

# The crania from modern cemeteries in Jaksice (Kujawsko-Pomorskie Province, Poland) and craniometric relationships among medieval and modern Central European populations<sup>1</sup>

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**Abstract:** *The paper presents the anthropometric characteristics of the crania from church cemeteries in Jaksice (Kujawy, Poland). The archaeological excavations in Jaksice were carried out in 1968 and 1969. The crania found were dated to the 15<sup>th</sup> and 17<sup>th</sup> centuries.*

*For each cranium 10 anthropometric measurements were taken according to R. Martin's (1928) technique. Their sex and age were estimated according to the methods recommended by European anthropologists. Data on craniological traits for 21 populations from Poland were collected from literature. Using principal components analysis differentiation of the Late Middle Ages and modern populations from Poland was analysed. The analysis was performed also with the use of the biological distance and the cluster analysis methods. High degree of resemblance of the studied crania to the crania of Central Poland (Kujawy, Wielkopolska) populations was revealed.*

**Keywords:** modern cranium, craniological traits, morphological variability, multivariate analysis, Poland

## Introduction

Archeological excavations in Jaksice (site 2) were carried out in 1968 and 1969 at the cemeteries located by the church. The investigation was conducted with regard to building a new church. In total 45 well preserved skeletons were uncovered, along with not numerous items of the material culture. These items together with the historical data allowed to date the cemetery to 15<sup>th</sup>–17<sup>th</sup> centuries (late medieval to modern times). All skeletons were situated in the same

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position: on the back, with the bones of lower extremities stretched and heads directed toward the west (Sikorski 1969).

The site Jaksice lies 7 km to the north from the town Inowrocław. Currently Jaksice lies in the Kujawsko-Pomorskie province. It is situated in the central part of Poland (Fig. 1). Its geographical position is 52° 51' N and 18° 16' E.

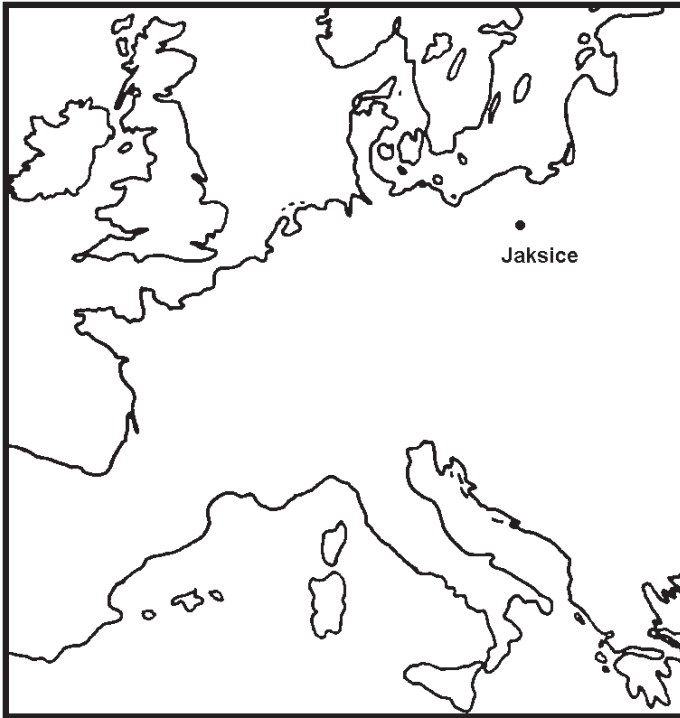


Fig. 1. Location of the village Jaksice.

In the Late Middle Ages this was a small agricultural settlement. The cemetery was used by a Roman Catholic population, associated with Jaksice parish. The examined skulls provide an insight into the morphological structure of the local rural community from Kujawy in the period of late medieval and in modern times.

The aim of this paper, apart from the characteristics of the morphological structure of the local rural population, is an attempt to answer the question, whether in the studied period occurred any significant morphological differentiation of the group according to the place of living (town–village) and geographical region.

The inspiration for such research was the elaboration of Sokal et al. (1987), in which relatively low differentiation of the morphological structure of human populations in Europe in the late medieval and modern times was shown. There were only very slight gradients of the variability of morphological traits in geographical space as well as gradients related to the language differentiation of the populations.

Therefore, we decided to check – while studying the skeletons of the local rural community of modern times – whether regional, provincial, ethnic etc. differentiation, presented in previous (mainly typological) studies, actually occurred in the period of late medieval and modern times in Central Europe, or whether very high genetic polymorphism in these populations caused, that essential differences in morphological structure between urban and rural societies as well as communities inhabiting different geographical or geographic-historical areas did not reveal.

## Material and methods

28 craniological measurements were taken according to the Martin's technique (1928), with the use of the Martin type calipers, with 1 mm accuracy.

Sex and age of individuals were estimated using methods recommended by European anthropologists (Piontek 1999). For the assessment of sex the complex method of sex determination on the basis of the cranium according to the method proposed by Acsádi and Nemeskéri (1970) was used, while for individual's age at death estimation, standards describing the sequence of cranial sutures obliteration, attrition of the occlusal surfaces of dental crowns and alveolar atrophy were applied.

Arithmetic means and standard deviations were calculated for all measurements (**Table 1**).

Comparative data on 21 late medieval and modern populations from Poland were gathered from literature (Piontek 1989/90, 1990). The list of comparative populations and their characteristics (location, dating, number of crania within a set, type of cemetery and the author who prepared the data) are given in **Table 2**. For the comparative purposes the means of the 10 measurements of male and female crania were used. Using the principal components analysis (PCA) differentiation of the populations under study and the position of the studied group of crania from Jaksice against the crania of populations from Kujawy, Wielkopolska and other regions of the contemporary Poland (Pomerania, Małopolska, Lower Silesia, Mazovia) were analysed.

The analysis of interpopulational differentiation was performed also with the use of the biological distance calculation method and the cluster analysis method. In this analysis the arithmetical means of male and female crania were standardized for the standard deviation calculated for the population from Kołobrzeg, due to a large number of items in the collection of male and female crania coming from that cemetery.

The Excel 7.0 calculation sheet, Statistica 5.0 statistical software and the PCA program developed by Maćkiewicz and Ratajczak (1992) were used for computations.

Table 1. Arithmetical means and standard deviations of cranial measurements.

No.	Traits	Males			Females		
		N	$\bar{X}$	SD	N	$\bar{X}$	SD
1.	g-op	17	172.9	5.84	19	165.8	6.84
2.	eu-eu	18	143.3	5.71	19	141.2	6.00
3.	co-co	16	119.3	8.05	18	117.7	4.58
4.	ft-ft	15	96.0	4.19	18	94.7	4.83
5.	zy-zy	3	128.3	7.57	7	125.7	6.75
6.	zm-zm	5	92.8	7.16	8	85.6	11.77
7.	au-au	13	118.0	10.32	18	108.9	11.82
8.	ast-ast	14	114.6	8.05	18	110.4	7.84
9.	ekm-ekm	8	59.6	6.37	12	54.4	6.49
10.	enm-enm	8	36.9	6.29	12	33.4	6.68
11.	ol-sta	7	44.9	7.52	12	47.0	6.41
12.	mf-ek	10	38.2	4.85	12	42.0	4.63
13.	mf-mf	7	18.9	5.49	6	16.5	6.89
14.	OH	13	32.5	3.07	12	33.3	3.17
15.	apt-apt	5	23.2	2.28	11	24.1	2.26
16.	n-ns	7	49.1	4.88	12	45.4	2.81
17.	n-pr	6	68.2	9.41	11	63.1	4.76
18.	n-ba	8	99.5	5.58	11	92.5	3.70
19.	ba-pr	7	90.0	4.40	7	87.9	3.93
20.	ba-b	12	132.9	4.25	13	123.6	4.05
21.	n-b	10	110.6	5.46	14	101.7	5.88
22.	b-l	17	105.7	7.37	17	103.4	6.47
23.	l-i	17	66.9	10.37	17	67.9	9.45
24.	i-o	14	43.2	8.91	16	40.3	9.22
25.	l-o	14	94.4	11.80	16	87.4	21.58
26.	au-au	13	121.1	12.61	17	108.8	13.11
27.	g-i	16	167.6	9.32	18	159.1	13.67
28.	n-i	10	166.2	7.42	14	156.5	10.28

## Results and discussion

**Table 1** presents arithmetical means and standard deviations of 28 cranial measurements for a group of male and female crania. Since mandibular measurements could have been taken only in 4 male crania, only n-gn distance was measured, without separate analysis of mandibular measurements.

Data for the population from Jaksice were compared with the data for 21 populations from different regions of Poland. These populations derive from

Roman Catholic Church cemeteries and one should expect that they represent medieval and modern inhabitants of Poland (**Table 2**). Ten measurements of male and female crania were selected for comparison.



Fig. 2. Late medieval and modern cemeteries included in the comparative studies.

Populations used for comparison were chosen according to the following criteria: number of crania within a given set, geographical location (Kujawy, Pomorze [Pomerania], Wielkopolska, Małopolska, Dolny Śląsk [Lower Silesia], Mazovia), dating of the cemetery and the set of craniometrical traits studied. The group of selected populations included collections of crania from rural church cemeteries (e.g. from Jaksice, Słaboszewo, Wronie), or town church cemeteries (e.g. from Elbląg, Kołobrzeg, Wiślica, Warszawa, Poznań). All the populations have been dated to between 12<sup>th</sup>–13<sup>th</sup> centuries (cemetery in Milicz) and 18<sup>th</sup>–19<sup>th</sup> centuries (cemetery in Lubiąż).

The arrangement of the populations under comparison for the first two principal components is shown in **Figure 3** for male groups (in **Figure 5** for female groups), and in relation to the first and third principal components – in **Figure 4** for male groups and **Figure 6** for female groups.

Table 2. Late medieval and modern cemeteries included in the comparative studies.

Cemetery	Chronology	Characteristic of the cemetery	Author of data
Aleksandrów Kujawski, Kujavia	Late Medieval	Cemetery at church of the local village group (N = 70)	Piech 1966 (unpublished data)
Czaplinek, Wielkopolska	15 <sup>th</sup> -18 <sup>th</sup>	Cemetery at church of the small city group (N = 30)	Kaliszewska-Drozdowska 1967
Czeladź Wielka, Wielkopolska	13 <sup>th</sup> -14 <sup>th</sup>	Cemetery of the local group, small city (N = 169)	Magnuszewicz, Rajchel 1980
Elbląg, Pomerania	Late Medieval	Cemetery at church of the city group (N = 88)	Piontek, Miłosz (in preparation)
Gniezno, Wielkopolska	11 <sup>th</sup> -17 <sup>th</sup>	Skeletal materials from Cathedral (N = 41)	Kaszycka 1989
Góra Chełmska near Koszalin, Pomerania	13 <sup>th</sup> -15 <sup>th</sup>	Cemetery at church (N = 264)	Wokroj 1972
Inowrocław, Kujavia	17 <sup>th</sup> -18 <sup>th</sup>	Cemetery at church of the small city group (N = 32)	Piontek 2002
Jaksice, near Inowrocław, Kujavia	15 <sup>th</sup> -17 <sup>th</sup>	Cemetery at church of the local village group (N = 36)	Piontek 1981
Kołobrzeg, Pomerania	14 <sup>th</sup> -18 <sup>th</sup>	Cemetery at Cathedral (N = 634)	Wokroj 1971
Kraków, Małopolska	15 <sup>th</sup> -18 <sup>th</sup>	Cemetery of the local city population (N = 203)	Kaczanowski 1965
Lubiń I, Wielkopolska	18 <sup>th</sup>	Cemetery at church of the local village group (N = 33)	Henneberg et al. 1984
Lubiń II, Wielkopolska	18 <sup>th</sup> -19 <sup>th</sup>	Cemetery at church of the local village group (N = 70)	Henneberg et al. 1984
Milicz, Silesia	12 <sup>th</sup> -13 <sup>th</sup>	Cemetery of the local group, small city (N = 399)	Miszkwicz, Gronkiewicz 1988
Pawłów Trzebnicki near Trzebnica, Silesia	15 <sup>th</sup> -17 <sup>th</sup>	City cemetery (N = 39)	Miszkwicz 1968
Poznań, Wielkopolska	15 <sup>th</sup> -18 <sup>th</sup>	Cemetery at church of the city group (N = 143)	Hałka 1935
Radziejów, Kujavia	Late Medieval	Cemetery at church of the local village group (N = 33)	Piechowska 1966 (unpublished data)
Skrwilno, Kujavia	13 <sup>th</sup> -16 <sup>th</sup>	Cemetery at church of the local village group (N = 310)	Florkowski 1973
Słaboszewo, Kujavia	14 <sup>th</sup> -17 <sup>th</sup>	Cemetery at church of the local village group (N = 170)	Piontek 1981
Warszawa, Mazovia	17 <sup>th</sup>	Cemetery at church St. Anna (N = 99)	Miszkwicz 1954
Wiślica, Małopolska	18 <sup>th</sup> -19 <sup>th</sup>	Skeletal materials from Cathedral (N = 60)	Wierciński 1970
Wrocław, Silesia	15 <sup>th</sup> -16 <sup>th</sup>	City cemetery, St. Elizabeth Church (N = 160)	Krzyżanowska et al. 1997
Wronie, Kujavia	Late Medieval	Cemetery at church of the local village group (N = 24)	Zduńczyk 1966 (unpublished data)

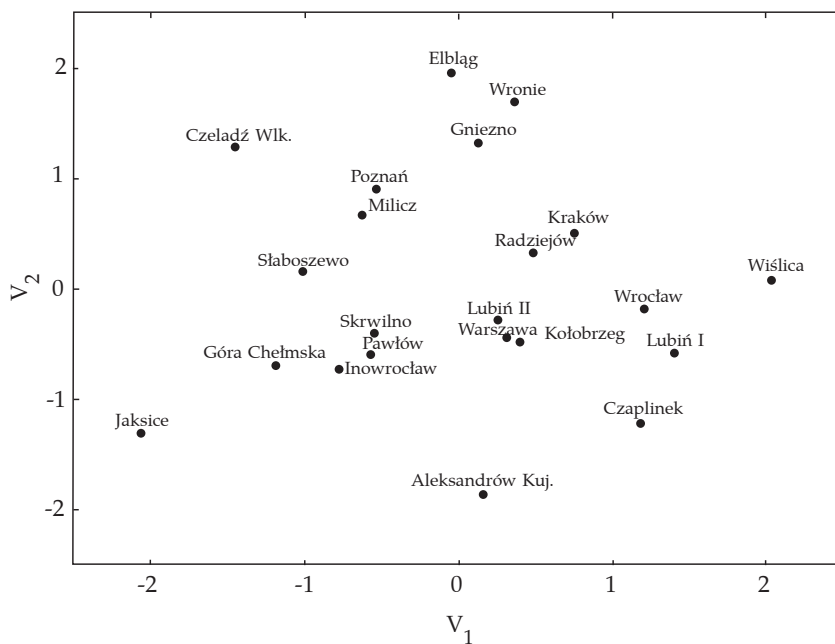


Fig. 3. Distribution of male populations by first (V<sub>1</sub>) and second (V<sub>2</sub>) principal component.

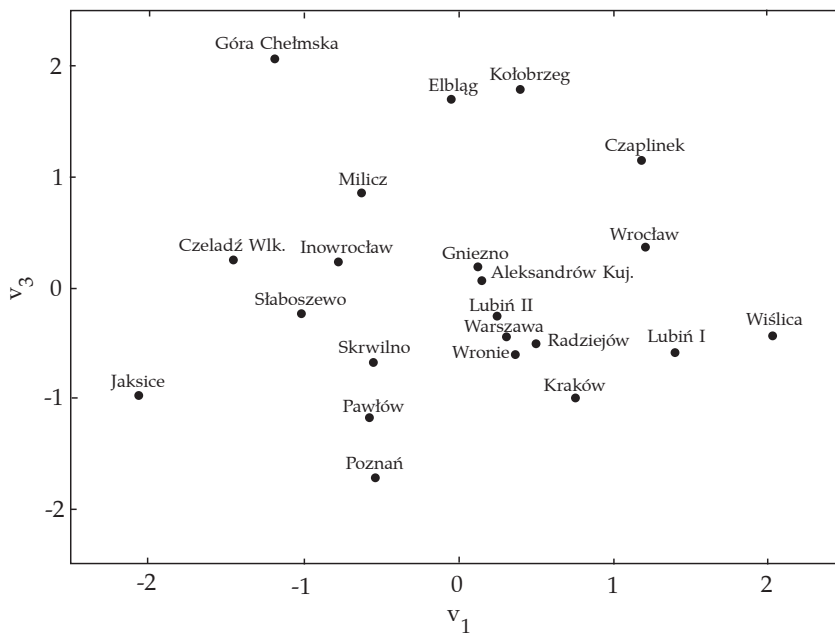


Fig. 4. Distribution of male populations by first (V<sub>1</sub>) and third (V<sub>3</sub>) principal component.

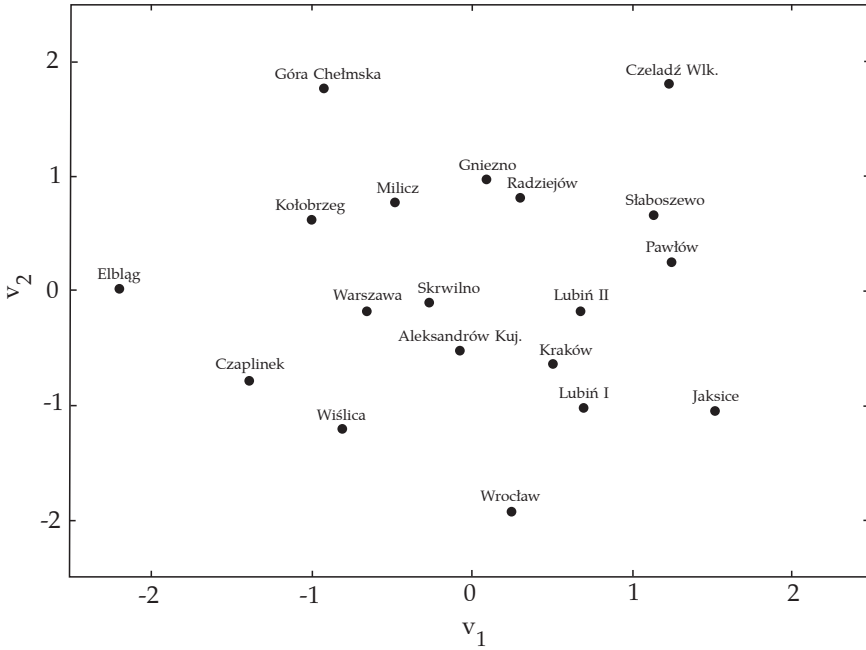


Fig. 5. Distribution of female populations by first ( $V_1$ ) and second ( $V_2$ ) principal component.

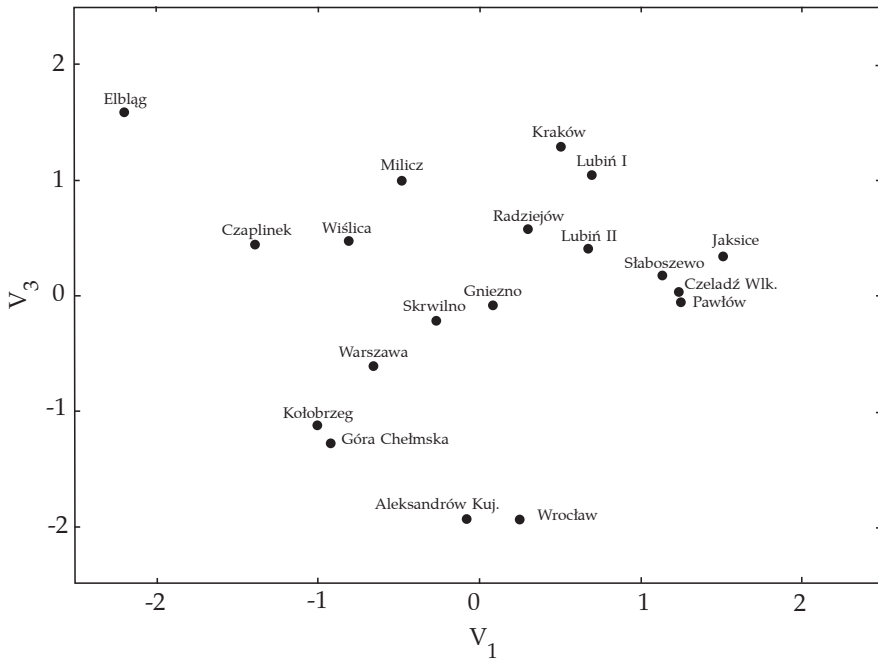


Fig. 6. Distribution of female populations by first ( $V_1$ ) and third ( $V_3$ ) principal component.



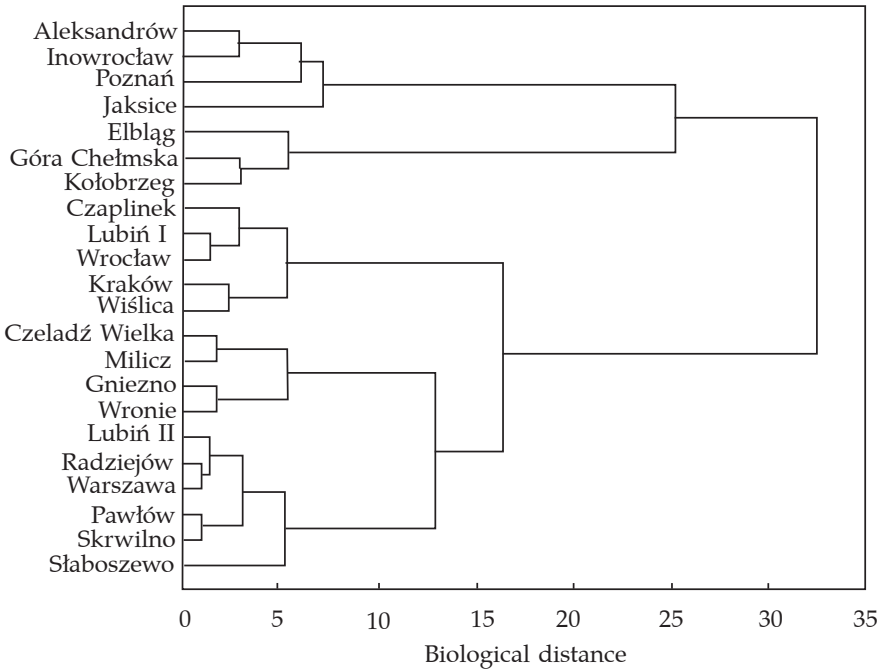


Fig. 7. Dendrogram grouping the compared populations (Ward's linkage method, squared Euclidean distances – males).

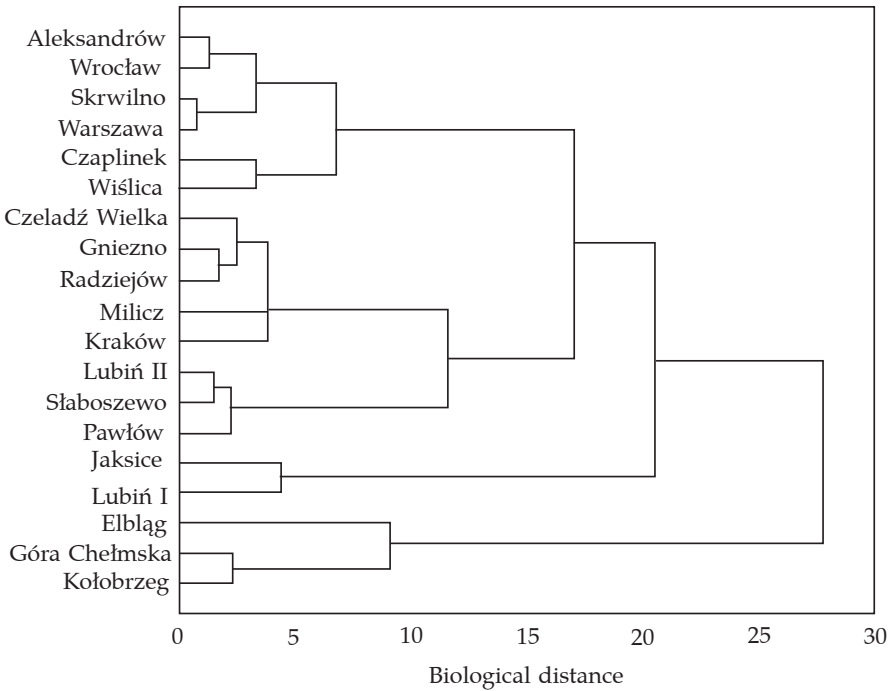


Fig. 8. Dendrogram grouping the compared populations (Ward's linkage method, squared Euclidean distances – females).

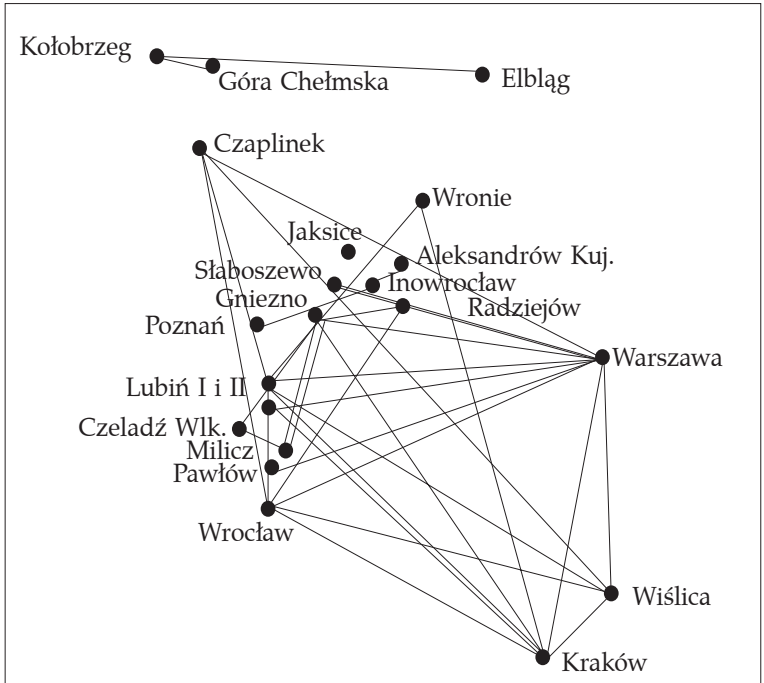


Fig. 9. Structure of the biological distances between male groups.

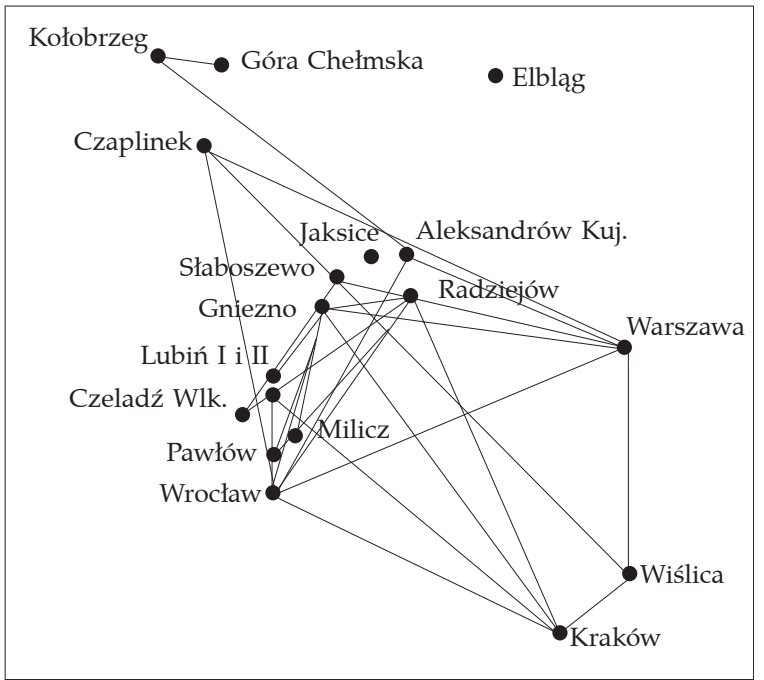


Fig. 10. Structure of the biological distances between female groups.

## Results obtained using the Principal Components Analysis (PCA)

**Males.** The first component (29.5%) differentiates the examined set of crania with regard to the width of the braincase and the height of the face, the second one (23.2%) with relation to the size of the skull, and the third one (16.2%) with regard to the shape of the braincase.

**Females.** The first component (27.8%) differentiates the examined set of crania with regard to the length of the braincase and the height of the face, the second one (20.8%) with relation to the size of the skull, and the third one (15.2%) with regard to the width of the face.

## Results obtained using the Cluster Analysis

The compared male and female populations grouped into 5 clusters. Within the males the Jaksice population is most similar to the populations from Kujavia and Wielkopolska regions. In reference to the females the Jaksice population is most similar to the populations from Lubiń (Wielkopolska region).

A separate cluster was formed by the populations from Pomerania. The remaining samples do not form any clusters with regard to chronology or geographical location. They are only slightly differentiated between one another and regional differentiation is poorly visible.

No apparent differences in biological similarity between the populations from towns, small towns and villages were observed; for example the populations from Warsaw, Cracow, Radziejów (small town) and Wronie (village) occupy the same position in relation to the first principal component.

The examined populations, distributed in the geographical space, were compared between one another with regard to the lowest values of biological distances. Within the males, most distinguished from the studied group were the samples from Jaksice, Góra Chełmska, and Kołobrzeg. As regards females, the most morphologically distinct were the populations from Jaksice, Lubiń, Elbląg, and Góra Chełmska.

Comparative studies have shown the likely existence of strong biological links among the populations under study, which means they were biologically poorly isolated from one another. Therefore, one may assume that in the Late Medieval and in the Modern Times the population from Polish territory was not strongly differentiated biologically and that the local structural differences were mainly related to factors affecting possibilities of biological and cultural contacts, i.e., to social and historical factors.

## Bibliography

**Acsádi G., Nemeskéri J.**

1970: *History of Human Life Span and Mortality*. Akademiai Kiado. Budapest.

**Florkowski A.**

1974: *Wstępne badania antropologiczne średniowiecznego cmentarzyska w Skrwilnie*. Zeszyty Naukowe UMK, Archeologia, 4: 252-258.

**Hałka S.**

1935: *Czaszki z XV–XVIII wieku pochodzące z dawnego cmentarza około kościoła św. Marcina w Poznaniu*. Przegląd Antropologiczny, 9: 47–54.

**Henneberg M., Wrześcińska A., Brodnicka J.**

1984: *Materiały szkieletowe z cmentarzyska (XIII–XVIII w.) przy kościele św. Leonarda w Lubiniu, gmina Krzywiń. Opracowanie wstępne*. Przegląd Antropologiczny, 50: 365–379.

**Kaczanowski K.**

1965: *Czaszki z cmentarzysk przy kościele Mariackim w Krakowie (XV–XVIII w.)*. Materiały i Prace Antropologiczne, 71: 57–112.

**Kaliszewska-Drozdowska M.D.**

1967: *Czaszki z cmentarzyska przy kościele Św. Trójcy w Czaplunku, pow. Szczecinek*. Przegląd Antropologiczny, 33: 87–91.

**Kaszycka K.**

1989: *Materiał szkieletowy z katedry gnieźnieńskiej (X/XI–XVII wiek)*. Przegląd Antropologiczny, 53: 137–148.

**Krzyżanowska M., Kwiatkowska B., Szczurowski J., Gronkiewicz S.**

1997: *Czaszki z kościoła św. Elżbiety we Wrocławiu (XV–XVI w.)*. *Studia Antropologiczne*, 4: 7–16.

**Maćkiewicz A., Ratajczak W.**

1992: *Principal Components Analysis. Accompanied by Fortran 77 Program on Diskette*. Poznań.

**Magnuszewicz M., Rajchel Z.**

1980: *Analiza kranjologiczna materiałów z cmentarzyska w Czeladzi Wielkiej, woj. leszczyńskie (XIII–XIV wiek)*. *Materiały i Prace Antropologiczne*, 99: 103–108.

**Malinowski A., Lewandowski L., Piontek J.**

1969: *État de dentition de la population polonaise depuis l'âge néolithique jusqu'aux temps modernes*. *Przegląd Antropologiczny*, 35: 211–223.

**Martin R.**

1928: *Lerbuch der Anthropologie*. Verlag von Gustav Fischer, Jena.

**Miłosz E.**

1989: *Procesy przemian biologicznych średniowiecznych populacji z Pomorza Zachodniego*. Wydawnictwo Naukowe UAM. Poznań.

**Miskiewicz B.**

1954: *Czaszki z terenu kościoła św. Anny w Warszawie*. *Materiały i Prace Antropologiczne*, 4: 104–142.

1968: *Analiza antropologiczna średniowiecznej ludności z Pawłowa, pow. trzebnicki (XV–XVI w. n.e.)*. *Materiały i Prace Antropologiczne*, 76: 197–216.

**Miskiewicz B., Gronkiewicz S.**

1988: *Analiza antropologiczna wczesnośredniowiecznej ludności z Milicza (XII–XIII w. n.e.)*. *Przegląd Antropologiczny*, 52: 195–202.

**Piech M.**

1966: *Cmentarzysko w Aleksandrowie Kujawskim*. (Dissertation in Department of Anthropology, Toruń University).

**Piechowska E.**

1966: *Cmentarzysko w Radziejowie Kujawskim*. (Dissertation in Department of Anthropology, Toruń University).

**Piontek J.**

1970: *Sprawozdanie z badań terenowych w Inowrocławiu w latach 1967–1968*. Przegląd Antropologiczny, 36: 267–268.

1979: *Procesy mikroewolucyjne w europejskich populacjach ludzkich*. Wydawnictwo Naukowe UAM. Poznań.

1981a: *Cmentarzysko późnośredniowieczne w Jaksicach, woj. bydgoskie*. [In:] "Źródła do badań biologii i historii populacji słowiańskich", A. Malinowski (ed.). Wydawnictwo Naukowe UAM, seria Antropologia 10: 15–21. Poznań.

1981b: *Biologiczna charakterystyka średniowiecznej populacji wiejskiej ze Staboszewa, woj. bydgoskie*. [In:] "Źródła do badań biologii i historii populacji słowiańskich", A. Malinowski (ed.). Wydawnictwo Naukowe UAM, seria Antropologia 10: 38–83. Poznań.

1989/90: *Antropologia średniowieczna i nowożytna Polski. Stan i perspektywy badań*. Prace i Materiały Muzeum Archeologicznego i Etnologicznego w Łodzi. Seria Archeologiczna, 36: 117–130.

1990: *Comparative Statistical Analysis of the Late Medieval Populations from Poland*. Glasnik Antropološkog Društva Jugoslavije, 27: 5–17.

1999: *Biologia populacji pradziejowych*. Zarys metodyczny. Wydawnictwo Naukowe UAM. Poznań.

2002: *The Crania from Modern Cemeteries in Inowrocław, Kujawsko-Pomorskie Province, Poland*. Variability and Evolution, 10: 55–73.

**Sikorski Cz.**

1991: *Kościół imienia Najświętszej Maryi Panny w Inowrocławiu*. Wydawnictwo Parafii Imienia Najświętszej Maryi Panny, Inowrocław.

**Sokal R.R., Uytterschaut H.**

1987: *A Classification of European Skulls From Three Time Periods*. American Journal of Physical Anthropology, 74: 1–20.

**Wierciński A.**

1970: *Zmiany w strukturze antropologicznej ludności Wiślicy w ostatnim tysiącleciu*. Rozprawy Naukowe Zespołu Badań nad Polskim Średniowieczem UW i PW, 5: 181–198.

**Wokroj F.**

1971: *Koło brzeg średniowieczny w świetle antropologii*. Materiały Zachodniopomorskie, 17: 313–371.

1972: *Antropologiczna analiza szczątków kostnych z średniowiecznego cmentarzyska Góra Chełmska*. Materiały Zachodniopomorskie, 18: 273–303.

**Zduńczyk I.**

1966: *Cmentarzysko w miejscowości Wronie*. (Dissertation in Department of Anthropology, Toruń University).