CORRELATION OF CHEILOSCOPIC PATTERN IN DIFFERENT SAGITTAL SKELETAL MALOCCLUSIONS.

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Table No.	Title of the Table
1	**Ethical committee approval form**
2	**Institutional research committee approval certificate**
3	**Consent form**
4	**PID from English**
5	**PID from Hindi**
6	**Plagiarism Report**
7	**Master data for the study**

TABLE OF CONTENTS

Introduction: Cheiloscopic pattern are unique to an individual, and have been used for identification in forensic sciences. The lip print pattern as a simple, convenien, non-invasive, non-radiographic method to predict and intercept the malocclusion had been anticipated because of its development at the same time as that of facial structure.

Material and method:145 subjects were divided into three groups based on their sagittal skeletal relationship as Group-I, (Class-I malocclusion, N=60 subjects), Group-II (Class-II malocclusion, N=60 subjects) and Group-III (Class-III malocclusion, N=25 subjects) using ANB angle, WITS appraisal and YEN angle. Lip prints of all the patients were recorded on the photographic paper with the help of the Lipstick . To avoid smudging of the lip prints taken on the photo paper lip prints were secured with a cellotape. The lip print pattern was scanned as a whole and was analysed in three different zones(right, centre and left), for both upper and lower lips.

The lip prints were analysed according Tsuschihashiclassification(typeI-IV) and interzone, intergroup and gender comparisons were done. Appropriate statistical analysis was done for comparing the parametres.

Result:No sexual dimorphism for cheiloscopic pattern was seen in all three groups. Most frequent lip print pattern was type I+TypeI'in group I ,TypeI'+Type I in group II and Type IV +Type I in group III for both upper and lower lip.Interzone comparison showed that cheiloscopic pattern of right and left zone did not differ significantly for both lips in each group. However, statistically significant difference was seen for right v/s centre and left v/s centre zone. Also intergroup comparison revealed statistically significant difference between groups. Cheiloscopic pattern showed statistically significant difference only for group III.

Conclusion: The type of cheiloscopic pattern deferred within in each group, but no definitive trend was seen. Hence its use as a reliable marker to assess sagittal malocclusion needs to be supported by further studies.

Keywords- Chieloscopy, sagittal dysplasia, Malocclusion

Malocclusion refers to the abnormal position of teeth in relation to the basal bone, to the adjacent teeth or to the opposing teeth , which compromises the health of oral tissues,disturb balance of stomatognathic system and can also lead to psychological and social problems . Causes of malocclusion are multifactorial but deleterious habits and local factors play an important role in facial and occlusal features and its prevalence is varied in different ethnic and racial groups. The early diagnosis and interventions is essential to address the improper developmental process and control environmental factors that causes malocclusion during the period of active growth. There are different methods available to predict malocclusions, which can help to prevent or intercept malocclusion at early stage, obviating the need of extensive orthodontic treatment later.

The diagnosis of malocclusion is accomplished conventionally by taking case history, clinical examination and cephalometric radiographs. Clinical examination at an early age when dentition is in transition stage (from primary to mixed),give an idea about space discrepancy problems at later stages.However for jaw discrepancy problems seen during this time,it is difficult to predict maxillary and mandibular basal bone growth by clinical examination alone.Maxillary and mandibular basal bone growth continues during this stage thus clinical examination of jaw bases cannot tell us about final skeletal jaw relationship once the growth is over . For the prediction of growth, serialcephalometric radiographs can be taken but this exposes the child to unnecessary radiation.

Considering this a simple, convenient, non invasive, non radiographic method to predict malocclusion at later stages would be helpful for predicting and intercepting the malocclusion.Finger print pattern (dermatoglyfics) and lip print pattern (cheiloscopy)had been used in forensic sciences for personal identification and criminal investigation .Finger and lip print pattern remain same throughout the life and are characteristic to each individual.Previous studies have attempted to find out an association between the Chelioscopic pattern (Lip prints) and malocclusion, if existed it can be used as simple and noninvasive predictor for future malocclusion.

Lip prints are normal lines and fissures in the form of wrinkles and grooves present in the Zone of transition of human lip, between the inner labial mucosa and outer skin, examination of these lip prints is known as

Cheiloscopy[1].The word "Cheiloscopy" is derived from the Greek word cheilos, which means lips. The lip prints are unique to an individual just like the fingerprints and shows strong hereditary pattern.[2] It also has been proved that lip prints recover after undergoing alterations such as minor trauma, inflammation and herpes and that the disposition and form of furrows does not vary with environmental factors.[3]

The furrows on the red part of human lips was first noted by anthropologist R.Fischer and he was the first to describe it in 1902.[4] In 1990, Kasprzak conducted a research for period of five years on 1500 persons to elaborate the practical use of cheiloscopy[4]. However, it was only in 1932 that Edmond Locard, one of France's greatest criminologists, recommended the use of lip prints in personal identification and criminalization[5].In 1950, Synder reported in his book *Homicide Investigation* that the characteristics of the lips formed by lip grooves are as individually distinctive as the ridge characteristics of finger prints[6]. Suzuki, in 1967, made detailed investigations of the measurement of the lips, the use and color of rouge, and the method for its extraction to obtain useful data for practical forensic application.[7]McDonell in 1972 conducted a study on lip prints between two identical twins and reported that two identical twins seemed to be indistinguishable by every other means but their lip prints were different. [8]

Lip groove pattern are established during 6th week of intrauterine life.[9] The basis of studying the relationship between lip print pattern and various dental anomalies is due to the development of teeth and associated structures(palate and alveolus), which coincides with the development of lip pattern during the 6th -13th week of intrauterine life.[10] The embryological development of palate ,alveolus and lips takes place at the same time .Any disturbance causing event during this period can effect all of these structures . The deviation from normal due to extraneous factors at the time of development, might also be reflected in the cheiloscopicpattern,Hence it was decided to evaluate cheiloscopic pattern in different dental deseases in previous studies. Lip print demonstrate significant regional variations,and are considered as analogous entities to dermatoglyphic pattern in correlation with various disease states like early childhood caries, malocclusion and periodontal problem.Jalannavar et al 2018 observed prevalence of dental caries was higher among children with branched groove lip patterns and malocclusion among reticular lip patterns.[1]

Aditi et al [11] 2021 observed Type I' PVG was most prevalent in skeletal Class I malocclusion and Class II Division 2 malocclusion ,Type III IG was most prevalent in skeletal Class II Division 1 malocclusion ,Type I CVG was most prevalent in skeletal Class III malocclusion **.**Kulkarni N et al,2012[12]observed that a combination of 1,III; 1′,III; and II,III types of lip prints were predominant in skeletal class I group of individuals. 1, IV and III,IV types of lip print combinations were predominant among skeletal class III group of patients. 1,II type of lip print combination was observed to be more predominant among skeletal class II individuals. .Ponnuswamy et al[8] undertaken the study to assess the strength of association between lip prints and skeletal class I and class II malocclusion in 25 patients .Statistically significant difference between the two malocclusions were observed in the Vertical and Branched patterns while the intersected, reticular and undermined patters showed no difference . Kaushal et al[2] 2018 obsrevered branched lip pattern to be most predominant.They did not find any correlation of lip prints with skeletal class I and class II malocclusion.

Over the year,various scientist had attempted to classify lip pattern Santos had divided into simple and compound types. Simple type was further subdivided into straight line, curved line, angled line, and sine‑shaped curve. Compound type was further subdivided into bifurcated, trifurcated, and anomalous groups. Suzuki and Tsuschihashi divided the Lip groove patterns into six types: Type 1 (clear cut groove running vertically across the lips), Type 1' (straight groove that disappear half way into the lip instead of covering the entire breadth of the lip or partial length of groove of Type 1), Type 2 (grooves that fork in their course or a branched groove), Type 3 (intersected groove), Type 4 (reticular groove), and Type 5 (grooves that do not fall into any of the above categories and cannot be differentiated morphologically)13.;AfcharBayat classified Lip groove patterns are into seven types: A1 (vertical and straight grooves, covering the whole lip), A2 (like the former, but not covering the whole lip), B1 (straight branched groove), B2 (angulated branched groove), C (converging grooves),   D (reticular pattern groves), and   E (other grooves)[9].RenauldsLip groove patterns are divided into tentypes: Type a (complete vertical), Type b (incomplete vertical), Type c (complete bifurcated), Type d (incomplete bifurcated), Type e (complete intersecting), Type f (incomplete

intersecting), Type g(reticulated), Type h (in the form of sword), Type i (horizontal), and Type j (other types).[9]etc.Amongst this Suzuki and Tsushihashi[13] classification as used in most of the studies was selected for classification of lip print pattern in present study.

Cheiloscopic pattern were found to be characteristic for population groups . Earlier studies included evaluation of the prevalence of different lip patterns in different population groups.Tsuchihashi[9] found that intersected lip pattern was most frequent in the Japanese population. Sivapathasundharam et al [14].noted that intersected lip pattern was predominant in Indo‑Dravidian population. Verghese et al. [15](2010) found that reticular lip pattern showed the highest incidence in Kerala population. Several studies have shown correlation between lip prints and dental caries and malocclusion.

As cheiloscopic pattern revealed variation in different population groups ,it could be anticipated that variation in the cheiloscopic pattern would be seen in skeletal malocclusion of different population groups.Also association between cheiloscopic pattern would be seen in skeletal malocclusion ,if existed can be used as a simple and non invasive predictor for future malocclusion for particular population groups.

Lip prints can easily be obtained by applying lipstick with applicator and imprint is taken on photo paper and secured with cellophane tape or directly on the cellophane tape which is stuck on the paper to secure the impression .The former method was used in the present study as lip print do not smudge by this method ,making its interpretation easy.Various authors has analysed the lip print pattern in different areas ,10 mm extent from the centre of the lower lip on either sides,four quadrants (upper right,upprleft,lower right ,lower left) and right,centre and left zones for upper and lower lip .To get better idea of lip print pattern on both sides we decided to evaluate it in three zones(right,centre,and left) for upper and lower lip in this study .Considering this, the present study was designed to explore the possible association of lip prints with sagittal skeletal malocclusion in our population.

AIM

The aim of the study was to assess chelioscopic pattern in different sagittal skeletal malocclusions.

OBJECTIVES

I.   To assess the cheiloscopic pattern of upper and lower lips in skeletal Class I malocclusion group in three different zones for males and females.

II.   To assess the cheiloscopic pattern of upper and lower lips in skeletal Class II malocclusion group in three different zones for males and females.

III. To assess the cheiloscopic pattern of upper and lower lip in skeletal Class III malocclusion group in three different zones for males and females.

IV.   To compare cheiloscopic patterns between different zones, both for upper and lower lips within the groups

V.   To compare cheiloscopic patterns, both for upper and lower lips between males and females in all the three skeletal malocclusion groups.

VI.   To compare cheiloscopic patterns , both for upper and lower lips between different types of skeletal malocclusion groups.

VII. To compare cheiloscopic patterns, between upper and lower lips within three skeletal malocclusion groups.

Vargese A J,Someskar M, Babu RU 2010[15]

This study was taken up to determine the predominant lip print type in Kerala population. 50 male and 50 female subjects of Kerala origin were included in the study. the study area was middle 10 mm of lower lip.Lip print is recorded with lipstick cellophane method. Type IV (reticular grooves) was the predominant pattern found in kerela populaion.lip print were classified accoding to Tsuchihashi"s classification of Type I (complete vertical grooves), Type I" (incomplete vertical grooves), Type II (forking grooves), Type III (intersecting grooves), Type IV (reticular grooves) and Type V (undetermined grooves).

Kulkarni N et al,2012[12]studied to find the correlation between sagittal skeletal jaw relation and lip prints. They selected 90 patients and divided them into three groups skeletal class I, class II and class III malocclusion.dolphin imaging(10.5) software was used for analyzing sagittal jaw relation. Lip impression was made on a transparent self-adhesive tape and pasted on white bond paper.they observed that a combination of 1,3; 1′,3; and 2,3 types of lip prints were predominant in skeletal class I group of individuals. 1,4 and 3,4 types of lip print combinations were predominant among skeletal class III group of patients. 1,2 type of lip print combination was observed to be more predominant among skeletal class II individuals. There was an association of combination of lip print patterns with respect to angle ANB, WITS appraisal, and beta angle There was significant difference when ANB angle was compared with lip print patterns on upper and lower lips. However, the upper right lip print combinations (1–4) were not significant print patterns. Beta angle showed no significant association with the lower right and left lip print combinations (1–4) but had a significant relation on the same side with 1′,1 combination of lip prints In this study, lip print pattern revealed no association with sagittal skeletal jaw relation.They concluded that lip prints can be employed for sagittal jaw relation recognition.

Raghav P, Kumar N, Singh S, Ahuja N.K,Ghalaut P[22]**, 2013**. The study was conducted to evaluate possible association between lip prints and skeletal malocclusion.114 subjects in the age between 18-30 years were divided in to skeletal class I, Class II and class III groups.Lip prints and lateral cephalograms of the individuals were recorded. Branched lip pattern was most commonly found with no

sexual dimorphism.Vertical lip pattern was prevalent in class III malocclusion therefore a definte correlation between these two was revealed.

Mathew SA,kasim k,Mridula KI,jayashekeran[29](2016). This study was done to determine the predominant rugae pattern and lip pattern in different gender.50 healthy(25 male and 25 female) subjects within 18 -30 years were selected.The most prevalent forms of rugae in both genders were curved and wavy type followed by straight and diverging types.Type IV in upper half of the lip and type I in lower half of the lip is found to be the most predominant in female.In male both upper and lower half showed a predominant type I pattern.They concluded that cheiloscopy and palatoscopy hold the potential to identify the sex and identity of the individual as they remain unique to every individual and remain stable over time.

Ponnusamy S, k Lakshmi V, K.S Premkumar, S. Sumalatha [8]2017. The study was undertaken to assess the strength of association between lip prints and skeletal class I and class II malocclusion in 25 patients .Statistically significant difference between the two malocclusions were observed in the Vertical and Branched patterns while the intersected, reticular and undermined patters showed no difference .They inferred that sagittal jaw relation and dental relationships get established before lip prints ,hence lip print assessment may aid the clinical orthodontist by predicting the type of malocclusion.

Jalannavar P, Prasad R , PatiL P[1], 2018. As lip and tooth enamel are derivatives of embryonic ectoderm,this study was designed to explore the relationship between cheiloscopy and dental caries and malocclusion. The study was conducted among 300 children aged 5-15 years.Dental caries and malocclusion were recorded by using DMFT index and Angle's method respectively. Lip prints were recorded on cellophane tape and analysed by Tsuchihasi's classification.Prevalence of dental caries was higher among children with branched groove lip patterns and malocclusion among reticular lip patterns. They inferred that Cheiloscopy patterns may be utilized effectively to study the genetic basis of dental caries and malocclusion as it is a non-invasive and inexpensive tool for screening.

Kaushal B , Mittal S , Agarwal I[2].2018 conducted the study to explore possible correlation of lip prints with skeletal class I and class II malocclusion with varying growth patterns . 90 subjects in the age group of 18 to 30 years with Class I and class

II malocclusion were divided into two groups. Lip prints of all individual were recorded and comparison was done between groups .Branched lip pattern was found to be most predominant.They did not find any correlation of lip prints with skeletal class I and class II malocclusion.

 Bai et al (2018)[30]**.**This study was done to evaluate the accuracy of various methods for gender determination such as lip prints,mandibular canine index (MCI) and finger prints and correlation between them.300 subjects aged between 18 and 25 years were included.Impression of lower mandibular arches,finger prints and lip prints were collected.Statistical analysis was done.In both males and females , Type II Lip print pattern and loop pattern of finger prints were predominant.Mesiodistal width of right MCI was found to have greater sexual dimorphism than left MCI.They inferred that although lip print ,finger print and mandibular canine index had their own specifications, correlation of three parameters did not show any significance.

.**Ravindran V,Rekha ,CV,Annamalai S,Sharmin DD,Baghkomeh PN**[28]**(2019)**.This study was done to assess the correlation between permanent molars and different cheiloscopic pattern.300 children with fully erupted permanent second molars were included in the study and their molar terminal planes were recorded .Lip prints of middle 10mm of lower lip were taken with lipstick -cellophane method .The most predominant cheiloscopic pattern was found to be type II (branched).It was observed that type I (common vertical) pattern was mostly related to angles class I ,type IV (reticular) pattern to class II . Type IV (reticular) pattern was present and type I (incomplete vertical) pattern was found to be absent in class III molar relations.In class III molar relation ,increased type II (branched) pattern was seen in males and type IV pattern in females.They concluded that lip prints can be an alternative to dermatoglyphics to predict malocclusion in permanent dentition.

Vignesh R,Rekha CV,Annamalai S,Nourozi P,Sharmin D(2017). This study was conducted to determine the correlation between cheiloscopic pattern with the terminal planes in deciduous dentition .the pattern of molar terminal plane of 300 children between 3 to 6 years of age who had complete primary dentition was recorded.lip print was obtained by lipstick-cellophane method.Middle 10 mm of lower lip print was analysed.Predominantly,type II (branched) cheiloscopic pattern was found.In mesial step,type IV (reticular) and type V (irregular) pattern was more prevalent.type

IV (reticular) pattern for distal step and type I(complete vertical) for flush terminal plane .

Mathew SA, Kasim K, Mrudula K, Jayashekeran[29] (2016)compared the uniqueness of rugae pattern and cheiloscopy and to determine the predominant rugae pattern and lip pattern in different gender. The study comprised of 50 healthy (25 males and 25 females)subjects of age between 18 and 30 years, who were randomly selected and they used the classification of rugae patterns suggested by Kapali et al. (straight, curved, wavy and circular), and classification of lip prints according to Suzuki and Tsusuchiashi's. The most prevalent forms in both genders were curved and wavy type followed by straight and diverging types. Most predominant lip pattern in females were Type IV in upper half of lip and Type I in lower half of the lip, in males both upper and lower half showed a predominant Type I pattern.

Kundu S, Gangrade P, Jatwar R, Rathia D[31] (2019) positive foolproof identification of known or unknown, living or deceased individuals are the primary universal roles in forensic criminal or social investigations wherein the definite procedures such as fingerprinting, karyotyping, dental records play the direct role although expensive and technique sensitive.Study sample comprised of 150 medical students i.e., 88 boys and 62 girls in age group of 18–21 years of Government MedicalCollege, Raigarh, Chhattisgarh. With prior ethical clearance (vide ethical dispatch number 200 dated December 07,2015) and informed consent, lip prints were recorded by application of a non smudged but thin and even coat of dark colored lip stick over the oral labial mucosa of the upper and lower lips and transferring the obtained replica to a cellophane paper fixed on to a permanent bond paper. The lip prints were analyzed with classification of Suzukiand Tsuchihashi for discrimination of gender in addition to individual personal identification and common lip print patterns in Raigarh. They concluded as lip prints do not change during thelife of a person hence still further studies needs to be undertaken to substantiate the cheiloscopic technique on the upper crest as a predominant technique for personal and gender identification.

Anu V et al[26] **(2020)** analysed predominant patterns of lip print in females and males and predominantpatterns of finger print in females and males and also identified if there exist any correlation between lip printsand finger prints.A cross sectional study was conducted in Sathyabama Dental College among 500individuals (250 females and 250 males) between age group of 18-40 years. Fingerprint and lip print ofall the subjects were collected and compared, and the results were analyzed based on Micheal Kucken classification system for fingerprints and Suzuki and Tsuchihashi classification for lip prints. Descriptive and inferential statistics were carried out. Level of significance was set as 0.05.They concluded that the reticular lip print pattern was found in majority (36.4%) of the males, whereas vertical grooves(29.6%) and branched grooves (29.6%) are common in females. Finger prints showed that loop pattern ismore common in both males and females. This study showed a significant correlation between lip prints and thumb pattern in males while females showed no significance.

Ghimire N et al [25](2013)analyzed and compared quadrant wise and sex wise predilection of lip print pattern.A total of 200 (18-25years) Nepalese undergraduate students of BPKIHS were selected. Thin layer of lip-stick was applied on the lips of these subjects. The hinged portion of a folded paper was inserted between the lips and the subjects were asked to press their lips onto it. Only middle 10 mm of both upper and lower lips were taken as study area. The lip prints, thus obtained were studied on the basis of Tsuchihashi's classification. Chi square test was used to analyze and compare the lip print patterns in all the quadrants of males and females, with the level of significance p<0.05. They concluded that the lip print pattern can be used as an additional tool for personal identification and sex determination. Further work on the subject can help to make cheiloscopy a practical reality in the forensic identification process.

Vignesh R,Sharmin DD[28] **(2019)**evaluated the correlation between different cheiloscopic patterns with the canine relationship in deciduous dentition.Three‑hundred children who were 3–6 years old with completeprimary dentition were recruited and the relationships between maxillary and mandibular canines were recorded in the proforma. Lip prints of the patients were recorded with

the lipstick‑cellophane method, and middle 10 mm of the lower lip was analysed for the lip print pattern. The patterns were classified based on the Tsuchihashi and Suzuki classification.They concluded that the lip prints can provide an alternative to dermatoglyphics to predict the canine relationship in primary dentition. Further studies with larger sample size are required to provide an insight into its significant correlations.

Mutalik VS[3] et aldetermined the most common pattern of lip prints, palatalrugae, and finger prints in the study subjects. Secondly, to determine if any specificpattern of lip print, palatal rugae, or the finger print concurs in individuals, and therebyestablish a database of these prototypes for human identification from a defined cohort.The sample size comprised 100 female students of a dentalcollege staying together in the hostel. Lip prints were recorded on a white bond sheetusing lipstick, palatal rugae on dental casts, and finger prints using printer's blue ink. They concluded that the approach of human identification utilizing conventional techniques andrelevant parameters is pertinent in defined groups. However, larger representative samplewith robust analytical tools may provide a necessary blueprint of human identification.

Kaushal B[2] et aldesigned to explore the possible association of lip prints with Skeletal Class I and Class II malocclusions with varying growth patterns. A sample of 90 subjects in the age group of 18‑30 years,fromDisttSolan,(H.P.) population were selected. Subjects were divided into two groups group I (Skeletal Class I) and group II (Skeletal Class II). Lip prints of all the individuals were recorded and compared between Skeletal Class I and Class II malocclusions with varying. Results: It was found that Branched lip pattern was most common in DisttSolan population with no sexual dimorphism. They concluded that there was no statistically significant association of lip prints with Skeletal Class I and Class II malocclusion was revealed. Key words: Lip prints, Orthodontic diagnosis, Skeletal malocclusion

Aditi S et al[11]The aim of this study was to assess the association between lip print pattern and different types of skeletal malocclusion.Materials and Methods: A sample of 60 individuals (18–30 years old) with skeletal Class I, Class II Division 1, Class II Division 2, and Class III malocclusion as confirmed by Angle between point A and point B. angle were taken for the study and were named as Groups I, II, III, and IV, respectively. Lip print was recorded by lipstick‑paper method and was classified according to Tsuchihashi classification as Type I,

Type I', Type II, Type III, Type IV, Type V. They concluded that the Lip print will help in sorting out participants in more reliable manner in cases of mass disaster or criminal investigations. Furthermore, they help in predicting type of malocclusion beforehand for the successful execution of preventive and interceptive orthodontic procedures.

Shivani Y [27]**et al** determined the lip prints are the normal lines and fissures in the zone of transition of human lip between labial mucosa and the outer skin. It has been proved that lip prints are analogous to thumb prints. A correlation between thumb prints and sagittal dental malocclusion has already been established. This infers that the lip prints can be employed for sagittal jaw relationship recognition.A total of 30 patients were taken with skeletal class III malocclusion. On the basis of ANB angle and wits appraisal patients were categorized into skeletal class III malocclusion. They concluded that the CVG+RG, PVG+RG, IG+RG types of lip prints were predominant in skeletal class III group of individuals.

Remya S[24]**et al** aimed that the wrinkles and grooves found on the mucosa of lips have characteristic patterns, known as lip prints. The present study was conducted to determine the uniqueness of lip prints, to identify the most common type and to evaluate the gender difference in the lip print patterns. Lip prints of 200 undergraduate medical students (100 males and 100 females) in the age group of 18-23 years were collected and analyzed with the help of a personal computer and Adobe photoshop software. The lip print pattern of an individual is unique and there is difference in the pattern of both sexes.

Garg R, Gupta S, Dagal N, Shekhawat [32] **(2015)**

Carried out this study on 200 individuals of 18 to 65 years of age to study lip print patterns in the SMS college Jaipur with an aim to various patterns of lip prints and document common patterns and their variation in their particular population. The subjects included were without any apparent physical deformity, inflammation, trauma, congenital deformity or orthodontic treatment, disease & deformity of lips. Even subjects with hypersensitivity to lips were also excluded from the study. Each lip was divided in 3 equal parts, where a horizontal line divided the upper lip from the lower lip and two vertical lines divided each lip onto equal 3 parts. Combinations of groove patterns for each part of lip were recorded. the classification of lip patterns

proposed by Tsuchihashi& Suzuki was followed in this study. Findings reveal that the lip pattern of an individual consists of a mixture of several patterns.It was observed that the different segments of the lips frequently had different patterns. Each typenever occurred singly, but in combination with other types. Results of incidences of various patterns among males & females show significant differences. Most common pattern found in present study in females was Type II-(418 segments-69.7%) and in males Type II present in 43% (258 segments). Most common pattern found in upper lip in total population was Type II (Branching Pattern)-336 segments (total 600 segments-56%). Followed by Type III-52.3%, Type I'- 47.3%, Type I-43.5%, Type IV-18.8%. Least commonly present pattern is Type V-95 (15.8%). In lower lip, most common pattern in total population was Type II -340 segments (total 600 segments- 56.7%). Followed by Type III-51.3%, Type I'- 47.8%, Type I-40%, Type IV-19%. Least commonly present pattern is Type V-106 segments (17.7%). No change either in size or in shape of the lip print in different periods (after one year).

Augustine J, Barpande SR, Tupkari JV[33] (2008)

Carried out a study to classify lip patterns and document common patterns and their variations in the population and also to evaluate any difference between the sexes and different age groups to ascertain whether there is any hereditary pattern in lip prints and thereby, to investigate the role of lip prints in person identification. 600 subjects(280 males and 320 females) were selected from rural and urban localities of Aurangabad, Maharastra with a mean age of 23.4(age range was 3-83years). The whole sample was divided in to three groups i.e. Group 1- 1-20 years, Group II- 21-40 y.o and Group III – 41 years and above. Lip print was taken after all the necessary precaution and preparations twice, first using scotch tape and second time using cellophane tape. The images were inverted and analysed in grayscale using an image scanner set at resolution of 600 ppi. The image was stored as TIFF(tagged image file format) for maximum details and analysed using Adobe® photoshop®7.0 software. The lip prints were classified using the classification given by Suzuki and Tsuchihashi (1970). To ascertain the inheritance of lip prints, 52 families with 112 offspring were studied. The lip prints of each member of a family were recorded together in a separate pro forma method. Each lip of the 112 offspring was compared with the

corresponding lip of his or her parents. The number of segments of each lip of the offspring that matched with those of both parents was noted and the higher resemblance of the two was recorded. Comparisons of all the other offspring in the family with their parents were made. Similarly, both the lips of each sibling were compared with the corresponding lip of one of his or her other siblings. Similar comparisons were made with all the other siblings in the family. Resemblance was considered positive if three or more segments of a lip matched with the corresponding lip of the other individual. This suggested that there was a resemblance of 75% or above between the two lips.It was observed that the medial and lateral parts of the lips frequently had different patterns. The most predominant pattern in the entire study population, taking both the upper and lower lips together, was type III which constituted 48.2% of all patterns followed in order by type II (18.92%), type IV (17.44%), type I (11.10%), type I' (2.54%) and type V (1.58%).patterns were found to be more common in the lateral segments than in the medial segments while type IV, type V and type I' were more common in the medial areas than the lateral. The lower lip, in contrast, showed a predominance of type I pattern in the medial segments as compared to the lateral. The upper lip of both males and females showed type III to be the most predominant pattern constituting 45.63% and 44.77% of all patterns respectively. This was followed by type II (25.63% in males and 24.45% in females), type IV (14.82% in males and 19.84% in females) and type I (10.54% in males and 7.27% in females).The lower lip of both males and females showed type III pattern to be the most common (52.68% in males and 50.78% in females) followed by type IV (16.07% in males and 18.52% in females).Among lip prints of 112 offspring studied, 63% were seen to have a positive resemblance with either of the parents.Of the 92 sibling-sibling combinations studied, 45.66% had a 50 positive resemblance with each other.

Ashwini SR et al[34] (2014)

The present study was conducted at School of Dental Sciences, Karad, India with an aim to
determine and compare the predominant lip print pattern in Kerala and Maharashtra population, correlate them in ABO blood groups. The number of subjects selected

were 200 (100 from Maharastra and 100 from kerala). Subjects from maharastra constituted of 69 females and 31 females whereas kerala subjects were all females. The lip print was recorded using the required precaution and procedure. Red lipstick was applied on the lips and the print was duplicated on cellophane tape. The classification scheme proposed by Tsuchihashi was used to analyze the lip prints. The analysis of lip print patterns revealed that no two lip prints matched with each other, thus establishing the uniqueness of the lip prints in each individual. The most common lip print pattern observed in our study group was Type IV (32.5%) followed by Type II (28.5%), Type III (17.5%), Type I (7.5%), Type V and Type I' (7% both).The most predominant lip print pattern in males was Type II and most predominant pattern in females was type IV. The most predominant lip print pattern in Kerala population was Type IV (53%) followed by Type III (19%), Type II (15%), Type V (6%), Type I (4%) and Type I' (3%). The most predominant lip print pattern in Maharashtra population was Type II (42%) followed by Type III (16%), Type IV (12%), Type I (11%), Type I' (11%) and Type V (8%).The lip print patterns does not show any correlation between ABO blood groups.

Ravindran V, Rekha CV, Annamalai S, Sharmin DD, Norouzi-BaghkomehP[28](2019)

With an aimto assess the correlation between different cheiloscopic patterns with the Angle's classification of molar relationships took up this study on 300 children aged 14-16 years with a mean age of 15.31± 0.67 years. Inclusion criteria waschildren with complete permanent dentition except 3rd molars, with complete occlusal development. Exclusion criteria were previous history of orthodontic treatment, retained deciduous teeth or root stumps, previous history of burn or chemical injury or lesions on lips, different molar relationships on either side of the same subject and uncooperative children. The lip print was obtained using the lipstick-cellophane technique and the lip print was read according to the method discussed by Suzuki and TsuchihashiThe middle part of the lower lip (10 mm wide) was taken as study area and Lip print pattern was determined by counting highest number of patterns in the above mentioned region.Type II (branched) pattern is the most predominant cheiloscopic pattern which was equally distributed among all the children. An

increase in type I (complete vertical) pattern was seen in children with class I molar relation. Type IV (reticular) pattern was seen in higher frequency in class II molar relation. Among children with class III molar relation, presence of type IV (reticular) pattern and absence of type I' (incomplete vertical) pattern was predominantly seen. On comparing between genders, among children with class III molar relationship, males showed an increased type II pattern and females showed an increased type IV pattern, which were statistically significant. None of the cheiloscopic patterns showed a significant relationship for permanent molar relationships.

Sharma V, Ingle NA, Kaur N, Yadav P[35](2014)

With a study sample of 200(100 males and 100 female) students in age range of 17-26 years of KD dental college Mathura, took up the study to identify the most common lip print pattern. The subjects fulfilling the inclusion criteria were selected for the study. The lip print was recorded using the lipstick-cellophane method and recorded on a A4 sheet. The sex of lip prints was not disclosed to the examiner, so as to reduce the errors while interpreting the results of thestudy.The pattern of lip prints was studied quadrant wise by using a magnifying lens by one examiner. Patterns of lip prints were classified according to the classification given by Suzuki and Tsuchihashi. The length and thickness of the lips were measured using standard sliding calipers. Measurements for the upper and lower lips were carried out separately. The most common lip patterns found in males were Type III and Type IV (20% each), followed by Type V (18%), Type I' (12%), Type I, Type II, and mixed type (10% each), as compared to females where the commonest patterns were Type I and Type I' (25% each), followed by Type II (17%), Type III and Type IV (10%), mixed type (8%), and Type V (5%).A statistically significant difference was found between males and females lip print pattern.The average thickness of the lower lip in males was 14.0 mm as compared to 11.1 mm in females, and the average difference between males and females was 2.9 mm for the lower lip. The maximum and minimum thicknesses of the lower lip in males were 16.9 mm and 11.5 mm, respectively. In females, the maximum and minimum thicknesses of the lower lip were 15.4 mm and 6.9 mm, respectively.Type III was the most common in quadrant A among males and types I and I' were the most common in quadrants a, b, and c among females.

Priya SP et al [36](2019)

For the practical application of lip prints for verification and comparison of the intentionally registered lip prints with the developed latent lip prints and also to verify uniqueness, gender variations and predominant lip print pattern took up the current study. The sample composed of 102 subjects(52 males and 50 females) in the age range of 18-30 years selected from the Ajman university Fujairah. excluded. Latent and superimposed lip impressions were made on a standard porcelain cup with ten sips within the time of two minutes (without lip rouge) and developed with the fingerprint powder. Lip rouge was applied with a disposable applicator, and a strip of transparent cellophane tape with the sticky side touching the lip was patted to obtain the prints and recorded on a white sheet without disclosing the identity. The sorting scheme proposed by Tsuchihashi was used to classify the lip patterns. Each lip print picture was divided into equal eight segments for the detailed evaluation of the features. The segments close to the midline were numbered as 1 and away from it were numbered as 2.the most frequent pattern was type III and the least common was type V. It was detected that each segment of the lips had displayed different predominant types. Also, no typed feature was present alone in any segment and so the predominant type was recorded. All the segments displayed type III as a predominant pattern except in the right upper 2 (RU2) segment where type I was prominent. Type I was the second frequent pattern Fig. 2: Types of lip prints as proposed by Tsuchihashi 1974. The classification was described as type I: clear grooves running across the lip vertically; type I′: the grooves like type I but do not run the entire height of the lip; type II: the grooves that divide become fork; type III: the intersecting grooves; type IV: the reticular grooves; and type V: the grooves cannot be differentiated into any type Fig. 3: Each lip print picture was divided into equal eight segments for the detailed evaluation of the features. The segments close to the midline were numbered as 1 and away from it were numbered as 2. RU, right upper; LU, left upper; LL, left lower; RL, right lower Fig. 4: Frequency of the lip print types recorded in each segment including both the genders. RU, right upper; LU, left upper; LL, left

lower; RL, right lower; segment close to midline was numbered as 1 and away from it was numbered as 2. Type III was recorded as the most frequent pattern among all the participants Lip Print as a Personal Identification Method followed by type I′, type II, and type IV in the descending order of frequency. Type V was the least common except in the left upper 2 (LU2) segment. The gender variations were not significant with the current report except in right upper 1 (RU 1) and left lower 1 (LL 1) segments.

Rekha VR, Sunil S, RathyR[37](2015)

Carried out this present study with the objectives of evaluating the correlation between lip prints and palm prints and heritability of lip prints and palmprints among parents and their off springs and also as a tool in detection of criminals. The study group comprised of 35 families from South Kerala population 2 to 88 years of age. Participants belong to the same family pedigree—Father, mother, children.Lip prints were traced in the normal rest position of the lips. This lip impression was immediately pasted on a white bond paper. While studying the lip prints, the central one third of each subject's lips was analyzed with the help of a magnifying lens. Digital photograph of right and left palms were taken using Canon IXUS 125 HS Camera and principal lines were analyzed. Y Tsuchihashi and T Suzukis' classification (1950) was used for lip prints. Wu et al's classification was used for palmprints. Category 5 (62.3%) was the most predominant pattern followed by Category 4 (27.2%), followed by Category 2 (6.1%) and Category 3 (4.4%) in the right palm. In the left palm Category 5 (70.2%) was the most predominant pattern followed by Category 4 (20.2%), followed by Category 3 (4.4%) and Category 2 (3.5%) and Category 6 (1.8%).The most predominant lip print pattern obtained was type II (33.3%) followed by type IV(27.2%), type I(24.6%). In this study in the right palm, Category 5 palm prints correlated with Type II lip pattern as no correlation with lip print and leftpalmprint was observed.Positive correlation was found (r = 0.138) between lip prints and right palmprints, but not statistically significant. significant associationbetween lip print patterns among parents and children was seen. No significant association could be established between right and left palm print among parents and children.

Sivan P Priya [38]**et al**

This study was carried out to check the reliability of the lip prints for the personal identification by comparing the registered lip prints with the developed latent lip prints made on the porcelain cups.They included 102 subjects (52 males and 50 females) within the age group of 18–30 years. Latent and superimposed lip impressions were made on a standard porcelain cup. The latent prints were developed with the fingerprint powder. Then, the lip prints with lip rouge were registered on a transparent adhesive tape. Both the developed latent lip prints and the registered lip prints were photographed with a standard ruler using the digital camera and were compared. The lip prints were classified with the scheme proposed by Tsuchihashi.The lip prints were unique to any individual irrespective of the gender variation. Type III was the most frequent pattern observed in the study group.

Nurul Afiqah Amani Binti Zaaba, Gheena[34]**.**

Conducted this study to investigate lip print pattern in males and females and to evaluate them between Malaysian and Indian population.they included 40 participants of both gender. 20 of them are from the Malaysian population and another 20 people are from the Indian population. Each participant was instructed to clean their lips with a clean white cloth, before taking the lip print. The lip prints were taken by lipstick cellophane method.Type I lip pattern was commonly seen in Indian population, followed by type III, II and IV. Whereas for Malaysian population, type III was most common followed by type I, II and IV. There was significant difference between both population. In this study, it showed that type I was the most common lip print pattern seen in both Indian and Malaysian population for females. Whereas for male, type III was more common in Malaysian population, and both type III and IV were more common in Indian population.

Vahanwala[16] **et al 2005**

Carried out this study to ascertain whether the lip-prints behold the potential for determination of sex of the individual from the configuration..They included20 male subjects and 30 females, in the age group of 19-29 years. The lip prints were obtained by lipstick- paper method and analysed by 3 reserachers. All the 30 females were correctly recognized as females on the basis of their lip-prints. Of the actual 20 lip-prints of the males, 16 of them were correctly identified as males, 1 as a female and 3 such lip-prints could not be classified whether male or female .

L.S Makeshraj et al [39](2016)

Conducted this study to find out most common lip print pattern and to assess their efficacy in sex determination. They included   100 individuals comprising of 46 males and 54 females in the age group of 18 to 25 years. They obtained the lip print by lipstick cellophane method.In lower lip, type I (vertical) was most common pattern for both males and females (54.3% and 51.9%). In upper lip, type II pattern (branched) was common in males (45.7%) and type IV pattern (reticular) in females (40.7%).they concluded that Lip prints can be used as an additional tool for personal identification.

Kothari R et al[18](2014)

Carried out this study to determine the sex of an individual from the configuration of lip prints.25females and 25 males of age group of 18-24 years were included in the study. Lipstick paper method was used to procure the lip print.Out of 50 participants, 38 were diagnosed correctly and distribution of lip patterns showed a statisticallysignificant difference between the genders (P< 0.05).

The present study was conducted in the Department of Orthodontics and Dentofacial Orthopedics, BabuBanarasi Das College of Dental Sciences, Lucknow on 145 subjects coming to the Department for Orthodontic treatment in the age range of 16 to 40years(mean age 20.5 ±2.5SD years) .The aim of the study was to find associationof Cheiloscopic pattern with different sagittal skeletal malocclusions. Sample was divided in to three groups- Group I (Class I Skeletal malocclusion), Group II (Class II Skeletal malocclusion), Group III(Class III Skeletal malocclusion).Chelioscopic pattern was assessed in three zones ie right, left and centre for both upper and lower lips.

SAMPLE SELECTION

The appropriate sample for the study was selected based on the following criteria-

Inclusion criteria

1. Patients within age range of 16-40 years.
2. Patients having Skeletal class I, class II, class III malocclusion
3. Patients with normal lip morphology.
4. Patients who werevoluntarilywilling to participate in the study.

Exclusion criteria

1. Patients who have undergone orthodontic treatment, Orthopaedic / myofunctional therapy or Orthognathic surgery previously.

2. Subjects having congenital or facial defects.

3. Patients having any type of mechanical or chemical injury on lips.

4. Individual with known hypersensitivity to lipsticks.

ETHICAL COMMITTEE APPOROVAL

Informed consent was taken from all the subjects as per the format. Approval was obtained from the Ethical and Research Committee of BabuBanarasi Das College of Dental Sciences,Lucknow,U.P,India.

ARMAMENTARIUM USED FOR THE STUDY

Following armamentarium was used in the study.

A. For obtaining lateral cephalogram

Digital Lateral cephalograms with cephalostat machine of Planmecaproline XC cephalostat (Finland) machine.(Figure :1)

Figure 1:Patient's position on cephalostat machine to take lateral cephalogram

B. Tracing armamentarium (Figure: 2)

A. Lateral cephalograph,the usual dimension of which is 8x10 inches

B. Acetate matte tracing sheet paper (0.003 inches thick,8x10 inches)of lateral cephalogram

C. View box

D. Masking tape

E. Sharp 3H drawing pencil

 F. Eraser

G.Protractor
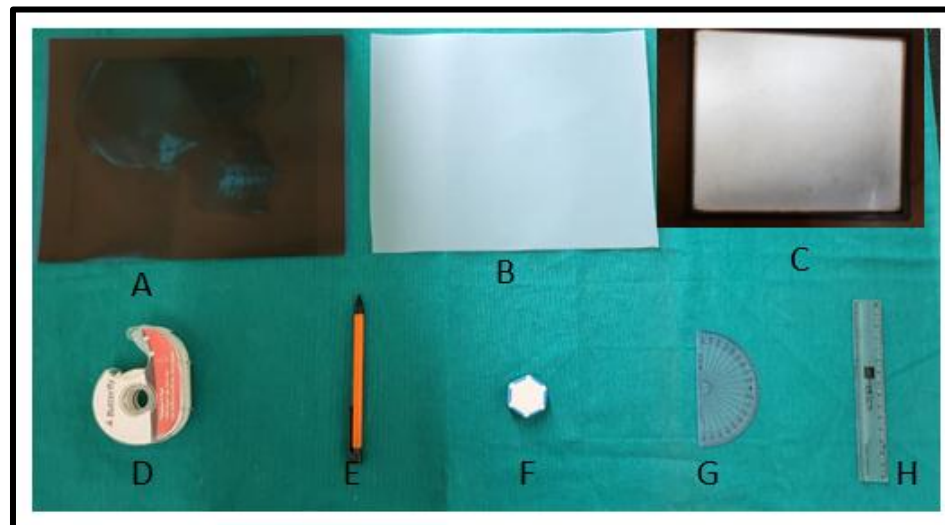
H.Scale

Figure 2: Armamentarium for tracing of lateral cephalogram

A. Lateral cephalograpm B. Acetate matte tracing sheet paper C. View boxD. Masking tape

E. Sharp 3H drawing pencil F. Eraser G. ProtractorH. Scale

C.Armamentarium for obtaining Lip Print (Figure: 3)

A.Lipstick(chambor matte riot Tuscany red 202)

B. Lip brush

C. Bard parker knife (no.15)

D. Dampen dish

E. Photo paper (glossy)

F. Cellotape (1 inch width,clear)
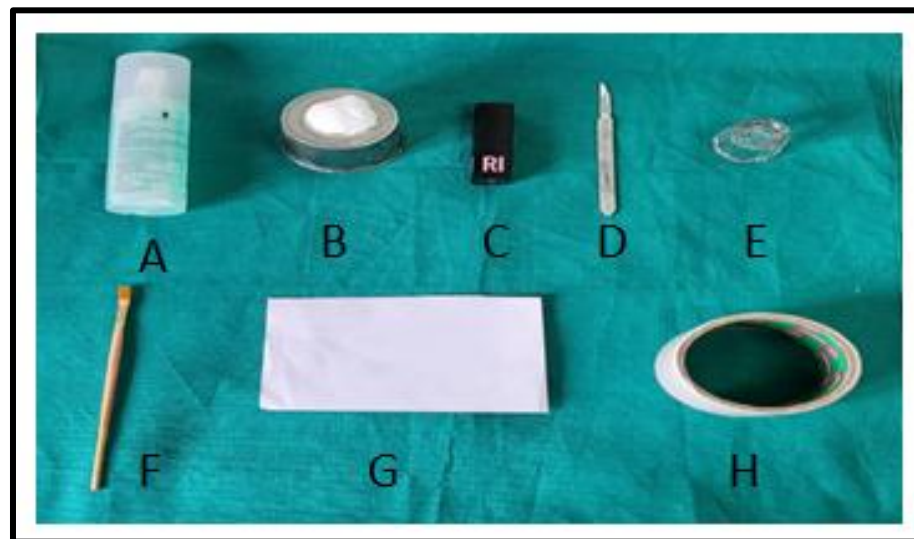
Figure 3: Armamentarium for recording Lip print

A. Cleanser B. Cotton C. Lipstick D. Bard parker knife E. Dampen dish F. Lip brush G. Photo paper G. Cellotape H. Cellotape (1 inch width,clear)

D.For analyzing the lip print pattern

A.Camera with scanner(Samsung galaxy Z flip 3)(Figure 4)
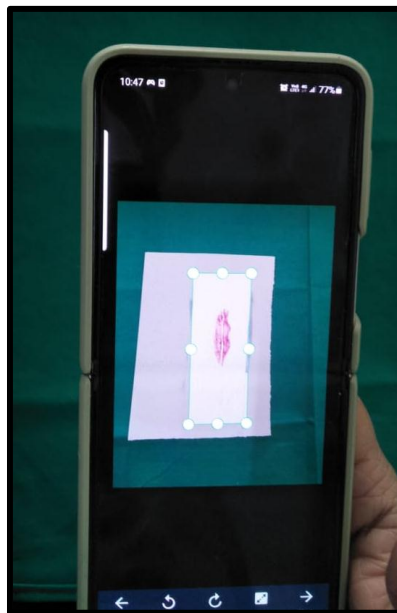
Figure 4: Camera with scanner

Methodology

Methodology will be discussed under following headings.

1.Obtaining the Lateral cephalogram

2.Landmarks,planes and parameters used for distribution of sample

3.Recording of lip print pattern

4.Analysis of lip print Pattern

1.Obtaining the Lateral cephalogram:

PlanmecaprolineXC cephalostat (Finland) was used to take the digital cephalogram of subjects following a standard protocol (Figure 1).The basic equipment to obtain lateral cephalometric views consisted of an xraysource ,an adjustable cephalostat,a film cassette with radiographic intensifying screen and a film cassette holder. All of these components are rigidly attached to each other at a fixed distance,to form cephalomertic radiographic unit.Digitalcephhalogram were taken with functional head positioner and patients were made to stand in natural head position which is a standardized and reproducible orientation of head in space .To achieve natural head position, each subject was asked to see on a distant point at eye level in the wall mirror. The ear post were used for correct sideways alignment of patients head so that the image would besymmetricand undistortedin right left direction. The subjects were asked to occlude in maximum intercuspationi.e centric occlusion and leave the lips relaxed.The receptor sourcedistance was fixed at 60 inch. The exposure values were set at 68 KV,5mA then, and exposure time of 23 seconds.

All lateralcephalogram were then transferred to computer loaded with Planmecasoftwere from where the digital lateral cephalogramwere saved In bitmap files and taken in CD ROM .The lateral cephalogram was then taken in printed hard copy with magnification scale of 1 and traced.

2.Landmarks, planes and parameters used for distribution of sample

Landmarks and reference planes used in the study to distribute the sample in different skeletal malocclusion(Figure: 5)

1-SELLA (s)-The geometric center f the pituitary fossa located by visual inspection.

2-POINT M- Is a constructed poit representing center of larest circle that is tangent to superior and anterior and palatal surface of the maxillary in sagittal plane.

3-POINT A-The deepest midline point on the premaxilla between the anterior nasal spine and prosthion.

4-POINT B- The most posterior point in the concavity between infradental and pogonion.

5- PONT G- The center of the largest circle that bistagent to the internal inferior ,anterior and posterior surfaces of the mandibular symphysis.It is a constructed point constructed by drawing two most fitting circles,then taking mean of the centres of two circles.

6.NASION(N)-The most anterior point present on the fronto nasal suture.

7.SN PLANE-This is defined as the line passes through the point nasion and point sella .

8.FUNCTIONAL OCCLUSAL PLANE –The line passes through the molar and premolar.
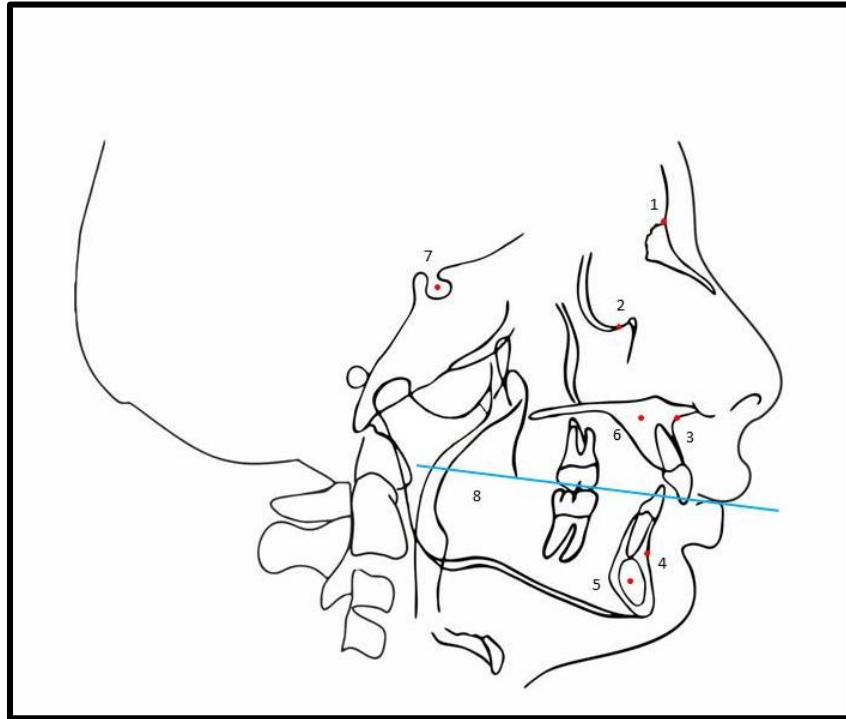
Figure 5:Cephalometric landmarks and planes used in study for sample distribution

1.Nasion2.Sella3.Point A 4.Point B5.Point G6.Point M 7.SN pane8.Occlusal Plane

PARAMETERS TO ASSESS THE ANTRO POSTERIOR DISCREPACY FOR SAMPLE SELECTION Fig. 6 (A,B,C)

1-WITS ANGLE- Linear distance between perpendicular from point A and point B on occlusal plane.

2-YEN ANGLE-The angle formed between the line joining sella (s) to point M and the line joining M to point G.

3.ANBangle:The angle formed between the line joining point A-Nasion and Nasion – point B
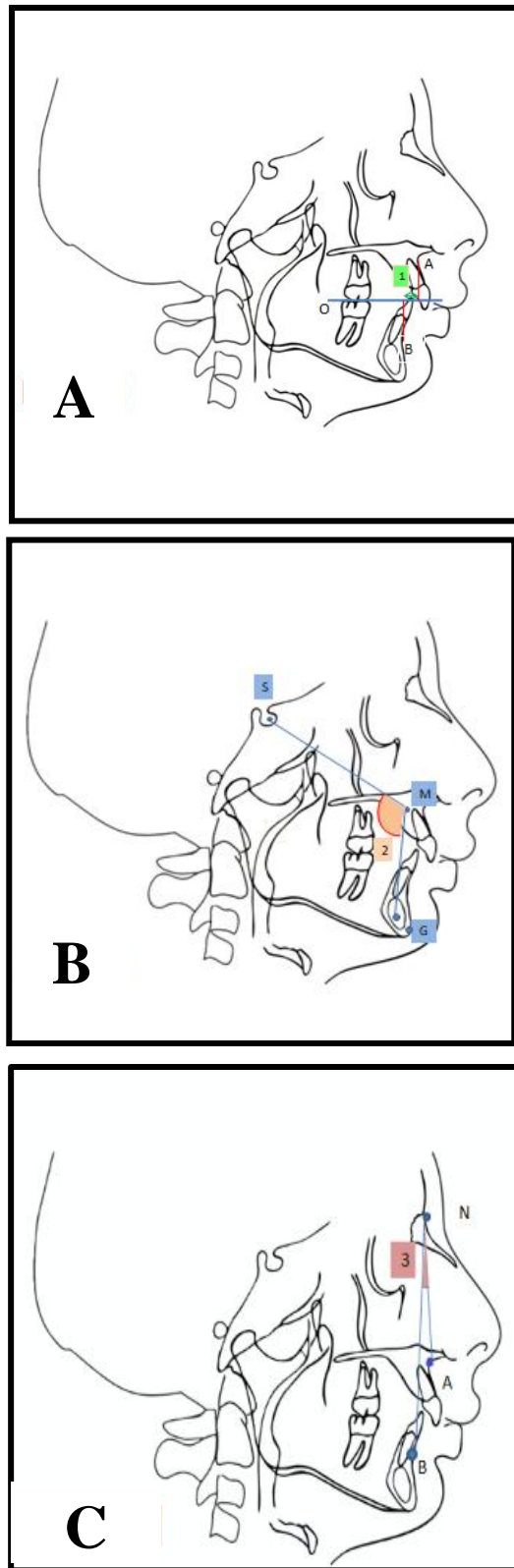
Figure.6 : Sagittal Dysplasia Indicator
A. WITS Appraisal B.YEN Angle C. ANB Angle

DISTRUBUTIONOF SAMPLE

Based on sagittal dysplasia indicators (WITS,YEN and ANB angle) Sample was divided into three groups(Table I ad Table II) ,GROUP1- with class 1 malocclusion(60 subjects),GROUP 2 with class II malocclusion(60 subjects) and GROUP 3 with class III malocclusion (25 subjects) . The groups were futhersubgrouped as Group Ia and Ib for females and males respectively of Group I. Similarly sub groups were made for Group II and III. **Table 3**The procedure and purpose of the study were explained to all the participants and consents forms were obtained at the institutional level

Table 1: Mean values of sagital dysplasia indicators(WITS appraisal,YENangle, and ANB angle)used in the study for sample selection.

Parameter	Class I	Class II	Class III
WITS (in mm)	1-2 mm	>2 mm	<1 mm
YEN angle	117-123 degrees	<117degree	>123 degree
ANB angle	2-3 degree	>3 degree	<2

Table 2: Mean values of saggital dysplasia indicators (WITS appraisal,YEN angle, and ANB angle) of the selected sample

Parameter	Group I Class I malocclusion	Group II Class IImalocclusion	Group III Class IIImalocclusion
WITS (in mm)	2	5	-3
YEN angle(in Degrees)	120	114	125
ANB angle(in Degrees)	2.5	6	-2

Table 3: Final sample distribution in different groups

Total sample N=145	Group I Class I malocclusion (n=60)		Group II Class II malocclusion (n=60)		Group III Class III malocclusion (n=25)	
Subgroups	Ia(females)	Ib(males)	IIa(females)	IIb(males)	IIIa(females)	IIIb(males)
n	n=28	n=32	n=38	n=22	n=14	n=11
Mean age(yrs)	20.5	20.3	22.5	19.7	19.5	21.7

Methodology

Recording of lip print

The participants were asked to sit in relaxed position on a dental chair. The lips of the participants were cleaned with the help of cleanser and cotton(figure 7,8) to remove dead skin,and already applied lip color,to make the lip cleaner and softer for better imprint. A portion of red‑colored lipstick was cut with the help ofBard‑Parker knife to avoid cross contamination and was put into the dappen dish(Figure 7 b   and 7 c). It was applied on the lips with the help of lip brush. The participants were asked to rub both the lips togetherto spread the lipstick(Figure 7d and 7 e).The photo paper strip was placed over the lips, and lip impression was made by pressing the photo paper strip first at the center of the lips followed by uniformly pressing it toward corner of the lips (Figure 8a).The lip impressions were then secured with cellotape so that the imprint doesnot smudge(Figure 8 b).It was then scanned with the camera(Figure 4), visualised and was assessed as per **Tsuschihashi classification**(figure 10). Each sample was divided in 3 zones each (C-centre,R-right,L-left) of upper and lower lip(Figure 9).
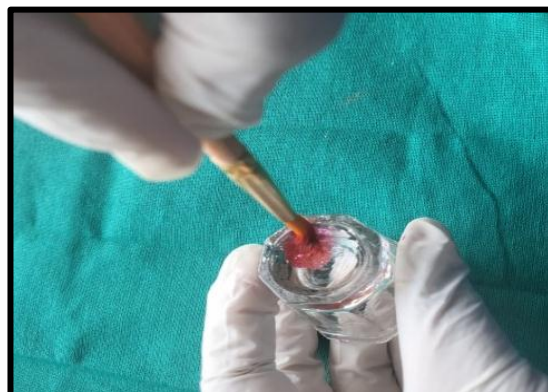
Fig. 7: Application of lip color before recording lip print

A. Cleaning of the Lip **B.** Cutting portion of Lipstick **C.** blending of Lip Color **D.** Application of Lip Color **E.** Ready Lip for Obtaining the imprint

A	**B**
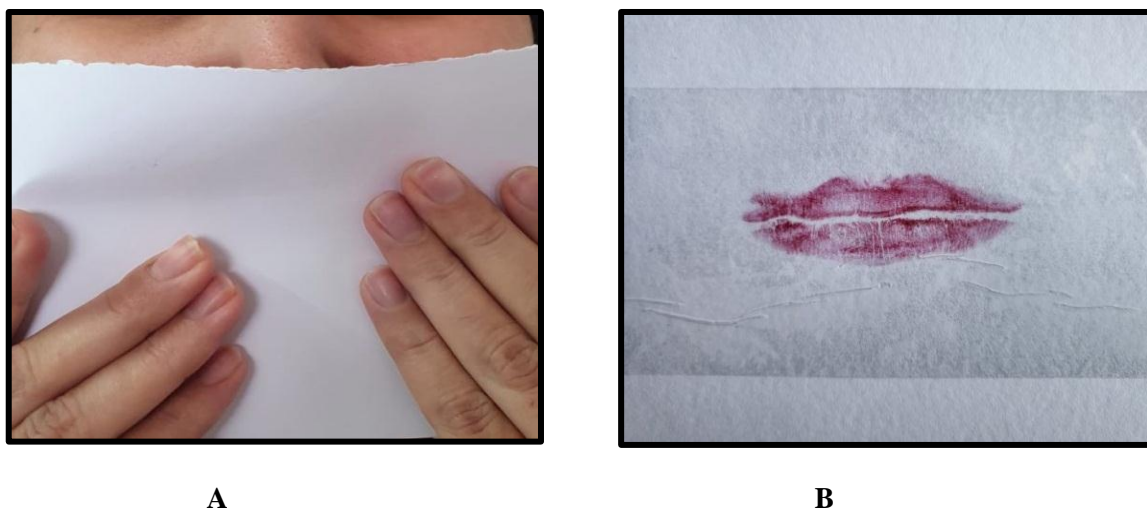
Fig. 8 Recording of Lip Print
A. Recording of Lip Print **B.** Obtained Lip Print secured with cellotape
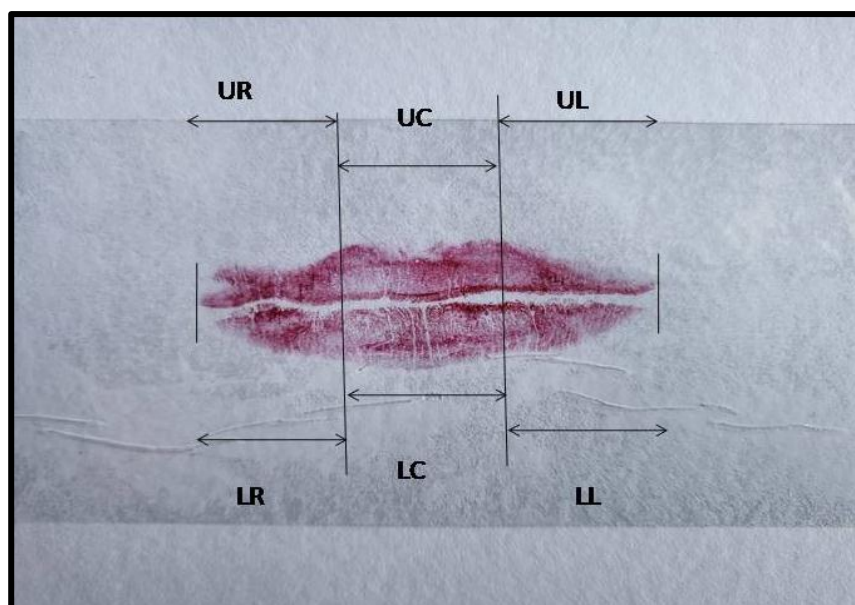
Fig.9: Division of lip Prints in Different Zones

Upper lip zones UR-Upper right,UC-Upper central,UL-Upper Left
Lower lip zones LR-Lower right,LC-Lower central,LL-Lower left
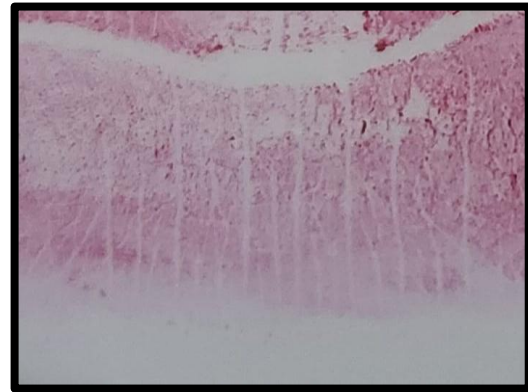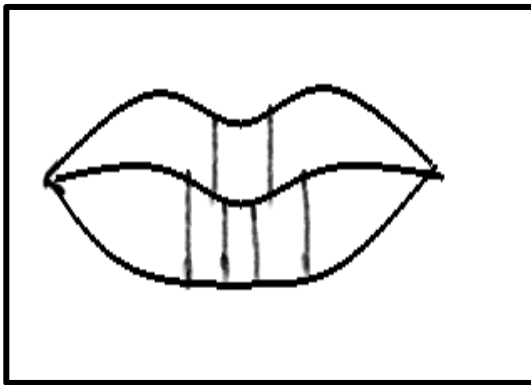
Type I Complete vertical Grooves
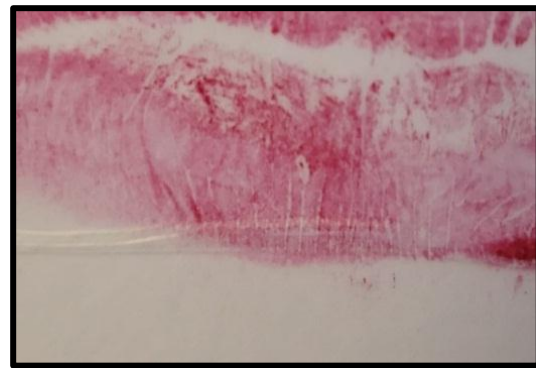
Type II Partial vertical grooves
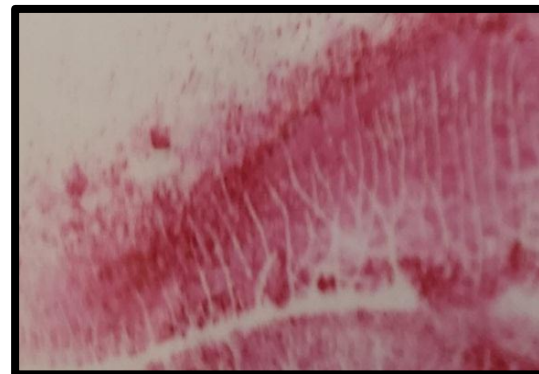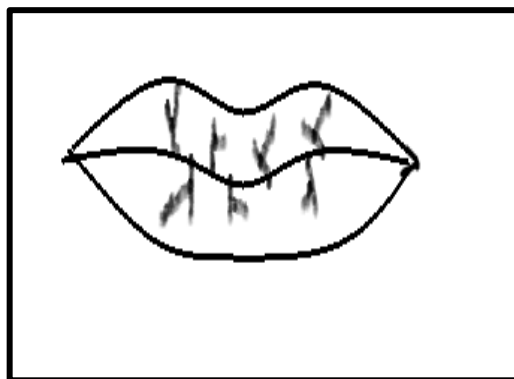
Type III Forked grooves
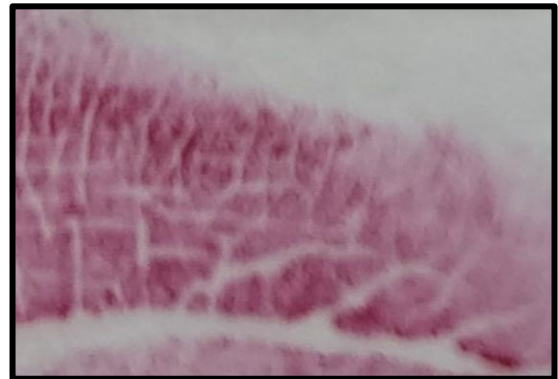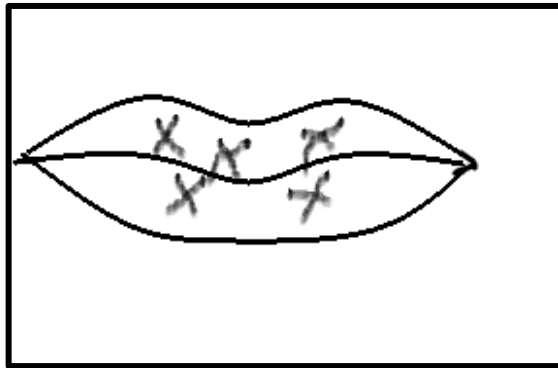
Type IV Intersected grooves
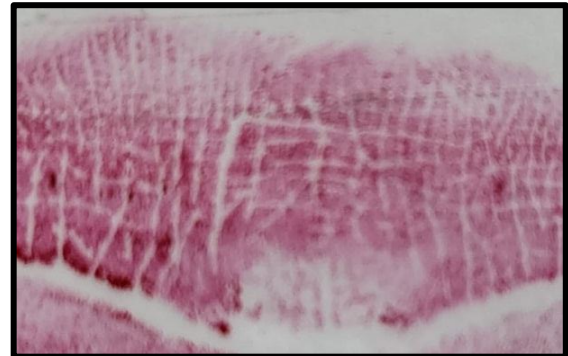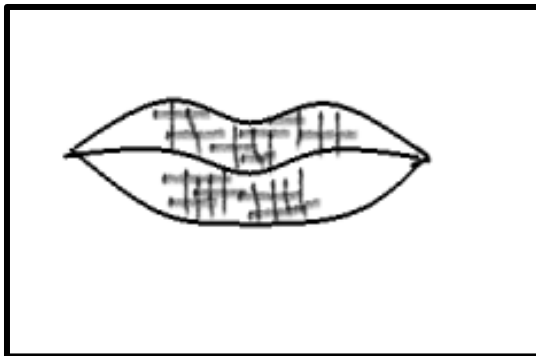
TYPE V Reticular groove
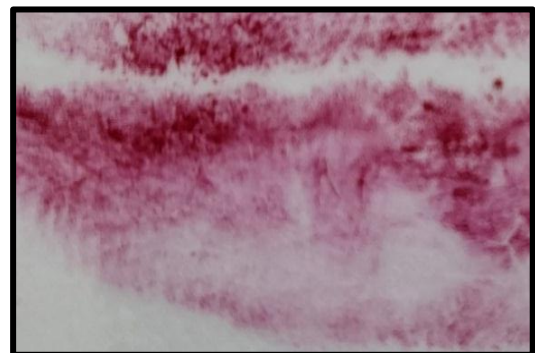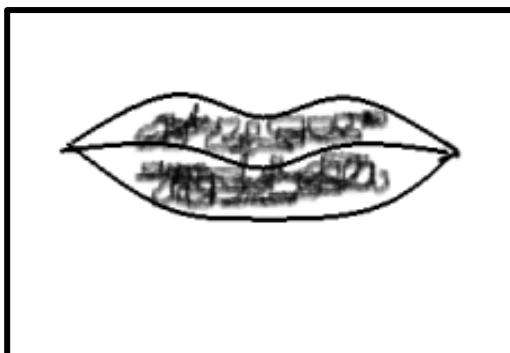
Type VI Undetermined

Fig. 10: Tsuchihashi Classification

Statistical Analysis Tool

Data will be analyzed using Statistical Package for Social Sciences (SPSS) version 21, IBM Inc. Descriptive was reported for each variable. Descriptive statistics such as mean and standard deviation for continuous variables and frequency along with percentages of categorical variables were calculated.

Summarized data was presented using Tables and Graphs. Shapiro Wilk test was used to check which all variables were following normal distribution. Chi square test was used for comparison and analysis of categorical variable between groups. Level of statistical significance will be set at p-value less than 0.05

CHI-SQUARED TEST

- It is to determine if there is any association between categorical data from two or more groups.
- Categorical data are data that can be separated into distinct groups that do not have a numerical relationship or order between them.
  Methodology.
  (a) Make a contingency table. Data are organized into a contingency table comprising row, and columns. The categories for one variable define the rows, and the categories for the other variable defines column.
   (b) Test the difference between observed and expected values.
1. Test compares the size of the discrepancy between the numbers observed in the rows and columns against the number that would be expected if the null hypothesis (that there are no differences between the groups) was true.
2. If the observed and expected values are close then it would be reasonable to anticipate that the null hypothesis is true. 2
3. Chi square distribution is a family of probability density curves that are defined by the number of degrees of freedom.
4. The test statistic CHI square is a squared value it will, always be positive and greater than zero irrespective of the direction of the difference between samples (i.e. greater than or less than).

5. Right hand tail of the CHI square distribution therefore represents the two-tailed probability that the samples were derived from the same population. 2 CHI square tests are therefore always regarded as two sided.

Assumptions.

1. Sample is randomly selected from the population.
2. Actual frequencies (not percentages or proportions) are entered into the contingency table.
3. Observations should be independent (not paired) if data are paired, McNemar's test should be used.
4. All values must be greater than 1. 5. 80% of the expected values must be >5.

$$\chi_c^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

O :Observed Frequency

E :Expected Frequency

Table 4: Measurement Reliability Table

For measurement reliability ,chieloscopic pattern of centre zone of upper lip of subjects each from group I,II and III were repeated.Cheiloscipic pattern was as obtained in first reading was compared to second reading using chi square test and was statistically non significant ,hence reading were reliable.

	Lip prints						
Class I	I	I'	II	III	IV	V	P VALUE
1st Reading	4	1	0	0	5	0	1.000
	40.0%	10.0%	0.0%	0.0%	50%	0.0%	
2nd Reading	5	0	0	0	5	0	
	50.0%	0.0%	0.0%	0.0%	50%	0.0%	
CLASS II 1st Reading	4	1	0	0	5	0	0.873
	40.0%	10.0%	0.0%	0.0%	50 %	0.0%	
2nd Reading	5	0	0	1	4	0	
	50.0%	0.0%	0.0%	10.0%	40%	0.0%	
CLASS III 1st Reading	4	1	0	0	5	0	1.000
	40.0%	10.0%	0.0%	0.0%	50%	0.0%	
2nd Reading	5	0	0	0	5	0	
	50.0%	0.0%	0.0%	0.0%	50%	0.0%	

P>0.05 non significant ; P<0.05 Just significant ; P<0.01 significant ; P<0.001 highly significant

The present study was conducted in the Department of Orthodontics and Dentofacial Orthopaedics Babu Banarasi Das college of Dental sciences, Lucknow with an aim to find association between cheiloscopic patterns and sagittal malocclusion.The sample for this study included lip print patterns of 145 subjects with skeletal Class I (Group I -60 participants), Class II (Group II- 60 participants) and Class III (Group III-25 participants) malocclusion with age range of 15-40 years (mean age 20.5 ±2.5SD years).

Lip prints of all 145 subjects were recorded and each lip print was divided into 3 zones -UR (Upper right) UC(Upper centre),UL (Upper left) for upper lip and LR (Lower right), LC(Lower centre) ,LL (Lower Left) for lower lip. 180 upper and 180 lower lip print zones were assessed for Group-I and Group-II and 75 upper and 75 lower lip print zones were assessed for Group III. The data obtained were tabulated and analysed in the following manners:

1. Comparison of Upper Lip print pattern(center zone) for sexual dimorphism in different groups(Table 5)

2. Comparison of lower Lip print pattern(center zone) for sexual dimorphism in different groups (Table 6)

3. Overall comparison of Upper Lip print pattern between different zones for each groups (Table 7)

4. Overall comparison of Lower Lip print pattern between different zones for each groups (Table8)

5. Comparison of centre zone of upper and lower lip within groups (Table 9)

Table 5: Comparison of Upper Lip print pattern(center zone) for sexual dimorphism in different groups

Groups	Sub Group		Type of lip print pattern						P value
			I	I'	II	III	IV	V	
Group I	I a	N	11	9	0	6	1	1	0.584
		%	39.3%	32.1%	0.0%	21.4%	3.5%	3.5%	
	I b	N	10	10	2	8	0	2	
		%	31.2%	31.2%	6.25%	25%	0.0%	6.25%	
	Total	N	21	19	2	14	1	3	
		%	35%	31.7%	3.33%	23.3%	1.66%	5%	
Group II	I a	N	11	15	2	7	2	1	0.399
		%	28.9%	39.5%	5.2%	18.42%	5.2%	2.63%	
	I b	N	7	9	1	4	1		
		%	31.8%	40.9%	4.54%	18.2%	4.54%		
	Total	N	18	24	3	11	3	1	
		%	30%	40%	5%	18.3%	5%	1.6%	
Group III	I a	N	5	3			6		0.926
		%	35.7%	21.4%			42.9%		
	I b	N	4	3			4		
		%	36.4%	27.3%			36.4%		
	Total	N	9	6			10		
		%	36.0%	24.0%			40.0%		

P>0.05 non significant ; P<0.05 Just significant ; P<0.01 significant ; P<0.001 highly significant

For upper lip print pattern in center zone, Type I and Type I' was observed most for males with equal distribution of 31.2% whereas for females Type I was observed most commonly (39.3%) followed by Type I'(31.2%) in Group I, difference between type of lip print pattern between males and females was statistically non significant.(p value= 0.584)

For upper lip print pattern of Group II in center zone, Type I' was observed most for males(40.9%) followed by Type I (31.8%), similarly for females Type I' (39.5%) was most common followed by Type I (28.9%) and Type I(7.9%) and difference between type of lip print pattern between males and females was statistically non significant.(p value= .399)

For upper lip print pattern of Group III in center zone, Type IV and Type I was observed most for males(both being 36.4%) and for females Type IV was most common(42.9%) followed by Type I(35.7%), and difference between type of lip print pattern between males and females was statistically non significant. (p value= 0.926)

Table 6: Comparison of lower Lip print pattern(center zone) for sexual dimorphism in different groups

Groups	Sub Group		Type of lip print pattern						P value
			I	I'	II	III	IV	V	
Group I	I a	N	18	7	1	0	1	0	0.542
		%	66.7%	25.9%	3.7%	0.0%	3.7%	0.0%	
	I b	N	19	9	0	2	2	1	
		%	57.6%	27.3%	0.0%	6.1%	6.1%	3.0%	
	Total	N	37	16	1	2	3	1	
		%	61.7%	26.7%	1.7%	3.3%	5.0%	1.7%	
Group II	I a	N	10	9	0	1	18		0.219
		%	26.3%	23.7%	0.0%	2.6%	47.4%		
	I b	N	2	3	1	1	15		
		%	9.1%	13.6%	4.5%	4.5%	68.2%		
	Total	N	12	12	1	2	33		
		%	20.0%	20.0%	1.7%	3.3%	55.0%		
Group III	I a	N	6	4	0		4		0.630
		%	42.9%	28.6%	0.0%		28.6%		
	I b	N	4	4	1		2		
		%	36.4%	36.4%	9.1%		18.2%		
	Total	N	10	8	1		6		
		%	40.0%	32.0%	4.0%		24.0%		

P>0.05 non significant ; P<0.05 Just significant ; P<0.01 significant ; P<0.001 highly significant

For lower lip print pattern in center zone, Type I was observed most for males(57.6.3%) as well as females (66.7%) followed by Type I'(25.9%) in females and followed by same type in males(TypeI'-27.3%) in Group I, and difference between type of lip print pattern between males and females was statistically non - significant. (p value =0.542)

For lower lip print pattern of Group II in center zone, Type IV was observed most for males(68.2%) as well as females (47.4%) followed by Type I (26.3%) in females and

followed by TYPE I' (13.6%) in males, and difference between type of lip print pattern between males and females was statistically non significant. (p value =0.219)

For lower lip print pattern of Group III in center zone, Type I was observed most for females(42.9%) followed by Type I' and Type IV having equal distribution of 28.6% and for males Type I and Type I' had equal distribution of 36.4% and followed by TYPE IV (18.2%), and difference between type of lip print pattern between males and females was statistically non significant. (p value =0.630)

As the difference in type of lip print pattern for both upper and lower lips was statistically non significant between males and females, hence total sample was combined for further evaluation.

Table 7: Overall comparison of Upper Lip print pattern betweendifferent zones for each group

Groups			Type of lip print pattern						P value
			I	I'	II	III	IV	V	
Group I	Right	N	28	16	7	9	0	0	<0.01
		%	46.7%	26.7%	11.7%	15.0%	0.0%	0.0%	
	center	N	21	19	2	14	1	2	
		%	35%	31.7%	3.33%	23.3%	1.66%	5%	
	Left	N	26	16	9	9	0	0	
		%	43.3%	26.7%	15.0%	15.0%	0.0%	0.0%	
	Total	N	75	51	18	32	1	3	
		%	41.66%	28.33%	10%	17.77%	.05%	3.6%	
Group II	Right	N	23	19	7	4	7	0	<0.01
		%	38.3%	31.7%	11.7%	6.7%	11.7%	0.0%	
	Center	N	18	24	3	11	3	0	
		%	30%	40%	5%	18.3%	5%	0.0%	
	Left	N	5	21	8	18	9	0	
		%	8.3%	35.0%	11.7%	30.0%	15.0%	0.0%	
	Total	N	46	64	18	33	19	0	
		%	25.55%	35.55%	10%	18.33%	10.50%	0.0%	
Group III	Right	N	10	3	11	0	1	0	<0.01
		%	40.0%	12.0%	44.0%	0.0%	4.0%	0.0%	
	Center	N	9	6		0	10	0	
		%	36.0%	24.0%		0.0%	40.0%	0.0%	
	Left	N	10	5	9	0	1	0	
		%	40.0%	20.0%	36.0%	0.0%	4.0%	0.0%	
	Total	N	29	14	20	0	12	0	
		%	38.7%	18.7%	26.7%	0.0%	16.0%	0.0%	

P>0.05 non significant ; P<0.05 Just significant ; P<0.01 significant ; P<0.001 highly significant

Table 7 showed different lip print pattern of upper lip in three different zones - right,centre and left for different groups.

For group I subjects,Type I(46.7%) was more predominant followed by type I'(26.7%) and Type III(15%) in right zone, in the centre zone Type I(35%) was most markedly found followed by Type I' (31.7%) andthen Type III(23.3%) ,in left zone Type I (43.3%)was most common lip print pattern followed by type I' (26.7%)and Type II, III(both 15%) .Overall comparison between different zones of Group II showed statistically significant difference.(p value= <0.01)

For **Group II subjects,** Type I(38.3%) was more predominant followed by type I'(31.7%)and Type II,IV(both11.7%)in right zone, in the centre zone Type I'(40.0%) was most markedly found followed by Type I (30%),thenType III (18.3%), and in left zone Type I'(35%)was most predominant lip print pattern followed by type III(30%)and Type IV(15%). Overall comparison between different zones of Group I showed statistically significant difference.(p value= <0.01)

For **Group III subjects**, Type II(44.0%) was most predominant followed by Type I(40.0%) ,Type I'(12.0%) in right zone, in the center zone Type IV(40.0%) was most markedly found followed by Type I (36.0%),Type I'(24.0%) and in left zone Type I (40.0%)was most found lip print pattern followed by type II(36.0%),Type I'(20.0%).Among overall 75 zones of group III most common pattern seen was Type I (38.7%) followed by Type II(26.7%). Overall comparison between type of upper lip print pattern in different zones for group III also showed statistically significant difference between zones. (p value= <0.01)

Table 8: Overall comparison of Lower Lip print pattern between different zones for each group

Groups			Type of lip print pattern						P value
			I	I'	II	III	IV	V	
Group I	Right	N	9	9	36	5	1	0	<0.01
		%	15.0%	15.0%	60.0%	8.3%	1.7%	0.0%	
	center	N	37	16	1	2	3	1	
		%	61.7%	26.7%	1.7%	3.3%	5.0%	1.7%	
	Left	N	11	11	34	5	0	0	
		%	18.0%	18.0%	55.7%	8.2%	0.0%	0.0%	
	Total	N	57	36	71	12	4	1	
		%	31.5%	19.9%	39.2%	6.6%	2.2%	0.6%	
Group II	Right	N	5	13	22	12	8		<0.01
		%	8.3%	21.7%	36.7%	20.0%	13.3%		
	Center	N	12	12	1	2	33		
		%	20.0%	20.0%	1.7%	3.3%	55.0%		
	Left	N	8	14	27	9	2		
		%	13.3%	23.3%	45.0%	15.0%	3.3%		
	Total	N	25	39	50	23	43		
		%	13.9%	21.7%	27.8%	12.8%	23.9%		
Group III	Right	N	7	3	15		0		<0.01
		%	28.0%	12.0%	60.0%		0.0%		
	Center	N	10	8	1		6		
		%	40.0%	32.0%	4.0%		24.0%		
	Left	N	10	8	1		6		
		%	40.0%	32.0%	4.0%		24.0%		
	Total	N	27	19	17		12		
		%	36.0%	25.3%	22.7%		16.0%		

P>0.05 non significant ; P<0.05 Just significant ; P<0.01 significant ; P<0.001 highly significant

Table 8showed different lip print pattern of lower lip in three different zones - right,centre and left for different groups. For group I subjects, Type II(60.0%) was more predominant followed by type I and Type I'(15.0%) in right zone, in the centre zone Type I(61.7%) was most markedly found followed by Type I' (26.7%) and in left zone Type II (55.7%)was most found lip print pattern followed by type I and Type I'(18.0%). Overall comparison between different zones of Group I showed statistically significant difference. (p value= <0.01)

For group II subjects,Type II(36.7%) was more predominant followed by type I'(21.7%) and Type III(20.0%) in right zone, in the center zone Type IV(55.0%) was most markedly found followed by Type I and Type I' (20.0%) and in left zone Type II (45.%)was most found lip print pattern followed by Type I'(23.3%).Overall

comparison between different zones of Group II showed statistically significant difference.(p value= <0.01)

For group III subjects, Type II(60.0%) was more predominant followed by type I(28.0%) in right zone in the center zone Type I(40.0%) was most markedly found followed by Type I' (32.0%) and in left zone Type I (40.0%) was most found lip print pattern followed by Type I'(32.0%). Overall comparison between type of upper lip print pattern in different zones for group III showed statistically significant difference between zones.(p value= <0.01)

Table 9 :Interzone comparison for each group for upper and lower lip print pattern

	Upper lip			Lower Lip		
	Group I P value	Group II P value	Group III P value	Group I P value	Group II P value	Group III P value
R vs L	0.125	0.117	0.887	0.776	0.047	0.897
R vs C	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
L vs C	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

P>0.05 non significant ; P<0.05 Just significant ; P<0.01 significant ; P<0.001 highly significant

On comparison between different zones separately for each lip and different groups, it was found that there was statistically non -significant difference between right and left zone, both for upper and lower lips for Group I, Group II and Group III. However, for both upper and lip print pattern, right and left zones showedstatistically significant difference from the center zone for all the groups. (p value<0.01)

There was statistically non -significant difference between right and left zone, both for upper and lower lips. Also lip print pattern in center zone was easily discernible, could be recorded easily without smudging and lip print pattern showed uniformity for that individual, hence it was decided to consider center zone for further comparison.

Table 10: Intergroup comparison of lip print pattern of upper and lower lip

	Upper lip pattern P value	Lower lip pattern P value
Group I vs II	<0.01	<0.01
Group I vs III	<0.01	<0.01
Group II vs III	<0.01	<0.01

P>0.05 non significant ; P<0.05 Just significant ; P<0.01 significant ; P<0.001 highly significant

For all intergroup comparisons, Group I vs II, Group I vs III and Group II vs III, both for upper and lower lip print pattern(center zone) showed highly significant difference.(p value= <0.01)

Table 11: Comparison of centre zone of upper and lower lip within groups

Malocclusion			Centre lip print pattern						p-value
			I	I'	II	III	IV	V	
Class I	Upper lip	N	21	19	2	14	1	3	<0.01
		%age	35%	31.7%	3.33%	23.3%	1.66%	5%	
	Lower Lip	N	37	16	1	2	3	1	
		%age	61.7	26.7	1.7	3.3	5.0	1.7	
Class II	Upper lip	N	18	24	3	11	3	1	<0.01
		%age	30%	40%	5%	18.3%	5%	1.6%	
	Lower lip	N	12	12	1	2	33		
		%age	20.0	20.0	1.7	3.3	55.0		
Class III	Upper lip	N	9	6	0	10	-		0.505
		%age	36.0	24.0	0.0	40.0	-		
	Lower Lip	N	10	8	1	6	-		
		%age	40.0	32.0	4	24.0	-		

P>0.05 non significant ; P<0.05 Just significant ; P<0.01 significant ; P<0.001 highly significant

Table 11 showed that Type I was most common lip print patrern followed by Type I' , both for upper and lower lips in **Group I**, however difference between the lips for type of lip print pattern was statistically significant. (p value <0.01). **For Group II, Type** I' and Type Iwas most common lip print patrern followed by Type III in upper lip and in lower lip type IV was most predominant (55%) followed by Type I and I' had both equal distribution(20%), however difference between the lips for type of lip print pattern was statistically significant. (p value <0.05).**For Group III**, Type IV was most common lip print patrern followed by Type I in upper lip whereas in lower lip Type I was most common followed by Type I', and difference between the lips for type of lip print pattern was statistically non significant. (p value =0.505).

Malocclusion refers to the abnormal position of teeth in relation to the basal bone, to the adjacent teeth or to the opposing teeth, which compromises the health of oral tissues, disturb balance of stomatognathic system and can also lead to psychological and social problems. The early diagnosis and interventions is essential to address the improper developmental process and control environmental factors that causes malocclusion during the period of active growth. There are different methods available to predict malocclusions, which can help to prevent or intercept malocclusion at early stage,obviating the need of extensive orthodontic treatment later.The diagnosis of future growth is difficult by clinical examination alone ,hence serial cephalometric radiographs were taken which exposed the child to unnecessary radiation. Considering this a simple, convenient, non invasive, non radiographic method to predict malocclusion at later stages would be helpful for predicting and intercepting the malocclusion. Finger print pattern (dermatoglyphics) and lip print pattern (cheiloscopy)had been used in forensic sciences for personal identification and criminal investigation. Recently both have been evaluated for their association with different diseases as diabetes, dental caries and malocclusion etc. Finger and lip print pattern remain same throughout the life and are characteristic to each individual.Lip prints are normal lines and fissures in the form of wrinkles and grooves present in the Zone of transition of human lip, between the inner labial mucosa and outer skin, examination of these lip prints is known as Cheiloscopy.[1] It also has been proved that lip prints recover after undergoing alterations such as minor trauma, inflammation and herpes and that the disposition and form of furrows does not vary with environmental factors.

Lip groove pattern are established during 6th week of intrauterine life.[9] The basis of studying the relationship between lip print pattern and various dental anomalies is due to the development of teeth and associated structures(palate and alveolus), which coincides with the development of lip pattern during the 6th -13th week of intrauterine life.The deviation from normal due to extraneous factors at the time of development, might also be reflected in the cheiloscopic pattern. Hence it was decided to evaluate cheiloscopic pattern in different dental diseases in previous studies.Considering this the aim of the present study was to correlate Cheiloscopic pattern in different sagittal skeletal malocclusions.

The present study included 145 subjects which were divided into three groups based on their sagittal skeletal relationship as Group-I, (Class-I malocclusion, N=60 subjects),

Group-II (Class-II malocclusion, N=60 subjects) and Group-III (Class-III malocclusion, N=25 subjects). The parameters used to confirm skeletal relationship were ANB angle, WITS appraisal and YEN angle. Lip print of all the patients were recorded on the photographic paper with the help of the Lipstick and to avoid smudging of the lip prints, that were secured with a cellotape. The obtained lip prints were then scanned with the camera and analyzed for type of pattern present.

The obtained lip print was divided into zones (upper lip-UR –upper right,UC-upper centre and upper left,lower lip LR-lower right,LC-lower centre,LL-Lower left).

Thus, total 180 zones in upper lip and 180 zones in lower lip in Class I and Class II and 75 zones each in upper and lower lip in class III malocclusion were evaluated. The lip prints were analysed accordingTsuschihashi[13]classification ,Type I – Complete vertical groove (CVG), Type I' – Partial vertical groove (PVG),Type II – Forked groove (FG),Type III – Intersecting groove (IG) ,Type IV – Reticular groove (RG),Type V – Undetermined groove (XG).

Assuming the center zone of upper and lower lips as most remarkable, reproducible and recognizable zone, lip prints of this zone had been compared to find out sexual dimorphism if existed between male and females sample in all the groups.

The resultsof the present study showed that in Group I ,Type I and Type I' was most prevalent upper lip print (center zone), for males with equal distribution of 31.2% whereas for females Type I was observed most (39.3%) followed by Type I'(31.2%) in Group I.InGroupIIType I' was observed most for males(40.9%) followed by Type I (31.8%), similarly for females Type I' (39.5%) was most common followed by Type I (28.9%) and Type III(7.9%), in Group III Type IV was observed most for males(42.9%) as well as females (36.4%). (Bar Diagram 1)

Lower lip print pattern in center zone, Type I was observed most for males(57.6.3%) as well as females (66.7%) for group I. Type IV was observed most for males(68.2%) as well as females (47.4%) followed by Type I (26.3%) in females in group II and Type I was observed most for females(42.9%) and Type I and Type I' had equal distribution of 36.4%for males in group III. Difference between type of lip print pattern between males and females was statistically non significant which indicatedthere was no sexual dimorphism.(Bar Diagram 2)

Bar diagram 1: Comparison of Upper Lip print pattern(center zone) for sexual dimorphism in
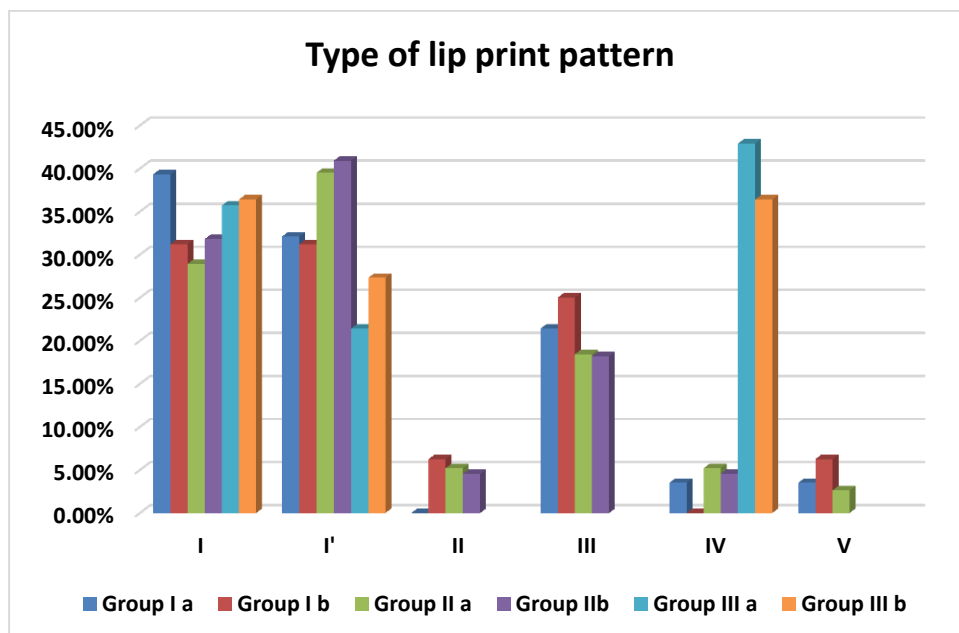
different groups

Bar diagram 2: Comparison of Upper Lip print pattern(center zone) for sexual dimorphism in different groups
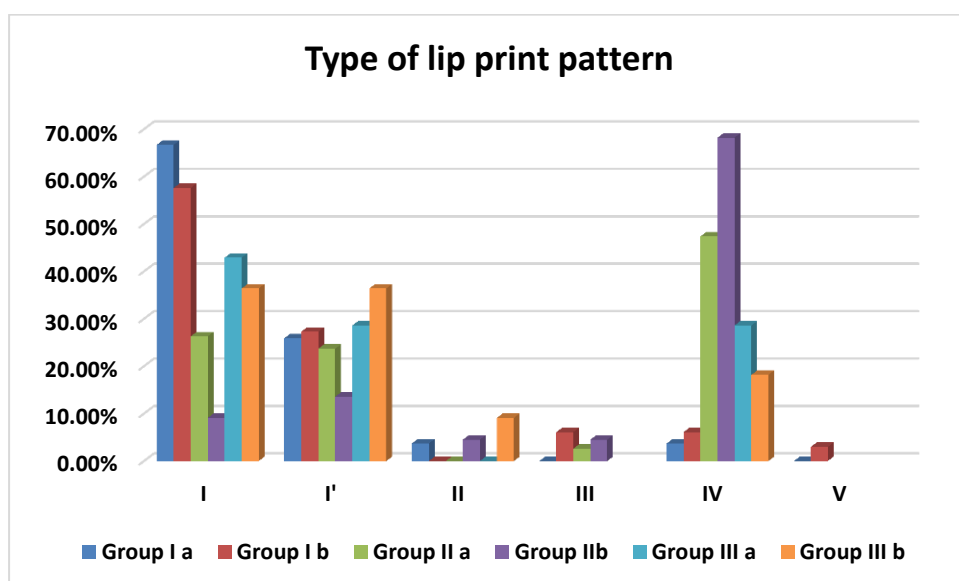
In similar studies by Sonal –Nayak[16], Sharma P[17],Kothari[18]et alSandhya Jain[19]observed Type I and Type I' as most dominant lip pattern for females which we also observed, but for males they found Type III and IV as most dominant which differed from our findings as we observed Type I'and Type I as most observed lip print for males .Ezemagu[20] etal found Type I'as most predominant pattern in males and Type I in females. Saraswathi[21] etal stated Type III lip print as most prevalent in both males and females

In accordance to the result of the present study, previous studies conducted in different ethnic population by various authors as Ponnusamy[8] ,Tsuchihashi[13], Vergeese[15], Raghav[22] et al,andKaushal B[2] et aletc.observed statistically insignificant difference between male and female lip print pattern, however in their studies the most prevalent lip print pattern for males and females was somewhat different from the present study.

Ponnusamy et al[8] assessed the strength of association between lip print patterns and skeletal class I and II malocclusion.They found vertical type lip print pattern (TypeI) was found to be the most prevalent in both the genders with no sexual dimorphism.

Tsuchihashi[13] investigated 64 subjects (22males and 42 females) living in Yokohama, and found that in both sexes Type III was commonest, followed in order by Type I, Type II, Type IV and Type V but the difference was statistically non-signifiacnt.

Raghav et al [22]found branched(Type II) lip pattern in both males(35.09%) and females(29.82%) as the most common and undetermined(Type V) as the least common in both sexes and no sexual dimorphism was seen.

Vergeese[15]found Type IV as the most frequently observed lip print in both the sexes and in both the quadrants followed by Type III with no sexual dimorphism in type of lower lip print pattern.

Kaushal B et al[2]did not found any sexual dimorphism in their study. Branched lip print pattern (Type II) was the most predominant in class I normodivegent,reticular(Type IV)in hypodivergent and intersected in hyperdivergent(Type III) . In skeletal Class II normodivergentmalocclusion, the most common lip print pattern was Intersected(Type III) and in Hypodivergent growth pattern it was Reticular (Type IV).

Contrary to the results of the present study, studies done by Vahanwala et al[16], Gondivkar[23], ,Jain S et[19],Remya S et[24].Ghimire et [25],Anu et al[27]ascertained that lip prints behold the potential for sex determination as theyfound marked differences in lip print patterns of males and females.

Jain S[19]et al found, Type IV lip print is common in males and femalesskeletal Class I malocclusion .In skeletal Class II malocclusion , Type IV was most common in males and Type II wasmost common lip print in females. In skeletal class III,males,Type I lip print was more common and class III Females Type II lip print was commonest . The difference between the male and female was statistically significant thus showing sexual dimorphism in lip print patterns.

Remya S[24] et al observed majority of the study group (52 people -26%) belonged to Type IV and 15 people (7.5%) belonged to Type V group.33 females(33%) belonged to Type II and 38 males (38%) belonged toType IV. This result was statistically significant in determining the gender (p value of <0.001).

N Ghimire[25]et al analyzed and compare quadrant wise and sex wise predilection of lip print pattern.Contrary to the result of our studyType I pattern was predominant in all the four quadrants among males (62%, 56%, 54%, 57% in first, second, third and fourth quadrants respectively). In female also type I was predominant in 2nd, 3rd and 4th quadrant (40%, 45%, 51% respectively) whereas in 1st(right upper) quadrant type II pattern was predominant (37%).

V Anu[26] et alassessed Lip prints and finger prints of 250 males and 250 Females for gender determination They observed Reticular lip print pattern in majority (36.4%) of the males, whereas vertical grooves (29.6%) and branched grooves (29.6%) were common in females.

Results of the present study did not shown sexual dimorphism for lip print pattern ,therefore the sample of males and females were combined for further evaluations.Comparison of lip print pattern between different zones for different groups are discussed below

Comparison of upper lip pattern in different zones (UR,UC,UL) for different groups showed that
for Group I subjects, Type I(46.7%) was more predominant followed by type I'(26.7%) and Type III(15%) in right zone, in the centre zone Type I(35%) was most markedly found followed by Type I' (31.7%) and then Type III(23.3%) ,in left zone Type I (43.3%)was most common lip print pattern followed by type I' (26.7%) and Type II,

III(both 15%) (Bar diagram 3). For Group II subjects, Type I(38.3%) was more predominant followed by type I'(31.7%) and Type II,IV

(both11.7%)in right zone, in the centre zone Type I'(40.0%) was most markedly found followed by Type I (30%),then Type III (18.3%), and in left zone Type I'(35%)was most predominant lip print pattern followed by type III(30%)and Type IV(15%). For For Group III subjects, Type II (44.0%) was most predominant followed by Type I(40.0%) ,Type I'(12.0%) in right zone, in the center zone Type IV(40.0%) was most markedly found followed by Type I (36.0%), Type I'(24.0%)   and in left zone Type I (40.0%)was most found lip print pattern followed by type II(36.0%), Type I'(20.0%).(Bar diagram 3).

The results for Lower lip pattern in different zones (LR,LC,LL) for different groups showed that

for Group I subjects,Type II(60.0%) was more predominant followed by type I and Type I'(15.0%) in right zone, in the centre zone Type I(61.7%) was most markedly found followed by Type I' (26.7%) and in left zone Type II (55.7%)was most found lip print pattern followed by type I and Type I'(18.0%).(Bar diagram 4) For group II subjects,Type II(36.7%) was more predominant followed by type I'(21.7%) and Type III(20.0%) in right zone, in the center zone Type IV(55.0%) was most markedly found followed by Type I and Type I' (20.0%) and in left zone Type II (45.%) was most found lip print pattern followed by Type I'(23.3%)(Bar diagram 4) For group III subjects, Type II(60.0%) was more predominant followed by type I(28.0%) in right zone in the center zone Type I(40.0%) was most markedly found followed by Type I' (32.0%) and in left zone Type I (40.0%) was most found lip print pattern followed by Type I'(32.0%)(Bar diagram 4).

Bar diagram 3: Overall comparison of Upper Lip print pattern betweendifferent zones for each group
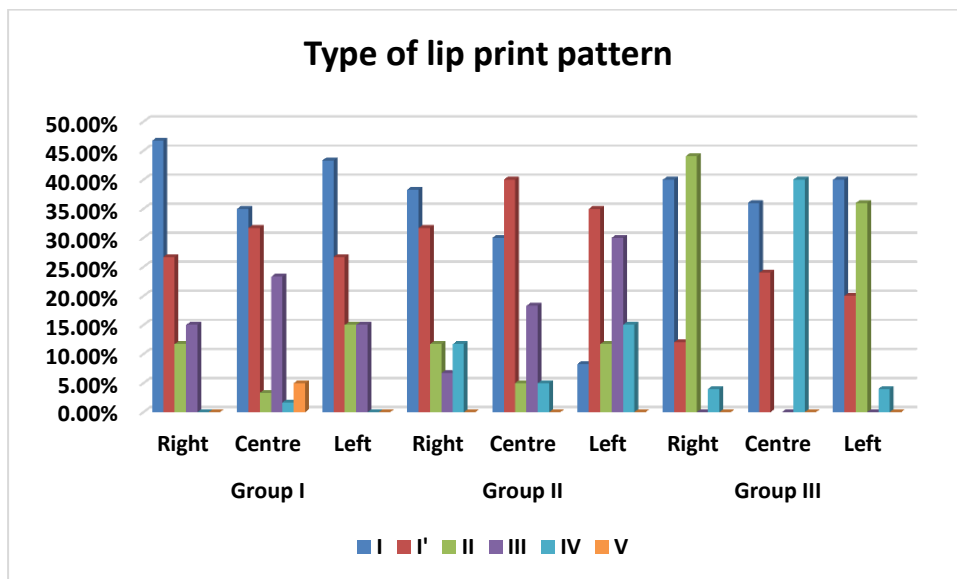
Bar Diagram 4: Overall comparison of Lower Lip print pattern between different zones for each group
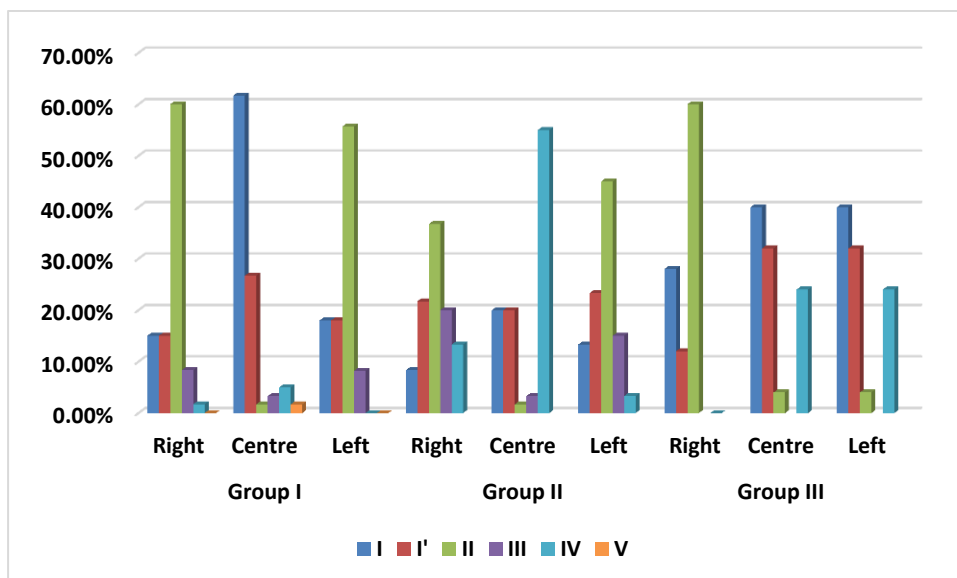
On intergroup comparison for different zones of both upper and lower lips for each group,it was found that difference between right zone and left zone was statistically non significantwhere as right v/s centre zone and left v/s centre zone showed statistically significant difference for each group.Albeit the difference existed between center Vs Right and left zone,but it was of low significance($p<.05$),hence for further comparisons of lip print pattern among different malocclusion groups only center zone was considered.

On comparing centre zone of upper and lower lip of all 3 groups,for group I,incentre zone of upper lip Type I was most prevalent (35.0%) followed by Type I' (31.7%) and then Type III(23.3%) and in lower lip Type I(61.7%) was most predominant followed by Type I'(26.7%).For group II,in upper lip centre zone ,Type I'was most predominant (40.0%) followed by Type I(30.0%) and in lower lip centre zone ,Type IV(55.0%)was most prevalent followed by Type I(20.0%) and Type I'(20.0%)(Bar diagram 5).For group III,in upper lip centre zone Type IV(40.0%) is most common followed by Type I(36.0%) and in lower lips,Type I (40.0%) was most prevalent followed by Type I'(32.0%)(Bar diagram 5). The difference between centre of upper and lower lip showed statistically significant difference for Group I and Group II and difference was statistically non-significant for Group III.

Bar diagram 5: Comparison of centre zone of upper and lower lip within groups
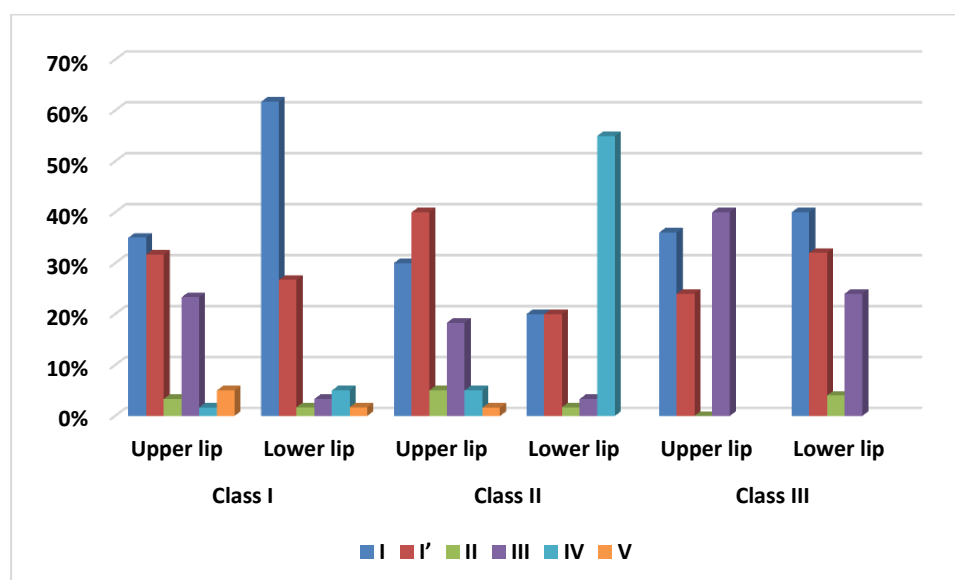
The results were compared to studies by Aditi[11]et al,Kulkrni[12] et al,Raghav P [23]et al,Shivani[28] et al,Kaushal[2],et al,Ponnussamy[8] et al,Vignesh[29] et al,also tried to find out

most prominent type of lip print pattern in different malocclusion . Some studies were in accordance and some studies were contradictory to the results of the present study.

Aditi[11] et al(2018) found that in skeletal class I malocclusion ,Type I' (53.3%) was the most prevalent pattern,whereasin present study Type I was most prevalent type.In skeletal class II division 1 Type III(66.6%) and in skeletal class II division 2 Type I'(73.3%)was most common pattern For class III ,Type I (66.6%) was the most prevalent pattern.Present study showed prevalence of Type I' in class II malocclusion in upper lip and Type I in class III malocclusion.This study was in accordance with our study.

Kulkarni[12] et al found combination of Type I +Type III,TypeI'+Type III and Type II+Type III were most common in skeletal class I group.TypeI+Type II Lip print pattern was most prevalent in skeletal class II malocclusion and In skeletal class III malocclusion Type I+TypeIV and Type III +Type IV was most common.As in this study they divided the lip print into four quadrants it cannot be directly compared but the trend observed in class I,class II ad class III malocclusion is in accordance with the present study. About the gender difference,females had more of Type I'(75.66%) followed by Type I(58.98%) and males had Type II lip pattern most predominantly.

Raghav P[22] et al (2013) observed Type IIwas the most prevalent lip pattern in skeletal class I group followed by Type IV.In skeletal class II group Type II was most common followed by Type III and in class III group Type I was most prevalent followed by Type II. Results of class I and II were contradictory to the present study but findings of class III malocclusion was in accordance with the present study.

Shivani[27]et al(2015) found Type I +Type IV,Type I' +Type IV,Type III +Type IV were predominant in skeletal class III malocclusion .The trend found in the present study was similar to this study.

Kaushal[2] et alfound that branched (Type II) lip print pattern was the most predominant in class I normodivegent,reticular (Type IV)in hypodivergent and intersected (Type III)in hyperdivergent . In skeletal Class II malocclusion, it was found that the most common lip print pattern is Intersected (Type III)and in Hypodivergent growth pattern the most common lip print pattern was Reticular pattern(Type IV).This study is not directly comparable as they have considered growth pattern but on comparing the trend of lip print pattern in class I, and II malocclusion the result is contradictory to the present study.

Ponnusamy[8] et al found that Vertical pattern (Type I)was found to be the most predominant followed by branched(Type II) in subjets with class I malocclusion .Branched type was most prevalent class II malocclusion ,vertical pattern was most common finding of class II malocclusion,and was in accordance with the present study.

Jalanvar P[1] et al found the reticular (Type IV- 24.6﹪)   pattern was predominant in crowding cases followed by the branched pattern(Type II -19.1%) in class I malocclusion.The results of this study are contradictory to Grooup I of present .The undetermined(Type V -21.6﹪) lip pattern was found Angle's class 2 malocclusion cases followed by the reticular pattern(Type IV-15.4﹪) which was also contradictory to Group II of present study . In Angle's class 3 ,the reticular pattern(Type IV-4.6﹪) was most predominant followed by intersected pattern(Type III-2.7﹪). The result of class III malocclusion was in accordance with the present study.

Vignesh[28] et alfound predominant patterns related to the Angle's class I were; type I (complete vertical) pattern , type IV (reticular) pattern for class II and presence of type IV (reticular) pattern with absence of type I' (incomplete vertical) pattern for class III. Results of class I and class III was in accordance with the present study.

Considering the results of our study, the most frequent Lip print pattern observed in Class I skeletal malocclusion was Type I followed by Type I',in class II skeletal malocclusion type I followed by Type I' and in class III skeletal malocclusion Type IV followed by Type I was most markedly present. Overall conclusion from above mentioned studies was that cheiloscopic pattern did not follow any definitive trend for different skeletal malocclusion in different population groups. The prevalence of type of lip print pattern differed that could be attributed to difference in the population groups, consideration of both upper and lower lip, contribution of both environmental and developmental factors in etiology of malocclusion. Central pattern can be determined only by developmental etiological factors of malocclusion and not by environmental factors,hence definitive trend could not be observed in different skeletal malocclusion.

Earlier studies conducted to evaluate prevalent lip patterns in different population also showed variation.Tsuchihashi[13] found that intersected lip pattern was most frequent in the Japanese population. Sivapathasundharam[14] et al. noted that intersected lip pattern was predominant in Indo‑ Dravidian population. Verghese[15]et al.found that reticular lip

pattern showed the highest incidence in Kerala population. This variability in cheiloscopic pattern in different population group would result in variabilities of cheiloscopic pattern in sagittal malocclusion as well.

Within the limitations of present study it can be suggested that though the cheiloscopic pattern differed,but no definitive trend was seen when each type of lip print pattern was compared between the groups.Hence use of cheiloscopic pattern as reliable marker to assess sagittal malocclusion at an early age needs to be supported by further studies on larger sample size and on different population groups.

Also further studies shall be carried out among,familymembers,twins,siblingsof different races to establish a clear cut association between the malocclusion and cheiloscopic pattern. There is an utmost need to standardize the protocols for lip print collection,development,preservation and examination and to establish a database for chieloscopic pattern to study its association with different orofacial disturbances.

The present study was conducted to find out association between Cheiloscopic pattern and skeletal sagittal malocclusion on 145 subjects and following conclusions could be drawn from the present study

1. Cheiloscopic pattern both for upper and lower lips did not show sexual dimorphism in all the three groups.

2. Most frequently observerved cheiloscopic pattern was Type I+Type I'in group I ,Type I'+Type I in group II and Type IV +Type I in group III for both upper and lower lip.

3. Cheiloscopic pattern assessed in three different zones (Right, Centre, Left) both for upper and lower lip, differed between zones for each groups. On interzone comparison of cheiloscopic pattern of right and left zone did not show statistically significant difference for upper and lower lip in all the three groups. However, right vs centre and left vs Centre zone showed statistically significant difference both for upper and lower lips in all three groups.

4. Cheiloscopic pattern both for upper and lower lips(central zone) differed significantly between groups.

5. Cheiloscopic pattern of centre zone of upper and lower lip showed statistically significant difference only for group III.

Though the type of cheiloscopic pattern diferred within in each malocclusion group, but no definitive trend were seen when each type of lip print pattern was compared between the groups. Hence use of cheiloscopic pattern as reliable marker to assess sagittal malocclusion at an early age needs to be supported by further studies on larger sample size and on different population groups.

Malocclusion refers to the abnormal position of teeth in relation to the basal bone, to the adjacent teeth or to the opposing teeth, which comprises the health of oral tissues, disturb balance of stomatognathic system and can also lead to psychological and social problems. The early diagnosis and interventions is essential to address the improper developmental process and control environmental factors that causes malocclusions during the period of active growth. There are different methods available to predict malocclusions, which can help to prevent or intercept malocclusion at early stage, obviating the need of extensive orthodontic treatment later. Clinical examination alone is not sufficient to predict growth. Radiographs pose radiation exposure hence simple noninvasive, non radiographic methods like lip and finger print patterns will be useful. Finger print and lip prints are unique to an individual and had been used in forensic sciences for personal identification and criminal investigation. Lip groove pattern are established during 6th week of IUL. The basis of studying the relationship between lip print pattern and various dental anomalies is due to the development of teeth and associated structures(palate and alveolus), which coincides with the development of lip pattern during the 6th-13th week IUL. The deviation from normal due to extraneous factors at the time of development, might also be reflected in the cheiloscopic pattern. Hence it was decided to evaluate cheiloscopic pattern in different dental diseases in previous studies. Considering this the aim of the present study was to correlate cheiloscopic pattern in different sagittal skeletal malocclusions.

The present study included 145 subjects which were divided into three groups based on their sagittal skeletal relationship as Group-1(class I malocclusion, N=60 subjects), GroupII(class IImalocclusion, N=60 subjects) and Group III (class III malocclusion, N=25 subjects). The parameters used to confirm skeletal relationship were ANB angle, witts appraisal and yen angle. Lip print of all the patients were recorded on the photographic paper with the help of the lipstick and to avoid smudging of the lip prints, they were secured with a cellotape. The obtained lip prints were then scanned with the camera and analyzed for type of pattern present. The obtained lip print was divided into zones(upper right, upper center, upper left, lower right, lower centre, lower left).

Thus, total 180 zones in upper lip and 180 zones in lower lip in class I and class II and 75 zones each in upper and lower lip in class III malocclusion were evaluated. The lip

prints were analyzed according to Tsuschihashi classification from type I-IV. Data was tabulated and appropriate statistical analysis was used for interzone, intergroup and gender comparison.

The following conclusions were drawn from the present study:

1. Cheiloscopic pattern both for upper and lower lips did not show sexual dimorphism in all the three groups.

2. Most frequently observerved cheiloscopic pattern was Type I+Type I'in group I ,Type I'+Type I in group II and Type IV +Type I in group III for both upper and lower lip.

3. Cheiloscopic pattern assessed in three different zones (Right, Centre, Left) both for upper and lower lip, differed between zones for each groups. On interzone comparison of cheiloscopic pattern of right and left zone did not show statistically significant difference for upper and lower lip in all the three groups. However, right vs centre and left vs Centre zone showed statistically significant difference both for upper and lower lips in all three groups.

4. Cheiloscopic pattern both for upper and lower lips(central zone) differed significantly between groups.

5. Cheiloscopic pattern of centre zone of upper and lower lip showed statistically significant difference only for group III.

Though the type of cheiloscopic pattern diferred within in each malocclusion group, but no definitive trend were seen when each type of lip print pattern was compared between the groups. Hence use of cheiloscopic pattern as reliable marker to assess sagittal malocclusion at an early age needs to be supported by further studies on larger sample size and on different population groups.

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Participant Information Document (PID)

1. **Study title**

   Correlation of cheiloscopic pattern in different sagittal skeletal malocclusions

2. **Invitation paragraph**

   You are being invited to take part in a research study. It is therefore important for you to understand why the study is being done and what it will involve. Please take time to read the following information carefully. Ask us for any clarifications or further information. Whether or not you wish to take part is your decision.

3. **What is the purpose of the study?**

   - The purpose of this study is to find out correlation of chelioscopic pattern in different sagittal skeletal malocclusions.

4. **Why have I been chosen?**

   You have been chosen for this study as you are fulfilling the required criteria for this study.The pre treatment lateral cephalogram taken for your fixed orthodontic treatment in the Department of Orthodontics and Dentofacial Orthopaedic,BBDCODS,will be used and lip prints will be recorded
   '

5. **Do I have to take part?**

   Your participation in the research is entirely voluntary. If you do, you will be given
   this information sheet to keep and will be asked to sign a consent form. During the study you still are free to withdraw at any time and without giving a reason.

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

   Nothing will happen to you. You just have to record your lip print and give permission to use your pre treatment X-ray.

7. **What do I have to do?**

   You do not have to change your regular lifestyles for the investigation of the study.

8. **What is the procedure that is being tested?**
   Correlation between different sagittal malocclusion and lip prints will be found out.

9. **What are the interventions for the study?**

   Along with pre treatment lateral cephalogram ,lip prints will be taken

10. **What are the side effects of taking part?**

    There are no side effects on patients of this study.

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

    There are no risks or disadvantages of taking part in this study.

12. **What are the possible benefits of taking part?**

    At present no benefit to the participating patient but the result of the study may help in early diagnosis and interception of malocclusion

13. **What if new information becomes available?**

    If additional information becomes available during the course of the research you will be told about these and you are free to discuss it with your researcher, your researcher will tell you whether you want to continue in the study. If you decide to
    withdraw, your researcher 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?

There is no chance of any mishapenning

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

Yes it will be kept confidential.

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

Result is the soul properties of the department of the Orthodontics BBDCODS Lucknow.Your identity will be kept confidential in case of any report/publications.

18. Who is organizing the research?

This research study is organized by Department of Orthodontics and Dentofacial Orthopaedics, BBDCODS Lucknow.

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 guide, Head of the Department of
Orthodontics and Dentofacial Orthopaedics, and the (IEC) (IRC) of the institution.

Contact for further information

Dr. NOOR ZAMAN
 PG student
Department of Orthodontics and
Dentofacial Orthopedics
BabuBanarasi College of Dental
Sciences.
Lucknow-226028
Email id swtsnoor@gmail.com
Mob - 9793026061

Dr. Lakshmi Bala,
Member Secretary IEC   ,
Babu Banarasi College of
Dental Sciences.
Lucknow
bbdcods.iec@gmail.com

Signature of PI…………………………………………………….
Name………………………………………………………………
Date ……………………………………………………………….

,

बाबू बनारसी दास कॉलेज ऑफ़ डेंटल साइंस

; बाबू बनारसी दास विश्व विद्यालय के एक घटक संस्था

बीबीडी सिटी फैजाबाद रोड लखनऊ . 227105 ;भारत

प्रतिभागी जानकारी दस्तावेज़ ; पीआईडी

1. अध्ययन शीर्षक

विभिन्न सजाइटल स्केलेटल मालऑक्ल्युशन में होंठ के छाप का सहसंबंध

।

2. निमंत्रण पैरा

आपको इस शोध में भाग लेने के लिए आमंत्रित किया जा रहा हैए इसलिए यह समझना आवश्यक है की यह अध्ययन क्यों किया जा रहा है और इसमें क्या शामिल होगा ॱ कृपया निम्न जानकारी को सावधानी पूर्वक पढ़ें ॱ किसी भी स्पष्टीकाण के लिए हमें पूछे ॱ आप भाग लेना चाहते है या नहीं आपका निर्णय है ॱ

3. अध्ययन का उद्देश्य क्या है ॱ

विभिन्न सजाइटल स्केलेटल मालऑक्ल्युशन में होंठ के छाप का सहसंबंध

4. मैं क्यों चुना गया हूँ ॱ

   I आपको इस अध्ययन के लिए चुना गया है क्योंकि आप इस अध्ययन के लिएए आवश्यक मानदंडों को पूरा कर रहे हैं। आपने हमारे विभाग में तेढे मेढे दातों का इलाज कराया है इलाज शुरू करने से पहले आपके एक्सरे लिए गए थे जिनका उपयोग इस अध्ययन में होगा I

5. क्या इसमें मुझे भाग लेना चाहिए

   अनुसंधान में आपकी भागीदारी पूरी तरह से स्वैच्छिक है। यदि आप सहमति देते हैं तो आपको

इस सूचना पत्र को रखने के लिए और सहमति पत्र पर हस्ताक्षर करने के लिए कहा जाएगा। अध्ययन के दौरान आप कभी भी किसी भी समय और बिना कारण बताए अपनी सहमति वापस लेने के लिए स्वतंत्र हैं।

6. क्या होगा यदि मैं इस अध्य्यन में भाग लेता हूँ

इस अध्य्यन में भाग लेने में कोई जोखिम या संभावित नुकसान नही है ।

8. किस प्रक्रिया का परीक्षण किया जा है ६

होठों के छाप और सजाइटल स्केलेटल मालऔक्ल्युशन   में संबध ढूंढा जा रहा है

9. इस शोध में कौन से हस्तक्षेप दिए जायेंगे

तेढे मेढे दातों के इलाज के लिए गए एक्सरे के अलावा होठों का छाप लिया जाएगा ।

10 इस अध्य्न्न में भाग लेने का क्या दुष्प्रभाव है ६

इस अध्य्न्न के मरीजो पर कोई दुष्प्रभाव नही होते है ।

11ण इस अध्य्न्न में भाग लेने के संभावित जोखिम और नुक्सान क्या है६

इस अध्य्न्न में भाग लेने में कोई जोखिम या संभावित नुकसान नही है ।

12. भाग लेने के संभावित लाभ क्या है ६

वर्तमान में भाग लेने वाले रोगी को कोई लाभ नहीं है लेकिन अध्ययन के परिणाम से भविष्य मे प्रारंभिक निदान और मालऑक्ल्युशन के अवरोधन में मदद मिलेगी

13. यदि कोई नयी जानकारी उपलब्ध हो जाती है ६

यदि अनुसंधान के दौरान अतिरिक्त जानकारी उपलब्ध हो जाती है तो आपको इनके बारे में बताया जाएगा और आप अपने शोधकर्ता के साथ चर्चा करने के लिए स्वतंत्र हैं, आपका शोधकर्ता आपको बताएगा कि क्या आप अध्ययन को जारी रखना चाहते हैं। यदि आप तय करते हैं तो वापस लेने, आपका शोधकर्ता आपके वापसी के लिए व्यवस्था करेगा अगर तुम अध्ययन में जारी रखने का निर्णय लेते हैं, तो आपको एक अद्यतन सहमति फॉर्म पर हस्ताक्षर करने के लिए कहा जा सकता है।

14. जब शोध अध्य्यन बंद हो जाता है तो क्या होता है६

 यदि अध्ययन निर्धारित समय से पहले खत्म हो जाता है तो आपको सूचित किया जाएगा ।

15. क्या कुछ गलत हो सकता ह

ऐसा होने की कोइ सम्भावना नही है , केवल आपके एकसरे का उपयोग होगा और होठों का छाप लिया जाएगा।

16. इस अध्ययन में मेरे हिस्से को गोपनीय रखा जाएगा६

हाँ यह गोपनीय रखा जाएगा।

17. शोध अध्ययन के परिणामों का क्या होगा६
परिणाम ऑर्थोडान्टिक्स और डेंटोफेसियल ऑर्थोपेडिक्स दन्त चिकित्सा विज्ञान के बाबू बनारसी दास कॉलेज लखनऊ के विभाग की कॉपी होगी । किसी भी रिपोर्ट / प्रकाशन के मामले में आपकी पहचान को गोपनीय रखा जाएगा।

18. अनुसंधान का आयोजन किसके द्वारा किया जाता है६

यह शोध अध्ययन ऑर्थोडैंटिक्स और डेंटोफेसियल विभाग दन्त चिकित्सा विज्ञानं के बाबू बनारसी दास कॉलेज लखनऊ द्वारा आयोजित किया जाता है।

19. क्या अध्ययन खत्म हो जाने बाद अध्ययन के परिणामों को उपलब्ध कराया जाएगा ६

हाँ।

20. कौन अध्ययन की समीक्षा किया है६

अध्ययन की समीक्षा की गई है और ऑर्थोडान्टिक्स और डेंटोफेसियल ऑर्थोपेडिक्स विभाग के प्रमुख, संस्था की आईईसी और आईआरसी ने मंज़ूरी दे दी हैI

21. अधिक जानकारी के लिए संपर्क
डॉ नूर जमां
 पीजी छात्र
ऑर्थोडान्टिक्स और डेंटोफेसियल ऑर्थोपेडिक्स विभाग
बाबू बनारसी दास कॉलेज ऑफ़ डेंटल साइंस
लखनऊ.226028

ई.मेल . swtsnoor@gmail.com
मोब . 9793026061

डॉ लक्ष्मी बालाए
सदस्य सचिव आईईसी
बाबू बनारसी दास कॉलेज ऑफ़ डेंटल साइंसेज
लखनऊ- 226028
bbdcods.iec@gmail.com

पीआई के हस्ताक्षर ....।
नाम ....
तारीख

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

BABU BANARASI DAS COLLEGE OF DENTAL SCIENCES (FACULTY OF BBD UNIVERSITY), LUCKNOW

INSTITUTIONAL RESEARCH COMMITTEE APPROVAL

The project titled **"Correlation of Cheiloscopic Pattern in different Sagittal Skeletal Malocclusions"** submitted by **Dr Noor Zaman** Post graduate student from the **Department of Orthodontics and Dentofacial Orthopaedics** as part of MDS Curriculum for the academic year 2019-2022 with the accompanying proforma was reviewed by the Institutional Research Committee present on **19th December 2019** 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. Vandana A Pant
Co-Chairperson

Prof. B. Rajkumar
Chairperson

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

Dr. Lakshmi Bala
Professor and Head Biochemistry and
Member-Secretary, Institutional Ethics Committee

Communication of the Decision of the VIIIth Institutional Ethics Sub-Committee

IEC Code: 06   **BBDCODS/03/2020**

Title of the Project: Correlation of Cheiloscopic Pattern in different Sagittal Skeletal Malocclusions.

Principal Investigator: Dr. Noor Zaman   **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. Noor Zaman,

The Institutional Ethics Sub-Committee meeting comprising following four members was held on 18th March 2020.

1.	Dr. Lakshmi Bala Member Secretary	Prof. and Head, Department of Biochemistry, BBDCODS, Lucknow
2.	Dr. Amrit Tandan Member	Prof. & Head, Department of Prosthodontics and Crown & Bridge, BBDCODS, Lucknow
3.	Dr. Sahana S. Member	Reader, Department of Public Health Dentistry, BBDCODS, Lucknow
4.	Dr. Sumalatha M.N. Member	Reader, Department of Oral Medicine & Radiology, BBDCODS, Lucknow

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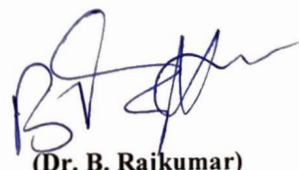
Decisions: The committee approved the above protocol from ethics point of view.

Forwarded by:

Lakshmi Bala
18/03/20

(Dr. Lakshmi Bala)
Member-Secretary
IEC **Member-Secretary**
Institutional Ethic Committee
BBD College of Dental Sciences
BBD University
Faizabad Road, Lucknow-226028

(Dr. B. Rajkumar)
Principal
PRINCIPAL BBDCODS
Babu Banarasi Das College of Dental Sciences
(Babu Banarasi Das University)
BBD City, Faizabad Road, Lucknow-226028

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 :- विविध प्रकार के चेहरों में बहार निकले दांतो को अंदर ले जाने की प्रक्रिया से सुंदरता में आये बदलाव का आकलन: ए सीफ्लोमेट्रिक अध्ययन ।

अध्ययन संख्या ....

विषय का पूरा नाम . . . .

जन्म की तारीख / आयु . . . .

विषय का पता . . . .

फोन नंबर। और ई-मेल पता . . . .

योग्यता . . . .

व्यवसाय: छात्र / स्वयं कार्यरत / सेवा / गृहिणी / अन्य (कृपया उचित के रूप में चिह्नित करें)

विषय की वार्षिक आय . . . .

नाम और नामांकित व्यक्ति (नाम) और उनके विषय के संबंध में . . . . (प्रयोजन के लिए मुकदमा संबंधित मौत के मामले में मुआवजे)

1. मैं पुष्टि करता हूं कि मैंने प्रतिभागी सूचना दस्तावेज को पढ़ लिया है और समझ लिया है . . . . इसके बाद के अध्ययन के लिए और सवाल पूछने का अवसर मिला है। या मुझे अन्वेषक द्वारा अध्ययन की प्रकृति समझाई गई है और सवाल पूछने का अवसर मिला है।

2. मैं समझता हूं कि अध्ययन में मेरी भागीदारी स्वैच्छिक है और बिना किसी दबाव के स्वतंत्र इच्छा के साथ दी गई है और किसी भी कारण के बिना किसी भी समय बिना किसी मेडिकल देखभाल या कानूनी अधिकारों को प्रभावित किए बिना किसी भी समय मैं वापस लेने के लिए स्वतंत्र हूं।

3. मैं समझता हूं कि इस परियोजना के प्रायोजक, प्रायोजक की ओर से काम करने वाले अन्य लोग, एथिक्स कमेटी और नियामक प्राधिकरणों को मेरे मौजूदा अध्ययन के संबंध में अपने स्वास्थ्य के रिकार्ड को देखने की मेरी अनुमति की आवश्यकता नहीं है और आगे की शोध इसके

संबंध में आयोजित किया जा सकता है, भले ही मैं परीक्षण से वापस ले जाऊं। हालांकि, मैं समझता हूं कि मेरी पहचान तीसरी पार्टी के लिए जारी किसी भी जानकारी या प्रकाशित में प्रकट नहीं होगी।

4. मैं इस अध्ययन से उत्पन्न किसी भी डेटा या परिणामों के उपयोग को प्रतिबंधित करने के लिए सहमत नहीं हूं एक प्रयोग केवल वैज्ञानिक उद्देश्य

   (प्रयोजनों) के लिए है

5. भविष्य के अनुसंधान के लिए मैं संग्रहीत नमूने (दांत / ऊतक / रक्त) का उपयोग करने की अनुमति देता हूं हांॅ नही [ ]

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 उन्हें पूरी तरह से समझा है। मैंने प्रतिभागी /स्वयंसेवक के सूचना दस्तावेज को भी पढ़ा और समझ लिया है

   प्रतिनिधि: ....

   हस्ताक्षरकर्ता का नाम . . . . तारीख ....।

   अन्वेषक के हस्ताक्षर . . . . दिनांक . . . .

   अध्ययन अन्वेषक का नाम . . . . दिनांक
   . . . .

   गवाह के हस्ताक्षर . . . . दिनांक . . . .

   गवाह का नाम . . . .

   पीआईडी की एक हस्ताक्षरित प्रति और विधिवत भरी सहमति फॉर्म प्राप्त किया विषय के हस्ताक्षर / अंगूठे का प्रभाव या कानूनी तौर पर दिनांक . . . .

   स्वीकार्य प्रतिनिधि

Curiginal

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Sources included in the report

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ANNEXURE

CLASS-I

Sr. No.	Name	Age	Sex	Upper Lip			Lower Lip		
				Right	Centre	Left	Right	Centre	Left
1	ANJUM AFROZ	21	FEMALE	II	I	II	II	I	II
2	BHANU	27	MALE	II	I	II	II	I	II
3	DEEPA SONI	29	FEMALE	II	I	II	II	I	II
4	KAMRAN JAVED	28	MALE	II	I'	II	II	I'	II
5	ANKITA BHADANI	29	MALE	III	III	III	III	III	III
6	TANJULA	26	FEMALE	III	I'	III	II	I'	II
7	DILEEP	30	MALE	II	I	II	II	I	II
8	JAYA	34	FEMALE	III	I'	III	III	I'	III
9	SWEETY	25	FEMALE	II	I'	II	II	I'	II
10	PRAGATI	24	FEMALE	I'	I'	I'	II	II	II
11	LUV KUSH	24	MALE	II	IV	I	II	V	I
12	ASHISH	28	MALE	II	I	II	II	I	II
13	SARA	30	FEMALE	II	I	II	IV	I	II
14	NIDHI SINGH	26	FEMALE	II	V	II	II	I'	II
15	AISHA	20	FEMALE	II	I	II	II	I	II
16	VAISHALI	37	FEMALE	III	IV	III	I'	I	I'
17	DEEPAK KUMAR	28	MALE	I	I	I	I	I	I
18	RAHUL	28	MALE	I'	I'	I'	I	I'	I
19	RITIKA	29	FEMALE	II	IV	II	II	I	II
20	AKASH	28	MALE	I'	IV	I'	I'	I	I'
21	GARIMA	20	FEMALE	I	IV	I	I	I	I
22	JHANVI	18	FEMALE	I'	IV	I'	II	I	II
23	RIBHU	25	MALE	II	IV	II	II	I	II
24	SARABJEET	26	MALE	I'	I'	I'	I'	I'	I'
25	SHIREEN	32	FEMALE	I'	I	I'	I'	I'	I'
26	CHETAN	31	MALE	I	IV	I	I	I	I
27	AAYUSHI	29	FEMALE	I'	IV	I'	II	I	II
28	AARUSHI	28	FEMALE	I	IV	I	I	I	I
29	DIVYA	28	FEMALE	II	I	II	II	I	II
30	RAHUL	30	MALE	II	I	II	II	I	II
31	PRACHI	28	FEMALE	II	I	II	II	I	II
32	ANANYA	28	FEMALE	II	I	II	II	I	II
33	VISHAL	25	MALE	III	IV	III	III	IV	III
34	SUDHA	24	FEMALE	II	I'	II	II	I	II
35	SHRADHHA	27	FEMALE	II	I	II	II	I	II
36	MONA	29	FEMALE	II	I'	II	II	I'	II
37	RAVI	21	MALE	III	III	III	III	III	III
38	ATUL	21	MALE	III	I'	III	II	I'	II
39	VIPIN	22	MALE	II	I	II	II	I	II
40	PRINCE	18	MALE	III	I'	III	III	I'	III
41	ANAS	17	MALE	II	I'	II	II	I'	II
42	NAMAN	19	MALE	I'	I'	I'	II	I	I'
43	HAMZA	17	MALE	II	IV	I	II	IV	I
44	NITANT	18	MALE	II	I'	II	II	I	II
45	KOVID	20	Male	II	I	II	II	I	II
46	SOMIT	22	MALE	II	IV	II	II	I'	II
47	SIDDHARTH	23	MALE	III	IV	III	I'	I	I'
48	KHALID	16	MALE	I	I	I	I	I	I
49	AYUSH	15	MALE	I	I	I	I	I	I
50	HIMANSHU	19	MALE	I'	I'	I'	I'	I'	I'
51	ABHAY	20	MALE	I'	IV	I'	I'	I	I'
52	AASHU	26	MALE	I'	I'	I'	I	I'	I
53	SACHIN	17	MALE	I'	IV	I'	II	I	II
54	MOHIT	32	MALE	II	IV	II	II	I	II
55	JHANVI	25	FEMALE	I'	I'	I'	I'	I'	I'
56	ARCHANA	24	FEMALE	I	IV	I	I	I	I
57	BULBUL	25	FEMALE	I'	IV	I'	II	I	II
58	DEVSHRI	27	Female	II	I	II	II	I	II
59	AMBIKA	28	FEMALE	I'	IV	I'	II	I	II
60	ADVIKA MISHRA	29	FEMALE	I'	IV	I'	I'	IV	I'

CLASS-II

Sr. No.	Name	Age	Sex	Upper Lip			Lower Lip		
				Right	Centre	Left	Right	Centre	Left
1	SHIVALIKA	25	FEMALE	I'	I'	I'	I'	I'	I'
2	AALIYA	24	FEMALE	IV	IV	IV	IV	I	IV
3	UBAID	35	MALE	I'	I'	I'	III	III	III
4	NAZIA ANJUM	25	FEMALE	I'	IV	I'	I	I	I'
5	ASHNIT	16	MALE	III	IV	III	I'	IV	II
6	PIYA DEVI	20	FEMALE	III	IV	III	I	IV	I
7	AKANSHA MISHRA	27	FEMALE	III	IV	I'	I'	I'	I
8	SHIWANGI	26	FEMALE	I'	I'	I	I'	I	I
9	ISMAT FAKHRA	27	FEMALE	III	I'	III	III	I	III
10	SHWETA TIWATI	30	FEMALE	I	IV	I	III	I	II
11	RAJEEV	21	MALE	I'	I'	I'	III	I'	I'
12	PALLAVI	30	FEMALE	I'	IV	III	I'	I'	I'
13	SANJANA	25	FEMALE	I'	IV	I'	IV	I'	I'
14	DEVIKA	20	FEMALE	III	IV	IV	III	I	II
15	SANA	20	FEMALE	II	IV	II	II	I	II
16	NOOR	32	FEMALE	II	IV	II	II	IV	II
17	RENU JAISWAL	25	FEMALE	IV	I	I'	IV	IV	I'
18	PREETI	24	FEMALE	I'	IV	I'	II	IV	II
19	SUDHA YADAV	23	FEMALE	I	IV	I	II	IV	II
20	ANKITA	27	FEMALE	I'	IV	I'	I'	I'	III
21	RIGZING	39	FEMALE	IV	IV	IV	III	IV	III
22	SANA AKEES	19	FEMALE	I'	I'	IV	I	I'	I
23	AMIT KUMAR	18	MALE	III	IV	III	II	II	II
24	FIDA HUSSAIN	18	MALE	III	IV	III	II	IV	II
25	MAHIMA CHAUHAN	21	FEMALE	II	IV	II	II	IV	II
26	SURAJ	23	MALE	III	IV	III	IV	IV	III
27	MANEESH KUMAR	20	MALE	III	IV	III	II	IV	II
28	FATIMA	19	MALE	III	IV	I'	III	IV	I'
29	VAISHALI	18	FEMALE	III	IV	III	III	IV	III
30	VISHAKHA	28	FEMALE	I'	IV	I'	I'	IV	I'
31	SURAJ	27	MALE	I'	IV	I'	I'	I	I'
32	RAJAT	18	MALE	I'	I'	I'	I'	I'	I'
33	SUSHANT	20	MALE	III	IV	IV	II	I	II
34	AASHISH	28	MALE	II	IV	II	II	IV	II
35	RUPAM	23	FEMALE	IV	I	I'	IV	IV	I'
36	SUJATA	24	FEMALE	III	IV	III	IV	III	II
37	KANUPRIYA	25	FEMALE	III	IV	III	II	IV	II
38	NIKITA	24	FEMALE	II	IV	II	II	IV	II
39	RAGHAV	16	MALE	III	IV	III	III	IV	II
40	ANAND	20	MALE	II	IV	II	II	IV	II
41	JAYA	23	FEMALE	IV	I	I'	IV	IV	I
42	SHIVANI	28	FEMALE	I'	IV	I'	II	IV	II
43	ANJALI	29	FEMALE	I	IV	I	II	IV	II
44	ANAHITA	29	FEMALE	I'	IV	I'	I'	I'	III
45	NIKHIL	27	MALE	I'	I'	IV	I	I'	I
46	ABRAR	26	MALE	III	IV	III	II	IV	II
47	KAIRAV	16	MALE	III	IV	III	II	IV	II
48	ADVIK	18	MALE	II	IV	II	II	IV	II
49	VIHAN	21	MALE	IV	IV	III	III	IV	III
50	KARTIK	20	MALE	III	IV	III	II	IV	II
51	ANI	23	FEMALE	III	IV	I'	III	IV	I'
52	RIYA	18	FEMALE	III	IV	III	III	IV	III
53	PRAMEET	25	MALE	I'	IV	I'	I'	IV	I'
54	ANAISHA	29	FEMALE	I'	I'	I'	I'	I'	I'
55	POORVI	30	FEMALE	III	IV	IV	II	I	II
56	SARTHAK	27	MALE	III	IV	III	I	IV	I
57	RUCHI	25	FEMALE	I'	I'	I'	I'	I'	I
58	SRISHTI	28	FEMALE	IV	IV	IV	IV	I	IV
59	PRIYANSHI	18	FEMALE	III	IV	IV	II	I	II
60	NITISH	20	FEMALE	I	IV	I	II	IV	II

CLASS-III

Sr. No.	Name	Age	Sex	Upper Lip			Lower Lip		
				Right	Centre	Left	Right	Centre	Left
1	Ram	25	male	I	I	I	II	I'	II
2	SHAURYA	16	MALE	I	IV	I'	II	II	II
3	ARIJIT	18	MALE	I	I	I	I	I	I
4	SUNIL	16	MALE	I	I	I	I	I	I'
5	AKANSHA	27	FEMALE	II	I'	II	I'	I	I'
6	SURENDRA	40	MALE	I	I	I	II	I	II
7	NARAYANI	22	FEMALE	IV	IV	IV	I	IV	I
8	SIDDHANT	16	MALE	II	IV	I	II	IV	II
9	SNEHA SINGH	19	FEMALE	I'	IV	I'	I'	I	I'
10	SHAIFALI	26	FEMALE	II	IV	II	II	I'	II
11	NIVEDITA	16	FEMALE	II	I	II	II	IV	II
12	PIYUSH	24	MALE	II	I'	II	II	I'	II
13	SWAGAT	27	MALE	II	IV	II	II	I	II
14	MINERVA	26	FEMALE	I'	I	I'	I	I	I
15	SNIGDHA	25	FEMALE	II	I	II	II	I'	II
16	HIMANSHI	27	FEMALE	II	I'	II	II	I'	II
17	AKHORI PRAKHAR	23	MALE	I	I'	I	I	I'	I
18	VIVEK	40	MALE	II	I'	II	II	I'	II
19	RIYA	20	FEMALE	I'	IV	I'	I'	I	I'
20	SAMREEN	35	FEMALE	I	IV	I	II	I	II
21	KAVISHA	24	FEMALE	I	I	I	II	I'	II
22	AASTHA	29	FEMALE	I	I'	I	I	I	I'
23	RABIA	26	FEMALE	II	IV	I	II	IV	II
24	REKHA	28	FEMALE	II	I	II	II	IV	II
25	AKSHAT	23	MALE	I	IV	I'	I	IV	I'