

## Morphology of the Gluteal Region in the Female Population 5 to 83 Years of Age

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**Abstract.** This study evaluated the development of gluteal region morphology in the female population 5 to 83 years of age. For the study, 132 female subjects were placed into four groups: prepubertal (ages 5 to 8 years;  $n = 10$ ), pubertal (ages 9 to 14 years;  $n = 38$ ) postpubertal (ages 15 to 41 years;  $n = 34$ ), and menopausal–postmenopausal (older than 42 years;  $n = 29$ ). The age, weight, and height of the subjects were routinely recorded, and body mass index was estimated. In addition, 11 measurements were performed on the gluteal region. The data were analyzed by Pearson and Spearman correlation analyses using SSPS 11.0 for Windows. In the prepubertal group, the intergluteal sulcus and infragluteal sulci did not actively change. Weight gain was the major factor influencing the shape of the gluteal region, whereas age had no effect. In the puberty group, the gluteal region expanded in all directions. During this period, it was difficult to determine any specific relation between measurements because of significant correlation involving all parameters. However, it should be mentioned that among the four groups, only in pubertal group did age significantly affect the shape of the gluteal region. In other three groups, weight seemed to be a major determinant. In the postpubertal and menopausal–postmenopausal groups, the buttocks sagged with weight gain, contrary to the belief that this happens with aging. This causes movement of the infragluteal sulci in downward and lateral directions as well as lengthening of intergluteal sulcus. Although the gluteal shape is open to the effects of demographic factors such as ethnicity, feeding habits, and lifestyle, according to these findings, it might be advised that in the assessment of the gluteal region morphology, it would be better to consider

its dynamic nature. Reshaping its only one part, which can be devastating unless the whole gluteal region and upper limb are addressed.

**Key words:** Development—Gluteal region—Morphology

Gluteal shape is influenced by several factors such as gender, age, weight, and lifestyle. Another factor, puberty, is the milestone in the development of the gluteal region. With puberty, physiologic psychological, and morphologic changes take place in the body. These changes shape the buttocks in different ways according to the gender of the subject. The development of pubic hair, testicles, and breasts under the effect of growth and puberty have been documented in detail [2], but because of its apparently less significant physiologic role, the morphology of the gluteal region was neglected for a long time. Another important step in a woman's life is menopause, during which the hormonal milieu changes. During this period, possible changes in the gluteal region have not yet been studied intensively.

In a previous study [1], the author demonstrated the changes in the gluteal region under the influence of age and weight gain in young and middle-aged women from the perspective of aesthetic surgery. The current study aimed to document the changes taking place in gluteal region through four major periods: the prepubertal, pubertal, postpubertal, and menopausal–postmenopausal periods.

### Materials and Methods

All measurements were performed by the same investigator (B.B.) on 132 randomly selected females

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5 to 83 years of age in a comfortable, well-lighted room. The subjects younger than 7 years of age were from the pediatric clinic of the hospital.

The measurements were performed in primary schools for the group 7 to 14 years of age, and in high schools of Zonguldak region for the group 15 to 17 years of age.

The subjects 18 to 24 years old were among the nursing staff and female patients who presented to the outpatient department reporting problems such as a nevus or scar. The subjects older than 24 years were selected randomly from female patients with a problem not affecting gluteal region morphology.

The subjects were asked to wear an examination dress and to stand barefoot in an anatomic position while measurements were taken. The body mass index (BMI) was calculated as the current weight (kg)/height (m<sup>2</sup>). The criteria for exclusion of subjects from the study specified morbid obesity, emaciation, a history of congenital hip dislocation, major trauma or surgery to the gluteal region, and pregnancy.

In this study, the anatomic reference points and measurements described previously [1] were used with some modifications (Fig. 1). Briefly, the reference points were the anterosuperior iliac spine (point A), the most prominent part of the major trochanter (point B), the cephalic point of the intergluteal sulcus (point D), the divergence point of the two infragluteal sulci caudal to the intergluteal sulcus (point E), and the lateral (point F) and most inferior (point C) points of the infragluteal sulcus.

Using these points, 11 measurements were performed (Table 1). The age, height, and weight of the subject were recorded as well.

In the current study, the circumference of the gluteal region was measured at the three different levels passing through points AA, BB, and CC. To calculate the lateral extension of the infragluteal sulcus, the distance from the lateral point of the gluteal sulcus (point F) to the midaxillary line (FML), ipsilateral trochanter (point B), and cephalic part of the intergluteal sulcus (point D) was recorded. Downsloping of the gluteal sulcus was estimated by recording the distance from point A to ipsilateral point F and point C (Table 2, Fig. 1). The leg circumference (LC) measurement was performed at the widest region of the proximal limb.

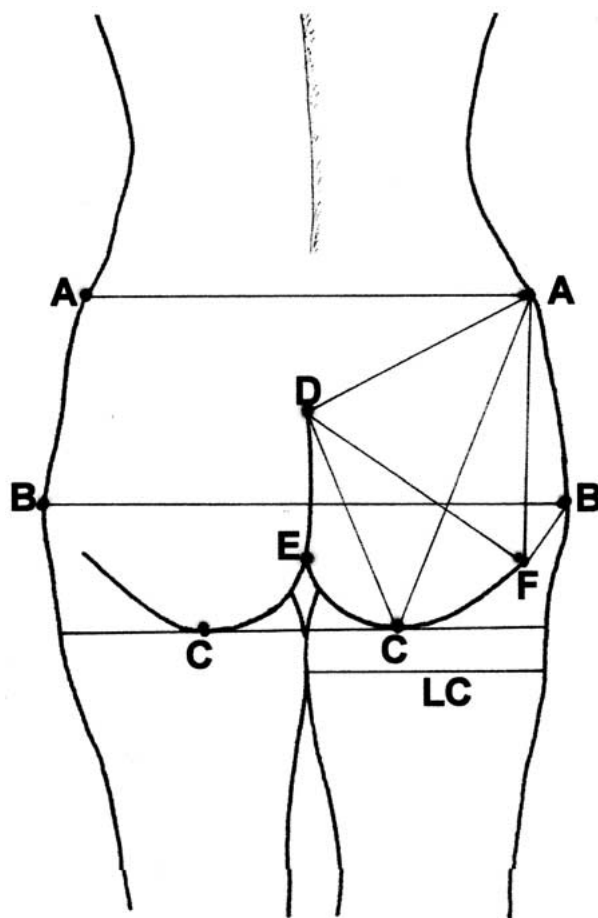
The subjects were divided into four groups on the basis of physiologic milestones as follows:

Group 1 ( $n = 10$ ): Prepubertal group (ages, 5–8 years)

Group 2 ( $n = 38$ ): Pubertal group (ages, 9–14 years)

Group 3 ( $n = 34$ ): Postpubertal group (ages, 15–41 years)

Group 4 ( $n = 29$ ): Menopausal–postmenopausal group (ages, >42 years).



**Fig. 1.** The measurements and the anatomic used as reference points (A) anterosuperior iliac spine (ASIS), (B) most prominent point of the greater trochanter, (C) most caudal point of the gluteal sulcus, (D) cephalic point of the intergluteal sulcus, (E) caudal point of the intergluteal sulcus, (F) lateral end point of the gluteal sulcus.

### Statistical Analyses

The correlation between the measurement was evaluated with Spearman correlation analyses for group 1 and with Pearson correlation analyses according to the group size for groups 2, 3, and 4. For statistical significance, an alpha level of 0.05 was determined.

### Results

The data obtained from the groups are presented in Table 2. The statistically significant results from the comparisons for each group are given in Tables 3 to 6.

#### Group 1

Neither BMI nor intergluteal sulcus (DE) length showed any significant correlation with other

**Table 1.** Descriptions of lines and circumferences

AA	Circumferential line passing through right and left anterior superior iliac spine (ASIS)
BB	Circumferential line passing through the most prominent point of the trochanters
CC	Circumferential line passing through the most inferior point of the infragluteal sulci
DE	Line drawn between cephalic and caudal points of the intergluteal sulcus
FLM	Line drawn from the lateral point of gluteal sulcus (point F) to the midaxillary line
AF	Line drawn from ASIS (point A) to the lateral point of the gluteal sulcus (point F)
DF	Line drawn from the cephalic point of the intergluteal sulcus (point D) to the lateral point of the gluteal sulcus (point F)
AD	Line drawn from ASIS (point A) to the cephalic point of the intergluteal sulcus (point D)
AC	Line drawn from ASIS (point A) to the most inferior point of infragluteal sulcus (point C)
BF	Line drawn from the lateral point of the gluteal sulcus (point F) to the ipsilateral trochanter (point B)
LC	Limb circumference

**Table 2.** Average measurements age, height, weight, BMI, and gluteal region

	Group 1 ( <i>n</i> = 10)	Group 2 ( <i>n</i> = 38)	Group 3 ( <i>n</i> = 34)	Group 4 ( <i>n</i> = 29)
Age (years)	6.8 ± 0.79	10.9 ± 1.5	26.9 ± 8	57.5 ± 10
Height (cm)	118.4 ± 7.6	145 ± 11.6	163.5 ± 5.3	159.9 ± 4.4
Weight (kg)	21 ± 2.2	35.7 ± 8.8	58.2 ± 8.4	71.5 ± 14
BMI (kg/m <sup>2</sup> )	15 ± 1	16 ± 2.5	21.7 ± 3	27.8 ± 5
AA (cm)	56 ± 2.8	70 ± 8.7	86 ± 7.3	100.9 ± 9.5
BB (cm)	59.8 ± 2.3	76 ± 8.3	94 ± 6.9	104.4 ± 8.8
CC (cm)	57.6 ± 2.5	73.5 ± 8.7	91.1 ± 6.7	96.7 ± 7.3
DE (cm)	4.4 ± 0.5	10.4 ± 4	9 ± 1.5	10.4 ± 2
AC (cm)	23.5 ± 1.3	30.1 ± 3.6	34.8 ± 5.6	35.4 ± 4.8
DF (cm)	20.5 ± 1.7	18.5 ± 2	23.4 ± 2.7	25.3 ± 4.9
AF (cm)	20.5 ± 1.7	26.7 ± 3.3	29.3 ± 2.8	31.3 ± 3
AD (cm)	18.4 ± 1.5	23.4 ± 4	29 ± 3.5	31.3 ± 3
FLM (cm)	8.5 ± 1	11.7 ± 1.9	11.5 ± 2.7	12.1 ± 2.4
BF (cm)	13.2 ± 1.6	16.8 ± 2.1	19 ± 2.6	18.7 ± 3.4
LC (cm)	34.7 ± 2.1	44.8 ± 5.6	56.1 ± 6.9	57 ± 5.6

BMI, body mass index; FLM, midaxillary line

parameters. Age was not strongly related to gluteal region dimensions. Weight was found to affect the width of the gluteal region rather than the height of this region because it was associated with AA ( $r = 0.672$ ;  $p = 0.033$ ), BB ( $r = 0.675$ ;  $p = 0.032$ ), CC ( $r = 0.691$ ;  $p = 0.027$ ), FLM ( $r = 0.685$ ;  $p = 0.029$ ), and LC ( $r = 0.743$ ;  $p = 0.014$ ). The other measurement, which was in close correlation with the width of the gluteal region, was BB. It was strongly correlated with AA ( $r = 0.719$ ;  $p = 0.019$ ), CC ( $r = 0.703$ ;  $p = 0.023$ ), LC ( $r = 0.704$ ;  $p = 0.023$ ), and FLM ( $r = 0.659$ ;  $p = 0.038$ ). The height of the subject was found to be in close relation with both vertical and horizontal dimensions such as AA ( $r = 0.818$ ;  $p = 0.004$ ), BB ( $r = 0.719$ ;  $p = 0.019$ ), AC ( $r = 0.749$ ;  $p = 0.013$ ), AF ( $r = 0.663$ ;  $p = 0.037$ ), FLM ( $r = 0.704$ ;  $p = 0.023$ ), and BF ( $r = 0.706$ ;  $p = 0.023$ ). The group 1 results are presented in Table 3.

#### Group 2

All dimensions were significantly in close association with each other. That is, any change in one dimension

or measurement directly was reflected in the other parameters. The group 2 results are presented in Table 4.

#### Group 3

The height of the subject did not have any correlation with the other measurements. Age was significantly correlated with AA ( $r = 0.001$ ;  $p = 0.567$ ), DE ( $r = 0.001$ ;  $p = 0.509$ ), AC ( $r = 0.445$ ;  $p = 0.008$ ). Weight and BMI were found to be strongly related to AA ( $r = 0.778$ ;  $p = 0.001$ ), BB ( $r = 0.814$ ;  $p = 0.001$ ), CC ( $r = 0.642$ ;  $p = 0.001$ ), DE ( $r = 0.395$ ;  $p = 0.021$ ), AC ( $r = 0.547$ ;  $p = 0.001$ ), AF ( $r = 0.626$ ;  $p = 0.001$ ), AD ( $r = 0.772$ ;  $p = 0.001$ ), FLM ( $r = 0.413$ ;  $p = 0.015$ ), and LC ( $r = 0.670$ ;  $p = 0.001$ ). The circumference taken at the level of AA was strongly correlated with BB ( $r = 0.843$ ;  $p = 0.001$ ), CC ( $r = 0.562$ ;  $p = 0.001$ ), LC ( $r = 0.539$ ;  $p = 0.001$ ), DE ( $r = 0.515$ ;  $p = 0.002$ ), AD ( $r = 0.670$ ;  $p = 0.001$ ), AC ( $r = 0.608$ ;  $p = 0.001$ ), AF ( $r = 0.467$ ;  $p = 0.005$ ), and FLM ( $r = 0.432$ ;

**Table 3.** Statistical results for group 1<sup>a</sup>

	Correlation coefficient	Age	Height	Weight	BMI	AA	RR	CC	DE	AC	DF	AF	AD	FLM	BF	LC
Age		1														
Height		0.681	1													
	Sig. (2-tailed)	0.030														
Weight		0.579	0.853	1												
	Sig. (2-tailed)	0.080	0.002													
BMI		-0.172	-0.310	0.169	1											
	Sig. (2-tailed)	0.636	0.383	0.640												
AA		0.447	0.818	0.672	-0.142	1										
	Sig. (2-tailed)	0.196	0.004	0.033	0.696											
BB		0.401	0.719	0.675	0.062	0.719	1									
	Sig. (2-tailed)	0.250	0.019	0.032	0.866	0.019										
CC		0.144	0.553	0.691	0.425	0.781	0.703	1								
	Sig. (2-tailed)	0.692	0.098	0.027	0.221	0.008	0.023									
DE		0.525	0.285	0.074	-0.284	0.000	0.325	-0.180	1							
	Sig. (2-tailed)	0.120	0.425	0.840	0.426	1.000	0.360	0.618								
AC		0.332	0.749	0.568	-0.383	0.717	0.462	0.395	0.257	1						
	Sig. (2-tailed)	0.349	0.013	0.087	0.275	0.020	0.179	0.259	0.473							
DF		0.123	0.147	0.026	-0.087	-0.054	-0.006	-0.057	0.219	0.055	1					
	Sig. (2-tailed)	0.736	0.685	0.944	0.811	0.883	0.986	0.876	0.543	0.880						
AF		0.181	0.663	0.586	-0.312	0.441	0.370	0.280	0.287	0.886	0.176	1				
	Sig. (2-tailed)	0.618	0.037	0.075	0.380	0.202	0.293	0.434	0.422	0.001	0.626					
AD		0.425	0.626	0.471	-0.201	0.424	0.503	0.357	0.110	0.088	0.568	0.114	1			
	Sig. (2-tailed)	0.221	0.053	0.170	0.578	0.222	0.138	0.312	0.762	0.810	0.087	0.754				
FLM		0.750	0.704	0.685	-0.020	0.340	0.659	0.233	0.615	0.373	0.364	0.410	0.550	1		
	Sig. (2-tailed)	0.012	0.023	0.029	0.957	0.337	0.038	0.517	0.058	0.288	0.301	0.239	0.100			
BF		0.492	0.706	0.469	-0.544	0.575	0.343	0.232	0.330	0.680	0.000	0.641	0.291	0.257	1	
	Sig. (2-tailed)	0.148	0.023	0.171	0.104	0.082	0.332	0.519	0.352	0.031	1.000	0.046	0.414	0.473		
LC		0.302	0.492	0.743	0.595	0.595	0.704	0.903	-0.108	0.137	-0.025	0.099	0.438	0.398	0.139	1
	Sig. (2-tailed)	0.396	0.148	0.014	0.070	0.070	0.023	0.000	0.767	0.707	0.945	0.785	0.205	0.254	0.701	

BMI, body mass index; FLM, mid axillary line; Sig., Significance<sup>a</sup>Significant correlations are highlighted with gray.

$p = 0.015$ ) measurements. Limb circumference was another parameter that significantly affected gluteal region morphology as a whole. The group 3 results are presented in Table 5.

#### Group 4

Age had no statistically significant effect on gluteal region dimensions. The height of the subject was correlated with circumferential measurements, namely, AA ( $r = 0.441$ ;  $p = 0.017$ ), BB ( $r = 0.421$ ;  $p = 0.023$ ), CC ( $r = 0.507$ ;  $p = 0.005$ ), LC ( $r = 0.434$ ;  $p = 0.019$ ), and DE ( $r = 0.402$ ;  $p = 0.031$ ). No significant correlation was found between the height of the subject and gluteal sulcus-related measurements (i.e. AC, AF, DF, BF, and FLM). Weight and BMI were strongly correlated with AA, BB, CC, LC, DE, AC, DF, BF, and LC (Table 6). The four circumferential measurements (AA, BB, CC, and LC) were closely correlated with each other. Limb circumference, as in the groups 2 and 3, was significantly correlated with almost all the parameters of the gluteal region. The group 3 results are presented in Table 6.

#### Discussion

The approach to gluteal region morphology varies from studying the effect of the fat accumulation on health [3] to investigating human mate selection [4]. In this study, the changes in gluteal morphology between the ages of 5 and 83 years in female population were assessed for four age groups: prepubertal, pubertal, postpubertal, and menopausal–postmenopausal.

The gluteal region is a very dynamic part of the body. The effect of the age, weight, height, and BMI on the gluteal region dimensions is not the same throughout life. Between the ages of 5 and 8 years, the age does not seem to influence the gluteal region morphology directly. During the same period, weight gain relates to increased circumference of the gluteal region, but the vertical dimensions remain unaffected. Interestingly, in this study, the infra- and intergluteal sulci were not affected by weight gain and age. Rather, the height of the subject was closely related to the downsloping of the infragluteal sulci. The four circumferential diameters of the gluteal region (AA, BB, CC, and LC), act in a harmony. This is the reason why BMI has no correlation with any

**Table 4.** Statistical results for group 2<sup>a</sup>

	Pearson correlation	Age	Height	Weight	BMI	AA	BB	CC	DE	AC	DF	AF	AD	FLM	BF	LC
Age		1														
Height		0.790	1													
	Sig. (2-tailed)	0.001														
Weight		0.763	0.819	1												
	Sig. (2-tailed)	0.001	0.001													
BMI		0.380	0.355	0.746	1											
	Sig. (2-tailed)	0.003	0.006	0.001												
AA		0.673	0.691	0.892	0.684	1										
	Sig. (2-tailed)	0.001	0.001	0.001	0.001											
BB		0.765	0.787	0.939	0.693	0.932	1									
	Sig. (2-tailed)	0.001	0.001	0.001	0.001	0.001										
CC		0.714	0.738	0.925	0.706	0.907	0.956	1								
	Sig. (2-tailed)	0.001	0.001	0.001	0.001	0.001	0.001									
DE		0.483	0.309	0.383	0.210	0.471	0.494	0.468	1							
	Sig. (2-tailed)	0.001	0.018	0.003	0.113	0.001	0.001	0.001								
AC		0.545	0.665	0.674	0.411	0.703	0.701	0.706	0.364	1						
	Sig. (2-tailed)	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.005						
DF		0.570	0.666	0.675	0.435	0.444	0.585	0.593	0.019	0.334	1					
	Sig. (2-tailed)	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.887	0.010						
AF		0.435	0.666	0.623	0.397	0.632	0.614	0.604	0.296	0.819	0.379	1				
	Sig. (2-tailed)	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.024	0.001	0.003					
AD		0.516	0.539	0.613	0.454	0.723	0.694	0.675	0.464	0.699	0.231	0.653	1			
	Sig. (2-tailed)	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.082	0.001				
FLM		0.306	0.485	0.588	0.413	0.604	0.529	0.564	0.270	0.534	0.346	0.531	0.430	1		
	Sig. (2-tailed)	0.020	0.001	0.001	0.001	0.001	0.001	0.001	0.040	0.001	0.008	0.001	0.001			
BF		0.417	0.613	0.577	0.367	0.585	0.634	0.656	0.457	0.761	0.455	0.800	0.517	0.556	1	
	Sig. (2-tailed)	0.009	0.001	0.001	0.024	0.001	0.001	0.001	0.004	0.001	0.004	0.001	0.001	0.001		
LC		0.691	0.660	0.906	0.741	0.935	0.940	0.937	0.465	0.764	0.536	0.654	0.728	0.620	0.618	1
	Sig. (2-tailed)	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	

BMI, body mass index; FLM, midaxillary line; Sig., significance<sup>a</sup> Significant correlations are highlighted with gray.

parameters, whereas the height and weight of the subject constitute a dilemma.

Another finding that needs clarification is the absence of correlation between the intergluteal sulcus (DE) length and other measurements of this region. The reason may be that this groove is highly dependent on the pelvic development, which is not characteristic of this age group.

When group 2, composed of the subjects supposedly at puberty (age, 9–14 years), is evaluated, dramatic expansions of all the parameters are seen. As can easily be seen in Table 4, very strong correlation exists between all the parameters. Age, height, weight, and BMI of the subjects unexceptionally affect all the parameters. The gluteal region develops in all directions at puberty. The intergluteal sulcus (DE) also takes part in this dynamic period. Its length increases as the gluteal region grows. In this age group, the gluteal region can be regarded as a closed system because any change in any dimension significantly affects all the other measurements.

After puberty and until the menopause (age, 15–41 years), age is related with only AA and DE, whereas the height of the subject has no effect on gluteal shape. This is not surprising because the growth of

the body is ceased. Weight and BMI are the major factors influencing gluteal region dimensions. While infragluteal sulci move downward and laterally, increase in the FLM distance indicates local fat accumulation in this region, which is one of the major problems with female buttocks. Changes in the gluteal region are directly related to limb circumference. This means that if the gluteal region is to be shaped, the proximal part of the limbs also should be addressed.

In the last group, consisting of females older than 41 years, age has no effect on the gluteal region morphology. In contrast to the previous group, the height of the patient is closely related to intergluteal sulcus length and circumference of the gluteal region. In this age group, weight and BMI are major determinants of the gluteal shape. As in group 3, with weight gain, the intergluteal sulcus DE lengthens, and the infragluteal sulci move downward and laterally, but these changes are not related to FLM distance. This may be attributable to possible atrophy of the subcutaneous fat tissue seen in the elderly, which should be taken into consideration when liposuction is used for a woman in this age group. Limb circumference also is related to gluteal region mor-

**Table 5.** Statistical results for group 3<sup>a</sup>

	Pearson correlation	Age	Height	Weight	BMI	AA	BB	CC	DE	AC	DF	AF	AD	FLM	BF	LC
Age		1														
Height		0.228	1													
	Sig. (2-tailed)	0.195														
Weight		0.362	0.382	1												
	Sig. (2-tailed)	0.035	0.026													
BMI		0.458	-0.018	0.890	1											
	Sig. (2-tailed)	0.006	0.920	0.001												
AA		0.567	0.280	0.834	0.778	1										
	Sig. (2-tailed)	0.001	0.109	0.001	0.001											
BB		0.325	0.307	0.911	0.814	0.843	1									
	Sig. (2-tailed)	0.061	0.078	0.001	0.001	0.001										
CC		0.155	0.237	0.706	0.642	0.562	0.791	1								
	Sig. (2-tailed)	0.381	0.177	0.001	0.001	0.001	0.001									
DE		0.509	0.032	0.405	0.395	0.515	0.434	0.336	1							
	Sig. (2-tailed)	0.002	0.856	0.018	0.021	0.002	0.010	0.052								
AC			0.445	0.228	0.594	0.547	0.608	0.553	0.378	0.279	1					
	Sig. (2-tailed)		0.008	0.196	0.001	0.001	0.001	0.001	0.028	0.110						
DF		0.176	0.200	0.130	0.049	0.134	0.164	0.193	0.041	-0.249	1					
	Sig. (2-tailed)	0.320	0.256	0.463	0.782	0.450	0.354	0.273	0.817	0.156						
AF		0.079	0.247	0.652	0.626	0.467	0.644	0.744	0.291	0.313	0.246	1				
	Sig. (2-tailed)		0.657	0.159	0.001	0.001	0.005	0.001	0.001	0.095	0.071	0.161				
AD		0.128	0.126	0.744	0.772	0.670	0.694	0.614	0.256	0.491	-0.061	0.676	1			
	Sig. (2-tailed)	0.471	0.476	0.001	0.001	0.001	0.001	0.001	0.144	0.003	0.732	0.001				
FLM		-0.065	0.228	0.488	0.413	0.432	0.534	0.501	0.568	0.273	-0.186	0.536	0.459	1		
	Sig. (2-tailed)	0.717	0.195	0.003	0.015	0.011	0.001	0.003	0.001	0.118	0.292	0.001	0.006			
BF		0.044	-0.066	0.240	0.289	0.281	0.337	0.237	0.342	0.011	-0.139	0.281	0.409	0.489	1	
	Sig. (2-tailed)	0.805	0.711	0.171	0.097	0.108	0.051	0.177	0.048	0.951	0.432	0.108	0.016	0.003		
LC		-0.006	0.165	0.679	0.670	0.539	0.782	0.840	0.347	0.452	0.088	0.717	0.713	0.630	0.333	1
	Sig. (2-tailed)	0.972	0.351	0.001	0.001	0.001	0.001	0.001	0.044	0.007	0.621	0.001	0.001	0.001	0.054	

BMI, body mass index; FLM, midaxillary line; Sig., significance<sup>a</sup> Significant correlations are highlighted with gray.

phology, as in the group 3. The increase in intergluteal sulcus (DE) length probably is attributable to sagging of the buttocks because this increment is closely related to the increase in DC, AC, and BF length. This type of relation is not seen in the groups 1 and 3.

In summary, in group 1, the intergluteal sulcus and infragluteal sulci do not actively change. Weight gain is the major factor influencing the shape of the gluteal region. As the surge of the hormones during puberty takes place (group 2), the gluteal region expands in all directions. During this period, it is difficult to discuss any specific relation between dimensions because of the significant correlation among all the parameters.

In the current study, age significantly affected the shape of the gluteal region only in group 2. In the other three groups, weight seemed to be major determinant. In both groups 3 and 4, the buttocks sagged with weight gain. This caused the infragluteal sulci (DE) to move in downward and lateral directions and a lengthening of the intergluteal sulcus.

It should be remembered that gluteal shape is open to the effects the demographic factors such as ethnicity, feeding habits, and lifestyle. Finally, in assessments of the gluteal region morphology, it would be better to consider its dynamic nature. Reshaping one part is devastating unless the whole gluteal region and upper limb are addressed.

## References

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**Table 6.** Statistical results for group 4<sup>a</sup>

	Pearson Correlation	Age	Height	Weight	BMI	AA	BB	CC	DE	AC	DF	AF	AD	FLM	BF	LC
Age		1														
Height		-0.187	1													
	Sig. (2-tailed)	0.332														
Weight		-0.019	0.479	1												
	Sig. (2-tailed)	0.922	0.009													
BMI		0.039	0.239	0.963	1											
	Sig. (2-tailed)	0.842	0.213	0.001												
AA		0.185	0.441	0.820	0.763	1										
	Sig. (2-tailed)	0.336	0.017	0.001	0.001											
BB		0.049	0.421	0.903	0.873	0.876	1									
	Sig. (2-tailed)	0.802	0.023	0.001	0.001	0.001										
CC		-0.074	0.507	0.924	0.872	0.779	0.918	1								
	Sig. (2-tailed)	0.702	0.005	0.001	0.001	0.001	0.001									
DE		-0.154	0.402	0.554	0.478	0.468	0.343	0.446	1							
	Sig. (2-tailed)	0.427	0.031	0.002	0.009	0.010	0.069	0.015								
AC		-0.074	0.027	0.601	0.653	0.184	0.361	0.427	0.428	1						
	Sig. (2-tailed)	0.702	0.889	0.001	0.001	0.339	0.054	0.021	0.021							
DF		0.308	0.193	0.567	0.601	0.489	0.467	0.457	0.471	0.437	1					
	Sig. (2-tailed)	0.104	0.316	0.001	0.001	0.007	0.011	0.013	0.010	0.018						
AF		-0.315	0.062	0.121	0.127	-0.277	-0.081	0.100	0.355	0.638	0.253	1				
	Sig. (2-tailed)	0.096	0.749	0.531	0.513	0.145	0.676	0.606	0.059	0.000	0.186					
AD		-0.046	-0.063	0.387	0.447	0.358	0.396	0.292	0.413	0.191	0.104	-0.033	1			
	Sig. (2-tailed)	0.814	0.746	0.038	0.015	0.057	0.034	0.124	0.026	0.322	0.591	0.864				
FLM		-0.248	0.353	0.354	0.269	0.156	0.280	0.345	0.346	0.306	-0.094	0.205	0.163	1		
	Sig. (2-tailed)	0.195	0.060	0.059	0.158	0.420	0.141	0.067	0.066	0.107	0.629	0.286	0.398			
BF		0.140	0.262	0.423	0.345	0.458	0.423	0.386	0.431	0.254	0.048	0.009	0.163	0.550	1	
	Sig. (2-tailed)	0.469	0.170	0.022	0.067	0.013	0.022	0.039	0.020	0.184	0.803	0.961	0.398	0.002		
LC		-0.342	0.434	0.793	0.753	0.474	0.679	0.779	0.624	0.562	0.387	0.388	0.521	0.520	0.335	1
	Sig. (2-tailed)	0.069	0.019	0.001	0.001	0.009	0.001	0.001	0.001	0.002	0.038	0.038	0.004	0.004	0.075	

BMI, body mass index; FLM, midaxillary line; Sig., significance<sup>a</sup> Significant correlations are highlighted with gray.