COMPARISON OF LIP LENGTH AND THICKNESS AMONG THREE VERTICAL GROWTH PATTERNS IN SKELETAL CLASS II JAW RELATIONSHIP IN THE POPULATION OF PESHAWAR

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ABSTRACT

Objective: To compare upper lip length and thickness and lower lip length and thickness among high angle, normal angle and low angle patients with a skeletal class II jaw relationship and to compare these four variables among the sexes in the population of Peshawar.

Methods: This cross-sectional study was conducted at Khyber College of Dentistry, Peshawar in January and February, 2021. Clinical and radiographic records of 120 patients, with the age range of 9 to 33 years, were used. 60 males and 60 females were equally distributed into 3 groups based on their vertical growth pattern, with 40 patients each in the high angle group, normal angle and low angle group. The one-way ANOVA and independent-samples t test were used for comparison between the three groups and sexes for the four research variables. P value of ≤.05 was considered significant.

Results: The mean age for the entire sample was 17.61 years ± 5.14. There was no statistically significant difference in means of lip lengths and thicknesses amongst the 3 groups and sexes.

Conclusions: Lip lengths and thickness are similar among the three vertical growth patterns and among the sexes in skeletal class II in the population of Peshawar.

Keywords: Cephalometry, Angle class II, face, sex factor, lip

INTRODUCTION

The adaptation of the soft tissues over the skeletal structures and the dentition forms the face of a person.[1] Disproportion in the soft tissue can reduce the aesthetic quality of the face,[2] which is undesirable as the attractiveness of the face influences self-esteem.[3] When planning either simple orthodontic treatment, or combining it with a surgical approach, lip lengths are one of the deciding factors of whether intrusion or extrusion of the incisors is required.[4,5] Whereas lip thickness is one of the factors that predicts treatment results when retracting upper incisors,[6] as is very common during treatment of class II skeletal and dental relationships.[7]

Thus when planning treatment for orthodontic or orthognathic cases, soft tissues are taken into account.

A Saudi study presented the findings that soft tissues may act independent of the underlying hard tissues when they increase in thickness.[8] Other studies from different parts of the globe have claimed that soft tissue thickness closely relates to the sagittal skeletal jaw relationship.[9–12] A study in Karachi found that for a class I skeletal jaw relationship, lip lengths and thickness follow the underlying vertical growth pattern of the facial skeleton, with longer faces having longer and thicker lips, and shorter faces having the opposite setup.[13]

This study aims to compare the upper lip length, upper lip thickness, lower lip length and lower lip thickness among high angle, normal angle and low angle patients with class II skeletal jaw relationship in the population of Peshawar, Pakistan, as no such study has been conducted previously. The secondary aim is to compare these variables among the sexes in the same population.

MATERIALS AND METHODS

This descriptive cross sectional study was conducted in Orthodontics Department, Khyber College of Dentistry, Peshawar in January and

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February, 2021, after obtaining ethical approval from the Research and Development Cell of the hospital in October 2020 (Ref. No. 11 ADR/KCD).

The sample size was calculated using OpenEpi, by using findings of Lee et al. that showed that 17 participants in every group would detect a clinically significant difference in lower lip length between normal angle and low angle patients.[14] This figure was rounded off to 20 in each group. To equalize the number of males and females, this number was doubled to 40. Thus, the total sample size came out to be 120.

Those patients were included who were undergoing orthodontic or orthopedic treatment at Khyber College of Dentistry, diagnosed as having class II sagittal jaw relationship, with the ANB reading >4º. Those lateral cephalograms were used that were of good quality i.e., the landmarks were not blurry or hard to define.

Patients with a history of facial trauma or surgery, previous orthodontic/orthopedic treatment or syndromes/asymmetries affecting the face were excluded.

Lateral cephalograms were taken with the patients' head maintained in Natural Head Position, with lips at rest and dentition in occlusion. All required measurements were taken after tracing the cephalometric landmarks manually on an acetate sheet, except the lip lengths, which were measured clinically on the patient. For the lip thickness, the radiograph's magnification ratio was adjusted.

The clinical and radiographic records of 120 patients, between 9 to 33 years of age, were picked form the database of the Orthodontics Department that were taken from 2019 to 2021, using non probability convenience sampling.

Three groups were made based on vertical growth pattern of the patient, using Sella-Nasion to Mandibular Plane Angle (SN-MP). Group 1 had 40 cephalograms of patients with a high angle, SN-MP ≥37º; Group 2 had 40 cephalograms of normal angle, SN-MP of 28º-36º; Group 3 had 40 cephalograms of low angle, SN-MP ≤27º.

Following four variables were assessed (Figure 1),

Upper lip length (ULL): distance in millimeters from subnasale to stomion.

Upper lip thickness (ULT): distance in millimeters from highest contour of upper incisor to highest contour of labrale superioris.

Lower lip length (LLL): distance in millimeters between soft tissue menton and stomion.

Lower lip thickness (LLT): distance in millimeters from highest contour of lower incisor to highest contour of labrale inferioris.

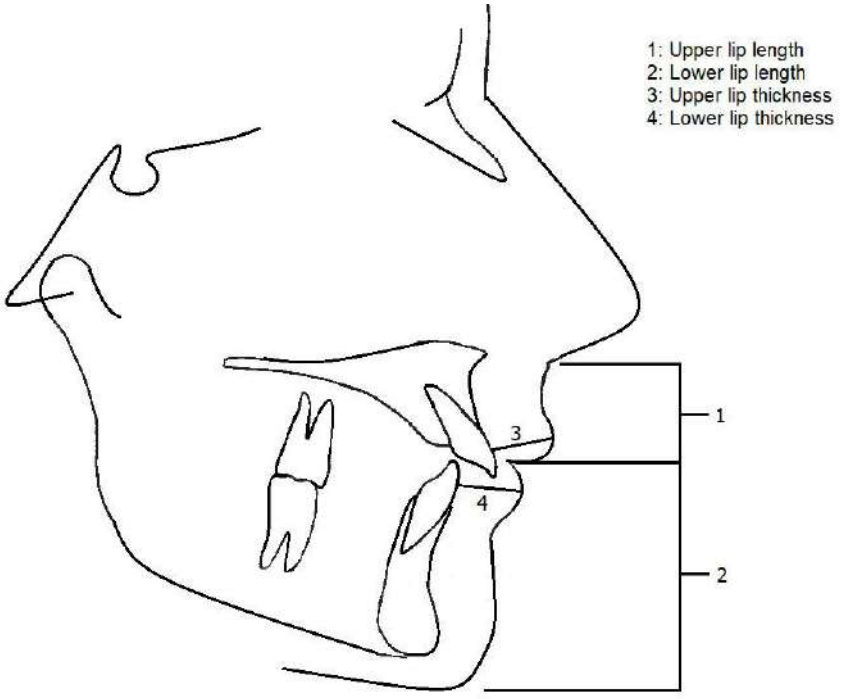

Figure 1: Graphic Representation of the lip lengths and thickness assessed in the study

IBM SPSS version 25 was used to analyze the data. All variables were numeric, so for each variable, mean with its standard deviation and error, and the minimum and maximum value were determined separately for each group. One-way ANOVA test was applied for comparing means of each variable amongst the three groups. Independent-samples t test was applied for comparing means of variables amongst the sexes. P value ≤.05 was considered statistically significant.

RESULTS

120 lateral cephalograms of skeletal class II relationship patients were analyzed for this study, of which 60 (50%) belonged to females and 60 (50%) to males, with each group (n=40) having 20 (16.6%) females and 20 (16.6%) males.

The age range was 9 to 33 years, mean age for the entire sample being 17.61 years ± 5.14. For group 1, mean age was 19.78 years ± 4.79, for group 2, it was 17.15 years ± 4.75, and for group 3, it was 15.90 years ± 5.20 years.

Table 1 shows descriptive statistics as mean with its standard deviation and error, the minimum and maximum values and the parameter's estimation for the population for the four research variables with respect to each group.

Table 1: Descriptive statistics and Parameters estimation of lip length and thickness among the three groups (n=120)

Variable	Group	n	Mean (mm)	SD	SE	Mini. (mm)	Max. (mm)	95% CI for mean	
								Lower	Upper
Upper lip Length	Group 1	40	22.10	4.03	0.63	23	35	20.81	23.39
	Group 2	40	20.63	2.78	0.44	15	26	19.73	21.52
	Group 3	40	20.55	3.10	0.49	13	27	19.56	21.54
	Total	120	21.09	3.39	0.31	13	35	20.48	21.71
Lower lip length	Group 1	40	40.83	5.86	0.92	26	53	38.95	42.70
	Group 2	40	39.75	4.92	0.77	30	50	38.17	41.33
	Group 3	40	38.93	4.73	0.74	26	48	37.41	40.44
	Total	120	39.83	5.21	0.47	26	53	38.89	40.78
Upper lip Thickness	Group 1	40	11.52	2.34	0.37	8	19	10.77	12.27
	Group 2	40	11.25	2.22	0.35	7	17	10.53	11.96
	Group 3	40	11.07	2.92	0.46	6	18	10.14	12.00
	Total	120	11.28	2.50	0.22	6	19	10.83	11.73
Lower lip Thickness	Group 1	40	14.75	3.25	0.51	10	25	13.70	15.79
	Group 2	40	14.70	2.81	0.44	9	23	13.80	15.59
	Group 3	40	13.83	3.40	0.53	7	21	12.74	14.92
	Total	120	14.42	3.17	0.28	7	25	13.85	15.00

N: number of participants; SD: Standard Deviation; SE: Standard Error; CI: Confidence Interval

For ULL and LLL, ANOVA showed that there was no significant difference in means for these two variables amongst the groups, p-value being .070 and .265 respectively. (Table 2)

For ULT and LLT, ANOVA showed that there was no significant difference in means for these two variables amongst the groups, p-value being .723 and .354, respectively. (Table 2)

Table 2: ANOVA test to compare mean lip lengths and thicknesses in the three groups

Variable		Sum of squares	df	Mean Square	P value
Upper lip length	Between Groups	61.11	2	30.55	.070
	Within Groups	1312.87	117	11.21	
	Total	1373.99	119		

Lower lip length	Between Groups	72.61	2	36.30	.265
	Within Groups	3164.05	117	27.04	
	Total	3236.66	119		
Upper lip thickness	Between Groups	4.11	2	2.05	.723
	Within Groups	739.75	117	6.32	
	Total	743.86	119		
Lower lip thickness	Between Groups	21.05	2	10.52	.354
	Within Groups	1175.09	117	10.04	
	Total	1196.14	119		

df: degree of freedom

The independent-samples t test showed that the lip lengths and thicknesses were equally distributed among the sexes, with a p value >.05 for all four research variables. (Table 3)

Table 3: Independent-samples t test to compare mean lip lengths and thicknesses among the sexes (n=120) for the three groups (n=40)

Group	Variable	Gender	n	Mean	SD	SE	P value
Group 1	**Upper lip thickness**	Male	20	22.25	3.76	0.84	.817
		Female	20	21.95	4.37	0.97	
	Upper lip length	Male	20	42.15	6.10	1.36	.156
		Female	20	39.50	5.44	1.21	
	Lower lip thickness	Male	20	11.65	2.70	0.60	.704
		Female	20	11.40	1.98	0.44	
	Lower lip length	Male	20	14.65	2.68	0.59	.849
		Female	20	14.85	3.81	0.85	
Group 2	**Upper lip thickness**	Male	20	20.95	3.25	0.72	.468
		Female	20	20.30	2.27	0.50	
	Upper lip length	Male	20	39.95	5.57	1.24	.801
		Female	20	39.55	4.32	0.96	
	Lower lip thickness	Male	20	11.87	1.95	0.43	.075
		Female	20	10.62	2.34	0.52	
	Lower lip length	Male	20	15.25	2.67	0.59	.220
		female	20	14.15	2.90	0.65	
Group 3	**Upper lip thickness**	Male	20	20.95	3.70	0.82	.379
		Female	20	20.05	2.41	0.55	
	Upper lip length	Male	20	39.55	4.80	1.07	.332
		Female	20	38.05	4.69	1.07	

	Lower lip thickness	Male	20	11.55	3.20	0.71	.232
		Female	20	10.42	2.54	0.58	
	Lower lip length	Male	20	14.35	3.48	0.77	.344
		Female	20	13.28	3.42	0.78	

n: number of participants; SD: Standard Deviation; SE: Standard Error

DISCUSSION

For diagnosis and treatment planning, the soft tissue analysis plays a role just as important as the hard tissues, whether it is for simple orthodontic procedures, or in conjunction with surgery.[4–6] Soft tissue imbalance can cause a dramatic reduction in facial aesthetics.[2] Hence, orthodontists should be aware of the dimensions of soft tissues that present with the underlying skeletal growth pattern in the community they are treating.

In our study, the mean age of the participants was 17.61 years ± 5.14, with 50% males and 50% females. Each group was given an equal share of both genders and analyzed separately and in conjunction to detect any form of dimorphism, which may exist in soft tissues.[15] The mean values for upper lip length and lower lip length were similar in all three vertical growth patterns in skeletal class II jaw relationship, with a p value of >.05. In accordance with our study, an Indian study by Ashraf et al. found no statistically significant difference in upper and lower lip length between high angle and low angle cases.[16] On the contrary, a Brazilian study by Feres et al. found that upper lip length was significantly (p <.001) increased in high angle cases (27.41±3.13mm) compared to normal angle cases (25.26±3.91mm). Low angle cases had the smallest lip lengths (23.21±2.55mm). Lower lip length was also significantly (p <.001) increased in high angle (47.61±3.71) when compared with normal and low angle cases. Although for lower lip length, no significant difference was detected between normal (44.63±3.92mm) and low angle (43.85±4.05mm) cases.[17]

In our study, the mean values for upper lip thickness and lower lip thickness were similar in all vertical growth patterns, with p >.05. Similar to our study, the study by Feres et al. gave non-significant results for correlation between lip thickness and vertical skeletal pattern (p>.05).[17] On the other hand, Ashraf et al. found significantly greater lip thickness in low angle cases when compared with high angle cases, with mean difference recorded to be 1.48mm (p value= 0.044).[16]

In our study, no significant difference was found between lip lengths and lip thickness amongst the sexes. Similarly, Feres et al. found no significant difference between lip lengths and thickness amongst the two sexes (p=.873).[17] On the contrary, Jeelani et al. from Karachi found that in skeletal class II jaw relationship, males had significantly thicker upper lips (12.30mm ± 2.16) compared to females (10.86 ± 1.13). They also had thicker lower lips (19.73 ± 2.18) compared to females (18.00 ± 2.00), although he did not differentiate between the different vertical growth patterns.[15]

The authors conclude that for the population of Peshawar, the lip lengths and thickness are not affected by the vertical growth pattern in skeletal class II jaw relationship in the population of Peshawar.

The limitations of our study were that the sample size was relatively small. The inclusion criteria demanded a class II skeletal relationship, irrespective of whether the maxilla was prognathic or mandible was retrognathic and the proclination of the incisors was not taken into consideration. All these factors may or may not have an influence on the length and thickness of the lips, and hence further research is warranted to investigate whether these factors play any role in determining the lip length and thickness in class II skeletal relationship.

CONCLUSIONS

1. Upper lip length is not affected by the skeletal vertical growth pattern in class II jaw relationship.
2. Upper lip thickness is not affected by the skeletal vertical growth pattern in class II jaw relationship.
3. Lower lip length is not affected by the skeletal vertical growth pattern in class II jaw relationship.
4. Lower lip thickness is not affected by skeletal vertical growth in class II jaw relationship.
5. Lip length and thickness are not affected by gender in class II sagittal skeletal jaw relationship.

DECLARATIONS

Authors contributions:

Conception/Design: Ahsan Mehmood Shah, Mashal Afridi.

Data Collection/Analysis/Interpretation: Ahsan Mehmood Shah, Mashal Afridi, Muhammad Saood, Mashal Kamran, Aatikah Javaid, Wagma Sardar.

Manuscript Writing/Approval: Ahsan Mehmood Shah, Mashal Afridi, Muhammad Saood, Mashal Kamran, Aatikah Javaid, Wagma Sardar.

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