Original Research Paper

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Evaluation of Soft Tissue Cephalometric Evaluation Using Holdaway Analysis in District Solan Population.

Abstract:

Introduction: The soft tissue of the face requires an independent appraisal besides skeletal and dental analysis to comprehensively diagnose and plan treatment to meet objectives of orthodontic treatment leading to a pleasing profile. Soft tissue envelope office plays an important role in esthetics, functional balance and facial harmony.

Aim: The aim of the study was to evaluate soft tissue cephalometric evaluation using Holdaway analysisin district Solan population.

Materials and Method: The study was conducted in the Department of Orthodontics and Dentofacial Orthopedics, Bhojia Dental College, Baddi, Distt. Solan(HP).Pretreatment lateral cephalograms of 60subjects(30males and 30 females) with Class II division 1 were taken. The patients aged between 12 and 26 years. Each of them fulfilled the following criteria, proclined maxillary anteriors, increased overjet, increased overbite, incompetent lips. Various cephalometric landmarks were identified and marked according to Holdaway analysis. The following measurements were recorded: Facial angle, H-line angle, upper sulcus depth, skeletal convexity at point A, Nose prominence, soft tissue subnasale to H-line,basic upper lip thickness, upper lip thickness, upper lip strain, lower lip to H-line, lower sulcus depth, soft tissue chin thickness.

Results: In the present study, significant variations were seen in facial angle, H-line angle, upper lip strain and lower sulcus depth when comparison of cephalometric measurement changes between males and females was done.

Conclusion: District Solan population showed significant difference in facial profile with more facial angle in females and more H-line angle, upper lip strain and lower sulcus depth in males.

Keywords: Cephalometry, soft tissues, standard values.

Introduction:

Dr Angle interpreted the concept of balance again a normality standard as follows: “There is a law for determining the best balance of features, or at least the best balance of the mouth with the rest of the features. It is that the best balance, the best harmony, the best proportion of the mouth in its relations to the other features require that there shall be the full complement of the teeth and that each tooth shall be made to occupy its normal position -- normal occlusion.[1]

Facial esthetics in dentistry has gained great attention in recent times. The success of orthodontic treatment is frequently related to the improvement gained in patient's facial appearance, which includes soft tissue profile and since there is a considerable variations in soft tissue covering, misleading conclusions can be produced if diagnosis and treatment planning is based on dental and skeletal measurements alone; therefore, analysis of soft tissue profile is mandatory.[2,3] Lifestyle of today's era demands the high esthetic perception. Macro-esthetics, mini-esthetics, and micro-esthetics have been emphasized, and orthodontic ethics has been linked to improving the nose, lip, and chin balance. Soft tissue analysis has been used by orthodontist and surgeon as an aid in diagnosis and treatment planning. The nature of the soft tissue profile is affected by many factors, including ethnicity, cultural origin, gender difference, and age; for this reason,

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[1]ISHA AGGARWAL, [2]TARANNUM SONI, [3]SANJAY MITTAL, [4]MANDEEP KAUR BHULLAR, [5]TANZIN PALKIT, [6]SUMIT CHATWALIA

[1-5]Bhojia Dental College and Hospital, Baddi, Himachal Pradesh

Address for Correspondence: Dr. Tarannum Soni
Post Graduate Student (2nd year)
Bhojia Dental College and Hospital, Baddi,
Himachal Pradesh
tarannumsoni99@gmail.com

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facial characteristics have been studied in various ethnic groups. The thickness of soft tissues is different in different populations, so it becomes mandatory to study soft tissue analysis along with hard tissue analysis for optimizing treatment results.[2,4]

The literature has recognized such importance where the topic has been addressed as early as 1907 when Angle emphasized the importance of the soft tissue relations and facial esthetics. As this would affect the psychological development of young persons, Holdaway (1983) has further stressed the implementation of proper soft tissue relations to provide patients with the best possible harmony of facial lines. Thus, many authors have emphasized the importance of incorporating soft tissue analysis during the process of diagnosis.[5]

Holdaway stated that "Usually as we correct malocclusions, we bring about changes in appearance that are pleasing to all concerned. However, most orthodontists who have practiced for even a few years have had the unpleasant experience of finding that some patients' faces looked better before the orthodontic corrections were made." He further stated that "Better treatment goals can be set if we quantitate the soft-tissue features which contribute to or detract from that 'physical attractiveness stereotype' which has been ingrained into our culture.[6]

Holdaway has attempted to quantify the soft tissue features that contribute to better orthodontic planning decision leading to improved treatment outcomes. Holdaway soft tissue analysis has addressed the main profile characteristics of the lower and middle facial structures. It also relates its findings to the facial upper third.[5,7]

Aim and Objectives:

- To evaluate soft tissue cephalometric evaluation using Holdaway analysis in district Solan population.
- To investigate the differences between the Holdaway soft tissue norms of males and females in district Solan population.

Materials And Method

The study was conducted in the Department of Orthodontics and Dentofacial Orthopedics, Bhojia Dental College, Baddi, Distt. Solan(HP). Pretreatment lateral cephalograms of 60 subjects(30 males and 30 females) with Class II division 1 were taken. Informed consent was obtained from all the subjects after explaining the nature and purpose of study.

Table 1:Grouping

Group I	Group II
Male (N=30)	Female (N=30)

Inclusion Criteria:

- The patients aged between 12 and 26 years.
- Proclined maxillary anteriors, increased overjet, increased overbite
- Incompetent lips.

Exclusion Criteria:

- Subjects who had history of previous orthodontic treatment
- Presence of any pathological conditions
- Facial asymmetry or deformity
- Obvious periodontal disease
- Evidence of previous trauma/surgery

Various cephalometric landmarks were identified and marked according to Holdaway analysis. The following measurements were recorded: Facial angle,H-line angle, upper sulcus depth, skeletal convexity at point A, Nose prominence, soft tissue subnasale to H-line,basic upper lip thickness, upper lip thickness, upper lip strain, lower lip to H-line, lower sulcus depth, soft tissue chin thickness.[8]

TABLE 2: Cephalometric Landmarks[8]

S.NO.	MEASUREMENTS	NORMS
1.	**Facial angle:** Facial angle is formed from the downward and inner angle formed at a point where the sella - nasion line crosses the soft tissue, and a line combining the suprapogonion with the Frankfort horizontal plane.	91+/- 7 degrees
2.	**H-line angle:** The H-line angle is the angle formed between the soft tissue facial plane line and the H line.	7 to 14 degrees
3.	**Upper lip sulcus depth:** A perpendicular is dropped from Frankfort horizontal tangent to the tip of the upper lip and from this line the depth of the upper lip sulcus is measured.	1 to 4mm
4.	**Skeletal convexity:** It is measured from point A to the facial plane line (skeletal).	-2 to +2mm
5.	**Nose prominence:** The dimension between the tip of the nose and a perpendicular line drawn from the vermilion to the Frankfort plane	14 to 24 mm
6.	**Soft tissue subnasale to H line:** Measurement from subnasale to H line.	3 to 7mm
7.	**Basic Upper lip thickness:** It is measured horizontally from the point on the outer alveolar plate 2mm below point A to the outer border of the upper lip. At this point, nasal structures will not influence the drape of the lip.	15mm
8.	**Upper lip thickness:** the dimension between the vermilion point and the labial surface of the maxillary incisor.	13 to 14mm
9.	**Upper lip strain:** It extends horizontally from the vermilion boarder of the upper lip to the labial surface of the maxillary central incisor. This measurement should be approximately the same as the upper lip thickness (within 1mm). If this measurement is less than the upp er lip thickness the lips can be considered to be strained.	14 to 16mm
10.	**Lower lip to H line:** It is measured from the most prominent outline of the lower lip to the H line. A negative reading indicates that the lips are behind the H line and positive reading indicates that the lips are ahead of the H line.	1 to 4mm
11.	**Lower sulcus depth:** This is measured at the point of deepest curvature between the lower lip and the soft tissue chin.	3 to 7mm
12.	**Soft tissue chin thickness:** This is recorded as a horizontal measurement and is the distance between the two vertical lines representing the hard tiss ue and soft tissue facial planes at the level of Ricketts suprapogonion.	10 to 12mm

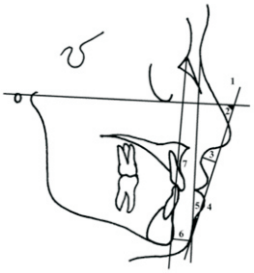

Fig.1: Cephalometric measurements: (1) H line; (2) soft tissue facial angle; (3) soft tissue subnasale to H line; (4) lower lip to H line; (5) H angle; (6) soft tissue chin thickness; (7) skeletal profile convexity.[8]

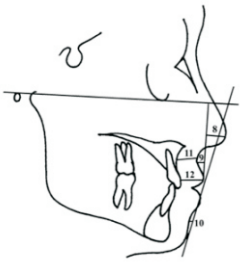

Fig 2. Cephalometric measurements: (8) nose prominence; (9) upper lip sulcus depth; (10) inferior sulcus to H line (lower lip sulcus depth); (11)basic upper lip thickness; 12) upper lip thickness.[8]

Data collection and analysis;

All the lateral cephalograms were traced by the principal investigators manually on a lead acetate paper with 0.5mm lead pencil on a view box. Precautions were taken to eliminate stray light for accurate identification of the cephalometric landmarks. All the angular measurements were obtained to the nearest of 0.5 by protractor and ruler.

Statistical analysis;

- Analysis was conducted using IBM SPSS STATISTICS (version 22.0).
- Normality of quantitative data were checked by measures of Kolmogorov Smirnov tests of Normality. Continuous data were given as mean±SD; range and median with interquartile range. Comparisons of values of skewed data were made by Mann-Whitney test for 2 groups (Gender).
- Gender was reported as counts and percentages.
- Spearman correlation coefficient were calculated to see relation between different variables.
- p value <0.05 was considered significant.

Table3: One Sample Kolmogorov-Smirnov Test

		Normal parameter	Most extreme differences	Test statistic	Asymp sig.			
Measurements	**N**	**Mean**	**Standard Deviation**	**Absolute**	**Positive**	**Negative**		
Facial angle	60	472.67	391.781	.332	.332	-.285	.332	.000[c]
Upper lip curvature	60	3.46	.761	.310	.310	-.173	.310	.000[c]
Skeletalconvexity at point A	60	3.28	1.027	.311	.157	-.311	.311	.000[c]
H-line angle	60	82.52	69.164	.325	.325	-.255	.325	.000[c]
Nose tip to H - line	60	15.38	4.059	.277	.260	-.277	.277	.000[c]
Upper sulcus depth	60	5.05	1.991	.177	.177	-.152	.177	.000[c]
Upper lip thickness	60	12.02	2.071	.184	.184	-.128	.184	.000[c]
Upper lip strain	60	5.75	3.358	.135	.135	-.128	.135	.009[c]
Lower lip to H - line	60	2.80	1.328	.243	.150	-.243	.243	.000[c]
Lower sulcus depth	60	4.60	1.045	.184	.184	-.166	.184	.000[c]
Soft tissue chin thickness	60	10.10	1.684	.160	.124	-.160	.160	.001[c]

Table 4:Descriptive Statistics For Males

Gender (Male)	**N**	**Mean**	**Standard deviation**	**Minimum**	**Maximum**
Facial angle	30	85.333	3.3460	79.0	95.0
Upper lip curvature	30	3.550	.8025	2.5	5.0
Skeletalconvexity at point A	30	3.250	.8978	.0	4.5
H-line angle	30	15.367	2.2816	10.0	18.0
Nose tip to H-line	30	16.200	2.6833	4.0	18.0
Upper sulcus depth	30	5.083	1.9612	3.0	10.0
Upper lip thickness	30	12.067	2.1961	8.0	19.0
Upper lip strain	30	7.033	3.4788	1.0	12.0
Lower lip to H-line	30	3.067	1.3755	.0	7.0
Lower sulcus depth	30	5.083	1.0093	3.0	7.0
Soft tissue chin thickness	30	10.167	1.8020	7.0	14.0

Table 5:Descriptive Statistics For Females

Gender (Male)	**N**	**Mean**	**Standard deviation**	**Minimum**	**Maximum**
Facial angle	30	860.000	43.1836	782.0	952.0
Upper lip curvature	30	3.367	.7184	2.5	5.0
Skeletalconvexity at point A	30	3.300	1.1567	.0	6.0
H-line angle	30	149.667	19.9453	102.0	182.0
Nose tip to H-line	30	14.567	4.9944	.0	18.0
Upper sulcus depth	30	5.017	2.0531	3.0	13.0
Upper lip thickness	30	11.967	1.9737	8.0	18.0
Upper lip strain	30	4.467	2.7258	1.0	10.0
Lower lip to H-line	30	2.533	1.2452	.0	4.0
Lower sulcus depth	30	4.117	.8477	3.0	6.0
Soft tissue chin thickness	30	10.033	1.5862	7.0	12.0

Table6:Comparison between males and females (Spearman's correlation coefficient)(N=30)

Gender(Males) N=30		Facial angle °	Upper lip curvature mm	Skeletal convexity at point A mm	H-line angle °	Nose tip to H-line mm	Upper sulcus depth mm	Upper lip thickness mm	Upper lip strain mm	Lower lip to H-line mm	Lower sulcus depth mm	Soft tissue chin thickness mm
Facial angle	Correlation Coefficient	1.000	.007	.024	.002	.385*	-.031	.002	.225	-.129	.019	.100
	Sig. (2-tailed)	.	.969	.899	.991	.036	.870	.993	.233	.499	.922	.598
Upper lip curvature mm	Correlation Coefficient	.007	1.000	-.043	-.252	.076	-.319	-.154	.122	-.050	.020	.056
	Sig. (2-tailed)	.969	.	.821	.180	.688	.085	.415	.519	.792	.917	.770
Skeletal convexity at point A mm	Correlation Coefficient	.024	-.043	1.000	.168	-.067	.174	-.122	-.242	-.048	.049	-.196
	Sig. (2-tailed)	.899	.821	.	.374	.726	.358	.519	.197	.801	.795	.298
H-line angle °	Correlation Coefficient	.002	-.252	.168	1.000	.184	.467**	-.056	.078	.298	-.213	-.148
	Sig. (2-tailed)	.991	.180	.374	.	.332	.009	.767	.682	.110	.258	.437
Nose tip to H-line mm	Correlation Coefficient	.385*	.076	-.067	.184	1.000	.126	.101	.067	-.014	.185	.400*
	Sig. (2-tailed)	.036	.688	.726	.332	.	.506	.596	.725	.942	.328	.029
Upper sulcus depth mm	Correlation Coefficient	-.031	-.319	.174	.467**	.126	1.000	.180	-.243	-.040	.064	-.118
	Sig. (2-tailed)	.870	.085	.358	.009	.506	.	.342	.196	.832	.737	.533
Upper lip thickness mm	Correlation Coefficient	.002	-.154	-.122	-.056	.101	.180	1.000	.436*	-.095	.232	.133
	Sig. (2-tailed)	.993	.415	.519	.767	.596	.342	.	.016	.618	.218	.482
Upper lip strain mm	Correlation Coefficient	.225	.122	-.242	.078	.067	-.243	.436*	1.000	.374*	.261	.384*
	Sig. (2-tailed)	.233	.519	.197	.682	.725	.196	.016	.	.042	.164	.036
Lower lip to H-line mm	Correlation Coefficient	-.129	-.050	-.048	.298	-.014	-.040	-.095	.374*	1.000	.078	.176
	Sig. (2-tailed)	.499	.792	.801	.110	.942	.832	.618	.042	.	.682	.352
Lower sulcus depth mm	Correlation Coefficient	.019	.020	.049	-.213	.185	.064	.232	.261	.078	1.000	.295
	Sig. (2-tailed)	.922	.917	.795	.258	.328	.737	.218	.164	.682	.	.113
Soft tissue chin thickness mm	Correlation Coefficient	.100	.056	-.196	-.148	.400*	-.118	.133	.384*	.176	.295	1.000
	Sig. (2-tailed)	.598	.770	.298	.437	.029	.533	.482	.036	.352	.113	.

Gender(Females) N=30		Facial angle °	Upper lip curvature mm	Skeletal convexity at point A mm	H-line angle °	Nose tip to H-line mm	Upper sulcus depth mm	Upper lip thickness mm	Upper lip strain mm	Lower lip to H-line mm	Lower sulcus depth mm	Soft tissue chin thickness mm
Facial angle	Correlation Coefficient	1.000	-.316	-.303	-.127	.063	-.119	.381*	-.095	.031	.016	.004
	Sig. (2-tailed)	.	.089	.103	.503	.741	.530	.038	.617	.873	.933	.985
Upper lip curvature mm	Correlation Coefficient	-.316	1.000	-.198	-.213	-.198	.168	.003	.151	.208	.390*	-.061
	Sig. (2-tailed)	.089	.	.294	.258	.295	.375	.989	.425	.269	.033	.749
Skeletal convexity at point A mm	Correlation Coefficient	-.303	-.198	1.000	-.022	.058	-.229	-.089	-.043	-.071	-.291	-.036
	Sig. (2-tailed)	.103	.294	.	.908	.762	.224	.640	.820	.709	.118	.852
H-line angle °	Correlation Coefficient	-.127	-.213	-.022	1.000	.403*	.268	.088	.016	-.187	-.074	-.061
	Sig. (2-tailed)	.503	.258	.908	.	.027	.152	.644	.931	.322	.699	.750
Nose tip to H-line mm	Correlation Coefficient	.063	-.198	.058	.403*	1.000	.166	.135	.071	.019	.023	.231
	Sig. (2-tailed)	.741	.295	.762	.027	.	.382	.478	.709	.921	.905	.219
Upper sulcus depth mm	Correlation Coefficient	-.119	.168	-.229	.268	.166	1.000	.164	-.194	-.291	.064	.022
	Sig. (2-tailed)	.530	.375	.224	.152	.382	.	.387	.303	.119	.736	.908
Upper lip thickness mm	Correlation Coefficient	.381*	.003	-.089	.088	.135	.164	1.000	-.157	-.399*	-.066	.218
	Sig. (2-tailed)	.038	.989	.640	.644	.478	.387	.	.408	.029	.729	.247
Upper lip strain mm	Correlation Coefficient	-.095	.151	-.043	.016	.071	-.194	-.157	1.000	.738**	.653**	.108
	Sig. (2-tailed)	.617	.425	.820	.931	.709	.303	.408	.	.000	.000	.570
Lower lip to H-line mm	Correlation Coefficient	.031	.208	-.071	-.187	.019	-.291	-.399*	.738**	1.000	.596**	.118
	Sig. (2-tailed)	.873	.269	.709	.322	.921	.119	.029	.000	.	.001	.536
Lower sulcus depth mm	Correlation Coefficient	.016	.390*	-.291	-.074	.023	.064	-.066	.653**	.596**	1.000	.070
	Sig. (2-tailed)	.933	.033	.118	.699	.905	.736	.729	.000	.001	.	.713
Soft tissue chin thickness mm	Correlation Coefficient	.004	-.061	-.036	-.061	.231	.022	.218	.108	.118	.070	1.000
	Sig. (2-tailed)	.985	.749	.852	.750	.219	.908	.247	.570	.536	.713	.

N=60		Facial angle °	Upper lip curvature mm	Skeletal convexity at point A mm	H-line angle °	Nose tip to H-line mm	Upper sulcus depth mm	Upper lip thickness mm	Upper lip strain mm	Lower lip to H-line mm	Lower sulcus depth mm	Soft tissue chin thickness mm
Facial angle	Correlation Coefficient	1.000	-.164	-.066	.744**	-.015	-.051	.124	-.304*	-.166	-.384**	.017
	Sig. (2-tailed)	.	.211	.619	.000	.907	.697	.346	.018	.204	.002	.898
Upper lip curvature mm	Correlation Coefficient	-.164	1.000	-.121	-.207	-.046	-.083	-.091	.177	.087	.243	-.004
	Sig. (2-tailed)	.211	.	.356	.113	.727	.526	.491	.177	.510	.061	.977
Skeletal convexity at point A mm	Correlation Coefficient	-.066	-.121	1.000	.040	.027	-.044	-.093	-.104	-.058	-.131	-.103
	Sig. (2-tailed)	.619	.356	.	.764	.838	.738	.482	.429	.658	.320	.435
H-line angle °	Correlation Coefficient	.744**	-.207	.040	1.000	.020	.165	.040	-.309*	-.131	-.466**	-.061
	Sig. (2-tailed)	.000	.113	.764	.	.881	.207	.761	.016	.317	.000	.643
Nose tip to H-line mm	Correlation Coefficient	-.015	-.046	.027	.020	1.000	.123	.100	.120	.054	.155	.287*
	Sig. (2-tailed)	.907	.727	.838	.881	.	.350	.447	.361	.680	.238	.026
Upper sulcus depth mm	Correlation Coefficient	-.051	-.083	-.044	.165	.123	1.000	.176	-.239	-.173	.069	-.049
	Sig. (2-tailed)	.697	.526	.738	.207	.350	.	.178	.065	.185	.603	.712
Upper lip thickness mm	Correlation Coefficient	.124	-.091	-.093	.040	.100	.176	1.000	.099	-.267*	.056	.170
	Sig. (2-tailed)	.346	.491	.482	.761	.447	.178	.	.453	.039	.671	.194
Upper lip strain mm	Correlation Coefficient	-.304*	.177	-.104	-.309*	.120	-.239	.099	1.000	.570**	.505**	.259*
	Sig. (2-tailed)	.018	.177	.429	.016	.361	.065	.453	.	.000	.000	.046
Lower lip to H-line mm	Correlation Coefficient	-.166	.087	-.058	-.131	.054	-.173	-.267*	.570**	1.000	.352**	.147
	Sig. (2-tailed)	.204	.510	.658	.317	.680	.185	.039	.000	.	.006	.261
Lower sulcus depth mm	Correlation Coefficient	-.384**	.243	-.131	-.466**	.155	.069	.056	.505**	.352**	1.000	.135
	Sig. (2-tailed)	.002	.061	.320	.000	.238	.603	.671	.000	.006	.	.302
Soft tissue chin thickness mm	Correlation Coefficient	.017	-.004	-.103	-.061	.287*	-.049	.170	.259*	.147	.135	1.000
	Sig. (2-tailed)	.898	.977	.435	.643	.026	.712	.194	.046	.261	.302	.

Results:

In Table 3, combined mean and standard deviation for the District Solan population was given. Most values for the District Solan population were similar to the Holdaway soft tissue norms. For facial angle, H line angle, upper lip strain and lower sulcus depth, some differences were found between Holdaway soft tissue norms and the values for the District Solan population. Table 4and table 5shows the descriptive statistics of the males and females and the comparisons of the sex differences.In facial angle ($p<0.001$), H line angle ($p<0.001$), upper lip strain($p<0.003$) and lower sulcus depth($p<0.001$) measurements, statistically significant sex differences were found between the District Solan males and females.Table 6 shows comparison between males and females of district Solan population using Spearman's correlation coefficient. They showed significant difference in facial profile with more facial angle in females and more H-line angle, upper lip strain and lower sulcus depth in males.Nose prominence, superior sulcus depth, soft tissue subnasale to H line, skeletal profile convexity, upper lip thickness, lower lip to H line, and soft tissue thickness did not vary by sex.

Discussion:

In orthodontic practice, various analyses are used to evaluate cephalometric radiographs. When assessing the success of orthodontic treatment, soft tissues values are often as important as hard tissue values. Therefore, soft tissue values must accurately reflect ideal norms for a particular ethnic group to which the patient belongs.8 It was thought that a study to determine the soft tissue norms for the District Solan population would be beneficial for orthodontic diagnosis and treatment planning.

The purpose of this study was to define current soft tissue norms for the District Solan population. The aim of this study was to evaluate the soft tissue evaluation usingHoldaway norms for District Solan individuals with esthetically pleasing appearance and ideal skeletal relationships in anteroposterior and vertical directions. The cephalometric films of those who lacked the ideal criteria were excluded. It was found that Holdaway's soft tissue norms and the District Solan population values were generally similar, except in facial angle, H line angle, upper lip strain and lower sulcus depth measurements.

The H angle is formed by a line tangent to the chin and upper lip with the NB line. Holdaway said the ideal face has an H angle of 7º-15º, which is dictated by the patient's skeletal convexity. Holdaway suggested that, with a normal ANB angle of 1º-3º, his soft tissue angle should be 7º-9º. The larger the ANB angle, the larger Holdaway's soft tissue angle, unless there is soft tissue compensation.8 The District Solan population values in this study for H angle were more for males to those given by Holdaway.

Holdaway also specified that “the contour in the inferior sulcus area should fall into harmonious lines with the superior sulcus form,” so a range of 3-7 mm will also be accepted as normal for inferior sulcus to the H line.8,9,10 According to all given values as stated above, District Solan population have ideal values for Nose prominence, superior sulcus depth, soft tissue subnasale to H line, skeletal profile convexity, upper lip thickness, lower lip to H line, and soft tissue thickness.

It was found that approximately half of Holdaway's soft tissue measurements in males and females were similar to those of this study's sample. However, in soft tissue facial angle, H line angle, upper lip strain and lower sulcus depth measurements, statistically significant sex differences were determined.

Conclusion:

In this study, Holdaway soft tissue norms for the District Solan population were determined. These variables have received extensive clinical and research usage in the field of both orthodontics and orthognathic surgery. Generally, most measurements were similar to the Holdaway norms. Some differences for soft tissue facial angle, H line angle, upper lip strain and lower sulcus depth measurementswere noticed. When comparisons were made between the sexes, some significant differences between males and females were found. On an average, males have relativelymore H-line angle, upper lip strain and lower sulcus depth than do the females and females had more facial angle. According to these results, new soft tissue norms are established for orthodontic diagnosis and treatment planning for the patient of the District Solan population. The results of this study should be an aid in designing treatment plans that are consistent with the perception of beauty, attractiveness, and facial balance for the native District Solan population.

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