COMPARISON OF FACIAL DIVINE PROPORTIONS IN HORIZONTAL AND VERTICAL FACIAL PATTERN: A COMPARATIVE STUDY

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By

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*"I extend my sincere thanks to my advisor, **Dr. Tripti Tikku, MDS, Professor**, Department of Orthodontics and Dentofacial Orthopaedics, Babu Banarasi Das College of Dental Sciences, Lucknow, for her constant support and guidance. Her insightful advice helped me navigate the challenges of this research project. I am deeply grateful for their patience, motivation, and expertise that she shared with me. Most importantly, I am thankful for her unwavering support, collaboration, and mentorship throughout the past three years."*

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-Dr. Monika Sharma

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF GRAPHS

LIST OF ANNEXURES

LIST OF ABBREVIATIONS

S.NO	ABBREVIATED FORM	FULL FORM
1.	TR	Trichion
2.	LC	Lateral canthus of eye
3.	CH	Cheilion
4.	LN	Lateral rim of ala of nose
5.	M	Menton
6.	TS	Lateral border of temple
7.	IPL	inter pupillary line
8.	MSP	Mid sagittal plane

Aim: To evaluate and compare the facial divine proportion in subjects with different facial pattern (Average, Horizontal and Vertical) using frontal facial photographs.

Material and method: Lateral cephalograms of 350 subjects were selected and divided into three groups based of facial divergence as Group I consisted of 100 normo-divergent subject; Group II consisted of 100 hypodivergent subjects and Group III consisted of 100 hyperdivergent subjects. The digital frontal facial photograph of all the selected subjects was taken and cropped in Adobe Photoshop. Four horizontal, nine vertical parameters were measured and from these three horizontal and seven vertical proportions were calculated usingIC Measure software for the evaluation of facial proportions. The data so obtained was tabulated and was subjected to statistical analysis.

Result: All horizontal and vertical parameters varied significantly different between various facial divergence groups except for width of nose and width of mouth. All horizontal facial proportions (TS(r-l)-TS(r-l), LC(r-l)-LC(r-l), LN(r-l)-LN(r-l) were deviated from the golden proportions in different facial divergence groups. Few vertical facial proportions TR-LC: LC-ME and CH-ME: LC-CH were deviated from the golden proportions in different facialdivergence groups. However TR-ME:LC-ME, LN-ME:TR-LN, LC-LN:LN-ME, LN-CH:LC-LN and LN-CH:CH- were closer to golden proportions. The deviation of facial proportions from standard golden proportions was maximum in hyperdivergent followed by hypodivergent and least in normo-divergent groups

Conclusion: Horizontal and vertical divine proportions deferred from golden proportions in all divergence groups. As per orthodontic perception racial facial proportions of the face must be taken in to consideration so as to get the best treatment results.

Keywords:Divine proportions, facial divergence, Normo-divergent, Hypodivergent, Hyperdivergent.

Facial beauty of an individual depends on proportion and relationship of various facial parts that varies among individuals. Facial harmony and balance are determined by underlying facial skeleton and overlying soft tissue drape[1].

The face is the most important individual factor determining the physical appearance of individuals, so the best esthetic outcome is an important treatment objective for patients satisfaction[2].

Facial harmony in orthodontics is measured by morphological relation and proportion of nose, lipand chin because their anatomic balance can be changed by growth as well as orthodontic treatment, so there is an important role of Orthodontist to get ideal proportion in an individual[1]. There had been always discussion over what constitute beauty, and numerous studies have tried to measure it qualitatively as well as quantitively. A number of linear measurements angles, ratios and proportions, rating scales helped us in judging facial beauty. Facial proportion for assessing beauty are topic of interest in orthodontics as well as for maxillofacial and plastic surgeons[3].

Among various norms or standard that had been proposed to establish facial attractiveness, facialdivine proportion, also known as golden ratio as denoted by symbol ‗phi' is considered as ratio which is the most famous & found to be most attractive to human eye & mind[3]. This is a precise mathematical proportion that the human body is designed to follow is. A Historically Greek mathematician Euclid first gave a geometrical description of divine proportion in the fourth century BC. A more precise definition of the golden proportion was later provided by the 12th- century Italian mathematician Fibonacci, who identified it as Phi (φ), with a value of 1.618[3]. Anytwo parts must have a ratio of 1.618 in order to be aesthetically proportionate[4]. This number is referred to as the "Divine Proportion" in a book written by Luca Pacioli in 1509 and illustrated by Leonardo da Vinci. Later on, Da Vinci dubbed this section as "golden section," or ―sectio aurea‖.In many Renaissance paintings and sculptures, the golden ratio was employed to create harmony and beauty. The Mona Lisa and the Vitruvian Man by Leonardo da Vinci both feature the goldenratio[5,6]

Divine proportions are calculated on bases of Fibonacci series. It is the ratio of the greater to the lesser of two consecutive numbers in the geometric sequence known as a Fibonacci series.

The symmetrical veins of a tree leaf, the striking color proportions of a peacock feather, the logarithmicspirals of a snail (Nautilus), the intersecting spirals in sunflower or pine cones, the lovely bands on a butterfly's wings, all follow Fibonacci series also known as the divine proportion and have aconnection to the exquisite art found in nature[1] .

Lambardi first proposed the divine proportion in dentistry[7]. Jefferson also believed that there is a universal standard for facial beauty regardless of race, age, sex and other variable, named as divine proportion[8]. Holdaway explains this truth very well, __It would be very difficult to correct the malocclusion without losing something in the way of facial beauty.'' He also claimed that not everyone had an ideal occlusion even in a sample of beauty queens[9]. The values of measured proportion in beautiful faces are likely to approximate divine proportion hence their importance is established and discussed in Orthodontic literature[3]. Orthodontists and maxillofacial and plastic surgeons, by studying the human face and profile, are constantly searching for guidelines for the reconstruction of facial dysmorphology and the correction of malocclusion[10].

In orthodontics, the proportions and morphologic relationships between the nose, lips, and chin establish facial harmony. Several studies have shown the existence of the correlation between attractiveness and proportions in face measurements that approach the Golden Ratio[1]. According to these reports, faces that have features with ratios close to the Golden Ratio are thought to be esthetically pleasing. However, Baker and Woods found that beautiful faces may or may not exhibit ratios in the divine proportion. Therefore, more evidence is required to substantiate the true significance of this fascinating concept of divine proportion in the clinical assessment of facial esthetics[11].

Rickets first observed relationship of divine proportion to the composition of hard and soft tissue of face[12]. He observed divine proportion after detailed examination of lateral, frontal cephalogram and photograph and used it as guide for treatment planning in orthodontics[13].

Schudy examined the cephalometric radiographs of individuals with different facial pattern having normal growth pattern, found that upper facial height varied very little between them[14].

According to Snow, the idea of the golden percentage can be applied to diagnose and improve symmetry, dominance, and proportion for a smile that is aesthetically pleasing[15].

As per Proffit and Fields, the mouth in the lower face should be located approximately one-third of the way between the base of the nose and the chin, and the vertical height of the midface should match the height of the lower face from the supraorbital ridges to the base of the nose[16]. Different photographic studies had been done to determine the relationships between measurements of the lower third of the face, lower lip, chin and upper lip[17,18]. The differences in the soft tissue profile of the lower third of the face were perceived in the variations of skeletal convexity, soft tissue thickness, protrusion of the lips and position of the lower incisors[17,18]. Correction of malocclusion mainly effects changes in the lower facial third (Bloom, 1961) and a treatment which is based on skeletal standards can result in disharmonious facial proportions[19]. Altered facial height may affect facial proportion and can be cause or effect of various malocclusions.

Previous studies had evaluated facial attractiveness by rating photograph qualitatively by using visual analog scale. Some other studies evaluated facial attractiveness using software. Khan et al compared attractive vs nonattractive males and females by rating the photographs and compared the various transverse and vertical proportions. They found that in attractive faces among vertical proportions (Total facial height, Lower & mid anterior facial height, Upper two- third of face) were close to golden proportions, while transverse proportions were deviated more from divine proportion in both groups[3]. Mizumoto et al. observed almost similar result in their study in Japanese women[20]. Kawakami et al. reported that deviations from divine proportion weremore in males as compared to female subjects[21]. Omotoso et al. also showed that there was bisexual variation in upper and lower face height[22].

Moss and his team used a 3D scanning technique for analyzing different male and female features in models from both genders. They concluded that these features had nothing to do with whether a face is proportioned or not[23].

Marquardt‘s mask designed on the basis of a perfect decagon which gaves us an idea of a strictly proportioned facial image from the golden rule:1.618. The goal of Marquardt's beauty analysis, is to conduct proactive research on human visual aesthetics, covering both its biological and mathematical foundations and the application of the findings to the development of technologies and information aimed at enhancing human visual attractiveness[24]. Study done by Rodríguez GLC et al demonstrated that attractive and proportioned patients (measured with the mask of

Marquardt), might not always have a perfect class I molar and found that from the group of unportioned patients, eight had a class I molar relationship, two had a class II and eight patients were class III[25].

In a study by Pancherz and his collaborators, facial beauty was compared to skeletal morphology; they found that attractive patients have an increased ANB and Witts value, and that they also presented a much more convex profile than the non-attractive ones. Similarly, several studies stated that sagittal malocclusions (skeletal) determined by the ANB angle had no effect on the subjects‘ frontal facial attractiveness[26].

It is well known that a patient's desire for better facial aesthetics is what drives them to seek orthodontic treatment, and in this sense, soft tissue assessment is crucial for orthodontic planning[27]. Hence, the need to comprehend what constitutes beauty has grown as orthodontists' abilities to alter the face have increased. This concept of divine proportions is influenced by overlying soft tissue & underlying hard tissue morphology as well[27]. In vertical plane skeletal morphology manifest itself according to variation in growth pattern/ facial divergence as normo-divergent (average), hypodivergent (horizontal) & hyperdivergent (vertical). This is an important criterion for diagnosis and treatment planning in orthodontics. Many a times soft tissue tries to camaflouge the hard tissue malocclusion to maintain the facial attractiveness & functional balance. Hence, measurements of hard tissue cephalometric parameters may not correlate to soft tissue parametersin patients with normal facial divergence.

With shift in paradigm towards soft tissue esthetics, assessment of facial divergence of soft tissue had been done in various studies[28]. However rather than focusing on cephalometrics values alone, investigations of numerical & proportional facial analysis either directly in patient photograph or using radiographs are better option to get an optimum treatment plan[28].

The orthodontists should handle their patients' expectations by focusing on the smile and facial aesthetics as the primary goals of treatment. As the type of growth pattern may vary with overlying soft tissue drape and may alter the divine proportions[1]. Hence, there was need to evaluate the relationship between facial esthetics and the divine proportions in subjects with variable growth pattern.

Considering this, the aim of the present study was to evaluate and compare the divine proportion in subjects with different malocclusions with varying facial pattern.

AIM:

The aim of the present study was to evaluate and compare facial divine proportion insubjects with different facial pattern (Average, Horizontal and Vertical).

OBJECTIVES:

1. To evaluate the facial divine proportion in subjects with average growth pattern.
2. To evaluate the facial divine proportion in subjects with horizontal growth pattern.
3. To evaluate the facial divine proportion in subjects with vertical growth pattern.
4. To compare the facial divine proportion in subjects with different growth pattern.

Leslie.Farkas (1983)[29]evaluated the vertical and horizontal proportion of the face in young adult north American Caucasians. Sample is divided into two group, Group I (n=153) included two subgroup of 103 subject and 50 subjects in which seven canons were calculated. In group II, three subgroup of n=100(6years), n=105 (12 years), n= 103(18 years) nine canons were calculated. Landmarks were marked and Standard anthropometrical methods were used for measurements. Nine formulas of facial proportion were calculated, Four canons for vertical measurements and four canons for horizontal measurements were done and remaining canons was for nasal bridge inclination. They found that there were no sex related changes except only two parameters of horizontal measurements. The absolute difference was greater between the vertical oriented facial proportion and smaller between the horizontal oriented facial proportion.

Lundstorm.A, Cooke.M.S (1991) [30] evaluated the **p**roportional analysis of facial profile in natural head position in Caucasian and Chinese children. Sample of 80 chinese children (n=40male, n=40 female) of 12-13 years age were selected for standardized lateral roentogenographic cephalograms in natural head position. Eleven indices (ratios): Eight horizontal, two vertical and one vertical/horizontal proportions were calculated and analysed. They found that there proportional difference between boys and girls were non significant for all variables, while ethnic differences were found with horizontal measurements.

Wang Dawai, M.D., Qian (1997) [31] compared the facial proportion canons in a Chinese and north American Caucasians populations. Sample of 206 subjects (n=105 males, n=101 females) of age 18-25 years of chinesese populations were compared with 103 healthy young north American caucasisans adults. Six horizontal facial measurements were taken : intercanthal width , lengths of the right and left eye fissure, width of the face(zy-zy), nose (al-al) and mouth(ch-ch) and compared to four neoclassical canons of facial proportions. They found that the mouths of Chinese people were significantly more often narrower than 1.5 times the nose width, while in North American Caucasian ethnics the mouth was significantly more frequently wider.

Baker.B.W, Woods.M.G (2001) [11] investigated the changes in a number of facial proportions as a result of combined orthodontic/orthognathic surgical treatment. Sample of 46 patients (n=36 women, n= 10 men) of mean age 24.5 years who had undergone a combined orthodontic/ orthognathic surgical treatment. pre- and post-treatment lateral cephalographs and pre-and posttreatment frontal (non-smiling) and profile color facial photos were given score by 12 judges using a visual analog scale. Judges were shown frontal and profile views simultaneously. Frontal photos were analysed to measure the ratio. Ten ratios were measured from pre- and posttreatment lateral cephalograms, and 11 were measured from the frontal photos. They found that there is no correlation between esthetic rating and the divine proportion in various facial and cephalometric ratios, either before or after treatment. and there seems to be no correlation between the change in esthetic rating as a result of treatment and changes in the values of the measured ratios.

S.C.L. Leong & P.S. White (2004) [32] compared the asthetic proportion between oriental and Caucasian nose in healthy volunteers (n=118, 61oriental, 57caucasian), photographs were taken and following measurements are compared : intercanthal width(EN-EN), basebone width (X–X), alar width (AL–AL), length of the nose (nasion to pronasion), nasolabial angle (CLA), tip angle (TA), pronasion projection (ACT), nasion projection (CN), nasofacial angle (NFA) and nasofrontal angle (NFR). Results showed that Caucasian nose projects more because of more acute nasolabial angle in oriental male than caucasian and small variation is found between male and female.

Edle.R, Agrwal.P, Wertheim.D (2005) [33] used anthropometric data in the form of Farkas‘ proportion indices in order to quantify facial attractiveness, and to relate measured change through surgery, to clinical judgement. Standardized full face and profile photographs of subjects who had undergone orthognathic surgeries (15 Caucasian patients (n= 9male, n= 6 female) of age group 20-44 year) were used in album form and rated by Ten experienced clinicians, comprising five orthodontists (3 male, 2 female) and five maxillofacial surgeons. album 1 for facial attractiveness (before surgery) and album 2 for improvement in facial attractiveness (before and after surgery). Twenty-five proportion indices were selected and linear measurements recorded from the pre- and post-surgical photographs. The corresponding change in indices and in clinicians‘ scores were compared. The result showed good reproducibility for digitalization, photography, and clinical assessment.

Johnston.D.J (2005) [34] investigated the influence of changing lower face vertical proportion on the attractiveness ratings scored by lay people. Ninety-two social science students evaluated a set of silhouettes with normal, enlarged, or decreased lower face proportions to determine which was more attractive. A picture with the Eastman normal lower face height in relation to total face height (lower anterior face height/total anterior face height, or LAFH/TAFH) of 55% was one of the ten randomly selected sequences of images. Other images showed LAFH/TAFH varying by up to four standard deviations (SD) from the Eastman norm and Class I anteroposterior (AP) relationship was present in all of the images. Repeatability was evaluated using a duplicate image in every sequence. A 10-point numerical scale was used by the participants to rate each image. Results shows that the most attractive image, according to lay people was the professional one with normal vertical facial proportions. Attractiveness scores reduced as the vertical facial proportions diverged from the diverged from the normal value. Significantly more people found images with a smaller lower face proportions to be attractive than those with a larger face proportion.

Kiekens.R.M.A (2006) [35] analyzed the putative relationship between facial esthetics and golden proportions in white adolescents. Three set of photographs ((frontal, three-quarter smiling, and lateral) of 64 subjects (age10-16 years) were evaluated by 78 adult laypeople on visual analog scale (VAS) from 0 to 100. Putative golden proportions were identified on frontal photographs and then only 19 proportion were selected. 13 landmarks were positioned and by three observers. The proportions and each proportion‘s deviation from the golden target (1.618) were calculated. This deviation was then related to the VAS scores, they found that beautiful faces deviated less from the golden standard than less beautiful faces, and only 4 of the 19 proportions showing a significant negative correlation with the VAS scores. Only 16% of the variance was explained by these variables taken together.

S.T.S.Roland, A.Y.S.Chan (2006) [36] compared the aesthetic facial proportions of southern Chinese and white women. sample of 100 chinese women (age 18-40years) who were not undergone facial surgery were selected. Frontal , right and left lateral and basal Photographs were taken. For facial proportion following measurements were taken : horizontal thirds, vertical fifths, width-length ratio of nose, nasolabial angle, nasal tip projection, shape of dorsum, columella, columella proportions, lobule-base ratio, nostril orientation, aesthetics triangle , width

of mouth, upper lip- lower face ratio, relation of lip to rickets line, shape of eyebrow,

configuration of the supratarsal crease. Results showed that chinese face had the wider intercanthal distance, the wider nasal base, a different profile of lower face and difference in eyelids in comparison to white women.

Panchrez.H, Matoula.S (2006) [37] compared the skeletofacial morphology of attractive and non-attractive subjects by taking lateral head films and facial photographs. 398 orthodontics patients were divided by panel of students into 34 attractive (25 female, 5males) and 34 non attractive (11 females, 21 males). Five transverse and seven vertical facial distances were measured. Standardized lateral head film were analyzed using variables: sagittal jaw (SNA,SNB,ANB,Wits and SNPg),vertical jaw(mandibular and maxillary plane angle, interjaw base angle), facial height, profile convexity, lip position. Results show that Only the ML/NL angle and the posterior facial height showed a significant correlation (P,.05) between the skeletofacial variables and the transverse and vertical facial disproportion indices.

Mizumoto. Y, Deguchi.T, Fong.KWC (2007) [20] measured soft tissue facial proportions in three groups of Japanese woman and compared it to the golden proportions. Group 1 was of young adult treated orthodontic patients patients(n=30) with skeletal class1 occlusion; groups 2 of models(n=30), group 3 of popular actress(n=14). Photographs were digitized for analysis and measured using software. Three measurements for the proportions of total face heights were done: seven for face height and three for face widths. They found that proportion of face heights in group 1 were similar to golden proportions, while group 2 differed from golden proportions and group 3 had golden proportion in all seven measurements. Facial width were deviated from the golden proportions, indicating a small mouth or wide set eyes in group 1 & group 2.

Kiekens.R.M.A (2007) [23] tested the hypothesis that facial attractiveness in adolescents is related to ideal angles and ratios, as indicated in the literature. Three set of photographs (frontal, three-quarter smiling, and lateral) of 64 subjects (age10-16 years) were evaluated by 76 adult laypeople on visual analog scale (VAS) from 0 to 100. Out of the 61 landmarks that three observers recorded, 45 were determined to have acceptable reproducibility. The literature identified 27 ideal ratios on frontal photographs and 26 ideal angles on lateral photographs based on these 45 landmarks. These

ratios and angles were calculated on each photograph. They found that beautiful faces have less deviation from the ideal target than less beautiful faces, according to two ratios and three angles that showed a significant negative correlation with the VAS scores.

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Verena Ferring, Hans Pancherz (2008) [26] in a longitudional study compared the facial proportion changes with divine values during growth. Growth changes were observed from childhood to adult with various occlusion (class I to class III). In total 102 full face photos of 40 subjects (20 female, 20 male) were analaysed. Photograph were examined by taking five transverse and seven vertical refernces distance and compared with ideal values. Facial proportion changes found were very small during growth period from childhood to adulthood but large interindividual variations are

seen. In comparison with the divine values, facial proportions in both sexes remain constant during growth.

Husein.O.F, Sepehr.A, Garg.R (2009) [38] evaluated the facial anthropometric and aesthetic measurements in Indian American women. Prospective cohort study in sample of 102 subjects aged 18-30 years were selected for digital photograph and landmarks were identified. 30 anthropometric measurements were marked and measured and compared with published norms for North American white women Using a visual analog scale, judges assessed the images' aesthetic quality. The remaining 85% of average Indian American women, average North American white women, and attractive Indian American women (top 15%) were contrasted. They found that 25 out of 30 facial measurements showed significant differences between Indian American women and North American white women. Intercanthal distance, mouth width, nasolabial angle, midface height 2, ear length, and nasal height are the six measurements that were correlated with aesthetic scores. 25 out of 30 facial measurements showed significant differences between IAW and NAWW. Intercanthal distance, mouth width, nasolabial angle, midface height 2, ear length, and nasal height are the six measurements that were correlated with aesthetic scores.

Packiriswamy.V, Kumar.P (2012) [39] conducted a study for identification of Facial Shapes by applying Golden Ratio to the facial Measurements. Sample of 300 Malaysian nationality subjects aged 18-28 years of Chinese, Indian, and Malay were selected. Anthropometrical landmark: trichion (tr), gnathion (gn), zygion (zy) were located and marked on the skin. The parameters measured were physiognomical facial height and width of face, and physiognomical facial index was calculated. Result showed that there were notable interracial and sexual differences based on the mean values of the measurements and index. Only 60 subjects had a regular face shape, and remaining 240 subjects had irregular face shape (short and long).

Chandra.H.J, Ravi.M.S, Sharma.S.M (2012) [40] compared the anthropometric measurements and facial proportions of the local population with that of the North American Caucasians. Sample of 100 subjects (50 males and 50 females) with Class I skeletal relationship and pleasing profile were selected. Direct anthropometric measurements were measured on patient with normal head position using magnetic level finder and measurements were done by classical methods of physical anthropology using standard instruments. various anthropometric measurements and facial proportional indices were determined (both horizontal and vertical). They found that on comparision of Caucasians with North America Caucasians displayed a wider mid-face, while the

local population had a wider lower-face. Compared to the Caucasian population in North America, the local population's proportional index values were higher overall.

Kharbanda.O.P[41] evaluated the vertical proportion of face among north Indian subjects. Lateral cephalogram of 48 subjects (n=25 male, n=23 female) with excellent occlusion and good facial harmony. The following linear measurements were measured : Total anterior facial height, anterior upper facial height, total posterior facial height, lower posterior facial height. Ratios were obtained and analyzed. They found that there was significant difference for both anterior and posterior facial heights between males and females, males have higher values than females, while the ratio of upper anterior facial height to total anterior facial height remained constant irrespective of the sex.

Peron.A.P.L.M, Morosini.I.C.(2012) [42] determined whether the perception of facial beauty and divine proportion are correlated among Brazilian Caucasian women. Standard facial photographs (frontal and lateral) of 85 Subjects (average age 23yrs 9 months) were taken in natural head position, evaluated by 5 orthodontists, 5 artists and 5 laymen and were classified, according to their subjective analysis of facial esthetic, in pleasant, acceptable and not pleasant. Frontal photographs were evaluated by divine proportion analysis using the computerized method. Six vertical and two transverse frontal facial proportions were analysed. Results showed that subjective analysis of facial aesthetics are 18.8% as esthetically unpleasant, 70.6% as esthetically acceptable, and 10.6% as esthetically pleasant. The groups classified as esthetically unpleasant, esthetically acceptable, and esthetically pleasant did not differ statistically significantly in their delta medians of divine proportion.

Rossetti .A, Menezes.M.D (2013) [43] evaluated if one or more golden relationships between different measurements of the human face exist for which they used three-dimensional (3D) stereophotogrammetry. Sample of 400 subject of age 19-35 years, white origin were selected, then scored by an Evaluation Jury. Each subject received an esthetic evaluation ranging from 0 to 40. Individuals with a score larger than 28 were considered very attractive (VA), and individuals with a score lower than 12 were considered not attractive (NA). Fifteen subjects per group were chosen by chance, with a final total group of 60 subjects: 15 VA males, 15 NA males, 15 VA females, and 15 NA females. . For each subject, a set of facial distances was obtained from the stereophotogrammetric facial reconstruction. 14 landmark with black liquid eyeliner were marked

on face and 13 facial distance were obtained. Result shows that for nine ratios, no significant effects of sex or attractiveness were found. Only the eye-mouth distance/height of the mandible ratio was significantly influenced by sex and attractiveness. Most of the facial ratios were different from the golden ratio.

Tripathi AA, Tandon RP, HantodkrN (2013) [1] evaluated the divine proportion in attractive north Indian young female population (n=100) of 18 to 26 years by measurement on facial photograph. Photograph in natural head position were taken and analysis was done in Adobe Photoshop software for four transverse and nine vertical measurements. photograph was selected on the basis of rating done by judges (orthodontist, maxillofacial surgeons, prosthodontist, beautician, layman). Photographs were measured and analyzed using digital Vernier caliper. Photographic transverse and vertical facial proportions showed high significance to divine proportions and found that more beautiful faces show less deviation from golden proportions.

Sunil kumar L N, Jadhav K S, Nazirkar G, Singh, Nagmode P S, Ali F M (2013) [44] evaluated the relationship between facial esthetic and golden proportion among north Maharashtrian population. Sample (n=300, 145 male, 155 female) includes facial photographs of young adults with skeletal and dental class I occlusion and with lip competency. Three measurements for the proportion of total face heights, seven for face height and three for face width were measured manually. They found that the anterior facial height measurements were proportionate to the total facial height. Only the lower facial width and height deviated from divine proportion, and most parameters indicate a soft tissue balance in relation to the golden proportion.

S.Rupesh ,S.Rakesh, J.J Winnier, A.Kaimal (2014) [45] evaluated the divine proportion in young female students (18 to 20 years) selected on the basis of rating done by judges (orthodontist, maxillofacial surgeons). Sample included 50 subjects 25 with high esthetic scores and 25 with low esthetics scores. silhouettes were taken and measured with digital vernier calliper. Five measured proportions in facial profile were taken for higher esthetics and lower esthetics groups. They found that on comparing high esthetics and low esthetics, deviation from divine proportion values for all variables were larger in the lower esthetics samples.

Kalra.S, Bagga.D.K, Agrawal.P (2015) [46] evaluated various facial proportions of Indian beauties using their frontal photographs in natural head position to establish anthropometric norms in beautiful Indian female and compare these values with Caucasian anthropometric norms. Frontal photographs of 30 female celebrities were downloaded from the internet. Photographs of only those Indian beauties that have been declared winners of either national or international beauty contests by a designated panel of judges were included in this study. Hardcopy of these photographs was taken in 5inch by 3.5inch format. Landmarks were marked and linear measurements and anthropometric proportions for 24 indices were calculated. These indices were-vertical to vertical, horizontal to horizontal and vertical to horizontal ratios. Result shows that, two variables, the mandibular face width index and the vermillion-cutaneous upper lip height index, were close to the silver proportion, while three variables, the upper face-face height index, nose mouth width index, and nasal index, were close to the golden proportion. In comparison with Caucasian population, there is significant difference in most of the values.

Anand S, Tripathi S, Chopra A.Khaneja K, Agrawal S (2015) [2] **i**n a photographic study examined the divine proportion of patients having orthognathic profile in Moradabad population n=100 (50male, 50female). Using adobe photoshop software analysis was based on the method of Ricketts assessing the divine proportions in vertical and transverse facial planes. Six horizontal and seven vertical ratios were compared with phi ratio. Horizontal mean ratio result for females were not much less from phi ratio except for interchilion/interdacryon ratio. Horizontal mean ratio for male were not much less from phi ratio except for interchilion / interdacryon ratio. All the vertical mean ratio for both male and female group were not much less from phi ratio except for intereye-soft menton/ intereye stomion ratio.

Tandel.M, Kanjiya.D (2015) [47] compared facial asthetics ‒norms‖ or standards in Gujrat region. Sample of 320 subjects (n=160males, n=160 females) of age group 18-25 were randomly selected.) Standardized photograph of the lateral and front view of the face were analysised by computer. Screen protractor software and a screen caliper were used to measure the face's vertical and angular dimensions. Result showed the proportion of middle face was 38.99% in male, 40.29% in females of and the lower face proportion was 61.01% in males and 59.71% in females. The mean values of nasofrontal angle, naso-facial angle, naso-mental angle and mento-cervical angle were 123.33°, 38.13°, 124.23° and 102.43° in males and 129.31°, 36.13°, 124.71°, 100.82° in females

respectively. So, the people of Gujarat possess a smaller middle face, a larger lower face, and a more protruding nasal bridge. The female Gujarati population exhibited a depressed nasal bridge and a less prominent glabella.

Sadacharan.C.M (2016) [48] evaluated the various facial ratios in Indian American women and compared with the Indian and Caucasian norms. Sample of 100 Indian American female students of age 18-30 years were selected. Facial anthropometric landmarks were marked manually on both side of face midline of face and measured using digital calliper. Facial ratios (vertical-vertical, horizontal-horizontal and vertical- horizontal) were analyzed and compared with Indian and Caucasian norms. Result shows that all the 25 variables were similar. Three variables namely-upper face height index, mandibulo-lower facial height and upper face height-biocular width index were close to golden ratio whereas nasal index was close to silver proportion.

Nguyen M S, Sag M, Nho Lev, Nguyen T T, Nguyen B B T, Jagomagi T (2016) [49] evaluated the proportion of frontal facial soft tissue of Vietnamese females in comparison to golden proportion. Facial photograph of 60 Vietnamese females of age 19 years were taken, which had symmetrical face, class I relationship occlusion, complete lip closure. Photograph were taken with camera in standard position. Photograph were measured using Core 1DRAW Graphic X3 software and vertical and horizontal facial proportion were analyzed. Result showed that Vietnamese women's soft-tissue facial proportions did not match the Golden proportions and Vertical facial proportions may become harmonious by altering the lower third of the face.

C M. Sadacharan (2016) [50] measured the facial ratio in Indian American male (n=100; 18-30years) and compared them with the Caucasian norms. Direct facial anthropometric measurements were made using a digital caliper. A set of facial ratios were calculated and compared with coefficients of variation (CV). Facial ratios (vertical-vertical, horizontal-horizontal, and vertical-horizontal) were measured and compared with Indian and Caucasian norms. The result showed that most of the facial ratios had small CV thus making them highly reliable due to reduced intra-sample variability. The upper face to face height and mandibulo upper face height indices were close to golden ratios whereas mandibulo lower face height, upper face height biocular width, and nasal indices were close to silver ratios.

Saurabh R, Piyush B, Sourabh B, Preeti O, Trivedi R, Vishnoi P (2016)[4] measured the facial and smile proportions in young adults and compared them with Caucasion and Japanese populations norms. sample (n= 200, 136 females and 64 males) of 18-25 years with well-balanced faces and Angles class I malocclusion were selected. Photograph in frontal repose position and measured for the total facial proportions, height and width dimensions using adobe photoshop software. They found that females were more closer to ideal ratio than males. In Indian population, upper 3rd facial height (TR-LC) was increased and mid-face height (LC-LN) was decreased; in lower 3rd of the face, LN-CH was slightly increased in comparison to CH-ME. In facial widths, outer canthal width (LC-LC) was greater in the Indian population and mouth width (CH-CH) was normal. When compared with Indian population, Japanese participants had wider noses, outer canthal distance, and bitemporal width. When Indian population was compared with Japanese and Caucasian populations, some parameters of facial proportions showed significant difference, which leads to the need for establishing standardized norms for various facial proportions in Indian population.

Khan NA, Nagar A, Tanon P, Singh GK, Singh A (2016)[3] evaluated the facial divine proportion and its relationship with facial attractiveness in North Indian population. Frontal facial photographs of 300 subjects (18-30 years) were divided on the basis of attractiveness. Two groups (n=130, 65 each of males and females) were analyzed for several parameters selected to assess vertical (Seven measurements) and transverse proportions (three measurements). For vertical proportions values of attractive females were more closer to divine proportion, and some parameters for lower facial width and height were deviated from divine proportions than in attractive males, while Transverse proportions are more deviated than divine proportion in both male and female group.

Costa.M.C.C, Barbosa.MC, Bittencourt (2016) [27] determined the relationship between facial heights by evaluating the soft tissues and underlying skeleton and by analyzing vertical facial proportions in the anterior region. In sample of 24 Brazalian individuals (n=7 men, n= 17 women) of age group 19-38 years, 24 lateral cephalogram and 48 photographs of face (24 profile, 24

frontal) were taken. The anatomical landmarks glabella, subnasal and menton were identified on the photographs. Linear measurements were obtained and cephalometric tracings were carried out in accordance with the analyses proposed by Thompson and Brodie, Schudy, Wylie and Johnson. Result showed that based on analyses by Schudy ($r=0.619$, $p<0.001$), Wylie and Johnson ($r=0.595$, $p<0.002$), Thompson and Brodie ($r=0.630$, $p<0.001$), and others, there was a positive correlation between assessments of the soft tissues and the underlying skeleton; however, individual discrepancies were found because of variations in soft tissue thickness.

Cassio Rocha Sobreira, Gisele Naback Lemes Vilan (2016) [51] Evaluated the vertical facial proportions of Afro-Brazilian and white Brazilian female children of aged 8–10-year-old. Sample of 70 young Brazilian females (n=35 white, n=35 black) lateral cephalometric radiographs were taken. Sample was divided into three age group n=22 (8-year-old), n= 18 (9 years old), n= 30 (10 years old). The following proportions were evaluated: LAFH/TAFH (ANS-Me/N-Me), TPFH/TAFH (S-Go/N-Me), LPFH/TPFH (Ar-Go/S-Go), LPFH/LAFH (Ar-Go/ANS-Me). Result showed that Afro-Brazilian and white Brazilian female children's facial proportions did not significantly differ from one another. Regardless of the racial group, the facial proportions stayed the same between the ages of 8 and 10 years.

Przylipiak.M, Przylipiak.MJ (2017) [52] evaluated the effects of malocclusions on facial attractiveness and to determine if it was correlated with the divine proportion among Caucasian origin. Sample of 335 subjects of (n=133 males, n=202 females of mean age 15.72 ± 4.03 years) . Standard frontal facial photos taken in natural head position was evaluated by 10 dental students using a 10-point visual analog scale (VAS). Lateral cephalogram of patients was assessed and divided into three malocclusion group of class I (n=174) Class II (n= 125) and Class III (n=36). After placing all of the assessments in chronological order, 30 visually appealing subjects received the highest score, and 30 visually unappealing subjects received the lowest score. 13 landmarks were determined and 12 ratios were measured. They found that of the twelve facial ratios, there were significant differences in the trichion-menton/nasion-menton, subnasale-menton/stomion-menton, nasion-subnasale/stomion-menton, nasion-subnasale/nasal width, and trichion-menton/right-left frontotemporale ratio between subjects that were attractive and- nonattractive.

Kaya KS, Turk B, Cankaya M, Seyhun N, Coskun BU (2018) [53] measured the facial soft tissue proportion to diagnose facial difference and anomalies in Turkish patients and also compared them to golden proportion. Photographs of 133 patients (61 female, 72 male) of age 18-40 years were taken. Facial height (Tr-Sn/Sn-Gn), Facial wideness (LcR-LcL/ChR-ChL), and Tr-Gn/Zg-Zg proportions for both the genders were measured and compared. The result showed that facial width and height proportion of Turkish population deviated from golden proportion, and facial morphologies of male were found to be predominately shorter and longer than females.

Virdi.S.S, Wertheim.D and Naini.F.B (2019) [54] determined the normative anthropometric craniofacial measurements and proportional relationships for Kenyans of African and compared it with African Americans (AA), North American Whites (NAW), and neoclassical canons. In sample of 72 Kenyan-African (age range 18–30 years) frontal and profile facial photographs taken in a natural head position and twenty-five direct facial anthropometric measurements and four angular measurements were taken with a digital vernier caliper. They found that in comparison to the Kenyan population, North American men's anthropometric measurements clearly differed, and there are discrepancies with comparison African American data. A database for facial analysis of the African and Kenyan populations may be created using the anthropometric data represented in terms of proportional values, angular measurements, and linear measurements.

Mutaz B. Habal (2020) [55] compared the facial proportions between eastern and western attractive young women. Subjects of group 1(n=43) were young attractive eastern women and group 2(n=22) were attractive young western women of beauty pagent contestants.3D photographs were taken and analysed using three-dimensional photogrammetric analysis tool.27 facial soft tissue landmarks were marked and facial proportions including absolute lengths, angles, proportions of facial volume and vertical and horizontal length were analyzed. They found that, in terms of absolute length, the Eastern participants had longer faces than the Western participants, and that Eastern preferred longer faces with greater upper-to-middle facial proportions than do Westerns. Compared to Western people, Eastern had wider faces—especially lower faces—as more attractive. With the exception of the nasofacial angle, the Eastern participants faces had wider nasofrontal, labiomental, and nasomental angles than western peoples.

Ibrahem Q and Farh H. (2020) [56] evaluated the facial soft tissue proportions of class I and II malocclusion patients (18-25) years and compared with the golden proportion using digital photographic images. Sample of 48 subjects were divided in three group- class I, Class II div1, Class II div 2 malocclusion. Frontal photographs in natural head position with digital imaging camera were taken. Using the Micro Dicom Viewer software, six landmarks, thirteen measures, and thirteen ratios were used for photographic measurements. They found that only three of the thirteen n ratios in class I malocclusio (TRME:LC-ME, LC-ME:TR-LC, and CH-ME:LN-CH) was similar to the golden proportion, whereas two ratios in class II division 1 (TRME:LC-ME, LC-ME: TR-LC) and thirteen ratios in class II division 2 (TR-ME:LC-ME, LC-ME:TR-LC, TR-LN:LN-ME, and LC-CH:CH-ME) were similar to golden ratio .

Crystal R. Soans, Karishma (2023) [57] assessed the vertical and horizontal proportions of the face and their relation of phi in males and females of south Indian population. Sample of 100 subjects (n=50 females, n= 50 males) of age 18-30 years with straight profile, photographs were taken under standardized condition. Adobe Photoshop CS5.1 software was used for making all the measurements. Seven vertical and six horizontal measurements were independently measured for male and females. Result showed that All of the horizontal and vertical facial proportions and phi were found to be statistically significantly correlated in South Indian males and females ($p < 0.05$). The intertemporal/intercanthal ratio, the interalae/nose width, and the intereye-soft menton/ala-soft menton were found to differ significantly between the male and female groups.

The present study was conducted in the Department of Orthodontics BBDCODS, with an aim to compare the facial divine proportions in subjects with different facial pattern using frontal facial photograph. The sample was selected from the patients coming to the Department of Orthodontics & Dentofacial Orthopaedics for fixed orthodontic treatment and divided in three groups on the basis of cephalometric parameters- Group I included 100 subjects with average growth pattern, Group II included 100 subjects with horizontal growth pattern and Group III included 100 subjects with vertical growth pattern. After assessment of growth pattern, frontal facial photographs of all subjects at rest were taken to assess and compare the facial divine proportion among different groups.

The approval was taken from Ethical Committee of Babu Banarasi Das College of Dental Science, BBDU, Lucknow before conducting the study, an informed consent was taken from all the participants of the study.

Eligibility criteria

Inclusion criteria:

1. Patients with age range of 18-30 years to ensure complete growth of soft and hard tissues.
2. Patients with aesthetically pleasing profile.
3. Patients having apparently symmetrical faces.
4. Patient who had not undergone previous fixed orthodontic treatment or any restorative procedures on anterior teeth.

Exclusion criteria:

1. Patients with congenital defect in craniofacial region or syndromes or facial asymmetry.
2. Patients with abnormal morphology in nose, lip and chin region.
3. Patients having any pathological involvement or jaws having any kind of surgical treatment.
4. History of trauma in maxillofacial region.
5. Patients not willing to participate in the study.

Sample:

Lateral cephalogram of 350 subjects who full filled the inclusion criteria the were selected from records of subjects who came to Department of Orthodontics for fixed orthodontic treatment. All lateral cephalogram were traced and Jarabak ratio and Mandibular plane angle was measured for all the subjects to distribute them according to growth pattern (Table1 and 2). The subjects with borderline values were excluded. Final sample included 300 subjects equally divided into three groups- Group I included 100 subjects with average growth pattern, Group II include 100 subjects with horizontal growth pattern and group III include 100 subjects with vertical growth pattern. Final distribution of sample is shown in Table 3.

Table 1: Average values of Jarabak ratio and SN-MP angle considered to divide the sample according to growth pattern.

Group	Jarabak ratio	SN-MP angle
Group 1 (Normo-divergent)	62-65%	$25\text{-}32^0$
Group II (Hypo-divergent)	$>65^0$	$< 25^0$
Group III (Hyper-divergent)	$< 62^0$	$>32^0$

Table 2: Shows values of Jarabak ratio and SN-MP angle obtained from the sample.

Group	N	Jarabak ratio (mean value)	SN-MP angle (mean value)
Group 1 (Normo-divergent)	100	62-65%	27- 37 degree
Group II (Hypo-divergent)	100	More than 65%	< 27 degrees
Group III (Hyper-divergent)	100	Less than 62%	> 37 degrees

Table 3: Final distribution of sample.

Group	N	Mean age
Group 1 (Normo-divergent)	100	23.0 ± 1.3
Group II (Hypo-divergent)	100	23.5 ± 2.3
Group III (Hyper-divergent)	100	23.0 ± 2.4

Frontal facial photograph of all the subjects were then taken for assessment of facial divine proportion and intergroup comparison was done.

Materials

A. Material used for taking lateral cephalogram

1. Cephalostat machine (Planmeca proline XC) in department oral medicine and radiology. (Figure.1)
2. Radiograph sheet (AGFA Drystar 2B) Film 11 x 14 inch
3. Thermal printer. (AGFA Drystar 2B)

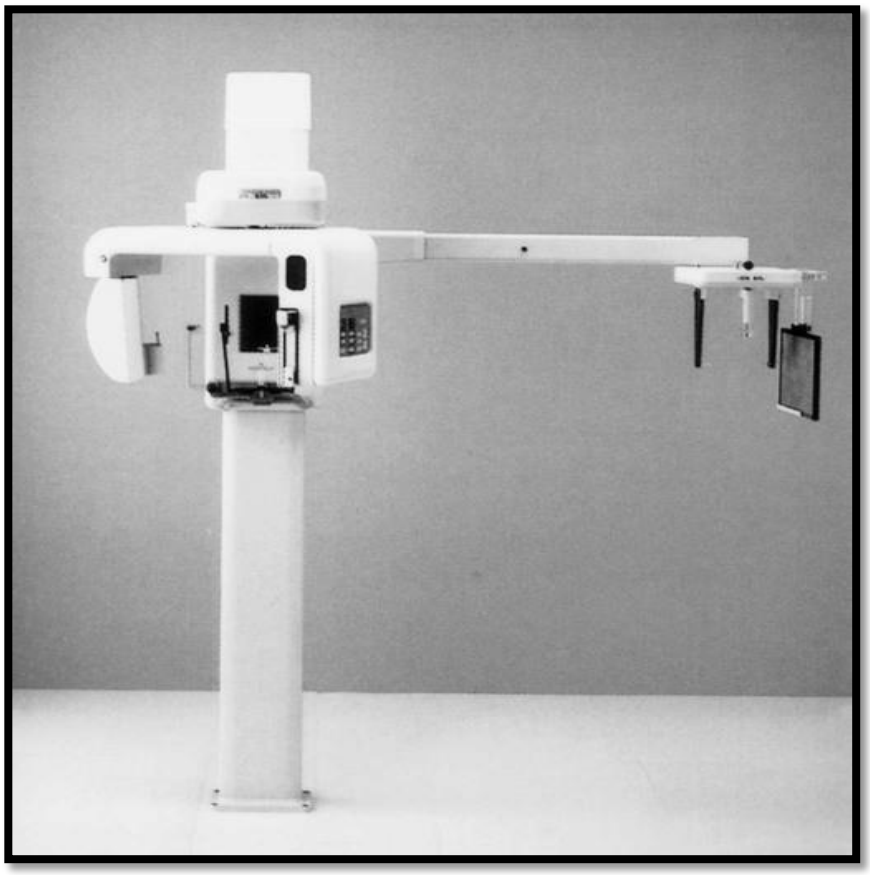


Figure1. Cephalostat machine

B. Material used for tracing the radiograph (figure. 2)

A. LED board

B. Lead acetate paper

C. Ruler

D. Pencil for tracing.

E. Tape

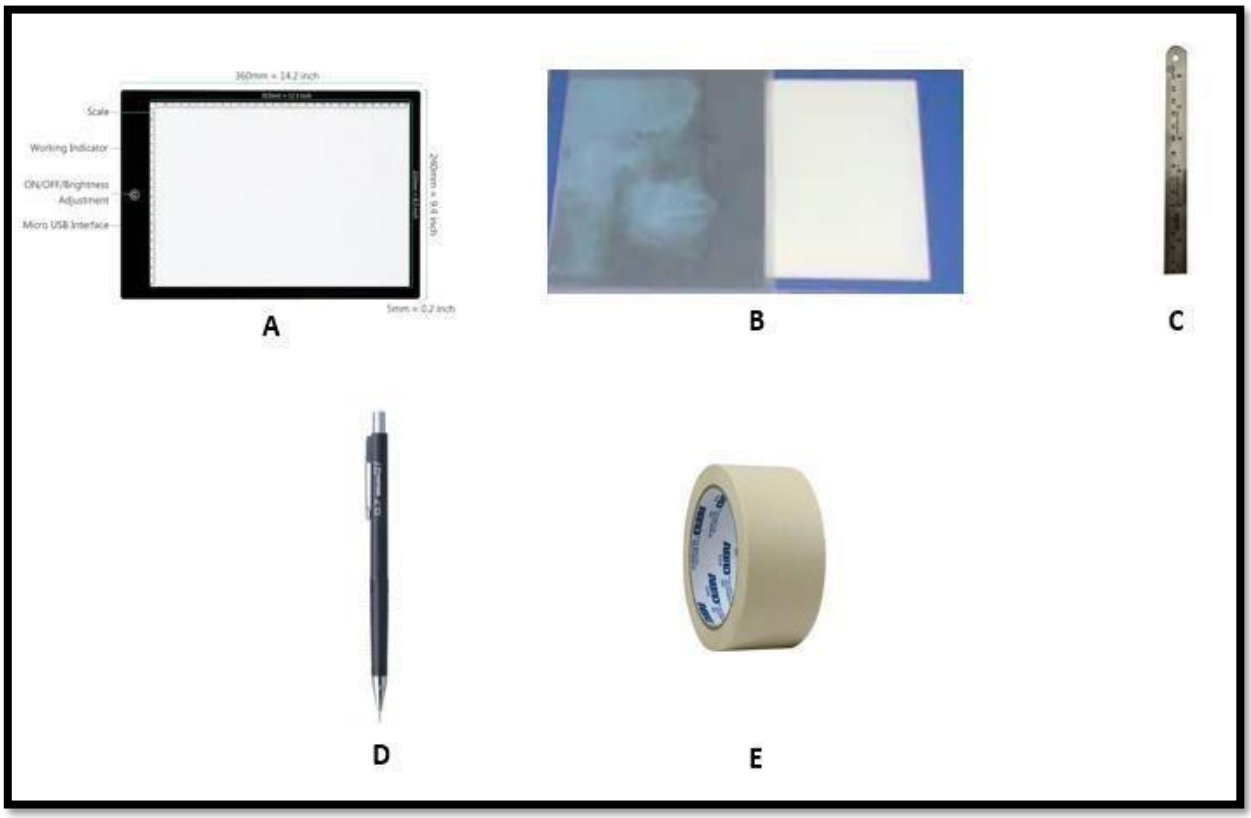


Figure 2. Shows Armaterium used for tracing the radiograph:

A) LED board **B) Leadacetate paper** **E) Tape**

C) Ruler **D) Pencil**

C . **Material used for taking Facial photograph (figure.3)**

A. Camera-Canon (LENS:18-55) 14megapixel Digital single lens reflex (DLSR)
B. Tripod stand
C. Ruler for calibration of photograph
D. White board

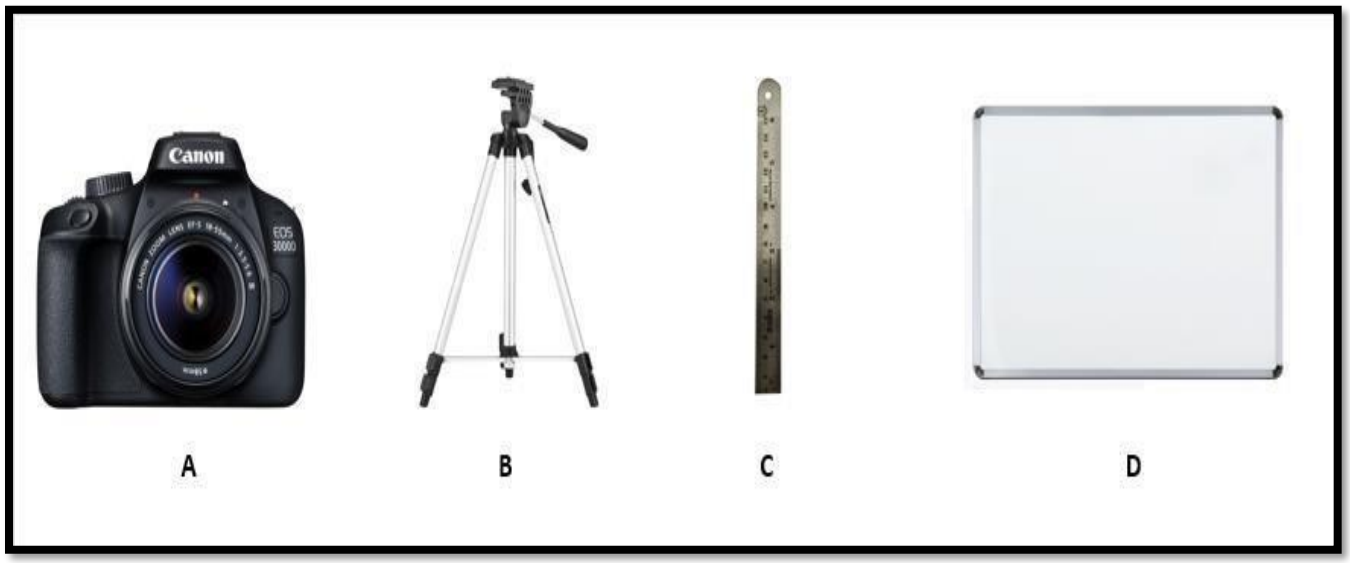


Figure 3. Shows Armaterium used for taking facial photographs and measurements
A)Camera **B) Tripod stand**
C) Ruler **D) White board**

D. Material used for assessment of facial divine proportion (Figure.4)

1. Computer system with loaded software
2. Adobe photoshop (Version 13.0.1X64) **Fig.4(A)**
3. IC Measure software version 2.0.0.286 **Fig.4(B)**

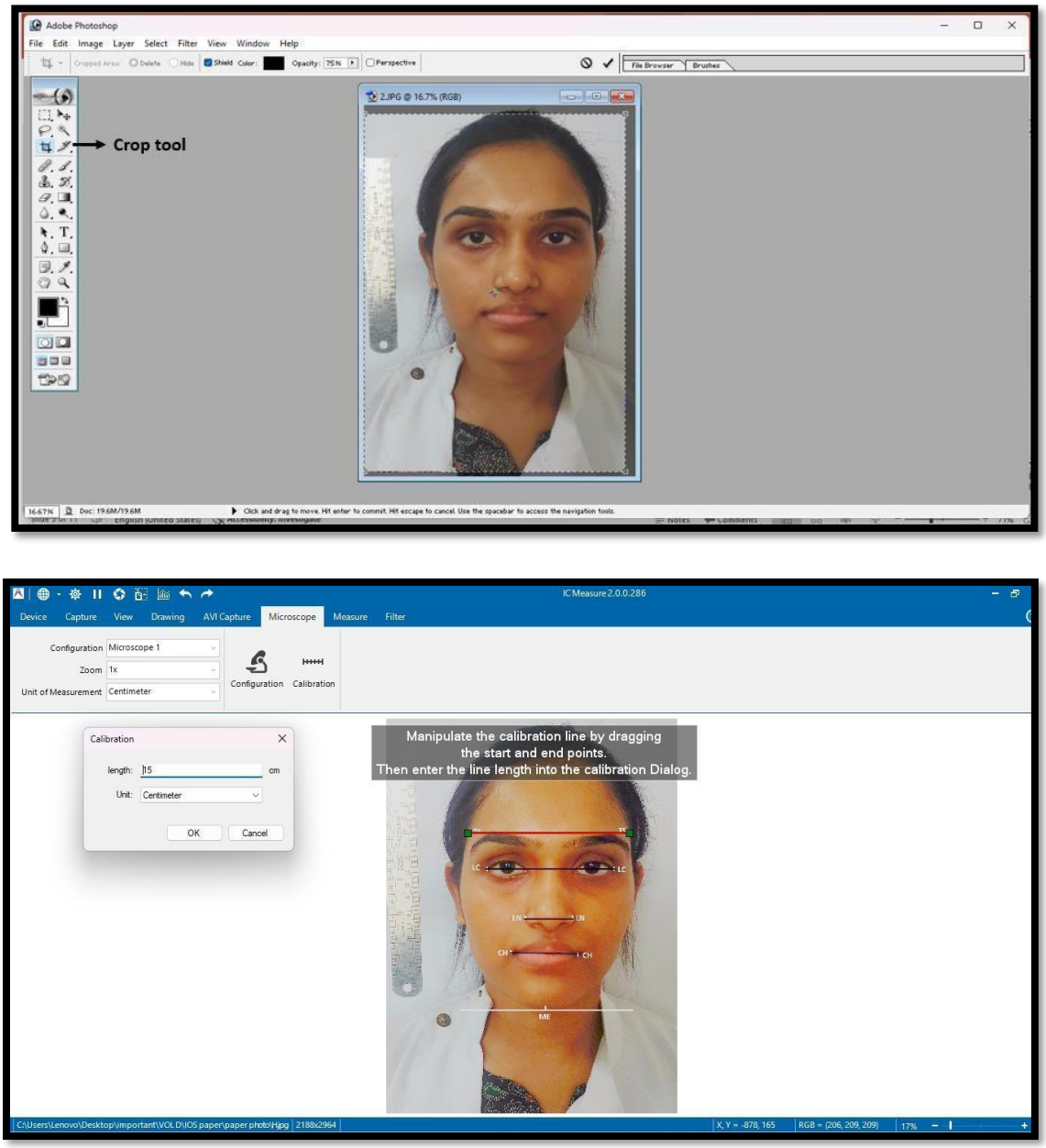


Fig.4: Shows material for assessment of facial divine proportion
(A) Adobe photoshop (B) ICMeasure software

METHOD:

1. For taking and Analyzing Lateral cephalogram

A) For Taking Lateral cephalogram

Planmeca proline XC was used to take the digital lateral cephalogram of selected subjects. The lateral cephalograms were taken in natural head position with lips relaxed and teeth in centric occlusion **(Figure-5).** Natural head position is a standardized and reproducible orientation of head that was attained by asking patients to look into mirror placed in front of them. The ear posts were used for correct alignment of the patients head for undistorted symmetrical image of the patient. Relaxed lip was achieved by giving direct instructions to the patient. The receptor- source distance was fixed at 60 inches. The exposure values were set at 68kV, 5mA at 23 second exposure time. All the cephalograms were transferred to a computer loaded with Planmeca software from where the digital lateral cephalograms were saved in bitmap files and was taken and printout is taken at 100% magnification was taken.

Fig.5: Patient position on cephalostat machine to take lateral cephalogram.

1. Lateral cephalogram radiograph was placed on LED board.
2. Tracing sheet (Lead acetate paper) was placed on radiograph and secured with tape. Orientation mark with permanent marker was made on lateral cephalogram and then transferred to lead acetate paper.
3. All hard tissue and soft tissue outline were traced using lead pencil (0.7mm) and required hard tissue landmarks were identified and reference plane were marked.

a. Hard tissue landmarks used in the study: (Figure.6)

1. **Sella (S):** Center of the contour of Sella Tursica.
2. **Nasion (N**): Most anterior point of the Nasofrontal suture in the midsagittal plane.
3. **Gnathion (Gn)**: Antero-inferior point of bony chin located by taking the midpoint between the anterior (Pogonion) and inferior (Menton) points of the bony chin.
4. **Menton (Me**): Lowest point on the bony chin.
5. **Gonion (Go):** A point on the curvature of the angle of the mandible located by bisecting the angle formed by lines tangent to the posterior ramus and the inferior border of the mandible.

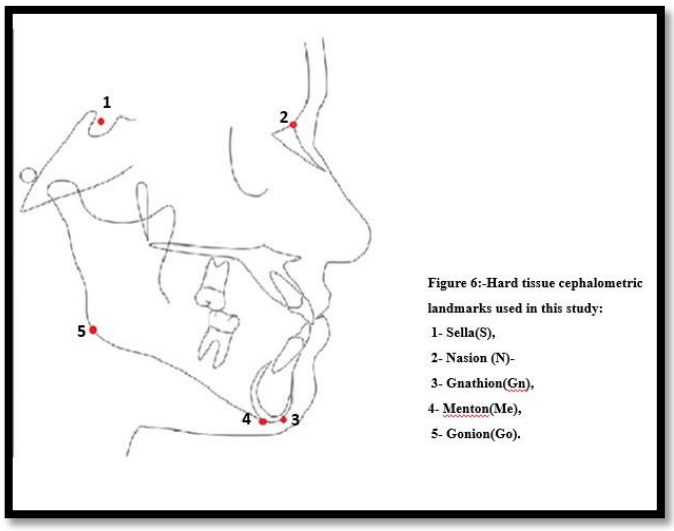
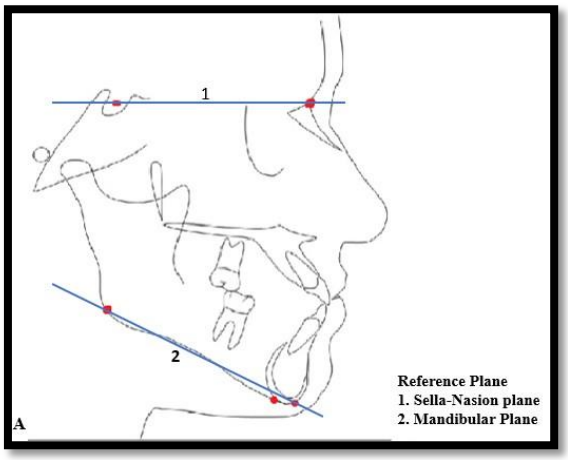


Figure.6: Hard tissue landmarks used in the study

1. Sella (S) 2.Nasion (N)
3.Gnathion (Gn) 4. Menton (Me)
5. Gonion (Go)

b. Reference plane – (Figure.7)

1. **S-N Plane**- Sella-Nasion plane (SN): The line connecting Sella to Nasion.
2. **Mandibular plane**- The line connecting Gonion to Gnathion.
3. **Anterior facial height**- The line connecting Nasion to Menton
4. **Posterior facial height**- The line connecting Sella to Gonion.



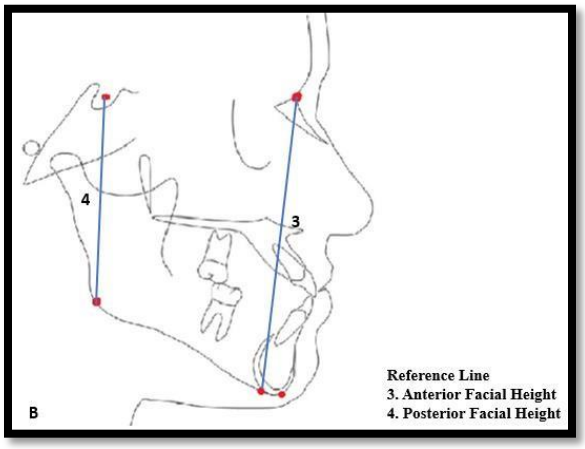


Figure 7: - Reference lines and Reference Planes used in the study:
1- Sella-Nasion plane(SN) 2- Mandibular plane (Go-Gn),
3- Anterior facial height(N-Me) 4- Posterior facial height (S-Go)

c. Parameters used in the study - (Figure. 8)

1. **Mandibular plane angle (Go-Gn to SN**)- The angle between SN Plane & Mandibular plane (Go-Gn) was measured by extending reference lines from S-N and Go-Gn posteriorly.
2. **Jarabak ratio (S-Go/N-Me) * 100** - The ratio between posterior facial height and Anterior facial heights was expressed in percentage.

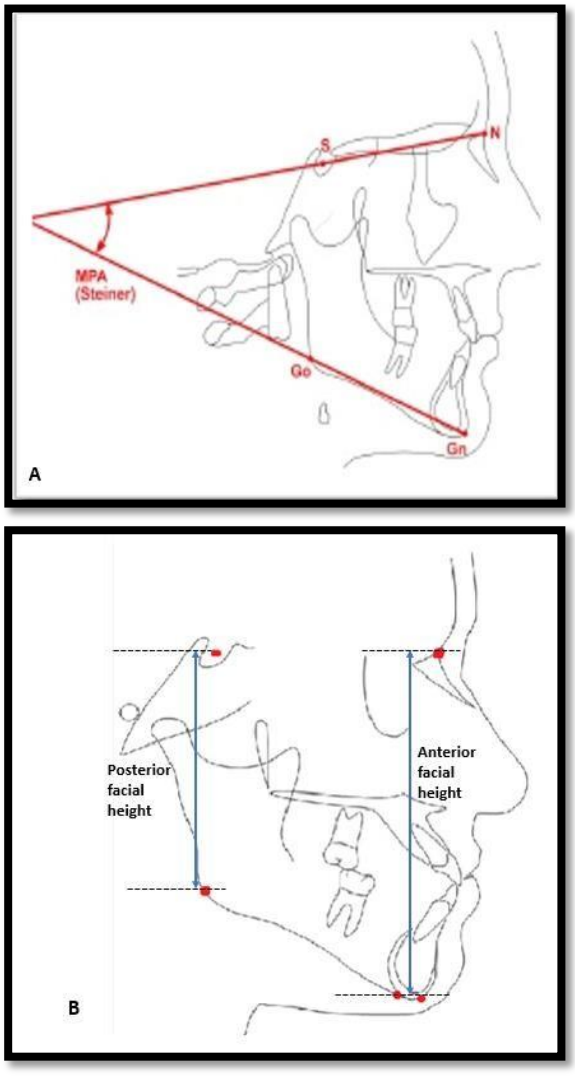


Figure 8: - Angular parameters and Ratios for assessment of growth pattern:

A. Mandibularplane angle (Go-Gn to SN),

B. Jarabak ratio

Based on the mean values of Mandibular plane angle and Jarabak ratios, sample was divided into three groups-

Group I – Normodivergent

Group II- Hypodivergent

Group III- Hyper divergent

The subjects with borderline values or contraindicatory values in two parameters were excluded. Table2 shows normal values and mean values as obtained in present study for parameter (Mandibular plane angle and Jarabak ratio) used for distribution of sample.

B) Method of taking digital Frontal facial photograph:

1. Digital frontal facial photographs were taken of all the subject with DSLR Camera.
2. The subjects were made to stand in an upright position against the white board and vertical ruler was attached to the background for calibration of the photograph(figure.9).
3. Frontal facial photographs of the subjects were taken in natural head position with maximum intercuspation and relaxed lip posture.
4. The natural head position was achieved by asking the subjects to stand still, look straight in a mirror placed in front of them.
5. DSLR camera was placed at a distance of 4 feet from the subjects faces and the camera was secured in a tripod stand at proper height, so as to have uniformity in taking photograph following a standard protocol.
6. The frontal photographs were transferred into laptop and saved as JPEG (Joint Picture editing group) Format that was identical in size and resolution.

Figure 9. Frontal facial photograph

C) Method of analyzing Photograph

1. All digital photographs (JPEG format) were imported into a commercially available photograph editing software (Adobe Photoshop, Windows 10, Adobe system) for editing.

2. The photographs were cropped vertically 5mm above the head and 25 mm below the soft tissue chin and horizontally 10 mm lateral to both ears to a size of 5 X 3.5 inch.

3. The selected and cropped frontal photographs were transferred to Paint (Microsoft Paint version 11.2304) for marking landmarks and reference planes on photographs as discussed later.

Following landmark and reference planes were identified on photograph.

A) Landmarks[1]: (Figure.10)

1. **Trichion (TR)** – Point at beginning of hair on the forehead in young people, which corresponds to the point at the junction of facial and skull fascia.
2. **Lateral canthus of eye (LC) -** A point situated on the midline of face corresponding to superior border of alar curve of the nose.
3. **Cheilion (CH)**- the point at the corner of the mouth.
4. **Lateral rim of ala of nose (LN)-** Point situated on the midline of nose corresponding to the superior border of alar curve of nose
5. **Menton (M)-** Point corresponding with soft tissue mention at the lower border of soft tissue chin.
6. **TS**- point at the lateral border of temple at the level of the eye.

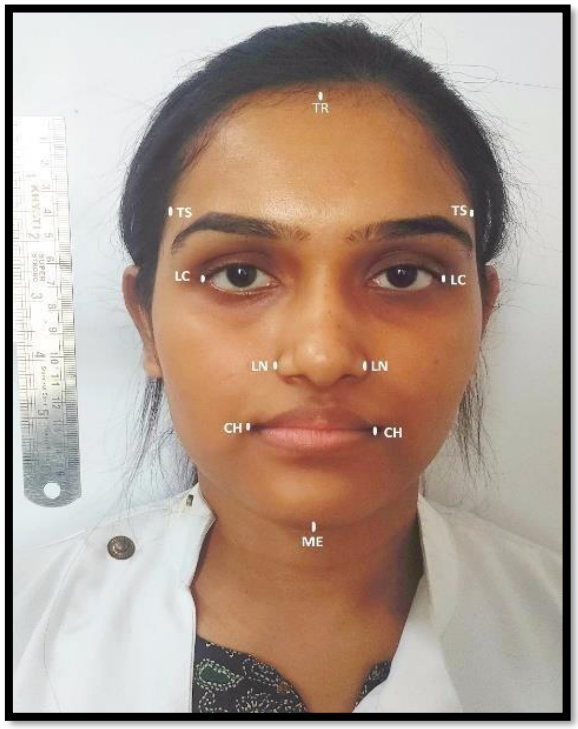


Fig 10A: Landmarks used in the study
1.Trichion 2. Lateral canthus of eye
3.Cheilion 4. Lateral rim of ala of nose
5.Menton 6. TS

B) Reference Plane (Figure 10.B)

1) IPL- inter pupillary line
2) MSP- midsagittal plane- perpendicular line extending from mid-point of IPL.
3) After identification of landmarks saved, photographs were then transferred to IC Measure software for measurement of vertical and horizontal parameters to assess facial divine proportion.
4) On IC Measure software, magnification error was eliminated by using calibration tool of photograph.
5) The image enhancement features of the software, like brightness, contrast, adjustment, magnification and other advanced tools were used to enhance the visibility of landmarks and adjustment of structures.

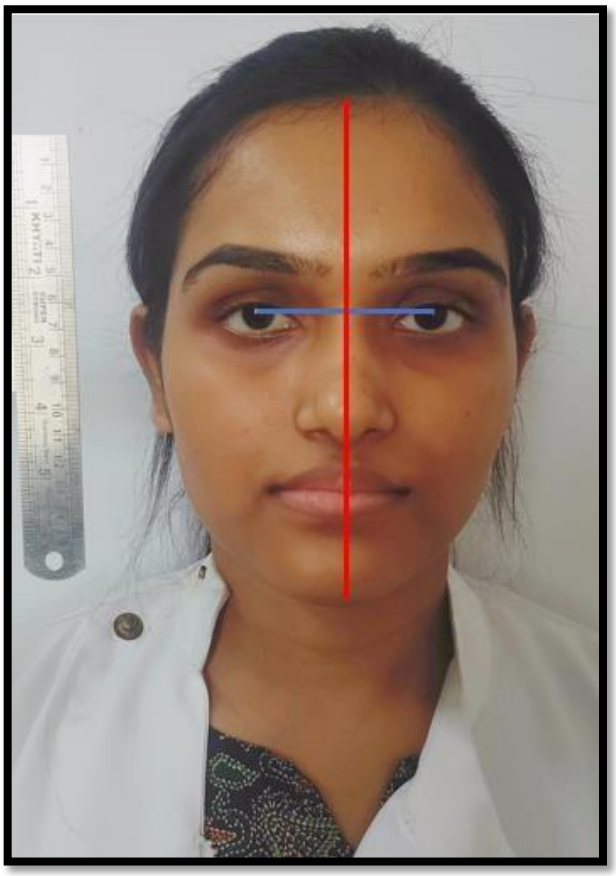


Figure 10.B: Reference Planes
1. **Inter pupuillary line**
2. **MSP- Mid Sagital Plane**

Parameters used to assess divine proportions in present study:

Nine parameters to evaluate ratios for vertical facial proportion and four parameters to evaluate ratios for horizontal facial proportion was used in the present study.

A) Parameters to evaluate Vertical Facial Proportion[3]- (Figure11):

All measurements were taken as perpendicular distance between lines drawn parallel to IPL at respective landmarks for parameter used to evaluate vertical facial proportion

1. **Total anterior facial height (TR-ME)** – The perpendicular distance between lines drawn parallel to IPL at Trichon (TR) and Menton (Me).
2. **Upper anterior facial height (TR-LC) -** The perpendicular distance between lines drawn parallel to IPL at Trichon (TR) and Lateral canthus (LC), which represented upper one-third of face.
3. **Middle anterior facial height (LC-LN)** - The perpendicular distance between lines drawn parallel to IPL at Lateral canthus (LC) and Ala of nose (LN), which represented middle one-third of face.
4. **Lower anterior facial height (LN-ME) -** The perpendicular distance between lines drawn parallel to IPL at Ala of nose (LN) and Menton (Me), which represented lower one-third of face.
5. **Upper and mid anterior facial height (TR-LN)** - The perpendicular distance between lines drawn parallel to IPL at Trichon (TR) and Ala of nose (LN).
6. **Lower and mid anterior facial height (LC-ME**) - The perpendicular distance between lines drawn parallel to IPL at Lateral canthus (LC) and Menton (ME).
7. **Upper one third of Lower anterior facial height (LN-CH) -** The perpendicular distance between lines drawn parallel to IPL at Ala of nose (LN) and Cheilion (CH).
8. **Lower two-third of Lower anterior facial height (CH-ME) -** The perpendicular distance between lines drawn parallel to IPL at Cheilion (CH) and Menton (Me).
9. **Mid anterior facial height and upper one third of Lower anterior facial height (LC-CH) -** The perpendicular lines drawn parallel to IPL at Lateral canthus (LC) and Cheilion (CH).

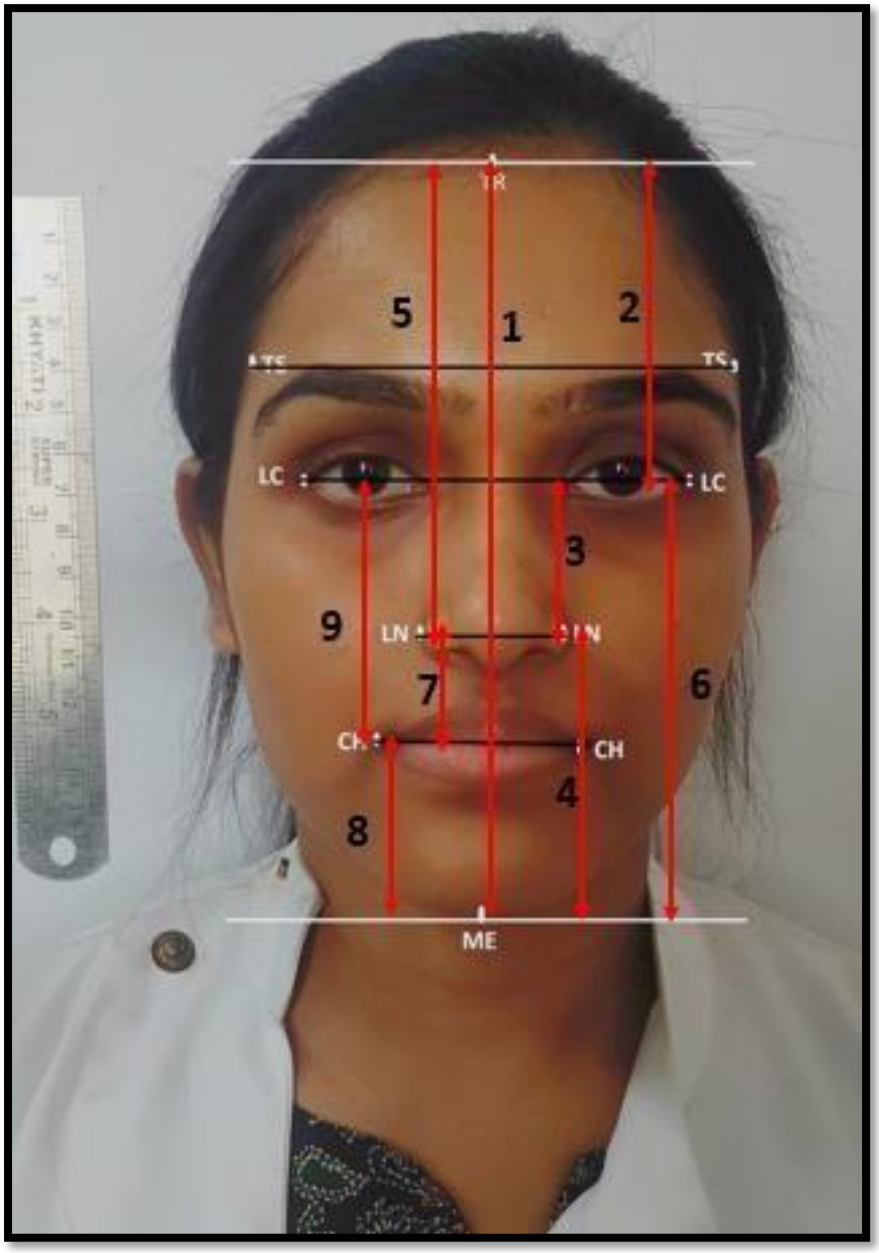


Figure 11: Shows Vertical parameters for facial proportion-
1) Total anterior facial height (TR-ME),
2) Upper anterior facial height (TR-LC),
3) Middle anterior facial height (LC-LN),
4) Lower anteriorfacial height (LN-ME),
5) Upper and mid anterior facial height (TR-LN),
6) Lower and mid anterior facial height (LC-ME),
7) Upper one third of Lower anterior facial height (LN-CH),
8) Lower two-third of Lower anterior facial height (CH-ME),
9) Mid anterior facial height and upper one third of Lower anteriorfacial height (LC-CH)

B) Parameters to evaluate Horizontal Facial Proportion[3]- (Figure.12)

All measurements were taken as perpendicular distance between lines drawn parallel to mid sagittal plane at respective landmarks for parameter used to evaluate horizontal facial proportion.

1. **Width of head (TS right- TS left**) – The perpendicular distance between lines drawn parallel to MSP at lateral border of temple of right side and left side.
2. **Lateral width of eye at the lateral canthus (LC right-LC left) –** The perpendicular distance between lines drawn parallel to MSP at lateral canthus of eye of right side and left side.
3. **Width of nose (LN right- LN left**) **–** The perpendicular distance between lines drawn parallel to MSP at ala of nose of right side and left side.
4. **Width of mouth (CH right- CH left) –** The perpendicular distance between lines drawn parallel to MSP at Cheilion of right side and left side.

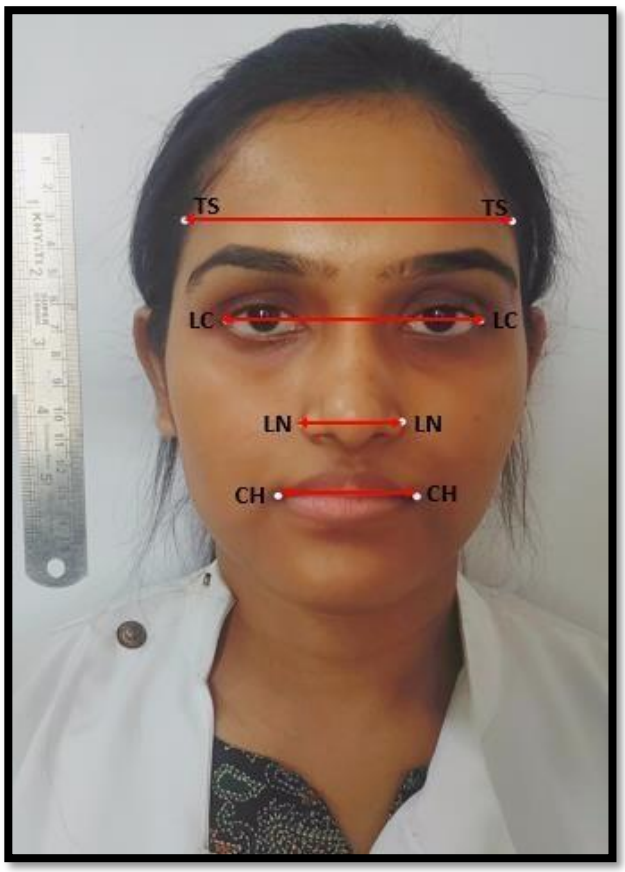


Figure 12: shows horizontal parameters for facial proportions-
1) Width of head(TS-TS), 2) Lateral width of eye at thelateral canthus (LC-LC),
3) Width of nose(LN-LN), 4) width of mouth(CH-CH)

Following parameters were used to evaluate vertical and horizontal divine proportions expressed as ratios between various parameters.

1. **Ratios to evaluate Vertical Facial Proportions are**:

- **TR-ME: LC-ME-** The ratio between Total facial height Lower (TR-ME) and Lower and mid anterior facial height (LC-ME).
- **TR-LC: LC-ME**- The ratio between Upper anterior facial height and Lower and mid anterior facial height (LC-ME).
- **LN-ME: TR-LN-** The ratio between Lower anterior facial height (LN-ME) and Upper and mid anterior facial height (TR-LN).
- **LC-LN: LN-ME-** The ratio between Middle anterior facial height(LC- LN) and Lower anterior facial height (LN-ME).
- **CH-ME: LC-CH**- The ratio between Lower two-third of facial height (CH-ME) and Mid anterior facial height and upper one third of Lower anterior facial height (LC-CH).
- **LN-CH: LC-LN**- The ratio between Upper one third of Lower anterior facial height (LN-CH) and Middle anterior facial height (LC- LN).
- **LN-CH: CH-ME**- The ratio between Upper one third of Lower anterior facial height (LN-CH) and Lower two-third of facial height (CH-ME).

2. **Ratios to evaluate Horizontal Facial Proportions are**:

- **TS (right-left): LC (r-l**) – the ratio of distance between TS of right and left side to LC of right and left side.
- **LC (r-l): CH (r-l)** - the ratio of distance between LC of right and left side to CH of right and left side.
- **CH (r-l): LN (r-l)-** the ratio of distance between CH of right and left side to LN of right and left side.

The data so obtained was tabulated and was subjected to statistical analysis.

Measurement of Reliability

Reliability of measurements was done by repeating the measurements of 10 subjects selected from the sample at 1 week interval from the first set of evaluation to the second set of evaluation by the same observer.

The comparison was done between the first and second set of measurements by student t test. Statistically no significant difference was noted between them. (Table 4).

Table 4: Reliability analysis

Sr. No.	Parameters	1st observ. (n=10)	2nd observ. (n=10)	Mean Difference	P value	Level of significance
HORIZONTAL PROPORTIONS						
1	TSTS – TSTS	10.50	10.18	0.325	0.206	NS
2	LCLC – LCLC	8.82	8.72	0.106	0.207	NS
3	LNLN – LNLN	3.70	3.64	0.061	0.168	NS
4	CHCH – CHCH	4.57	4.35	0.220	0.169	NS
VERTICAL PROPORTIONS						
1	TRMe – TRMe	16.59	15.97	0.623	0.343	NS
2	TRLC – TRLC	7.34	7.09	0.252	0.343	NS
3	TRLN – TRLN	10.50	10.75	-0.249	0.343	NS
4	LCCH – LCCH	5.92	5.90	0.025	0.343	NS
5	LCLN – LCLN	3.26	3.27	-0.012	0.343	NS
6	LNCH – LNCH	2.78	2.76	0.023	0.343	NS
7	LNMe – LNMe	6.10	6.08	0.013	0.343	NS
8	CHME – CHME	3.37	3.30	0.066	0.343	NS
9	LCMe – LCMe	9.26	9.29	-0.025	0.343	NS

Data analysis

Data was entered into Microsoft Excel spreadsheet and was checked for any discrepancies. Summarized data was presented using Tables and Graphs. The data was analysed by SPSS (21.0 version). Shapiro Wilk test was used to check which all variables were following normal distribution. Data was normally distributed therefore, inferential statistics were performed using parametric test i,e one way Anova followed by Tukeys test for post hoc pairwise comparison. Level of statistical significance was set at p-value less than 0.05

TOOLS FOR STATISTICAL ANALYSIS

Formula used for the analysis

A. The Arithmetic Mean

The most widely used measure of central tendency is arithmetic mean, usually referred to simply as the mean, calculated as

$$\bar{X} = \frac{\sum_{i=1}^{n} X_i}{n}$$

B. The Standard Deviation

The standard deviation (SD) is the positive square root of the variance, and calculated as

$$SD = \sqrt{\frac{\sum X_i^2 - \frac{(\sum X_i)^2}{n}}{n-1}}$$

where, n= no. of observations

and also denoted by subtracting minimum value from maximum value as below

C. Tests of significance

Test of significance are used to estimate the probability that the relationship observed in the data occurred purely by chance was there a relationship between the variables. They are used to test the hypothesis proposed at the start of the study.

In this study Parametric tests were used

a) **The data was normally distributed**
b) **The data was obtained from the sample which is randomly selected**
c) **The data was quantitative data**

I. ANALYSIS OF VARIANCE

Analysis of variance (ANOVA) is used when we compare more than two groups simultaneously. The purpose of one-way ANOVA is to find out whether data from several groups have a common mean. That is, to determine whether the groups are actually different in the measured characteristic. One way ANOVA is a simple special case of the linear model. For more than two independent groups, simple parametric ANOVA is used when variables under consideration follows Continuous exercise group distribution and groups variances are homogeneous otherwise non parametric alternative Kruskal-Wallis (H) ANOVA by ranks is used. The one way ANOVA form of the model is

$$Y_{ij} = \alpha_{.j} + \varepsilon_{ij}$$

where:

- Y_{ij} is a matrix of observations in which each column represents a different group.
- $\alpha_{.j}$ is a matrix whose columns are the group means (the –dot j‖ notation means that α applies to all rows of the j^{th} column i.e. the value α_{ij} is the same for all i).
- ε_{ij} is a matrix of random disturbances.

The model posits that the columns of Y are a constant plus a random disturbance. We want to know if the constants are all the same.

Assumptions are:

a) Response variable must be normally distributed (or approximately normally distributed).
b) Samples are independent.
c) •Variances of populations are equal.
d) The sample is a simple random sample (SRS).

Two-way anova is used when we have one measurement variable and two nominal variables, and each value of one nominal variable is found in combination with each value of the other nominal variable. It tests three null hypotheses: that the means of the measurement variable are equal for different values of the first nominal variable; that the means are equal for different values of the second nominal variable; and that there is no interaction (the effects of one nominal variable don't depend on the value of the other nominal variable). When we have a quantitative continuous outcome and two categorical explanatory variables, we may consider two kinds of relationship between two categorical variables, In this relationship we can distinguish effect of one factor from that of the other factor. This type of model is called a **main effect model** or **no interaction** model.

Tukey Multiple Comparison Test

After performing ANOVA, Tukey HSD (honestly significant difference) post hoc test is generally used to calculate differences between group means as

where,

$$q = \frac{\bar{X}_1 - \bar{X}_2}{SE}$$

$$SE = \sqrt{\frac{S^2}{2}\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}$$

S^2 is the error mean square from the analysis of variance and n_1 and n_2 are number of data in group 1 and 2 respectively.

Statistical significance

Level of significance "p" is level of significance signifies as below:

$p > 0.05$	Not significant (ns)
$p < 0.05$	significant (*)

The present study was conducted in the Department of Orthodontics BBDCODS, with an aim to compare the facial divine proportions in subjects with variable facial pattern. The sample was selected from the patients coming to the Department of Orthodontics & Dentofacial Orthopaedics for fixed orthodontic treatment and divided in three groups on the basis of cephalometric parameters- Group I included 100 subjects with average growth pattern, Group II included 100 subjects with horizontal growth pattern and Group III included 100 subjects with vertical growth pattern. After assessment of growth pattern, frontal facial photographs of all subjects at rest was taken to assess and compare the facial divine proportion among different groups. The results of the study are tabulated as follows:

- Table 5: Descriptive statistics of various horizontal and vertical parameters for evaluation of facial proportion in Groups.
- Table 6A: Mean values of various horizontal and vertical parameters of Group I, Group II and Group III.
- Table 6B: Comparative statistics of various horizontal and vertical parameters used to asses facial proportion among different groups using ANNOVA.
- Table 7: Intergroup comparison of mean difference of horizontal and vertical parameters using post-hoc.
- Table 8: Descriptive statistics of various horizontal and vertical proportion for evaluation of facial proportion in Groups.
- Table 9A: Mean values of horizontal and vertical proportions of Group I, Group II and Group III.
- Table 9B: Comparative statistics of horizontal and vertical proportions used to assess divine proportion among different groups using ANOVA test.
- Table 10**:** Intergroup comparison of mean difference of horizontal and vertical proportions post-hoc.
- Table 11: Comparison of various facial proportions between three groups.

Table 5: Descriptive statistics of various horizontal and vertical parameters for evaluation of facial proportion in different groups.

PARAMETER	Mean ± SD	Std. error	95% confidence interval for mean		Minimum (in cm)	Maximum (in cm)
			Lower bound	Upper bound		
GROUP I						
HORIZONTAL PARAMETERS (in cm)						
TS-TS	10.91 ± 1.464	0.147	10.62	11.20	5	15
LC-LC	8.647±0.948	0.09537	8.4555	8.8340	7.20	11.41
LN-LN	3.746±0.560	0.05635	3.6344	3.8581	2.70	5.77
CH-CH	4.654±0.547	0.05506	4.5457	4.7642	3.42	6.37
VERTICAL PARAMETERS (in cm)						
TR-ME	16.52±2.03	1.404	14.937	20.510	10.06	15.4
TR-LC	7.897±1.884	0.189	7.521	8.273	5.76	13.5
TR-LN	9.32±1.486	0.149	9.03	9.62	6	13
LC-CH	6.081±0.924	0.092	5.897	6.265	4.61	9.68
LC-LN	4.24±2.90	0.351	4.293	5.686	2.40	5.29
LN-CH	3.072±0.727	0.73	2.927	3.217	2.19	5.6
LN-ME	6.163±0.748	0.075	6.014	6.312	4.69	8.56
CH-ME	3.286±0.429	0.0431	3.201	3.372	2.46	4.38
LC-ME	10.48±2.55	0.255	7.106	8.119	8.5	11.48
GROUP II						
HORIZONTAL PARAMETERS (in cm)						
TS-TS	11.61 ±1.498	0.150	11.31	11.91	10	16
LC-LC	9.016±1.21	0.121	8.775	9.256	6.95	13.22
LN-LN	3.838±0.500	0.050	3.738	3.937	3.03	5.72
CH-CH	4.726±0.728	0.072	4.581	4.870	3.63	7.06
VERTICAL PARAMETERS (in cm)						
TR-ME	16.312±1.917	0.191	15.931	16.692	11.84	22.72
TR-LC	7.127±0.977	0.097	6.933	7.321	4.97	10.06
TR-LN	9.32 ±1.395	0.140	9.92	10.47	7	15
LC-CH	5.761±0.673	0.067	5.628	5.895	4.43	7.74
LC-LN	3.123±0.460	0.046	3.032	3.215	2.08	4.71
LN-CH	2.688±0.330	0.033	2.622	2.753	2.01	3.76
LN-ME	6.110±0.692	0.069	6.014	6.312	4.50	7.59
CH-ME	3.083±1.051	0.046	3.394	3.577	2.52	4.58
LC-ME	9.168±1.029	0.102	8.964	9.373	6.83	12.01
GROUP III						
HORIZONTAL PARAMETERS (in cm)						
TS-TS	11.48±1.302	0.132	11.21	11.74	8	15
LC-LC	8.39 ±0.86	0.112	8.920	9.367	6.75	12.25
LN-LN	3.739±.437	0.044	3.651	3.827	4.93	3.739
CH-CH	4.720±.512	0.051	4.617	4.824	5.99	4.72
VERTICAL PARAMETERS (in cm)						
TR-ME	17.321±1.821	0.184	16.954	17.688	12.96	25.26
TR-LC	7.872±1.429	0.145	7.584	8.160	5.410	14.60
TR-LN	10.40±1.383	0.141	10.12	10.68	6	13
LC-CH	6.200±.772	0.078	6.044	6.355	3.41	10.08
LC-LN	4.890±3.75	0.277	3.599	4.702	2.47	15.29
LN-CH	3.127±1.434	0.145	2.838	3.416	2.17	16
LN-ME	6.450±0.730	0.074	6.312	6.607	4.97	8.56
CH-ME	3.506±0.511	0.051	3.403	3.609	2.54	6.16
LC-ME	11.48±2.4	0.193	8.646	9.415	2.91	12.62

Table 5: shows the descriptive statistics of various horizontal and vertical parameters for evaluation of facial proportion of Group I, Group II, Group III.

Table 5: shows Descriptive statistics of various horizontal and vertical parameters for evaluation of facial proportion in different groups.

GROUP I:

For **Horizontal parameters** in Group I, mean value of **Width of Head (TS-TS)** was 10.91 ± 1.464cm, **Lateral width of eye at the lateral canthus (LC-LC)** was to 8.647±0.948cm, **Width of Nose (LN-LN)** was 3.746±0.560cm, and **Width of Mouth (CH-CH)** was 4.654±0.547cm.

For **Vertical parameters** in Group I, mean value of **Total anterior facial height (TR-ME**) was 16.52±2.03cm, **Upper anterior facial height (TR-LC)** was 7.897±1.884cm, **Upper and mid anterior facial height (TR-LN)** was 9.32±1.486cm , **Mid anterior facial height and upper one third of Lower anterior facial height (LC-CH)** was 6.081±0.924cm, **Middle anterior facial height (LC-LN)** was 4.24±2.90cm, **Upper one third of Lower anterior facial height (LN-CH)** was 3.072±0.727cm , **Lower anterior facial height (LN-ME)** was 6.163±0.748cm, **Lower two-third of Lower anterior facial height (CH-ME)** was 3.286±0.429cm, and **Lower and mid anterior facial height (LC-ME)** was 10.48±2.55cm.

GROUP II:

For **Horizontal parameters** in Group II, mean value of **Width of Head (TS-TS)** was 11.61 ±1.498cm, **Lateral width of eye at the lateral canthus (LC-LC)** was to 9.016±1.21cm, **Width of Nose (LN-LN)** was 3.838±0.50cm, and **Width of Mouth (CH-CH)** was 4.726±0.728cm.

For **Vertical parameters** in Group II, mean value of **Total anterior facial height (TR-ME)** was 16.312±1.917cm, **Upper anterior facial height (TR-LC)** was 7.127±0.977cm, **Upper and mid anterior facial height (TR-LN)** was 9.32 ±1.395cm, **Mid anterior facial height and upper one third of Lower anterior facial height (LC-CH)** was 5.761±0.673cm, **Middle anterior facial height (LC-LN)** was 3.123±0.460cm, **Upper one third of Lower anterior facial height (LN-CH)** was 2.688±0.330cm, **Lower anterior facial height (LN-ME)** was 6.110±0.692cm, **Lower two-third of Lower anterior facial height (CH-ME)** was 3.083±1.051cm, and **Lower and mid anterior facial height (LC-ME)** was 9.168±1.029cm.

GROUP III:

For **Horizontal parameters** in Group III, mean value of **Width of Head (TS-TS)** was 11.48±1.302cm, **Lateral width of eye at the lateral canthus (LC-LC)** was to 8.39 ±0.86cm, **Width of Nose (LN-LN)** was 3.739±0.437cm, and **Width of Mouth (CH-CH)** was 4.720±0.512cm.

For **Vertical parameters** in Group III, mean value of **Total anterior facial height (TR-ME)** was 17.321±1.821cm, **Upper anterior facial height (TR-LC)** was 7.872±1.429cm, **Upper and mid anterior facial height (TR-LN)** was 10.40±1.383cm , **Mid anterior facial height and upper one third of Lower anterior facial height (LC-CH)** was 6.200±0.772cm, **Middle anterior facial height (LC-LN)** was 4.89±3.75cm, **Upper one third of Lower anterior facial height (LN-CH)** was 3.127±1.434cm, **Lower anterior facial height (LN-ME)** was 6.450±0.730cm, **Lower two- third of Lower anterior facial height (CH-ME)** was 3.506±0.511cm, and **Lower and mid anterior facial height (LC-ME)** was 11.48±2.4cm.

TABLE.6A: Mean values of horizontal and vertical parameters of Group I, Group II and Group III.

Parameters	**Group I (N=100)**	**Group II (N=100)**	**Group III (N=100)**
	Mean± SD	**Mean± SD**	**Mean± SD**
HORIZONTAL PARAMETERS (in cm)			
TS-TS	10.91±1.464	11.61±1.498	11.48±1.302
LC-LC	8.647±0.948	9.016±1.21	8.39 ± 0.86
LN-LN	3.746±0.560	3.838±0.500	3.739±0.437
CH-CH	4.654±0.547	4.726±0.728	4.720±0.512
VERTICAL PARAMETERS (in cm)			
TR-ME	16.52±2.03	16.312±1.917	17.321±1.821
TR-LC	7.89±1.884	7.127±0.977	7.872±1.429
TR-LN	9.32±1.486	9.32 ±1.395	10.40±1.383
LC-CH	6.081±0.924	5.761±0.673	6.200±0.772
LC-LN	4.24 ± 2.90	3.123±0.460	4.890± 3.75
LN-CH	3.072±0.727	2.688±0.330	3.127±1.434
LN-ME	6.163±0.748	6.110±0.692	6.450±0.730
CH-ME	3.286±0.429	3.083±1.051	3.506±0.511
LC-ME	10.48±2.55	9.168±1.029	11.48± 2.4

TABLE. 6B: Comparative statistics of horizontal and vertical parameters used to assess divine proportion among different groups using ANOVA test.

PARAMETERS		Sum of squares	df	Mean square	F	P value
HORIZONTAL PARAMETERS						
TS-TS	Between groups	27.319	2	13.659	6.726	0.001***
	Within groups	595.031	293	2.031		
	total	622.350	295			
LC-LC	Between groups	13.246	2	6.623	5.521	0.001***
	Within groups	351.456	293	1.200		
	total	364.702	295			
LN-LN	Between groups	0.601	2	0.301	1.190	0.306(NS)
	Within groups	73.965	293	0.252		
	total	74.566	295			
CH-CH	Between groups	0.311	2	0.156	0.426	0.653(NS)
	Within groups	107.076	293	0.365		
	total	107.388	295			
VERTICAL PARAMETERS						
TR-ME	Between groups	105.322	2	52.661	0.779	0.001***
	Within groups	19811.606	293	67.616		
	total	19916.927	295			
TR-LC	Between groups	38.074	2	19.037	8.730	0.001***
	Within groups	638.907	293	2.181		
	total	676.981	295			
TR-LN	Between groups	63.771	2	31.886	15.762	0.001***
	Within groups	590.687	292	2.023		
	total	654.458	294			
LC-CH	Between groups	10.179	2	5.090	8.021	0.001***
	Within groups	185.912	293	0.635		
	total	196.091	295			
LC-LN	Between groups	173.880	2	86.940	13.161	0.001***
	Within groups	1935.571	293	6.606		
	total	2109.451	295			
LN-CH	Between groups	11.369	2	5.685	6.400	0.002**
	Within groups	260.266	293	0.888		
	total	271.635	295			
LN-ME	Between groups	6.962	2	3.481	6.639	0.002**
	Within groups	153.640	293	0.524		
	total	160.602	295			
CH-ME	Between groups	2.912	2	1.456	6.634	0.001**
	Within groups	64.300	293	0.219		
	total	67.212	295			
LC-ME	Between groups	146.856	2	73.428	19.800	0.001***
	Within groups	1086.580	293	3.708		
	total	1233.437	295			

$p<0.5$ non-significant; $p<0.05$ just significant; $p<0.01$ significant; $p<0.001$ highly significant.

Table 6A and Table 6B shows mean values and comparative statistics of horizontal and vertical parameters used to assess divine proportion among different groups using ANNOVA

All horizontal and vertical parameters used to assess divine proportion for three groups showed statistically significant difference between groups except Width of Nose (LN-LN), Width of Mouth (CH-CH).

Horizontal parameters:

For **Width of head (TS-TS)** highest mean value of 11.61 ±1.498cm was in Group II, followed bymean value of 11.48±1.302cm in Group III and then mean value of 10.91 ± 1.464cm in Group I (Group II > Group III > Group I) and difference between them was statistically highly significant (p=0.001). For **Lateral width of eye at the lateral canthus (LC-LC)** highest mean value of 9.016
±1.121cm was in Group II, followed by mean value of 8.647±0.948cm in Group I and then mean value of 8.39±0.86cm in Group III (Group II > Group I > Group III) and difference between them was statistically highly significant (p=0.001). For **Width of Nose (LN-LN)** highest mean value of 3.838±0.50cm was in Group II, followed by mean value of 3.746±0.560cm in Group I and then mean value of 3.739 ± 0.437cm in Group III (Group II > Group I > Group III) and difference between them was statistically non- significant (p=0.306) on. For **Width of Mouth (CH-CH)** highest mean value of 4.726±0.728cm was in Group II, followed by mean value of 4.720±0.512cm Group III and then mean value of 4.654±0.547cm in Group I (Group II > Group III > Group I) and difference between them was statistically non-significant (p=0.653).

Vertical parameters:

For **Total anterior facial height (TR-ME)** highest mean value of 17.321±1.821cm was in Group III, followed by mean value of 16.52±2.03cm in Group I and then mean value of 16.312± 1.917cm in Group II (Group III > Group I > Group II) and difference between them was statistically highly significant (p=0.001). For **Upper anterior facial height (TR-LC)** highest mean value of 7.897±1.884 cm was in Group I, followed by mean value of 7.872±1.429cm in Group III and then mean value of 7.127± 0.977cm in Group II (Group I > Group III > Group II) and difference between them was statistically highly significant (p=0.001).

For **Upper and mid anterior facial height (TR-LN)** highest mean value of 10.40±1.383cm was in Group III, followed by mean value of 9.32±1.486cm in Group I and then mean value of 9.32 ±1.395cm in Group II (Group III > Group I > Group II) and difference between them was statistically highly significant (p=0.001). For **Mid anterior facial height and upper one third of Lower anterior facial height (LC-CH**) highest mean value of 6.200±0.772cm was in Group III, followed by mean value of 6.081±0.924cm in Group I and then mean value of 5.761 ±0.673cm in Group II (Group III > Group I > Group II) and difference between them was statistically highly significant (p=0.001). For **Middle anterior facial height (LC-LN)** highest mean value of 4.89±3.75cm was in Group III, followed by mean value of 4.24±2.90 cm in Group I and then mean value of 3.123 ±0.460cm in Group II (Group III > Group I > Group II) and difference between them was statistically highly significant (p=0.001).

For **Upper one third of Lower anterior facial height (LN-CH)** highest mean value of 3.127±1.434cm was in Group III, followed by mean value of 3.072±0.727 cm in Group I and then mean value of 2.688±0.330 cm in Group II (Group III > Group I > Group II) and difference between them was statistically significant (p=0.002). For **Lower anterior facial height (LN-ME)** highest mean value of 6.450±0.730cm was in Group III, followed by mean value of 6.163±0.748 cm in Group I and then mean value of 6.110±0.692 cm in Group II (Group III > Group I > Group II) and difference between them was statistically significant (p=0.002). For **Lower two-third of Lower anterior facial height (CH-ME)** highest mean value of 3.506±0.511cm was in Group III, followed by mean value of 3.286±0.429 cm in Group I and then mean value of 3.083±1.051 cm in Group II (Group III > Group I > Group II) and difference between them was statistically highely significant (p=0.001).

For **Lower and mid anterior facial height (LC-ME)** highest mean value of 11.48±2.4cm was in Group III, followed by mean value of 10.48±2.55cm in Group I and then mean value of 9.168±1.029cm in Group I (Group III > Group I > Group II) and difference between them was statistically highly significant (p=0.001).

Table 7: Inter group comparison of mean difference of horizontal and vertical parameters using post-hoc.

PARAMETERS	GROUPS	MEAN DIFFERENCE	Std. ERROR	P Value
HORIZONTAL PARAMETERS				
TS-TS	I vs II	-0.700	0.202	0.002**
	I vs III	-0.565	0.204	0.016*
	II vs III	0.135	0.203	0.785(NS)
LC-LC	I vs II	-0.371	0.144	0.029*
	I vs III	0.245	0.146	0.214(NS)
	II vs III	0.616	0.145	0.001***
LN-LN	I vs II	-0.091	0.072	0.403(NS)
	I vs III	0.006	0.071	0.995(NS)
	II vs III	0.098	0.071	0.355(NS)
CH-CH	I vs II	-0.071	0.085	0.685(NS)
	I vs III	-0.065	0.086	0.725(NS)
	II vs III	0.005	0.086	0.998(NS)
VERTICAL PARAMETERS				
TR-ME	I vs II	0.210	0.273	0.772(NS)
	I vs III	-0.798	0.275	0.011**
	II vs III	-1.009	0.274	0.001***
TR-LC	I vs II	0.770	0.209	0.001***
	I vs III	0.024	0.210	0.993(NS)
	II vs III	-0.745	0.210	0.001***
TR-LN	I vs II	-0.869	0.202	0.001***
	I vs III	-1.073	0.204	0.001***
	II vs III	-0.203	0.203	0.577(NS)
LC-CH	I vs II	0.319	0.112	0.014**
	I vs III	-0.118	0.113	0.550(NS)
	II vs III	-0.438	0.113	0.001***
LC-LN	I vs II	1.12	0.388	0.012**
	I vs III	-0.64	0.391	0.226(NS)
	II vs III	-1.76	0.390	0.001***
LN-CH	I vs II	0.384	0.133	0.012**
	I vs III	-0.055	0.134	0.911(NS)
	II vs III	-0.439	0.134	0.003**
LN-ME	I vs II	0.053	0.102	0.862(NS)
	I vs III	-0.296	0.103	0.012**
	II vs III	-0.349	0.103	0.002**
CH-ME	I vs II	0.202	0.102	0.118(NS)
	I vs III	-0.219	0.103	0.085 (NS)
	II vs III	-0.422	0.102	0.001***
LC-ME	I vs II	1.314	0.301	0.001***
	I vs III	-1.000	0.304	0.003**
	II vs III	-2.315	0.303	0.001***

p<0.5 Non-significant; p<0.05 just significant* ; p<0.01 significant**; p<0.001 highly significant***.

Table 7: shows intergroup comparison of mean difference of horizontal and vertical parameters using post-hoc.

HORIZONTAL PARAMETERS:

Intergroup comparison of horizontal parameters showed that for **Width of Head (TS-TS**) there was statistically significant difference between Group I vs Group II (p=0.002) and there was statistically just significant difference between Group I and Group III (p=0.016), however there was non-significant difference between Group II vs Group III (p=0.785).

For **Lateral width of eye at the lateral canthus (LC-LC)** there was statistically just significant difference between Group I vs Group II (p=0.029), and statistically highly significant difference between Group II vs Group III (p=0.001) however there was non-significant difference between Group I vs Group III (p=0.214).

For **Width of Nose (LN-LN)** there was non-significant difference between Group I vs Group II (p=0.403), Group I vs Group III (p=0.995) and Group II vs Group III (p=0.355).

For **Width of Mouth (CH-CH)** there was non-significant difference between Group I vs Group II (p=0.685), Group I vs Group III (p=0.725) and Group II vs Group III (p=0.998).

VERTICAL PARAMETERS:

Intergroup comparison of vertical parameters showed that for **Total anterior facial height (TR-ME)** there was non-significant difference between Group I vs Group II (p=0.722), statistically significant difference between Group I vs Group III (p=0.011) and statistically highly significant difference between Group II vs Group III (p=0.001). For **Upper anterior facial height (TR-LC)** there was statistically highly significant difference between Group I vs Group II (p=0.001) and Group II vs Group III (p=0.001), however there was non-significant difference between Group I vs Group III (p=0.993). For **Upper and mid anterior facial height (TR-LN)** there was statistically highly significant difference between Group I vs Group II (p=0.001) and Group I vs Group III (p=0.001), however there was non-significant difference between Group II vs Group III (p=0.577). For **Mid anterior facial height and upper one third of Lower anterior facial height (LC-CH)** there was statistically highly significant difference between Group II vs Group III (p=0.001) and statistically significant difference between Group I vs Group II (p=0.014), however there was non-significant difference between Group I vs Group III (p= 0.550).

For **Middle anterior facial height (LC-LN)** there was statistically significant difference between Group I vs Group II (p=0.012) and statistically highly significant difference between Group II vs Group III (p=0.001), however there was non-significant difference between Group I vs Group III (p= 0.226). For **Upper one third of Lower anterior facial height (LN-CH)** there was statistically significant difference between Group I vs Group II (p=0.012) and Group II vs Group III (p=0.003). however, there was non-significant difference between Group I vs Group III (p= 0.091).For **Lower anterior facial height (LN-ME)** there was statistically significant difference between Group II vs Group III (p=0.002) and Group I vs Group III (p=0.012), however there was non-significant difference between Group I vs Group II (p= 0.862).For **Lower two-third of Lower anterior facial height (CH-ME)** there was statistically highly significant difference between Group II vs Group III (p= 0.001) however there was non-significant difference between Group I vs Group II (p=0.118) and Group I vs Group III (p=0.085). For **Lower and mid anterior facial height (LC-ME)** there was statistically highly significant difference between Group I vs Group II (p=0.001) and Group II vs Group III (p= 0.001). however, there was statistically significant difference between Group I vs Group III (p=0.003).

Table 8: Descriptive statistics of various horizontal and vertical proportions for evaluation of facial proportion in different groups.

PROPORTIONS	Mean ± SD	Std. error	95% confidence interval for mean		Minimum (in cm)	Maximum (in cm)
			Lower bound	Upper bound		
GROUP I						
HORIZONTAL PROPORTION (in cm)						
TS-TS:LC-LC	1.2621± 0.104	0.010	1.241	1.282	0.70	1.48
LC-LC:CH-CH	1.864±0.149	0.014	1.834	1.894	1.52	2.28
CH-CH:LN-LN	1.254±0.135	0.011	1.246	1.290	0.97	1.58
VERTICAL PROPORTIONS (in cm)						
TR-ME:LC-ME	1.676±0.56	0.218	2.332	3.199	1.27	18.64
LC-ME:TR-LC	1.36±0.33	0.044	0.968	1.142	0.25	1.60
TR-LN:LN-ME	1.527±0.267	0.026	1.474	1.581	0.88	2.19
LN-ME:LC-LN	1.662±0.654	0.065	1.532	1.793	0.52	2.63
LC-CH:CH-ME	1.869±0.305	0.030	1.809	1.930	1.29	2.68
LC-LN:LN-CH	1.31±0.781	0.078	1.368	1.680	0.81	3.61
CH-ME:LN-CH	1.112±0.228	0.022	1.066	1.157	0.56	1.62
GROUP II						
HORIZONTAL PROPORTIONS (in cm)						
TS-TS:LC-LC	1.290±0.071	0.007	1.276	1.304	1.14	1.50
LC-LC:CH-CH	1.918±0.144	0.014	1.889	1.947	1.55	2.34
CH-CH:LN-LN	1.232 ±0.108	0.010	1.210	1.253	1.01	1.51
VERTICAL PROPORTIONS (in cm)						
TR-ME:LC-ME	1.782±0.127	0.012	1.757	1.807	1.26	2.64
LC-ME:TR-LC	1.298±0.144	0.014	1.269	1.326	0.90	1.81
TR-LN:LN-ME	1.605±0.199	0.019	1.635	1.714	1.27	2.29
LN-ME:LC-LN	1.80±0.254	0.025	1.929	2.030	1.36	2.65
LC-CH:CH-ME	1.667±0.199	0.019	1.628	1.707	1.23	2.35
LC-LN:LN-CH	1.172±0.183	0.018	1.136	1.209	0.73	1.63
CH-ME:LN-CH	1.15±0.163	0.016	1.273	1.338	0.88	1.76
GROUP III						
HORIZONTAL PROPORTIONS (in cm)						
TS-TS:LC-LC	1.259±0.089	0.009	1.241	1.277	0.85	1.49
LC-LC:CH-CH	1.79±0.22	0.019	1.904	1.983	1.50	2.58
CH-CH:LN-LN	1.268±0.111	0.011	1.246	1.290	0.97	1.58
VERTICAL PROPORTIONS (in cm)						
TR-ME:LC-ME	2.099±0.964	0.097	1.904	2.293	1.53	5.46
LC-ME:TR-LC	1.47±0.33	0.030	1.129	1.252	0.32	1.60
TR-LN:LN-ME	1.624±0.243	0.024	1.574	1.673	0.98	2.07
LN-ME:LC-LN	1.822±0.462	0.046	1.729	1.915	0.51	2.76
LC-CH:CH-ME	1.796±0.293	0.029	1.736	1.855	0.88	2.72
LC-LN:LN-CH	1.57±0.601	0.061	1.207	1.450	0.21	3.61
CH-ME:LN-CH	1.190±0.247	0.025	1.140	1.240	0.18	2.18

Table.8: shows descriptive statistics of various horizontal and vertical proportions for evaluation of facial proportion in different groups.

Table 8 shows descriptive statistics of various horizontal and vertical proportions for evaluation of facial proportion in different groups.

GROUP I:

For **Horizontal proportions in Group I**, mean value of Width of Head: Lateral width of eye at the lateral canthus **(TS-TS:LC-LC)** was 1.2621± 0.104cm, Lateral width of eye at the lateral canthus: Width of Mouth (**LC-LC:CH-CH**) was to1.864±0.149cm, Width of Mouth: Width of Nose **(CH-CH:LN-LN)** was 1.254±0.135cm.

For **Vertical proportions in Group I**, mean value of Total anterior facial height: Lower and mid anterior facial height **(TR-ME:LC-ME)** was 1.676±0.56 cm, Lower and mid anterior facial height :Upper anterior facial height **(LC-ME:TR-LC)** was 1.36±0.33cm, Upper and mid anterior facial height : Lower anterior facial height **(TR-LN:LN-ME)** was 1.527±0.267cm, Lower anterior facial height: Middle anterior facial height **(LN-ME:LC-LN**) was 1.662±0.654cm, Mid anterior facial height and upper one third of Lower anterior facial height : Lower two-third of Lower anterior facial height (**LC-CH:CH-ME)** was 1.869±0.305cm, Middle anterior facial height : Upper one third of Lower anterior facial height **(LC-LN:LN-CH)** was 1.31±0.781cm, Lower two-third of Lower anterior facial height : Upper one third of Lower anterior facial height **(CH-ME:LN-CH)** was 1.112±0.228 cm.

GROUP II:

For **Horizontal proportions in Group II**, mean value of Width of Head: Lateral width of eye at the lateral canthus **(TS-TS:LC-LC)** was 1.290±0.071cm, Lateral width of eye at the lateral canthus: Width of Mouth (**LC-LC:CH-CH**) was to 1.918±0.144cm, Width of Mouth : Width of Nose **(CH-CH:LN-LN)** was 1.282 ±0.108cm.

For **Vertical proportions in Group II**, mean value of Total anterior facial height : Lower and mid anterior facial height **(TR-ME:LC-ME)** was 1.782±0.127 cm, Lower and mid anterior facial height :Upper anterior facial height **(LC-ME:TR-LC)** was 1.298±0.144cm, Upper and mid anterior facial height : Lower anterior facial height **(TR-LN:LN-ME)** was 1.605±0.199cm, Lower anterior facial height: Middle anterior facial height **(LN-ME:LC-LN**) was 1.780±0.254cm, Mid anterior facial height and upper one third of Lower anterior facial height : Lower two-third of Lower anterior facial height (**LC-CH:CH-ME)** was 1.667±0.199cm, Middle anterior facial height

: Upper one third of Lower anterior facial height **(LC-LN:LN-CH)** was 1.172±0.183cm, Lower two-third of Lower anterior facial height : Upper one third of Lower anterior facial height **(CH-ME:LN-CH)** was 1.15±0.163cm.

GROUP III:

For **Horizontal proportions in Group III**, mean value of Width of Head: Lateral width of eye at the lateral canthus **(TS-TS:LC-LC)** was 1.259±0.089cm, Lateral width of eye at the lateral canthus: Width of Mouth (**LC-LC:CH-CH**) was to 1.79±0.22cm, Width of Mouth: Width of Nose **(CH-CH:LN-LN)** was 1.268±0.111cm.

For **Vertical proportions in Group III,** mean value of Total anterior facial height : Lower and mid anterior facial height **(TR-ME:LC-ME)** was 2.099±0.964cm, Lower and mid anterior facial height :Upper anterior facial height **(LC-ME:TR-LC)** was 1.47±0.33cm, Upper and mid anterior facial height : Lower anterior facial height **(TR-LN:LN-ME)** was 1.624±0.243cm, Lower anterior facial height: Middle anterior facial height **(LN-ME:LC-LN**) was 1.822±0.462cm, Mid anterior facial height and upper one third of Lower anterior facial height : Lower two-third of Lower anterior facial height (**LC-CH CH-ME)** was 1.796±0.293cm, Middle anterior facial height : Upper one third of Lower anterior facial height **(LC-LN:LN-CH)** was 1.57±0.601cm, Lower two-third of Lower anterior facial height : Upper one third of Lower anterior facial height **(CH-ME:LN-CH)** was 1.190±0.247cm.

TABLE.9A: Mean values of horizontal and vertical proportions of Group I, Group II and Group III.

PROPORTIONS	Group I (N=100)	Group II (N=100)	Group III (N=100)
	Mean ± SD	Mean ± SD	Mean ± SD
HORIZONTAL PROPORTIONS			
TS-TS : LC-LC	1.2621± 0.104	1.290±0.071	1.259±0.089
LC-LC : CH-CH	1.864±0.149	1.918±0.144	1.79± 0.22
CH-CH : LN-LN	1.254±0.135	1.282 ±0.108	1.268±0.111
VERTICAL PROPORTIONS			
TR-ME : LC-ME	1.67± 0.56	1.782±0.127	2.099±0.964
LC-ME : TR-LC	1.36± 0.33	1.298±0.144	1.47± 0.33
TR-LN : LN-ME	1.527±0.267	1.605±0.199	1.624±0.243
LN-ME : LC-LN	1.662±0.654	1.780±0.254	1.822±0.462
LC-CH : CH-ME	1.869±0.305	1.667±0.199	1.796±0.293
LC-LN : LN-CH	1.31±0.781	1.172±0.183	1.57±0.601
CH-ME : LN-CH	1.112±0.228	1.15±0.163	1.19±0.247

TABLE 9B: Comparative statistics of horizontal and vertical proportions used to assess divine proportion among different groups using ANOVA test.

PROPORTIONS		Sum of squares	df	Mean square	F	P value
HORIZONTAL PROPORTIONS						
TS-TS : LC-LC	Between groups	0.066	2	0.033	2.314	0.001***
	Within groups	4.160	293	0.014		
	total	4.226	295			
LC-LC : CH-CH	Between groups	0.322	2	0.161	5.926	0.001***
	Within groups	7.969	293	0.027		
	total	8.291	295			
CH-CH : LN-LN	Between groups	0.059	2	0.030	3.679	0.101(NS)
	Within groups	2.357	293	0.008		
	total	2.416	295			
VERTICAL PROPORTIONS						
TR-ME: LC-ME	Between groups	50.073	2	25.037	13.265	0.001***
	Within groups	553.025	293	1.887		
	total	603.098	295			
LC-ME : TR-LC	Between groups	2.944	2	1.472	14.485	0.001***
	Within groups	29.778	293	0.102		
	total	32.722	295			
TR-LN : LN-ME	Between groups	1.110	2	0.555	9.771	0.001***
	Within groups	16.591	292	0.057		
	total	17.701	294			
LN-ME : LC-LN	Between groups	5.019	2	2.510	10.667	0.001***
	Within groups	68.929	293	0.235		
	total	73.948	295			
LC-CH: CH-ME	Between groups	2.083	2	1.041	14.288	0.001***
	Within groups	21.354	293	0.073		
	total	23.437	295			
LC-LN : LN-CH	Between groups	6.168	2	3.084	9.228	0.001***
	Within groups	97.918	293	0.334		
	total	104.085	295			
CH-ME: LN-CH	Between groups	1.883	2	0.942	20.200	0.001***
	Within groups	13.657	293	0.047		
	total	15.540	295			

$p<0.5$ Non-significant; $p<0.05$ just significant ; $p<0.01$ significant; $p<0.001$ highly significant.

TABLE.9A and 9B: shows mean values and comparative statistics of horizontal and vertical proportions used to assess divine proportion among different groups using ANOVA test.

All horizontal and vertical proportions used to assess divine proportion for three groups showed statistically significant difference between groups except Width of Mouth: Width of Nose (CH-CH: LN-LN).

Horizontal proportions:

For Width of Head: Lateral width of eye at the lateral canthus **(TS-TS:LC-LC)** highest mean value of 1.290±0.071cm was in Group II, followed by mean value of 1.262±0.104cm in Group I and then mean value of 1.259 ± 0.089cm in Group III (Group II > Group I > Group III) and difference between them was statistically highely significant (p=0.001). For Lateral width of eye at the lateral canthus: Width of Mouth (**LC-LC:CH-CH**) highest mean value of 1.918±0.144cm was in Group II, followed by mean value of 1.864±0.149cm in Group I and then mean value of 1.79±0.22cm in Group III (Group II > Group I > Group III) and difference between them was statistically highly significant (p=0.001). For Width of Mouth: Width of Nose **(CH-CH:LN-LN)** highest mean value of 1.282±0.108 cm was in Group II, followed by mean value of 1.268±0.111cm in Group III and then mean value of 1.254 ±0.135cm in Group I (Group II > Group III > Group I) and difference between them was statistically non-significant (p=0.101).

Vertical proportions

For Total anterior facial height: Lower and mid anterior facial height **(TR-ME:LC-ME**) highest mean value of 2.099±0.964cm was in Group III, followed by mean value of 1.782±0.127cm in Group II and then mean value of 1.67±0.56cm in Group I (Group III > Group II > Group I) and difference between them was statistically significant (p=0.001). For Lower and mid anterior facial height: Upper anterior facial height **(LC-ME:TR-LC)** highest mean value of 1.47±0.33cm was in Group III, followed by mean value of 1.36±0.33 cm in Group I and then mean value of 1.298±0.144cm in Group II (Group III > Group I > Group II) and difference between them was statistically significant (p=0.001).

For Upper and mid anterior facial height: Lower anterior facial height **(TR-LN:LN-ME)** highest mean value of 1.624±0.243cm was in Group III, followed by mean value of 1.605±0.199cm in Group II and then mean value of 1.527±0.267 cm in Group I (Group III > Group II > Group I) and

difference between them was statistically significant (p=0.001). For Lower anterior facial height: Middle anterior facial height **(LN-ME:LC-LN**) highest mean value of 1.822±0.462cm was in Group III, followed by mean value of 1.780±0.254cm in Group II and then mean value of 1.662±0.654 cm in Group I (Group III > Group II > Group I) and difference between them was statistically significant (p=0.001).

For Mid anterior facial height and upper one third of Lower anterior facial height: Lower two-third of Lower anterior facial height (**LC-CH:CH-ME)** highest mean value of 1.869±0.305cm was in Group I, followed by mean value of 1.796±0.293cm in Group III and then mean value of 1.667±0.199cm in Group II (Group I > Group III > Group II) and difference between them was statistically significant (p=0.001). For Middle anterior facial height: Upper one third of Lower anterior facial height **(LC-LN:LN-CH)** highest mean value of 1.57±0.601cm was in Group III, followed by mean value of 1.31±0.781cm in Group I and then mean value of 1.172±0.183cm in Group II (Group III > Group I > Group II) and difference between them was statistically significant (p=0.001).

For Lower two-third of Lower anterior facial height: Upper one third of Lower anterior facial height **(CH-ME:LN-CH)** highest mean value of 1.19±0.247cm was in Group III, followed by mean value of 1.15±0.163cm in Group II and then mean value of 1.112±0.228cm in Group I (Group III > Group II > Group I) and difference between them was statistically significant (p=0.001).

Table 10: Comparison of mean difference of horizontal and vertical proportions according to their groups.

PROPORTIONS	GROUPS	MEAN DIFFERENCE	Std. ERROR	P Value
HORIZONTAL PROPORTIONS				
TS-TS : LC-LC	I vs II	-0.028	0.018	0.279(NS)
	I vs III	-0.115	0.018	0.001***
	II vs III	-0.086	0.018	0.001***
LC-LC : CH-CH	I vs II	-0.053	0.024	0.079(NS)
	I vs III	0.070	0.025	0.015**
	II vs III	0.124	0.024	0.001***
CH-CH : LN-LN	I vs II	0.022	0.016	0.376(NS)
	I vs III	-0.013	0.017	0.706(NS)
	II vs III	-0.036	0.016	0.086(NS)
VERTICAL PROPORTIONS				
TR-ME : LC-ME	I vs II	-0.107	0.053	0.109(NS)
	I vs III	0.110	0.053	0.099(NS)
	II vs III	0.218	0.053	0.001***
LC-ME : TR-LC	I vs II	0.064	0.040	0.251(NS)
	I vs III	-0.116	0.040	0.012*
	II vs III	-0.180	0.040	0.001***
TR-LN : LN-ME	I vs II	-0.147	0.033	0.001***
	I vs III	-0.096	0.034	0.014**
	II vs III	0.050	0.034	0.296(NS)
LN-ME : LC-LN	I vs II	-0.317	0.068	0.001***
	I vs III	-0.159	0.069	0.057(NS)
	II vs III	0.157	0.069	0.060(NS)
LC-CH : CH-ME	I vs II	0.202	0.038	0.001***
	I vs III	0.073	0.038	0.136(NS)
	II vs III	-0.128	0.038	0.003**
LC-LN : LN-CH	I vs II	0.142	0.101	0.343(NS)
	I vs III	-0.256	0.102	0.034*
	II vs III	-0.398	0.102	0.001***
CH-ME : LN-CH	I vs II	-0.193	0.030	0.001***
	I vs III	-0.078	0.030	0.030*
	II vs III	0.114	0.030	0.001***

p<0.5 non-significant; p<0.05 just significant; p<0.01 significant; p<0.001 highly significant.**

Table 10: shows comparison of mean difference of horizontal and vertical proportions according to their groups.

HORIZONTAL PROPORTIONS:

Intergroup comparison of horizontal proportions showed that for Width of Head: Lateral width of eye at the lateral canthus **(TS-TS:LC-LC)** there was statistically highly significant difference between Group I vs Group II (p=0.001) and Group II vs Group III (p=0.001), however there was non-significant difference between Group I vs Group II (p=0.279).

For Lateral width of eye at the lateral canthus: Width of Mouth (**LC-LC:CH-CH)** there was statistically highly significant difference between Group II vs Group III (p=0.001) and statistically significant difference between Group I vs Group III (p=0.015), however there was non-significant difference between Group I vs Group II(p=0.079)

For Width of Mouth: Width of Nose **(CH-CH:LN-LN)** there was non-significant difference between Group I vs Group II(p=0.376), Group I vs Group III(p=0.706) and Group II vs Group III(p=0.086).

VERTICAL PROPORTIONS:

Intergroup comparison of vertical proportions showed that for Total anterior facial height: Lower and mid anterior facial height **(TR-ME:LC-ME**) there was statistically highly significant difference between Group II vs Group III(p=0.001). however, there was non- significant difference between Group I vs Group II (p=0.109) and Group I vs Group III (p=0.099).

For Lower and mid anterior facial height: Upper anterior facial height **(LC-ME:TR-LC**) there was statistically highly significant difference between Group II vs Group III (p=0.001), statistically just significant difference between Group I vs Group III (p=0.012). however, there was non- significant difference between Group I vs Group II (p=0.251).

For Upper and mid anterior facial height: Lower anterior facial height **(TR-LN:LN-ME**) there was statistically highly significant difference between Group I vs Group II (p=0.001), there was statistically significant difference between Group I vs Group III (p=0.014), however there was non-significant difference between Group II vs Group III (p=0.296).

For Lower anterior facial height: Middle anterior facial height **(LN-ME:LC-LN**) there was statistically highly significant difference between Group I vs Group II (p=0.001), however there was non-significant difference between Group I vs Group III (p=0.057) and Group II vs Group III (p=0.060).

For Mid anterior facial height and upper one third of Lower anterior facial height: Lower two-third of Lower anterior facial height (**LC-CH:CH-ME)** there was statistically highly significant difference between Group I vs Group II (p=0.001), there was statistically significant difference between Group II vs Group III (p=0.003), however there was non-significant difference between Group I vs Group III (p=0.136).

For Middle anterior facial height: Upper one third of Lower anterior facial height **(LC-LN:LN-CH)** there was statistically highly significant difference between Group II vs Group III (p=0.001), there was statistically just significant difference between Group I vs Group III (p=0.034), however there was non-significant difference between Group I vs Group II (p=0.343).

For Lower two-third of Lower anterior facial height: Upper one third of Lower anterior facial height **(CH-ME:LN-CH)** there was statistically highly significant difference between Group I vs Group II (p=0.001) and Group II vs Group III (p=0.001), however there was statistically just significant difference between Group I vs Group III (p=0.030).

TABLE.11: Comparison of various facial proportion between three groups

PROPORTIONS	GROUP I			GROUP II			GROUP III		
	Mean ±SD	Std. error	%value (considering 1.618=100%)	Mean ±SD	Std. error	%value (considering 1.618=100%)	Mean ±SD	Std. error	%value (considering 1.618=100%)
HORIZONTAL PROPORTIONS									
TS-TS:LC-LC	1.2621±0.104	0.010	78.%	1.290±0.071	0.007	79.76%	1.259±0.089	0.009	77.83%
LC-LC:CH-CH	1.864±0.149	0.014	115.23%	1.918±0.144	0.014	118.55%	1.79±0.22	0.019	110.63%
CH-CH:LN-LN	1.254±0.135	0.011	77.50%	1.232 ±0.108	0.010	76.23%	1.268±0.111	0.011	78.39%
VERTICAL PROPORTIONS									
TR-ME:LC-ME	1.67±0.56	0.218	103.21%	1.782±0.127	0.012	110.13%	2.099±0.964	0.097	129.7%
LC-ME:TR-LC	1.36±0.33	0.044	84.05%	1.298±0.144	0.014	80.23%	1.47±0.33	0.030	90.85%
TR-LN:LN-ME	1.527±0.267	0.026	94.37%	1.605±0.199	0.019	99.19%	1.624±0.243	0.024	100.37%
LN-ME:LC-LN	1.662±0.654	0.065	102.7%	1.780±0.254	0.025	110.01%	1.822±0.462	0.046	112.6%
LC-CH:CH-ME	1.869±0.305	0.030	115.5%	1.667±0.199	0.019	103.02%	1.796±0.293	0.029	111.2%
LC-LN:LN-CH	1.31±0.781	0.078	80.96%	1.172±0.183	0.018	72.43%	1.57±0.601	0.061	97.03%
CH-ME:LN-CH	1.112±0.228	0.022	68.72%	1.15±0.163	0.016	71.07%	1.190±0.247	0.025	73.54%

For comparing standard divine proportion of 1.618 to proportion observed in present study, it was taken as 100%. The proportions observed in present study were then expressed in respective percentage with respect to 1.618 as shown in Table 11.

HORIZONTAL PROPORTIONS:

For Group I, Width of Head: Lateral width of eye at the lateral canthus **(TS-TS:LC-LC)** was 78%, and for Width of Mouth: Width of Nose **(CH-CH:LN-LN)** was 77.50% and both these values werelesser than divine proportion of 100% (1.618). On contrary Lateral width of eye at the lateral canthus: Width of Mouth **(LC-LC:CH-CH)** showed 115.23% a valued that was more than divineproportion of 100% (1.618).

For Group II, Width of Head: Lateral width of eye at the lateral canthus **(TS-TS:LC-LC)** was 79.76%, and for Width of Mouth: Width of Nose **(CH-CH:LN-LN)** was 76.23% and both these values were lesser than divine proportion of 100% (1.618). On contrary Lateral width of eye at the lateral canthus: Width of Mouth **(LC-LC:CH-CH)** showed 118.55% a valued that was more thandivine proportion of 100% (1.618).

For Group III, Width of Head: Lateral width of eye at the lateral canthus **(TS-TS:LC-LC)** was 77.81%, and for Width of Mouth: Width of Nose **(CH-CH:LN-LN)** was 78.39% and both these values were lesser than divine proportion of 100% (1.618). On contrary Lateral width of eye at the

lateral canthus:Width of Mouth **(LC-LC:CH-CH)** showed 110.63% a valued that was more than divine proportion of 100% (1.618).

VERTICAL PROPORTIONS:

For Group I, Total anterior facial height: Lower and mid anterior facial height **(TR-ME:LC-ME**) was 103.21%, Lower anterior facial height: Middle anterior facial height **(LN-ME:LC-LN)** was 102.7%, which was more closer to divine proportion of 100% (1.618) and for Upper and mid anterior facial height: Lower anterior facial height **(TR-LN:LN-ME**) was 94.37% these values were almost closer to divine proportion of 100% (1.618).

For Lower and mid anterior facial height: Upper anterior facial height **(LC-ME:TR-LC**) was 84.05% , Middle anterior facial height: Upper one third of Lower anterior facial height **(LC-LN:LN-CH)** was 80.96%and Lower two-third of Lower anterior facial height : Upper one third of Lower anterior facial height **(CH-ME:LN-CH)** was 68.72%, these values were lesser than divine proportion of 100% (1.618).

On contrary Mid anterior facial height and upper one third of Lower anterior facial height: Lower two-third of Lower anterior facial height (**LC-CH:CH-ME)** showed 115.5% values was more than divine proportion of 100% (1.618).

For Group II, Upper and mid anterior facial height: Lower anterior facial height **(TR-LN:LN-ME**) and Lower anterior facial height: Lower two-third of Lower anterior facial height (**LC-CH:CH-ME)** showed 99.19%, and 103.2% respectively a valued that was more closer to divine proportion of 100% (1.618).

For Lower and mid anterior facial height: Upper anterior facial height **(LC-ME:TR-LC**) was 80.23%, for Lower two-third of Lower anterior facial height: Upper one third of Lower anterior facial height **(CH-ME:LN-CH)** was 71.07% and Middle anterior facial height: Upper one third of Lower anterior facial height **(LC-LN:LN-CH)** was 72.43% and these values were lesser than divine proportion of 100% (1.618).

On contrary Total anterior facial height: Lower and mid anterior facial height **(TR-ME:LC-ME**) and Lower anterior facial height: Middle anterior facial height **(LN-ME:LC-LN)** showed 110.13%, and 110.01% a valued that was more than divine proportion of 100% (1.618).

For Group III, Upper and mid anterior facial height: Lower anterior facial height **(TR-LN:LN-ME**) was 100.3% and Middle anterior facial height: Upper one third of Lower anterior facial height **(LC-LN:LN-CH)** was 97.03%, and these values was more closer to divine proportion of 100% (1.618).

For Lower and mid anterior facial height: Upper anterior facial height **(LC-ME:TR-LC**) was 90.85%, for Lower two-third of Lower anterior facial height: Upper one third of Lower anterior facial height **(CH-ME:LN-CH)** was 73.54% showed a valued that was lesser than divine proportion of 100% (1.618).

On contrary Total anterior facial height: Lower and mid anterior facial height **(TR-ME:LC-ME**) was 129.7%, Lower anterior facial height: Middle anterior facial height **(LN-ME:LC-LN)** was 112.6% and Lower anterior facial height: Lower two-third of Lower anterior facial height (**LC-CH:CH-ME)** was 111% showed a valued that was more than divine proportion of 100% (1.618).

Facial harmony and balance is determined by underlying facial skeleton and overlying soft tissue drape[1]. In orthodontics, it is measured by morphological relation and proportion of nose, lip and chin, because their anatomic balance can be changed by growth as well as by orthodontic treatment. Hence, Orthodontist play an important role to get ideal proportion in an individuals[1].

There had been always discussion over what constitute beauty, and numerous studies have tried to measure it qualitatively as well as quantitively, using linear measurements, angles, ratios and proportions.

Among various norms or standard that had been proposed to establish facial attractiveness, facial divine proportion, (also known as golden ratio) as denoted by symbol ‗phi' is considered as ratio that is most attractive to human eye and mind[3]. The concept of divine proportion dates back to fourth century BC, Fibonacci, identified it as Phi (φ), with a value of 1.618 between two parts in order to be aesthetically proportionate[4].

Lambardi first proposed the divine proportion in dentistry[7]. Ricketts[5] was the first orthodontist to apply divine proportion to the composition of facial hard and soft tissue[12]. According to Snow, the idea of the golden percentage can be applied to diagnose and improve symmetry, dominance, andproportion for a smile that is aesthetically pleasing[15]. Several studies had shown the existence of thecorrelation between attractiveness and proportions in face measurements that approach the GoldenRatio. Other studies found that beautiful faces may or may not exhibit ratios in the divine proportion.

Few studies relate facial beauty to skeletal morphology and found that attractive patients had an increased ANB and Wit's value, more convex profile than the non-attractive ones. Other studies stated that sagittal malocclusions (skeletal) determined by the ANB angle had no effect on the subjects' frontal facial attractiveness[26]. Thus, facial attractiveness is influenced by overlying soft tissue & underlying hard tissue morphology as well[27]. Therefore, more evidence is required to substantiate the true significance of this fascinating concept of divine proportion in the clinical assessment of facial esthetics.

The assessment of malocclusion in vertical plane is an important criterion for diagnosis and treatment planning in orthodontics. In vertical plane skeletal morphology manifest itself according

to variation in growth pattern facial divergence as normo-divergent (average grower), hypodivergent (horizontal grower) & hyperdivergent (vertical grower). With shift in paradigm from hard tissue and occlusion to soft tissue esthetics, assessment of effect of facial divergence on soft tissue had been done in various studies[28]. However, investigations of numerical and proportionalfacial analysis either directly on patients photograph for subject with variable facial divergence had not been evaluated in previous studies. As the type of growth pattern may vary with overlying soft tissue drape and may alter the divine proportions[1]. Hence there is need to evaluate the relationship between facial esthetics and the divine proportions in subjects with variable growth pattern.

The orthodontists should handle their patients' expectations by focusing on the smile and facial aesthetics as the primary goals of treatment. Considering this, aim of study was to evaluate and compare the facial divine proportion in subjects with different facial pattern (normo-divergent, hypodivergent and hyperdivergent). No study had been conducted to evaluate divine proportions in subjects with different growth pattern, hence direct comparison would not be possible.

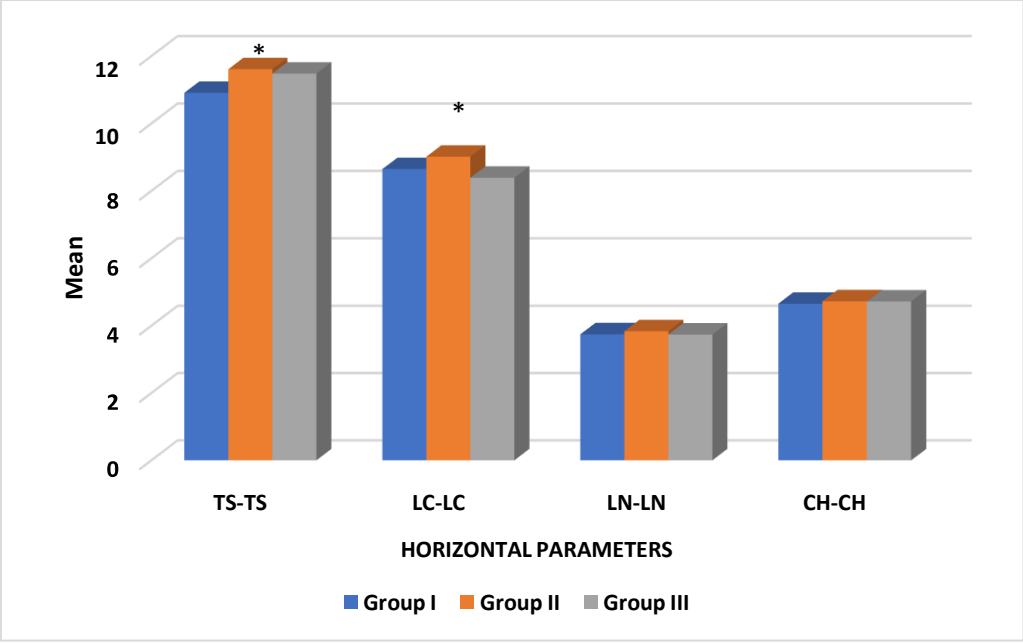
The present study was conducted in the Department of Orthodontics & Dentofacial Orthopaedics, Babu Banarasi Das college of Dental Sciences, Lucknow on 300 subjects taken from record files of the department. The subjects were divided into three groups based on facial divergence as evaluated by Jarabak ratio and Steiner‘s mandibular plane angle (Sn-Go-Gn) on lateral cephalogram which routinely taken for all the patients coming for fixed orthodontic treatment. A total of 350 subjects were selected for assessing facial divergence. The subjects with borderline or controversial values for two parameters selected for facial divergence were excluded.
Hence, final sample of the study included 100 normo-divergent subject (Group I), 100 hypodivergent subjects (Group II) and 100 hyperdivergent subjects (Group III).

The digital frontal facial photograph of all the selected subjects was taken using DSLR camera which was fixed on a tripod stand and kept at a distance of 4 feets from the subject and the vertical stand of tripod was adjusted so that camera and face of the subject were parallel to each other. A metallic ruler was attached vertically on back wall for calibration of the photographs. Digital photographs saved as JPEG were transferred to laptop and were cropped using Adobe Photoshop. Cropped photographs were transferred to IC Measure software for the evaluation of facial proportions. The photographs from all groups were analyzed for four horizontal, nine vertical

parameters after accurate identification of required landmarks. Mid sagittal Plane (Msp) was used as reference plane to measure the parameters, (drawn perpendicular to inter-pupillary line (IPL) passing through nasion). From these horizontal and vertical parameters, three horizontal and seven vertical ratios were calculated. Also, these were expressed in percentage and compared to standard divine proportions of 1.618 taken as 100%. The data obtained for thirteen linear parameters were recorded on micro-soft excel sheet and subjected to statistical analysis.

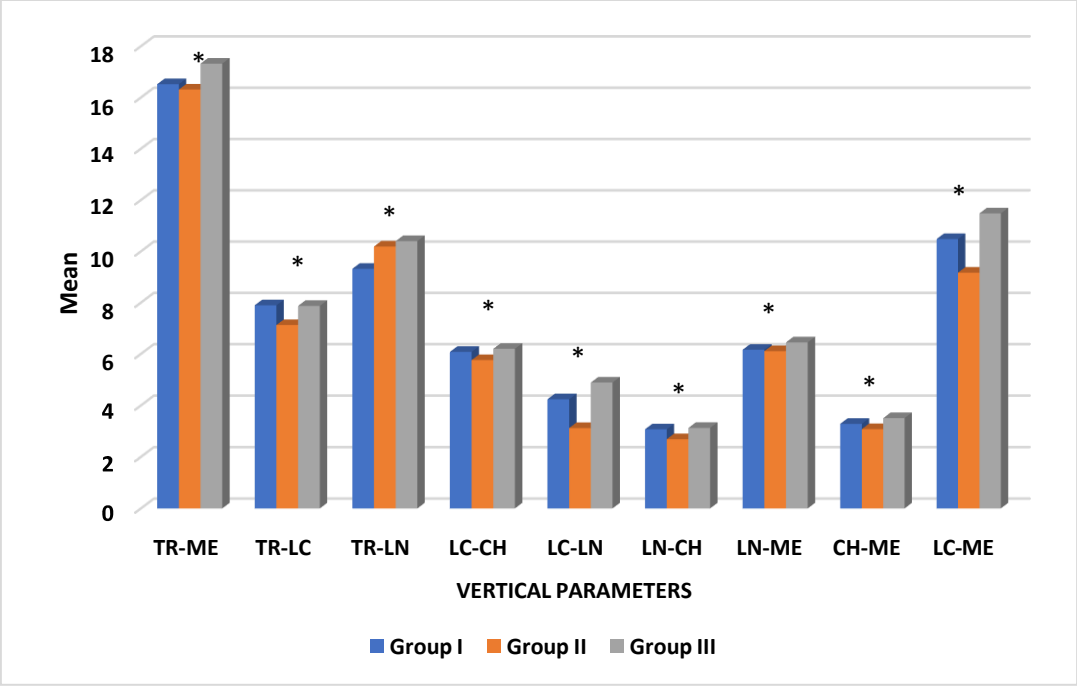
Overall result of the study showed that all facial proportions in all the groups were deviated from golden proportions however, horizontal proportion were found more deviated from golden proportions than vertical proportions.

Intergroup comparison for **horizontal parameters** showed statistically highly significant difference for **width of head (TS-TS)**(p=0.001) Group II> Group III> Group I; and **Lateral width of eye at the lateral canthus (LC-LC)** (p=0.001) Group II > Group I > Group III. whereas there was statistically insignificant difference was observed for **Width of nose (LN-LN)** Group II >Group I > Group III and **Width of mouth (CH-CH)** Group II >Group III > Group I. **(Table6A**; **GRAPH 1).**



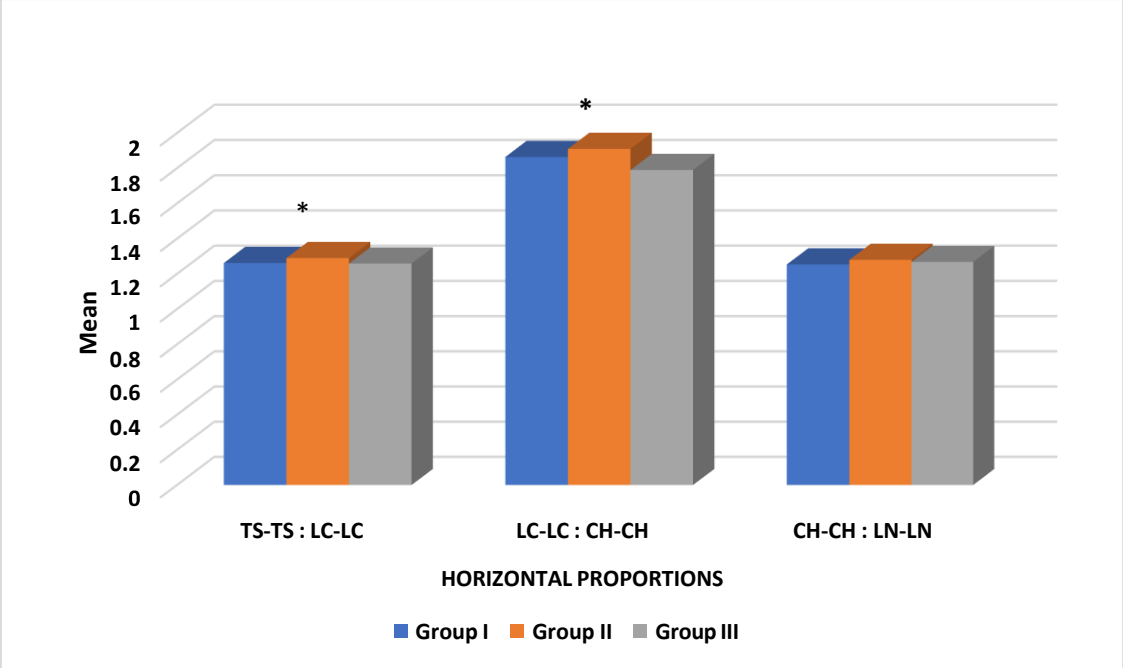
GRAPH 1: Intergroup comparison of horizontal parameters.

Intergroup comparison for **vertical parameters** showed statistically highly significant difference for **Total anterior facial height (TR-ME)** (p=0.001), **Upper and mid anterior facial height (TR-LN)** (p=0.001)**, Mid anterior facial height and upper one third of Lower anterior facial height (LC-CH**) (p=0.001)**, Lower anterior facial height (LN-ME)** (p=0.002)**, Middle anterior facial height (LC-LN**) (p=0.001), **Lower two-third of Lower anterior facial height (CH-ME)** (p=0.001)**, Upper one third of Lower anterior facial height (LN-CH)** (p=0.002) **and Lower and mid anterior facial height (LC-ME)** (p=0.001) with higher mean value Group III> Group I> Group II, except **Upper anterior facial height (TR-LC)** (p=0.001) Group I> Group III> Group **II. (Table 6A; Graph2).**



GRAPH 2: Intergroup comparison of vertical parameters

Intergroup comparison of horizontal proportions showed statistically significant difference for **Width of head: Lateral width of eye at the lateral canthus (TS-TS: LC-LC)(p=0.001)** (Group II> Group I> Group III), **Lateral width of eye at the lateral canthus: Width of mouth (LC-LC: CH-CH)(p=0.001)** (Group II > Group I > Group III); whereas there was statistically insignificant difference was observed for **Width of mouth :Width of nose (CH-CH:LN-LN)** (Group II >Group III > Group I). **(Table9A; GRAPH 3)**

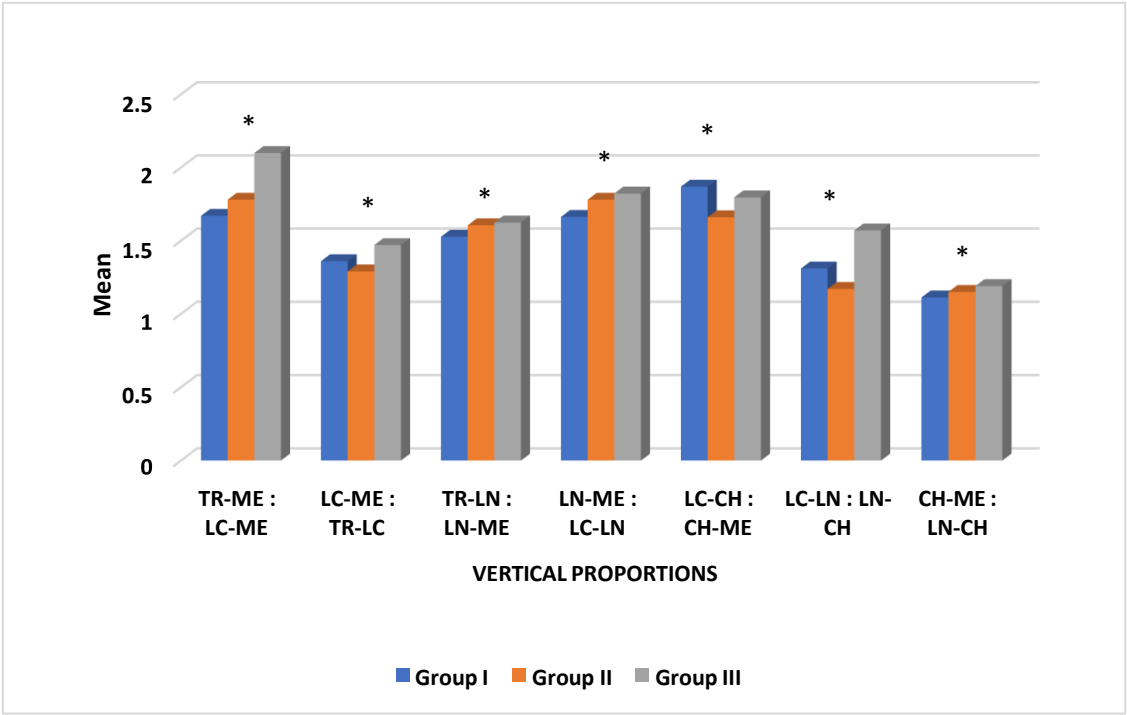


GRAPH 3: Comparison of mean of horizontal proportions in Group I, Group II, and Group III

On Intergroup comparison of **vertical proportions**, all proportions were found statistically significant difference for **Total anterior facial height: Upper anterior facial height (TR-ME:TR-LC**), **Upper and mid anterior facial height: Lower anterior facial height (TR-LN: LN-ME), Lower anterior facial height: Middle anterior facial height (LN-ME:LC-LN) and Upper one third of Lower anterior facial height (CH-ME:LN-CH)** Group III> Group II> Group I) (p=0.001).

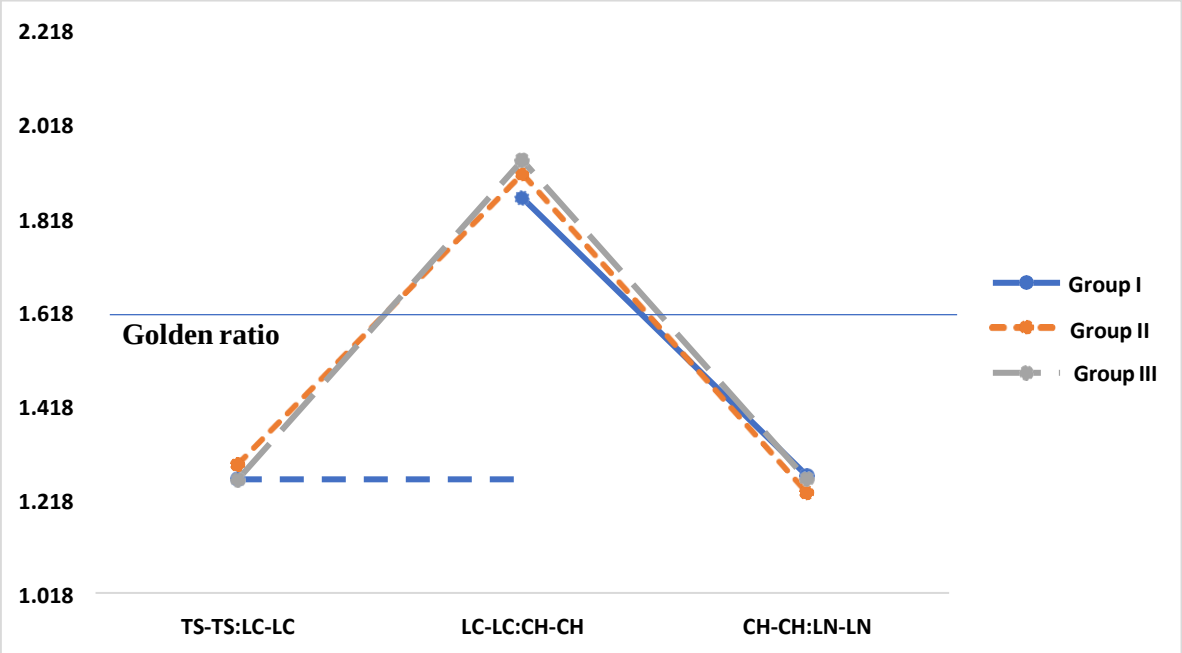
Mid anterior facial height and upper one third of Lower anterior facial height: Lower two-third of Lower anterior facial height (LC-CH:CH-ME) (Group I> Group III> Group II) (p=0.001),

Lower and mid anterior facial height: Upper anterior facial height (LC-ME:TR-LC) and **Middle anterior facial height: Upper one third of Lower anterior facial height (LC-LN:LN-CH**) (Group III> Group I> Group II) (p=0.001). **(Table 9A; Graph 4)**



GRAPH 4: comparison of mean of vertical proportions in Group I, Group II, and Group III

The facial proportions for all the groups obtained from the present study were compared from divine proportions. Group I (Normo-divergent) showed least deviation followed by Hypodivergent group then Hyperdivergent group from divine proportions. However previous studies in which divine proportion was considered on basis of gender, esthetics, racial, malocclusion by **Khan,et.al, Mizumoto et al, Kawakami et.al, Mantelakis et al , M.S.Ngyuen. etal**, **Sunil kumar L N et al, Saurabh et al**, **Soans et al, Ana Paula Lazzari Marques Peron, Kaya KS et. al, S.Rupesh et.al , Kalra.et.al, Chakravarthy M.S etal, Rdriguez.et.al** also found that horizontal proportions were more deviated as compared to vertical proportions from divine proportions which is in agreement to the result of the present study. **Anand Awadhesh Tripathi et al, Anand.et.al, and Kikens et.al** found that almost all parameters (horizontal and vertical) used in their study was comparable to divine proportion which is contrary to the present study.



Graph.5. Shows comparison of horizontal facial proportion between three facial divergence groups

In the present study all the **horizontal proportions** were deviated from divine proportions in all three divergence groups. No study had been conducted to evaluate divine proportions in subjects with different growth pattern, hence direct comparison with previous studies would not be possible. **(Graph.5)**

Width of head to lateral width of eye (TS-TS:LC-LC) was found statistically significant different in all divergence groups ($p<0.001$) and it was also deviated on the **lower side** from divine proportions in all divergence group (Group II (79.96%)Group I (78%) Group III (77.81%), which indicate small temple width and normal eye width in the present study (**Graph.5)**. Similar results were observed by **Khan.et.al**[3] also, **Sunil kumaret.al**[44], **Saurab.et.a**l[4] who studied the divine proportions in North Indian Male and Female (87.14% and 82.20%), North Indian Maharashtrians (86.5%) and Central Indian Male and Female (75% and 74%) respectively. In other studies, done by **Soans.et.al**[57] width of head to lateral width of eye also showed statistically significant difference among male and females of South Indian population. Similarity for the result observed may be due to the sample taken was from same ethnic origin.

M.S.Ngyuen. et.al[49] found narrower temporal soft tissue width in **Vietnamese females** with values lesser than divine proportion (76%) and **Qamar ibrahem.et.al**[56] also found the small temple width and normal eye width in **Syria** (77.6%, 76.4% and 72.4% respectively) among ClassI, Class II div1 and Class II div2 malocclusion which is again in accordance with the result of the present study.

In contrary to result of present study **Mizumoto et al**[20]**,** found the exactly same proportions for width of head to lateral width of eye in **Japanese women** with Class I occlusion, models and popular actress while TS-TS:LC-LC was 1.620. A**nand Awadhesh Tripathil.et.al**[1] in north Indian females**,**and **Anand.et.al**[2] among Moradabad population in their study reported that **width of head to lateral width of eye** was closer to divine proportions with no statistically significant difference among males and females. This difference could be attributed to division of sample based on gender, hence morphometric differences between males and females were clearly demarcated in their study.

Lateral width of eye to width of mouth (LC-LC:CH-CH) was found statistically significant different in all divergence group ($p<0.001$) and it was also deviated on the **higher side** from divine proportions in all divergence group (Group II (118.55%) Group I (115.23%) Group III (110.63%) which indicate small mouth width with normal eye width in the present study (**Graph.5)**. Similar results were observed by **Khan.et.al**[3] **also** (117%in males, 122%in females), **Sunil kumaret.al**[44] (121.1%), **Saurab.et.a**l[4] (112%in males, 114% in females) for divine proportions. In other studies done by **Soans.et.al**[57]**,** found statistically significant difference

among male and females in Indian population, similarly in **M.S.Ngyuen.et.al**[49] among Vietnamese females(118.8%) and **Qamar ibrahem.et.al**[56] in Syria population also found similar result which indicate small mouth width with normal eye width (112.8%,117.5% and 127.1% respectively) among different malocclusion groups. **Mizumoto.et.al**[20]**,** also reported small lip width with normal eye in **Japanese women** with Class I occlusion, models and popular actress (129%, 120.2% and 118.1% respectively). **Chakravarthy M.S et.al**[48] reported in Indian American men that intercanthal to nasal width differed significantly with Caucasian mens. **Ana Paula Lazzari Marques Peron.et.al**[42] also found similar resulton Brazilian Caucasian women that lateral width of eye to width of mouth proportion of a face is not influenced by pleasant faces.

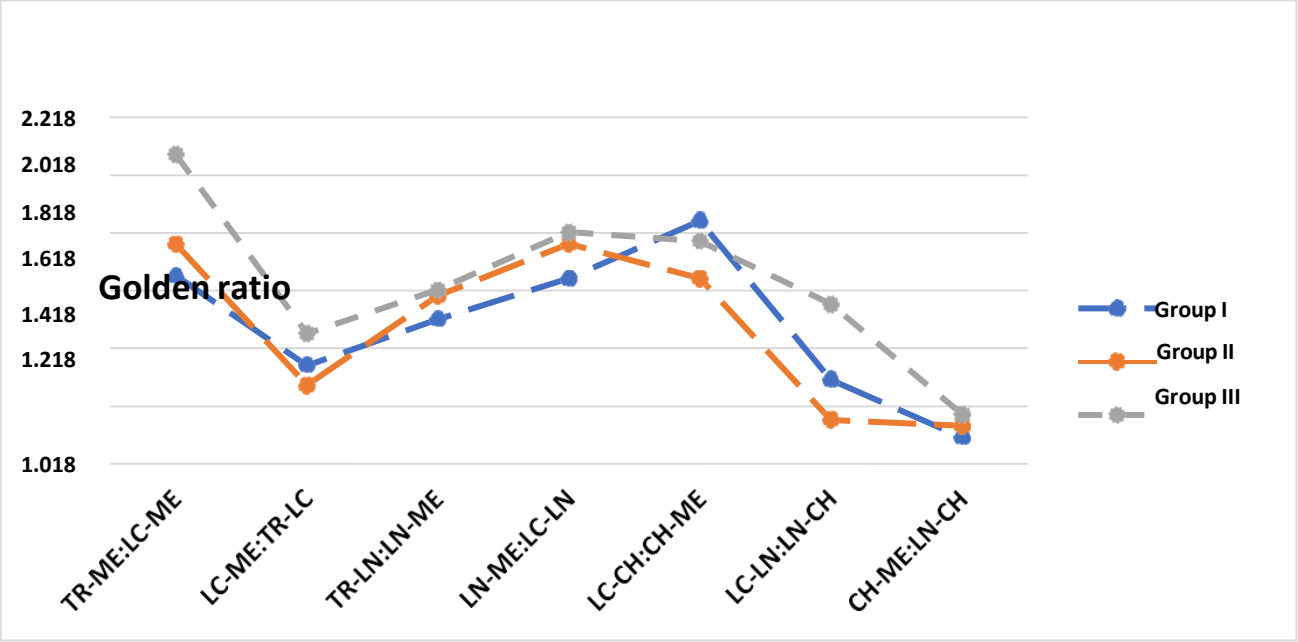
In contrary to result of present study. **Kaya KS.et.al**[53] among **Turkish** found that width of head to lateral width of eye did not differ significantly between the male and female groups (p= 0.075) from the Golden Proportion. **Anand Awadhesh Tripathil.et.al**[1] in North Indian females**,** and **Anand.et.al**[2] among Moradabad population in their study reported that Lateral width of eye to width of mouth was closer to divine proportions with no statistically significant difference among males and females. **Profit and While**[58] reported that width of mouth should be approximately the distance between iris.

Width of mouth to width of nose (CH-CH: LN-LN) was also found different among all divergence groups but the difference was statistically non-significant between them. However, was deviated on the **lower side** from divine proportion in all divergence group (Group III (78.39%), Group I (77.56%), Group II (76.23%respectively) which predict the combination of small mouth width and average nose width in the present study (**Graph.5)**. Similar, results were observed by **Khan.et.al**[3] also (74.78%in males, 81.58%in females), **Sunil kumaret.al**[44] (77.9%), **Saurab.et.al**[4] (79%in males, 80% in females), in Indian populations. Other studies by **Chakravarthy M.S.et.al**[48], **Anand.et.al**[2]**, Soans.et.al**[57]**,** found statistically significant difference among male and females among Indian population. **Ana Paula Lazzari Marques Peron.et.al**[42] showed no statistically significant difference among pleasant and unpleasant groups of **Brazilian Caucasian women**. **M.S.Ngyuen.et.al**[49] in Vietnamese females (75.5%) and **Qamar ibrahem.et.al**[56] (85.4%,83.2% and 79.3%) among different malocclusion groups showed deviation from divine proportions. **Mizumoto et al**[20]**,** also showed small lip width and average nose width in **Japanese women** as these measurement difference finding in above studies could be due to ethnic differences present among them.

Kalra.et.al[46]**.** who studied divine proportion in Indian females and A**nand Awadhesh Tripathil.et.al**[1] who studied divine proportion among north Indian females found that Width of mouth to width of nose was much closer to divine proportions with no statistically significant differences which is not in aggrement to the result of the present study.

The differences in extent of deviation from standard divine proportion of our population in comparison to other groups could be due to racial and ethecial variation.

Among **vertical proportions** measured in the present study **Total anterior facial height to Lower and mid anterior facial height, Upper and mid anterior facial height to Lower anterior facial height (**TR-LN:LN-ME**), Lower anterior facial height to Middle anterior facial height** (LN-ME:LC-LN**), Mid anterior facial height and upper one third of Lower anterior facial height to Lower two-third of Lower anterior facial height(**LC-CH.:CH-ME), **Middle anterior facial height to Upper one third of Lower anterior facial height** (LC-LN:LN-CH**)** were closer to divine proportions(100±5%) whereas **Lower and mid anterior facial height to Upper anterior facial height** (LC-ME:TR-LC) and **Lower two-third of Lower anterior facial height** to **Upper one third of Lower anterior facialheight** (CH-ME: LN-CH) was found deviated from divine proportions.



Graph.6. Shows comparison of vertical facial proportion between three gro

Total anterior facial height to Lowerand mid anterior facial height (TR-ME: LC-ME**)** showed statistically significant difference among all divergence groups (p-0.001) and was also deviated from divine proportion in Group I (103.21%,1.67) <Group II (110.13%,1.78) < Group III (129.7%,2.09) which indicate longer upper facial height as compared to mid and lower anterior facial height **(Graph.6).** On comparison with normo-divergent group of present study similar results was observed by **Chakravarthy M.S.et.al**[50]**,** A**nand Awadhesh Tripathil.et.al**[1] **and S.Rupesh.et.al**[45] who studied the divine proportions in Indian American men (1.60)**, north Indian** females (1.73), and Maharashtrians population(1.58) respectively and was closer to golden ratio which was similar to result for normo-divergent group of the present study. Similarity for the result observed may bedue to the sample taken was from same ethnic origin.
Sunil kumaret.al[44] and **Kalra.et.al**[46] reported in North Indian Maharashtrians and Indian beauties that Total anterior facial height to Lower and mid anterior facial height was lesser to golden ratio (93.9%) indicating lesser upper facial height than mid and lower facial height which is contraindicatory to the result of the present study.

In Hypodivergent and Hyperdivergent groups, the total anterior facial height to Lower and mid anterior facial height showed more deviation on the higher side from divine proportions. Similarly in other study done by **M.S.Ngyuen.et.al**[49] higher facial height in Vietnamese females with values higher than divine proportion (107.5%) was observed. **Soans.et.al**[57] and **Anand .et.al**[2] also showed there was a statistically significant difference among male and female of South Indian andMoradabad population**.**

In contrary to result of present study **Khan et.al**[3], found Total anterior facial height to Lower and mid anterior facial height in north Indian male and female 100.74% and 99.51% respectively and **Saurabh.et.al**[4] in central Indian male and female found 103% and 104% respectively and both groups were in approximation to golden proportions. **Kawakami.et.al**[21] also reported that deviation from divine proportion were more in male than female subject. Other studies by **Mizumoto.et.al**[20] found largerforehead, larger middle facial third relative to total face in Japanese women with class I occlusion, models and popular actress (100.8%,101.8% and 101.6% respectively). **Qamar ibrahem.et.al**[56] also found Total anterior facial height to Lower and mid anterior facial height **(**100.7%,98.5% and 100.6% respectively) closer to divine proportion among different malocclusion groups. Probable explanation of these slight variation in upper

facial height to mid and lower facial height among different studies may be attributed to difference in etheical and racial variation of chosen sample.

Upper and mid anterior facial height to Lower anterior facial height (TR-LN:LN-ME**)** in the present study showed statistically significant difference among three divergence group, however was closer to divine proportion Group I (94.37%), Group II (99.19%) and Grouo III (100.3%) respectively **(Graph.6)**. Similar to it **Kawakami.et.al**[21] also foundUpper and mid anterior facial height to Lower anterior facial height closer to golden ratios in both male and female groups. Present results are also in accordance with **Saurabh.et.al**[4]**, Mizumoto.et.al**[20] who studied for central Indian population (92% in male and 99% in female) and in Japanese women (94%,104.3% and 101.8% respectively) irrespective of racial differences. In other studies, done among different malocclusion group by **Qamar ibrahem.et.al**[56] showed that Upper and mid anterior facial height toLower anterior facial height ratio was closer to divine proportion for class II div2 malocclusion group that tend to perceived as more attractive than the other two groups (class I, class II div1).

In contrary to result of present study, **Khan et.al**[3] observed deviation from divine proportion as in north Indian population with values of 85.29% and 82.81% respectively. **Sunil kumar.et.al**[44]**,** A**nand A.T et.al**[1] **a**nd **S.Rupesh.et.al**[45] showed that total anterior facial height to Lower and mid anterior facial height was lesser than divine proportions with statistically significant differences among males and females groups. Other studies done by **Kaya KS.et.al**[53], **M.S.Nguyen.et.al**[49] showed that total anterior facial height to Lower and mid anterior facial height proportion percentage difference from golden proportion was significantly deviated in male than females groups. **Ana Paula Lazzari Marques Peron.et.al**[42] showed no statistically significant differences among Brazilian Caucasian women.

Lower anterior facial height to Middle anterior facial height (LN-ME:LC-LN**)** showed statistically significant difference among all divergence groups (p-0.001) and was also deviated from divine proportion in Group I (102.7%) <Group II (110.1%) < Group III (112.6%) respectively **(Graph.6)**. Similar results were found by A**nand AT et.al**[1]**, Kawakami.et.al**[21]**,** and **Mizumoto.et.al**[20] who studied in NorthIndian females (1.677), Oriental population and Japanese women (1.600) who concluded that thevertical height of the midface should equal the height if the lower face and in lower face, the mouth should be about one-third of the between the base of nose

and chin.

Similar findings for hypodivergent and hyperdivergent groups in present study were observed in other studies. **Khan et.al**[3]**, Sunil kumar.et.al**[44] and **Saurabh.et.al**[4] found increase Lower anterior facial height with values higher than divine proportion in north Indian female and male (133.49% and 146.47%), North Maharashtrians (136.6%) and Central Indian male and females (127% and 115%) respectively. Similarly, **M.S.Ngyuen. et.al**[49] found increase Lower anterior facial height in **Vietnamese females** with values higher than divine proportion (106.9%) and **Qamar ibrahem.et.al**[56] in **Syria** population found similar results (125.9%, 127.2% and 111.7% respectively) among ClassI, ClassII div1 and Class II div2 malocclusion. **Knight and Keith**[59] also showed an increase in the lower anterior facial height percentage was associated with less attractive face for females than males

Mid anterior facial height and upper one third of Lower anterior facial height to Lower two-third of Lower anterior facial height (LC-CH.:CH-ME) showed statistically significant difference among all divergence groups (p-0.001) and was also deviated on **higher side** from divine proportion in Group I (103%) <Group II (115.5%) < Group III (111.2%) respectively **(Graph.6).** Similar results for divine proportion were observed by **Khan.et.al**[3], **Sunil kumaret.al**[44], **Saurab.et.al**[4] and **Anand AT et.al**[1] who studied the divine proportions in North Indian for Female (99.5%), North Indian Maharashtraians (90.2%), Central Indian Male and Female (95% and 97%) and North Indian female (1.640) respectively. In other studies done by **M.S.Ngyuen. et.al**[49], **Mizumoto.et.al**[20] and **Chakravarthy M.S et.al**[50] found shorter lower third of face in **Vietnamese females, Japanese women** and **Indian American men** with values closer to divine proportion (102.7% , 101.8% and 1.66 respectively). **Qamar ibrahem.et.al**[56] also found shorter lower third of face in Syria **(**91.3%, 94.6% and 96.2% respectively) closer to divine proportion among different malocclusion groups.

In contrary to result of present study, **Kawakami.et.al**[21] and **Ana Paula Lazzari Marques Peron.et.al**[42] found in their study that value of Lower two-third of Lower anterior facial height was lesser than divine proportions with no statistically significant differences among oriental population and Brazalian Caucasian women.

Middle anterior facial height to Upper one third of Lower anterior facial height (LC-LN:LN-CH**)** showed statistically significant difference among all divergence groups (p-0.001) and was

also deviated on **lesser side** from divine proportion in Group II (72.43%) <Group I (80.96%) < Group III (97.03%) respectively which could be interpreted as larger upper lip lenth and commissure height than nasal height proportions while considering divine proportion in group I and II, this proportion was much closer to divine proportion in Group III. **(Graph.6).**

Similar results were observed by **Khan.et.al**[3]**, Mizumoto.et.al**[20] who studied the divine proportions in North Indian for Female (101.97%) and in Japanese women (97.2% in models and 100.1% in actress) respectively. In other studies, done by **Soans.et.al**[57] Middle anterior facial height to Upper one third of Lower anterior facial height also showed statistically significant difference among male and females of South Indian population.

In the present between among Normo-divergent and hypodivergent groups, the Middle anterior facial height to Upper one third of Lower anterior facial height was deviated on the lesser side from divine proportions. Similar to it other studies done by **Sunil kumaret.al**[44], **Saurab.et.a**l[4] found shorter Upper one third of Lower anterior facial height in North Maharashtians (71.1%) and Central Indian male and females (75% and 84%) with values lesser than divine proportions. In other studies done by **M.S.Ngyuen.et.al**[49] in **Vietnamese females** (90.1%) found deviated from divine proportions**,** and **Qamar ibrahem.et.al**[56] in Syria population (78.8%,73.7% and 84.6% respectively) reported values lesser than divine proportion among different malocclusion groups. Compared to White people, **Kawakami.et.al**[21] reported that the upper third of the lower anterior facial height was shorter in the oriental population. **Anand AT et.al**[1] showed statistically significantdifference and values lesser than golden ratio among North Indian females.

Ana Paula Lazzari Marques Peron.et.al[42] among Brazilian Caucasianwomen and **Anand et.al**[2] among Moradabad population in their study reported that Middle anteriorfacial height to Upper one third of Lower anterior facial height was lesser than divine proportionswith no statistically significant difference among males and females. **M.S.Ngyuen.et.al**[49] found larger forehead in **Vietnamese females** with values lesser than divine proportion (84.1%) and **Saurabh et.al**[4] among Central Indian population Lower and mid anterior facial height to Upper anterior facial height was lesser than divine proportions (91% and 89% respectively) which is in accordance with the result of Group I and Group II of the present study.

Lower and mid anterior facial height to Upper anterior facial height (LC-ME:TR-LC) showed statistically significant difference among all divergence groups ($p<0.001$) and was also deviated

on **lesser side** from divine proportion in Group I (84.05%) <Group II (80.23%) < Group III (90.85%) respectively which is suggestive of larger forehead with average lower and mid anterios facial height**(Graph.6).** Similar, results was observed by **Anand AT.et.al**[1] showed statistically significant difference from divine proportion among males and females. **Ana Paula Lazzari Marques Peron.et.al**[42] showed no statistically significant difference among males and females with divine proportions.

In contrary to present study **Khan.et.al**[3], who studied the divine proportions in North Indian female and males observed (103.21% and 101.35%) and **Mizumoto.et.al**[20] in Japanese women observed 98.6%, 95.9% and 96.4% respectively which is more closer to divine proportion. In other studies, done by **Sunil kumar.et.al**[44] and **Kawakami.et.al**[21] also found similar results. **Qamar ibrahem.et.al**[56] showed longer upper facial heightin **Syria** (98.8%, 105.6% and 99.6% respectively) and **Juhi and Rajiv.et.al** also showed same result with insignificantly difference between various malocclusion groups. It can be concluded that height of forehead appeared to have little effect on facial features among malocclusion groups.

Lower two-third of Lower anterior facial height to **Upper one third of Lower anterior facial height** (CH-ME: LN-CH) showed statistically significant difference among all divergence groups ($p<0.001$) and was also deviated on lesser side from divine proportion in Group I (68.72%) <Group II (71.07%) < Group III (73.54%) respectively which indicate longer upper lip height and shorter lower two-third of lower anteriorfacial height **(Graph.6).** Similar, results was observed by **Sunil kumar.et.al**[44] (92.1%), **Saurab.et.a**l[4] (89% in male and 93% in female) and **M.S.Ngyuen.et.al**[49] (91.7%) with values lesser than divine proportion. **Anand AT.et.al**[1] and **Kawakami.et.al**[21] found statistically significant difference among male and females for above parameter. However, **Ana Paula Lazzari Marques Peron.et.al**[42] showed no statistically significant difference from divine proportions among Brazalian Caucasian women.

In contrary to present study **Khan.et.al**[3] also, and **Mizumoto.et.al**[20] who studied the divine proportions in North Indian for female (104.45) and in Japanese women with class I occlusion and popular actress with values of 97.1%, and 101.1% respectively which was more than the proportion obtained in the present study and much closer to divine proportions. **Qamar ibrahem.et.al**[56] indicating longer upper lip height among different malocclusion group

The overall conclusion drawn from present as well as above mentioned studies is that golden proportion is not studly followed for all parameter evaluating horizontal or vertical proportions in any of the population groups. It could be suggested that golden proportion can guide us to what contribute to facial attractiveness. However, for any facial proportion instead of abosolute number, range needed based on racial and etheic variation of that population group. This range would help us in planning orthodontic treatment for esthetically pleasing outcome. Also facial divine proportion, when attainted by ortho surgical approach of that population group must be considered. Within limitation of the present study, it can be suggested that divine proportions are not absolutedeterminants of facial attractiveness and values changes with facial divergence. If the divine proportions are to be used in the orthodontic treatment/orthognathic surgical planning, they shouldbe used only as a general guidelines alongside other well-established treatment planning methods as ideal proportions changes over time and the ideal result varies with the patient expectations[2].

The major limitation of present study was that sample was not deviated based on gender, hence morphological difference between male and females may have overlapped the divine proportion as obtained in the present study. Further studies on larger sample size divided on basis of gender can validate the result of present study. Also different norms for facial proportions in different divergence group could be established for our population.

Conclusion

The following conclusions may be drawn from the present study conducted to evaluate and compare parameters and proportions in both horizontal and vertical plane amongst different facial divergence taken into account.

1. All horizontal and vertical parameters varied significantly different between various facial divergence groups except for width of nose and width of mouth.
2. All horizontal facial proportions (Width of head to Lateral width of eye, Lateral width of eye to Width of mouth, and Width of mouth to Width of nose) were deviated from the goldenproportions in different facial divergence groups.
3. Few vertical facial proportions (Lower and mid anterior facial height to Upper anterior facial height and Lower two-third of Lower anterior facial height to Upper one third of Lower anterior facial height) were deviated from the golden proportions in different facial divergence groups. However, Total anterior facial height to Upper anterior facial height and Lower anterior facial height to Middle anterior facial height in Normo-divergent groups; Mid anterior facial height and upper one third of Lower anterior facial height to Lower two-third of Lower anterior facial height in Hypodivergent groups; Middle anterior facial height to Upper one third of Lower anterior facial height in hyperdivergent groups were closer to golden proportions.
4. The deviation of facial proportions from standard golden proportions was maximum in hyperdivergent followed by hypodivergent and least in normo-divergent groups.
5. Upper and mid face to lower facial proportions in all divergence pattern were closer to golden proportions

Horizontal and vertical divine proportions deferred from golden proportions in all divergence groups. As per orthodontic perception racial facial proportions of the face must be taken in to consideration so as to get the best treatment results.

Further studies on larger sample size divided on basis of gender can validate the result of present study. So, different norms for various facial proportions in different divergence group could be established our population.

Facial beauty of an individual depends on proportion and relationship of various facial parts that varies among individuals. Facial harmony and balance is determined by underlying facial skeleton and overlying soft tissue drape[1].

The face is the most important individual factor determining the physical appearance of individuals, so the best esthetic outcome is an important treatment objective for patients satisfaction[2]. Facial harmony in orthodontics is measured by morphological relation and proportionof nose, lip and chin because their anatomic balance can be changed by growth as well as orthodontic treatment, so there is an important role of Orthodontist to get ideal proportion in an individual[1].

A number of linear measurements angles, ratios and proportions, rating scales helped us in judging facial beauty. Facial proportion for assessing beauty are topic of interest in orthodontics as well as for maxillofacial and plastic surgeons[3]. Among various norms or standard that had been proposed to establish facial attractiveness, facial divine proportion, also known as golden ratio as denoted by symbol _phi' is considered as ratio[3]. The concept of divine proportion dates back to fourth century BC, Fibonacci, identified it as Phi (φ), with a value of 1.618 between two parts in order tobe aesthetically proportionate[4].

It is well known that a patient's desire for better facial aesthetics is what drives them to seek orthodontic treatment, and in this sense, soft tissue assessment is crucial for orthodontic planning[27]. Hence, the need to comprehend what constitutes beauty has grown as orthodontists' abilities to alter the face have increased[27]. This concept of divine proportions is influenced by overlying soft tissue & underlying hard tissue morphology as well[27]. In vertical plane skeletal morphology manifestitself according to variation in growth pattern facial divergence as normo-divergent (average), hypodivergent (horizontal) & hyperdivergent (vertical). This is an important criterion for diagnosis and treatment planning in orthodontics. With shift in paradigm towards soft tissue esthetics, assessment of facial divergence of soft tissue had been done in various studies[28]. However rather than focusing on cephalometrics values alone, investigations of numerical & proportional facial analysis either directly in patient photograph or using radiographs are better option to get an optimum treatment plan[28]. Hence there is need to evaluate the relationship between facial esthetics and the divine proportions in subjects with variable growth pattern.

The purpose of this study is to evaluate and compare the facial divine proportion in subjects with different facial pattern (normo-divergent, hypodivergent and hyperdivergent).

The present study was conducted in the Department of Orthodontics & Dentofacial Orthopaedics, Babu Banarasi Das college of Dental Sciences, Lucknow on 300 subjects taken from record files of the department. The subjects were divided into three groups based on facial divergence as evaluated by Jarabak ratio and Steiner‘s mandibular plane angle (Sn-Go-Gn) on lateral cephalogram which routinely taken for all the patients coming for fixed orthodontic treatment. A total of 350 subjects were selected for assessing facial divergence. The subjects with borderline or controversial values for two parameters selected for facial divergence were excluded. Hence, final sample of the study included 100 normo-divergent subject (Group I), 100 hypodivergent subjects (Group II) and 100 hyperdivergent subjects (Group III). The digital frontal facial photograph of all the selected subjects was taken. Digital photographs were cropped using Adobe Photoshop. Cropped photographs were transferred to IC Measure software for the evaluation of facial proportions. The photographs from all groups were analyzed for four horizontal, nine vertical parameters after accurate identification of required landmarks. Mid sagittal Plane (Msp) was used as reference plane to measure the parameters, (drawn perpendicular to inter-pupillary line (IPL) passing through nasion). From these horizontal and vertical parameters, three horizontal and seven vertical ratios were calculated. Also, these were expressed in percentage and compared to standard divine proportions of 1.618 taken as 100%. The data obtained for thirteen linear parameters were recorded on micro-soft excel sheet and subjected to statistical analysis.

The following conclusions may be drawn from the present study conducted to evaluate and compare parameters and proportions in both horizontal and vertical plane amongst different facial divergence taken into account.

1. All horizontal and vertical parameters varied significantly different between various facial divergence groups except for width of nose and width of mouth.
2. All horizontal facial proportions (Width of head to Lateral width of eye, Lateral width of eye to Width of mouth, and Width of mouth to Width of nose) were deviated from the goldenproportions in different facial divergence groups.
3. Few vertical facial proportions (Lower and mid anterior facial height to Upper anterior facial height and Lower two-third of Lower anterior facial height to Upper one third of

Lower anterior facial height) were deviated from the golden proportions in different facialdivergence groups. However, Total anterior facial height to Upper anterior facial height and Lower anterior facial height to Middle anterior facial height in Normo-divergent groups; Mid anterior facial height and upper one third of Lower anterior facial height to Lower two-third of Lower anterior facial height in Hypodivergent groups; Middle anteriorfacial height to Upper one third of Lower anterior facial height in hyperdivergent groups were closer to golden proportions.

4. The deviation of facial proportions from standard golden proportions was maximum in hyperdivergent followed by hypodivergent and least in normo-divergent groups.

5. Upper and mid face to lower facial proportions in all divergence pattern were closer to golden proportions

Horizontal and vertical divine proportions deferred from golden proportions in all divsergence groups. As per orthodontic perception racial facial proportions of the face must be taken in to consideration so as to get the best treatment results.

Further studies on larger sample size divided on basis of gender can validate the result of present study. So, different norms for various facial proportions in different divergence group could be established our population.

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BABU BANARASI DAS UNIVERSITY

BBD COLLEGE OF DENTAL SCIENCES, LUCKNOW

INSTITUTIONAL RESEARCH COMMITTEE APPROVAL

The project titled "**Comparison Of Facial Divine Proportion In Horizontal And Vertical Facial Pattern – A Comparative Study**" submitted by **Dr Monika Sharma** Postgraduate student in the **Department of Orthodontics & Dentofacial Orthopaedics** for the Thesis Dissertation as part of MDS Curriculum for the academic year 2021-2024 with the accompanying proforma was reviewed by the Institutional Research Committee in its meeting held on **14th September, 2022** at BBDCODS.

The Committee has granted approval on the scientific content of the project. The proposal may now be reviewed by the Institutional Ethics Committee for granting ethical approval.

Prof. Dr. Puneet Ahuja
Chairperson

Dr. Mona Sharma
Co-Chairperson

ANNEXURE-II

BABU BANARASI DAS UNIVERSITY
BBD COLLEGE OF DENTAL SCIENCES, LUCKNOW

BBDCODS/IEC/09/2022 Dated: 16th September, 2022

Communication of the Decision of the Xth Institutional Ethics Sub-Committee Meeting

IEC Code: 13

Title of the Project: Comparison Of Facial Divine Proportion In Horizontal And Vertical Facial Pattern – A Comparative Study.

Principal Investigator: Dr Monika Sharma **Department:** Orthodontics & Dentofacial Orthopaedics

Name and Address of the Institution: BBD College of Dental Sciences Lucknow.

Type of Submission: New, MDS Project Protocol

Dear Dr Monika Sharma,

The Institutional Ethics Sub-Committee meeting comprising following members was held on 15th September, 2022.

1.	Dr. Lakshmi Bala Member Secretary	Prof. and Head, Department of Biochemistry
2.	Dr. Praveen Singh Samant Member	Prof. & Head, Department of Conservative Dentistry & Endodontics
3.	Dr. Jiji George Member	Prof. & Head, Department of Oral Pathology & Microbilogy
4.	Dr. Amrit Tandan Member	Professor, Department of Prosthodontics and Crown & Bridge
5.	Dr. Rana Pratap Maurya Member	Reader, Department of Orthodontics & Dentofacial Orthopaedics

The committee reviewed and discussed your submitted documents of the current MDS Project Protocol in the meeting.
The comments were communicated to PI, thereafter it was revised.

Decisions: The committee approved the above protocol from ethics point of view.

Forwarded by:

Prof. Dr. Puneet Ahuja
Principal
BBD College of Dental Sciences
BBD University, Lucknow

PRINCIPAL
Babu Banarasi Das College of Dental Sciences
(Babu Banarasi Das University)
BBD City, Faizabad Road, Lucknow-226028

Lakshmi Bala 16/09/22

Dr. Lakshmi Bala
Member-Secretary
Institutional Ethics Sub-Committee (IEC)
BBD College of Dental Sciences
BBD University, Lucknow

Member-Secretary
Institutional Ethic Committee
BBD College of Dental Sciences
BBD University
Faizabad Road, Lucknow-226028

ANNEXURE -III

Babu Banarasi Das College of Dental Sciences

(Babu Banarasi Das University)

BBD City, Faizabad Road, Lucknow – 227105 (INDIA)

Guidelines for Devising a Participant / Legally Acceptable Representative InformationDocument (PID) in English

1. Study Title

comparison of facial divine proportions in horizontal and vertical facial pattern : a comparative study

2. Invitation Paragraph

You are being invited to take part in a research study. Before you decide it is important for you to understand why the research/study is being done and what it will involve. Please take time to read the following information carefully and discuss it with friends, relatives and your treating physician/family doctor if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

3. What is the purpose of the study?

the purpose of the study is to compare and evaluate facial divine proportions in horizontal and vertical facial pattern: a comparative study

4. Why have I been chosen?

No patient is required as it is an in vitro study

5. Do I have to take part?

Not applicable.

6. What will happen to me if I take part?

Not applicable.

7. What do I have to do?

Not applicable

8. What is the procedure that is being tested?

The procedure will involve comparative evaluation of facial divine proportions in horizontal and vertical facial pattern: a comparative study

9. What are the interventions for the study?

- To evaluate the facial divine proportion in subjects with average growth pattern.
- To evaluate the facial divine proportion in subjects with horizontal growth pattern.
- To evaluate the facial divine proportion in subjects with vertical growth pattern.
- To compare the facial divine proportion in subjects different growth pattern.

10. What are the side effects of taking part?

Not applicable

11. What are the possible disadvantages and risks of taking part?

Not applicable

12. What are the possible benefits of taking part?

Not applicable

13. What if new information becomes available?

Sometimes during the course of a research project, new information becomes available about the research being studied. If this happens, your researcher will tell you about it and discuss with you whether you want to continue in the study. If you decide to withdraw, your researcher/investigator will make arrangements for your withdrawal. If you decide to continue in the study, you may be asked to sign an updated consent form.

14. What happens when the research study stops?

If the study stops/finishes before the stipulated time, this will be explained to the patient/volunteer.

15. What if something goes wrong?

If any severe adverse event occurs, or something goes wrong during the study, the complaints will be handled by reporting to the institution (s), and Institutional ethical community.

16. Will my taking part in this study be kept confidential?

Yes

17. What will happen to the results of the research study?

The results of the study will be used to be compare facial divine proportions among different growth pattern..

18. Who is organizing the research?

This research study is organized by the academic institution (BBDCODS).

19. Will the results of the study be made available after study is over?

Yes

20. Who has reviewed the study?

The study has been reviewed and approved by the Head of the Dept, and the IEC/IRC of the institution.

21. Contact for further information

Dr. Monika Sharma

Department of Orthodontics and Dentofacial Orthopaedics

Babu Banarasi Das College of Dental Sciences.

Lucknow-227105

Mob- 9120362422

Dr. Rohit Khanna (HOD)

Department of Orthodontics and Dentofacial Orthopaedics

Babu Banarasi College of Dental Sciences.

Lucknow-227105

Mob-9415037011

Dr. Sneh Lata Verma (Reader)

Department of Orthodontics and Dentofacial Orthopaedics

Babu Banarasi College of Dental Sciences.

Lucknow-227105

Mob-8960943326

Signature of PI……

Name……..

Date……

ANNEXURE -IV

Babu Banarasi Das College of Dental Sciences

(Babu Banarasi Das University, Lucknow)

BBD City, Faizabad Road, Lucknow – 227105 (INDIA)

प्रतिभागी के तिए

1.अध्ययन शीर्क? **सूचना पत्र**

क्षैतिज और ऊर्ध्वधर चेहरे के पैटर्न मेंं चेहरे के तिव्य अर्ुपवि की िुलर्ः एक िुलर्वत्मक अध्ययर्

2. तनमंत्रण अनुच्छेद?

मवन्य हीं।

3. अध्ययन का उद्देश्य क्या है?

क्षैतिज और ऊर्ध्वधर चेहरे के पैटर्न मेंं चेहरे के तिव्य अर्ुपवि की िुलर्ः एक िुलर्वत्मक अध्ययर्

4. मुझे इस अध्ययन के तिए क्ययं चुना गया है?

तकसी रोगी की आवश्यकिव हीं है।

5. क्या इसमेंं मुझे भाग िेना चातहए?

मवन्य र्ही।

6. मुझे क्या हयगा यतद मैंं इस अध्ययन मेंं भाग िेिा हं।

मवन्य र्ही।

7. मुझे क्या करना है?

मवन्य र्ही।

8. तकस प्रतिया का अध्ययन तकया जा रहा है?

इस प्रतियव मेंं क्षैतिज और ऊर्ध्वधर चेहरे के पैटर्न मेंं चेहरे के तिव्य अर्ुपवि कव िुलर्वत्मक मूल्वकर् शवतमल होगवः एक िुलर्वत्मक अध्ययर्

9. इस शयध में कौन से हस्तक्षेप तदए जाएं गे?

औसत वृद्धि पैटर्न वाले तवषयों में चेहरे के तिव्य अर्ुपवि कव मूल्ांकर् करर्व।

• क्षैतिज तवकवस पैटर्न वाले तवषयों में चेहरे के तिव्य अर्ुपवि कव मूल्ांकर् करर्व।

• ऊर्ध्वधर तवकवस पैटर्न वाले तवषयों में चेहरे के तिव्य अर्ुपवि कव मूल्ांकर् करर्व।

• तवतभन्न तवकवस पैटर्न वाले तवषयों में चेहरे के तिव्य अर्ुपवि की तुलर्ा करर्व।

10. इस अध्ययन में भाग लेने के क्या दुष्प्रभाव हैं?

मवन्य र्ही।

11. इस अध्ययन में भाग लेने के संभातवत जोखिम और नुकसान क्या है?

मवन्य र्ही।

12. अध्ययन में भाग लेने के संभातवत लाभ क्या है?

मवन्य र्ही।

13. क्या हयगा यतद कयई नई जानकारी उपिब्ध हय जाती है?

मवन्य र्ही।

14. क्या हयिा है जब अध्ययन / शयध परीक्षण बंद हय जाता है?

मवन्य र्ही।

15. क्या हयगा अगर कु छ गित हय जाता है?

मवन्य र्ही।

16. क्या इस अध्ययन में मेरा तहस्सा गयपनीय रिा जाएगा?

मवन्य ।

17. अध्ययन / शयध परीक्षण के पररमाण का क्या हयगा?

अध्ययर् के पररणवमों कव उपयोग तवतभन्न तवकवस पैटर्न के बीच चेहरे के तिव्य अर्ुपवि की तुलर्ा करर्े के तलए तकयव जवएगव।

18. इस अध्ययन कय कौन आयोजित कर रहा है और इस परीक्षण के तिए धन कहां से आएगा?

यह शोध अध्ययर् शैक्षतणक संस्थवर् (बीबीडीसीओडीएस) द्ववरव आयोतजत तकयव जवव है।

19.क्या सेवाएं शयध ित्म हय जाने के बाद उपिब्ध रहेगी या नही?ं

हव।

20. अध्ययन की समीक्षा तकसने की है?

अध्ययर् की समीक्षव की गई है और तवभवग के प्रमुख, और आईईसी/आईआरसी के द्ववरव अर्ुमोतित तकयव गयव है। तर्म्न
लोगों से संपक करें

21.अतधक जानकारी के तिए संपक करें ।

डॉ.मयंकनका शमा
ऑथोडोंटक्स और डेंटोफेशयल ऑथोपेतडक्स
तवभवग बवबू बर्वरसी कॉलेज ऑफ डेंटल
सवइसेज।
लखर्ऊ-227105
मो.- 9120362422
डॉ रोतहि खन्नव (एचओडी)
ऑथोडोंटक्स और डेंटोफेशयल ऑथोपेतडक्स

तवभवग बवबू बर्वरसी कॉलेज ऑफ डेंटल
सवइसेज।

लखऊ-227105
मो.-9415037011
डॉ स्नेह लिव वमव (रीडर)
ऑथोडोंटक्स और डेंटोफेशयल ऑथोपेडिक्स
तवभवग बवबू बर्वरसी कॉलेज ऑफ डेंटल
सवइसेज।
लखऊ-227105
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bbdcods.iec@gmail.com
पीआईकवहस्तक्षर .....
र्वम .....
तिर्क.....

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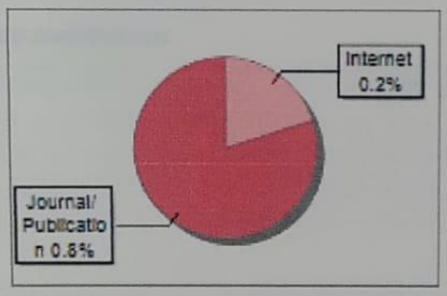
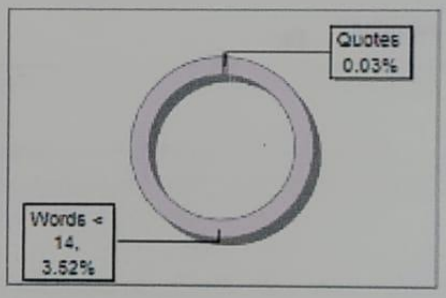
Submission Information

Author Name	Monika sharma
Title	COMPARISON OF FACIAL DIVINE PROPORTIONS IN HORIZONTAL AND VERTICAL FACIAL PATTERN: A COMPARATIVE STUDY
Paper Submission ID	1449263
Submitted By	amarpal.singh056@bbdu.ac.in
Submission Date	2024-02-20 10:47:30
Total Pages	60
Document type	Dissertation

Result Information

Similarity 1 %





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Language	English
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Journals & publishers	Yes
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SIMILARITY %	MATCHED SOURCES	GRADE

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LOCATION	MATCHED DOMAIN	%	SOURCE TYPE
1	www.dx.doi.org	<1	Publication
2	bioresources.cnr.ncsu.edu	<1	Internet Data
3	www.biosciencejournals.com	<1	Publication
4	The use of three-dimensional cephalometric references in dentoskeletal symmetry by Porto-2014	<1	Publication
5	www.medrech.com	<1	Publication

APPENDIX-III

Babu Banarasi Das College of Dental Sciences

(Babu Banarasi Das University)
BBD City, Faizabad Road, Lucknow – 227105 (INDIA)

Consent Form (English)

Title of the Study: Assessment of aesthetic outcome after retraction of anterior teeth in subjects with different facial divergence: a cephalometric study

Study Number……..
Subject's Full Name…….
Date of Birth/Age …… ,
Address of the Subject…….
Phone no. and e-mail address……
Qualification ……
Occupation: Student / Self Employed / Service / Housewife/
Other (Please tick as appropriate)
Annual income of the Subject……
Name and of the nominees(s) and his relation to the subject.....(For the purpose of compensation in case of trial related death).

1. I confirm that I have read and understood the Participant Information Document dated..... for the above study and have had the opportunity to ask questions. **OR** I have been explained the nature of the study by the Investigator and had the opportunity to ask questions.

2. I understand that my participation in the study is voluntary and given with free will without any duress and that I am free to withdraw at any time, without giving any reason and without my medical care or legal rights being affected.
3. I understand that the sponsor of the project, others working on the Sponsor_s behalf, the Ethics Committee and the regulatory authorities will not need my permission to look at my health records both in respect of the current study and any further research that may be conducted in relation to it, even if I withdraw from the trial. However, I understand that my Identity will not be revealed in any information released to third parties or published.
4. I agree not to restrict the use of any data or results that arise from this study provided such a use is only for scientific purpose(s).

Yes [ ] No [ ] Not Applicable [ ]

6. I agree to participate in the above study. I have been explained about the complications and side effects, if any, and have fully understood them. I have also read and understood the participant/volunteer's Information document given to me.

Signature (or Thumb impression) of the Subject/Legally Acceptable Representative:……..
Signatory_s Name……. Date …….
Signature of the Investigator…… Date……..
Study Investigator_s Name..... Date……..
Signature of the witness…… Date……..

Name of the witness……

Received a signed copy of the PID and duly filled consent form

Signature/thumb impression of the subject or legally Date……..

Acceptable representative

APPENDIX-IV

Babu Banarasi Das College of Dental Sciences

(Babu Banarasi Das University)

BBD City, Faizabad Road, Lucknow – 227105 (INDIA)

सहमति पत्र

अध्ययन का शीर्षक :- तिथि प्रकार के चेहरों में बहार तनकले दाांिो को अांदर ले जाने की प्रक्रिया से स ांदरिा में आये बदलाि का आकलन: ए सीफ्लोमेट्रिक अध्ययन I

अध्ययन सांख्या ....

तिर्य का पूरा नाम .....

जन्म की िारीख / आय ु .....

तिर्य का पिा .....

फोन नांबर। और ई-मेल पिा .....

योग्यिा .....

व्यिसाय: छात्र / स्ियां कायषरि / सेिा / गृतहणी / अन्य (कृ पया उतचि के रूप में तचतननि करें) तिर्य की िार्षर्क आय .....

नाम और नामाांक्रकि व्यतक्ति (नाम) और उनके तिर्य के सांबांध में .....

(प्रयोजन के तलए म ुकदमा सांबांतधि मौि के मामले में म ुआिजे)

1. मैं प ुति करिा ह क मने प्रतिभागी सचना दस्िाि ेज को पढ़ तलया है और समझ तलया है .... इसके बाद के

अध्ययन के तलए और साि पूछने का अिसर तमला ह। या म झे अन्िेर्क द्वारा अध्ययन की प्रकृ ति समझाई गई है और साि पूछने का अिसर तमला ह।ै

2. मैं समझिा ह क अध्ययन में मेरी भागीदारी स्िैच्छछक है और तबना क सी दबाि के स्िि ांत्र इच्छा केसाथ दी गई है और क सी भी कारण के तबना क सी भी समय तबना क सी मेतडकल दखभाल या कानूनी अतधकारों को प्रभातिि क ए तबना क सी भी समय मैं िापस लेने के तलए स्िि ांत्र ह।

3. मैं समझिा ह क इस पर ायोजना के प्रायोजक, प्रायोजक की ओर से काम करने िाले अन्य लोग, एतथक्स कमेटी और

तनयामक प्रातधकरणों को मरे मौजूदा अध्ययन के सांबांध में अपने स्िास्थ्य के र कॉड को दखने की मेरी अन मति की

आिश्यकिा नहीं है और आगे की शोध इसके सांबांध में आयोतजि क या जा सकिा है, भले ही मैं परीक्षण से िापस ले जाऊ। हालाांक्रक, मैं समझिा ह क मेरी पहचान िीसरी पाटी के तलए जारी क सी भी जानकारी या प्रकातशि में प्रकट नहीं होगी।

4. मैं इस अध्ययन से उत्पन्न क सी भी डटा या पर णामों के उपयोग को प्रतिबांतधि करने के तलए सहमि नहीं ह एक प्रयोग के िल िैज्ञातनक उद्देश्य

(प्रयोजनों) के तलए है

5. भतिष्य के अन सांधान के तलए मैं सांग्रहीि नमूने (दाांि / ऊिक / रि) का उपयोग करने की अन मति दिा ह हाँ नहीं [ ]

6. मैं उपरोक्त अध्ययन में भाग लेने के लिए सहमत हूं। मुझे जटिलताओं और साइड इफेक्ट्स, यदि कोई हो, के बारे में समझाया गया है और मैंने प्रतिभागी/सहयोगी के सूचना दस्तावेज को भी पढ़ा और उन्हें पूरी तरह से समझा है।

समझ लिया है प्रतिनिधि: .....

हस्ताक्षरकर्ता का नाम ..... दिनांक .....।

अनुिेर्क के हस्िाक्षर ..... क्रदनांक ....
अध्ययन अनुिेर्क का नाम ..... क्रदनांक ....
गिाह के हस्िाक्षर ..... क्रदनाांक ....
गिाह का नाम .....
पीआईडी की एक हस्िाक्षररि प्रति और तितथि भरी सहमति फॉमष
प्राप्त क्रकया तिर्य के हस्िाक्षर / अांगूठे का प्रभाि या कानूनी
िौर पर क्रदनांक ....

स्िीकायष प्रतितनतध