Mortality rates for certain age groups of children and adolescents in four towns of western Croatia in the 19th century

Umrljivost določene starostne skupine otrok in mladostnikov v štirih mestih zahodne Hrvaške v 19. stoletju

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Abstract

Aims: Mortality trend analysis among children and adolescents during the 19th century in the following towns in Western Croatia: Rijeka, Bakar, Kastav and Grobnik.

Sources and methods: The analysis is based on data collected in the Registry of Deaths kept at the State Archives in Rijeka. The causes of death were systematised according to the current International Statistical Classification of Diseases and Related Health Problems (ICD-10).

Results: It was found that of the 10,168 deceased divided into seven age groups, children and adolescents under 19 represented 63.4 % of all deceased. Of the total mortality, infants and children under one year of age constituted 25.2 %, children between one and three years of age 24.0 %, between four and six 6.9 % and between seven and nineteen 7.3 %. The most common causes of death were analysed in two groups of children (0–6 and 7–19 years of age): In both of these groups the most common causes of death were mostly the ones described in chapter XVIII according to ICD-10, i.e. symptoms, signs and abnormal clinical findings that occur significantly more among pre-schoolers than school children (62.7 % vs. 37.6 %). Those are followed by certain infectious and parasitic diseases that are less common in the younger group and significantly more common in the older group (14.6 % vs. 35.2 %). Diseases of the respiratory system are almost equally divided between the two groups (10.5 % vs. 11.6 %).

Conclusion: By applying adjusted descriptive analytical methods it is possible to reconstruct basic mortality indicators from the past using registries of deaths.

Izvleček

Cilji: Analiza trendov umrljivosti med otroki in mladostniki v 19. stoletju v mestih zahodne Hrvaške: Reki, Bakru, Kastavu in Grobniku.

Viri in metode: Analiza temelji na podatkih, zbranih v registru umrlih v Državnem arhivu na Reki. Vzroki smrti so bili sistematizirani po veljavni Mednarodni statistični klasifikaciji bolezni (MKB-10).

Rezultati: Ugotovili so, da od 10.168 umrlih, razdeljenih v sedem starostnih skupin, predstavljajo otroci in mladostniki do 19. leta 63,4 % vseh umrlih. Od celotne umrljivosti dojenčkov in otrok predstavlja skupina otrok, mlajših od enega leta starosti, 25,2 % umrljivosti, otroci od 1–3 let, 24,0 %, otroci, stari 4–6 let, 6,9 %, ter otroci, stari 7–19 let 7,3 % umrljivosti Najpogostejši vzroki smrti so bili analizirani v dveh skupinah otrok (0–6 in 7–19 let). V obeh skupinah so bili najpogostejši vzroki smrti večinoma bolezni, ki so opisane v poglavju 18 po MKB-10, torej simptomi, znaki in nenormalni klinični izvidi, ki se pojavljajo pogosteje med predšolskimi kot šolskimi otroki (62,7 % vs. 37,6 %). Tem sledijo nekatere infekcijske in parazitarne bolezni, ki so manj pogoste pri mlajši skupini, in bistveno pogostejše v starejši skupini (14,6 % vs. 35,2 %).

Bolezni dihal so skoraj enako zastopane med obema skupinama (10,5 % vs. 11,6 %).

Sklep: Z uporabo prilagojene deskriptivno-analitične metode raziskave je iz starih mrliških knjig možno rekonstruirati osnovne kazalnike umrljivosti.

Introduction

In historical demographic research, the most interesting subjects are the traditional birth and mortality rates. However, since we are faced with the problem of missing vital objective statistical data that are available in today's research of that field from the very beginning, as is the case with any research attempt, we are forced to use other sources and apply modified methods of research and statistics processing.

Of the small number of possible sources, the most acceptable are the preserved registries of births, marriages and deaths, as well as registries of Confirmations and *Libri Status Animarum* (family registers) that were gradually and mandatorily started to be kept in parishes after the Council of Trent (1545–1563)[1]. In Croatia, especially in its western part, this practice very soon took root although in certain towns such as Krk, Osor, Cres and Rijeka such books were kept voluntarily by priests at an earlier date during the middle of the 16th century, even before the Church made it mandatory.

For a long time, the records contained within those books were the most important and the only (somewhat) reliable source of data on demographic and other types of change in the towns in question, so it is understandable why they can be a valuable primary source for different types of research, especially interdisciplinary ones. The same can be said for research initiated from the standpoint of the history of medicine in the broadest sense of the word[2].

Concerning the 268 such books from the 49 associated parish books kept in the State Archives in Rijeka, it should be borne in mind that the majority is yet to be researched, especially in terms of the history of medicine and demographics. To be honest, a couple of individual papers on general demographic trends in Rijeka and its adjacent area have already been published[3-5] as well as a couple of shorter partial studies on birth rate[6] and general mortality rate.[7-9]

Adding to that research, the aim of this paper is to process and present some of the new data from the said registries in order to present mortality rates and causes of death of children and adolescents in certain age, or rather, development groups under 19 years of age in the Kvarner region in the selected years of the 19th century.

Sources and research methods

The research is oriented toward data processing of a sample of 10,168 deceased during the 19th century in four towns in the Kvarner region. By processing the starting years of each decade, 5,560 or rather 1,522 deceased were registered in the coastal and fairly large port towns of Rijeka and Bakar, and 2,431 or rather 655 deceased were registered in the hinterland, the rural area, in Kastav and Grobnik. Such a selection ensured an even coverage of the geographical area and upheld the chronological continuity so the acquired sample of practically 10 per cent of the total mortality can be considered respectable.

We used registries of deaths of four parishes, now kept at the State Archives in Rijeka and the Archives of the Parish of the Assumption (of the Virgin Mary), which covered nearly all of the population of Rijeka at the time. Original registries included the following town parishes: Rijeka, Bakar, Kastav and Grobnik (the list of original items from the archives can be found in the Appendix).

The archival material had been viewed, for the most part, in its original form and then photographed and saved in a digital form, after which it was viewed on a PC. All the acquired data were entered directly into tables prepared in Microsoft Excel on the

computer, which subsequently made it possible to sort and statistically process them and to present the results in the form of tables and charts.

Of all the relevant data for this purpose, gender, age and causes of death have been processed and systematically sorted into groups according to the current International Statistical Classification of Diseases and Related Health Problems (ICD-10) (10).

The collected data were processed using descriptive statistics and modified standard demographic methods. We used the chi--square test wherever possible, and the p--value was set at < 0.05.

Results

Mortality in age groups according to gender

Table 1 clearly shows the number of deceased according to gender and age groups. With the intention of empirically confirming the high share of younger population in the overall mortality rate, a total of 10,168 deceased from the ten selected years were sorted according to gender into seven groups, with each representing a segment of the developmental age. Stillborn children and infants deceased during the first month of life represent perinatal mortality, followed by infants deceased between one and eleven months of age, toddlers (one to three years of age), pre-schoolers (four to six years of age), school children (seven to twelve years of age) and children in puberty and adolescents (thirteen to nineteen years of age). The ones who were over 20 when they died have been put into a separate group for adults. The eighth group for the deceased of an unknown age was added for statistical reasons.

On the whole, there was a slightly higher number of deceased males versus females (50.2 % vs. 49.8 %). More boys than girls die in the period up to the first year of life, and then it is the other way around between the first and the third year of life, with more boys dying between the fourth and twelfth year, and from 13 on there is a slightly bigger share of women. However, a statistically reliable difference ($p < 0.01$) has only been confirmed for the perinatal period.

The table reveals that those deceased in their developmental age, i.e. until the 19th year of age, represent 63.3 % of all deceased, or conversely, that adults represent the remaining 36.0 %, and that 0.7 % are of unknown age.

Regarding the perinatal mortality, it should be kept in mind that in a parallel research of the years in question there were 10,637 births and that 1,016 stillborn children or children deceased in the first month of life revealed in this paper correspond to a 95.5 ‰ perinatal mortality rate.

If we add infants, i.e. children under one year of age, to the deceased new-born children, it turns out that 2,554 of them represented 25.2 % of the overall mortality rate; when correlated with 10,637 births, this means that almost one in four new-born children did not live long enough to see their first birthday.

The share of the next developmental stage (small children between one and three years of age) in the overall mortality was 24.0 %. If we add further 6.9 %, which was the share of pre-schoolers in the overall mortality, we get 5,693 children, meaning that 56.0 % of children did not reach the age required for admission into the first grade of elementary school.

School children, children in puberty and adolescents, i.e. children between ages of seven and nineteen comprise 7.3 % of the ovreall mortality.

When we sum up the number of deaths in the developmental age, it turns out that only 6,435 children, or 63.3 % of 10,168 births reached adulthood.

Additional calculation of the average age of deceased from individual groups shows that the average age of deceased in the perinatal period was 7.0 ± 6.6 days, and in the infant period 5.6 ± 3.2 months. In the group of deceased between one and three years of age the average age was 1.7 ± 0.8 years, and in the group of deceased between four and six years 4.8 ± 0.8 years. Among the deceased school children, the average age was 8.8 ± 1.7 years, and in the children in puberty and adolescents 16.1 ± 1.9 years. Among the

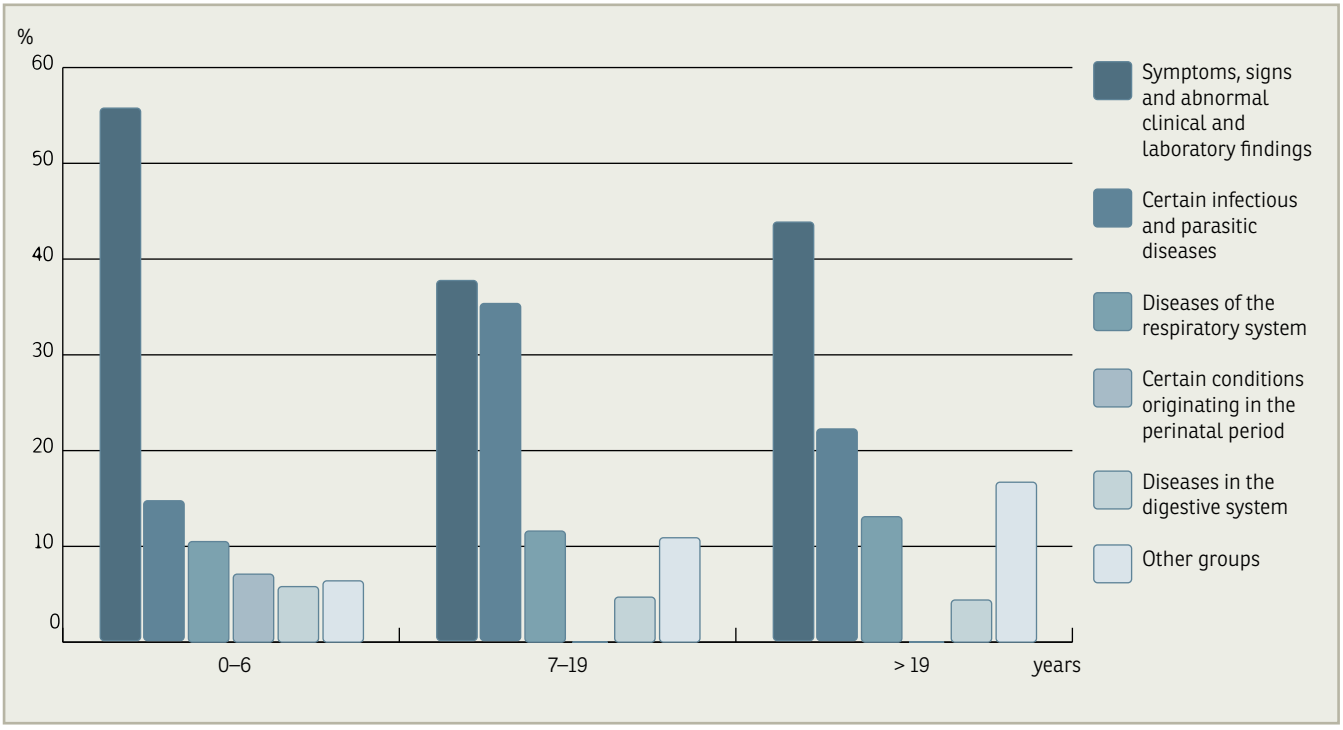

Figure 1: Frequency comparison of the most common disease groups as the cause of death among pre-schoolers, school children, adolescents and adults

deceased who were older than 20 years the average age was 55.3 ± 20.3 years. The differences according to gender in all groups are negligible.

Frequency comparison of the most common disease groups as the cause of death among pre-schoolers, school children, adolescents and adults

In part two of the paper all subjects have been sorted into three age groups (pre--schoolers, school children, adolescents and adults) and groups divided by cause of death have been sorted according to frequency, as shown in Figure 1.

Pre-schoolers had a significantly higher number of deaths (55.6 %) described in *chapter* XVIII according to ICD-10–Symptoms, signs and abnormal clinical findings and, naturally, in *chapter* XVI–Certain conditions originating in the perinatal period, which account for 7.1 % of deaths. On the other hand, a significantly smaller percentage of deaths compared with the average were caused by what is described in *chapter* I–Infectious and parasitic diseases 5 %, *chapter* X–Diseases of the respiratory system 10.5 % and other disease groups 6.4 % ($p < 0.01–0.05$).

Leading causes of death among school children and adolescents can be found in *chapter* XVIII, but its 37.6 % share in mortality was significantly smaller than the average. Immediately following that, with a 35.2 % share, are causes of death described in *chapter* I, which had a significantly higher occurrence in this particular group than in other groups ($p < 0.01$).

In the adult group, the leading causes of death were also the ones contained in *chapter* XVIII, but with a 43.7 % share this did not deviate from the expected average. Immediately after that come cha*pters* I and X with 22.1 % and 13.1 %, respectively, which was significantly higher than the average. This age group also had a significantly higher number of diagnoses contained in other disease groups, or 16.7 % ($p < 0.01$).

Taken altogether, symptomatic diseases, or rather descriptive and non-clinically defined diseases were prevalent causes of death in small children. In older age groups this ratio gradually changed toward a rise in clinically defined diagnoses.

Discussion

Generally speaking, child mortality in the general population ranged between 100–200 ‰[11-14] in most European cities during the nineteenth century, and the situation was similar in the USA[15] and Japan[16]. The current studies treat the mortality of children in several ways. They show the circumstances in particular cities,[17-19] compare urban with rural regions,[20-21] compare groups of children in different religious communities,[22] and highlight the negative effects of migration on illness and dying of children.[23] However, they also record the preventive attempts to improve health care for children and the positive steps in reducing child mortality.[24-25]

Individual cases of recording causes of death in certain parishes in Croatia started at the turn of the 18th into the 19th century, coinciding with the rest of the Austrian Empire. As time went by, parish priests who took these records broadened their knowledge and adopted the instructions issued by Church and secular authorities as well as the experiences of their predecessors. Their diagnostic scope would then include dozens of descriptions, mostly of symptoms and undefined conditions, which they use as they saw fit. Given the historical context, this is not surprising.

Since local circumstances concerning public health, except in certain segments, and only in Rijeka as a metropolitan area experiencing fast development, did not significantly improve during the century, we can use data published in the second half, or rather from the end of the 19th century, for comparison. So, for example, Dr Antonio Felice Giacich, a physician from Rijeka, in an unusually valuable booklet published in 1883 reported data on birth and mortality rates for children in Europe of the time, the Habsburg Monarchy, Croatian territories and the Kvarner region. The data shows that in Norway infants had a 16 % share in the overall mortality and in Hungary 28 %, and children under the age of five between 31 and 50 %. In the towns of Kvarner, the share of infants in overall mortality was 24 % for Bakar and up to 33 % for Rijeka,

Table 1: Mortality according to gender and age groups (N = 10,168)

Gender of the deceased	Age of the deceased														Total	
	Months				*Years*								*Unknown age*			
	< 1		1–11		1–3		4–6		7–12		13–19		≥ 20			
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n
Males	569**	11.4	804*	15.7	1,190	23.3	359	7.0	208	4.7	154	3.0	1,788	35,0	32	0.6	5,106
Females	447**	8.8	734	14.5	1,251	24.7	339	6.7	196	3.9	184*	3.6	1,872**	37,0	41	0.8	5,062
Total	1,016	10.0	1,538	15.1	2,441	24.0	698	6.9	404	4.0	338	3.3	3,660	36,0	73	0.7	10,168

*$p < 0.05$, ** $p < 0.01$

and children under five between 40 % and 56 %,[26] which was also confirmed in this research. However, because of the inconsistencies in registration (under-registration), especially in smaller communities, it should not be taken for granted.[27]

Interesting official reports from the then eight counties of Croatia-Slavonia can be used for comparison. These data clearly show demographic and public health problems of a certain area at a certain time. For example, at the end of the 19th century in Modruš-Rijeka County every year between 325 to 796 children contracted diphtheria with a mortality rate of 35 %. Smallpox occurred in between 90 and 296 cases with a fatal outcome in about one fourth of all the cases. Measles epidemics were generally mild, but there were also ones with a 15 % mortality rate. Typhoid fever varied between 20 and 270 cases with 1 % to 30 % of fatal outcomes. Dysentery occurred sporadically, and in up to 270 cases with 56 % of fatal outcomes. With regards to the total number of inhabitants, yearly mortality was around 3 %. In the overall mortality, infectious diseases had a share of 4.4 % to 8.4 %, violent deaths about 1.4 %, while the remaining 90 % to 93 % of the cases were so-called *deaths of natural causes and other diseases*.[28]

Unfortunately, even the official statistical data were not entirely reliable, especially when it comes to vital statistics because of the sources of the data, i.e. registries of deaths which contain causes of death determined by persons with no medical education and with a minimal share of qualified personnel in the form of physicians and midwives.

Among the Slovenians, mostly in the Central part of the country (Carniola, Ljubljana) more studies on vital statistics of the 19th and the 20th century were done than in Rijeka and the Littoral. It would be interesting to make some comparisons about children mortality in the future.[29-34]

Conclusion

To summarise, the obtained results of the mortality rate research in certain child and adolescent age groups in four towns of Western Croatia during the 19th century are consistent with the well-known traditional morbidity and mortality rates, which have not changed much for centuries, apart from certain larger epidemics.

The attempt to use adjusted descriptive analytical methods in order to validly reconstruct basic indicators of mortality in the past using registries of deaths to upgrade the knowledge about a part of demographic indicators in the regional history and the history of a wider area, can thus be considered this paper's success.

Appendix

Original archive material: Registries of Births and Deaths in Rijeka, Bakar, Kastav and Grobnik

Liber Mortuorum Parvulorum, 1766–1813. Rijeka: State Archive. Sign. 275 (K4) 475.

Protocollum Sepultorum, 1789–1807. Rijeka: State Archive. Sign. 275 (K4) 477.

Matricola Mortuorum, 1815–1854. Rijeka: State Archive. Sign. 275 (K4) 478.

Matricula Mortuorum, 1828–1841. Tom. IV. Rijeka: State Archive. Sign. 275 (K4) 479.

Morti. 1849–1855. Tomo VII. Rijeka: State Archive. Sign. 275 (K4) 481.

Matricula Mortuorum, 1860–1863. Tomus IX. Rijeka: State Archive. Sign. 275 (K4) 483

Matricula Mortuorum, 1864–1870, Tom. X. Rijeka: State Archive. Sign. 275 (K4) 484.

Matricula Mortuorum. Tomus XI., 1870–1877. Rijeka: State Archive. Sign. 275 (K4) 485

Tomo Morti dal 1877–1884. Rijeka: State Archive. Sign. 275 (K4) 486. 19.

14⁰ Tomo Morti dal 1889–1892. Rijeka: State Archive. Sign. 275 (K4) 488.

Morti, 1766–1815. Rijeka: Archive of the Parish of the Assumption (of the Virgin Mary).

Liber Mortuorum, 1773–1815. Rijeka: State Archive. Sign. 275 (K4) 15.

Liber Defunctorum 1815–1857. Rijeka: State Archive. Sign. 275 (K4) 16.

Matica mrtvih 1858–1891. T. III. Rijeka: State Archive. Sign. 275(K4) 18.

Liber mortuorum, 1774–1818. Rijeka: State Archive .Sign. 275 (K4) 209.

Liber mortuorum, 1819–1882. Rijeka: State Archive. Sign. 275 (K4) 210.
Liber mortuorum,1883 -. Rijeka: State Archive . Sign. 275 (K4) 211.
Protocolum Mortuorum II. in Parochia Grobnik, 1795–1815. Rijeka: State Archive. Sign. 275 (K4) 168.
Liber III. Defunctorum. Anno 1815 usque 1857. Rijeka: State Archive. Sign. 275 (K4) 169.
Matricula Defunctorum Ecclesiae Parochialis in Grobnik, 1858–1902. Rijeka: State Archive. Sign. 275 (K4) 170.

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