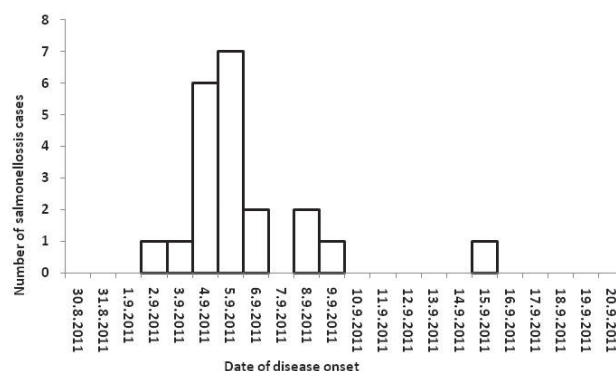

Figure 2. Date of Salmonellosis onset (N = 21).

The persons exposed to the food in the restaurant had a 24.8 times greater probability of Salmonellosis than un-

Table 2. Univariate analysis for exposure to food from restaurant.

Exposure to food from specific restaurant	*Salmonella* Enteritidis cases	Controls	Odds ratio (OR) with confidence interval (CI)	p – value
YES (+)	14	8	24.8 95% CI 7.5 – 82.3	P < 0.05
NO (-)	6	85	Ref	

exposed persons (univariate analysis OR 24.8; 95% CI 7.5 - 82,3; p<0.05; multivariate analysis OR 14.7; 95% CI 3.5-61.3, p<0.05). The difference is statistically significant (p < 0.05). The results are presented in Table 2. By multivariate analysis (logistic regression), the persons exposed to the food in the restaurant also had a 14.7 times greater probability (OR 14.7; 95% IZ 3.5 – 61.3; p < 0.05) of getting Salmonellosis than unexposed persons.

The persons exposed to the specific DWSS had the same probability of Salmonellosis as unexposed persons (OR 1.0; 95% CI 0.4 – 2.6).

3.3.2 Case-control study number 2
   (n = 442, GEC cases = 151, controls = 291)

The questionnaire was returned by post, fax or into the mailbox at the community health centre by 442 persons. The onset of disease with GEC is presented in Figure 3.

The persons exposed to drinking water from a specific DWSS, had 3.4 greater probability of getting GEC than persons exposed to drinking water from other DWSS (univariate analysis OR 3.4; 95% CI 2.2 – 5.1) This difference is statistically significant (p < 0.05). The results are presented in Table 3. Those exposed to drinking water from a specific DWSS also had a 2.9 times greater probability (OR 2.9; 95% CI 1.7 – 5.3) to get GEC according to the multivariate analysis (logistic regression). The difference is statistically significant (p < 0.05).

Figure 3. Date of GEC onset among the population according to the data from questionnaire (N = 151).

3.4 Implemented preventive public health measures

On 6 September 2013, the operator of the public DWSS advised its users to boil their tap water. An inspection of the DWSS was conducted with the control of possible pressure drops in the network and of the defect log for the last two weeks. After water sampling and user notification, the cleaning and washing out of the complete DWSS was executed, together with its disinfection by chlorine substances.

The measure of tap water boiling was cancelled on 10 September 2011.

Table 3. Univariate analysis for exposure to tap water from the specific DWSS.

Exposure to tap water from specific DWSS	GEC cases	Controls	Odds ratio (OR) with confidence interval(CI)	p - value
YES (+)	101	109	3,4 95% IZ/CI 2.2 – 5.1	p < 0.05
NO (-)	50	182	Ref	

The stratified analysis (dose response relationship) indicates a statistically significant relationship between illness and the quantity of ingested tap water of 0 to 1 litre or more per day (x^2_{trend}=6.01, p<0.01) (Table 4). The risk of illness increased with the amount of daily consumed tap water.

In the restaurant, a general cleaning and education about the HACCP system took place; six employees underwent medical examination with counselling. One person was temporarily prohibited from work. The HACCP system was upgraded. The owner promised to try to establish a new kitchen due to the large number of prepared meals.

Table 4. Stratified analysis of multiple levels of exposure due to daily amount of ingested tap water.

Daily amount of ingested tap water	Cases with diarrhoea and/or vomit	Controls	Odds ratio (OR) with confidence interval(CI)	p - value
> = 1 litre	103	161	2.6 95% CI 0.5-12.3	p = 0.24
0,5 l	38	80	1.9 95% CI 0.4-9.3 4	p = 0.43
0,2 l	5	22	0.9 95% CI 0.1-5.7	p = 0.91
Did not drink tap water	2	8	Ref.	

Persons exposed to food from the specific restaurant had the same probability of getting the GEC as non-exposed (OR 1.0; 95% CI 0.4 – 2.6 p > 0.05).
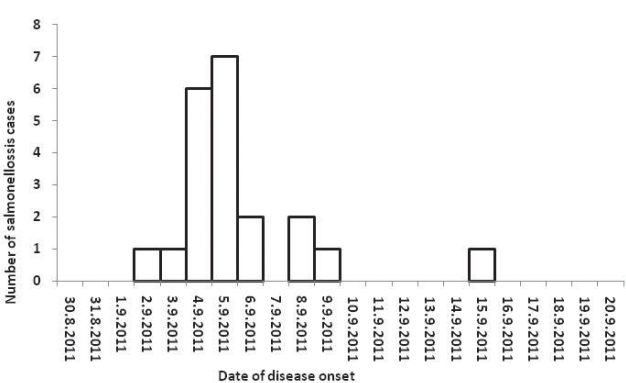
4 DISCUSSION

The outbreaks investigation type has its limitations when compared with planned scientific studies. Often the outbreak is detected with a delay, the data gathering is influenced by the recall bias, time pressure is always present in the processing of the outbreak, quick action is necessary according to the information and facts available and decisions for compromise solutions need to be made. Additionally, sometimes it is not possible to acquire adequate environment samples due to the delay of processing.

The doctor at the health centre, who on 3 September 2011 suspected the outbreak of IID, should have, according to the *Communicable Diseases Act,* informed the regional epidemiologist; instead he decided to inform the operator of the DWSS, as he suspected water pollution. The DWSS operator should immediately have informed the regional epidemiologist and decided on water boiling in the case of suspicion of water pollution according to the *Rules on drinking water*; instead of that, they informed the Department for Drinking Water after a two day delay and introduced water boiling on 6 September 2014.

The epidemiological investigation of the outbreak started on 6 September 2011, after 3 persons with a serious form of Salmonellosis had been hospitalised and it was not yet clear that there were two outbreaks. The determination of the outbreak was immediately followed by the outbreak investigation, with activation of different services: the Institute of Regional Public Health Kranj, National Institute of Public Health, inspection bodies and the DWSS operator. No earlier than in the course of the epidemiological investigation, it became obvious that there were two outbreaks, the outbreak of GEC and of Salmonellosis.

During the time of the outbreak from 30 August 2011 to 20 September 2011, 90 persons had sought medical help because of intestinal infectious disease due to diarrhoea, bloody diarrhoea, abdominal pain, general weakness and vomiting. Doctors reported 21 cases of Salmonellosis (ICD A02.0) and 69 cases of GEC (ICD A09.0); a total of 90 cases. The epidiagram showed a point source of infection and the peak of GEC outbreak on 4 September 2011 and the peak of Salmonellosis outbreak on 5 September 2011. The attendees of the family picnic were also part of Salmonellosis outbreak, due to home delivery food from the specific restaurant on 4 September 2011.

From the stool of 21 cases, the bacteria *Salmonella* Enteritidis was isolated; the isolates were related considering the molecular typing (PFGE) in 99.99% and belonged to the same epidemical strain, which is otherwise the second most common to appear in Slovenia. The presence of other IID agents was not detected in any of the stool samples.

Residents were supplied with drinking water mainly from public DWSS with underground water, where disinfection and other preliminary water treatment had not been done in 2010 and up until August 2011. Water samples were taken at the time when the number of cases was declining. In samples of drinking water from households of the cases, obtained from 5 to 9 September 2011, indicative parameters for faecal contamination of drinking water were present, but the bacteria *Salmonella* spec. was been isolated.

The on-site inspection in the specific popular local restaurant, where home deliveries were also made, discovered a range of non-conformities; in two employees, the bacteria *Salmonella* Enteritidis was isolated; according to the molecular typing (PFGE), the isolates were related in 99.99% to those in the diseased persons. The restaurant had been supplied with drinking water from the specific DWSS, which was also the risk factor for the GEC.

According to EFSA directives, in the absence of laboratory confirmation of the same disease agent in infected persons in the outbreak and in the food, respectively drinking water, the analytical epidemiologic investigation provides equal proof, where either the cohort study or case control study proves a statistically significant association between the ingestion of a common food and the people who became ill in the outbreak (5).

With the aim of gathering additional data to clear up what was happening and why, we wanted to obtain data for analytical epidemiologic studies based on questionnaires, which on 9 September 2011 were sent in single copy by non-addressed mail to approximately 6000 households. 442 questionnaires were returned; 151 of them classified among the diseased with GEC. The sampling would be more adequate if a representative resident sample had been selected. For this reason and low response, we decided in favour of case control studies.

The persons exposed to the food in the restaurant had a 24.8 times greater probability for Salmonellosis (univariate analysis OR 24.8; 95% CI 7.5 – 82.3; p < 0.05; respectively 14.7 times (multivariate analysis OR 14.7 95% CI 3.5-61.3, p < 0.05) greater probability for Salmonellosis than unexposed persons.

In the period from 1996 – 2005, *Salmonella* spp. was the second largest cause of gastroenteritis in Slovenia, with an average yearly incidence of 103.3 / 100,000 inhabitants and was also a common source of outbreaks. In 84.4%, isolates of *Salmonella* Enteritidis were found (6). The epidemiologic reservoir of infection is poultry, pigs, dogs, cats, birds and other wild animals. The clinical picture includes nausea, vomiting, diarrhoea, temperature and abdominal spastic pains. The incubation period is from 12 to 24 hours (7 to 72 hours). The disease lasts for 3 to 5 days. A severe course of disease emerges with small children, elderly persons, chronic patients and patients with defective immunity. The peak of infection is in summer (7).

The analysis of waterborne outbreaks in Slovenia in the period from 1981 - 2004 showed that the agents were determined only for half of the outbreaks: most often *Shigella* sonnei (22 x), to a lesser extent also noroviruses, hepatitis A virus, *Shigella* flexneri, E. coli, *Campylobacter*, Streptococcus faecalis, rotaviruses, adenoviruses, astroviruses, *Entamoeba* histolytica and *Lamblia* intestinalis

(8). The bacteria *Salmonella* spec. has never been found as a source of waterborne outbreaks.

Food is the primary, most important and most common method for infection with the bacteria *Salmonella* Enteritidis (7), so we believed that food was the main source of infection in patients with Salmonellosis. But for six people infected in the outbreak, there was no clear epidemiologic connection with the specific restaurant, although their bacteria isolates were 99.99% related to the people who were infected via the ingestion of food from the restaurant. However, the restaurant had also been supplied with drinking water from a specific DWSS that was the subject of the epidemiologic investigation and the risk factor for GEC.

According to the literature, water contaminated with salmonellas can be the source of bacteria transfer on food (9). The presence of salmonellas in drinking and bathing water is the result of surface faecal pollution of the water from sewage, trickling water from agricultural land, cesspit leaking and excrement of wild animals and birds (7). The Salmonellas can survive in water for longer periods and can also breed in heavily polluted water and during warmer months of the year. There is evidence of the presence of Salmonella in the biofilms of the water supply systems. In the USA, in the area of evidence of a high degree of infections by salmonellosis, research of surface water on its presence was conducted from April 2005 to April 2006. The bacteria *Salmonella* spp. was determined in 79.2% of water samples. The highest monthly occurrence rate and the highest number of different salmonella serotypes in water were found in August, and in general, the concentrations were significantly higher in the summer months (10).

In the literature we may observe that the bacteria Salmonella spp. is a potentially possible but rare cause of waterborne outbreaks. In the outbreak of *Salmonella* Enteritidis in Colorado, 111 persons got sick. *Salmonella* Enteritidis was found in untreated groundwater, which was the water source for the town water supply system. Obviously, contamination occurred due to adverse conditions, as the PFGE analysis confirmed the identity of the serotypes of *Salmonella* Enteritidis in groundwater, in the people affected with disease and in local birds and game (11). The hydric outbreak with the *bacteria Salmonella enterica* serotype *4,5,12:i:–* (serotype which is similar in antigens to *Salmonella* Typhimurium) was the consequence of infection of a private water supply system (12). The pollution of water tanks on the site by frog and/or mouse excrement led to the outbreak with the bacteria *Salmonella* Saintpaul, with 28 cases of gastroenteritis among more than 200 workers (13).

We confirmed the causal connection between the gastroenteritis and drinking water from a specific water source by the epidemiologic investigation and two analytical case and control studies and also confirmed the connectedness between the Salmonella enteritis and food ingestion in a specific restaurant. In the Salmonellosis outbreak, food ingestion in a specific local restaurant was a risk factor, where many irregularities in connection with

the HACCP system were found and two of the employees also had the bacteria Salmonella Enteritidis present in their stools.

Additionally, this restaurant was supplied with drinking water from the specific DWSS. According to the fact that both outbreaks took place concurrently, in the same geographical area, it can be concluded that in the restaurant the intake of *Salmonella* enteritidis also occurred through tap water from the DWSS and due to non-compliance with the HACCP recommendations, salmonellosis occurred in people who had consumed food from this restaurant. Both outbreaks, the outbreak of non-specific gastroenteritis and the outbreak of Salmonellosis, are probably the consequence of faecal contamination of the specific DWSS.

5 CONCLUSION

We confirmed the casual connection between the gastroenteritis and drinking water from a specific DWSS by the epidemiologic investigation and two analytical case and control studies and also confirmed the connection between the Salmonella enteritis and food ingestion in the specific restaurant. According to the fact that both outbreaks took place concurrently, in the same geographical area, it can be concluded that in the restaurant the intake of *Salmonella* enteritidis also occurred through drinking water from the DWSS, and due to non-compliance with the HACCP recommendations, salmonellosis occurred in people who had consumed food from this restaurant. The source of infection was probably the consequence of faecal contamination of the specific water source.

The most important aims of processing outbreaks are public health measures for the protection of public health and an outbreak analysis to prevent outbreaks in the future.

According to the *Rules on drinking water,* the operator of the DWSS can decide on his/her own when water boiling will be introduced; perhaps in future this competence could be assigned to professional services.

Based on the approach to this outbreak, we can conclude that timely communication between the medical service, epidemiological service and DWSS operators is pivotal.

The kitchen in the restaurant was planned for preparation of a much lesser number of meals than were actually prepared and had many deficiencies according to the HACCP system. In planning ordinary inspections, the inspection services should also consider the number of prepared meals, i.e. volume of sales.

CONFLICT OF INTEREST

The authors declare that no conflict of interest exist.

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None.

ETHICAL APPROVAL

Not required.

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DEPRESSION AND ANXIETY IN WOMEN DURING PREGNANCY IN SLOVENIA
DEPRESIJA IN ANKSIOZNOST PRI ŽENSKAH MED NOSEČNOSTJO V SLOVENIJI

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ABSTRACT

Keywords:
depression, anxiety, pregnancy, prevalence

Objective. The aim of the study was to evaluate the prevalence of elevated depression and anxiety among pregnant women and to examine its correlation with medical complications and socio-demographic characteristics.

Methods. The study is based on a cross-sectional design of a sample of 348 women in three trimesters of pregnancy who received routine obstetrical care at the University Medical Centre Ljubljana, Department of Obstetrics and Gynaecology. The responding women filled out a questionnaire on socio-demographic variables, the Centre for Epidemiologic Studies Depression Scale CES-D and the State Trait Anxiety Inventory STAI.

Results. 21.7% of pregnant women were identified as suffering from elevated depression symptomatology, 15.7% reported high state anxiety and 12.5% had high trait anxiety. No significant differences in depression and anxiety across pregnancy trimesters were found. The women who have suffered from health complications during previous pregnancies showed higher state anxiety; those experiencing complications during their current pregnancy reported more intense symptoms of depression and of state and trait anxiety than women free of complications. Less educated, lower income and mothers of many children in the third pregnancy trimester reported more intensive symptoms of depression and trait anxiety.

Conclusions. Elevated depression and anxiety are frequent among pregnant women. The results draw attention to the need for early detection and treatment of depression and anxiety during pregnancy.

IZVLEČEK

Ključne besede:
depresija, anksioznost, nosečnost, prevalenca

Namen. *Cilj raziskave je bil oceniti prevalenco povišane depresivne in anksiozne simptomatike pri ženskah med nosečnostjo ter preveriti njun odnos z zdravstvenimi zapleti in nekaterimi sociodemografskimi dejavniki.*

Metode. *V presečno raziskavo je bilo vključenih 348 nosečnic treh trimesečij nosečnosti, ki so se v okviru Ginekološke klinike Univerzitetnega kliničnega centra v Ljubljani udeležile rednih pregledov. Nosečnice so izpolnile vprašalnik demografskih spremenljivk, Lestvico depresivnosti CES-D ter Vprašalnik anksioznosti kot stanja in poteze STAI.*

Rezultati. *21,7 % udeleženk je poročalo o pomembno povišani depresivni simptomatiki, 15,7 % jih je navajalo visoko anksioznost kot stanje, visoka anksioznost kot poteza je bila prepoznana pri 12,5 % nosečnic. Med nosečnicami treh trimesečij nosečnosti ni bilo pomembnih razlik v izraženosti depresivne in anksiozne simptomatike. Ženske z zdravstvenimi zapleti v preteklih nosečnostih so poročale o pomembno intenzivnejših simptomih anksioznosti kot stanja, tiste z zapleti v trenutni nosečnosti pa o pomembno intenzivnejši depresivni simptomatiki ter anksioznosti kot stanju in potezi v primerjavi z ženskami brez zdravstvenih zapletov. Udeleženke z nižjo stopnjo izobrazbe in nižjimi prihodki ter nosečnice tretjega trimesečja z večjim številom otrok so poročale o intenzivnejši depresivni simptomatiki in anksioznosti kot potezi.*

Zaključek. *Povišana depresivna simptomatika in anksioznost sta pogost in razširjen problem žensk med nosečnostjo. Rezultati opozarjajo na potrebo po zgodnjem odkrivanju ter zdravljenju depresivnih in anksioznih motenj v nosečnosti.*

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1 INTRODUCTION

Pregnancy represents an important turning point in the lifecycle of a woman and her family and is a time of enormous biological, psychological and social challenges for the mother to be. Although it is a period of fulfilment, it can also be a time of emotional and psychological disturbances when dealing with new demands. There is growing evidence that the antenatal period is a time of increased liability to mental disorders. The most common psychiatric illnesses during pregnancy and the postpartum period are depressive and anxiety disorders (1).

According to international data, estimates of the prevalence of depression during pregnancy vary widely, from 7-15% in developed to 19-25% in poorer countries (2). Studies in Sweden (3) and Norway (4) showed that approximately 10% of pregnant women meet the criteria for anxiety disorders. There are no exact data available on the incidence and prevalence of depression and anxiety disorders among women of reproductive age in Slovenia. However, this can be assessed considering available statistics on patients seeking medical attention due to mental disorders. In the period between 2005 and 2007, in the population of women aged 20 to 39, which corresponds to 95% of the population of pregnant women in Slovenia, on average 44.2 out of 1000 women had been administered for the first time at the primary level because of a mental disorder (5). The predominant causes were depression, anxiety, reactions to stress and somatoform disorders (5).

Depressive and anxiety disorders during pregnancy can have detrimental effects on the course of the pregnancy, its outcome, the development of a child and maternal well-being. According to studies, high levels of depressive symptoms in pregnant women have been found to be associated with adverse obstetric and neonatal outcomes, including increased risk for spontaneous preterm delivery (6-8), low birth weight (9), preeclampsia (10), etc. Depression in late pregnancy has been linked to increased risk of epidural analgesia, operative deliveries and admissions to neonatal care units (11). Field et al. (12) have noted that maternal depressive symptoms during pregnancy may be contributing to newborn neurobehavioral functioning. High anxiety during pregnancy has been linked to lower birth weight, shorter birth length, shorter gestations (13) and increased uterine artery resistance (14). Studies have shown that antenatal anxiety is associated with elevated risk of having an infant with non-optimal neuro-motor development (15). Anxiety in pregnancy could have long-term effects on children's behavioural/emotional problems (16). However, some studies did not report significant associations between maternal anxiety and perinatal outcomes (17).

As there are limited data on the epidemiology of depression and anxiety among pregnant women in Slovenia, the aim of the present study was to examine the prevalence of elevated depressive and anxiety symptomatology during the three trimesters of pregnancy and to explore whether there is an association between depression/anxiety and medical complications as well as socio-demographic characteristics.

2 METHODS

2.1 Participants

350 women attending routine obstetrical care or antenatal classes at the University Medical Centre Ljubljana, Department of Obstetrics and Gynaecology were approached and invited to participate in the study. The inclusion criteria were: age 18 and above and the ability to read and speak Slovenian. 348 women consented to cooperate. The response rate was 99%.

The data collection was conducted according to the appropriate pregnancy trimester. The sample in the first trimester consisted of 100 women that attended the nuchal translucency screening test or the first antenatal visit between the 10th and 13th week of pregnancy. The sample of women in their second trimester, between the 16th and 26th gestational week, comprised of 117 women who consented to cooperation before attending the foetal morphology ultrasound scan or other regular antenatal visits. For the third trimester, data was collected on 131 women who participated in antenatal classes for expectant parents or other regular examinations. The following women were pregnant for 29 weeks or more.

Participants were recruited prior to undertaking their medical examinations or antenatal classes between April 2011 and July 2011. Upon giving an informed consent, women completed a self-administered, anonymous survey. Research was conducted according to ethical principles and was approved by The National Medical Ethics Committee in January 2011, reference number 150/02/11.

2.2 Measures

Responding women filled out a questionnaire on socio-demographic variables, the Centre for Epidemiologic Studies Depression Scale CES-D and the State Trait Anxiety Inventory STAI. The women were able to complete the whole survey in approximately 15 minutes.

The following variables about the participants were included in the socio-demographic survey: age, educational level, employment, socioeconomic status, marital status, duration of relationship, number of previous children and gestational age. Presence of medical complications in previous and current pregnancies was also recorded.

The Centre for Epidemiologic Studies Depression Scale CES-D is a short self-report measure, originally designed to assess the intensity of depressive symptomatology in the general population (18), but it has also been used as a screening test for depression disorders in medical settings (19) and in numerous studies with pregnant women. It measures affective, cognitive, behavioural and somatic symptoms of depression within the previous seven days. The scale is composed of 20 items. Each of them is scored on a 4 point scale for evaluating the frequency of depressive symptoms. The total score ranges from 0 to 60, with higher scores indicating more severe symptoms of depression. Although the CES-D does not allow for a clinical diagnosis of depression, studies have shown that a score

greater than 16 can differentiate between depressed and non-depressed subjects (18) and that a score ≥ 22 represents severe depressive symptoms (20). For the purposes of the study, both cut-off scores were used. The scale has been shown to be valid and reliable across diverse demographic groups (18). In the present study, CES-D demonstrated high internal consistency with Cronbach α, ranging from 0.84 to 0.88 across all three trimesters of pregnancy.

State Trait Anxiety Inventory (STAI) is a short self-report instrument composed of two subscales measuring two distinct anxiety concepts, state and trait anxiety. State anxiety is defined as a transitory emotional condition, while trait anxiety refers to a relatively stable proneness of a person to respond with anxiety in different situations. Each scale contains 20 items. Each of the items is rated on a 4 point scale, asking the respondent to evaluate how she feels at a particular moment (state-anxiety) or how she generally feels (trait-anxiety). Higher scores indicate greater levels of state and trait anxiety. Although there is no cut-off score established for STAI, some previous studies used scores of 45 as an indication of high state-anxiety (21) and trait-anxiety (22). In this study, we used the score of 45 to differentiate between anxious and non-anxious groups. The results of the reliability generalisation study for STAI, based on 816 research articles between 1990 and 2000, suggest that the internal consistency estimates of the measure are generally satisfactory for various populations (23). Cronbach α of the STAI in the current study were >0.92 for state subscale and >0.84 for trait subscale across pregnancy trimesters and reflect good internal consistency.

2.3 Statistical analysis

The frequency of positive depression and anxiety screens, based on established cut-off scores on CES-D and STAI, were determined. The normality of the distribution of depression and anxiety scales were tested using the Shapiro-Wilk test. Due to non-normality distribution appropriate non-parametric tests were conducted.

For the analysis of differences in depression, state and trait anxiety scores according to pregnancy trimesters and the presence of medical complications, the Mann-Whitney U and the Kruskal-Wallis tests were used. The associations between scores of depression and anxiety and socio-demographic variables were examined using Spearman's rho correlation coefficients. The internal consistency of CES-D and STAI was assessed using Cronbach's alpha.

In all statistical tests, a p-value of 0.05 or less was considered as significant.

Statistical analysis was performed using SPSS, version 20.

3 RESULTS

The age of women who took part in the study varied between 20 and 39 years of age (M=31.23; SD=4.61). More than half of the women (56.3%) were pregnant with their

first child, 29.3% with their second. The majority of the participants were married or cohabiting with a partner and the average duration of their relationship was 7.19 years (SD=4.59). 2% of the women were single. 48.4% of the responding women had an average socioeconomic status. 19.3% of the women had medical complications during previous pregnancies, while 16.7% had complications during the current pregnancy, with the highest frequency among the women who were in their third trimester of pregnancy.

There were no significant differences in maternal age, educational level, employment status and matrimonial and socio-economic statuses between the respondents in all three pregnancy trimesters.

Based on cut-off scores for denoting clinically relevant levels of depressive symptomatology (CES-D≥16), 21.7% of participants reported elevated depressive symptoms, with the highest frequency in the first pregnancy trimester and lowest in the second. Overall, 8.4% of pregnant women reported severe depressive symptoms (CES-D≥22). In the anxiety questionnaire, 15.8% of the women had an elevated state anxiety (STAI-S≥45), with the highest frequency in the first trimester. The rate of high trait anxiety (STAI-T≥45) was 12.5% among all pregnant women. Mean, standard deviation and percentage of pregnant women whose scores exceeded the proposed cut-off scores on CES-D and STAI for each pregnancy trimester are presented in Table 1.

No significant differences in depression (x^2(2)=0.458, p=0.795), state anxiety (x^2(2)= 2.614, p=0.271) and trait anxiety (x^2(2)=0.660, p=0.719) scores due to pregnancy trimesters were observed using the non-parametric Kruskal-Wallis test.

The results of the Mann-Whitney U test showed that women experiencing medical complications in previous pregnancy (pregnancies) reported a significantly higher state anxiety when compared with those without prior pregnancy complication(s) (U=3669.0, p=0.035). No significant difference in depression and trait anxiety scores between the two groups (p=0.760 and p=0.286, respectively) was found.

Women having complications during their current pregnancy had significantly higher levels of depression (U=6515.0, p=0.013) as well as state (U=6419.0, p=0.004) and trait anxiety (U=-6454.0, p=0.008) when compared with women without complications.

Bivariate associations between socio-demographic factors and depression as well as state and trait anxiety scores are shown in Table 2. Scores of elevated depression and trait anxiety were significantly correlated with lower levels of education and lower income. State anxiety scores were in correlation only with level of income. The number of children was significantly correlated with depressive symptoms and trait anxiety for women in the 3rd pregnancy trimester (r=.210 and r=.197 respectively; both p-values<0.05). There were no significant associations of depression and anxiety scores with maternal age and the duration of partnerships.

Table 1. CES-D and STAI scores for three pregnancy trimesters.

	Pregnancy trimester			
	1st trimester	2nd trimester	3rd trimester	Total
	Cases (%)			
CES-D				
≤15	75.0	81.7	77.9	78.3
≥16	25.0	18.3	22.1	21.7
≥22	7.0	8.7	9.1	8.4
STAI-S				
≤44	82.0	84.6	85.5	84.2
≥45	18.0	15.4	14.5	15.8
STAI-T				
≤44	88.9	87.9	86.0	87.5
≥45	11.1	12.1	14.0	12.5
	Mean (*SD*)			
CES-D	10.86 (7.58)	11.03 (8.26)	10.51 (7.67)	10.79 (7.83)
STAI-S	36.06 (9.41)	35.79 (9.37)	34.33 (8.81)	35.32 (9.18)
STAI-T	34.37 (7.26)	35.61 (8.76)	34.87 (7.93)	34.98 (8.03)

Table 2. Correlation matrix of socio-demographic variables, depression and anxiety scores.

	CES-D	STAI-S	STAI-T
Age	-.020	-.027	-.024
Education	-.175**	-.049	-.199**
Income	-.177**	-.128**	-.224**
Duration of partnership	-.099	-.025	-.035
Number of children	.077	.040	.061

** Significance levels based on *p*<0.05.

Depression and anxiety scales were highly correlated (depression and state anxiety scale *r*=.614, depression and trait anxiety scale *r*=.618, both *p*-values<0.001).

4 DISCUSSION

High incidence of significant depressive symptomatology and high anxiety was found during pregnancy. 21.7% of pregnant women in all three trimesters scored above the cut-off score of 16 in the CES-D, while 8.4% of women reported severe depressive symptoms. High state anxiety was found in 15.8% of pregnant women, while 12.5% of women suffered high trait anxiety. Especially in the first pregnancy trimester, a substantial number of pregnant women reported elevated depressive symptoms (25.0%) and nearly one in five pregnant women (18.0%) suffered from high state anxiety. The results pose a great concern, as it has been debated previously that high scores on self-report measures of depressive symptomatology may correspond to clinical diagnosis and/or predispose a person to the experience of a clinical depression in the future (24). Furthermore, it has been shown that about half of the women scoring over 40 on the STAI anxiety scale meet the criteria for anxiety disorder (25). Elevated levels of anxiety and depression during pregnancy should be taken as a

serious problem, as recent research provides an extensive body of evidence demonstrating the adverse impact of such disorders on the course of the pregnancy, the development of the foetus and maternal well-being.

As different stages of pregnancy are associated with physical and emotional changes in women, we expected significant differences in scores of depression and anxiety across respondents of all three pregnancy trimesters, but the results did not confirm our hypothesis. The results are consistent with meta-analysis on the prevalence of depression by pregnancy trimesters, assessed by validated screening instruments and structured interviews on a total sample of 19,284 pregnant women, indicating that the prevalence of depression during pregnancy does not differ significantly by trimester (26). Similarly, the study on 3,472 pregnant women showed the stage of pregnancy was not correlated with depression as measured by CES-D (27).

In the context of providing adequate care for women, an important issue is whether previous and/or current pregnancy complications affect psychological functioning during the pregnancy. Our data showed that women who experienced complications in the previous pregnancy (pregnancies) reported significantly higher levels of state anxiety, but not depression and trait anxiety, when compared to women without previous complications. According to results, the elevated anxiety is situational in nature (state-anxiety) and could be correlated to the moment of data collection, occurring before regular antenatal examinations. The setting of data collection could contribute to the remembering of difficult past pregnancy experiences and thus reactivate emotional tension and anxiety in women. A recent study has shown the location of data collection had a significant impact on state anxiety scores; women who completed the STAI questionnaire in a "high-risk" hospital-based clinic had higher state anxiety scores in comparison to women approached at "low-risk", community based clinics (28). A longitudinal study in Germany

showed that women who had previously experienced still-birth and miscarriage had increasing levels of anxiety on the STAI questionnaire despite the obstetrician's confirmation of good health of the foetus and normal development of the pregnancy (29).

Women experiencing medical difficulties in current pregnancies reported significantly higher levels of depressive symptomatology as well as state and trait anxiety when compared to women free of complications. Similarly, King et al. (30) reported that women with medical disorders had considerably higher scores on measures of depression and anxiety when compared to the control group of antenatal women. Dayan et al. (31) found significant associations between stress related to the health of the foetus and depression. It is not to be doubted that medical complications in a pregnancy are highly aggravating life circumstances for women, making them more vulnerable, sad and worried.

Findings regarding socio-demographic characteristics indicated that a lower socio-economic status (as measured in education and income levels) is an important correlation factor in depression and trait anxiety symptoms' severity, while state anxiety was significantly associated only with lower income. Lower income, reflected mainly in material resources of a woman or her family, can be a source of distress as pregnancy and birth of a child brings additional existential and financial burdens. Previous reports have shown that socio-economic status is related to psychological well-being; women with a higher education experience less anxiety during pregnancy in comparison to those with lower educational levels (32-34). Studies in the United States have shown pregnant women of lower SES are more likely to experience antenatal depression in comparison to women of the middle or upper income classes (35, 36). Similarly, the results of other studies showed depressive symptoms were significantly associated with lower maternal education, unemployment and poverty (37) and that a low socio-economic status was significantly and independently related to the presence of depression and/or anxiety diagnosis in the second pregnancy trimester (3).

An association between depression, anxiety and the number of children was significant only to women in the third pregnancy trimester. Other studies also observed women with children reporting higher levels of psychological distress (38) and that parity moderated psychological functioning during pregnancy (39). It is possible that the results are reflecting differences in adjustment to the pregnancy of women with and without children as the pregnancy progresses. The third trimester is a time of physical demands, and changes that occur may be more straining to women who are already challenged with care for their families. Furthermore, women who are pregnant for a second time or more have an insight into the potential hazards of labour and are thus more aware of the demands of the postnatal period. For them, the birth of a child requires not only the reorganisation of intimate relationships but also that of the previously existing family systems.

In our study, no significant associations were found between the duration of partnerships, depression and anxi-ety, although a large number of studies reported a strong association between relationship quality and psychological well-being of the pregnant women. A recent population-based study in Norway confirmed a strong association between relationship satisfaction and maternal emotional distress, more precisely anxious and depressive symptomatology during pregnancy (40). One can assume the duration of an intimate relationship could reflect its stability and could contribute to the feelings of safety; however, it does not reflect its quality and satisfaction of the partners.

We did not find any significant correlations between depression, anxiety and the age of women, which is consistent with some other studies (24, 27, 31).

Depression and anxiety often co-occur. Likewise observed in this study, the depression and anxiety scales were highly correlated, thus supporting comorbidity statistics in primary care (41).

This study has some limitations that should be acknowledged when interpreting the results. The symptoms of depression and anxiety were assessed using only self-report measures, which are not equivalent to diagnostic criteria but only show a possibility for psychiatric diagnosis. However, it has been argued that high scores on self-report measures of depression and anxiety may correspond with clinical diagnosis (24, 25). A structured diagnostic interview would have strengthened the study and could therefore be included in further research regarding this topic. Information on mental health conditions before pregnancy were not evaluated, although it is known that previous psychiatric disorders are associated with new-onset of depressive and anxiety disorders (42). Previous and/or current psychiatric diagnosis and comorbid mental health conditions should be evaluated in future studies. Furthermore, smoking status should also be addressed in future researches that include pregnant women, as it has been demonstrated that smoking during pregnancy is related to low birth weight (43).

5 CONCLUSIONS

One cannot ignore our findings that elevated anxiety and especially depression are frequent among pregnant women, whereas the highest prevalence is observed in the first pregnancy trimester. Women of lower socio-economic status and those facing medical complications are observably more liable to depression and anxiety during their pregnancies. Our findings are notably highlighting the importance of implementing better early detection and treatment strategies for women during pregnancy in order to reach what should be a common goal: a reduction of the burden of mental health problems among pregnant women in Slovenia. Screening for depression and anxiety as an integral part of systematic healthcare for pregnant women would constitute an important step in this direction.

CONFLICT OF INTEREST

The authors declare that no conflict of interest exist.

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ETHICAL APPROVAL

Research was conducted according to ethical principles and was approved by The National Medical Ethics Committee in January 2011, reference number 150/02/11.

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A FIVE SITE CLOSTRIDIUM PERFRINGENS FOOD-BORNE OUTBREAK: A RETROSPECTIVE COHORT STUDY

IZBRUH OKUŽB S CLOSTRIDIUM PERFRINGENS, PRENESENIH S HRANO, NA PETIH LOKACIJAH: RETROSPEKTIVNA KOHORTNA RAZISKAVA

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ABSTRACT

Keywords:
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Clostridium perfringens,
cohort studies

Introduction. In May of 2012, we investigated a food-borne *Clostridium perfringens* outbreak in Slovenia involving a single kitchen and five venues, with 477 exposed persons.

Methods. In order to identify the causative agent, vehicle of infection and source of contamination, we conducted microbiological and environmental investigations and an analytical cohort study (n = 138).

Results. The case definition in the outbreak was met by 104 persons. Predominant symptoms were diarrhoea, nausea and abdominal cramps. Median incubation time and duration of illness were 12 and 22.5 hours respectively. Stool samples were collected from 18 persons and in 13 *C. perfringens* spores were present; enterotoxin was detected in 9 persons. PCR and PFGE analysis of isolates from a cook with earlier onset time, who did not consume the implicated food, and cases from four venues showed the same strain of *C. perfringens* type A (with *cpe*-gene), indistinguishable by PFGE analysis. No food samples could be obtained. An analytical study showed that one food item (French salad) was the most likely vehicle of infection (RR: 6.35; 95% CI: 1.62-24.90).

Conclusions. This was the largest *C. perfringens* outbreak in Slovenia to date. Proper analytical study in combination with detailed laboratory investigation with genotypisation enabled us to identify a causative agent, vehicle of infection and possible source of contamination. Fast response and interdisciplinary collaboration led to timely implementation of control measures. These have led to the kitchen acquiring new equipment and improving staff knowledge of risks and processes, thus reducing the likelihood of future reoccurrences.

IZVLEČEK

Ključne besede:
izbruhi nalezljivih
bolezni, epidemiologija,
Clostridium perfringens,
kohortne raziskave

Uvod. *V maju 2012 smo preiskovali izbruh okužb s Clostridium perfringens, prenesenih s hrano, v katerega so bile vpletene ena kuhinja in pet lokaciji s 477 izpostavljenimi osebami.*

Metode. *Da bi ugotovili povzročitelja, pot prenosa in vir kontaminacije, smo izvedli laboratorijsko in okoljsko preiskavo ter analitično kohortno raziskavo (n = 138).*

Rezultati. *Definiciji primera v izbruhu so ustrezale 104 osebe. Prevladujoči simptomi so bili: driska, slabost in trebušni krči. Mediana časa inkubacije in trajanja bolezni je bila 12 ur in 22,5 ure. Vzorci blata so bili odvzeti 18 osebam; pri 13 so bile prisotne spore C. perfringens, enterotoksin je bil zaznan pri 9 osebah. PCR- in PFGE-analiza izolatov kuharja z zgodnejšim časom pojava obolenja, ki ni užival impliciranih živil, in primerov s štirih lokacij sta pokazali enak sev C. perfringens tipa A (s cpe genom), ki se ni razlikoval pri analizi PFGE. Vzorcev živil ni bilo mogoče pridobiti. Analitična študija je pokazala, da je bila najverjetnejša pot prenosa okužbe eno izmed živil (francoska solata) (RT: 6,35; 95% IZ: 1,62-24,90).*

Zaključek. *To je bil največji izbruh s C. perfringens v Sloveniji do zdaj. Ustrezna analitična raziskava v kombinaciji s podrobno laboratorijsko preiskavo z genotipizacijo nam je omogočila identifikacijo povzročitelja, pot prenosa okužbe in mogoč vir kontaminacije. Hiter odziv in interdisciplinarno sodelovanje je pripeljalo do pravočasne implementacije nadzornih ukrepov. Ti so privedli do nabave nove opreme v kuhinji, izboljšanja znanja osebja o tveganjih in procesih ter s tem zmanjšali verjetnost za ponovitve v prihodnje.*

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1 INTRODUCTION

C. perfringens is a Gram-positive, rod-shaped, spore form-ing anaerobic bacterium whose association with food-borne outbreaks is well documented (1, 2). It is also a common inhabitant of normal human gastrointestinal microbiota, making its confirmation as the causative agent of a food-borne outbreak more complicated (3).

C. perfringens is classified into five types (A–E) on the basis of its ability to produce one or more of the major exotoxins α, ß, ε and ι (4). *C. perfringens* enterotoxin (cpe) is encoded by *cpe*-gene and it is produced by less than 5% of *C. perfringens* type A strains (5). Enterotoxin producing *C. perfringens* type A is reported as one of the most com-mon food poisoning agents worldwide (3, 6-8). Incubation time ranges between 6-25 hours, usually 10-12 hours (1). The most common clinical manifestations of food poison-ing caused by this microorganism are acute diarrhoea and abdominal cramps. Symptoms generally last from 12 to 24 hours (1, 2). Elderly and immunocompromised people are more likely to have prolonged or severe symptoms (2). The more severe form of the disease may cause ne-crosis of the small intestine, peritonitis and septicaemia (2). Case fatalities are very rare, occurring in <0.03% of cases (9). The most common vehicles for the pathogen are meat and poultry, although it has been also found on vegetable products, including spices and herbs, and in raw and processed foods. Settings where large quantities of food are prepared several hours before serving (hospitals, nursing homes, cafeterias, schools, prisons, etc.) are the most common locations where *C. perfringens* poisoning oc-curs (2). Essential measures to prevent food-borne diseases caused by *C. perfringens* are: appropriate cooking, cooling rapidly through the temperature range between 55-15 °C, storing foods at temperatures <10-12 °C and re-heating the food to an internal temperature of above 70 °C before consumption (10, 11).

In the Unites States of America, estimates made in 2011, based on active and passive surveillance, place *C. perfrin-gens* as the third most common cause of food-borne illness, accounting for 10% of cases (9). In the European context, during the last ten years (up to 2011) England and Wales reported 81 outbreaks, affecting almost 3000 persons (12).

In Slovenia, notifications of infectious diarrhoea comprise a quarter of all infectious diseases notifications, remaining an important public health issue (13). Food-borne illness and outbreaks caused by *C. perfringens* are reportable. In the last ten years, two such outbreaks were notified: one in 2003 (31 cases) and one in 2004 (55 cases) (14).

On the afternoon of Thursday, 17 May 2012, the regional Health Inspectorate of Nova Gorica was informed, by an anonymous phone call, about several cases of a gastroin-testinal illness affecting the guests of a cafeteria at a local food factory. There was a kitchen at the same location providing food for the cafeteria and another four venues, exposing 477 adults. The outbreak investigation team from the regional Institute of Public Health of Nova Gorica, in collaboration with health inspectors, went on site.

The objective of our comprehensive investigation of the event (epidemiological study, microbiological investiga-tion and environmental risk assessment) was to confirm the outbreak and identify the causative agent, the vehicle of infection and the source of contamination in order to implement appropriate control measures.

2 METHODS

2.1 Epidemiological study

We conducted a retrospective cohort study and used it to conduct case findings for confirmation of the outbreak and for descriptive and analytical analysis. The study popula-tion included all attendees and kitchen staff present at one of the venues served by the kitchen under scrutiny on Wednesday, 16 May 2012. We excluded any persons who reported a symptom onset time before the defined date. If the excluded person was considered a possible index case/source of food contamination, we performed a face-to-face interview. The study population was iden-tified on the basis of presence lists at each venue. Lo-cal staff members distributed questionnaires during a five day period to encompass all the persons who might be absent due to illness or personal motives. A phone reporting system for regional doctors of family practice and regional emergency departments was established to include persons who might be too ill to be present during questionnaire distribution. The questionnaire was self-ad-ministered and included questions on demography, clinical symptoms, location and food consumption. To facilitate recall of consumed items, we included a copy of the menu that was available.

A case definition was established for probable and con-firmed case. A probable case was defined as any attendee or kitchen staff with one or more of the following symp-toms: diarrhoea, nausea, vomiting or abdominal pain with-in 48 hours after attending one of the implicated venues on Wednesday, 16 May 2012.

A confirmed case was defined as any attendee or kitchen staff who satisfied the criteria for probable case and had laboratory confirmation. In our analysis, we used both probable and confirmed cases.

Data from compiled questionnaires were digitalised with Epidata Entry (Epidata DK. Denmark, EpiData Associa-tion, 2000-2012. Available from: http://www.epidata.dk). Data quality was assured by double data entry (15). The software used for analysis was STATA 12 (StataCorp. 2011. Stata Statistical Software: Release 12. College Sta-tion, TX: StataCorp LP). We described the study popula-tion. We compared exposed and non-exposed to various food items in terms of disease occurrence. We tested the association between eating various food items and the risk of becoming subsequently ill with Fisher's exact test. To analyse the possible differences in groups regarding continuous variables, the Student t-test was used. Mul-tivariable analysis was done by fitting a robust Poisson regression model. The level of statistical significance was set at $p < 0.05$.

2.2 Microbiological investigation

Recommended laboratory criteria used in association with clinical presentation and epidemiological evidence to implicate *C. perfringens* in food-borne outbreaks are: (I.) isolation of 10^5 organisms/g from epidemiologically implicated food, (II.) isolation of 10^6 spores/g from stool of two or more ill persons, (III.) identification of the same serotype of *C. perfringens* in stools from different patients, (IV.) identification of the same serotype in both food and stool isolates and (V.) demonstration of cpe in the stool of two or more ill persons (1, 16-18). We defined a laboratory confirmed case as: isolation of 10^6 spores/g of stool from a symptomatic person or detection of cpe in the stool. We collected stool samples within two days of illness onset and tested them for *C. perfringens*, *Bacillus cereus*, *Salmonella* spp., *Campylobacter* spp., *Shigella* spp., *Yersinia enterocolitica*, enteric E. *coli*, *Aeromonas* spp., enterotoxic *Staphylococcus aureus, noroviruses* and *rotaviruses*. When enough samples were available, we tested for the presence of cpe (Techlab ELISA *C. perfringens* enterotoxin test).

We analysed selected *C. perfringens* isolates using multiplex polymerase chain reaction (PCR) for toxynotypisation and *cpe*-gene detection. We used pulsed field gel electrophoresis (PFGE) for molecular genotypisation. We collected hand swabs from kitchen staff that could be in contact with food or had access to clean kitchen areas and tested them for: coagulase-positive staphylococci, *Escherichia coli,* faecal streptococci, *Pseudomonas aeruginosa* and *Proteus* spp. Collection of nasopharyngeal swabs of kitchen staff was planned but not executed, since microbiological evidence of *C. perfringens* among guests was already available.

2.3 Environmental risk assessment

The outbreak investigation team visited and assessed the kitchen and the distribution point on site. All kitchen records, including previous inspections and hazard analysis and critical control points (HACCP) documentation, were reviewed. Temperatures and processes of preparation, storage and transportation of food items prepared on Wednesday, 16 May were reviewed. Staff practices on food preparation, hygiene, cooking, storage, handling and distribution, with focused attention on hygiene, temperature control and transport, were assessed. We did not collect environmental samples before confirmation of the outbreak (18 May). At that time, kitchen cleaning was already being performed. Environmental samples were collected after disinfection and tested for coagulase-positive staphylococci, *Escherichia coli,* enterococci, *Pseudomonas aeruginosa*, *Proteus* spp. and aerobic mesophilic bacteria. Food leftovers or ingredients used for preparation were not available for sampling.

3 RESULTS

3.1 Epidemiological study

We received responses from 139 of 477 (29%) overall, of whom 129 of 467 (28%) were attendees and 10 of 10 (100%) were staff. One cook was excluded on the basis of estab-

lished criteria. No cases were reported by regional doctors of family practice or regional emergency departments.

According to our definitions, we identified 104 cases, with an overall attack rate of 75% (104/138). Attack rate among attendees was 78% (101/129) and 33% (3/9) among kitchen staff. Males and females represented 56% and 44% of the cohort respectively. The median age was 43 years (range: 22-58 years). The symptoms and signs reported among the 104 cases were diarrhoea (88%), nausea (74%), abdominal cramps (38%), vomiting (13%) and fever defined as body temperature above 37.5 °C (8%). The incidence of abdominal cramps was significantly different among genders (18.5% in males versus 46.6% in females; p = 0.001).
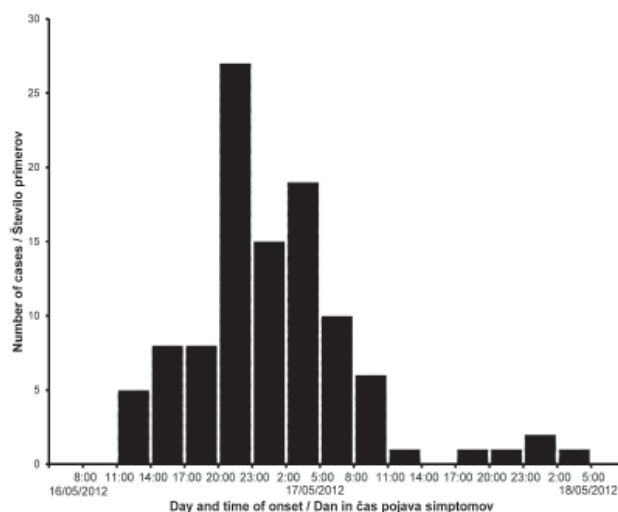

Figure 1. Epidemic curve, *Clostridium perfringens* gastroenteritis outbreak cases, Nova Gorica-Ajdovščina-Sežana, May 2012 (n = 104).

Food was served in three menus. Variations of the single food items ordered were possible. Serving started at 10:30 until 12:00 (n = 124). At one venue, food was served again at 17:00 (n = 12) and 19:30 (n = 2). The epidemic curve is shown in Figure 1. The median incubation time was 12 hours (n = 104; range: 0.5-37.2 hours). The median duration of illness was 23 hours (n = 85; range: 4-59 hours); in 42% of the population symptoms lasted for more than 24 hours. The epidemic curve is consistent with a point-source outbreak. Table 1 shows the results of univariate analysis of food items served. Two items present in the first menu seemed significantly associated with disease occurrence. To control for confounding, these food items were included in a robust Poisson regression model. In the multivariable analysis, the only significant risk that remained was for French salad, with those eating it having 6.4 times the risk of being ill compared to those not eating it, taking into account the other variable (Table 2). The interview with the excluded cook disclosed a clinical picture compatible with *C. perfringens* poisoning with symptoms onset time on Tuesday, 15 March 2012. In later stages, this statement was changed to Wednesday, 16 March 2012. The cook did not consume any food prepared at the implicated kitchen on the day of the outbreak.

Table 1. Relative risk of illness (and 95% confidence intervals) for food items served on 16 May, *Clostridium perfringens* outbreak, Nova Gorica-Ajdovščina-Sežana, May 2012 (n = 138).

	Exposed			Non Exposed			RR	95% CI	p value
	Cases	Non Cases	AR%	Cases	Non Cases	AR%			
French salad	102	18	85.0	2	16	11.1	7.65	2.07--28.32	0.000
Chicken pane	94	17	84.7	10	17	37.0	2.29	1.39--3.76	0.000
Vale stake	4	6	40.0	100	28	78.1	0.51	0.24--1.10	0.015
Roasted potatoes	1	7	12.5	103	27	79.2	0.16	0.03--0.99	<0.001
Green salad	0	7	0.0	104	27	79.4	0.0	n.c./n.i.	0.000
Vegetable soup	0	3	0.0	104	31	77.0	0.0	n.c./n.i.	0.014
Cheese dumplings	0	6	0.0	104	28	78.8	0.0	n.c./n.i.	<0.001

AR: attack rate; RR: risk ratio; CI: confidence interval; n.c.: non computable

Table 2. Multivariable analysis showing final model and relative risk of illness for food items served on 16 May, *Clostridium perfringens* outbreak, Nova Gorica-Ajdovščina-Sežana, May 2012 (n = 138).

Food item	RR	95% CI	p value
French salad	6.35	1.62-24.90	0.008
Chicken pane	1.33	0.88-2.00	0.173

RR: risk ratio; CI: confidence interval; n.c.: non computable

3.2 Microbiological investigation

Twelve cases and 5 non cases provided a stool sample. Among cases, 9 samples tested positive for *C. perfringens* with a spore count higher than 10^6/g; 8 tested positive for cpe (8/9). Out of 4 tested samples, all of them were identified as *C. perfringens* Type A positive for *cpe*-gene and were indistinguishable by PFGE analysis. Each of the four samples was collected from a different venue. Among non-cases, 3 samples tested positive for *C. perfringens* with a spore count higher than 10^6/g; none tested positive for cpe (0/3). Additionally, we collected a stool sample from the excluded cook with an earlier symptom onset time. The sample tested positive for *C. perfringens* with a spore count higher than 10^6/g; it also tested positive for cpe. It was identified as a *C. perfringens* Type A strain positive for the presence of *cpe*-gene and indistinguishable by PFGE analysis from the other tested samples. None of the 5 hand swabs collected tested positive (one sample was from the excluded cook).

3.3 Environmental risk assessment

The kitchen provided food for five venues in a 40 km radius: a food factory on the same site as the kitchen, two industrial factories, the regional penitentiary and a day care centre for people with physical and mental disabilities. Ingredients and partially prepared food were delivered to the kitchen from a central facility. Documentation on transportation and food storage abided by the required standards. The French salad was prepared on site with potatoes, peas, cucumbers, carrots and mayonnaise. Fast refrigeration of the salad was obtained with the use of blast chillers and stored at <5 °C before serving. Critical control points for preparation of fried chicken pane included core temperature measurement and hot hold temperature checks. At two of the venues, where transport time was longer than 1 hour, temperature of the food was checked upon arrival.

No irregularities in the critical control point logbooks and in the implementation of the HACCP plan were detected at the time of inspection. Reports from previous inspections (the last one on 4 May 2012) did not show any irregularities. Practices during preparation, hygiene, cooking, storage, handling and distribution of food followed the required standards. The implementation of the use of blast chillers in the cooling processes was recent. All environmental samples tested negative. The national surveillance system did not detect any other possibly related outbreak in the same time frame.

4 DISCUSSION

This paper presents the results of an investigation of a point source *C. perfringens* outbreak conducted among kitchen staff and guests of five venues served by the same kitchen. From the results of our cohort study, at least 104 persons fell ill. Microbiological analysis confirmed that *C. perfringens* was the causative organism in this outbreak. Molecular genotypisation showed an indistinguishable profile among the isolate form the cook and among cases from four different venues. This suspected index case had symptom onset time on the day before the incriminated food was served and did not consume food prepared by the kitchen on the day the outbreak occurred. These results were indicative of a common source and of a probable origin of food contamination. Despite the absence of food samples, the results from the univariate analysis suggested that the French salad and chicken pane were the most likely vehicles of infection. After multivariable analysis, only the French salad retained statistical significance. Despite the fact that no practice violations were detected during the environmental risk assessment, preparation processes violation or tempera-

ture abuse of the prepared food items would have been necessary to allow the occurrence of the outbreak. It is important to note that *C .perfirngens* has one of the fastest doubling times known (19). Small missteps in temperature control of foods could have led to sufficient growth to cause illness. Based on these results, we implemented the following control measures: all ill persons were advised to stay at home until recovery; persons with a higher risk for spreading the disease were advised to be excluded from work for 48 hours after symptoms resolution; additional education of all kitchen staff on the importance of correct hygiene practices, exclusion from work when sick and temperature control of foods was performed. We gave particular importance to the critical control points of both implicated items. As refrigeration processes with the use of blast chillers were of recent implementation and our analytical study incriminated the French salad, we focused our advice on processes involving refrigeration and cold-holding. We planned an additional inspection after the conclusion of the outbreak investigation. This later revealed that education of staff on hygiene practices continued. Additionally, the kitchen acquired new equipment (more blast chillers) to improve refrigeration and temperature control processes.

According to our national surveillance data, this was the largest *C. perfringens* outbreak in Slovenia to date and the first in the last ten years. A possible explanation for the relatively low occurrence is a well regulated and controlled HACCP system established across the country. Food operators are required to implement and follow procedures based on those principles (20), regularly verified by internal checks and official controls. Other explanations could include the lack of routine testing for the pathogen, the fact that cpe is only detectable for two days after illness onset (21) and the usually mild and short clinical picture. To enhance detection of outbreaks caused by *C. perfringens*, emphasis should be placed on surveillance, fast response, acquisition of detailed clinical picture and aimed laboratory analysis.

Recommended laboratory criteria (1, 16–18) in conjunction with biological plausibility (clinical picture, incubation time, duration of illness) were used to identify *C. perfringens* as the causative agent. The detection of cpe in the stool samples provided additional confirmation on the causative agent. When cpe is detected in at least some of the cases, it is considered a reliable indicator for implicating *C. perfringens* as the etiologic agent in food-borne outbreak (21–23).

The lack of food samples proved a challenge for providing indisputable scientific evidence, besides analytical results, linking disease occurrence with the same mode of transmission at all venues. PCR and PFGE were performed on stool samples of cases from kitchen staff and four venues. In all tested samples, PCR analysis identified a type A *C. perfringens* with the enterotoxin gene, which is commonly produced by <5% of type A clostridia (5,24) such as antibiotic-associated and sporadic diarrhea, associated with plasmid-borne cpe-positive strains, may be food-related; (4. PFGE is useful in an outbreak situation for

helping to identify which isolates have identical molecular genotypes and, therefore, might have a common source (3, 25). Our PFGE analysis confirmed the same genotype in all the analysed samples, giving us robust scientific proof on the connection with the implicated kitchen.

The main objective of our cohort study was to identify the vehicle of infection. From analysis of the epidemic curve and considering the median incubation time of 12 hours, the most probable time of infection was the cafeteria meal served on Wednesday, 16 May 2012. After univariate and multivariable analysis of the food items served, only the French salad remained significantly associated with the disease (RR: 6.35; 95% CI: 1.62-24.90; p = 0.008). According to the European Food Safety authority guidelines, such confirmation with analytical tools represents for the European Union Food-borne Outbreak Reporting System a reportable outbreak with strong epidemiological evidence (statistically significant association in well-designed analytical epidemiological study) (26). Despite statistical exclusion, we feel that due to the high biological plausibility of poultry as a vehicle, this item could not be ruled out completely; as such, control measures aimed at avoiding reoccurrences were directed to hazard control points critical for both items.

Regarding the source of food contamination, a cook who did not consume food on the implicated date reported a symptom onset time on Tuesday, 15 March 2012, indicating a possible index case. This statement was changed afterwards to a later onset time. Even though we ensured privacy during the interview, this change of statement could be explained by information bias due to prevarication caused by the fear of repercussions at the workplace. Three asymptomatic kitchen staff members had spore counts higher than 10^6/g. Such high spore counts can be found in healthy adults (27) but are to be evaluated with care in case of an outbreak scenario as humans, in case of hygiene practice violations, should be considered a risk factor for spread of *C. perfringens* (28). We hypothesise the possible index case as the most likely source of contamination, as clinical symptoms and higher shed of bacteria would have vastly increased the chances of contamination. Molecular genotypisation showing an indistinguishable profile in the stool sample from this case compared to the other 4 samples collected at different venues of the outbreak is supportive evidence of our hypothesis. This guided our decision to improve the knowledge of the staff on *C. Perfingens* transmission and hygiene practices.

In addition to the questionnaire, to avoid losing cases that could have been too sick to be at work and hence receive the questionnaire, we alerted the regional doctors of family practice and emergency departments to report such cases to us directly. Although no cases were reported this way, such an effort in conjunction with monitoring at a national level was of importance in the early stages of the investigation when there was no solid evidence that the outbreak was limited to one kitchen. We observed a low response proportion probably due to the lack of interest of non-affected persons, the absence of a constant presence of a formal authority and some social unrest present

at some venues. This could have led to an overestimation of our general AR but should not have affected the food specific RR nor the direction of the association. To limit non-response bias during data collection, we collaborated with the management personnel at each venue to promote the highest possible response proportion from all the attendees while extending the data collection period up to 5 days. Despite this 5 day window, we collected the majority of the questionnaires on the second day of investigation, avoiding as much as possible spreading rumours about particular food items that would bias the response of exposed and non-exposed persons altering the resulting measures of association obtained. In the future, the use of new technologies such as online questionnaires and smartphones could be used to increase response and improve the speed of data analysis at the same time.

In 42% of cases, the symptoms of disease persisted for more than 24 hours (median 22.5 hours (range: 4-59 hours). The commonly accepted range of duration of disease in the general population is under 24 hours (1,2). This finding is consistent with recent articles (29,30) suggesting that the range of duration of *C. perfringens* illness in the general population could be extended up to two or three days. Our data were collected with a self-administered questionnaire, therefore the influence of individual judgment and information bias cannot be excluded. We tried to minimise those influences on our estimations with clear symptom description in the questionnaire and fast execution of the investigation. Our findings could be of importance in other outbreak investigations while formulating hypotheses regarding the causative agent based on clinical signs. Additional research should try to confirm the results, attempting to prioritise the objective measurement of symptoms and their duration.

A possible limitation of our laboratory analysis was that, due to technological constraints, the location of the expressed *cpe*-gene could not be identified. Numerous papers discuss the distinction between a chromosome encoded cpe, usually implicated in food-borne outbreaks, and a plasmid encoded cpe, usually found in other cases of gastroenteritis (sporadic out-patient or nosocomial antibiotic associated) (3, 27, 31). This demarcation is not so well defined anymore, since plasmid encoded clostridia had been recently found implicated in food-borne outbreaks and knowledge on their epidemiological differences is still evolving, providing new ground in the analysis of *C. perfringens* related outbreaks (31–36)

5 CONCLUSIONS

We investigated the largest food-borne outbreak due to *C. perfringens* to date in Slovenia. As in many real life outbreak investigations, we were faced with a lack of food samples available for testing. Nevertheless, a proper epidemiological study in combination with detailed microbiological investigation with genotypisation enabled us to confirm the outbreak and identify the causative agent, the source of contamination and the vehicle of infection. We hypothesise the source of food contamination being

a cook with an earlier onset of symptoms. The cook did not consume the incriminated food and tested positive for the presence in the stools of a strain of *C. perfringens* Type A positive for *cpe*-gene that was indistinguishable by PFGE analysis from the other strains detected during the outbreak at the different venues. Analytical data analysis allowed us to prove our hypothesis that a food item prepared at the kitchen was implicated in the outbreak. Despite the fact that no hygiene and practice violations were detected during the environmental risk assessment, some food preparation and storage violations would still be required to allow the organism to cause illness. With this consideration, we based our recommendations on the obtained results, suggesting control measures aimed at improving hygiene practices (source of food contamination) and temperature control of foods (vehicle of infection). This has led to the kitchen acquiring new equipment and improving staff knowledge of risks and processes, thus reducing the likelihood of future reoccurrences.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

FUNDING

ETHICAL APPROVAL

Slovenian regional public health institutes have general consent to conduct comprehensive outbreak investigations as regulated by the Slovenian Communicable Diseases Act, 2006. Activities include, but are not limited to, contact tracing, interviews, sampling of human and environmental specimens, notification of reportable diseases, communication of the results to the scientific community and general public. Collected data were used only for the purposes of this outbreak investigation. Specific approval was not needed but the scope of use for the data collected was explained at each venue; the participation was voluntary.

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RISK FACTORS FOR EATING DISORDERS AMONG MALE ADOLESCENT ATHLETES

DEJAVNIKI TVEGANJA MOTENJ HRANJENJA MED ŠPORTNIKI V ADOLESCENCI

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ABSTRACT

Keywords:
metabolic processes,
SCOFF questionnaire, diet,
breakfasts

Objective. Eating disorders (ED) are an important and increasing problem in adolescents. The objective of this study was to examine the risk factors and the prevalence of risk for ED among male adolescent elite athletes and nonathletic controls. Differences between male athletes competing in aerobic, anaerobic and aerobic-anaerobic sports were examined as well.

Methods. This was a cross-sectional epidemiological study. A cross-sectional questionnaire survey and anthropometric measurements were conducted on 351 adolescents (athletes n = 228; controls n = 123). All participants were aged 15-17 at the time of measuring. Risk for ED was determined using a SCOFF questionnaire.

Results. The overall prevalence of the risk for ED in male adolescents was 24.8%, with no significant differences among athletes and controls or different subgroups of athletes (p>0.05), although the highest prevalence (37.2%) was registered in aerobic subgroup of athletes. Higher number of attempts to lose weight was associated with increased risk of ED in each group (athletes and controls). Other predictors referred to lack of breakfast and body composition in aerobic subgroup of athletes and number of meals and training frequency in anaerobic subgroup. The most common reasons for dieting were improvement of sport results (19.6-44.2%) and better self-esteem (41.5%) in athletes and controls respectively.

Conclusions. Participation in the competitive sport itself is not associated with the increased risk for ED. It seems that risk factors for ED for adolescent athletes competing in aerobic and anaerobic sports represent a subject that deserves consideration and further investigation in the future.

IZVLEČEK

Ključne besede:
metabolični procesi,
vprašalnik SCOFF, hujšanje,
zajtrki

Namen. Namen raziskave je bil ugotoviti dejavnike tveganja in prevalenco tveganja za motnje hranjenja med športniki adolescenti in kontrolno skupino ter razlike med športniki, ki tekmujejo v aerobnih, anaerobnih in v aerobno-anaerobnih športnih.

Metode. Športniki so bili iz 22 različnih športnih panog (N = 228; kontrola N = 123). Merjenci so bili med meritvami stari od 15 do 17 let. Splošen vprašalnik se je nanašal na pogostost in trajanje treninga, zmanjševanje telesne teže, metode, ki so jih za to uporabljali, in prehranjevalne navade. Za oceno tveganja za nastanek motnje hranjenja je bil uporabljen vprašalnik SCOFF.

Rezultati. Telesna sestava je bila izmerjena z napravo InBody230. Najvišja prevalenca tveganja za motnje hranjenja je bila opažena v aerobni skupini (37,2 %). Najpogostejši vzrok za zmanjševanje telesne teže je bil med športniki izboljšanje tekmovalnega dosežka (19,6 %-44,2 %), v kontrolni skupini pa dvig samopodobe (41,5 %). Dejavniki tveganja za razvoj motenj hranjenja se med skupinami razlikujejo. Najpogostejši je bil število poizkusov zmanjšanja telesne teže. V aerobni skupini se je kot najpomembnejši dejavnik pokazal zajtrk (p = 0,028).

Zaključek. Dejavniki za povečano tveganje motenj hranjenja se v aerobni in aerobno-anaerobni skupini nanašajo na prehranjevalne navade, v anaerobni skupini pa na pogostost treninga. Trenerji so še vedno glavni razlog zmanjševanja telesne teže med športniki adolescenti.

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1 INTRODUCTION

Eating disorders (ED) are serious mental illnesses with increasing incidence (1). These disorders are characterised by a preoccupation with food, body weight and shape that leads to behaviours such as starvation, fasting, binge eating and purging and excessive exercise (2). They are increasingly common conditions among adolescent athletes and their untrained age-matched counterparts. ED in athletes usually occurs during adolescence, which is a critical period for the continuation of their sporting careers (3). Common risk factors for ED among athletes are tendency to improve sports achievement, the specificity of the sport, gender, level of training and eating habits (4-7).

Previous studies (6, 7) have reported that female adolescents are more susceptible for ED, although in recent years there is an increase in ED occurrence among male adolescents as well (1). The prevalence of ED among the adolescent male athlete population is around 15%, while in the control – non-athlete population it is even higher – 17% (8).

The association between the prevalence of ED and different sports and/or levels of training was already addressed in previous studies (5, 7). The range of prevalence in male collegiate athletes, where sports were separated into 8 different subgroups (endurance, aesthetic, ball game, power sports, technical, weight class, antigravitation and motor) is from 1% to 22% (9-11). The prevalence of ED is higher in high trained athletes and sports where weight and body shape are a factor of success (7, 8, 12).

To our knowledge, the literature does not provide a comparison of prevalence of risk and risk factors for ED among different groups of sports based on the dominant metabolic processes in a specific sport (e.g. aerobic, anaerobic and aerobic-anaerobic). In each sport, the specificity of training must conform to the specific demands of competition, therefore grouping sports by dominant metabolic process seems logical as we know that specific body composition is related to the specificity of sport (13).

Gender, eating habits, level of training and specificity of sport are the factors that affect the development of the body and its composition in adolescence (14, 15). However, those same factors are also involved in the etiology of ED (7, 16). Therefore the evaluation of possible differences in those parameters among the subjects with and without the risk for ED is important and may provide new insights into the possible risk factors for ED in the male adolescent population.

The main aim of our study was to evaluate the frequency of risk for ED among adolescent male athletes and age-matched untrained controls and to explore the possible differences in the body composition and risk factors for ED among different sport groups based on dominant metabolic process for specific sport while using an untrained adolescent population as a control.

2 METHODS

2.1 Participants

A total of 187 adolescent male athletes and 123 age and sex matched untrained controls volunteered to participate. The adolescent athletes were enrolled in 22 different sport disciplines (40 sport clubs that were randomly selected from the list of Slovenian National Sport Federation), while controls were randomly selected from 4 different high schools in Slovenia. The main inclusion criteria for both adolescent athletes and untrained controls were (1) a birth date in 1996, 1997 or 1998 (age of 15, 16 or 17 at the time of data collection), (2) at least one year of training in a sports club (for adolescent athletes) and (3) being a 1st, 2nd or 3rd year student at one of the Slovenian high schools (for untrained controls). The average duration of club based sports activity was 4.6 (± 2.4) years in the aerobic group, 8.5 (± 2.9) years in anaerobic and 6.9 (± 3) years in aerobic-anaerobic group. Sample selection was based on the total number of adolescents born in provided years. The sample was calculated using the formula for cross sectional studies (17): considering a total population of 28,229 male individuals, the expected frequency of risk for ED of 20% and variability of 5%, it totalled 246 individuals, with a confidence interval of 95%. The study was approved by the National Medical Ethic Committee (No. 125/06/13). The respondents gave written consent to participate.

2.2 Study design

This was a cross-sectional cohort study. All participants completed a general and SCOFF questionnaire (explained in details below) regarding eating behaviour, training status and weight control methods and risk for ED. Participants were also measured for body composition, body weight, body height and waist to hip ratio (WHR).

2.3 Assessment procedure

2.3.1 Questionnaires

General questionnaire included a battery of assessment questions regarding training and physical activity history (years of club based sport activity, number of trainings per week and duration of one training), nutrition patterns (eating breakfast and number of meals per day), dieting and weight regulation history (use of diuretics, laxatives, vomiting) and a self-esteem question (scale from 1- not satisfied to 5- totally satisfied). A SCOFF questionnaire, which is a specific tool for detecting risk for ED (18), was also administered to the respondents. The SCOFF questionnaire contains five yes/no questions concerning eating habits and attitudes toward a person's weight and body shape. A threshold of 2 positive answers has been proposed to raise a suspicion on an existing ED (19). The SCOFF questionnaire appears highly effective as a screening instrument and has been widely adopted to raise the index of suspicion of an ED (20). Reliability of the Slovenian version of SCOFF questionnaire was proved with cal-

culated Cronbach alpha, which was 0.454. Results were in a line with other known studies (21, 22).

2.3.2 Body composition measurements

Weight and body composition were measured using a portable bioelectrical impedance machine InBody 230 with tetra polar eight point tactile electrodes. It shows the impedance values from the measurements at 2 frequencies (20, 100 kHz) (23). It was already used in previous studies and proved to be an acceptable device to measure body fat mass, percentage of body fat mass and total fat free mass in healthy population (24). Based on the data, we later on calculated the body mass index (BMI). Athletes were measured before training to avoid the possible influence of dehydration and increased body temperature on body composition results.

Height and waist to hip ratio were measured by the WHO STEPwise Approach to Surveillance protocol (STEPS) (25). Percentiles of BMI for age were calculated with the WHO AnthroPlus programme. BMI-for-age less than 5th percentile was taken as a cut-off for identifying thinness or underweight (26).

All the participants were measured by the same experienced examiner. During the measurement, participants were barefoot and with the least possible clothing.

2.4 Statistical analyses

The statistical analyses were carried out using SPSS version 17.0. Results were expressed as mean value with standard deviation (SD) for continuous data and as absolute numbers (N) and percentages (%) for categorical data. Chi square (x^2) test was used to examine categorical frequencies. One-way ANOVA was used to find differences between the groups, with post-hoc Bonferroni correction for multiple comparisons.

Based on the SCOFF questionnaire score, the subjects were divided into two groups: with and without the increased risk for ED, and this variable was used as a split variable when ANOVA was used (e.g. risk vs. no risk). Furthermore, adolescent athletes were classified into three subgroups based on the dominant metabolic processes

Table 1. Classification of the 22 different sports into aerobic, anaerobic and aerobic-anaerobic sports.

Aerobic	Anaerobic	Aerobic-anaerobic
Cross-country skiing	Sprint	Middle distance running
Long distance running	High/ long/ triple jump	Football
Rowing	Gymnastics	Basketball
Triathlon	Skiing	Volleyball
Cycling	Ski jumping	Short and middle distance Swimming
Long distance swimming	Judo	Handball
Mountain running		Tennis
		Dancing

(27) for given sport discipline (aerobic, anaerobic and aerobic-anaerobic; Table 1).

A logistic regression analysis was carried out for predicting the likelihood between results of the SCOFF questionnaire as the depended variable and BMI, BFM% (percent of body fat mass), SMM (skeletal muscle mass), FFM (fat free mass), SLM (skeletal lean mass), training history, nutrition patterns, dieting and weight regulation history as independent variables. It was made separately for each group (aerobic, anaerobic, aerobic-anaerobic, control). Initially, only one predictor was used in logistic regression, while later on the combination of three predictors was used to find the perfect match model. The significance level for all tests was set to 0.05.

3 RESULTS

The highest prevalence of risk for ED was noticed in the aerobic group (37.2%) compared with the anaerobic (19.2%) and aerobic-anaerobic (23.9%) groups and controls (23.6%), but the difference between the groups was not significant (p=0.567). The overall prevalence of the risk for ED in our male adolescent sample was 24.8%.

A significantly higher number of controls (10/123) compared with the athletes (1/187) were defined as underweight according to BMI for age percentiles criteria (χ^2(2) = 12.507, p = 0.0004; Table 2). No differences in the prevalence of underweight were observed between athletes competing in the aerobic (0%), anaerobic (0%) and aerobic-anaerobic (1.1%) subgroups. When comparing the anthropometric parameters of subjects with and without the risk for ED (based on the SCOFF questionnaire score), within the subgroups of athletes (aerobic, anaerobic, aerobic-anaerobic) and untrained controls, we have found that in anaerobic subgroup of athletes and control group there was no significant difference in any of the anthropometric parameters used (p > 0.05 for all instances). However, in other subgroups of athletes (aerobic and aerobic-anaerobic) there were some significant differences between subjects with and without the risk for ED, where subjects with increased risk for ED presented with more height, weight, BMI percentile WHO, BMI and skeletal lean mass (Table 2).

Some eating habits such as the lack of breakfast (p=0.004) and number of meals per day (p=0.009) showed a significantly different distribution between groups. The lack of breakfast was rather common in the aerobic-anaerobic group (46.7%) and controls (45.5%). The cut-off value for normal number of meals per day was 4 and normal eating pattern in regard to this was best observed in the aerobic group where only 7% of subjects had less than 4 meals per day, while among the subjects from the anaerobic, aerobic-anaerobic and control groups, the frequencies of having less than four meals per day were 28.8%, 21.7% and 29.3% respectively.

Self-esteem measured with the five rate scale was significantly different among the groups and was the lowest in the control group, where the percentage of subjects with low

Table 2. Anthropometric and body composition data presented for athletes and controls separated into groups by risk for eating disorders.

Variable	Aerobic N = 43 Risk No risk N = 16 N = 27		P Value	Anaerobic N = 52 Risk No risk N = 10 N = 42		P Value	Aerobic-anaerobic N = 92 Risk No risk N = 22 N = 70		P Value	Untrained controls N = 123 Risk No risk N = 29 N = 94		P Value
Risk for disordered eating (%)*	16 (37.2)			10 (19.2)			22 (23.9)			29 (23.6)		
Age (years), mean (SD)	16.06 (0.2)	15.63 (0.1)	0.100	16.00 (0.3)	15.78 (0.1)	0.418	16.14 (0.2)	15.81 (0.1)	0.125	16.07 (0.2)	16.20 (0.1)	0.461
Height (cm), mean (SD)	180.59 (6.8)	176.02 (5.00)	**0.015****	175.48 (5.2)	174.89 (6.8)	0.801	179.62 (8.5)	178.10 (7.3)	0.415	179.16 (6.4)	177.98 (6.3)	0.381
Weight (kg), mean (SD)	70.85 (9.4)	64.21 (8.6)	**0.023****	70.84 (9.1)	67.03 (9.9)	0.237	73.95 (12.9)	67.76 (9.7)	**0.019****	72.30 (12.1)	68.60 (13.7)	0.193
BMI percentile WHO, mean (SD)	56.43 (25.4)	49.29 (25.7)	0.382	70.44 (24.0)	60.02 (24.1)	0.224	67.66 (22.0)	55.53 (23.9)	**0.038****	63.63 (24.4)	50.81 (32.5)	0.052
WHR, mean (SD)	0.81 (0.03)	0.80 (0.03)	0.360	0.82 (0.03)	0.80 (0.04)	0.123	0.830 (0.06)	0.081 (0.05)	0.223	0.82 (0.05)	0.82 (0.05)	0.634
Skeletal muscle mass (kg), mean (SD)	36.14 (4.9)	32.60 (3.9)	**0.012****	36.04 (3.6)	33.82 (4.3)	0.140	35.97 (5.2)	33.79 (5.3)	0.094	34.31 (4.7)	32.69 (5.3)	0.146
Body fat mass (kg), mean (SD)	7.17 (3.4)	6.46 (3.1)	0.491	7.63 (4.3)	7.30 (4.5)	0.834	10.60 (7.9)	8.04 (4.2)	0.052	11.43 (6.5)	10.51 (6.3)	0.498
Percent Body Fat mass (%), mean (SD)	9.97 (3.9)	9.77 (3.5)	0.870	10.34 (4.7)	10.46 (4.8)	0.942	13.67 (7.4)	11.70 (5.7)	0.193	15.27 (5.8)	14.51 (5.79)	0.535
Body mass index (kg/m^2), mean (SD)	21.66 (2.0)	20.72 (2.3)	0.184	23.05 (2.3)	21.86 (2.7)	0.211	22.82 (3.2)	21.28 (2.1)	**0.011****	22.46 (2.9)	21.52 (3.5)	0.193
Skeletal lean mass (kg), mean (SD)	60.04 (7.7)	54.51 (6.1)	**0.013****	59.73 (5.5)	56.4 (6.7)	0.149	59.70 (8.2)	56.36 (8.2)	0.099	57.39 (7.4)	54.77 (8.3)	0.131
BMI underweight; n (%)	0 (0)			0 (0)			1 (1.1)			10 (8.1)		

Underweight; BMI-for-age ≤ 5th percentile
* no significant differences in the distribution among the groups (p = 0.567)
** significant differences between the subjects with and without the risk for ED (p < 0.05)

self-esteem was 10.6%. At the time of entrance to the study, 4-9% of subjects were dieting to lose weight (no difference between groups, p>0.05) but the percentage of those who tried to lose weight more than three times was significantly higher in the anaerobic group (19.2%, p = 0.008) compared to other groups. There was no significant difference in the use of different weight-control methods (Table 3).

Aims of reducing weight were different between groups. In athlete subgroups (aerobic, anaerobic and aerobic-anaerobic), the most common aim was sports achievement, whereas the control group most often reported better self-esteem as the main reason to reduce weight. Although the majority of participants stated that the decision to lose weight was their own decision, it is worth noting that 20.9% of aerobic and 25% of anaerobic athletes reported that dieting was directed by the trainer (Table 4).

In a logistic regression analysis, the lack of breakfast was a significant predictor of higher risk for ED among aerobic group of athletes (p = 0.028). A very important predictor for this sports group was also the number of attempts to lose weight (p = 0.074), while in the aerobic-anaerobic

Table 3. Eating habits, self-esteem and weight control methods among athletes and controls.

Symptoms of disordered eating	Aerobic N = 43	Anaerobic N = 52	Aerobic- anaerobic N = 92	Controls N = 123	Difference between groups
Without breakfast	9 (20.9)	14 (26.9)	43 (46.7)	56 (45.5)	**0.004****
< 4 meals/day	3 (7)	15 (28.8)	20 (21.7)	36 (29.3)	**0.009****
Self-esteem < 3	3 (7)	1 (1.9)	6 (6.5)	13 (10.6)	**0.012***
Trying to lose weight now	4 (9.3)	3 (5.8)	7 (7.6)	5 (4.1)	0.567
Tried to lose weight ≥ 3	3 (7)	10 (19.2)	6 (6.5)	4 (3.3)	**0.008****
Weight control methods ¥	16 (37.2)	26 (50)	23 (25)	56 (45.5)	0.430
Reduce food consumption	5 (11.6)	9 (17.3)	7 (7.6)	8 (6.5)	
Sport activity	5 (11.6)	7 (13.5)	14 (15.2)	29 (23.6)	
Reduce food and sport activity	5 (11.6)	10 (19.2)	12 (13)	18 (14.6)	
Vomiting	1 (2.3)	0 (0)	0 (0)	1 (0.8)	
Diuretics	0 (0)	0 (0)	0 (0)	0 (0)	

Data are given in numbers (percentage).
¥ Total weight control methods.
**p < 0.01
*p < 0.05

Table 4. Reported reasons for dieting among athletes and controls.

Reasons for dieting	Aerobic N = 43	Anaerobic N = 52	Aerobic- anaerobic N = 92	Controls N = 123	Difference between groups
Aim of reducing weight ¥¥	27 (62.8)	28 (53.8)	42 (45.7)	68 (55.3)	**0.000*****
Sports achievement	13 (30.2)	23 (44.2)	18 (19.6)	14 (11.4)	
Better self-esteem	6 (14)	1 (1.9)	19 (20.7)	51 (41.5)	
Sports achievement and better self-esteem	8 (18.6)	4 (7.7)	5 (5.4)	3 (2.4)	
Told by:					**0.019***
Teacher/trainer	9 (20.9)	13 (25)	11 (12)	3 (2.4)	
Teammate	1 (2.3)	0 (0)	1 (1.1)	3 (2.4)	
Doctor	1 (2.3)	1 (1.9)	1 (1.1)	3 (2.4)	
Family	2 (4.7)	1 (1.9)	5 (5.4)	7 (5.7)	
Friends/partners	2 (4.7)	2 (3.8)	0 (0)	5 (4.1)	
Nobody/my decision	33 (76.7)	36 (69.2)	76 (82.6)	110 (89.4)	

Data are given in numbers (percentages).
¥¥ Total reducing weight aims.
***p < 0.001
*p < 0.05

group it was the most significant predictor for higher risk for ED (p = 0.002). In the anaerobic group, the number of trainings per week raised suspicion for ED the most (p = 0.037), while in the control group it seems that there is some relationship between self-esteem level and risk for ED (p = 0.069) (Table 5). Groups of metabolic processes did not show significant influence on risk of ED (p = 0.446; B = 0.042; Wald statistics = 0.580).

4 DISCUSSION

The main findings of this study indicate that there are no significant differences in the risk for ED occurrence between adolescent male athletes and their untrained controls. These findings are in concordance with Norwegian research where the sample characteristics were comparable to ours (5). We assume that the lack of differences might be due to a shorter period of exposure to sport-specific demands such as experienced pressure to diet, weigh-in procedures, number of weight fluctuations and subjective evaluation among adolescent compared to the adult elite athletes. The overall prevalence of risk for ED was 24.8% (77/310), with the highest prevalence recorded in the aerobic subgroup of athletes (37.2%). There are some significant anthropometric differences among the subjects with and without the risk for ED within the subgroups of aerobic athletes and aerobic-anaerobic athletes. Significantly higher values of height, weight, skeletal muscle mass and skeletal lean mass were measured

Table 5. Logistic regression analysis with disordered eating as the dependent variable in groups of athletes and controls.

Variable	B	Exp(B) (95% CI)	p Value	Percentage correct
Aerobic				
Lack of breakfast	-1.569	0.208 (0.043 to 1.001)	**0.050***	69.8
Skeletal muscle mass	-0.199	0.819 (0.690 to 0.973)	**0.023***	67.4
Skeletal lean mass	-0.125	0.885 (0,792 to 0,984)	**0.024***	67.4
Fat free mass	-0.118	0.888 (0.802 to 0.984)	**0.024***	67.4
Weight	-0.083	0.921 (0.854 to 0.992)	**0.031***	62.8
No. of attempts to lose weight	-0.784	0.457 (0.222 to 0.937)	**0.033***	72.1
Anaerobic				
No. of meals per day	-0.072	0.487 (0.124 to 1.108)	0.086	80.8
No. of attempts to lose weight	-0.536	0.585 (0.399 to 0.857)	**0.006***	84.6
No. of trainings per week	-0.727	0.483 (0.308 to 0.760)	**0.002***	88.5
Aerobic-anaerobic				
Body mass index	-0.241	0.786 (0.641 to 0.964)	**0.021***	77.2
BMI percentile	-0.025	0.976 (0.953 to 0.999)	**0.037***	76.1
No. of attempts to lose weight	-0.933	0.393 (0.228 to 0.680)	**0.001***	79.3
Weight	-0.052	0.950 (0.907 to 0.994)	**0.028***	75.0
Control				
No. of attempts to lose weight	-0.486	0.615 (0.398 to 0.950)	**0.028***	75.6
BMI percentile	-0.014	0.987 (0.972 to 1.001)	0.066	76.4
Self-esteem	0.554	1.740 (1.073 to 2.822)	**0.025***	74.8

*p < 0.05

in subjects with higher risk for ED in the aerobic group. In the aerobic-anaerobic group, parameters related to body mass (weight, BMI percentile and BMI) were significantly lower in the group without the risk for ED. The lack of breakfast was very common among male adolescents, accounting for 39.3% across all groups, with the highest prevalence in the aerobic-anaerobic group (46.7%) and untrained controls (45.5%). Interestingly, although the lack of breakfast was least frequent in the aerobic group of athletes (20.9%), it was a significant predictor of ED occurrence in the logistic regression model (p=0.028). Finally, it seems that risk factors that raise suspicion for ED differ significantly according to the predominant metabolic nature of the sport, as we have highlighted different risk factors that increase risk for ED in sports subgroups (aerobic, anaerobic and aerobic-anaerobic).

4.1 Prevalence of disordered eating among athletes and controls

In general, studies indicate a higher frequency of disordered eating in elite athletes than controls (6, 11). By contrast, some researches on high school athletes report no greater risk for the development of an eating disorder than for controls (8, 28, 29), which is supported also by our findings. The risk for ED (based on SCOFF questionnaire score >2) did not show a trend toward greater occurrence in adolescent male athletes. Similar results to ours were shown in research (8), which examined weight concerns, dieting, body dissatisfaction and eating behav-

iour of German high school athletes and compared the disordered eating behaviour of these athletes with regular high school students and founded no differences in the ED prevalence. Similar results were also reported from the female adolescent population by DiBartolo and Shaffer, who even concluded that there is less ED symptomatology and more healthy psychological functioning in athletes than non-athletes (30). It seems that in our sample participation in a competitive sport itself was not associated with increased risk for ED. The reported prevalence of risk for ED in male adolescents as described with the use of the SCOFF questionnaire ranged from 11.2% to 38.9% in previous studies (31–33). Our results are relatively high but within the range of previously reported results. The highest prevalence of risk for ED was registered in the aerobic subgroup of athletes, which is in accordance with previous findings (11, 34). Although the direct comparison with those findings is difficult because they studied female athletes and used different tools to assess eating disorder risk. The high prevalence of risk for ED in aerobic sports could be due to the fact that extra body weight can limit performance.

4.2 Risk factors for eating disorders among athletes and controls

Variables associated with disordered eating among adolescent athletes and controls differ in some main points. Analysis did not show a significant impact of specific met-

abolic processes on higher risk for ED. The only variable that was associated with symptoms of disordered eating in each group was number of attempts to lose weight. A higher number represents higher risk for ED. Results were in line with the literature (5, 35). Other predictors referred to breakfast and body composition in the aerobic group and number of meals and training frequency in the anaerobic group. Aerobic athletes are aware of the fact that being thin, fibrous and fat free is the main physical aspect of performance enhancement in their discipline (e.g. long-distance running or cycling athletes often turn to strict diets, since the loss of body fat correlates with better performance) (12). This may explain differences in body composition parameters (SMM, SLM, FFM) between aerobic athletes with risk and no risk for ED. The lower the values of body composition parameters, the lower the risk for ED. In the aerobic-anaerobic and control groups, BMI is a common predictor, but low self-esteem is the strongest predictor that raises suspicion for ED in controls. This findings may be explained by the fact that adolescents are less satisfied with their body image than adults (37). It is also known that athletes have higher self-esteem (36), which might explain the fact that self-esteem was not related with the risk for ED in athletes. BMI and low self-esteem have already been shown as risk factors for ED, especially in the adolescent population (4, 35, 38).

Although aerobic athletes have the best eating habits compared to other subgroups, which is in accordance with recent studies (39), omission of breakfast is an important predictor for higher risk for ED in this subgroup (p = 0.028).

4.3 Reasons for dieting in athletes and controls

As expected, athletes reported dieting to impove sport results and non-athletes to improve self image. Losing weight to improve perfomance is the most important reason among athletes. Young athletes are perfectionists and extremly performance oriented, and because of this they could be at increased risk for development of an eating disorder (40). When analysing the pressures exerted by different sporting contexts, the intrisic characteristics of each discipline were an important element. Coaches etablish certain objectives that athletes try to achieve, pushing themselves to the limit (12). Because of such circumstances, young male athletes (not just female) indicate coaches as the main promotors of their dieting (5, 12). This shows us why more attention should be placed on male athletes and their coaches to minimise risk for ED in adolescent athletes in the future.

5 CONCLUSION

Over the past decades, eating disorders were mostly related to the female population. Few studies included male adolescent athletes and age-matched controls. Yet, to our knowledge, this is the first study that has compared prevalence of risk for eating disorders among adolescent male athletes on the basis of metabolic processes. The highest prevalence was found in the group of aerobic athletes, but differences between all 4 groups were not significant. Furthermore, breakfast has been included as a risk factor for the first time. Results have shown that it is the most important predictor in the aerobic group of athletes. We can conclude that risk factors for ED in the aerobic group refer to specific body composition and breakfast consumption, while in the anaerobic group training frequency is the risk factor. Risk factors in the aerobic – anaerobic and control groups are comparable. Trainers are still the main reason for dieting among adolescent athletes.

Because of the different questionnaires and methologies used in recent studies, longitudinal research with an experienced clinical interviewer that could show us the prevalence of true eating disorders and avoid false positives or false negatives, depending on the range of criteria, should be done in the future. Based on clinical interviews, we could probably find some differences in prevalence between athletes and controls that were not found with the self-reporting questionnaires in our case. Due to the dividing of athletes into groups, bigger samples should also be used in future. Finally, for more relevant data on eating habits and nutritional status, content and quantity of meals should be recorded as well.

CONFLICT OF INTEREST

The authors declare that no conflict of interest exists.

FUNDING

ETHICAL APPROVAL

Ethical approval was received from the Slovenian National Medical Ethic Committee (No. 125/06/13).

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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.

Kategorija prispevka

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.

Primeri za citiranje literature:

primer za knjigo:
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:
Urlep F. Razvoj osnovnega zdravstva v Sloveniji zadnjih 130 let. In: Švab I, Rotar-Pavlič D, editors. Družinska medicina. Ljubljana: Združenje zdravnikov družinske medicine, 2002: 18-27.

Goldberg BW. Population-based health care. In: Taylor RB, editor. Family medicine. 5th ed. New York: Springer, 1999: 32-6.

primer za članek iz revije:
Barry HC, Hickner J, Ebell MH, Ettenhofer T. A randomized controlled trial of telephone management of suspected urinary tract infections in women. J Fam Pract 2001; 50: 589-94.

primer za članek iz revije, kjer avtor ni znan:
Anon. Early drinking said to increase alcoholism risk. Globe 1998; 2: 8-10.

primer za članek iz revije, kjer je avtor organizacija:
Women's Concerns Study Group. Raising concerns about family history of breast cancer in primary care consultations: prospective, population based study. BMJ 2001; 322: 27-8.

primer za članek iz suplementa revije z volumnom in s številko:
Shen HM, Zhang QF. Risk assessment of nickel carcinogenicity and occupational lung cancer. Environ Health Perspect 1994; 102(Suppl 2): 275-82.

Payne DK, Sullivan MD, Massie MJ. Women's psychological reactions to breast cancer. Semin Oncol 1996; 23(Suppl 2): 89-97.

primer za članek iz zbornika referatov:
Sugden K. et al. Suicides and non-suicidal deaths in Slovenia: molecular genetic investigation. In: 9th European Symposium on Suicide and Suicidal Behaviour. Warwick: University of Oxford, 2002: 76.

primer za magistrske naloge, doktorske disertacije in Prešernove nagrade:
Bartol T. Vrednotenje biotehniških informacij o rastlinskih drogah v dostopnih virih v Sloveniji: doktorska disertacija. Ljubljana: Biotehniška fakulteta, 1998.

primer za elektronske vire:
Mendels P. Textbook publishers extend lessons online. Pridobljeno 23.9.1999 s spletne strani: http://www.nytimes.com/library/tech/99/09.

Tabele

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.

Slike

Morajo biti profesionalno izdelane. Pri pripravi slik upoštevajte, da gre za črno-beli tisk. Slikovno gradivo naj bo pripravljeno:
− črno-belo (ne v barvah!);
− brez polnih površin, namesto tega je treba izbrati šrafure (če gre za stolpce, t. i. tortice ali zemljevide);
− v linijskih grafih naj se posamezne linije prav tako ločijo med samo z različnim črtkanjem ali različnim označevanjem (s trikotniki, z zvezdicami...), ne pa z barvo;
− 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.

Vsaka slika mora biti navedena v besedilu. Besedilo k sliki naj vsebuje naslov slike in potrebno razlago vsebine. Slika naj bo razumljiva tudi brez branja ostalega besedila. Pojasniti morate vse okrajšave v sliki. Uporaba okrajšav v besedilu k sliki je nedopustna. Besedila k slikam naj bodo napisana na mestu pojavljanja v besedilu.

Fotografijam, na katerih se lahko prepozna identiteta bolnika, priložite pisno dovoljenje bolnika.

Merske enote

Naj bodo v skladu z mednarodnim sistemom enot (SI).

Kratice in okrajšave

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.

UREDNIŠKO DELO

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 popravke odobri in upošteva. Popravljen čistopis vrne v uredništvo po spletni aplikaciji Editorial Manager. Sledi jezikovna lektura, katere stroške krije izdajatelj. Med redakcijskim postopkom je zagotovljena tajnost vsebine prispevka. Avtor dobi v pogled tudi prve, t. i. krtačne odtise, vendar na tej stopnji upoštevamo samo še popravke tiskovnih napak. Krtačne odtise je treba vrniti v treh dneh, sicer menimo, da avtor nima pripomb.

V uredništvo se trudimo za čim hitrejši uredniški postopek. Avtorji se morajo držati rokov, ki jih dobijo v dopisih, sicer se lahko zgodi, da bo članek odstranjen iz postopka.

Morebitne pritožbe avtorjev obravnava uredniški odbor revije.

Za objavo prispevka prenese avtor avtorske pravice na Nacionalni inštitut za javno zdravje kot izdajatelja revije (podpiše Izjavo o avtorstvu). Kršenje avtorskih in drugih sorodnih pravic je kaznivo.

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