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DENTAL PATTERNS OF COIMBRA POPULATION

ABSTRACT: The dentition of 507 identified skeletons (250 ♀ and 257 ♂) from the largest cemetery of Coimbra (Portugal) has been studied. These individuals were born in Coimbra between 1803 and 1917. The detailed analysis, on their original records, of their birth places and professions as well as the historic and demographic sources and the anthropological results (analysis of variance) are indicating an important biological homogeneity and a low socio-economic level for this sample. The Coimbra population had small teeth, with their dental size patterns as follows:

MD diameter: $M^1\ M^2\ I^1\ M^3\ C\ P^1\ P^2\ I^2$
$M_1\ M_3\ M_2\ P_2\ P_1\ C\ I_2\ I_1$

BL diameter: $M^1\ M^2\ M^3\ P^2\ P^1\ C\ I^1\ I^2$
$M_1\ M_2\ M_3\ P_2\ C\ P_1\ I_2\ I_1$

The crown index indicates that all the upper (expect I^1*) teeth and lower anterior teeth and premolars are larger buccolingually than mesiodistally while the first upper incisor and lower molars have opposite dimensions. A very low level of asymmetry was found when mean values for right and left crown dimensions were compared. On the other hand, an important sexual dimorphism (statistically significant in practically all cases) appears, represented by larger BL dimensions than corresponding MD ones and with canines showing significant sexual differences.*

KEY WORDS: Odontometry — Sexual dimorphism — XIXth-XXth centuries — Coimbra (Portugal).

INTRODUCTION

The human osteological collections of the Anthropological Institute of Coimbra University (Portugal), are some of the most important in Europe because they are made up of a very large number of identified Portuguese skeletons. The birth-places, sexes, ages at death, probable causes of death, professions, family associations, marital status and names of these individuals, who were born between 1803 and 1917 and died between 1894 and 1936 (Bocquet & Morais 1987), are known.

The earliest collection is comprised of 575 skulls (366 males and 219 females) from the Medical Schools of Coimbra, Lisbon and Oporto. This series was created by Prof. Bernardino Machado, of the Anthropological Institute, between 1896 and 1903. Two other collections were obtained by Prof. Tamagnini between 1931 and 1942, from the largest cemetery of Coimbra (Cemetèrio da Conchada). One of them is made up of 507 complete skeletons (265 males and 239 females) and the other of 1075 skulls (524 males and 511 females). References connected with research on these collections can be found in Fer-

nandes (1985). Therefore, these 2154 Portuguese males and females are of fundamental importance for anthropological knowledge of the Iberian Peninsula populations, as well as being of great use when investigating numerous problems that anthropology currently faces about age and sex diagnosis.

The initial objective of the present work was to study the dental pattern from all of these Portuguese samples. However, previous research in a large number of different anthropological traits (Bocquet 1984, Bocquet et al. 1978, Bocquet and Morais 1978, Cunha 1989, Cunha and Van Vark 1991), as well as the detailed analysis of the place of birth of these individuals (in their original records) have demonstrated the heterogeneity of these collections since they consist of people from different parts of Portugal. Consequently, the individuals born in Coimbra from Tamagnini's Collections have been chosen for the present investigation since a more homogeneous genetic pool can be expected.

In this way, the main goals of the present study are to describe the Coimbra sample, to establish the dental size and shape patterns of this population and to study the sexual dimorphism and the possible asymmetry between right and left teeth. Since at the present time, knowledge about dental anthropology of the Iberian Peninsula populations is scarce (Garralda and Mesa 1985, Galera 1989 1990, Smets 1991), we hope to contribute significantly to this field with the present research.

MATERIAL AND METHODS

The material under study consists of 507 individuals (250 females and 257 males) who were born in several "freguesias" (the smallest administrative districts) from the "concelho" (several "freguesias") of Coimbra between 1803 and 1917. These human remains are housed in the Institute of Anthropology of Coimbra University where all the measurements and observations were made.

In order to complete the dental pattern of the Coimbra population, the mesiodistal (MD) and the bucolingual (BL) crown diameters were measured (to the nearest 0.1 mm) using the Lefèvre, Verdène and Fléchier anatomo-mechanic technique (Lefèvre 1972 1973). A special caliper designed by Bermúdez de Castro (1985) was employed. This accurate instrument has the peculiarity of vertical movable branches which end in two very thin and plane laminas. It is interesting to remark that because of the usefulness of this caliper, a large number of dental research has been currently done (since 1985: Bermúdez de Castro 1986, Galera 1989, Galera and Garralda 1989, González 1990, Smets 1991, etc.) in the Iberian Peninsula, using it. Teeth were not measured if it was apparent that wear had made an appreciable alteration in crown size. To minimize intraobserver error, all measurements were taken by one researcher after an initial test to ensure consistency. Because methodological and terminological diversity has tended to obscure the field of dental mensurements, it is important to state that thickness or breadth terms are used, in the present work, as synonymous of the BL diameter while width or length are for the MD dimension.

The basic statistical parameters of these diameters (N, $\bar{X}$ and S.D., Sokal and Rohlf 1981) as well as the crown and the robustness indices (Hillson 1986) were also calculated for each tooth. Furthermore, maxillary cheek tooth length (P1 – M3 diameter) and length of the cranial base (basion-nasion length) were measured in order to determine Flower's Index assessing the "general tooth size" of our sample (Bräuer 1988, Flower 1885).

An analysis of variance (Sokal and Rohlf 1981, Leguebe 1986) was made to see if the ten district sub-samples (each one of these sub-samples was formed for all the individuals that were born in the same "freguesia") could be grouped in only one sample. On the other hand, the independent sample t-test was used to check on the equality of univariate means between the sexes (Sokal and Rolhf 1981).

All the statistical analyses mentioned above were done with an Olivetti M24 PC using the SPSS programs and in the main frame.

THE COIMBRA SAMPLE

Coimbra is situated 224 km north of Lisbon and 120 km south of Oporto, in the center of Portugal and it is skirted by the Mondego River, the largest river which originates within the country (*Figure 1*). The city is located 100 meters above sea level, and one of its geographical peculiarities is that it has a continental climate, despite its proximity to the sea (45 km), with cold winters and hot summers (Roque 1982).

Of the 31 "freguesias" which currently comprise the "concelho" of Coimbra, only 10, the ones which have largest number of individuals in the Tamagnini's Collection, were used for the present study (Santa Cruz, São Bartolomeu, Santa Clara, Cernache, Santo António dos Olivais, Eiras, Sé, Ceira, Almedina and San Martinho do Bispo; *Figure 1*). The individual distribution of our sample within these "freguesias", in total and by sex, is stated in *Figure 2*. The detailed analysis of these data shows us similar frequencies for males and females in every one of these "freguesias", although some differences appear as for instance a lower number of females (24 %) than males (34 %) in Santa Cruz which is the result of a lesser or equal frequency of males than females in the rest of "freguesias" (except in San Martinho do Bispo where there are 3 % of males and 2 % of females). Likewise, nearly fifty per cent of the total number of skulls studied is from Santa Cruz and Sé, followed in order by Santo António dos Olivais (13 %) and São Bartolomeu (12 %).

The study of the professions of each individual of our sample on their original records (*Figure 3*) demonstrates that while women belonged almost exclusively to the domestic service (94.7 %), men were mainly artisans (35.29 %) and qualified laborers (10.50 %). The miscellaneous group (43.28 % of men and 2.12 % of women) is formed of some jobs with very low frequencies that could not be included in other categories (as for instance coachmen) and a special group, the greatest one, made up by individuals that had an unclear profession in their original records (all of them were designated as "hard-working" in the male cases).

Another important aspect related to our sample is the age group distribution. *Table 1* shows that individuals between the ages of 11 and 80 are represented. Differences between sex are not too significant although women are under-represented for the 31 – 40 age group, with only 18 individuals, and men for the 81 – 90, with only 5 individuals while females have 22 for this same group.

The mean age of this series is 44.95 ± 21.65 years.

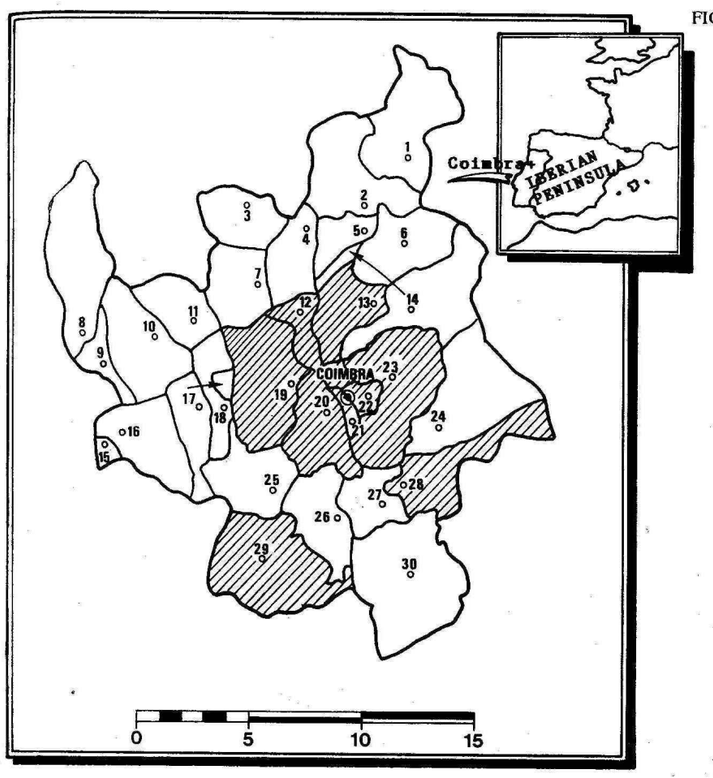

FIGURE 1. *Geographical location of Coimbra and its "freguesias".*

1 Botão
2 Souselas
3 Vila de Matos
4 Trouxemil
5 Torre de Vilela
6 Brasfemes
7 Antuzede
8 Lamarosa
9 S. Martinho de Árvore
10 S. Silvestre
11 S. João do Campo
12 Santa Cruz
13 Eiras
14 S. Paulo de Frades
15 Arzila
16 Ameal
17 Taveiro
18 Ribeira de Frades
19 S. Martinho do Bispo
20 Santa Clara
21 Almedina
22 Sé
23 Santo António dos Olivais
24 Torres do Mondego
25 Antanhol
26 Assafarge
27 Castelo Viegas
28 Ceira
29 Cernache
30 Almalaguês

///// "FREGUESIAS" used

TABLE 1. *Age group distribution of Coimbra sample.*

AGE GROUPS (YEARS)	MEN		WOMEN		TOTAL	
	N	%	N	%	N	%
≥ 11	1	0.4	5	2.0	6	1.2
11 – 20	37	14.4	34	13.6	71	14.0
21 – 30	53	20.6	42	16.8	95	18.7
31 – 40	42	16.3	18	7.2	60	11.8
41 – 50	45	17.5	30	12.0	75	14.8
51 – 60	25	9.7	34	13.6	59	11.6
61 – 70	27	10.5	37	14.8	64	12.6
71 – 80	22	8.6	25	10.0	47	9.3
81 – 90	5	2.0	22	8.8	27	5.3
91 – 100	–	0.0	3	1.2	3	0.6
TOTAL	257		250		507	

RESULTS

Results of analysis variance in each kind of tooth (*Table 2*) indicate that the variances of the several groups do not show statistical differences. P is close to the significant level (P = 5 %) in five cases (the MD diameter of the right lower first incisor and the BL diameter of the right lower canine and first molar and the left upper second premolar and first molar) but never reaches it. Therefore the individuals from the ten "freguesias" were included in the same sample which can be considered as homogeneous for these dental traits.

The Flower Index was calculated in 117 individuals of our sample given an average of 39.85 which indicates small teeth for the Coimbra population. This index was greater for females (N = 49; X = 40.48) than for males (N = 68; X = 39.13) because the nasion-basion length was smaller in the first group.

Descriptive statistics of MD and BL diameters of Coimbra population can be analyzed in *Table 3*.

TABLE 2. *Analysis of variance of Coimbra population.*

TEETH	MESIODISTAL DIAMETER		BUCCOLINGUAL DIAMETER	
	RIGHT	LEFT	RIGHT	LEFT
	F	F	F	F
I^1	0.6318	0.9453	1.9945	0.9175
I^2	1.2136	1.1356	1.5763	0.8180
C^1	1.0921	0.7801	1.4866	1.9218
P^1	2.0548	1.2585	2.0550	1.2103
P^2	2.0299	1.2610	0.8734	2.2444
M^1	1.5292	1.3531	1.2038	2.4409
M^2	1.1576	1.2785	0.6716	1.6696
M^3	0.9469	1.0244	0.7592	0.6707
I_1	2.4246	1.7329	0.8934	0.8693
I_2	1.6976	1.9065	1.9553	1.2050
C_1	1.4936	1.7882	2.2400	0.8515
P_1	0.9226	0.7260	1.8223	1.2078
P_2	1.1665	0.7793	1.6760	1.0383
M_1	1.2027	0.4476	2.4228	1.0475
M_2	1.8758	1.9186	1.7005	1.1526
M_3	0.8586	0.4460	1.1142	2.1519

Upper and lower molars have the greatest diameters, the first molar being larger than the second, and the second larger than the third. For the remaining teeth, a more heterogeneous pattern occurs depending on the dimensions considered. For the MD diameter of the upper teeth, the first incisor has the biggest dimensions after the molars, followed in order by the canine, the first premolar, the second premolar and the second incisor; for the lower teeth, the second premolar has the greatest diameters followed by the first premolar, the canine, the second incisor and the first incisor. For the BL diameter, the second premolar has the largest dimension after the molars, followed in order for the first premolar, the canine and the incisors from which, while in the upper maxillary the first incisor is greater than the second, in the mandible, the opposite happens. Molars have the highest variability, especially for the third molar.

Mean values for crown dimensions and teeth from right and left sides are given separately (*Table 3*). The level of asymmetry is very low. The greatest difference between right and left antimere is for the BL diameter of the third upper molar (0.28 mm). Both sides were not pooled together because it would create an unreal increase of the sample size since right and left sides are from the same individuals.

The relative size of the dentition from Coimbra population can be analyzed in *Table 4*. The robustness index indicates that the biggest tooth is the first molar, followed in order by the second and the third molar, and always the upper molars are smaller than their respective lower ones. For the rest of the teeth, the mandible shows that second premolar is the greatest, followed in order by the first premolar, the canine, the second and the first incisors. The upper jaw has

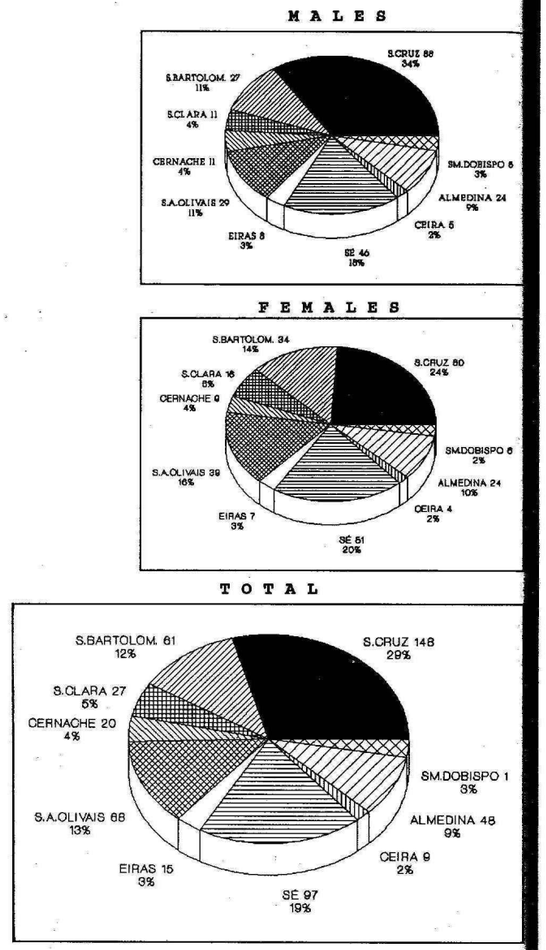

FIGURE 2. *Individual distribution within the "freguesias", in total and by sex.*

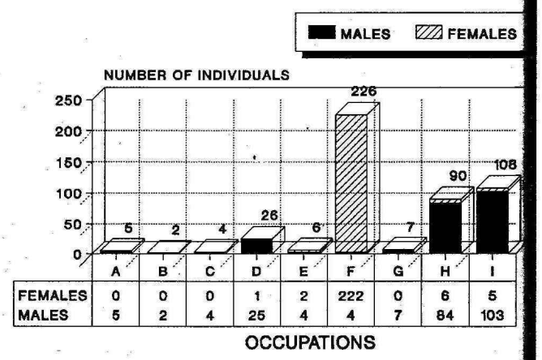

FIGURE 3. *Occupations of the studied Coimbra population.*

A – rural workers, B – soldiers, C – industrial laborers, D – qualified laborers, E – qualified professionals, F – domestic service, G – land owners, H – artisans, I – miscellaneous jobs

TABLE 3. *Descriptive statistics of mesiodistal and buccolingual diameters (in millimetres). Coimbra population (pooled sexes).*

TEETH	MESIODISTAL DIAMETER						BUCCOLINGUAL DIAMETER					
	RIGHT			LEFT			RIGHT			LEFT		
	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD
I_1	131	7.90	0.5	123	7.97	0.5	189	6.87	0.5	186	6.95	0.5
I^2	166	5.90	0.6	163	5.94	0.6	196	6.11	0.5	203	6.13	0.5
C^1	251	6.97	0.5	237	6.99	0.5	266	7.98	0.6	263	7.96	0.6
P^1	216	6.12	0.6	224	6.17	0.5	227	8.61	0.6	227	8.70	0.6
P^2	224	5.94	0.5	230	5.94	0.5	222	8.84	0.6	237	8.89	0.6
M^1	250	9.56	0.6	238	9.63	0.6	251	10.52	0.6	237	10.45	0.6
M^2	270	8.54	0.7	261	8.78	0.6	271	10.24	0.7	264	10.17	0.7
M^3	128	7.89	0.9	135	8.11	0.9	127	9.67	0.7	134	9.39	1.0
I_1	183	4.81	0.4	183	4.81	0.4	221	5.68	0.4	221	5.67	0.4
I_2	220	5.37	0.4	216	5.37	0.4	259	6.11	0.4	257	6.07	0.4
C_1	265	6.02	0.5	272	6.01	0.5	290	7.50	0.6	301	7.45	0.6
P_1	271	6.20	0.5	263	6.17	0.5	275	7.43	0.6	264	7.47	0.6
P_2	262	6.41	0.5	260	6.34	0.5	260	7.99	0.5	257	8.03	0.6
M_1	206	10.40	0.6	204	10.37	0.6	206	9.72	0.5	207	9.63	0.6
M_2	247	10.03	0.7	244	9.97	0.7	245	9.48	0.6	244	9.48	0.6
M_3	153	10.05	0.8	153	9.95	0.8	150	9.29	0.7	153	9.27	0.7

largest canines, followed in order by the first incisor, the first and the second premolars and the second incisor.

The crown index (*Table 4*) indicates that all the upper teeth (with the exception of the first incisor) and the lower incisors, canines and premolars have the BL diameter greater than their respective MD dimensions. On the other hand, lower molars have the contrary pattern.

The descriptive statistics of the MD and BL diameters for both sexes are given in *Tables 5* and *6*. Men have greater diameters than women for all the teeth except for the right third upper molar which is a little larger in the female series since the high variability of this dental piece.

The statistical analysis of this sexual dimorphism can be observed in *Table 7*. Significant differences have been found for all the Coimbra dentition except for the right and left MD diameter of the upper third molar, the left MD diameter of the lower third molar (as consequence, again, of their variability) and the right MD diameter of the second lower incisor. Furthermore, and with the only exception of the second lower premolar, BL dimensions have always greater sexual dimorphism than their respective MD ones, canines being the dental pieces with greater differences between the sexes.

DISCUSSION

Many studies have been conducted all over the world to establish the size and shape of teeth in both living and extinct hominid and various anthropological issues have arisen from these findings (as some of the well known and more current syntheses demonstrate: Cruwys and Foley 1986, Hillson 1986, Pompa 1990, Kieser 1990, Kelley and Larsen 1991). But at present, research on this topic is very scarce in the Iberian Peninsula and in consequence the understanding of several problems is only starting to be resolved. One of the points at issue is the low number of samples with a good chronology, location and description of the sample. These problems are increased by other, methodological, as for instance the diagnosis of sex, and for this reason making the interpretation of the data very difficult.

Kieser (1990) in the introduction of his book, titled "Human adult odontometrics" tells us that "tooth length and width provide significant information on such human biological problems as the genetic relationship between populations". But as we comment above, this information will be better when we know more about the studied populations. In consequence the historic, demographic and all the possible sources found on them, will play an invaluable role in understanding their biological processes.

The birthplace study of the individuals of Coimbra sample in their original records demonstrates that geographically (*Figure 1*), all of them were born in a small area of Portugal. These results together with the analysis of variance (*Table 2*) indicate an important homogeneity for our population that is also supported by other sources.

In this way, the demographic development of the Coimbra population throughout time is a very interesting aspect to consider. The studies of Roque (1982 & 1988) indicate that in 1801 the city of Coimbra was comprised of 9 "freguesias" (São Bartolomeu, São Cristovao, São João de Almedina, São João de Sta. Cruz, S. Pedro, São Salvador, Santiago, Sta. Justa and Sé) and had 15,203 inhabitants. In

TABLE 4. *Robustness and crown indices of Coimbra population.*

TEETH	ROBUSTNESS INDEX						CROWN INDEX					
	RIGHT			LEFT			RIGHT			LEFT		
	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD
I^1	128	54.64	6.0	121	55.70	6.0	128	87.61	6.3	121	87.45	6.7
I^2	160	36.32	5.4	159	36.56	5.2	160	104.46	10.8	159	103.69	10.1
C^1	244	55.59	7.4	235	55.88	6.9	244	114.63	8.4	235	114.34	7.8
P^1	214	53.00	7.6	220	53.84	7.4	214	141.19	9.9	220	141.41	9.3
P^2	219	52.78	7.2	225	52.90	6.6	219	149.18	11.8	225	149.86	10.5
M^1	245	100.82	11.6	232	100.79	11.2	245	110.23	5.3	232	108.62	4.8
M^2	266	87.75	11.9	256	89.68	11.6	266	120.28	7.7	256	116.11	6.7
M^3	125	76.58	12.5	133	76.63	14.8	125	123.66	14.0	133	116.30	9.3
I_1	181	27.53	3.6	179	27.29	3.4	181	118.98	10.9	179	118.58	11.6
I_2	218	32.82	3.7	212	32.73	3.8	218	113.96	9.7	212	113.58	9.0
C_1	259	45.48	6.2	267	44.81	6.2	259	125.23	10.5	267	124.60	10.9
P_1	266	46.27	6.3	257	46.22	6.3	266	120.27	9.3	257	121.31	10.1
P_2	253	51.47	6.6	252	51.09	7.0	253	124.93	9.7	252	127.21	9.4
M_1	201	101.31	10.9	202	100.00	10.8	201	93.61	4.2	202	92.94	4.9
M_2	241	95.31	11.1	239	94.71	12.3	241	94.78	5.0	239	95.29	5.1
M_3	145	93.49	13.6	147	92.38	13.1	145	92.66	5.5	147	93.52	5.8

1854, these nine "freguesias" were reduced to four (Sta. Cruz, São Bartolomeu, Sé Velha and Sé Catedral) and two new ones were created, namely Sta. Clara and Sto. Antonio dos Olivais, maintaining the number of inhabitants at around 15,000. In 1864 the population of Coimbra decreased to 12,727, probably as a result of the mortality crisis occurring between 1855 and 1859 due, mainly, to a cholera epidemic (Roque 1982). In 1878 the population increased to 13,369 and reached 20,000 in 1911. After this later date, a significant population increase occurred. In 1970 there were around 56,000 people living in Coimbra and 75,000 in 1981. All these data give us important information for the present research because the low population rate increased during the period studied, allowing us a low immigration rate, if it existed at all, and confirming the stability of the population throughout time.

On the other hand, it is important to emphasize that all the "freguesias" analyzed existed some centuries ago as small nuclei of population which generally appeared around a monastery. This is, for instance, the case of Santa Clara which was designated as a "freguesia" in 1854 but arose as a small center of population from the time when D. Dinis was the king of Portugal some 700 years ago (Roque 1988, Baptista Da Piedade 1990). So, it is easily deducible that an important part of our population's ancestors lived in Coimbra a long time ago.

Moreover, two other factors must be taken into account, the fact that all the individuals of our sample were born in Coimbra, and that during the last century and the beginning of the present one, women gave birth in their own homes (especially when they were of a low socio-economic level) and as a consequence, the birth place records reflect exactly where the individual is from.

So, the final conclusion, based on the demographic and historic sources as well as the birth place records previously described, is an important biological homogeneity for our sample.

With respect to the socio-economic level of the Coimbra population, the profession records (*Figure 3*) demonstrated that it was low in general although males had a higher position than females. Anyway, it should be remembered that all the individuals of the present series from the Conchada cemetery were donated to the Institute of Anthropology of Coimbra because their families could not afford an adequate burial.

Other data again confirm the occupation files. Roque (1982, 1988) describes Coimbra from the last century as a city surrounded by fields (country houses and/or small rural holdings) where rural and urban populations coexisted. He tells us that, during these times, a clear social stratification existed. Coimbra was topographically divided on a Hill, called "Bairro Alto" (High District), where the University was located and where students, teachers, administrators, ecclesiastics, etc., with their servants, lived (the "freguesias" of Sé and Almedina belonged to this area); a Lower District, called "Bairro Baixo" where artisan life was developed (Sta. Cruz and São Bartolomeu belonged to this area) and lastly, the periphery of the city (the rest of the "freguesias") that was inhabited by the poorest people who were mainly agrarian. Concerning their diet, the staples were mainly bread and vegetables, meat was limited and in consequence represented an exception in thheir daily meals. However the consumption of it must have been highly related to the socio-economic level (Roque 1988).

TABLE 5. *Descriptive statistics of mesiodistal and buccolingual diameters (in millimetres). Female Coimbra population.*

TEETH	MESIODISTAL DIAMETER						BUCCOLINGUAL DIAMETER					
	RIGHT			LEFT			RIGHT			LEFT		
	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD
I^1	59	7.72	0.5	49	7.83	0.5	81	6.74	0.4	78	6.79	0.4
I^2	77	5.77	0.7	72	5.81	0.6	87	5.99	0.5	85	6.01	0.5
C^1	116	6.80	0.5	112	6.81	0.4	121	7.67	0.5	122	7.65	0.5
P^1	95	6.01	0.5	99	6.07	0.5	101	8.40	0.5	102	8.48	0.5
P^2	100	5.84	0.5	103	5.87	0.5	99	8.63	0.6	105	8.70	0.6
M^1	113	9.44	0.6	103	9.49	0.6	116	10.36	0.6	106	10.24	0.6
M^2	113	8.39	0.7	110	8.67	0.6	113	9.98	0.6	113	9.97	0.7
M^3	46	7.92	0.7	53	7.93	0.9	45	9.50	0.8	53	9.02	1.1
I_1	85	4.74	0.4	83	4.74	0.4	98	5.55	0.4	98	5.55	0.4
I_2	101	5.33	0.4	97	5.29	0.4	121	6.01	0.4	119	6.01	0.3
C_1	127	5.84	0.4	124	5.82	0.4	136	7.21	0.5	138	7.16	0.5
P_1	118	6.11	0.5	116	6.06	0.5	121	7.26	0.5	116	7.30	0.6
P_2	110	6.20	0.5	114	6.16	0.5	111	7.85	0.5	115	7.89	0.5
M_1	82	10.20	0.6	83	10.21	0.6	82	9.55	0.5	85	9.45	0.6
M_2	97	9.82	0.6	104	9.76	0.6	96	9.23	0.6	103	9.21	0.6
M_3	58	9.81	0.8	56	9.79	0.9	58	9.06	0.7	56	8.96	0.7

In consequence, the low socio-economic level of the population under study is confirmed, emphasizing the fact that, although an important part of these people lived in the High District, they were mainly servants, as for example, the women that lived in Sé and Almedina (30 % of all women, *Figure 2*).

The dental size patterns of Coimbra sample is very similar and sometimes equal to that of other Iberian populations until now studied. In this manner, our series has the same patterns as the medieval Cántabros from Santa María de Hito (Smets 1991) which is located in the North of Spain. Little differences appear with two other Muslim medieval populations from the South of Spain, San Nicolás in Murcia (González 1990) and La Torrecilla in Granada (Martin et al. 1978). For San Nicolás, the mandible teeth were only studied (González 1990) being the single difference for the BL diameter of the first premolar that is wider than the canine. Just the opposite that happened in the Coimbra series.

The dissimilarities between Coimbra and La Torrecilla are exclusively of the upper MD diameters in which the last series has the third molar wider than the first incisor and the second incisor than the second premolar. Same differences have been found when the dental patterns of Coimbra were compared with an earlier sample from Granada. We are talking about the Eneolithic population from Gorafe (Souich 1974). Both series have exactly the same dental size patterns as that of Coimbra but for the upper mesiodistal dimensions the pattern of the Granadian samples is:

$$M^1 / M^2 / M^3 / I^1 / C / P^1 / I^2 / P^2$$

Muge is another interesting series that is made up by Mesolithic (C-14 dates: between 5115±300 and 7350±350 B.P.) Portuguese people who were excavated in this site (Lefèvre 1973), located very close to Lisbon. The dental size patterns of this population are very similar to the Coimbra sample, the only differences being for the upper MD diameter of the second incisor and the second premolar (the first one is longer than the second one) and the lower BL dimension of the first premolar and the canine (the first one is thicker than the second). Finally, some differences were found in comparing with the Middle Bronze people from Los Tolmos de Caracena (Galera and Garralda 1989). These individuals from the Spanish Central Plateau have greater MD diameters for their lower first premolar than their second premolar and larger BL dimensions for their first lower premolar than their canine.

The conclusion is a very stable dental size pattern throughout time in the Iberian Peninsula as expected from the results that other investigators got in populations all over the world (Fléchier and Verdène 1975, Menard 1977, Frayer 1978, Chamla 1980, Brace and Nagai 1982, Sharma 1983, Calcagno 1986, Gambarotta 1987, Haeussler et al. 1989, Harris and Rathbun 1989, İşcan 1989). The dissimilarities reflect the genetical differences among these heterochronic groups who lived in different mesoecological conditions.

In the assessment of sexual dimorphism in tooth size, univariate and multivariate methods have been employed by other authors in the analysis of size. Although in the present study univariate methods (Student t-test) have only been used (because sexual dimorphism was not the only and main goal), another research considering multivariate technics has just started and we hope it will give the maximum information about the sexual dimorphism of the Coimbra population.

TABLE 6. *Descriptive statistics of mesiodistal and buccolingual diameters (in millimetres). Male Coimbra population.*

TEETH	MESIODISTAL DIAMETER						BUCCOLINGUAL DIAMETER					
	RIGHT			LEFT			RIGHT			LEFT		
	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD
I^1	72	8.05	0.5	74	8.07	0.5	108	6.97	0.5	108	7.06	0.4
I^2	89	6.02	0.6	91	6.04	0.5	109	6.20	0.4	118	6.21	0.5
C^1	135	7.12	0.5	125	7.16	0.5	145	8.23	0.6	141	8.22	0.5
P^1	121	6.22	0.5	125	6.25	0.5	126	8.77	0.6	125	8.88	0.6
P^2	124	6.03	0.5	127	6.00	0.4	123	9.01	0.6	132	9.05	0.6
M^1	137	9.65	0.6	135	9.73	0.5	135	10.65	0.6	131	10.61	0.6
M^2	157	8.65	0.7	151	8.87	0.6	158	10.44	0.7	151	10.33	0.7
M^3	82	7.87	1.0	82	8.22	0.9	82	9.77	0.6	81	9.64	0.8
I_1	98	4.88	0.4	100	4.88	0.4	123	5.78	0.4	123	5.77	0.4
I_2	119	5.41	0.5	119	5.44	0.5	138	6.20	0.4	138	6.13	0.4
C_1	138	6.20	0.5	148	6.17	0.5	154	7.77	0.5	163	7.69	0.6
P_1	153	6.28	0.5	147	6.26	0.5	154	7.57	0.5	148	7.59	0.6
P_2	152	6.57	0.5	146	6.48	0.5	149	8.09	0.5	142	8.14	0.6
M_1	124	10.53	0.6	121	10.48	0.6	124	9.83	0.5	122	9.75	0.5
M_2	150	10.16	0.7	140	10.12	0.8	149	9.63	0.6	141	9.68	0.6
M_3	95	10.20	0.8	97	10.04	0.8	92	9.44	0.7	97	9.44	0.6

Univariate methods (Moorrees and Reed 1954, Beresford 1969, Lavelle 1972, Perzigian 1976, Sciulli 1979, Harris and Nweeia 1980a, Kieser 1985, Kieser and Groeneveld 1987) reported the dental dimensions of males to be considerably larger than those of females, the largest differences being found in the canines. They also found that generally, BL diameters are more dimorphic than MD. We got the same pattern for the dental sexual dimorphism of the Coimbra sample. But these results are not always the same as it happened in the Highland Beach Mound people studied by İşcan (1989) where the most dimorphic teeth were the upper second premolars and lower canines.

Kieser (1990) in his interesting book about human odontometrics states that several theories exist about the canine size dimorphism in non-human primates as for instance, canines as weapons which enable males to defend other group members from predators; canines as a reproductive advantage; canines as a by-product of body size dimorphism; etc. According to this author, any or all of these theories may apply to humans although it is difficult to decide which is correct since our canines have become more reduced in size and since we have also to consider that humans have clearly not been subjected to the same selective pressures that seem to have been applied to other non-human primates. Anyway and in spite of their marked reduction in size, the canines of humans have remained the most highly dimorphic teeth in the dental arcade. But currently and although many studies about human sexual dental dimorphism have been made and much has been written about the explanation of canine dimorphism in man, the interpretation continues to be very confused as indicated in the last phrase that Kieser wrote in the paragraph dedicated to sexual dimorphism in canines: "taken together, these studies suggest that the reasons behind canine size dimorphism are as elusive as when Baron Cuvier first addressed the problem in 1834".

Finally and with respect to the dental size asymmetry, a lot of research has been done (Suarez 1974, Perzigian 1975, Doyle and Johnston 1977, Harris and Nweeia 1980b, Townsend and Brown, 1980, Garn et al. 1981, Townsend and García-Godoy 1984, Kieser and Groeneveld 1986a, 1986b, 1988). This topic has recently emerged as a useful tool for studies in public health and epidemiology as Kieser (1990) cited in his book, in the idea of greater odontometric asymmetry in human groups with higher levels of stress. For the Coimbra sample we found very low differences between right and left antimeres, but we have to remember that this series was formed by individuals who were much affected by various stresses. For this reason it is prudent to wait for new research (comparing different socio-economic groups from Coimbra or considering other dental traits) to interpret these data.

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TABLE 7. *Sexual dimorphism of the Coimbra population's dentition. Student t-test (significant level: $p \leq 0.05$).*

TEETH	MESIODISTAL DIAMETER						BUCCOLINGUAL DIAMETER					
	RIGHT			LEFT			RIGHT			LEFT		
	DF	t	P	DF	t	P	DF	t	P	DF	t	P
I^1	129	−3.67	0.00	121	−2.50	0.01	187	−3.61	0.00	184	−4.14	0.00
I^2	164	−2.63	0.01	161	−2.63	0.01	194	−3.37	0.00	201	−3.02	0.00
C^1	249	−5.05	0.00	235	−5.92	0.00	264	−8.01	0.00	261	−8.90	0.00
P^1	214	−2.85	0.01	222	−2.53	0.01	225	−5.13	0.00	225	−5.61	0.00
P^2	222	−2.81	0.01	228	−2.10	0.04	220	−4.53	0.00	235	−4.53	0.00
M^1	248	−2.66	0.01	236	−3.42	0.00	249	−3.95	0.00	235	−4.79	0.00
M^2	268	−3.12	0.00	259	−2.53	0.01	269	−5.63	0.00	262	−4.11	0.00
M^3	126	+0.26	0.79	133	−1.93	0.06	125	−2.13	0.03	132	−3.73	0.00
I_1	181	−2.18	0.03	181	−2.25	0.03	219	−4.38	0.00	219	−4.33	0.00
I_2	218	−1.39	0.17	214	−2.65	0.01	257	−4.02	0.00	255	−2.79	0.01
C_1	263	−6.27	0.00	270	−6.02	0.00	288	−9.61	0.00	299	−9.12	0.00
P_1	269	−2.76	0.01	261	−3.25	0.00	273	−4.73	0.00	262	−4.21	0.00
P_2	260	−5.94	0.00	258	−4.85	0.00	258	−3.70	0.00	255	−3.72	0.00
M_1	204	−3.73	0.00	202	−3.17	0.00	204	−3.74	0.00	205	−3.83	0.00
M_2	245	−4.02	0.00	242	−4.02	0.00	243	−5.57	0.00	242	−6.27	0.00
M_3	151	−2.97	0.00	151	−1.77	0.08	148	−3.27	0.01	151	−4.44	0.00

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