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STUDIES ON DENTAL MORPHOLOGY OF A MODERN  
POLISH POPULATION

INTRODUCTION

Dental morphology as a part of physical anthropology seems to offer very promising results in studies on human variability. There are two main properties of the dentition that make it very suitable for this purpose:

— its endogenous character; strong genetic control and relative freedom from the effect of postnatal environment [Møller 1967, Ludström 1977]

— its indestructability under fossil conditions (among many others: Steślicka [1948, 1962]).

Due to these properties teeth have attracted a great interest of anthropologists since the end of 19<sup>th</sup> century (Flower 1885, Zuckerkandl 1891, Muhldreiter 1891, Vram 1897, Topinard 1892 — after Zubov [1973]) up to now. Since some odontological methods have been unified lately [Zubov 1968] and at the same time the new dental features classified [Zubov 1977] morphological results are still more interesting. They enable, in addition to another anthropological and archeological data, to trace biology and adaptive changes of human groups.

In Polish literature the majority of odontological works concerns dental morphology of skeletal populations from various historical periods (among others: Steślicka [1967, 1970], Szlachetko [1959], Kozaczek [1977], Kaczmarek [1980]), whereas dental morphology of contemporary Poles is poorly documented [El-Nofely Aly 1976, Szlachetko 1978]. In such a situation, the purpose of this article is to provide additional information on morphological characteristics of the dentition of modern Polish people.

MATERIAL AND METHODS

Materials employed here were gathered in 1979 in following places: Poznań, Kórnik, Luboń, Oborniki, Szamotuły (North-West Poland, the Great Poland region). 475 children of both sexes, 7-15 years of age,



pupils of primary schools were examined for dental morphology (fig.1). Structures of permanent teeth were scored on grounds of direct observations within oral cavity either on both sides or on the right one. Detailed morphological observations were available by studying wax

prints made on the right side of oral cavity in accordance with Zubov's technique [Zubov, Nikitiuk 1974]. Dental morphological traits were classified after Dahlberg [1963] and Zubov [1968, 1977]. Detailed description of all methods

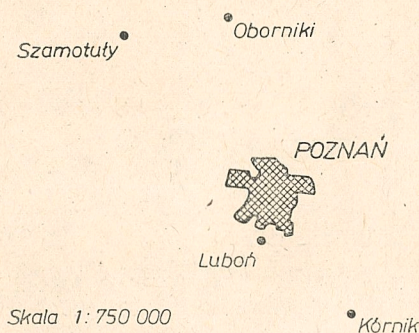


Fig. 1. Places where materials were gathered

used here is given in the author's previous paper [Kaczmarek 1979]. From among many dental characteristics, those of discriminant value for ethnogenetic analysis were chosen [Zubov 1968a, 1973, 1979]. Some of them are of known genetic determination [Jørgensen 1955, Turner 1965, 1969, Hanihara 1963, 1965, Hanihara et al. 1975, Bianco, Chakraborty 1976, Perzigian 1976]. Dental characteristics included in this study are as follows:

1. spacing of maxillary central incisors ( $I^1 - I^1$  spacing),
2. crowding of maxillary lateral incisor ( $I^2$  crowding),
3. reduction of upper lateral incisor (peg-shaped  $I^2$ ),
4. upper central incisor lingual surface forms (shovel-shaped  $I^1$ ),
5. molar occlusal surface patterns (hypocone reduction on upper molars, cusp numbers and groove category on lower ones),
6. the presence of Carabelli's cusp (*tuberculum Carabelli*) on the first upper molar,
7. the presence of such tooth crown elements as: distal trigonid ridge, deflecting wrinkle and tuberculum accessorium mediale internum on the first lower molar,
8. the description of molar microrelief as the presence of intracusp furrows on molar occlusal surface. Type of the first paracone furrow ( $1pa$ ) on the first upper molar (its three forms are presented in fig. 2) was noted, second metaconid furrow ( $2med$ ) points of contact with intercusp furrows on the first lower molar were traced (fig. 3) and positions of the first and second entoconid furrows on the second lower molar ( $1end$ ,  $2end$ ) were taken into consideration.

Each trait was counted per individual. Then incidence of all characters involved here was calculated within examined groups without



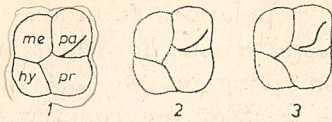


Fig. 2. 1pa furrow patterns on maxillary molars

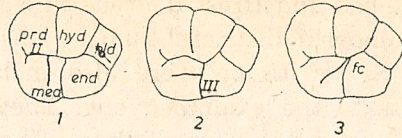
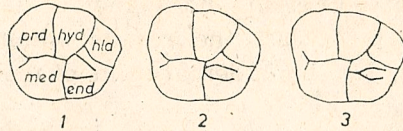


Fig. 3. 2med furrow endings on lower molars

Fig. 4. 1end and 2end furrows patterns on lower molars



sex separation for the results obtained for both sexes were not significantly different at the 0.05 probability level.

In order to state dental variability in examined groups multivariate method of Grewal „biological distance” in Sjøvold's [1973] modification was used as dental traits are quasi-continuous and scoring them may be limited to presence-absence of expression. The Sjøvold's formula is as follows:

$$\bar{X} = \frac{\sum \left[ (\theta_1 - \theta_2)^2 - \left( \frac{1}{N_1} + \frac{1}{N_2} \right)^2 \right]}{r}$$

$$\text{var } \bar{X} = \frac{\sum \left[ 2 \left( \frac{1}{N_1} + \frac{1}{N_2} \right)^2 \right]}{r^2}$$

where  $\theta$  — angular transformation  $\theta = \arcsin(1 - 2p)$ ,  
 $\theta_1$  — angular transformation for the first examined group,  
 $\theta_2$  — angular transformation for the second examined group,  
 $N_1$  — number of objects in the first group,  
 $N_2$  — number of objects in the second group,  
 $r$  — number of features observed.

“Biological distance” between two groups calculated in this way is regarded as significant, at 0.05 probability level, when the value of mean biological distance is greater than twice its standard deviation. With this formula biological distances between Polish group and some other ones were calculated. In order to provide comparable results dental morphological data scored in the same way as presented here were chosen. These are data for contemporary Slavic groups living in European part of Soviet Union: Russians from Belgorodsk, Smolensk and Pskov districts [Vaščeva 1977a, 1977b], Byelorussians from



Vitebsk and Brest districts [T e g a k o 1972] and finally Ukrainians from Obuhovski district [Z u b o v 1979]. Another populations from this part of Soviet Union were also included into comparisons for their nearness to the examined one. They are: Polish living in the East Lithuania and Lithuanians from East and North part of the country [P a p r e c k i e n é 1980a, 1980b]. Some dental morphological traits were also compared with data for Polish medieval skeletal populations from Gruczno 12<sup>th</sup> - 13<sup>th</sup>c. [S t ę ś l i c k a 1970], Cedynia 12<sup>th</sup> - 14<sup>th</sup>c. [K a c z m a r e k 1980] and Pomorze and Kujawy 12<sup>th</sup> - 14<sup>th</sup>c. [S t ę ś l i c k a 1967]. At last the results obtained here were compared to available data for single dental traits of modern Poles.

### RESULTS AND DISCUSSION

The dental morphological characters of contemporary Poles, represented here by particular groups from the Great Poland region, are shown in tables 1 - 11. Variability of these groups expressed by means of biological distance is relatively small. All biological differences between described groups are insignificant at the 0.05 probability level

Table 1. I<sup>1</sup> - I<sup>1</sup> spacing and I<sup>2</sup> crowding distributions in modern Polish

Group	Spacing			Crowding		
	N	n	%	N	n	%
Poznań	87	19	21.8	87	5	5.7
Kórnik	98	20	20.4	91	5	5.4
Luboń	93	21	21.5	73	5	5.3
Oborniki	97	22	22.6	97	4	4.1
Szamotuły	80	18	22.5	74	3	4.0
Total	455	99	21.8	421	22	5.3

Table 2. Distribution of the maxillary lateral incisor reduction in contemporary Polish

Group	N	Forms of reduction									
		0		1		2		3		2+3	
		n	%	n	%	n	%	n	%	n	%
Poznań	87	73	83.9	12	13.8	2	2.3	0	0.0	2	2.3
Kórnik	98	76	77.5	18	18.4	4	4.0	0	0.0	4	4.0
Luboń	91	73	80.2	15	16.5	3	3.3	0	0.0	4	4.2
Oborniki	95	75	78.9	16	16.9	4	4.2	0	0.0	4	4.2
Szamotuły	83	68	81.9	12	14.4	3	3.6	0	0.0	3	3.6
Total	454	365	80.4	73	16.1	16	3.5	0	0.0	16	3.5



Table 3. Distribution of the shovel-shaped maxillary central incisor in modern Polish

Group	N	Forms of shoveling									
		0		1		2		3		2+3	
		n	%	n	%	n	%	n	%	n	%
Poznań	87	85	97.7	1	2.3	0	0.0	0	0.0	0	0.0
Kórnik	95	94	98.9	1	1.1	0	0.0	0	0.0	0	0.0
Luboń	78	73	93.6	3	3.8	2	2.6	0	0.0	2	2.6
Oborniki	97	95	97.9	2	2.1	0	0.0	0	0.0	0	0.0
Szamotuly	86	85	98.8	1	1.2	0	0.0	0	0.0	0	0.0
Total	395	389	98.5	8	2.1	2	0.4	0	0.0	2	0.4

Table 4. Distribution of the hypocone reduction on maxillary molars in modern Polish

Group	N	Occlusal surface patterns									
		4		4-		3+		3		3+3+	
		n	%	n	%	n	%	n	%	n	%
Poznań	M <sup>1</sup> =85	82	98.7	3	1.3	0	0.0	0	0.0	0	0.0
	M <sup>2</sup> =42	9	21.4	16	38.0	10	24.3	7	16.3	17	40.6
Kórnik	M <sup>1</sup> =90	87	96.6	3	3.4	0	0.0	0	0.0	0	0.0
	M <sup>2</sup> =42	4	9.5	20	47.6	4	9.5	14	33.4	18	42.9
Luboń	M <sup>1</sup> =88	87	98.9	1	1.1	0	0.0	0	0.0	0	0.0
	M <sup>2</sup> =49	4	8.3	28	57.1	9	18.4	8	16.3	17	34.7
Oborniki	M <sup>1</sup> =91	90	98.9	1	1.1	0	0.0	0	0.0	0	0.0
	M <sup>2</sup> =47	4	8.5	21	44.6	10	21.2	11	23.0	21	44.6
Szamotuly	M <sup>1</sup> =86	83	96.5	3	3.5	0	0.0	0	0.0	0	0.0
	M <sup>2</sup> =38	3	7.9	15	39.5	14	36.8	8	21.5	18	47.6
Total	M <sup>1</sup> =441	430	97.5	11	2.5	0	0.0	0	0.0	0	0.0
	M <sup>2</sup> =211	24	11.4	100	47.4	39	18.5	48	22.7	87	41.2

Table 5. Distribution of the tuberculum Carabelli on the first maxillary molar in modern Polish

Group	N	Forms of the Carabelli's cusp													
		0		1		2		3		4		5		2-5	
		n	%	n	%	n	%	n	%	n	%	n	%	n	%
Poznań	88	59	72.7	0	0.0	1	1.1	4	4.5	10	11.3	14	10.3	29	32.9
Kórnik	100	60	60.0	0	0.0	0	0.0	3	3.0	14	14.0	23	23.0	40	40.0
Luboń	96	58	60.4	1	1.0	1	1.0	3	3.1	16	16.7	17	17.8	38	39.6
Oborniki	101	71	70.3	0	0.0	1	0.9	1	0.9	11	10.9	17	16.8	30	29.7
Szamotuly	90	59	65.5	0	0.0	0	0.0	3	3.3	9	10.0	19	21.2	31	34.5
Total	475	307	64.6	1	0.2	3	0.6	14	2.9	60	12.6	90	18.9	168	35.4

or close to its critical value (table 12). Thus inhabitants of the Great Poland region may be treated as homogenous population and due to it they will be called simply a Polish population in what follows. Tables 13 - 19 include comparative data and table 20 presents mean measures of



Table 6. Distribution of the cusp number on lower molars in modern Polish

Group	N	Cusp number							
		6		5		4		3	
		n	%	n	%	n	%	n	%
Poznań	M <sub>1</sub> =71	1	1.5	61	85.9	9	12.6	0	0.0
	M <sub>2</sub> =44	0	0.0	2	4.6	42	95.4	0	0.0
Kórnik	M <sub>1</sub> =80	1	1.2	65	81.2	14	17.6	1	1.3
	M <sub>2</sub> =43	0	0.0	3	6.9	39	90.8	1	2.3
Luboń	M <sub>1</sub> =73	0	0.0	68	93.2	5	6.8	0	0.0
	M <sub>2</sub> =46	0	0.0	3	6.5	43	93.5	0	0.0
Oborniki	M <sub>1</sub> =82	1	1.6	74	90.2	7	8.2	0	0.0
	M <sub>2</sub> =45	0	0.0	1	2.3	44	97.7	0	0.0
Szamotuły	M <sub>1</sub> =78	0	0.0	73	93.6	5	6.4	0	0.0
	M <sub>2</sub> =39	0	0.0	1	2.6	37	94.8	1	2.6
Total	M <sub>1</sub> =384	3	0.8	341	88.8	40	10.4	1	0.3
	M <sub>2</sub> =217	0	0.0	10	4.6	205	94.4	1	0.4

„biological distance” between Polish and modern populations taken into comparison.

Observations of dental arch length changes are very interesting for odontologists and that is why two characteristics — spacing and crowding — are listed here. The most typical form of spacing is this between maxillary central incisors. The incidence of this feature was high in the material (table 1). Comparison of this trait between examined Poles and their neighbouring groups stresses this fact even more (table 13, also Zubov [1973:87]). On the other hand, results presented here are very similar to that given by Masztalerz for modern Polish population [Masztalerz 1962:109] on condition that the author does not specify the particular type of spacing and it should be supposed that various types of this feature could be scored.

Crowding of I<sup>2</sup>, however is infrequently observed in presented material (5.3%, table 1) opposite to Masztalerz's suggestion about much higher incidence of this trait in modern Polish [Masztalerz 1962:109] (doubts as above). Comparisons of these traits between Polish and neighbouring populations show the highest similarity to Ukrainians and Russians (Pskov and Somolensk districts, table 13) Anyhow, it should be stated that maxillary incisors are tending to be spaced rather than crowded in dental arch.

Turning to I<sup>2</sup> reduction, it is seen that although the severest form peg-shaped tooth, was never observed, two others (first and second) were very often noticed — 3.5%, much to author's surprise (table 2). From among many human groups only Asiatic populations share simi-



Table 7. Distribution of the occlusal surface patterns on lower molars in modern Polish

Group	N	Patterns of occlusal surface																	
		Y6		+6		Y5		+5		X5		Y4		+4		X4		Y3	
		n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Poznań	M <sub>1</sub> = 57	0	0.0	1	1.8	19	33.3	27	47.3	1	1.8	1	1.8	8	14.0	0	0.0	0	0.0
	M <sub>2</sub> = 40	0	0.0	0	0.0	0	0.0	2	5.0	0	0.0	0	0.0	27	87.5	11	7.5	0	0.0
Kórnik	M <sub>1</sub> = 52	1	1.9	0	0.0	14	26.9	28	53.9	1	1.9	4	7.7	4	7.7	0	0.0	1	2.4
	M <sub>2</sub> = 41	0	0.0	0	0.0	0	0.0	1	2.4	2	4.9	3	7.3	27	65.8	7	17.1	0	0.0
Luboń	M <sub>1</sub> = 56	0	0.0	0	0.0	31	55.4	22	39.3	1	1.8	2	3.5	0	0.0	0	0.0	0	0.0
	M <sub>2</sub> = 44	0	0.0	0	0.0	0	0.0	1	2.3	1	2.3	4	9.1	26	59.0	12	27.3	0	0.0
Oborniki	M <sub>1</sub> = 66	1	1.5	0	0.0	28	42.4	30	45.4	2	3.0	1	1.5	4	6.2	0	0.0	0	0.0
	M <sub>2</sub> = 38	0	0.0	0	0.0	0	0.0	1	2.6	0	0.0	3	7.9	21	55.3	13	34.2	0	0.0
Szamotuły	M <sub>1</sub> = 57	0	0.0	0	0.0	17	29.8	34	59.6	3	5.3	1	1.7	2	3.6	0	0.0	0	0.0
	M <sub>2</sub> = 34	0	0.0	0	0.0	0	0.0	1	2.9	0	0.0	0	0.0	24	70.6	8	23.6	1	2.9
Total	M <sub>1</sub> = 288	2	0.6	1	0.4	109	37.9	141	48.9	8	2.8	9	3.2	18	6.2	0	0.0	1	0.3
	M <sub>2</sub> = 217	0	0.0	0	0.0	0	0.0	6	3.1	3	1.5	10	5.1	125	63.7	51	26.0	1	0.6



Table 8. Distribution of the distal trigonid ridge, tuberculum accessorium mediale internum and deflecting wrinkle on the first lower molar in contemporary Polish

Group	Distal trigonid ridge			Tuberculum accessorium mediale inter.			Deflecting wrinkle		
	N	n	%	N	n	%	N	n	%
Poznań	67	0	0.0	80	2	2.6	61	6	9.8
Kórnik	69	1	1.5	86	4	4.7	71	0	0.0
Luboń	71	0	0.0	73	3	4.2	65	5	7.7
Oborniki	77	0	0.0	80	2	2.5	71	6	8.5
Szamotuły	71	0	0.0	76	0	0.0	61	5	8.2
Total	355	1	0.1	395	11	2.9	329	22	4.8

Table 9. Distribution of the 1pa furrow patters on the first maxillary molar in modern Polish

Group	N	Furrow patterns					
		1		2		3	
		n	%	n	%	n	%
Poznań	58	25	41.7	33	58.3	2	3.4
Kórnik	51	22	43.2	28	54.9	2	3.9
Luboń	54	25	46.3	27	50.0	2	3.7
Oborniki	54	20	37.0	29	53.7	2	3.7
Szamotuły	59	21	33.6	36	61.0	2	3.4
Total	276	113	40.9	153	55.4	10	3.7

Table 10. Distribution of the 2med furrow endings on the first lower molar in contemporary Polish

Group	N	2med endings					
		II		III		fc	
		n	%	n	%	n	%
Poznań	43	18	41.8	10	23.3	15	35.0
Kórnik	50	22	44.0	12	24.0	16	32.0
Luboń	56	22	39.3	16	28.6	18	32.1
Oborniki	57	19	33.3	16	28.1	22	38.6
Szamotuły	37	14	37.8	9	24.4	14	37.8
Total	243	95	39.0	63	25.9	85	34.9

lar incidences of I<sup>2</sup> reduction [Zubov 1973 : 108]. This result must not be treated too rigorously as the next examinations should be taken in that case.

One of the most commonly observed dental traits is shovelling type of incisors lingual surface, firstly described by Hrdlička (after Carbonell [1963]). The data gathered for present populations indicate a high frequency of this trait in Mongoloid groups — an average



Table 11. Distribution of the 1end and 2end furrows patterns on the second lower molar in contemporary Polish

Group	N	Furrows patterns							
		Parallel.		D		T		D+T	
		n	%	n	%	n	%	n	%
Poznań	16	8	50.0	3	18.8	5	31.2	8	50.0
Kórnik	15	5	33.3	4	26.7	6	40.0	10	66.7
Luboń	16	10	62.5	0	0.0	6	37.5	6	37.5
Oborniki	13	6	46.2	2	15.4	5	38.4	7	53.8
Szamotuły	10	3	30.0	0	0.0	7	70.0	7	70.0
Total	70	32	45.7	9	12.8	29	41.4	38	54.3

Table 12. The mean measures of biological distance between examined groups from the Great Poland region (the value in parenthesis is the standard deviation)

Group	Poznań	Kórnik	Luboń	Oborniki	Szamotuły
Poznań		0.0142 (0.0110)	0.0180 (0.0110)	0.0109 (0.0114)	0.0149 (0.0124)
Kórnik			0.0225 (0.0110)	0.0230 (0.0116)	0.0253 (0.0128)
Luboń				0.0227 (0.0112)	0.0192 (0.0121)
Oborniki					0.0100 (0.0116)
Szamotuły					

incidence of it ranges from 59% to 100% — where it has at the same time low frequency in Caucasoid groups [Carbonell 1963, Hanihara 1963, 1974, Zubov 1968, 1973, Sakai 1975, Turner 1977]. This trait is also included into consideration here but only maxillary first incisors are observed and according to Hanihara [1963] the second and third grades of shovelling are scored together. Shovel-shaped maxillary first incisors were very seldom observed in modern Polish (0.4% — see table 3), opposite to the data given by El-Nofely Aly [1976]: for men — 12.7%, for women 14.6%. Quite different results may be found in medieval Gruczno 12<sup>th</sup>-13<sup>th</sup>c. [Stęślicka 1970], where this trait was observed in 43.2% compared to Cedynia 12<sup>th</sup>-14<sup>th</sup>c. [Kaczmarek 1980] — 1.1%. Such a wide range of results in groups corresponding chronologically is incomprehensible. It is well known that in the past this trait was more frequently observed than now [Carbonell 1963, Brabant 1965] but both latter cited groups chronologically correspond to each other. Thus what the reasonable explanation could be? Is it an effect of adaptive changes or simply differences in



Table 13. The I<sup>1</sup> - I<sup>1</sup> spacing and I<sup>2</sup> crowding comparative data for modern Polish and various neighbouring groups

Group*	Spacing		Crowding	
	N	%	N	%
Byelorussians (Vitebsk district)	220	14.5	220	11.2
Byelorussians (Brest district)	453	10.5	453	9.0
Russians (Belgorodsk dis.)	118	12.7	118	10.8
Russians (Smolensk district)	411	22.2	409	8.1
Russians (Pskov district)	245	18.8	243	7.1
Ukrainians (Obuhovski dis.)	102	10.8	102	4.9
Polish (in Lithuania)	412	12.4	408	3.7
Lithuanians (East)	964	12.0	959	2.3
Lithuanians (North)	1263	11.9	1251	3.7
Polish (the Great Poland region)	455	21.8	421	5.3

\* the authors of comparative data are cited in the chapter „Material and methods”

methods? Comparison with some Slavic groups stresses higher incidences of this trait in these latter ones (table 14) in contrary to the rest of compared groups.

The latest phylogenetic structure on maxillary molars is fourth linguo-distal cusp called hypocone (Cope, Osborne after Stęślicka [1948 - 1962], Biedowa, Radwańska [1976]). This cusp is expressed in various forms with extreme one when it is completely absent and tooth is tritubercular. Nowadays a wide range of hypocone reduction is observed [Zubov 1973: 116]. In modern Polish, as it is generally seen, the frequency of hypocone presence decreases from M<sup>1</sup> to M<sup>2</sup> (table 4). The first maxillary molar is here always 4-cusped (no hypocone reduction at all) and the hypocone absence on M<sup>2</sup> is not so strongly expressed — only 42.6%. The other three major cusps were always present. The data on hypocone absence in medieval groups from Gruzno 12th - 13th c. M<sup>1</sup> — 17.6%, M<sup>2</sup> — 8.9%, Pomorze and Kujawy 12th - 14th c. M<sup>1</sup> — 3.0%, M<sup>2</sup> — 46.0% [Stęślicka 1967, 1970] and Cedynia 10th - 12th c. M<sup>1</sup> — 0.0%, M<sup>2</sup> — 41.8% [Kaczmarek 1980] are very similar to those obtained for modern Polish. However, comparing them with Slavic and non-Slavic groups one shows that modern



Table 14. Distribution of the I<sup>2</sup> reduction and I<sup>1</sup> shovelling in modern Polish compared to neighbouring groups

Group*	Forms of reduction			Type of shovelling		
	N	0 %	2+3 %	N	1 %	2+3 %
Byelorussians (Vitebsk dist.)	184	82.5	2.1	252	45.7	18.4
Byelorussians (Brest district)	595	85.8	1.9	460	34.5	4.2
Russians (Belgorodsk dists)	115	87.7	0.0	117	—	1.7
Russians (Smolensk dist.)	411	86.0	1.0	409	—	11.5
Russians (Pskov dist.)	245	92.3	0.4	243	—	9.1
Ukrainians (Obuhovski dist.)	—	—	—	102	84.3	1.0
Polish (East Lithuania)	408	86.5	1.5	410	6.6	0.5
Lithuanians (East)	957	83.6	2.3	963	3.6	0.3
Lithuanians (North)	1247	80.0	1.8	1259	5.3	0.6
Polish (the Great Poland region)	454	80.4	3.5	395	2.1	0.4

\* the authors of comparative materials are cited in the chapter „Material and methods”

Polish upper molars are tending to be more often 4-cusped with less expressed hypocone reduction even on M<sup>2</sup>.

Similarly to the cusps reduction on maxillary molars several accessory structures are observed. One of the most common ones is accessory cusp on the linguo-medial surface called Carabelli's cusp. A definite range of this cusp frequencies in Mongoloid and Caucasoid groups is well known [Dahlberg 1963, Hanihara 1963, Zubov 1973, Turner 1977]. It is more frequent in Caucasians. In contemporary Polish as well as in Russians this trait was infrequently observed (tables 5 and 15), whereas in medieval group from Pomorze and Kujawy 12th-14th c. [Stęślicka 1967] Carabelli's cusp was observed more often and with sex differences (men — 61.7%, women 40.7%).

Many hypotheses concerning anthropogenesis as well as ethnogenesis are based on lower molars occlusal surface structures (among many others: Gregory and Hellman after Stęślicka [1948], Hellman, after Zubov [1968]). As dental morphological traits on lower molars are complicated ones, firstly cusp reduction, expressed as a cusp number (the absence of hypoconulid) is given here, then cusps



Table 15. The M<sup>2</sup> hypocone reduction and the presence of tuberculum Carabell on M<sup>1</sup> in contemporary Polish and neighbouring groups

Group*	Hypocone reduction M <sup>2</sup>		Carabelli's cusp on M <sup>1</sup>		
	N	3+3+ %	N	0 %	2-5 %
Byelorussians (Vitebsk district)	173	51.7	190	60.7	33.7
Byelorussians (Brest district)	421	67.1	406	47.8	42.5
Russians (Belgorodsk dist.)	90	38.9	107	47.7	33.6
Russians (Smolensk dist.)	326	48.4	374	48.9	28.0
Russians (Pskov dist.)	194	44.7	217	50.0	32.8
Ukrainians (Obuhovski dist.)	278	47.6	100	39.0	47.0
Polish (East Lithuania)	324	60.2	352	29.8	47.2
Lithuanians (East)	713	59.0	869	21.5	52.8
Lithuanians (North)	965	57.1	1138	27.0	48.2
Polish (the Great Poland region)	218	42.6	475	64.6	35.4

\* the authors of comparative data are cited in the chapter „Material and methods”

number and groove patterns (table 7 and 8). Very complicated, 6-cusped lower molars were observed very seldom (0.8%) and only on M<sup>1</sup>. Once, on both M<sub>1</sub> and M<sub>2</sub> extremely reduced 3-cusped tooth with Y pattern was noticed (0.3% and 0.4% respectively). The remaining M<sub>1</sub> were in 88.8% 5-cusped and in 10.4% 4-cusped in contrast to M<sub>2</sub> where 5-cusped teeth were noticed in 4.6% and 4-cusped in 94.4%. Thus it can be seen that the reduction goes from M<sub>1</sub> down to M<sub>2</sub>. The most frequent pattern on M<sub>1</sub> was “+” (65.1%) whereas Y was rarely observed (42.0%). On M<sub>2</sub> first of all “+” pattern was noticed — 66.8%. In addition it may be said that the most typical form of M<sub>1</sub> was “+” 5 (48.9%) for M<sub>2</sub> “+” 4 (63.7%). Comparison of lower molar structures between modern Polish and reference groups informs of less complicated M<sub>1</sub> in Polish (6-cusped were only present in 0.8%) with similar M<sub>1</sub> reduction frequency (4-cusped M<sub>1</sub>) but much stronger M<sub>2</sub> reduction. 5-cusped M<sub>2</sub> incidence is on the average twice greater in reference groups whereas 4-cusped M<sub>2</sub> is significantly more frequent in the present data. The lower molars in medieval groups considered here — Gruzno 12th - 13th c., Cedynia 12th - 14th c. — are less reduced with Y pattern on M<sub>1</sub> as the major one.



Table 16. Distribution of some lower molars occlusal patterns in modern Polish and compared groups

Group*	First lower molar				Second lower molar		
	N	6 %	+5 %	4 %	N	5 %	4 %
Byelorussians (Vitebsk district)	161	5.4	26.9	13.0	177	22.1	74.5
Byelorussians (Brest district)	368	1.4	26.7	9.0	1219	18.0	79.9
Russians (Belgorodsk dist.)	100	5.0	—	3.0	99	7.1	90.9
Russians (Smolensk dist.)	334	3.3	—	12.5	334	12.8	85.3
Russians (Pskov dist.)	167	1.7	—	14.4	214	11.0	86.7
Ukrainians (Obuhovski dist.)	99	1.0	24.3	9.1	81	13.6	82.2
Polish (East Lithuania)	237	2.1	57.7	9.3	323	10.2	89.2
Lithuanians (East)	593	0.8	48.4	7.8	727	11.0	88.6
Lithuanians (North)	844	0.8	50.4	6.3	870	10.5	89.2
Polish (the Great Poland region)	384	0.8	48.9	10.4	217	4.6	94.4

\* the authors of comparative data are cited in the chapter „Material and methods”

Characteristics on lower molars occlusal surface like: distal trigonid ridge, deflecting wrinkle and tuberculum accessorium mediale internum vary significantly in present groups. The distal trigonid ridge is infrequently observed in European populations (to 5% Zubov [1973: 142] and in present data was observed only in 0.1%. In reference groups the incidence is on the average higher. Tuberculum accessorium mediale internum, the most typical form for deciduous second molar [Suzuki, Sakai 1956] is also observed on permanent teeth. As well as distal trigonid ridge, tuberculum accessorium mediale internum was seldom observed in Polish — 2.9%, even in comparison to another groups. The deflecting wrinkle is very typical for Mongoloid groups and together with shovel-shaped incisors, low frequencies of Carabelli's cusp, distal trigonid ridge forms so-called “Mongoloid Dental Complex” what means that these characteristics are typical for Mongoloid groups [Hanihara 1963]. In European populations on contrary it is less frequent. The same was observed here and in reference groups (for all traits mentioned above see tables 8 and 17). In compliance with these data the result obtained by Steślicka for medieval population from Pomorze



Table 17. Distal trigonid ridge, tuberculum accessorium mediale internum and deflecting wrinkle in modern Polish compared to neighbouring groups

Group*	Distal trigonid ridge		Tuberculum accessorium mediale internum		Deflecting wrinkle	
	N	%	N	%	N	%
1 Byelorussians (Vitebsk district)	166	5.3	—	—	—	—
2 Byelorussians (Brest district)	460	1.2	—	—	—	—
3 Russians (Belgorodsk distr.)	93	2.2	206	0.9	101	6.8
4 Russians (Pskov district)	140	0.6	158	4.0	151	4.9
5 Russians (Smolensk dist.)	327	0.9	334	5.3	326	8.9
6 Ukrainians (Obuhovski dist.)	99	4.0	98	7.1	99	5.0
Polish (East Lithuania)	181	1.1	245	2.0	191	6.8
7 Lithuanians (East)	481	1.0	603	3.2	490	4.3
8 Lithuanians (North)	625	0.6	877	2.6	666	7.2
Polish (the Great Poland region)	355	0.1	395	2.9	329	4.8

\* the authors of comparative data are cited in the chapter „Material and methods”

and Kujawy 12th - 14th c. [1967] — for men 21.0%, for women 18.0% is doubtful for its suggestion of mongoloid influence. Does it mean that previously given remarks still hold?

As far as odontoglyphics is concerned, theoretical background for furrows characteristics has been given by Zubov in his works [1973, 1977]. Generally it may be said that all odontoglyphic characters observed in Polish are similar to European populations [Zubov 1977: 280, 281]. *1pa* furrow on  $M^1$  was the most often of the second type, the third one, the most characteristic for Mongoloid groups, was seldom observed in Polish, as well as in compared groups (tables 9 and 18). *2med* furrow on  $M_1$  rarely contacted with the third groove (table 10) unlike in comparative data (table 19) and finally *1end* and *2end* furrows on  $M_2$  were most frequently of D and T types, much less incidence is concerning parallel type (table 11). No data for comparative groups in this respect are obtainable. As *1end* and *2end* furrows do not discriminate groups so well as another morphological traits of teeth, they are eliminated from odontological comparative studies.



Table 18. Odontoglyphic patterns of *1pa* furrow on  $M^1$  in modern Polish compared to their neighbours

Group*	N	<i>1pa</i> furrow patterns		
		1 %	2 %	3 %
Russians (Belgorodsk dist.)	101	75.2	13.9	10.9
Russians (Smolensk dist.)	344	52.5	31.3	16.2
Russians (Pskov district)	386	38.4	42.2	19.4
Polish (East Lithuania)	507	28.5	65.7	5.8
Lithuanians (East)	576	28.6	65.5	5.9
Lithuanians (North)	779	29.7	65.2	5.1
Polish (the Great Poland region) <i>North-West Poland</i>	276	40.9	55.4	3.7

\* the authors of comparative data are cited in the chapter „Material and methods”

Table 19. Odontoglyphic patterns of *2med* furrow on  $M_1$  in modern Polish and comparative materials

Group*	N	<i>2med</i> furrow patterns		
		II %	III %	fc %
Russians (Belgorodsk dist.)	92	42.4	48.9	8.7
Russians (Smolensk district)	310	44.4	39.2	16.5
Russians (Pskov district)	142	48.1	31.4	20.5
Ukrainians (Obuhovski dist.)	65	23.1	36.9	40.0
Polish (East Lithuania)	185	48.1	13.5	38.4
Lithuanians (East)	422	53.1	9.7	37.2
Lithuanians (North)	590	49.7	13.1	37.3
Polish (the Great Poland region)	243	39.0	25.9	34.9

\* the authors of comparative data are cited in the chapter „Material and methods”



Table 20. The mean measures of biological distance between modern Polish and comparative groups (the standard deviation values are below in parentheses)\*\*

Group*	1	2	3	4	5	6	7	8	9	10
1		0.1750 (0.0050)	0.1082 (0.0021)	0.1456 (0.0041)	0.0924 (0.0020)	0.0687 (0.0030)	0.0769 (0.0054)	0.0322 (0.0023)	0.0445 (0.0016)	0.0388 (0.0014)
2			0.0427 (0.0030)	0.0587 (0.0053)	0.0344 (0.0036)	0.0472 (0.0048)	0.0765 (0.0066)	0.0164 (0.0036)	0.1254 (0.0027)	0.1504 (0.0026)
3				0.2814 (0.0041)	0.0556 (0.0021)	0.0476 (0.0033)	0.0505 (0.0054)	0.0575 (0.0022)	0.0523 (0.0013)	0.0496 (0.0019)
4					0.0568 (0.0041)	0.0376 (0.0047)	0.0739 (0.0070)	0.2363 (0.0042)	0.2294 (0.0033)	0.2665 (0.0034)
5						0.0140 (0.0034)	0.0799 (0.0064)	0.1210 (0.0021)	0.1458 (0.0017)	0.1076 (0.0015)
6							0.0461 (0.0065)	0.0733 (0.0030)	0.0931 (0.0023)	0.0870 (0.0025)
7								0.0747 (0.0055)	0.1099 (0.0047)	0.0812 (0.0047)
8									0.0043 (0.0017)	0.0029 (0.0016)
9										0.0032 (0.0016)
10										

\* 1 - modern Polish presented here, 2 - Byelorussians (Vitebsk district), 3 - Byelorussians (Brest district), 4 - Russians (Belgorodsk dist.), 5 - Russians (Smolensk dist.), 6 - Russians (Pskov dist.), 7 - Ukrainians (Obuhovskii dist.), 8 - Polish living in Lithuania, 9 - Lithuanians (East), 10 - Lithuanians (North)

\*\* the underlined standard deviations mean insignificance

Turning out to the variability of dental morphological traits among all presented contemporary groups and defined here in terms of mean measures of „biological distance” it may be said that these differences are large (table 20, fig. 5). The majority of biological distances between groups are significant, except for homogenous Lithuanian populations.

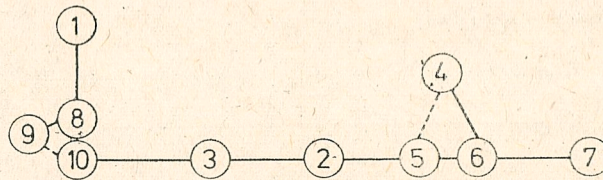


Fig. 5. Biological distances between Polish and compared groups presented graphically

Modern Polish are the most similar to people from Lithuania (Polish living there and Lithuanians) and from among Slavic groups for Ukrainians and Russians (Smolensk and Pskov districts). Such pattern of variability suggests slight relation between biological and geographical distances among all groups mentioned here.



## CONCLUSIONS

On grounds of the dental morphological traits analysis of a modern Polish population following conclusions may be drawn:

1. There is no clear trend for dental morphological variability in Polish, neither towards reduction nor complication of the teeth structures (for instance — lower teeth reduction is much more expressed than that of upper ones).

2. All dental morphological structures observed here are typical for European populations. Morphology of the Polish dentition is on average characterized as: frequent  $I^1 - I^1$  spacing, seldom  $I^2$  crowding, strongly reduced  $I^2$ . Shovelling of  $I^1$  is slightly expressed, maxillary molars are slightly reduced with infrequent presence of Carbelli's cusp. Lower molars are strongly reduced and the groove pattern is more often "+" than Y. Distal trigonid ridge on  $M_1$  is present extremely seldom; also deflecting wrinkle and tuberculum accessorium mediale internum were seldom recorded. Odontoglyphic structures are as well as another dental macrostructures similar to European groups. They include seldom presence of the third lpa furrow pattern on  $M^1$ . 2 med furrow ending is the most often on second groove and both entoconid furrows the most often remind D and T, rarely are parallel.

3. The very specific propriety of the Polish dentition is relatively low incidence of Carabelli's cusp, high incidence of  $I^1 - I^1$  spacing and reduced  $I^2$ .

4. Diversity between groups, e.g. Polish and comparative data, shows that there is slight evidence for relation between biological and geographical distances. Polish people remind mostly Lithuanian groups.

5. The vast and incomprehensive divergence between several data for Polish indicates need for continuing studies on dental morphology.

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## BADANIA MORFOLOGII ZĘBÓW WSPÓŁCZESNEJ POPULACJI POLSKIEJ

MARIA KACZMAREK

W pięciu miejscowościach woj. poznańskiego (Poznań, Kórnik, Luboń, Oborniki, Szamotuły) zbadano morfologię uzębienia stałego 475 osobników obu płci w wieku 7-15 lat. W celu scharakteryzowania przeciętnego uzębienia Polaków wybrano cechy o charakterze dziedzicznym i rasowo-diagnostycznym. Obserwowano następujące cechy uzębienia i struktury koron zębowych: diastemę I<sup>1</sup>-I<sup>1</sup>, stłoczenia I<sup>2</sup>, redukcję I<sup>2</sup>, łopatomaty kształt językowej powierzchni górnego przyśrodkowego siekacza, redukcję hypokonusa na górnych trzonowcach, obecność guzka Carabelliego na M<sup>1</sup>, liczbę guzków i typ bruzd na dolnych trzonowcach. Na M<sub>1</sub> obserwowano obecność dystalnego grzebienia trigonidu, fałdki kolankowatej i *tuberculum accessorium mediale internum* oraz mikrostruktury odontogliczne — kształt 1pa na M<sup>1</sup>, zakończenie 2med na M<sub>1</sub> oraz przebieg 1end i 2end na M<sub>2</sub>. Wszystkie cechy rejestrowano zgodnie z metodyką Dahlberga [1963] i Zubova [1968, 1977], opisaną szczegółowo w poprzedniej pracy autora (Kaczmarek 1979). Cechy rejestrowano bezpośrednio w jamie ustnej oraz na wykonanych po prawej



stronie obu szczęk wyciskach woskowych, zgodnie z techniką podaną przez Zubova (Zubov, Nikitjuk 1974). Na podstawie uzyskanych danych wyliczono częstości poszczególnych wariantów cech, nie uwzględniając podziału na płeć, gdyż różnice płciowe w częstościach cech były nieistotne (tabele 1-11). Dla oceny podobieństw i różnic badanych grup i materiału porównawczego zastosowano wielocechową metodę „odległości biologicznej” Grewala w modyfikacji Sjøvolda [1973] według następujących wzorów:

$$\bar{X} = \frac{\sum \left[ (\theta_1 - \theta_2)^2 - \left( \frac{1}{N_1} + \frac{1}{N_2} \right) \right]}{r}$$

$$\text{var } \bar{X} = \frac{\sum \left[ 2 \left( \frac{1}{N_1} + \frac{1}{N_2} \right)^2 \right]}{r^2}$$

gdzie:  $\theta$  — transformacja kątowna  $\theta = \arcsin 1 - 2p$ ,  $\theta_1$  — transformacja kątowna częstości cech w pierwszej grupie,  $\theta_2$  — transformacja kątowna częstości cech w drugiej grupie,  $N_1$  — liczebność pierwszej grupy,  $N_2$  — liczebność drugiej grupy,  $r$  — liczbą badanych cech.

Obliczone w ten sposób odległości biologiczne (tab. 12) są dla badanych grup reprezentujących Polaków nieistotne na poziomie 0,05. Fakt ten pozwala traktować je w dalszym omówieniu jako całość stanowiącą reprezentację populacji polskiej. Materiał porównawczy zamieszczono w tabelach 13-19. Tabela 20 prezentuje odległości biologiczne Polaków i porównywanych z nimi grup. Jak wynika z tabel, przeciętne uzębienie Polaków można określić następująco: wykazują tendencję do częstych diastem I<sup>1</sup>-I<sup>1</sup>, rzadkich stłoczeń I<sup>2</sup>, silnie zredukowanego I<sup>3</sup>. Językowa powierzchnia pierwszych górnych siekaczy ma rzadko łopatowaty kształt. Trzonowce górne są słabo zredukowane z niezbyt często występującym na nich guzkiem Carabelliego. Trzonowce dolne są silnie zredukowane, a typ bruzd na powierzchni żucia tych zębów tworzy częściej wzór „+” niż Y.

Pierwszy dolny trzonowiec prawie w ogóle nie posiada dystalnego grzebienia trigonidu, rzadko fałdkę kolankowatą oraz *tuberculum accessorium mediale internum*. Na pierwszym górnym trzonowcu bruzda 1pa rzadko tworzy trzecią formę, natomiast bruzda 2med na M<sub>1</sub> kończy się najczęściej na drugiej głównej bruzdzie 2med. Obie bruzdy entokonidu 1end i 2end na M<sub>2</sub> — najczęściej tworzą kształt równoległy.

Pod względem wszystkich badanych cech Polacy należą do określonego przez Zubova zachodniego pnia odontologicznego, to znaczy że obserwowane w badanym materiale częstości poszczególnych wariantów cech są podobne do obserwowanych najczęściej w populacjach europejskich. Specyficzne właściwości morfologii koron zębowych to: bardzo rzadko obecny dystalny grzebień trigonidu oraz rzadko obserwowany guzek Carabelliego.

Z porównania Polaków z innymi grupami słowiańskimi i niesłowiańskimi zamieszkałymi w europejskiej części ZSRR wynika, że Polacy najbardziej podobni są do Polaków zamieszkałych na Litwie i Litwinów. Spośród Słowian najbardziej podobni do Polaków są Ukraińcy, najmniej Białorusini.

Zaobserwowane rozbieżności w ocenie pewnych struktur zębów Polaków (różne dane na temat częstości łopatowatej formy siekaczy górnych, fałdki kolankowatej) zobowiązują do kontynuowania tych badań.