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RESEARCH ARTICLE

Population and Age Characteristics of Pelvic Sizes in Azerbaijani Women Based on the Study of Skeletal Materials

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ARTICLE INFO	ABSTRACT
	The aim of the study was the osteometric examination of the pelvises of Azerbaijani women. A total of 78 mounted pelvic specimens from the osteological collection of the museum at the Department of Human Anatomy of the Azerbaijan Medical University were studied. The results of the study present pelviometric characteristics of contemporary Azerbaijani women. The studied sample was divided into three age categories (16-20 years; 21-35 years; 36-60 years) and the pelviometric indicators of these groups were compared using analysis of variance. Pelvimetry results showed that most pelvic dimensions do not vary significantly with age. It was also found that narrow pelvic forms predominate in the studied sample of women. Despite the small sample size, the authors believe that their results can be used (with certain limitations) by forensic anthropologists and clinicians as dimensional-typological standards for the pelvis sizes of Azerbaijani women.

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1. INTRODUCTION

The study of the size typology of the female pelvis in Azerbaijani women to identify anthropometric, population, age, and other differences has not been conducted in previous years. There are only fragmentary data on pelvimetric data taken from works of the early 20th century, which are referenced in textbooks of the corresponding period [1]. This situation served as a significant motivation to address the corresponding issue. Therefore, based on these premises, as well as to identify possible anthropological and population characteristics in the structure of the pelvis in Azerbaijani women, we decided to conduct the corresponding osteometric studies.

2. MATERIALS AND METHODS

The study material consisted of an osteological collection from the museum of the Department of Human Anatomy at the Azerbaijan Medical University (AMU). The museum collection includes more than 100 mounted specimens of the female pelvis (each such specimen consists of two paired pelvic bones (os coxae) and the sacral bone (os sacrum), which are connected at anatomical joints). This collection has been gathered since the foundation of AMU (1930) and each pelvic specimen has an

annotation (information about gender and age). Most specimens are made from fully macerated bones, connected with silicone glue (the thickness of the glue corresponds to the cartilage lost during maceration). However, some old specimens are made with preserved cartilages and ligaments by the embalming method. Thus, it can be said that we had a sample selected by a blind method. However, due to various defects and cuts on the specimens (they are constantly demonstrated to students), 78 specimens of the female pelvis were suitable for our work purposes. This sample was conditionally divided by us into 3 age categories: 16-21 years; 21-35 years; 36-60 years. Each age group ultimately included 26 osteological objects (mounted pelvic specimens). Fifteen pelvimetric characteristics were measured on each object:

1. Anatomical conjugate - the distance between the promontory of the sacrum and the upper edge of the pubic symphysis.
2. Transverse diameter - the distance between the most distant points (right and left) on the arcuate line (linea arcuata).
3. True conjugate - the distance between the promontory of the sacrum and the most protruding point of the pubic symphysis into the pelvic cavity.
4. Diagonal conjugate - the distance between the promontory of the sacrum and the lower edge of the pubic symphysis.
5. Oblique diameter - the distance between the sacroiliac joint of one side and the ilio-pubic eminence of the opposite side. The size is determined between the points formed at the intersection of these anatomical elements with the arcuate line.
6. Direct size of the wide part of the pelvis – the distance between the most protruding point into the pelvic cavity on the lower edge of the symphysis and the middle of the junction between the second and third sacral vertebrae.
7. Transverse size of the wide part of the pelvis – the distance between the most distant points of the acetabular cavities.
8. Transverse size of the narrow part of the pelvis – the smallest distance between the inner surfaces of the ischial bones.
9. Direct size of the narrow part of the pelvis – the distance between the lowest point on the lower edge of the symphysis and the middle of the sacrococcygeal junction.
10. Transverse size of the pelvic outlet – the maximum distance between the inner surfaces of the ischial tuberosities.
11. Longitudinal size of the pelvic outlet (conjugate of the outlet) – the distance between the most protruding point into the pelvic cavity on the lower edge of the symphysis and the tip of the coccyx.
12. Symphysiosacral distance – the distance between the most protruding point into the pelvic cavity on the lower edge of the symphysis and the middle point on the anterior edge of the sacral apex (this size almost coincides with size 9 but is still different from it).
13. Interspinous size – the distance between the peaks of the ischial spines.
14. Intercrestal distance – the maximum distance between the outer edges of the iliac crests.
15. Pelvic height – the distance from the ischial tuberosity to the highest point of the iliac crest.

The measurement results were recorded in a special pelvimetric form compiled by the Department of Anatomy for pelvic measurements. The data from the measurements were entered into an electronic database created in Microsoft Excel (version 15.0, 2016), where the necessary calculations were then performed. For the obtained values of the pelvimetric characteristics, the main statistical characteristics were calculated (mean for all data, standard deviation and its error, 95% confidence interval for the mean, min, max). Differences between age groups were tested using analysis of variance.

3. RESEARCH RESULTS

The parameters obtained during the pelvimetric studies were grouped and entered into an electronic database in the Microsoft Excel software environment. In total, as a result of measurements of the studied osteological collection, 1170 numerical indicators of pelvic sizes were obtained. After calculating the relevant variational-statistical characteristics for the entire database (the characteristics were calculated both for the entire sample as a whole and for each age group separately), these indicators were organized and grouped into a table. This table containing the relevant data in detailed form is presented below (Table No.1).

Table 1: Pelvimetric indicators of female pelvises based on the study of the Osteological collection of the anatomy museum of AMU

Pelviometric Characteristic	Statistical Parameters								
	Age Group	N	Mean (cm)	S	S(r)	95% Confidence Interval for Mean		min	max
						min	max		
1 Anatomical conjugate	16-21	26	10,26	0,91	0,18	9,89	10,62	7,9	11,5
	22-35	26	10,43	0,92	0,18	10,06	10,80	7,4	12,0
	36-60	26	10,70	1,17	0,23	10,23	11,17	7,4	12,8
	total	78	10,46	1,01	0,11	10,23	10,69	7,4	12,8
2 Transverse diameter	16-21	26	11,74	1,02	0,20	11,33	12,15	9,6	12,9
	22-35	26	11,68	1,21	0,24	11,19	12,17	9,4	13,8
	36-60	26	11,62	1,33	0,26	11,08	12,15	9,4	14,1
	total	78	11,68	1,18	0,13	11,41	11,94	9,4	14,1
3 True conjugate	16-21	26	10,08	1,21	0,24	9,59	10,57	7,3	12,5
	22-35	26	10,42	1,26	0,25	9,92	10,93	8,3	12,9
	36-60	26	10,51	1,37	0,27	9,96	11,06	7,6	12,6
	total	78	10,34	1,28	0,14	10,05	10,63	7,3	12,9
4 Diagonal conjugate	16-21	26	10,88	1,55	0,30	10,26	11,51	7,5	12,6
	22-35	26	11,71	1,50	0,29	11,11	12,32	7,7	14,0
	36-60	26	11,42	1,49	0,29	10,81	12,02	7,8	13,8
	total	78	11,34	1,53	0,17	10,99	11,68	7,5	14,0
5 Oblique diameter	16-21	26	11,71	1,33	0,26	11,17	12,25	7,8	13,2
	22-35	26	12,26	1,05	0,21	11,84	12,69	8,3	13,3
	36-60	26	12,55	1,27	0,25	12,03	13,06	8,7	13,8
	total	78	12,17	1,26	0,14	11,89	12,46	7,8	13,8
6 Direct parameter of the wide part of pelvis	16-21	26	10,89	1,37	0,27	10,34	11,44	7,4	12,5
	22-35	26	11,29	1,52	0,30	10,67	11,90	7,6	13,3
	36-60	26	11,13	1,12	0,22	10,67	11,58	7,8	12,5
	total	78	11,10	1,34	0,15	10,80	11,40	7,4	13,3
	16-21	26	11,14	1,58	0,31	10,50	11,78	7,5	12,6

7 Transverse diameter of the widest part of the pelvis	22-35	26	11,66	1,40	0,28	11,10	12,23	7,9	13,3
	36-60	26	11,52	1,25	0,25	11,01	12,02	7,4	12,9
	total	78	11,44	1,42	0,16	11,12	11,76	7,4	13,3
8 Transverse diameter of the narrow part of pelvis	16-21	26	9,72	0,81	0,16	9,39	10,05	7,1	10,6
	22-35	26	9,96	1,12	0,22	9,51	10,42	6,8	11,3
	36-60	26	10,01	1,22	0,24	9,51	10,50	6,9	12,5
	total	78	9,90	1,06	0,12	9,66	10,14	6,8	12,5
9 Direct parameter of the narrow part of the pelvis	16-21	26	10,02	0,72	0,14	9,73	10,31	7,9	11,4
	22-35	26	10,10	1,40	0,27	9,53	10,66	7,1	12,3
	36-60	26	10,51	1,26	0,25	10,00	11,02	7,3	12,2
	total	78	10,21	1,17	0,13	9,94	10,47	7,1	12,3
10 Transverse size of the outlet from the pelvic cavity	16-21	26	9,96	1,10	0,22	9,51	10,40	7,3	12,0
	22-35	26	10,15	1,01	0,20	9,75	10,56	8,0	12,0
	36-60	26	10,44	1,06	0,21	10,01	10,87	8,1	12,2
	total	78	10,18	1,06	0,12	9,94	10,42	7,3	12,2
11 Longitudinal size of the outlet from the pelvic cavity	16-21	26	9,89	1,25	0,25	9,39	10,40	7,8	12,3
	22-35	26	10,40	1,20	0,24	9,92	10,89	7,9	12,2
	36-60	26	10,08	1,23	0,24	9,59	10,58	7,7	11,8
	total	78	10,13	1,23	0,14	9,85	10,40	7,7	12,3
12 Distance symphysis – sacral	16-21	26	10,94	0,89	0,17	10,58	11,30	8,7	12,5
	22-35	26	10,54	0,84	0,17	10,20	10,88	8,5	12,5
	36-60	26	10,22	1,18	0,23	9,74	10,70	7,5	12,4
	total	78	10,57	1,01	0,11	10,34	10,80	7,5	12,5
13 Interspinous distance	16-21	26	10,38	0,87	0,17	10,03	10,73	8,2	12,1
	22-35	26	10,41	1,05	0,21	9,99	10,84	7,2	12,0
	36-60	26	10,01	0,93	0,18	9,63	10,39	7,4	11,7
	total	78	10,27	0,96	0,11	10,05	10,48	7,2	12,1
14 Intercrestal distance	16-21	26	25,84	1,39	0,27	25,28	26,40	22,6	27,5
	22-35	26	26,05	1,87	0,37	25,30	26,80	21,8	29,0
	36-60	26	27,22	2,26	0,44	26,31	28,13	22,0	30,0
	total	78	26,37	1,95	0,22	25,93	26,81	21,8	30,0
15 Pelvic height	16-21	26	20,93	1,72	0,34	20,23	21,62	18,0	25,5
	22-35	26	20,90	1,93	0,38	20,12	21,68	17,5	26,2
	36-60	26	21,83	2,12	0,42	20,98	22,69	16,9	26,5
	total	78	21,22	1,95	0,22	20,78	21,66	16,9	26,5

Note: N – number of pelvic specimens; X – mean value of the characteristic; S – standard deviation; S(r) – standard error of the mean.

Overall, in the studied sample, the most variable pelvic parameters were the oblique diameter, diagonal conjugate, and the transverse size of the wide part of the pelvis. Slightly less variable were characteristics such as the true conjugate and the direct size of the wide part of the pelvis. In the first age group, the indicators fluctuated within a wider range. In this case, the total pelvic dimensions showed greater variability, while the dimensions of the small pelvis were less variable (direct size of the narrow part of the pelvis, transverse size of the pelvic outlet, and interspinous distance). In the second age group, the total pelvic dimensions (pelvic height, intercrest distance, diagonal conjugate, etc.) were also the most variable. The dimensions within the pelvic ring in this group were the least variable; however, the mean values for almost all parameters were higher than in the previous age category. In the third age group, the same total dimensions were the most variable as in the second group. At the same time, the variability of the true conjugate and transverse diameter increased significantly, as well as the oblique diameter and direct size of the narrow part of the pelvis. The parameters of the small pelvis in this group also had low variability, but for most characteristics, the highest mean values among all groups were observed.

We understood that we had a small sample, and it was heterogeneous (spread over a long time interval). These factors did not favor an objective examination of morphodynamic changes in pelvic dimensions with age. Nevertheless, we conducted an analysis of variance to compare the pelvimetric characteristics among the three conditionally distinguished groups. The results of the analysis of variance are presented in Table 2.

Table 2: Results of comparison of pelviometric characteristics from three conditionally selected groups using analysis of variance

Statistical Parameters \ Studied Characteristic	Anatomical conjugate	Transverse diameter	True conjugate	Diagonal conjugate	Oblique diameter	Direct parameter of the wide part of pelvis	Transverse diameter of the widest part of the pelvis	Transverse diameter of the narrow part of pelvis	Direct parameter of the narrow part of the pelvis	Transverse size of the outlet from the pelvic cavity	Longitudinal size of the outlet from the pelvic cavity	Distance symphysis – sacral	Interspinous distance	Intercrestal distance	Pelvic height
D (between)	0,961	0,421	1,567	0,194	2,315	1,58	1,087	2,652	0,134	0,222	0,802	1,182	0,572	13,8	32,5
D (within)	0,149	0,866	0,894	0,537	0,461	0,315	0,456	0,821	1,574	0,588	1,517	1,12	1,01	5,447	2,9
F	6,461	0,485	1,752	0,361	5,025	5,016	2,385	3,229	0,085	0,377	0,528	1,055	0,566	2,534	11,3
P	<0,01	<0,63	<0,21	<0,7	<0,02	<0,02	<0,13	<0,07	<0,92	<0,69	<0,60	<0,37	<0,58	<0,11	<0,01

Note: D(inter) – value of intergroup dispersion; D(intra) – value of intragroup dispersion; F – calculated Fisher criterion value; P – probability of the null hypothesis being true.

4. DISCUSSION

As seen from the table, the results of the analysis of variance did not reveal significant differences for most of the studied characteristics across the groups. Only 3 out of 15 pelvimetric characteristics show notable variability with age, and the differences in these parameters are statistically significant. However, we have already mentioned that with such a small sample size, it is difficult to draw substantial conclusions about the morphodynamic changes in the dimensions of the female pelvis. In this case, the results of the analysis of variance are useful in that they indicate we studied a relatively

homogeneous sample. Therefore, our pelvimetric research results can be used as pelvimetric standards for Azerbaijani women, derived from skeletal material.

 Considering the obtained figures in the context of their relationship to pelvic configuration, we found that a significant number of the studied pelvic bones can be classified as narrow. We compared the obtained data with average parameters within the Caucasoid race (2, 3). Pelves with a transverse diameter of less than 11.8 cm and a transverse diameter of the pelvic outlet of less than 10.5 cm were classified as narrow forms of the pelvis, and there were 18 (23.1%) of them in the collection. Some specimens in our collection had differences of 1.5 cm or more in some osteometric characteristics (true conjugate, diagonal conjugate, transverse diameter, intercrest distance, transverse size of the wide part) from the average values in the direction of decrease. We believe these can be classified as borderline pelvis forms. In total, there were 18 such objects in our collection. Thus, we observed an increased number of both narrow pelves and borderline pelves. This conclusion emerged when comparing our results with pelvimetric data from distant populations (3, 4, 5) and with pelvic size values of women from geographically closer ethnic groups (6, 7).

This interesting observation of a high number of narrow and borderline pelves is likely due to our small sample size. However, this fact warrants further investigation, as the percentage of narrow pelves is very high and likely indicates a trend toward a higher prevalence of narrow forms in the overall population. In this context, our results can serve as comparative material when analyzing corresponding results obtained in future pelvimetric studies of Azerbaijani women. These studies could involve both skeletal material and pelvimetric measurements obtained through CT and sonographic examinations.

5. CONCLUSIONS

For the first time, pelviometric studies have been conducted on bone pelvis specimens of Azerbaijani women from the anatomy museum. The studied material was found to be relatively homogeneous in the context of age-related morphodynamics, and the analysis of measurements indicated that narrow pelvic forms may be predominant among Azerbaijani women (in the population as a whole). The results of this study will be highly useful for clinicians who can use them for comparison with their own research data. The pelviometric database also holds significant value for forensic anthropologists and specialists in historical anthropology. Forensic anthropologists, by expanding this database, can use it as a dimensional-typological standard for the pelvis sizes of Azerbaijani women in their protocols. The results we present will also be of interest to researchers from adjacent geographic regions in the context of comparative studies between populations living in Western Asia.

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