

The Skeletal Posterior Facial Heights Change Among Adolescent Subjects (A Cephalometric Study)

Hussain A Obaidi

BDS, MSc (Prof)

Manar Y Abdul-Qadir

BDS, MSc (Assist Lect)

Dept of Pedod, orthod, and Prev Dentistry

College of Dentistry, University of Mosul

ABSTRACT

Aims: To find out the changes among four age groups for total posterior facial height, upper anterior facial height and lower posterior facial height. **Materials and Methods:** The sample subjects were having normal class I molar relationships. The sample included: age 11 years (23 males and 25 females), age 12 years (19 males and 22 females), age 13 years (22 males and 28 females), and age 14 years (22 males and 22 females). All subjects were radiographed with lateral cephalometric films and the films were traced. The traced parameters of facial heights were measured. The results were subjected to the descriptive statistics and to the ANOVA And Duncan's Multiple Range tests to detect the changes among the four age groups and to student's t-test to explore the sex variation for these parameters. **Results:** The total posterior facial height displayed no significant change between 13 and 14 years groups, however, the values at both 13 and 14 years groups were significantly greater than that at 11 year. The lower posterior facial height in males demonstrated a significantly higher value at 14 years group as compared to both 11 and 12 years groups, while females showed significantly higher value for both 13 and 14 years groups than 11 years group. The sex variation of the facial heights showed that males possessed significantly greater values than females for the lower anterior facial height at 11 years group, the changing also displayed significantly greater value for the total posterior facial heights at 14 years group. **Conclusions:** Both sexes tend to show an increase in the facial heights with the increase in the age groups and there are significant changes in facial heights between males and females except for total posterior facial height at 14 years age group.

Key words: Total posterior facial height, lower posterior facial height, ramus height.

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INTRODUCTION

The facial height parameters are involved in developing long, short, and average face. The facial heights are potentially affected by the upward growth of the cranial base, upper face and the downward growth of the mandible. This divergent growth pattern permits the vertical growth of the dento-alveolar components⁽¹⁾. Ibrahim *et al.*,⁽²⁾ found that the vertical measurement (ramus height) was larger in 10-12 years age than in the 12-14 years for female subjects whereas, the vertical measurement was greater in the 12 to 14 years age than in the 10-12 year age for male subjects.

The sex variation of the facial heights in normal class I molar occlusion were

studied by many researchers. Gasgoos⁽³⁾ and Al-Sultan⁽⁴⁾ found that the posterior facial heights were significantly greater in males than females. Other investigators have also demonstrated greater total posterior facial height in males as compared to females⁽⁵⁾.

Specific knowledge regarding the age variations of the posterior facial height is greatly required for the diagnosis, prognosis and treatment plan of the orthodontic cases.

The aim of this study was to assess the differences of the posterior facial heights among four age groups of Iraqi adolescent subjects living in Mosul city.

MATERIALS AND METHODS

The individuals involved in this study

were selected from intermediate and primary schools in the center of Mosul City. The sample included: Age 11 years (23 males & 25 females), age 12 years (19 males & 22 females), age 13 years (22 males & 28 females), age 14 years (22 males & 22 females).

The criteria for the sample selection were full complement of permanent teeth excluding the third molars and normal occlusion with bilateral class I molar and canine relationships⁽⁶⁾, normal overjet and over bite (1–4 mm)⁽⁷⁾, no detectable crowding and rotations, no apparent facial disharmony, and no previous orthodontic treatment or maxillofacial surgery. Subjects at 11 years of age were selected based on presence of Class I molar relationship with normal overjet and overbite⁽⁸⁾. Each subject was radiographed with lateral cephalometric film and the films were manually traced. After tracing of the

cephalometric radiographs, the following parameters were measured (Figure 1): 1- Total posterior facial height (S–Go), as defined by Bjork⁽⁹⁾. 2- Upper posterior facial height (S–PP), as described by Fields *et al.*,⁽¹⁰⁾. 3- Lower posterior facial height (ramus height, Ar–Go) as defined by Bjork⁽⁹⁾.

All these parameters were measured to the nearest 0.5 mm. The results were analyzed by applying the descriptive analysis (the mean, standard deviation, minimum, and maximum values). Analysis of variance and Duncan's Multiple Range Test were used to detect the differences of the facial heights among the age groups at p value ≤ 0.05 , student's t -test was utilized to explore the sex variations of these parameters among the age groups at p value ≤ 0.05 .

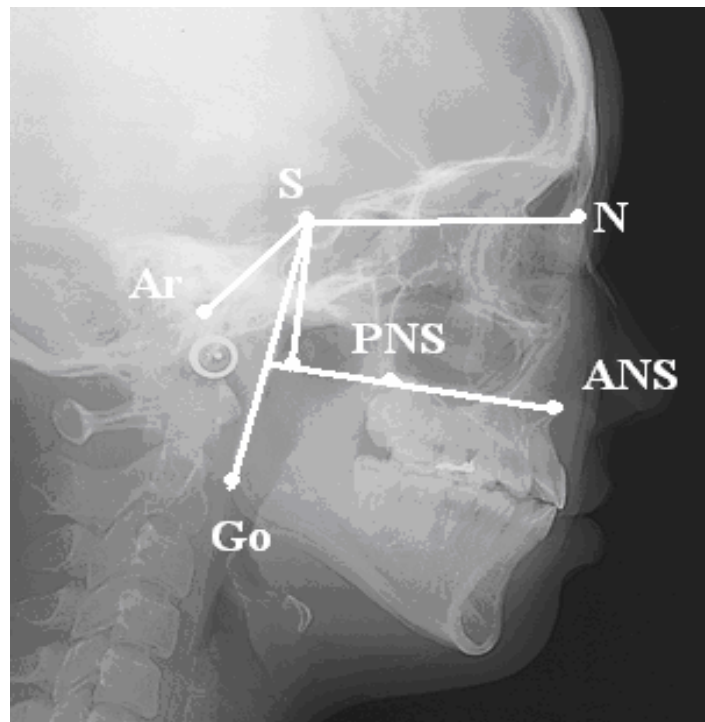


Figure (1): Cephalometric measurements: 1– Total post facial height (S–Go); 2– Upper posterior facial height (S–PP); 3– Lower posterior facial height (Ar–Go).

RESULTS

The minimum, maximum, mean values and SD for all studied parameters for both sexes in the four age groups are shown in table (1). It can be noticed, that

in both male and female samples all parameters showed the highest mean values at 14 years group.

Comparison between males and females showed that for 11, 12 and 13 years

groups the males possessed insignificantly higher value than females for S-Go and S-PP, females displayed higher values for Ar-Go with no significance. At 14 years

group, all parameters showed higher values in males than in females with significant difference noticed for S-Go Table (1).

Table (1): Descriptive statistics and t-test for the posterior facial heights of males and females.

Age	Length	Sex	No.	Min	Max	Mean	± SD	t-test	P-value
11 Years	S-Go	Male	23	65	79	72.70	3.48	0.46	0.65
		Female	25	66	80	72.20	3.91		
	S-PP	Male	23	42	54	48.45	2.86	0.49	0.54
		Female	25	40.5	52	47.82	2.78		
	Ar-Go	Male	23	33	46	41.89	3.08	-0.28	0.78
		Female	25	37	48	42.14	3.16		
12 Years	S-Go	Male	19	68	85	75.71	5.22	0.71	0.48
		Female	22	63.5	82	74.75	5.28		
	S-PP	Male	19	42.5	56	48.66	3.26	0.44	0.62
		Female	22	41.5	54.5	48.01	3.16		
	Ar-Go	Male	19	39	50	44.16	3.72	-0.32	0.70
		Female	22	39.5	50	44.55	3.25		
13 Years	S-Go	Male	22	70	87	77.77	4.07	-0.36	0.72
		Female	28	68	82.5	77.07	3.48		
	S-PP	Male	22	43.5	56.5	48.56	4.14	0.52	0.64
		Female	28	42.5	55	47.92	3.62		
	Ar-Go	Male	22	37.5	51	44.73	3.73	-1.43	0.16
		Female	28	39	51.5	46.14	3.24		
14 Years	S-Go	Male	22	71	93	81.43	5.87	2.06	0.046*
		Female	22	69.5	89.5	78.00	5.16		
	Ar-PP	Male	22	44.5	58.5	50.28	3.46	0.43	0.38
		Female	22	43	56.5	49.53	3.84		
	Ar-Go	Male	22	38.5	59	47.61	4.89	0.31	0.75
		Female	22	40	56	47.18	4.20		

All measurements in mm. * Significant differences between males and females ($p \leq 0.05$). S-Go: Sella-Gonion, Ar-PP: Sella-Palatal plane, Ar-Go: Articulare-Gonion.

The following results were obtained through Analysis of variance and Duncan's Multiple Range Test (Tables 2, 3 and 4); both male and female samples showed higher values for all parameters at 12 years group as compared to 11 years group with no significance. Comparison between 12 and 13 years groups revealed that all pa-

rameters displayed higher values at 13 years group in both sexes. However, this difference was statistically not significant. Both male and female samples demonstrated higher values at 14 years group as compared to 13 years group for all parameters. The differences failed to reach the level of significance.

Table (2): Analysis of variance and Duncan's Multiple Range Tests of S-Go variable.

Sex	Age Group	No.	Mean	±SD	Sig*
Male	11 Years	23	72.696	3.480	A
	12 Years	19	76.083	5.100	AB
	13 Years	22	77.773	4.067	BC
	14 Years	22	81.432	5.872	C
Female	11 Years	25	72.200	3.905	a
	12 Years	22	74.545	5.282	ab
	13 Years	28	77.071	3.477	b
	14 Years	22	78.000	5.157	b

ANOVA test for males: F-value = 13.45; p-value = 0.000; S ($p \leq 0.05$). ANOVA test for females: F-value = 8.42; p-value = 0.000; S ($p \leq 0.05$). Means with the same letters were statistically not significant.

Table (3): Analysis of ANOVA and Duncan's Multiple Range Tests of S-PP variable.

Sex	Age Group	No.	Mean	±SD	Sig*
Male	11 Years	23	48.45	2.86	A
	12 Years	19	48.66	3.26	A
	13 Years	22	48.56	4.14	AB
	14 Years	22	50.28	3.46	B
Female	11 Years	25	47.82	2.78	a
	12 Years	22	48.66	3.16	ab
	13 Years	28	47.92	3.62	a
	14 Years	22	49.53	3.84	b

ANOVA test for males: F-value = 12.64; p-value = 0.000; S ($p \leq 0.05$). ANOVA test for females: F-value = 9.26; p-value = 0.000; S ($p \leq 0.05$). Means with the same letters were statistically not significant.

Table (4): Analysis of ANOVA and Duncan's Multiple Range Tests of Ar-Go variable.

Sex	Age Group	No.	Mean	±SD	Sig*
Male	11 Years	23	41.891	3.082	A
	12 Years	19	44.158	3.716	A
	13 Years	22	44.727	3.734	AB
	14 Years	22	47.614	4.889	B
Female	11 Years	25	42.140	3.157	a
	12 Years	22	44.545	3.251	ab
	13 Years	28	46.143	3.240	b
	14 Years	22	47.182	4.199	b

ANOVA test for males: F-value = 8.13; p-value = 0.000; S ($p \leq 0.05$). ANOVA test for females: F-value = 9.74; p-value = 0.000; S ($p \leq 0.05$). Means with the same letters were statistically not significant.

DISCUSSION

The total posterior facial height in males demonstrated higher values with increasing age group with significantly

higher value noticed at 14 years group as compared to 11 years group. This indicates an increase in S-Go distance with increasing age, which coincides with the findings

of Bambha⁽¹¹⁾ who reported a continued increase in S-Go in males from 11 to 14 years. Al-Baiati⁽¹²⁾ also reported significant increase in S-Go between 11 and 14 years in males. Similar pattern was noticed in females as they showed higher values with increasing age group and they showed significantly higher value at 14 years group as compared to 11 years group. Similar findings were reported by Bambha⁽¹¹⁾ for females from 11 to 14 years and by Al-Baiati⁽¹²⁾ who reported significant increase in S-Go in females between 11 and 14 years. According to Bjork⁽¹³⁾, the increase in the posterior face height has two components: (1) the lowering of the middle cranial fossa in relation to the anterior one, as the cranial base bends, the condylar fossae then being lowered and the mandible is also lowered. (2) the second component, which is the larger one, is the increase in the height of the ramus. Males displayed higher values than females in the four age groups with significant difference noticed at 14 years group. Similar findings were reported by Bmabha⁽¹¹⁾ who demonstrated larger S-Go dimension in males from 6 to 17 years, and Al-Baiati⁽¹²⁾ who showed higher value in male subjects at 11 and 14 years with significant difference noticed at 11 years.

Upper posterior facial height (S-PP) disclosed significantly greater mean value at 14 years age group when compared with 11 years age group for both sexes, this indicates that the upper posterior facial height reach the statistical change at the 11 years age group. The sex variation of the upper posterior facial height displayed insignificant differences at all age groups. This indicates no significant change expected between sexes at these age groups. This finding coincides with the another researcher⁽³⁾, who found a significant change between males and females only at age 18-25 years. The non-significant sex difference of upper posterior facial height at 11, 12 13 & 14 years age groups may be existed in these age groups.

Lower posterior facial height (ramus height) showed higher values with increasing age group in males with significantly higher value noticed at 14 years group as compared to both 11 years and 12 years

groups indicating an increase in ramus height with increasing age. The present findings come in agreement with those of Bishara *et al.*,⁽¹⁴⁾ for males between 10 and 15 years. Females also showed higher mean dimensions of ramus height with increasing age group with significant difference noticed between 14 years group and 11 years group. Similar findings were reported by Bishara *et al.*,⁽¹⁴⁾ for females between 10 and 15 years. The increase in ramus height occurs in response to endochondral replacement at the condyle accompanied by surface remodeling as stated by Proffit⁽¹⁵⁾. Comparison between male and female subjects revealed no significant difference between the sexes with females showing larger mean dimensions than males in 11 years, 12 years and 13 years groups, and this comes in agreement with the findings of Lewis *et al.*,⁽¹⁶⁾ where they reported that females continue to show greater values than males from 7 to 15 years. However, at 14 years group, the results of this study showed a larger value in males than in females. This difference in the results may be attributed to the ethnic variation.

CONCLUSIONS

The adolescent ages for both sexes increase in the facial heights with the increase in the age groups and there are significant changes in facial heights between males and females.

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