

Angular Relationship Between Frankfort Horizontal Plane And Sella-Nasion Plane In Bhavnagar Population: A Retrospective Cephalometric Study

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Abstract: Background: The angle between Frankfort horizontal (FH) plane and Sella-Nasion (SN) plane is considered to be 7°. Various studies have shown that the FH-SN angulations can vary; which can affect cephalometric diagnosis of a case. Objective: To determine the angular relationship between Frankfort Horizontal Plane and Sella-Nasion Plane in Bhavnagar population and to assess whether the FH-SN angle exhibits sexual dimorphism or not. Material And Methods: 85 Lateral cephalograms of patients belonging to Bhavnagar were retrieved from record room of department of orthodontics and dentofacial orthopaedics, college of Dental Science and Hospital, Amargadh. These were hand traced and angle between FH plane and SN plane was measured and recorded. Result: The average FH-SN angle was $7.19^\circ \pm 3.16^\circ$. FH-SN angle was greater in female samples compared to males. However, the difference was not statistically significant. Conclusion: The average FH-SN angle for a group of patients belonging to Bhavnagar was found to be $7.19^\circ \pm 3.16^\circ$ which compared to the given norm. [Ghanshani V Natl J Integr Res Med, 2023; 14(3):1-4, Published on Dated: 18/05/2023]

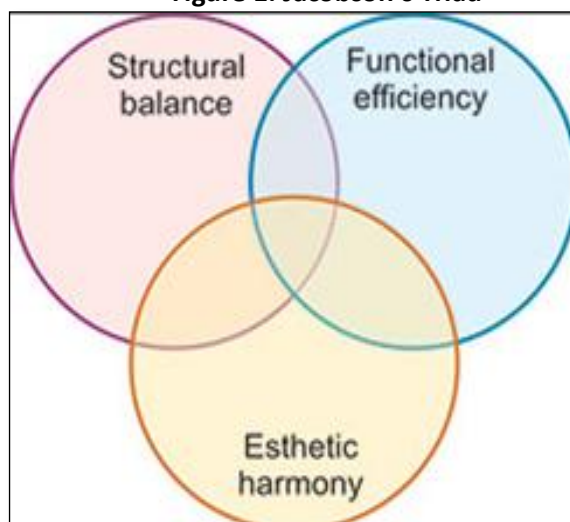
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Introduction: The objective of contemporary orthodontic care is to bring harmonious facial esthetics with consequent improvement in social well-being and quality of life of an individual.

One of the fundamental tool is the lateral cephalogram which is used in orthodontic diagnosis, treatment planning, evaluation of care outcome, prediction of growth and research purposes¹.

Figure 1: Jacobson's Triad



Cephalometric analysis has been a mainstay of orthodontic diagnosis in which different reference planes are drawn by various

investigators. Most important and commonly used reference planes are SN plane followed by FH plane.

Frankfort Horizontal plane is constructed by joining the inferior most point in bony orbit called orbitale (Or) with the superior most point on external auditory meatus called porion (Po).

Sella Nasion plane is constructed by joining the mid-point of sella tursica (S) with nasion (N).

Commonly used cephalometric analyses use these two planes.

Though all cephalometric planes show some variations, SN plane followed by FH plane have been found to be relatively stable².

The relationship between FH and SN planes was demonstrated in 1957 by Daugaard-Jensen, who found it as a almost constant mean angle of 7° during growth.

The literature suggests that the angle between these lines is relatively constant at 7° and the true horizontal axis or constructed FH is obtained by tracing a line in a clockwise direction approximately 7° from SN.

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However, this constancy has not yet been sufficiently proven by reliable evidence³. Any changes in the FH-SN angulation can affect the cephalometric diagnosis.

However various studies have shown that the FH-SN angulation is not always 7° so assessment of FH-SN angle is imperative before drawing any cephalometric conclusion². The primary objective of this study is to determine an average FH-SN angle for a group of patients belonging to Bhavnagar.

The secondary objective is to assess whether the FH-SN angle exhibits sexual dimorphism or not.

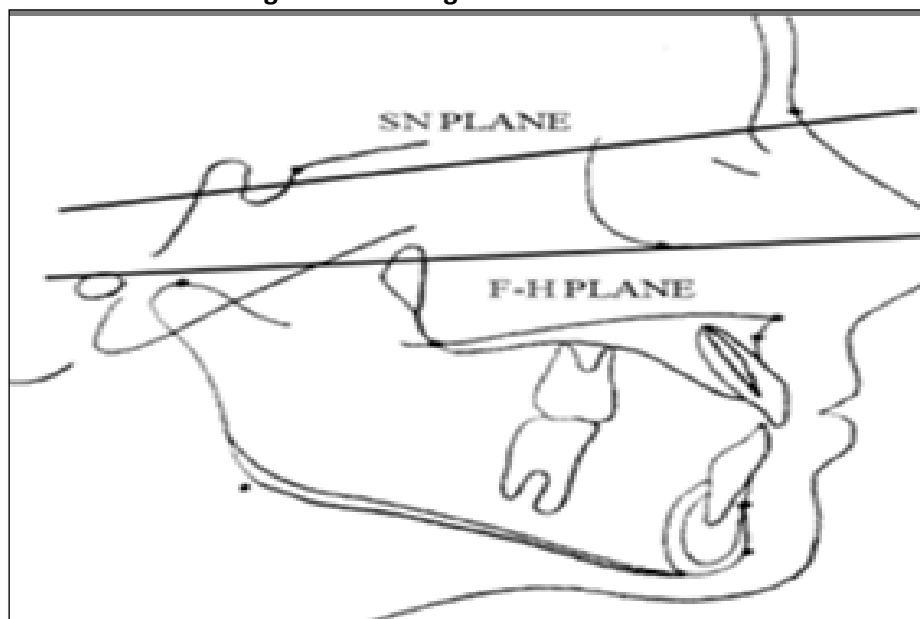
Material & Methods: The study was conducted after obtaining ethical clearance from the institutional ethics committee, college of dental science and hospital, Amargadh. The armamentarium used was: 3H pencil, 0.003 inch acetate tracing paper, Geometry box comprising of eraser, divider, and protractor, ruler, set squares and compass, X-ray viewer.

Total 85 lateral cephalograms of Bhavnagar patients (43 males and 42 females) within the age group of 15 to 25 years were selected from the record room of department of orthodontics and dentofacial orthopaedics, college of dental science & hospital, Amargadh.

None of these patients had any kinds of craniofacial deformities. Radiographs with unclear landmarks & magnified image were excluded from the study. Lateral cephalometric radiograph for each participant were in centric occlusion and the Frankfort Plane oriented horizontally according to Natural Head Position (NHP).

Lateral cephalograms were hand traced using a sharp 3H pencil on acetate tracing paper in a dark room using X-ray viewer. Cephalometric landmarks were verified by another investigator before the reference planes (FH and SN) were constructed. The angle between the FH and SN plane was then measured nearest of 0.5 degree and noted.

Figure 2: Drawing Of Reference Planes



After 2 weeks of initial measurement, 25 lateral cephalograms were randomly selected and measured again to ensure the intra-observer variability.

Normal distribution of obtained data was assessed using Kolmogorov-Smirnov and Shapiro-Wilk tests. Gender dimorphism of FH-SN angle for the samples was evaluated using independent t-test. Mean and standard deviation of FH-SN angle of all the 85 samples were then calculated.

Results: The average age of the samples was 19.4 ± 4.2 years. The values of Kolmogorov-Smirnov and Shapiro Wilk tests were found to be above 0.05; which suggest there was normal distribution of the data.

The mean FH-SN angle was 7.19 ± 3.16o.

FH-SN angle was greater in female samples as compared to the male samples; however, the difference was not statistically significant.

Table 1: Age And FH-SN Angle Of The Samples

Parameters	Number of samples	Mean age (years)	Mean FH-SN angle (degrees)
MALES	43	20.2±4.3	6.95±3.34
FEMALES	42	18.6±4.1	7.43±2.98
TOTAL	85	19.4±4.2	7.19±3.16

Table 2: T-Test Statistics Comparing FH-SN Angle Between Gender Groups

Parameters	Males		Females		t-value	p-value
	Mean	SD	Mean	SD		
FH-SN angle (degrees)	6.95	3.34	7.43	2.98	-1.624	0.106 (NS)

Discussion: The present retrospective cephalometric study was conducted to determine an average FH-SN angle for a group of Bhavnagar patients. The average FH-SN angle in this study was found to be $7.19^\circ \pm 3.16^\circ$.

This value is close to the generally accepted 7° angulation between FH and SN planes. But, there are studies which have reported FH-SN angle greater than 7° as well⁴⁻⁷.

This discrepancy in FH-SN angle could be due to the racial variation that might be existing between the samples of those studies. Moreover, any cephalometric difference less than 2° not considered clinically significant⁸.

It is evident that FH-SN angle shows inter-individual variability. Intra-individual variability of FH-SN angle is still debated; however it is accepted that this angle remains almost constant (7°) throughout the life of an individual.

There are studies in which it was reported that there is increase in FH-SN angle with age^{4,7}.

This study cannot answer this question whether the FH-SN angle changes with age because of its cross-sectional design.

Hence, further longitudinal studies with adequate sample size are needed to assess changes in FH-SN angle with the age of individual.

Variation in FH-SN angle affects the diagnosis of an orthodontic case. According to Moore⁹, as the FH-SN angle increases there is decrease in SNA and SNB values.

The cause of variation in FH-SN angle can be variation in inclination of SN line, FH line or both.

Hence, it is important to evaluate the FH-SN angle before making any cephalometric diagnosis.

If the variation of FH-SN angle is due to SN line, cephalometric parameters which use FH line alone should be used for making cephalometric diagnosis; however cephalometric planes tend to be highly variable and poorly related.

Hence, cephalometric analysis should always be performed using more than one reference plane¹⁰.

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