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## Aesthetic Surgical Procedures- Is It A Matter of Age?

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**Abstract:** Face is the seat of an individual's identity. Hence treatment plan and execution of corrective esthetic surgeries are challenging. The average age at which patients become self-aware of dentofacial deformities and seek professional help is usually in the second decade of life when they begin to develop a sense of individualistic identity to integrate into the society. However, it is observed that individuals in the older age groups are seeking treatment for correction of dentofacial deformities. The aim of this study was to identify the age at which individuals report for orthognathic surgery. For the purpose of this study, data collection was done retrospectively from the hospital archives for patients undergoing orthognathic surgery during a period of ten months from June 2019 to March 2020. In our study it was observed that despite differences in chief complaints, 54.17% females and 45.83% males seek jaw corrective procedures. Though the association between age of patients and osteotomy procedure was not of statistical significance ( $p=0.470 > 0.05$ ), there was a substantial increase in those seeking treatment in the fourth decade of life (16.67%) implying a marked clinical significance. This increase is due to the multidisciplinary team involved in functional rehabilitation of patients in this age group.

**Keywords:** Dentofacial Deformity; Orthognathic Surgery; Corrective Jaw Surgery; Age ; Facial Aesthetic Surgery

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### INTRODUCTION

Orthognathic procedures and other aesthetic surgical procedures are used to correct abnormalities related to maxilla and mandible or nose. There are various indications for why patients seek orthognathic treatment. These include correction of malocclusion, temporomandibular joint dysfunction, unaesthetic facial appearance, sleep apnea (Posnick, 2013; Solanki, Cobb and Ali, 2016; Al-Sebaei *et al.*, 2017; Naini and Gill, 2017; Grabowski and Steinbacher, 2019; Denadai *et al.*, 2020). Abnormal dentofacial relationships can be corrected using three major treatment strategies in order to achieve the three pillars of stomatognathic triad- function, stability and aesthetics, depending upon the patient's chief complaint and age at which treatment is sought (Isufi, no date; Weaver *et al.*, 1998; Yamaguchi *et al.*, 2010; Celikoglu *et al.*, 2011; Kim *et al.*, 2017; Lauc *et al.*, 2017; Chavanavesh, Petdachai and Chuenchompoonut, 2018). These include;

1. Orthopedic appliance therapy which acts as growth modifiers and uses the inherent growth potential of bone to prevent anticipated jaw relation abnormalities in an individual (Bastiani, no date; Alle, Suma and Sharmada, 2012; Linsen, Wolf and Müßig, 2016; Durgekar, 2018; Fischer *et al.*, 2018; Zhao *et al.*, 2018; Alhammadi *et al.*, 2019; Shen *et al.*, 2019; Oliveira *et al.*, 2020; Rekhawat, Durgekar and Reddy, 2020);

2. Orthodontic appliance therapy which elicit bone deposition-resorption by selective remodelling of alveolar segment of bone in response to pressure (Surana, Chakrabarty and Dhar, 2012; Williams, Atack, Sandy and A. Ireland, 2013; Williams, Atack, Sandy and A. J. Ireland, 2013; Zhang *et al.*, 2013; Gallone *et al.*, 2019; Staderini, Meuli and Gallenzi, 2019; Quinzi *et al.*, 2020), or by using

3. Orthognathic surgery, which involves the surgical repositioning of jaws (Lee, Kim and Chung, 2014; Spagnoli, 2014; Reyneke and Ferretti, 2016; Dehghani, Fazeli and Sattarzadeh, 2017; Eslamipour *et al.*, 2017; Naini and Gill, 2017; Pelo *et al.*, 2018; Bardet *et al.*, 2019; Christianto and Leung, 2019; Jeyaraj and Chakranarayan, 2019; Steinbacher, 2019);

Orthopedic appliance therapy relies on selective growth inhibition and promotion at certain craniofacial sutures, hence, use of growth potential is a pre-requisite for successful treatment (A. Jain *et al.*, 2019; Maspero *et al.*, 2019; Caplin *et al.*, 2020). Orthodontic appliance therapy is usually camouflage therapy to mask skeletal abnormalities in borderline cases of dentofacial deformities (Benyahia *et al.*, 2011; Alhammadi, 2019; Park,

Emamy and Lee, 2019). The skeletal age, dental age and chronological age should all be taken into consideration for successful treatment, however, it remains largely a controversial topic and depends upon the choice of patient and their dental health care provider.

Orthognathic surgery is however, largely performed after growth completion to avoid effects of growth on facial skeleton(Wolford, Karras and Mehra, 2001a, 2001b; Spagnoli, 2014). Orthognathic surgery is the treatment of choice to correct malocclusion and improve facial aesthetics in patients where growth has ceased, which is usually towards the end of the second decade of life. However, recent trends are pointing towards an increasing number of patients in the late third to fifth decade of life seeking treatment(Bailey *et al.*, 2001; Parton *et al.*, 2011). There can be various reasons for this shift, mostly attributed to an increase in frequency of patients being diagnosed with obstructive sleep apnea and the success of maxillo-mandibular advancement surgery in treatment(Li *et al.*, 2015; Lau *et al.*, 2019; Lee *et al.*, 2019; Houppermans *et al.*, 2020). Orthognathic surgery also plays a pivotal role in multidisciplinary treatment plans involving congenital malformation of teeth like amelogenesis imperfecta, periodontally and prosthetically compromised cases, where rehabilitation can not be managed successfully in the presence of jaw size abnormalities(Honda *et al.*, 2018; Kim, Jeon and Huh, 2018; Philip, 2019; Ertas *et al.*, 2020).

As the life expectancy is increasing so is the concept of ageing gracefully, as are the advances in technology and surgical techniques which allow for maintaining a youthful glow. Ageing being a natural process can not be stopped, but it can be delayed using treatment modalities such as blepharoplasty, face lifts, brow lifts, liposuction, botox injections etc. these adjuncts to orthognathic treatment help in delaying the signs of ageing(Mohamed and Perenack, 2014; Bagheri, Khan and Bohluli, 2018; Mazzaferro, Naran and Bartlett, 2019). However, with advancing age, there are chances that patients experience certain difficulties during the perioperative and postoperative period in undergoing orthognathic surgery. There are numerous reports on increased incidences of neurosensory disturbances, hardware failure, infection, bleeding, non union, temporomandibular joint dysfunction, etc. in patients undergoing orthognathic surgery in older age(Kobayashi *et al.*, 2006; Sadakah and Elshall, 2018; Brecher *et al.*, 2019).

Till date the institutional team has conducted several clinical trials (Jesudasan, Wahab and Sekhar, 2015; Christabel *et al.*, 2016; Kumar, 2017b; Packiri, Gurunathan and Selvarasu, 2017; Patil *et al.*, 2017; Rao and Santhosh Kumar, 2018; Abhinav *et al.*, 2019; S. V. Jain *et al.*, 2019; Sweta, Abhinav and Ramesh, 2019),genetic studies (Marimuthu *et al.*, 2018), various surveys (Kumar and Sneha, 2016; Patturaja and Pradeep, 2016; Kumar, 2017a; Kumar and Rahman, 2017) and literature update (Kumar, 2017c) over various topics of surgical interest. The goals of this present study were to determine the age wise frequency distribution of patients seeking orthognathic treatment, their motivation to undergo treatment and the treatment performed for maxillo-mandibular corrective surgery and their distribution amongst the genders. Our team has rich experience in research and we have collaborated with numerous authors over various topics in the past decade (Deogade, Gupta and Ariga, 2018; Ezhilarasan, 2018; Ezhilarasan, Sokal and Najimi, 2018; Jeevanandan and Govindaraju, 2018; J *et al.*, 2018; Menon *et al.*, 2018; Prabakar *et al.*, 2018; Rajeshkumar *et al.*, 2018, 2019; Vishnu Prasad *et al.*, 2018; Wahab *et al.*, 2018; Dua *et al.*, 2019; Duraisamy *et al.*, 2019; Ezhilarasan, Apoorva and Ashok Vardhan, 2019; Gheena and Ezhilarasan, 2019; Malli Sureshbabu *et al.*, 2019; Mehta *et al.*, 2019; Panchal, Jeevanandan and Subramanian, 2019; Rajendran *et al.*, 2019; Ramakrishnan, Dhanalakshmi and Subramanian, 2019; Sharma *et al.*, 2019; Varghese, Ramesh and Veeraiyan, 2019; Gomathi *et al.*, 2020; Samuel, Acharya and Rao, 2020)

## **MATERIALS AND METHODS**

A retrospective study was conducted in our center for a period of ten months from June 2019 to March 2020. Potential subjects for the study were identified using treatment terminologies for orthognathic surgery via online search of digital archives of our institution. Institutional ethical clearance was obtained for data retrieval and usage as required for the study (SDC/SIHEC/2020/DIASDATA/0619-0320)

Patients were included as subjects in the study if they had accessible preoperative, intraoperative and postoperative records. Patients undergoing treatment for craniofacial syndromes, cleft orthognathic surgery, distraction osteogenesis were excluded. From a total of 31 relevant case records; 24 patients were included in the study after scrutiny for the inclusion and exclusion criteria. Demographic details such as name, age and sex were recorded along with the diagnosis and type of treatment performed. The data collected was analysed using Chi Square test with SPSS software version 20.

## **RESULTS AND DISCUSSIONS**

31 patients underwent corrective surgical procedures for facial asymmetry. 7 patients were excluded as they did not meet the inclusion criteria, 4 were excluded as they were syndromic patients, 3 were excluded as they had surgery for post traumatic residual deformity. 24 patients underwent orthognathic surgery exclusively for esthetic correction of maxillomandibular skeletal deformity.

From the study population, it was identified that 54.16% (n=13) females and 45.83% (n=11) males sought orthognathic treatment (Graph 1). The study did not reveal any significant variation between the genders as almost equal numbers of male seek corrective jaw surgery as females. This is in accordance with previously published studies reporting similar gender prevalence (Cunningham and Moles, 2009).

Most authors report women are more likely to seek orthognathic surgery to improve cosmetic appearance while males desire improvement in functional needs which is also the same in our subjects (Yu *et al.*, 2013; Dahy *et al.*, 2018; Song *et al.*, 2019). Facial aesthetics was the chief complaint for 10 out of 13 females and 8 out of 11 males. The remaining patients both males (n=3) and females (n=3) sought correction of dental malocclusion on an interdisciplinary basis to meet their rehabilitation needs with an esthetic completeness. Females present with bimaxillary protrusion (16.67%, n=4) and transverse skeletal deformities (16.67%, n=4) the most, while males presented with mandibular prognathism more (16.67%, n=4) (Inference 4). These results are in confluence with results of other studies conducted in asian subcontinent and worldwide (Martinez, no date; Stellzig-Eisenhauer, Lux and Schuster, 2002; Rabie, Wong and Min, 2008; Ngan and He, 2010; Erverdi, Ateş and Motro, 2015).

The data was divided according to age into three groups namely up to 20 years, 21 to 30 years and above 30 years of age. In the up to 20 years age group a total of 29.17% (n=7) patients sought treatment. In the 21 to 30 age group 54.17% (n=13) patients sought treatment and 16.67% (n=4) patients sought treatment in the above 30 years age group (Graph 2). Our study showed the highest treatment being done in the third decade of life and there is a substantial increase in patients seeking treatment in their fourth decade of life and so forth. This increase is observed due to the increased life expectancy of individuals which advocates a need for prosthetic rehabilitation of dentition requiring a multidisciplinary approach due to change in skeletal relationships after loss of teeth due to periodontal reasons or advancing age (Ahmed, no date; Jacobson, 2002; Kim *et al.*, 2018; Mallikarjuna, 2018; Kawai *et al.*, 2020). As the age increases for surgical treatment there is a need to pay close attention to bone dynamics, systemic illnesses, oral health, psychological state of the individual to adjust with the post operative facial aesthetics (Ağırnaslıgil *et al.*, 2019; Avelar *et al.*, 2019; Bruccoli *et al.*, 2019; Posnick and Kinard, 2019; Mugnier *et al.*, 2020).

Graph 3 represents the distribution of various diagnoses in the target population group seeking treatment for orthognathic surgery. Overall transverse facial asymmetry (29.17%, n=7) is the most commonly diagnosed condition while maxillary prognathism is the least commonly diagnosed condition (4.17% , n=1).

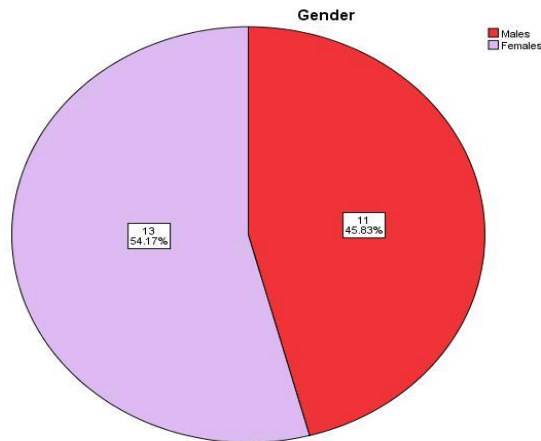
Upon data analysis it was observed that our population subset were treated with a frequency of 33.33% (n=8) for maxillary, mandibular and maxillomandibular skeletal malformations equally (Graph 4).

The most commonly affected bone - maxilla, mandible or both per age group were also identified. In our study population group of upto 20 years, the mandible was most commonly affected in 12.50% (n=3) patients, followed by maxilla and both arches equally 8.33% (n=2). In the 21-30 age group, 25% (n=6) patients had skeletal discrepancies involving both arches, while 16.67% (n=4) had maxillary discrepancy alone and 12.50% (n=3) patients for mandibular discrepancy. In the above 30 years age group, patients had discrepancies of maxilla and mandible with equal frequency 8.33% (n=2) (Inference 1).

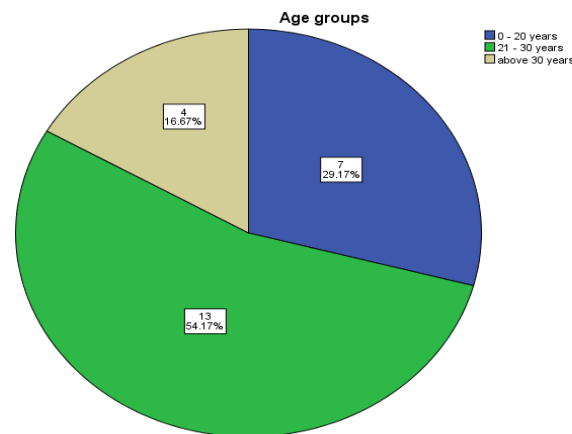
The most commonly diagnosed skeletal discrepancies according to age groups where bimaxillary protrusion is seen as the most common diagnosis which is consistent with the studies in literature (Inference 2). Maxillary retrognathism and mandibular prognathism are the characteristic skeletal abnormalities seen in asian population with the highest prevalence which is consistent with studies in the literature (Kalha, Latif and Govardhan, 2008; Arunkumar, Reddy and Tauro, 2010; Biradar and Madanagowda, 2010; Singh *et al.*, 2017; Olkun and Sayar, 2019; Olkun, Borzabadi-Farahani and Uçkan, 2019; Hammoudeh *et al.*, 2020; Kochar *et al.*, 2020; Takasu *et al.*, 2020).

Correlation of distribution of treatment modalities shows a wide combination and permutation of treatment being done for patients with skeletal mal relations (Inference 7). The most commonly performed treatment was anterior maxillary osteotomy with genioplasty, which shows a trend towards treatment of bimaxillary protrusion using these techniques. Our institution is passionate about high quality evidence based research and has excelled in various fields ( (Pc, Marimuthu and Devadoss, 2018; Ramesh *et al.*, 2018; Vijayashree Priyadharsini, Smiline Girija and Paramasivam, 2018; Ezhilarasan, Apoorva and Ashok Vardhan, 2019; Ramadurai *et al.*, 2019; Sridharan *et al.*, 2019; Vijayashree Priyadharsini, 2019; Chandrasekar *et al.*, 2020; Mathew *et al.*, 2020; R *et al.*, 2020; Samuel, 2021)

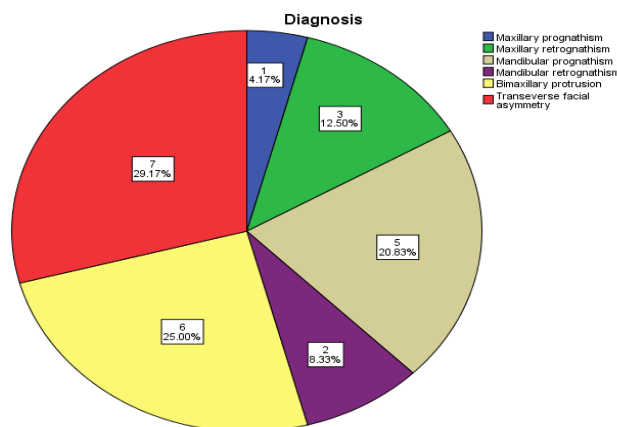
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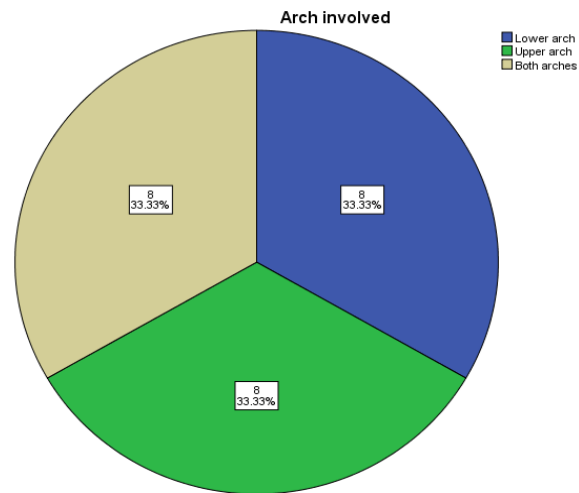
**Graph 1 : Pie chart showing gender distribution of orthognathic surgery amongst patients which shows females (54.17% - purple) are treated more frequently than males (45.83% - red)**



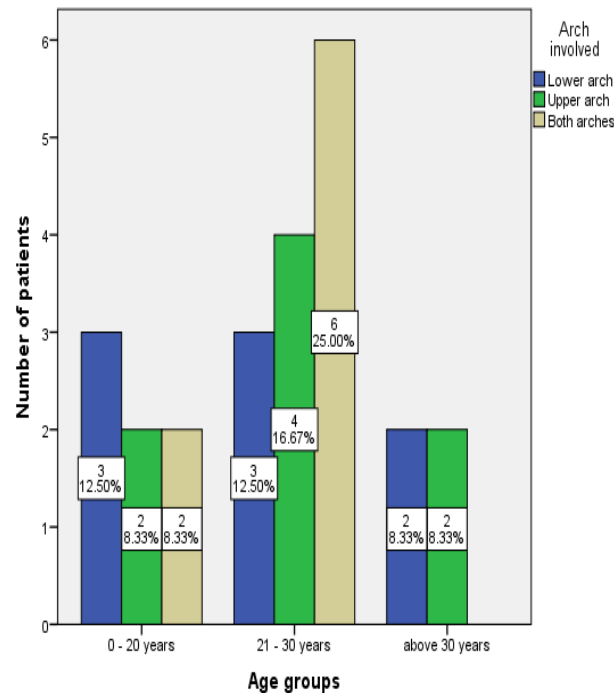
**Graph 2 : Pie chart showing age distribution of orthognathic surgery amongst patients which shows orthognathic surgery was performed most commonly in the 21 to 30 age group (54.17% - green), followed by patients in the up to 20 years of age (29.17% - blue) and least in the above 30 years age group (16.67% - beige)**



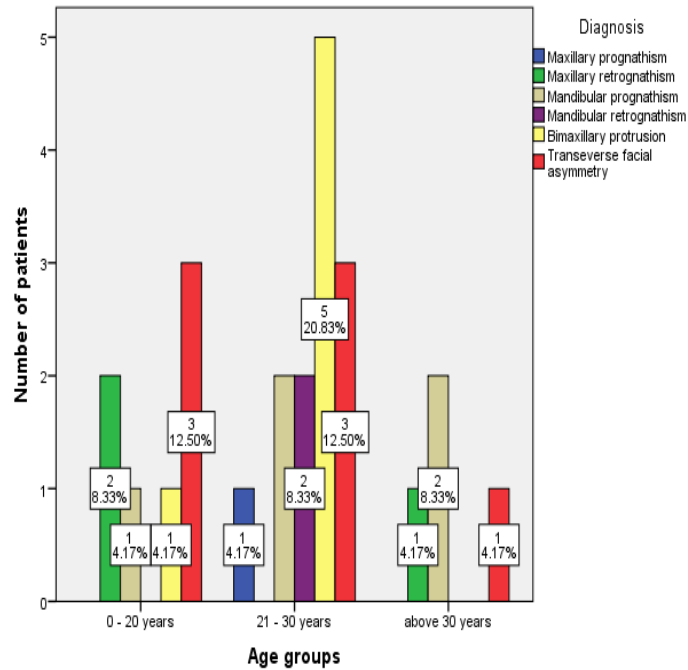
**Graph 3 : Pie chart illustrating the distribution of various diagnoses amongst the patients treated for maxillofacial skeletal discrepancies. Transverse facial asymmetry (29.17%, red) was the most commonly diagnosed condition while the least commonly diagnosed condition was maxillary prognathism (4.17%, blue).**



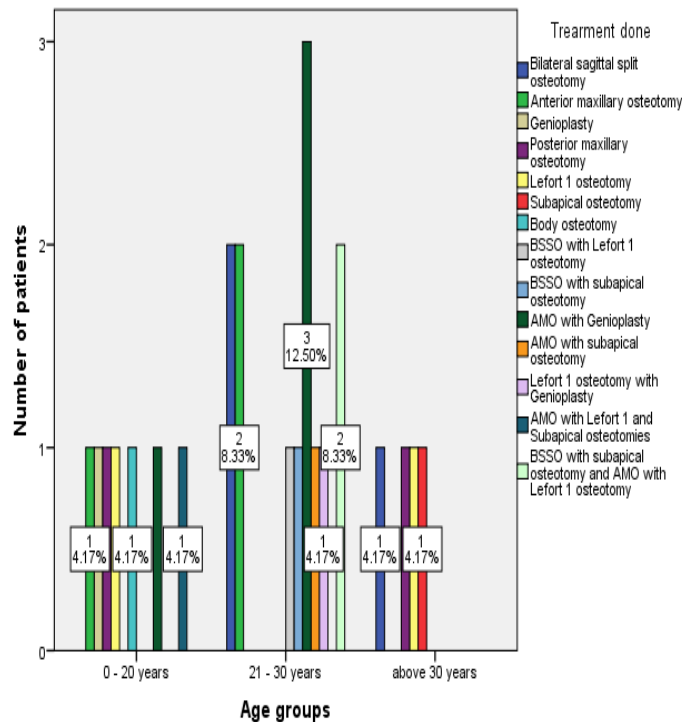
**Graph 4 :** Pie chart representing equal frequency of osteotomy procedures done in maxillary arch alone, mandibular arch alone and combination osteotomy in both arches (33.33% in each) in patients being diagnosed and treated for maxillofacial skeletal malformations



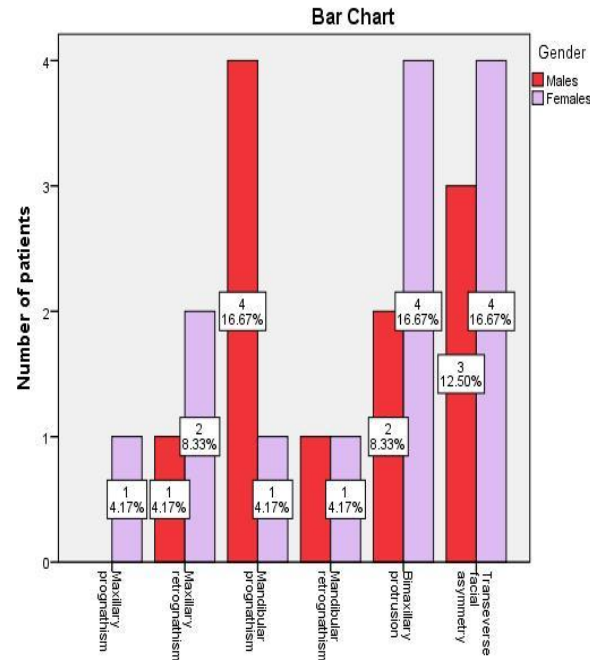
**Inference 1 :** Bar graph representing the most common arch with skeletal discrepancy according to age groups undergoing orthognathic treatment (where X axis represents age groups, Y axis represents number of patients, blue- lower arch, green- upper arch, beige- both arches) which was not statistically significant with p value = 0.499 by Chi square test.



**Inference 2 :** Bar graph representing the most common skeletal discrepancy according to age groups undergoing orthognathic treatment (where X axis represents age groups, Y axis represents number of patients, blue- maxillary prognathism, green- maxillary retrognathism, beige- mandibular prognathism, violet- mandibular retrognathism, yellow- bimaxillary protrusion, red- transverse facial asymmetry) which was not statistically significant with p value = 0.359 by Chi square test.



**Inference 3 :** Bar graph representing the most common treatment performed according to age groups (where X axis represents age groups, Y axis represents number of patients) showing a wide distribution of combination of various surgical techniques across the entire spectrum of age groups which was not statistically significant with p value = 0.470 by Chi square test.



**Inference 4 : Bar graph showing distribution of various skeletal discrepancies across the genders (where X axis represents the skeletal discrepancy , Y axis represents number of patients, red- males, purple-females). Females show a higher number of bimaxillary protrusion(16.67%) and transverse facial discrepancies(16.67%), while males present with mandibular prognathism (16.67%) the most with p value-0.578 >0.05 on Chi Square Test.**

#### CONCLUSION

The purpose of this study was to determine if demographic factors such as age and gender have influence over individuals seeking orthognathic surgery. This research gives an insight into the age range over which orthognathic surgery is performed at our institution. It reflects the variation between Individuals in terms of their skeletal dental and chronological age. The knowledge of recommended age limitations of surgery allows comparison to age limitation suggested by long-term outcome measures which are objective in nature.

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