

Specificity of structure of complete mortality of individuals buried in the cemetery at the hospital and the church of Holy Spirit as compared to other cemeteries in Lublin from the 15th to 18th century

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ABSTRACT: The goal of the study is to analyse and evaluate a complete mortality of individuals buried in the cemetery at the hospital and the church of Holy Spirit in Lublin. The main question is whether and to what extent the results of research into the subject will reflect the physical condition and the low social status of individuals from the Holy Spirit hospital-poorhouse. The comparison includes burials of Lublin burghers, church dignitaries and religious brothers and sisters of the Cathedral and Pobrygidkowski Church. This study discusses such issues as the share of children, juveniles and adults, the sex ratio, distribution of age and sex of adult and the average life span for men and women. The differences in the cumulative distributions of age frequency (d_x) for the compared cemeteries were assessed using the Kolmogorov-Smirnov test. To evaluate the differences in average life span of adults the Student's t-test was used after verification of the equality of variance by using the F-Snedecor test. The cemetery at the hospital and the church of Holy Spirit clearly stands out among comparable sites, not only in the way of burying the dead. The study of individuals buried in the Holy Spirit cemetery showed: the largest share of children and juveniles, as well as small percentage of individuals over the age of 50 years, which resulted from a low average life span for both men and women (significant differences). The comparison of the cumulative relative numbers (d_x) from the interval of 10–15 year shows this percentage to be the highest and remain so up to the last interval, i.e. 60 years and more (significant differences for group 15–20 years – compared with the Cathedral and the 30–40 years – compared with the Pobrygidkowski Church). A poor physical condition, clearly related with low social status, is indicated by a variety of illnesses, injuries and malformations which were recorded in a large number of the skeletal remains, i.e. more than 70% of individuals.

KEY WORDS: medieval hospital – poorhouse, Lublin crypts and churchyard cemeteries, complete mortality in age and sex groups, average life span

Introduction

In recent years, there has been a significant intensification of archaeological research of crypts and churchyard cemeteries in Lublin used since the Middle Ages. It was carried out with a direct participation of anthropologists. Three such sites were comprehensively explored in the Downtown: the cemetery at the Hospital and Church of Holy Spirit, the Cathedral crypts and the cemetery and crypts of Pobrygidkowski Church (Tkaczyk et al. 2010; Niedźwiadek 2002, 2011).

Establishment of the Holy Spirit complex, which consists of a hospital, a church and a cemetery dates back to the year 1419. It was in use until the end of the seventeenth century, and terminated its activity in the eighteenth century.

The term hospital, *hospitale*, *xenodochium* or *noscominum* as used in the Middle Ages and in Early Modern times denoted an institution which bears little resemblance to a hospital as we know it today. In fact, it was a shelter for the poor, the sick, children – waifs and for other people who needed help. Only in a few cases did it also deal with the treatment of the sick (Litak 1998, p. 13). Poorhouses were established as a sign of piety and fidelity to Christian principles and virtues commanding “feed the hungry, clothe the naked, shelter the homeless, take care of the sick” (Ogrodowska 2012, p. 45).

Historical sources distinguish two groups of hospital inmates: the first were residents, and the other were boarders (Prucnal 2005, p. 91). Apart from them, buried in the churchyard cemetery were also people of unknown identity who

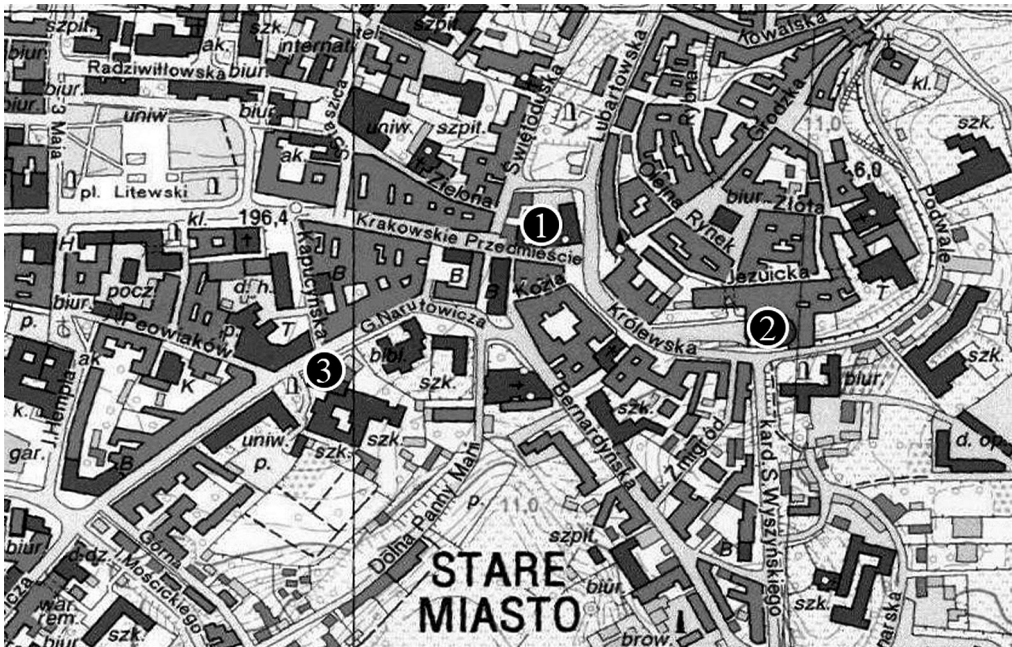


Fig. 1. Site locations: 1 – Holy Spirit, 2 – Cathedral, 3 – Pobrygidkowski Church (map: geoportal.gov.pl; graphic design: T. Myśliwiec)

were sometimes found dead in the city (Prucnal 2005, p. 147).

It should be noted that each of these groups is a part of the local community of a specific nature and does not represent it as a whole. The locations of the sites included in the study are shown in Figure 1.

The aim of the study is to analyze and evaluate the mortality, by the groups of age and sex of individuals buried in the cemetery at the Hospital and Church of Holy Spirit (further in the text and in the figures – Holy Spirit). Obtained results were compared with the data from the Cathedral crypts (Lublin Cathedral of St. John the Baptist and St. John the Evangelist, in the text and figures – Cathedral) and Pobrygidkowski Church (Church of the Assumption of Our Lady of Victory, in the text and figures – Pobrygidkowski Church). All sites have a similar chronology. Most of the graves are dated to the 15th–18th century.

The paper discusses such issues as the share of burials of children, juveniles and adults, the sex ratio, share of adults in particular classes of age (separately for both sex groups), and the average life span for men and women. It also presents preliminary results concerning the nature and frequency of pathological changes in groups of age and sex.

The results obtained during anthropological studies were confronted with the outcomes of historical and archaeological research.

Material and methods

The bone material of 170 individuals included in elaboration comes from the excavations at the old cemetery at the Hospital and Church of Holy Spirit. Comparative studies include the remains

of 87 individuals from the Cathedral crypts, and 77 individuals from the Pobrygidkowski Church (Kozak-Zychman 2002, 2002a; Kozak-Zychman, Trzaska 2012; Kozak-Zychman et al. 2012).

Many skeletons discovered in the Holy Spirit cemetery were incomplete, with individual bones generally well preserved. The main reason of this may be the practice of embedding newer graves into older ones. Limited burial space resulted in the widespread practice of plowing cemeteries over in order to make room for further burials (Florek 2012, p. 42; Niedźwiadek 2012a, p. 89).

From historical sources and archaeological research, it is known that buried in the Cathedral crypts were primarily church dignitaries and religious brothers as well as Lublin burghers. The excavated part of crypts dates back to the 16th–18th century (Niedźwiadek 2002; Kozak-Zychman 2004). The condition of the skeletal remains were predominantly very poor, mainly because of earlier intrusions (search) and devastation of the burials.

In the church and monastery complex of Bridgettines of the Assumption of Our Lady of Victory, as in the Cathedral, were buried members of the clergy, religious sisters and brothers and Lublin burghers (Wadowski 2004, p. 407–15; Marczewski 2011, pp. 13–18). Some were buried in coffins within the cemetery, inside and outside the walls of the church. Another form was burial in the crypts. The vast majority dates back to the 15th–18th century (Niedźwiadek 2012, p. 65). Also in this case, the majority of skeletal remains in the crypts were relocated and mingled. This is supposed to have occurred during the earlier works carried out successively in order to prepare room for new burials.

Age of adults was determined primarily on the basis of the degree of obliteration

ration of major cranial sutures, changes in dentition, i.e. grade of dental micro wear attrition and changes in morphology of the surface of pubic symphysis (Boothwell 1981; Szilvássy 1988; Piontek 1999). In most cases, it was possible to determine the age in classes of 5 or 10 years, and approximately in 10% of cases in larger classes. For individuals who died at the age of juvenile (*Iuvenis*), the main criterion was the severity of skeletal ossification, including merging of epiphysis with the shafts of long bones (Piontek 1999; Scheuer, Black 2000). In the case of children the basis was dental age and length of shafts of long bones, the size of ilium, pubis, ischium, clavícula and scapula (Ubelaker 1989; Florkowski, Kozłowski 1994). Range of age classes from 1 to 2 years. The sex of the deceased (excluding children) was determined primarily on the basis of morphology of the pelvis, descriptive and metric features of the skull, and massiveness of other bones of postcranial skeleton (Martin, Saller 1957, Adsádi, Nemeskéri 1970; Piontek 1999; White, Folkens 2005).

Children and juveniles (up to 20 year, i.e. *Infans* and *Iuvenis*) were grouped into four 5-year classes of age (0–5, 5–10, 10,15 and 15–20), and others in five 10-years classes (20–30,30–40, 40–50, 50–60, 60–x). The upper limit of the last class is the age of 70.

Due to the occasionally significant percentage of individuals of borderline category of age in the tested series (e.g. *Infans II/Iuvenis*) and adults, the structure of age and sex was analyzed after their prior addition (Piontek 1977, p. 40). This procedure of the addition, equable (for individuals from borderline of two age classes) or proportional (according to the empirical distribution for adults) has been made for the whole set of skel-

etal remains from the Holy Spirit cemetery and similarly in case of both sets included in the comparative study. Abandonment of the procedure of addition would result in a shift in proportions – children: juvenile: adults.

On the basis of individual determinations of age (and compilations of data in defined groups) a table of mortality (also called the table of life expectancy) was made for analyzed groups from the Holy Spirit cemetery using parameters and method of calculation described by many authors, e.g. Sobczyk (1982, 2006), Czub (1985) or Piasecki (1990).

The individual determinations of age were also used to calculate the average life span of men and women buried in the studied places of burial (here as arithmetic mean). For the model of stagnant population, average age of the dead is equal to average life span (Piasecki 1990, p. 14).

The observed differences in the cumulative (from age class 0–5 to class 60–x) percentage abundance (d_x) for compared sites was assessed using the Kolmogorov-Smirnov test (Fletcher, Lock 1995, pp. 117–18), assuming 5% risk of error, i.e. the 95% confidence level. Comparisons and assessments were made in pairs: cemetery of Holy Spirit – Cathedral, cemetery of Holy Spirit – Pobrygidkowski Church and Cathedral – Pobrygidkowski Church. The largest differences in the cumulative relative number (D) were the basis for the calculations, the results of which were compared with the critical values in the relevant tables, taking into account the size of the compared series.

To evaluate the differences in the average life span of adults, the Student's t-test was used, after verification of the equality of variance, by using the F-Snedecor test (Sobczyk 1982, p.132; 2006;

Góralski 1987, p. 190). Also in both cases the 5% risk of error was adopted.

Pathological changes were evaluated mainly macroscopically during the detailed examination of skeletal remains from individual graves. They were identified on the basis of characteristic of morphological features changed by the process of bone disease, and were differentiated on the basis of diagnostic features described in numerous works (e.g. Gładkowska-Rzeczycka 1976; 1989; Piekarz, Piontek 1999; Roberts, Manchester 1999; Ortner 2003). In some cases radiological images of bones were made (RTG). Some calculations were made to determine the structure of diseases, i.e. percentage of distinguished

types of pathology in relation to total amount of pathological changes, and number of skeletons with pathological changes in relation to its total number in groups of age and sex (Gładkowska-Rzeczycka 2010). This paper presents the overall results of the research. Details will be the subject of separate studies.

Results

Distribution by age and sex of individuals buried in the cemetery at the hospital and church of Holy Spirit is shown in Table 1.

The particular attention is paid to, in the case of Holy Spirit cemetery, almost twice as large participation of older children (10–15 years) compared with the

Table 1. The structure of age and sex of the population buried in the cemetery at the Hospital and Church of Holy Spirit

Age (years)		Males		Females		Undetermined sex		Total	
		N	%	N	%	N	%	N	%
Infans I i II	0–5	–	–	–	–	14	22.6	14	8.2
	5–10	–	–	–	–	9	14.5	9	5.3
	10–15	–	–	–	–	26	41.9	26	15.3
<i>Infans II/Iuvenis</i>	14–16	–	–	–	–	1	1.6	1	0.6
<i>Iuvenis</i>	15–20	3	4.8	2	4.4	9	14.5	14	8.2
<i>Iuvenis/Adultus</i>	18–22	1	1.5	–	–	1	1.6	2	1.2
<i>Adultus</i>	20–30	14	22.2	22	48.9	–	–	36	21.2
<i>Maturus</i>	30–40	23	36.5	7	15.6	–	–	30	17.6
	35–45	2	3.2	–	–	–	–	2	1.2
	40–50	9	14.3	4	8.9	–	–	13	7.6
	50–60	2	3.2	1	2.2	–	–	3	1.8
<i>Senilis (60-x)</i>	60–x	3	4.8	–	–	–	–	3	1.8
Adults	higher than 20 years	6	9.5	9	20.0	2	3.2	17	10.0
Total		63	100.0	45	100.0	62	100.0	170	100.0

youngest ones (0–5 years). In the group of adults, the largest percentage are the individuals who died between 20 and 30 years of age, i.e. in the category of *Adultus*. A large share is also taken by the first ten-year class of the category of *Maturus* (30–40 years). The least represented was the category of *Senilis*, and in the last ten-year class (50–60 years) of the category of *Maturus* (Fig. 2). For three distinguished groups of age, i.e. children (0–15 years), juveniles (15–20 years) and adults (>20 years), the share in the studied cemetery can be approximated by the proportion of 2,5 : 1 : 5.

In the case of the Cathedral crypts, attention should be drawn to a low, about 15% share of the burials of children (*Infans I* and *Infans II*) and the high (the highest) percentage of the category of *Adultus* – 39.0%. There are also much more – than at the Holy Spirit cemetery – individuals at the age *Senilis* – 13%.

In relation to burials at the Pabrygidkowski Church, a note should be taken of the high share of children *Infans I* (more than 25%), and the absence of juveniles,

i.e. *Juvenis*. One of the reasons for that may be the failure to include all the materials in the study. Some of them remained in one of the excavated crypts, which was closed in the course of archaeological research as it threatened to collapse.

In a summary comparison (Fig. 3) the Pobrygidkowski Church stands out with already the mentioned high share of children. While in the cases of the Holy Spirit cemetery as well as the Cathedral, which is interesting and intriguing, the largest percentage is that of the *Adultus* category.

Among the 108 individuals from the Holy Spirit cemetery, for whom the sex was determined (Table 1), 63 were men (58.3%) and 45 women – 41.7%.

In the crypts of the Cathedral, there were more graves of men (69.6%) than those of women (30.4%). The proportion of men was also slightly higher in the Holy Spirit cemetery (58.3%).

The sex ratio for the dead from Pobrygidkowski Church was very similar to that for the Cathedral and amounted to 67.8% and 32.2%, respectively.

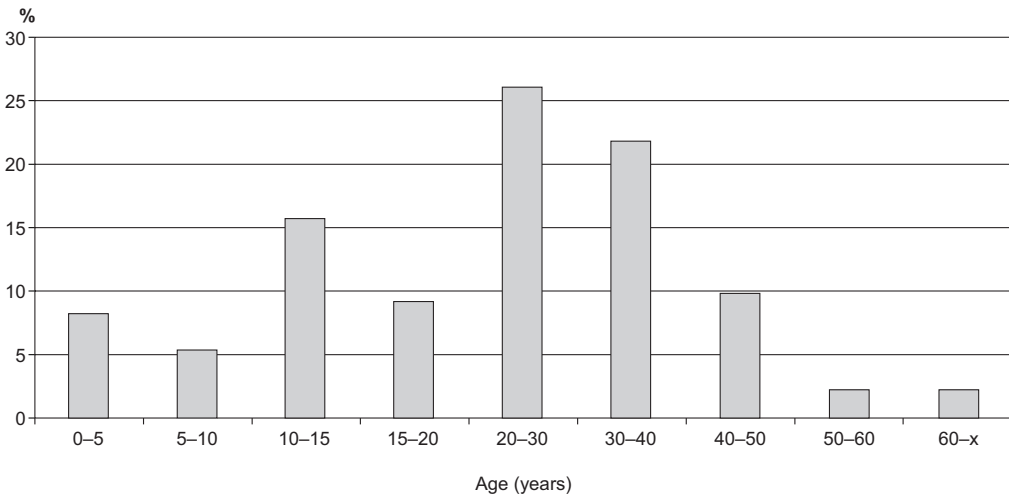


Fig. 2. Complete mortality by age groups at the cemetery at the Hospital and Church of Holy Spirit

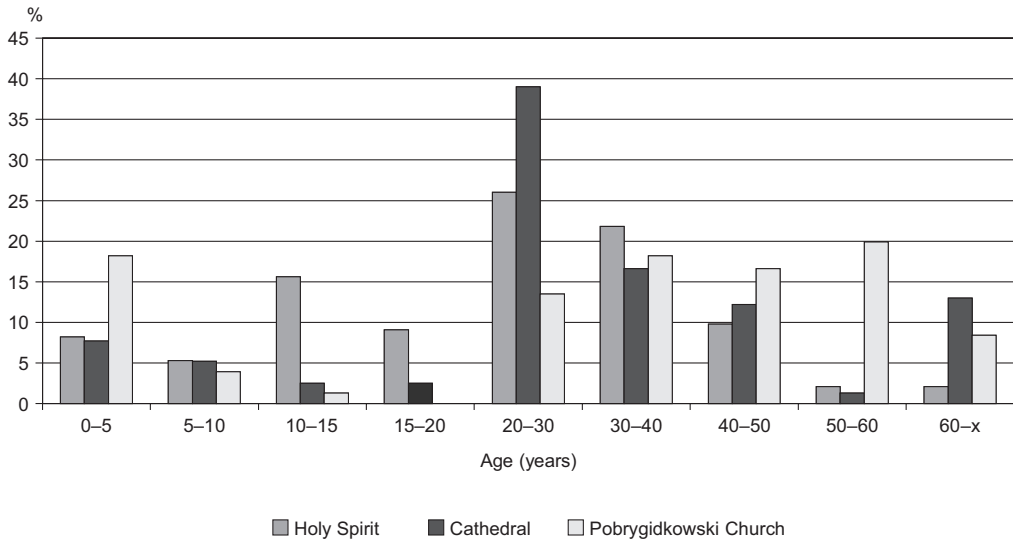


Fig. 3. The differentiation of age of population buried in the compared sites

Figure 4 presents the percentage of burials of men and women in the studied sites.

In the Cathedral, for both men and women, in the category of *Adultus* (20–30 years: 41.8% and 60.0%, respectively) accounted for the highest proportion of the burial community. In the group of women, a fairly high proportion – up to 20% – were also found to have died at old age, category *Senilis* (60 and more years). Besides, a large share – up to 25% – were men in the first ten-year class of the category of *Maturus* (30–40 years).

In the case of women buried in the Pobrygidkowski Church, the largest percentage – like in the Holy Spirit cemetery and the Cathedral – belonged to the category of *Adultus* (29.4%), and in the case of men, the category of *Maturus* (24.2% for each ten-year class).

Calculated on the basis of data from Table 1, the life span of men and women buried in the Holy Spirit cemetery shows a distinct differentiation. For individuals over 15 years old, the average age

for men is a little over 36 years (36.3), and for women less than 33 years (32.7). Taking into account only adults (above 20 years of age), this values are slightly higher and amount to more than 37 (37.5) and over 33 (33.4), respectively.

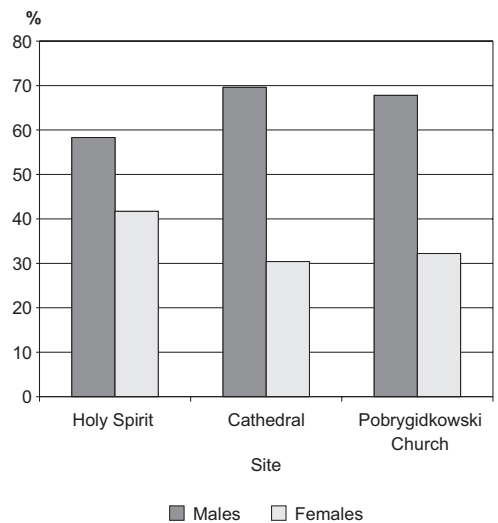


Fig. 4. Sex ration of population buried in the compared sites

Table 2. Table of life expectancy (table of mortality) of individuals buried at the Holy Spirit cemetery

Age (years)	D_x	d_x	l_x	q_x	L_x	T_x	e_x°
0-5	14.0	8.2	100.0	0.082	479.5	2520.6	25.2
5-10	9.0	5.3	91.8	0.058	445.8	2041.1	22.2
10-15	26.5	15.6	86.5	0.180	393.5	1595.3	18.4
15-20	15.5	9.1	70.9	0.128	391.8	1201.8	17.0
20-30	44.1	26.0	61.8	0.421	488.0	870.0	14.1
30-40	37.0	21.8	35.8	0.609	249.0	382.0	10.7
40-50	16.7	9.8	14.0	0.700	91.0	133.0	9.5
50-60	3.6	2.1	4.2	0.500	31.5	42.0	10.0
60-x	3.6	2.1	2.1	1.000	10.5	10.5	5.0

Table 3. Average life span of men and women from the studied sites

Site	Males				Females				$\bar{x}M - \bar{x}F$	
	>15 years		>20 years		>15 years		>20 years		>15	>20
	N	\bar{x}	N	\bar{x}	N	\bar{x}	N	\bar{x}	years	years
Holy Spirit	63	36.3	59	37.5	45	32.7	43	33.4	3.6	4.1
Archicathedral	-	-	32	42.2	-	-	14	41.8	-	0.4
Pobrygidkowski Church	-	-	38	46.4	-	-	18	40.0	-	6.4

Table 3 compares the average age of the diseased by groups of. It is illustrated in Figure 5.

In the crypts of the Cathedral, sex was not specified for the individuals in the category of *Iuvenis*. In the case of the

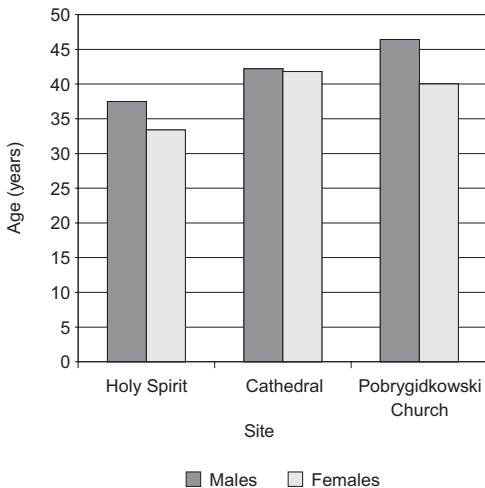


Fig. 5. Average life span of adult population buried in the compared sites

Pobrygidkowski Church, the burials of juveniles were not recorded.

Only in the case of individuals above 20 years of age, did the differences between the averages for men and women from the Holy Spirit cemetery prove to be statistically significant.

At this stage of the study, the difference between the average for men and women (over 20 years of age) buried in the Cathedral and Pobrygidkowski Church can be considered as random (at 5% risk of error). Without a doubt, small number of samples influenced the results obtained.

Statistically significant, however, were the differences between the average life span for men in the comparisons: Holy Spirit-Cathedral and Holy Spirit-Pobrygidkowski Church.

In the case of differences between average values of average women's life span, statistically significant results were obtained for the same pairs of sites. It can be considered as a further confirmation of the different status of the Holy Spirit cemetery.

On the basis of the table of mortality (Table 2) it can be deduced, that the life expectancy of newborn (e_0^0) for the group from the Holy Spirit cemetery is more than 25 years, and life expectancy of adults (e_{20}^0) – is about 14 years, which means that life expectancy, regardless of sex, is slightly more than 34 years. However, the special nature of the studied cemetery, where temporary patients and residents of the hospital-shelter were buried, should be kept in mind.

For the Cathedral the value e_0^0 is more than 31 years (31.5), while e_{20}^0 – less than 17 years (16.8). In the case of the Pobrygidkowski Church, e_0^0 is 34.5, while e_{20}^0 almost 24 years (23.9). Also with regard to those burial places, it should be remembered that, apart of Lublin burghers, church dignitaries, and monks and nuns were buried there.

In the summary comparison of collective cumulative percentages, as shown in Figure 6, the cemetery of Holy Spirit

clearly stands out with the *Infans II* level representing the highest percentage up to the *Senilis*.

In the comparison of the pair: Holy Spirit-Cathedral – the largest difference of the cumulative relative abundances (d_x) refers to the category *Iuvenis* and amounts to 20.3. It means that the Holy Spirit cemetery holds over 20% more individuals who died younger than 20 years of age. Observed differences were statistically significant.

In the case of the Holy Spirit cemetery and Pobrygidkowski Church, the largest difference (30.9) was in the first ten-year class of the *Maturus* age category. There were more individuals at the Holy Spirit cemetery who died before their forties. Differences were significant statistically.

In the comparison: Cathedral-Pobrygidkowski Church the largest observed difference (20.0) was in the category of *Adultus*. However, it turned out to be statistically insignificant.

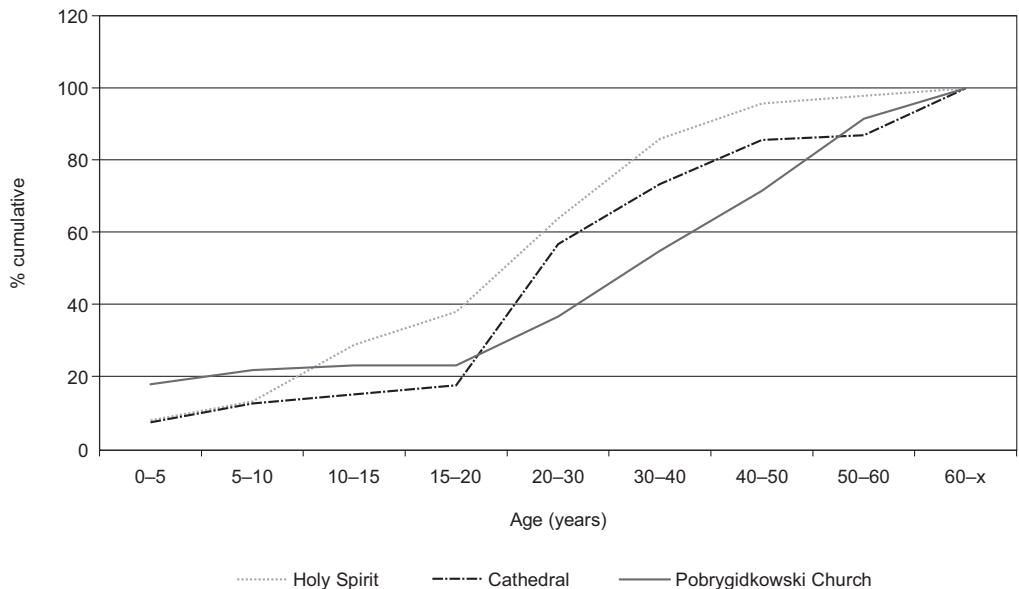


Fig. 6. Cumulative percentages of particular age categories (d_x) in the compared sites

Among the pathological changes, that were recorded in more than 70% of skeletons from the Holy Spirit cemetery, the most frequently observed were the developmental defects (including i.a. *canalis sacralis apertus*, *spina bifida*, Perthes disease) – nearly 40%. Less numerous were inflammatory changes, most of which were nonspecific (fistulas bounded with chewing organ or *periostitis* changes in the long bones) – slightly more than 20%. Degenerative and deformative changes related mainly to the spine (vertebral body flattening, osteophytes, Schmorl's nodes) and peripheral joints, and accounted for over 16%, and injuries (mainly fractures marks on the bones of forearms and lower limbs) – approximately 13%. Other diseases were from the group of metabolic disorders (e.g. *cribra orbitalia*) and neoplasms (tumors and tumor-like lesions).

Analysis by age groups showed that the changes occurred more than three times as often in the adults as in children and juveniles. In the case of adults there were frequent degenerative and deformative diseases and injuries (over 37%). While in the case of children and juveniles, diseases of metabolic nature (almost 50%).

In men, besides developmental changes (over 32%), a significant percentage exhibited degenerative and deformative changes (approximately 25%), inflammatory diseases (approximately 18%) and injuries (nearly 16%), while in women – next to developmental changes (almost 40%) – inflammatory diseases (approximately 19%) and injuries (approximately 17%).

Discussion

The cemetery at the hospital and the church of Holy Spirit clearly differs from the other similar-dated cemeteries in

Lublin, i.e. the Cathedral crypts and the crypts and cemetery of Pobrygidkowski Church. However, as compared to other medieval cemeteries in Poland, the manner of burying the dead did not differ in any particular way from the generally accepted rules (Miśkiewicz 1969, pp. 246–47; Florek 2012, p. 42). In the cemetery at the church of Holy Spirit, the skeletons were lying in several layers. In addition to predominant single burials, graves containing the remains of 2 to 6 individuals were also discovered. The bodies were lodged in the supine position, their heads oriented generally north-west, with the upper limbs alongside the trunk or on the waist level. The predominant direction was probably closely related to the orientation of the church which is built along a similar axis, with the altar in the south-east corner (Tkaczyk et al. 2010, p. 7).

The reason for the higher proportion of men than women buried in the Holy Spirit cemetery could be found in written sources. As we know from a documented visit in 1603, both residents and boarders were mostly men (Wadowski 2004, p. 399; Prucnal 2005, p. 149).

The dominance of men is not surprising also in the case of the Cathedral and Pobrygidkowski Church. Apart from burghers, buried in the crypts of the Cathedral were mainly monks, i.e. the Jesuits, to which the church belonged for nearly two centuries (Jabłoński 1998, p. 15). Also the Pobrygidkowski Church, as mentioned earlier, was a burial place for members of the clergy and secular persons of similar social strata (Marczewski 2011, pp. 13–18).

Although the burial community of the Holy Spirit cemetery is not fully representative of the population of Lublin, it outlined a general pattern respecting also other series from the Lublin region.

It was found that a higher percentage of women died in the age category of *Adultus* and that there was a shift of the age of men in all 3 ten-year classes of the *Maturus* age category. (Kozak-Zychman 1996, p. 141–43).

The low values of the average life span, for both men and women buried in the Holy Spirit cemetery, should probably be linked with numerous and varied pathological changes which were observed on the skulls and postcranial skeletons (e.g. ankylosing spondylitis, syphilis, post-inflammatory changes after injuries). Similar substantiation can be formulated in relation to the whole structure of complete mortality, as in the groups of sex. Although the percentage of skeletons changed as a result of disease is comparable to similar-dated cemeteries in Poland, including the late medieval Gdańsk cemetery (Gładkowska-Rzeczycka 2010), their structure is slightly different. Changes of degenerative and deformative nature at the Holy Spirit cemetery were relatively few, while there were much more malformations.

It is known that for pathological changes to appear on the bone, the disease process has to be sustained. The survival is conditioned by high resistance of the organism or by sufficiently strong cultural buffering – in this case, perhaps, by hospital care. In such a situation we would have to deal with the phenomenon of osteological paradox, (Wood et al. 1992, pp. 344–345), which cannot be excluded here.

Meals offered by the hospital at the Church of Holy Spirit, according to documents defining its statute, was to be ample, copious and varied, available three times a day (Prucnal 2005, p. 172). Preserved menus allow to reconstruct, if not all, then at least the main ingredients of

served dishes. Three times a week, meals of meat were served – beef or veal, less often pork; twice a week grits – buckwheat, millet, barley or oat, bread, vegetables, pork fat, beetroot or sour soup, butter, herring and freshwater fish and beer. Wine and spirits were used rather as a form of medication (Prucnal 2005, pp. 176–77). Butter, fat and oil were used for frying and seasoning (buttering) dishes. The hospital had its own brewery. The beer was therefore, in addition to water, the basic type of beverage. From hospital Supplementary products, such as milk, cheese, eggs, vegetables (mainly peas or beans, but also cabbage, carrots, parsnip, turnip, beetroot) and fruit (plums, apples, pears and nuts) were sourced from the hospital grange to enrich the inmate's diet. It seems that the hospital was largely self-sufficient in providing food to its inmates (Prucnal 2005, p. 192). Of course, one cannot assume that the set menu was strictly followed, at least because of the seasonal availability of certain products and the general economic situation.

Conclusions

The nature and specificity of the Holy Spirit cemetery known from historical sources are confirmed by the results of the archaeological research. Social differentiation of the population of Lublin at that time is directly linked to the place and method of burial.

Anthropological studies have provided a number of interesting information about the complete mortality of people buried in the excavated cemeteries. The burial community from the cemetery at the hospital and the church of Holy Spirit is characterised by the largest share of children and juveniles, and a small per-

centage of individuals aged over 50 years, which resulted from the short average life span for both men and women. The cause was probably a variety of diseases, injuries and malformations, a large number of which were recorded on the skeletal remains. The depicted structure of diseases should probably be associated with a significant share of children, juveniles and adults before the age of 40.

The results obtained during the study did not differ significantly from our expectations, although, probably, it does not completely reflect the reality of those times (restrictions of inference related to the nature of the cemetery and the state of burials preservation).

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Authors' contributions

WKZ conceived the paper's aim and design; ASz actively served as an investigator in the performance of the project and drafting of the manuscript. Both authors performed statistical analyses and co-edited the final version of the text.

Conflicting interests

The authors declare that they have no conflicts of interest in the research.

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