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KNOWLEDGE, ATTITUDE, AND PERCEPTION ON REFERENCE POINTS AND ITS SIGNIFICANCE AMONG UNDERGRADUATE DENTAL STUDENTS

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ABSTRACT

The aim of this study was to assess the awareness of reference points and their significance in undergraduate dental students. A survey was conducted in January 2020 among dental students (Third years, Final years, Interns). It was an online questionnaire-based study, conducted to assess the awareness of reference points. 150 dental students (Third years, Final years, Interns) participated in this study. The questionnaire was equally distributed among the Third years, Final years, Interns. The goal of developing this questionnaire was to know about the awareness the dental students have on reference points. Results showed that the students in their internship were more aware of anterior and posterior reference points and their importance. Within the limitation of the current study, it is observed that there was a statistically significant difference between the undergraduate students on awareness of

reference points. So it can be concluded that interns have a better knowledge about the reference points and its significance than third year and final year students.

INTRODUCTION

In the fabrication of complete or partial dentures, clinicians require one or more reference planes that are used in accurate positioning of cast models on an articulator. The articulator is a mechanical device that simulates the movement of the jaw and relations of the teeth during functioning. It is essential for diagnostic and therapeutic procedures. (Zarb, 2013)Therefore, the transfer of a cast of the jaws into the articulator using suitable reference points is necessary. The evolution of reference planes was primarily related to the restoration of occlusion in the well-controlled form and position of the teeth. (Weisgold, 1975)The maxillary cast in the articulator usually creates a basic orientation which creates an occlusal relationship, and it should be positioned by identifying three points in different orientations, which can't be on an equivalent line. Most of the planes are formed by two points located posterior to the maxillae and one point located anterior to them. The horizontal plane of reference plane established on the face of the patient by one anterior reference point and two posterior reference points from which measurements of the posterior anatomic determinants of occlusion and mandibular motion are made. (Rahn, Ivanhoe, and Plummer, 2009)

Anterior point of reference is the point located on the mid-face, along with two posterior reference points, creates a reference plane, whereas posterior reference points are located one on each side of the face within the transverse horizontal axis, which with an anterior point of reference, creates the horizontal reference plane. In prosthetic procedures for esthetic reasons clinicians have stated that the selection of the 3rd point of reference on the Frankfort horizontal plane and establishment of a plane of occlusion is important.

The anterior reference points are orbitale; orbitale minus, nasion minus; ala of the nose; Incisal edge and articulator midpoint to articulator axis - horizontal plane distance. The posterior reference points are Byron point; Gysi point; Bergstrom point; Lundeen’s point; Simpson’s point; Weinberg’s point.

A face-bow is used to transfer the spatial relationship of the cranium base to the articulator, usually by relating it to a plane of reference. The most common reference plane is the Frankfort plane (FP), which is horizontal when the patient is in the natural head position. The axis-orbitale plane (AOP) has also been considered horizontal and used as a reference. (Weinberg, 1961)

However, some studies have shown that these planes are not horizontal, and mounting a maxillary cast according to these planes can result in an inaccurate mounting and even end up in incorrect centric relation. The criteria utilized in the selection of those reference points are simple location, convenience, and reproducibility. In general, two points are positioned in the area of the temporomandibular joints (TMJ) and a third or posterior point is selected, anterior to the TMJs, to define a plane of reference, which is oriented in the articulator so that the three-dimensional (3D) position of the upper cast is reproduced as it is in the patient. (Foster, Howat and Naish, 1981) Ellis suggested that proper mounting of the maxillary cast can be achieved when

two relationships are established: (1) The distance of the maxillary arch from the intercondylar hinge axis. (2) the 3D relationship between the maxillary occlusal plane and therefore the skull. (Ellis, Tharanon and Gambrell, 1992)
A plane of reference which has been used to record the angular relationship between the condylar path and the occlusal plane relationship is FP. Hence, the FP is marked over the lateral cephalometric radiograph by joining the lowest point in the margin of the left and right bony orbit (orbitale) and the highest point within the margin of the proper or left bony acoustic meatus (porion). (Brandrup-Wognsen, 1953; Olsson and Posselt, 1961; Santos et al., 1996) The selection of perfect anterior and posterior reference points is a really crucial step in maxillofacial rehabilitation procedures. A comprehensive understanding of these points is required for logical clinical applications.

Previously our department has published extensive research on various aspects of prosthetic dentistry ('Evaluation of Corrosive Behavior of Four Nickel–chromium Alloys in Artificial Saliva by Cyclic Polarization Test: An in vitro Study', 2017; Ganapathy, Kannan, and Venugopalan, 2017; Jain, 2017a, 2017b; Ranganathan, Ganapathy and Jain, 2017; Ariga et al., 2018; Gupta, Ariga and Deogade, 2018; Anbu et al., 2019; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Varghese, Ramesh and Veeraiyan, 2019), this vast research experience has inspired us to research on the awareness of reference points among undergraduate students.

MATERIALS AND METHOD

STUDY DESIGN

Awareness based survey

DATA COLLECTION

A survey was conducted in January 2020 among dental students (Third years, Final years, Interns). It was an online questionnaire-based study, conducted to assess the awareness of reference points and their significance. 150 dental students (Third years, Final years, Interns) participated in this study. The data collection was done via google forms.

SURVEY INSTRUMENT

A pretested, self-administered, closed-ended questionnaire comprising the following sections formed the survey instrument. A structured questionnaire containing 10 questions were prepared. The questionnaire was equally distributed among the Third years, Final years, Interns. The goal of developing this questionnaire was to know about the awareness the dental students have on reference points. The questions had to be answered with a Yes or No response.

DATA ANALYSIS

The data collected was entered into an Excel sheet and subjected to statistical analysis using SPSS version 20. A Chi-square test was done. The independent variables are age and gender while dependent variables are knowledge, attitude, and practice of reference points. The level of significance was set at $p<0.05$.

RESULTS AND DISCUSSION

The results **obtained** from this study showed that among the undergraduate students, Students in their internship were more aware of reference points

27.33% when compared to the other group of students. Final year students 25.3% more commonly did not have knowledge about orbitale reference points when compared to the other group of students. Third-year students 29.3% more commonly did not have knowledge about nasion reference point,26% more commonly did not have knowledge about orbitale minus reference point,28% more commonly did not have knowledge about ala of nose reference point,27.3% more commonly did not have knowledge about Bergstrom reference point,24.6% more commonly did not have knowledge about Beyron reference point when compared to the other group of students, 28% more commonly did not have knowledge about Gysi reference point when compared to the other group of students. Third-year students 28% more commonly were not aware of the advantages of posterior reference point and 29.3% more commonly were not aware of the advantages of anterior reference point when compared to the other group of students.

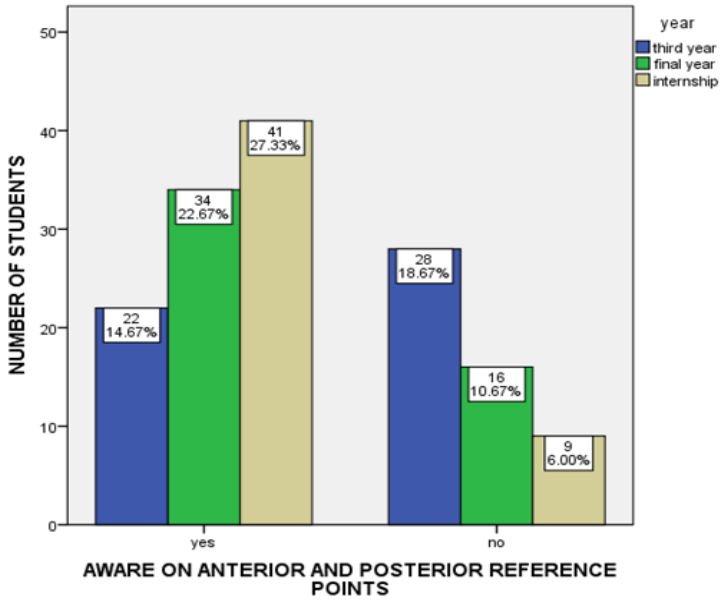

Figure 1:Bar chart represents awareness level on anterior and posterior reference points and the number of students. The X-axis represents awareness level and Y-axis represents the number of students. Students in their internship were more aware of reference points (beige) 27.33% than the final year students(green bar) and third years (blue bar).(Chi Square test, p value=0.000 ($p<0.05$ statistically significant).

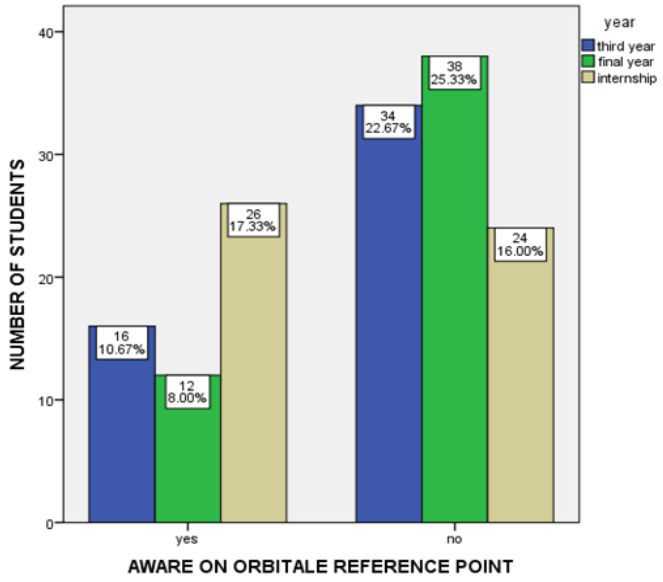

Figure 2:Bar chart represents the awareness level on the orbitale reference point and number of students. The X-axis represents awareness level and Y-axis represents the number of students. Final year students(green)25.3% more commonly did not have knowledge about orbitale reference points when compared to the other group of students.

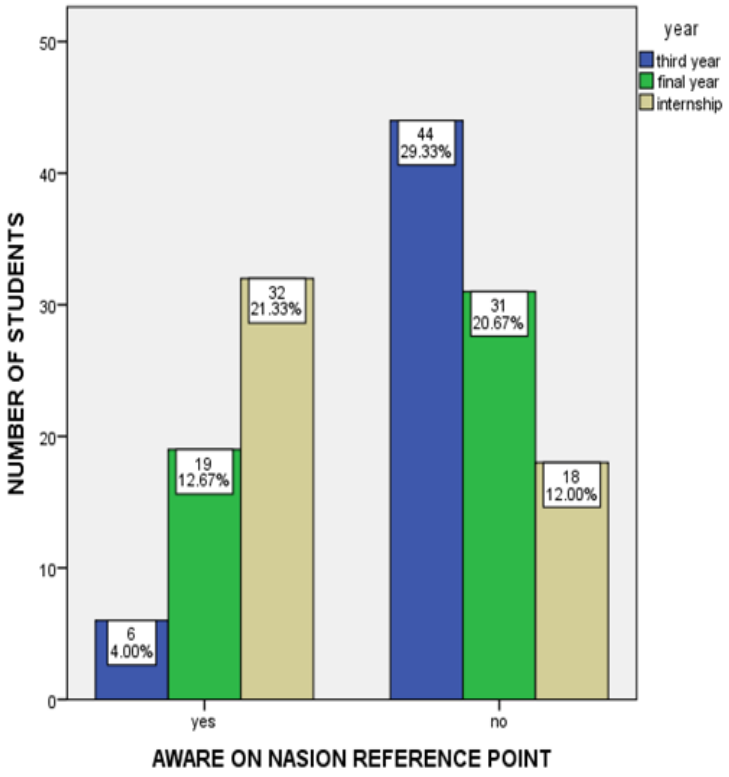

Figure 3:Bar chart represents the awareness level on the nasion reference point and number of students. The X-axis represents awareness level and Y-axis

represents the number of students. Third-year students(blue)29.3% more commonly did not have knowledge about the nasion reference point when compared to the other group of students.

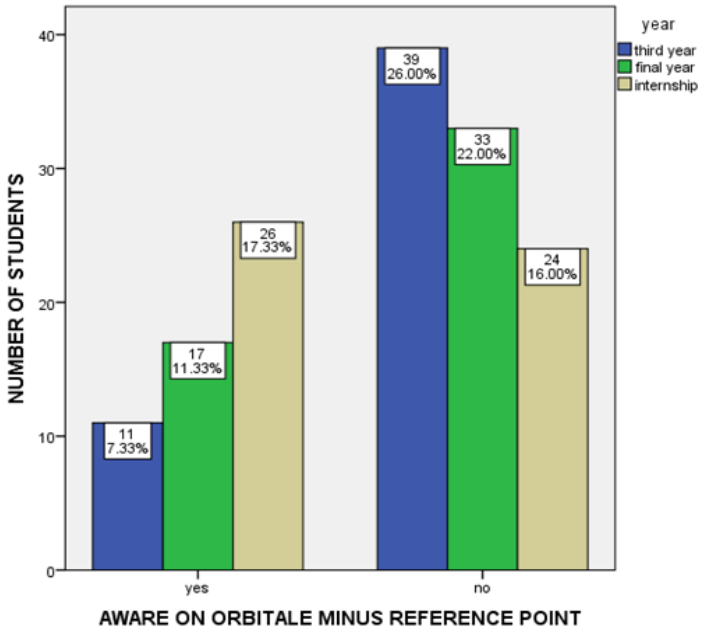

Figure 4:Bar chart represents the awareness level on the orbitale minus reference point and a number of students. The X-axis represents the awareness level and Y-axis represents the number of students. Third-year students(blue)26% more commonly did not have knowledge about orbitale minus reference points when compared to the other group of students.

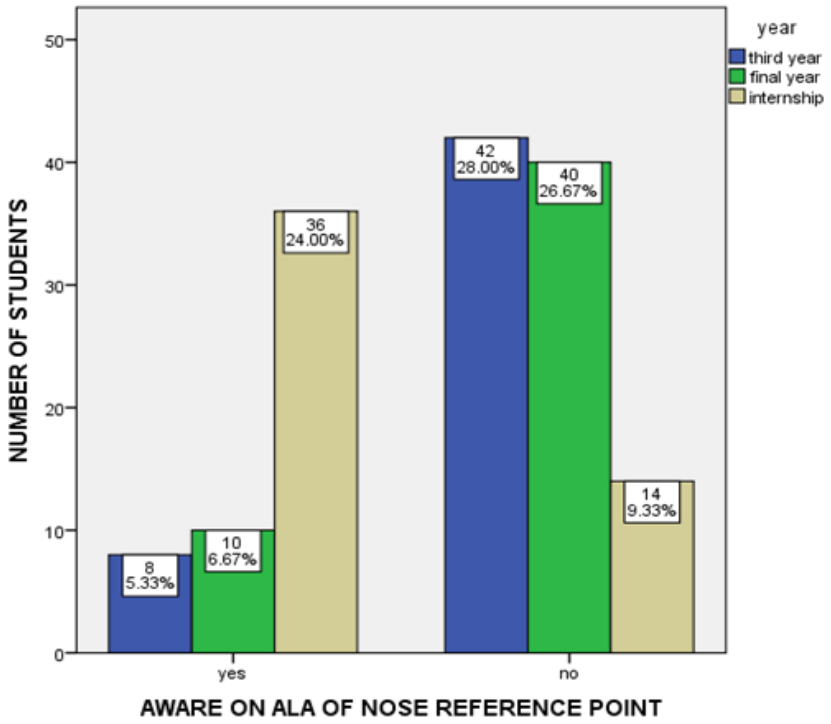

Figure 5:Bar chart represents awareness level on ala of nose reference point and number of students. The X-axis represents awareness level and Y-axis

represents the number of students. Third-year students(blue)28% more commonly did not have knowledge about ala of nose reference point when compared to the other group of students.

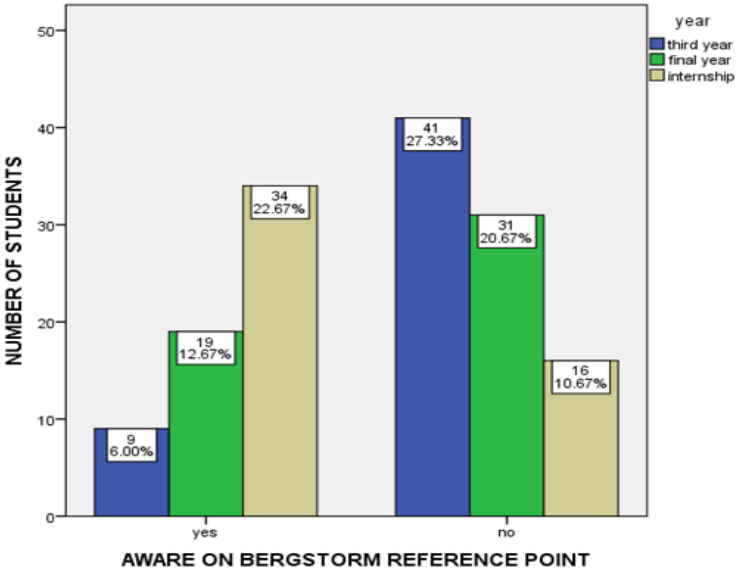

Figure 6: The bar chart represents the awareness level on Bergstrom's reference point and the number of students. The X-axis represents awareness level and Y-axis represents the number of students. Third-year students(blue)27.3% more commonly did not have knowledge about Bergstrom's reference point when compared to the other group of students.

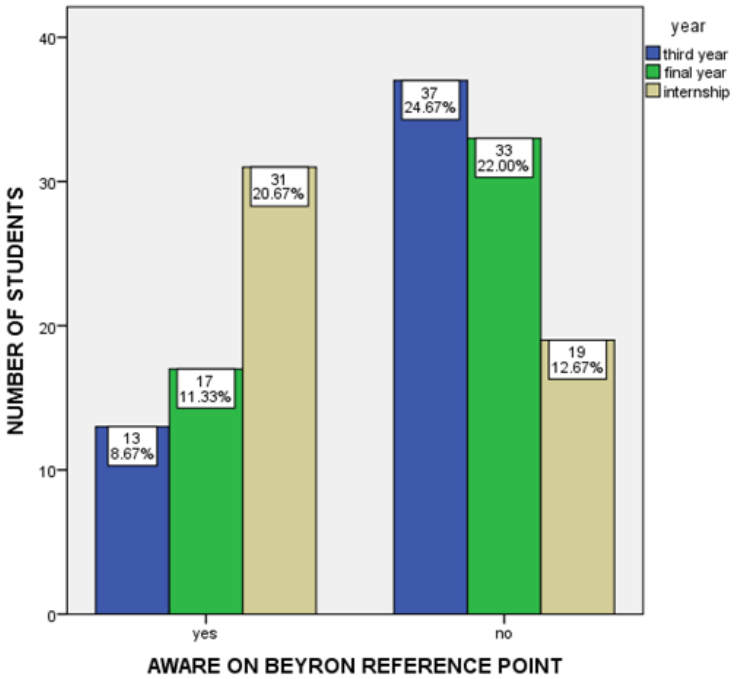

Figure 7: The bar chart represents the awareness level on Beyron reference point and number of students. The X-axis represents the awareness level and Y-axis represents the number of students. Third-year students(blue)24.6% more commonly did not have knowledge about Beyron reference point when compared to the other group of students.

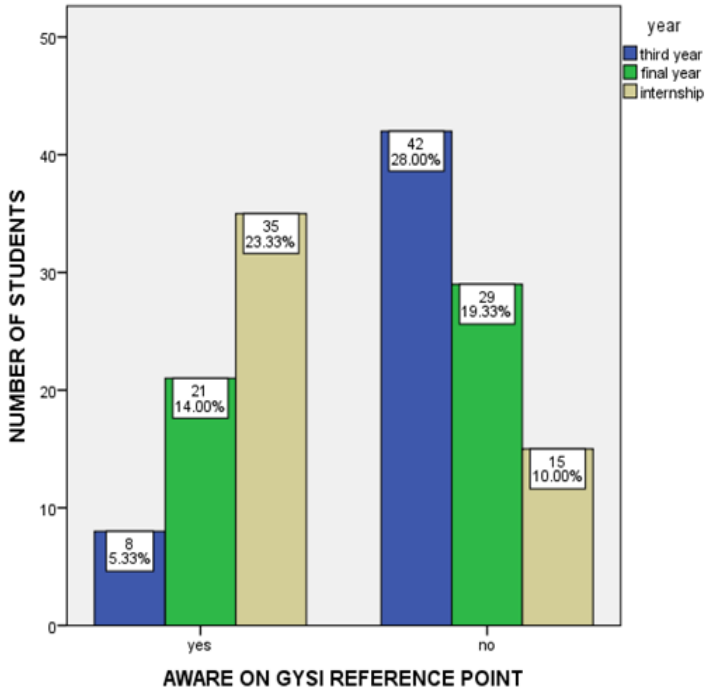

Figure 8: Bar chart represents the awareness level on Gysi reference point and number of students. The X-axis represents awareness level and Y-axis represents the number of students. Third-year students(blue)28% more commonly did not have knowledge about the Gysi reference point when compared to the other group of students.

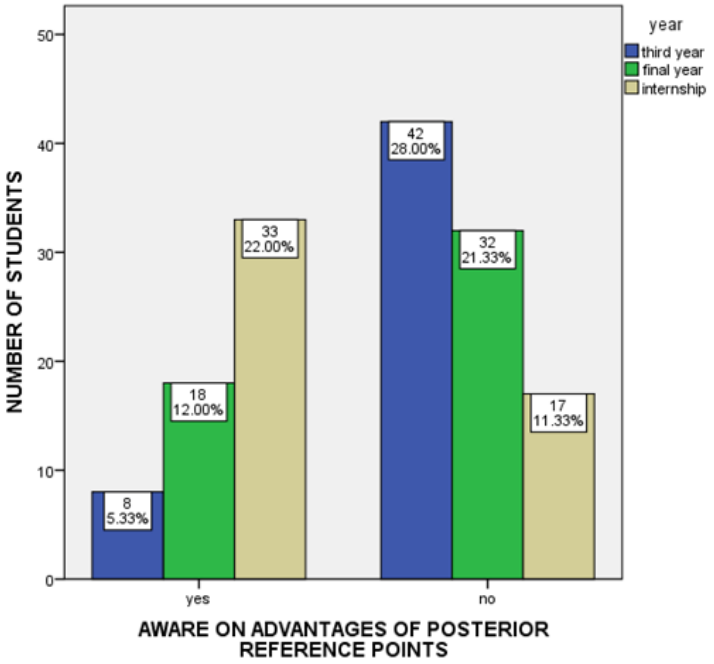

Figure 9:Bar chart represents the awareness level on the advantages of posterior reference points and a number of students. The X-axis represents awareness level and Y-axis represents the number of students. Third-year students(blue)28% more commonly were not aware of the advantages of posterior reference points when compared to the other group of students.

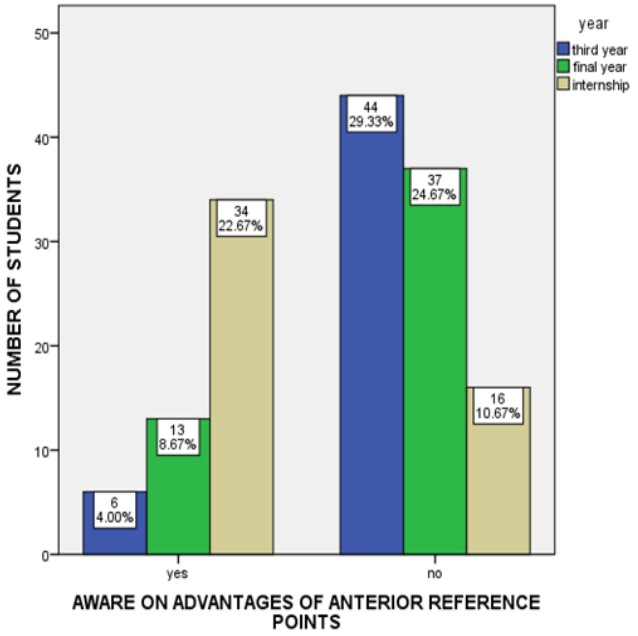

Figure 10:Bar chart represents the awareness level on the advantages of anterior reference point and the number of students. The X-axis represents the awareness level and Y-axis represents the number of students. Third-year students(blue)29.3% more commonly were not aware about the advantages of anterior reference point when compared to the other group of students.

150 undergraduate students were selected for this study among which 50 students were third-year students,50 were from final year and 50 students were interns. Among them, 27.3% of interns were aware of anterior and posterior reference points, 22.6% of final year students were aware of anterior and posterior reference points and 14.6% of third years were aware of anterior and posterior reference points (figure 1). Orbitale is the lowest point of the infraorbital rim of the skull which can be palpated on the patient. One orbitale and the two posterior points determine the horizontal axis of rotation which defines the axis - orbital plane. (Kumar *et al.*, 2012) however in our study, 17.35% of interns were aware of orbitale reference point and 16%of interns were not aware of orbitale reference point,8% of final year students were aware on the orbitale reference point and 25.3% of final year students were not aware of orbitale reference point,10.6% of third-year students were aware on the orbitale reference point and 22.6% of third-year students were not aware on the orbitale reference point(figure 2).

The nasion reference point is widely used with Whip Mix FaceBow. The nasion can be located in the head as the deepest part of the midline depression just below the level of the eyebrows. (Ercoli *et al.*, 1999) However in our study,21.3% of interns were aware of nasion reference point and 12 %of interns were not aware of nasion reference point,12.6% of final year students were aware on the nasion reference point and 20.6% of final year students were not aware of nasion reference point,4% of third-year students were aware

on the nasion reference point and 29.3% of third-year students were not aware on the nasion reference point(figure 3).17.3% of interns were aware of orbitale minus reference point and 16 %of interns were not aware of orbitale minus reference point,11.3% of final year students were aware on orbitale minus reference point and 22% of final year students were not aware of orbitale minus reference point,7.3% of third-year students were aware on orbitale minus reference point and 26 % of third-year students were not aware on orbitale minus reference point(figure 4).

24 % of interns were aware of ala of nose reference point and 9.3 %of interns were not aware of all of nose reference point,6.6% of final year students were aware on ala of nose reference point and 26.6% of final year students were not aware of ala of nose reference point, 5.3% of third-year students were aware on ala of nose reference point and 28 % of third-year students were not aware on ala of the nose reference point(figure 5).22.6% of interns were aware of Bergstrom reference point and10.6 %of interns were not aware of Bergstrom reference point,12.6% of final year students were aware on Bergstrom reference point and 20.6% of final year students were not aware of Bergstrom reference point, 6% of third-year students were aware on Bergstrom reference point and 27.3% of third-year students were not aware on Bergstrom reference point(figure 6).

20.6% of interns were aware of Beyron reference point and12.6 %of interns were not aware of Beyron reference point,11.3% of final year students were aware on Beyron reference point and 22% of final year students were not aware of Beyron reference point, 8.6% of third-year students were aware on Beyron reference point and 24.6% of third-year students were not aware on Beyron reference point(figure 7).23.3% of interns were aware of Gysi reference point and10 %of interns were not aware of Gysi reference point,14% of final year students were aware on Gysi reference point and 19.3% of final year students were not aware of Gysi reference point, 5.3% of third-year students were aware on Gysi reference point and 28% of third-year students were not aware on Gysi reference point(figure 8).

22% of interns were aware about advantages of posterior reference point and 11.3 %of interns were not aware about advantages of posterior reference point,12% of final year students were aware on advantages of posterior reference point and 21.3% of final year students were not aware about advantages of posterior reference point, 5.3% of third-year students were aware on advantages of posterior reference point and 28% of third-year students were not aware on advantages of posterior reference point(figure 9).22.6% of interns were aware about advantages of anterior reference point and 10.6 %of interns were not aware about advantages of anterior reference point,8.6% of final year students were aware on advantages of anterior reference point and 24.6% of final year students were not aware about advantages of anterior reference point, 4% of third-year students were aware on advantages of anterior reference point and 29.3% of third-year students were not aware on advantages of anterior reference point(figure 10).

CONCLUSION

Within the limitation of the current study, it can be concluded that interns have a better knowledge of reference points and their significance. More dental education and workshop programs on reference points can be conducted to educate undergraduate students.

AUTHOR CONTRIBUTIONS

First author, Jayakeerthana Srinivasan performed the data collection by reviewing patient details, filtering required data, analyzing and interpreting statistics, and contributed to manuscript writing. The second author, Dr. V Ashok contributed to the conception of study title, study design, analyzed the collected data, statistics, and interpretation and also critically revised the manuscript.

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CONFLICT OF INTEREST

There were no potential conflicts of interest as declared by authors.

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