
Quality Of Impressions Made For Fixed Partial Denture By Dental Students

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Abstract: An impression is a negative replica or copy in reverse of the surface of an object. Impression materials in the market are classified by various methods: chemical type, physical properties and viscosities. The aim of the study was to evaluate the quality of impressions made for fixed prostheses by undergraduate and postgraduate students. A total of 875 impressions photographs were analysed based on 10 parameters. The parameters were voids on finish line, lack of wash material, inadequate tray retention etc. They were given scores based on the outcomes, as unacceptable, acceptable and good. The results were recorded and tabulated. Various tests were performed using SPSS software to gain the correlation. The most common errors found among them were the lack of flash, followed by improper tray pressure, voids on the preparation, lack of material, improper fusion of materials. Increased errors were found at the finish line and the presence of blood in impression surfaces were also observed. The quality of impression making by the postgraduate students were better than undergraduates

Keywords: Finish line, Fixed partial denture, Impressions, Material fusion, Tray retention, Voids.

INTRODUCTION:

The important part of prosthesis fabrication is the transfer of accurate records to dental laboratories (Beier, Grunert and Kulmer, 2007). One of the most challenging procedures in dentistry is obtaining an optimum gingival displacement and an ideal impression for fixed dental prosthesis (Christensen, 2003). Only if an impression is of adequate quality, the technician can fabricate an indirect restoration with minimal error. The success of the restoration depends on the ability of the dentist to identify and analyse the quality of impression and requirement of any improved quality of impression (Samet et al., 2005).

Accurate transfer of impression requires a general understanding of soft and hard tissues anatomy, more accurately at the finish line (Winstanley, Carrotte and Johnson, 1997). It also requires a need to understand and select the required gingival displacement techniques and impression materials accordingly (Christensen, 2013; Baba et al., 2014). Results from various studies reported an improvement in handling and knowledge about the modern impression materials (Donovan and Chee, 2004; Rubel, 2007). Despite these, the quality of impression sent to the laboratory is apparently inadequate for fabrication of indirect prosthesis (Stewardson, 2005; Mitchell et al., 2009). Numerous studies have been done on the quality of impression and their accuracy (Ceyhan, Johnson and Lepe, 2003; Christensen, 2005). Majorities have been looking forward to the laboratory parameters (Joshi, Bhrat and Shrenoy, 2009) such as handling, pouring stages (Thongthammachat et al., 2002), or dimensional stability of the dyes (Leeper, 1979). Only few studies have actually reported the quality of impression made clinically (Samet et al., 2005).

As more patients opt for replacement techniques currently, the concerns, quality and cost of the fixed partial denture have been of prime importance (Northeast et al., 1992). Proper design and construction of the fixed partial denture must be done. It must restore the functional and aesthetical unit for the patient (Assif et al., 1985). These can be improved by the standard of impressions and the laboratory procedures. Correct impression materials and the trays are required for the abutments once they are prepared completely (Marquis et al., 1986). If the impression stage is not done proper it nullifies the preparation and finishing of the abutment however great it may be (Jain et al., 2018). The strength and aesthetics of denture depends on the practitioner's technique. Just like how the advancements on impression techniques are being focused on, several other streams are also being focused on simultaneously by research groups, mainly on various advancements about ceramics (Ashok and Suvitha, 2016; Ganapathy et al., 2016; Ranganathan, Ganapathy and Jain, 2017), implants (Ajay et al., 2017; Ganapathy, Kannan and Venugopalan, 2017; Duraisamy et al., 2019) and other advancements (Ashok et al., 2014; Subasree, Murthykumar and Others, 2016; Vijayalakshmi and Ganapathy, 2016). Several plant based studies (Venugopalan et al., 2014) are also being carried on which has an impact on the longer run in the

advancements(Jyothi et al., 2017) in providing efficient treatments along with various in vitro studies belonging to this entity(Selvan and Ganapathy, 2016).

Transfer of the impression requires thorough knowledge of the hard and soft tissue anatomy of maxilla and mandible. Proper selection of the impression materials and the gingival displacement techniques must be employed by the practitioners convenience. Various studies have proved to increase the improvements in the techniques currently. Despite that, the impressions taken have remained the same with no marked improvement(Murphy, Bates and Stafford, 1972). The aim of the study was to evaluate the quality of impressions made for fixed prostheses by undergraduate and postgraduate dental students.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 METHOD:

A total of 875 working impression photographs were taken from the patient records who visited Saveetha dental college from the period of June 2019 to March 2020. The study setting was the University setting. This retrospective study was approved by the following ethical approval number of the university, SDC/SIHEC/2020/DIASDATA/0619-0320. Type III examination procedures were included and 875 case sheets were reviewed. Cross verification of data for error identification was done. Simple random technique followed to minimise sampling bias. Random selection of participants, use of universal accepted DMFT were taken as Internal validity of sample. Defining the eligibility criteria of sample as the external validity.

The parameters were voids on finish line, lack of wash material, inadequate tray retention, tray pressure, tray exposure(show through), material inadequate fusion, voids on the impression, gingival displacement- lack of flash, blood on the gingival margin, tear at the finish line.

Data collection was reviewed among 86,000 population who visited a private dental college from the period of June 2019 to March 2020. Data entered in Microsoft excel sheet and then transported to SPSS software. Variable definition process was done using table and graphical illustration.

Impressions were numbered prior commencement. For each impression ten parameters were observed and scoring were given accordingly, as unacceptable, as acceptable and as good. Results were recorded and statistical analysis was done between factors to determine correlations if present. All the impressions were made up of two stage putty wash techniques using light body and putty in standard. Descriptive statistics and chi-square tests were done using the SPSS software analysis.

RESULTS AND DISCUSSION:

Percentage distribution of study subjects based on graduation. 44% of the study subjects were Undergraduates and 56% of them were Postgraduates (Figure 1). Out of the 875 impressions observed, Based on various parameters, percentage distribution of impressions based on voids on the finish line. 20.37% of the impressions were unacceptable and 44.62% of them were acceptable and 35.01% of them good (Figure 2). Based on lack of material. 17.73% of the impressions were unacceptable, 28.95% of them were acceptable and 53.32% of them were good (Figure 3). Based on tray separation, 16.93% of the impressions were unacceptable and 33.41% of them were acceptable and 49.66% of them good (Figure 4). Based on tray pressure, 21.62% of the impressions were unacceptable and 33.87% of them were acceptable and 44.51% of them good (Figure 5). Based on tray show through, 9.61% of the impressions were unacceptable and 32.15% of them were acceptable and 58.24% of them good (Figure 6). Based on material fusion, 17.51% of the impressions were unacceptable and 37.87% of them were acceptable and 44.62% of them good (Figure 7). Based on voids on preparation. 20.02% of the impressions were unacceptable and 54% of them were acceptable and 25.97% of them good (Figure 8). Based on lack of flash, 35.24% of the impressions were unacceptable and 42.91% of them were acceptable and 21.85% of them good (Figure 9). Based on blood on gingiva, 16.13% of the impressions were unacceptable and 48.05% of them were acceptable and 35.81% of them good (Figure 10). Based on tear, 18.42% of the impressions were unacceptable and 49.89% of them were acceptable and 31.69% of them good (Figure 11).

Association between the graduation levels and voids on finish line distribution of the impressions. Undergraduate impressions unacceptable are 8.6% and the postgraduate impressions are 11.7%, Acceptable postgraduate impressions are 25.6% and undergraduate impressions are 19%. Postgraduate impressions (18.6%) are good when compared with the undergraduates(16.3%) in terms of voids with a statistical significant difference found.(Pearson Chi-square Test $p= 0.045$, $p<0.05$) (Figure 12). Association between the graduation levels and lack of material distribution of the impressions. Undergraduate impressions unacceptable are 7.6%

and the postgraduate impressions are 10%, Acceptable postgraduate impressions are 16% and undergraduate impressions are 13%. Postgraduate impressions (29.8%) are good when compared with the undergraduates (23.4%) in terms of lack of material but no statistical significant difference found.(Pearson Chi-square Test $p=0.960$, $p>0.05$) (Figure 13). Association between the graduation levels and tray separation distribution of the impressions. Undergraduate impressions unacceptable are 7.3% and the postgraduate impressions are 9.6%, Acceptable postgraduate impressions are 18.1% and undergraduate impressions are 15.2%. Postgraduate impressions (28.1%) are good when compared with the undergraduates (21.4%) in terms of tray separation but no statistical significant difference found.(Pearson Chi-square Test $p=0.819$, $p>0.05$) (Figure 14). Association between the graduation levels and tray pressure distribution of the impressions. Undergraduate impressions unacceptable are 9.2% and the postgraduate impressions are 12.3%, Acceptable postgraduate impressions are 18.7% and undergraduate impressions are 15.2%. Postgraduate impressions(32%) are good when compared with the undergraduates(19.5%) in terms of tray pressure but no statistical significant difference found.(Pearson Chi-square Test $p=0.903$, $p>0.05$) (Figure 15). Association between the graduation levels and tray show through distribution of the impressions. Undergraduate impressions unacceptable are 3.3% and the postgraduate impressions are 6.2%, Acceptable postgraduate impressions are 16.8% and undergraduate impressions are 15.3%. Postgraduate impressions(32.8%) are more good when compared with the undergraduates(25.4%) in terms of tray show through but no statistical significant difference found.(Pearson Chi-square Test $p=0.098$, $p>0.05$) (Figure 16). Association between the graduation levels and voids on preparation distribution of the impressions. Undergraduate impressions unacceptable are 8% and the postgraduate impressions are 12%, Acceptable postgraduate impressions are 30% and undergraduate impressions are 24%. Postgraduate impressions (13.9%) are good when compared with the undergraduates (12%) in terms of voids on preparation but no statistical significant difference found.(Pearson Chi-square Test $p=0.438$, $p>0.05$) (Figure 17). Association between the graduation levels and lack of flash distribution of the impressions. Undergraduate impressions unacceptable are 16% and the postgraduate impressions are 19.2%, Acceptable postgraduate impressions are 23% and undergraduate impressions are 19.8%. Postgraduate impressions (13.6%) are good when compared with the undergraduates (8.2%) in terms of lack of flash with a statistical significant difference found. (Pearson Chi-square Test $p=0.04$, $p<0.05$) (Figure 19). Association between the graduation and presence of tear in the impressions. Undergraduate impressions deemed unacceptable are 8.1% and the postgraduate impressions are 10.2%, Acceptable postgraduate impressions are 27.4% and undergraduate impressions are 22.4%. Postgraduate impressions (18.1%) are good when compared with the undergraduates(13.5%) in terms of tear but no statistical significant difference found.(Pearson Chi-square Test $p=0.826$, $p>0.05$)(Figure 20).

Self evaluation of the quality of the impression by the dentist is an essential step in the success of clinical restoration. While making a definite impression various factors must be considered separately to obtain an acceptable amount of success and accuracy. Current study aimed to evaluate the quality of impression, errors in the impressions taken in private dental College. This studies results showed that almost all the impressions taken had at least one detectable error. These findings were in agreement of previous studies(Carrotte, Johnson and Winstanley, 1998; Albashaireh and Alnegrish, 1999). However they do not correlate with few other studies done by Berier(Beier, Grunert and Kulmer, 2007) in which only 3% of the impressions were unacceptable. Other studies reported that experienced dental clinic shins record better impressions with proper gingival displacement and moisture control. Careful attention must be paid in the detailing which can be a reason for low failure rate. Another study concluded that at least 55% of the impressions evaluated had cervical finish line error(Winstanley, Carrotte and Johnson, 1997).

Impressions with proper gingival displacement, finish line placement and moisture control can be expected to be of greater accuracy(Johnson, Lepe and Aw, 2003). 16.11% of the impressions had visible blood stains on them. Blood stains or source of possible infections. This can also lead to increased probability of error on the finish line. Also many researchers have found that the accuracy of impression materials decreases with increase in moisture. To minimise trauma to the gingiva during tooth preparation and obtain good tissue health dentist must place retraction cord or use any of the convenient retraction procedures in the clinical practice(Baba et al., 2014). A study(Sorensen et al., 1991) suggested usage of 0.12 percentage of chlorhexidine gluconate to optimise the tissue health before the commencement of procedure which has also been authorised by many others. The causes of poor finish line can be due to the inadequate gingival displacement and isolation procedures. Other factors include the sulcular width, duration of retraction cord, improper usage of the cord leads to poor recording of the cervical finish lines. A study done by Finger et al, concluded that 0.2 mm of the gingival sulcus can be produced irrespective of the type of material used to record the impression. Better combination of light body material can lead to more accurate reproduction of the tissues than the monophasic impression techniques. Some others concluded that if sulcus depth of 0.2 mm is required then the dentist must aim for at least 0.3 to 0.4 mm of tissue depth while preparation. To obtain 0.2 mm of the sulcular width, few authors suggested that the retraction cord must be placed in the gingiva for a minimum of four minutes. Thorough wetting of the retraction

cord before removal from the sulcus was recommended by few other authors(Baba et al., 2014). When the wetting is not proper it can result in traumatic damage to the gingival epithelium and induces bleeding. The tray used for impression must be rigid to resist deformation from the pressure both during the impression making and during removal(Basha and Ganapathy, 2018). In contrast few studies have shown that more rigid materials can also result in an increase in the marginal opening of restorations. Others have also concluded that it may result in increased tray flexure. The amount of errors represented in the impressions was increased(Kannan and Venugopalan, 2018). This indicates that the practitioners must show more importance on the errors and try to rectify them as minimum as possible. Various procedures and techniques have been available to obtain a proper scan of the tooth. Recently digital scans have also come up to increase the accuracy of the impressions. 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; Ezhilarasan, Apoorva and Ashok Vardhan, 2019; Ramadurai et al., 2019; Sridharan et al., 2019; Vijayashree Priyadharsini, 2019; Mathew et al., 2020)

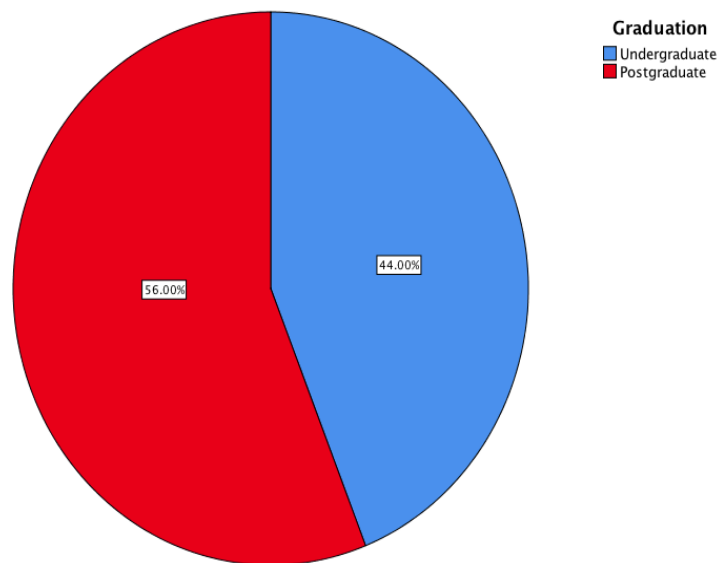


Fig.1:Pie diagram represents the percentage distribution of study subjects based on graduation. 44% of the study subjects were Undergraduates (blue) and 56% of them were Postgraduates (red).

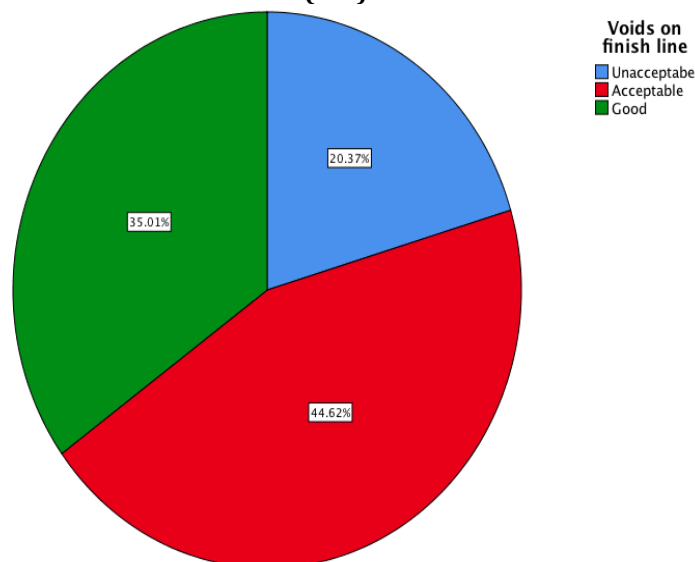


Fig.2: Pie diagram represents the percentage distribution of impressions based on voids on the finish line. 20.37% of the impressions were unacceptable (blue) and 44.62% of them were acceptable (red) and 35.01% of them good (green).

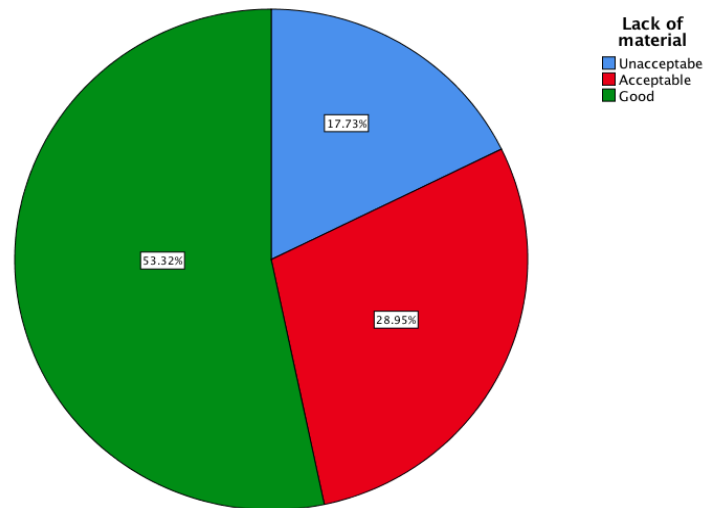


Fig.3: Pie diagram represents the percentage distribution of impressions based on lack of material. 17.73% of the impressions were unacceptable (blue) and 28.95% of them were acceptable (red) and 53.32% of them were good (green).

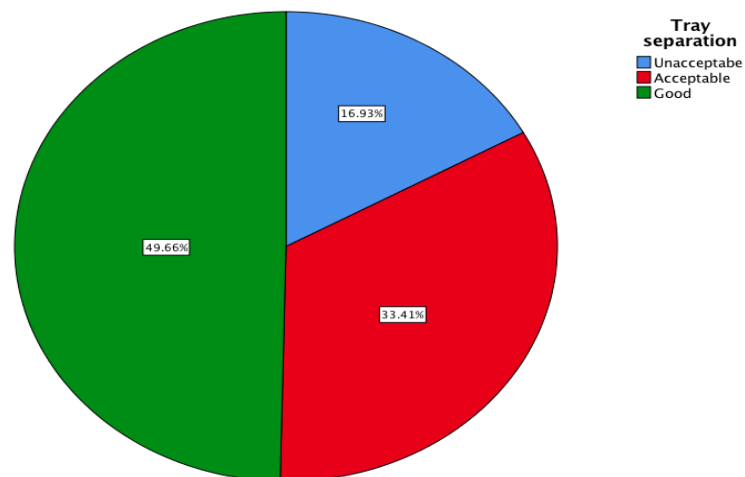


Fig.4: Pie diagram represents the percentage distribution of impressions based on tray separation. 16.93% of the impressions were unacceptable (blue) and 33.41% of them were acceptable (red) and 49.66% of them good (green).

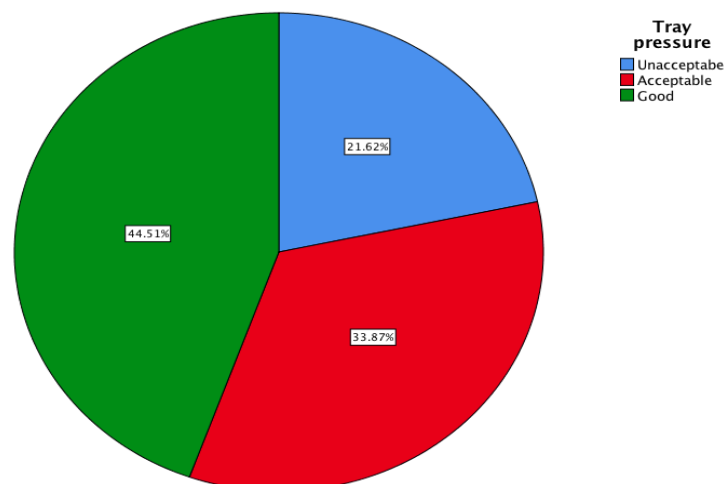


Fig.5: Pie diagram represents the percentage distribution of impressions based on tray pressure. 21.62% of the impressions were unacceptable (blue) and 33.87% of them were acceptable (red) and 44.51% of them good (green).

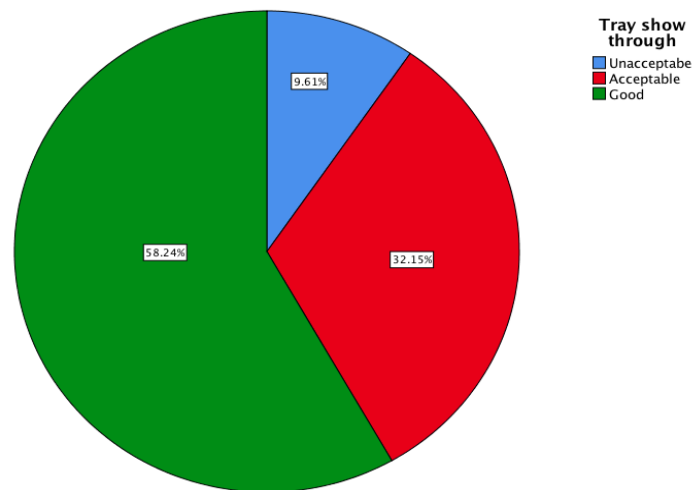


Fig.6: Pie diagram represents the percentage distribution of impressions based on tray show through. 9.61% of the impressions were unacceptable (blue) and 32.15% of them were acceptable (red) and 58.24% of them good (green).

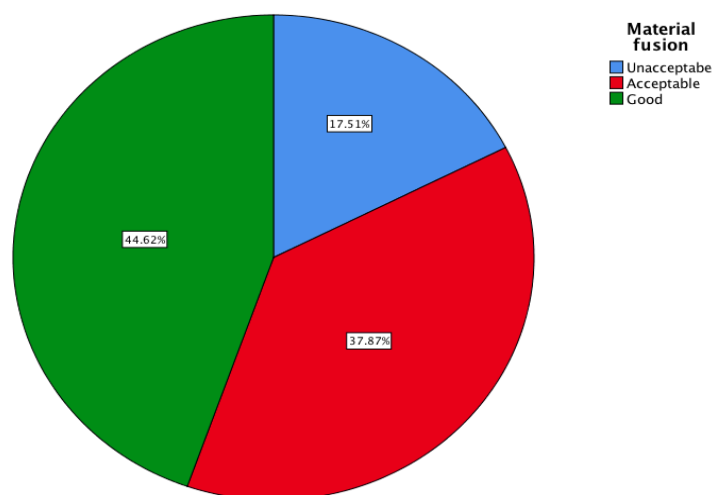


Fig.7: Pie diagram represents the percentage distribution of impressions based on material fusion. 17.51% of the impressions were unacceptable (blue) and 37.87% of them were acceptable (red) and 44.62% of them good (green).

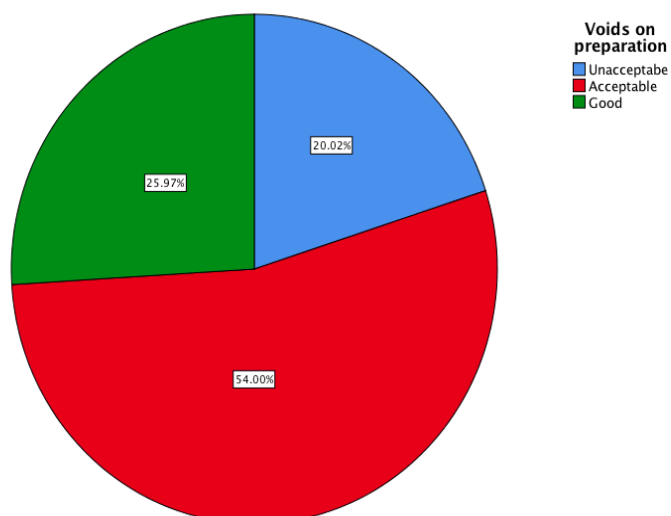


Fig.8: Pie diagram represents the percentage distribution of impressions based on voids on preparation. 20.02% of the impressions were unacceptable (blue) and 54% of them were acceptable (red) and 25.97% of them good (green).

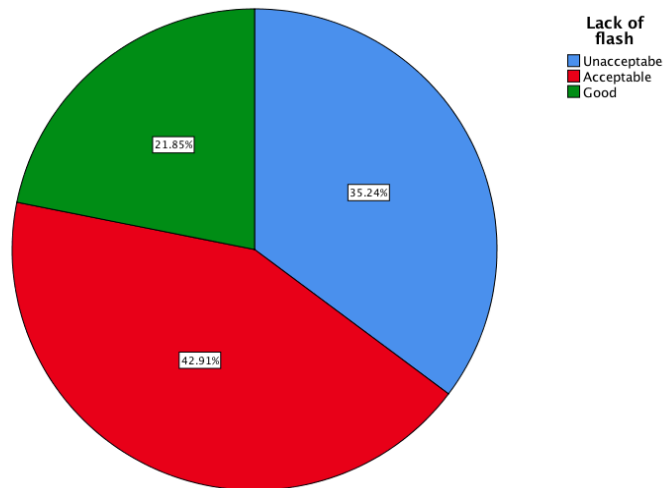


Fig.9: Pie diagram represents the percentage distribution of impressions based on lack of flash. 35.24% of the impressions were unacceptable (blue) and 42.91% of them were acceptable (red) and 21.85% of them good (green).

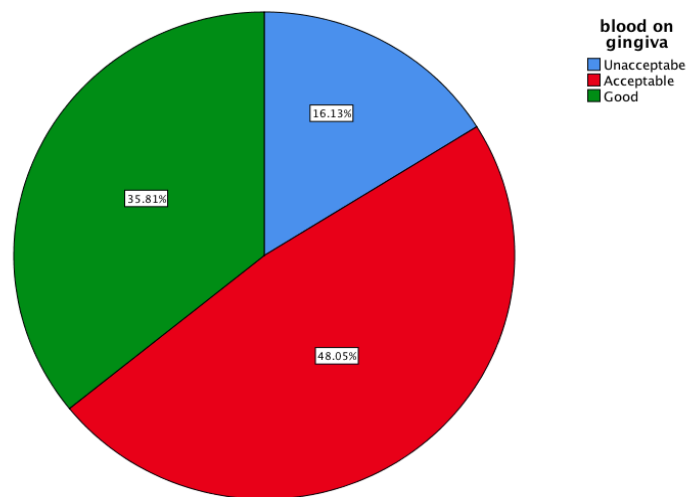


Fig.10: Pie diagram represents the percentage distribution of impressions based on blood on gingiva. 16.13% of the impressions were unacceptable (blue) and 48.05% of them were acceptable (red) and 35.81% of them good (green).

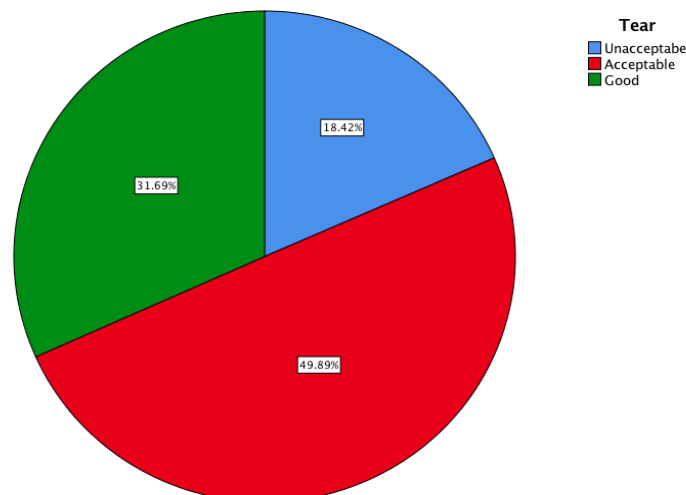


Fig.11: Pie diagram represents the percentage distribution of impressions based on tear. 18.42% of the impressions were unacceptable (blue) and 49.89% of them were acceptable (red) and 31.69% of them good (green).

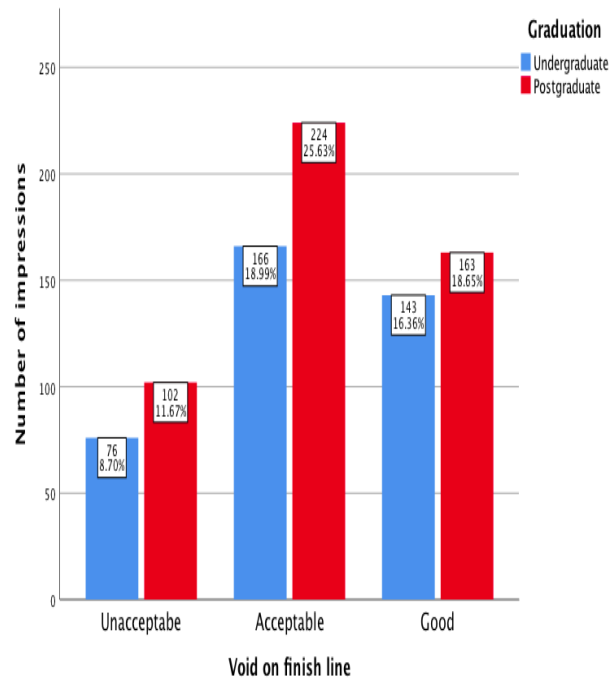


Fig.12: Bar diagram representing association between the graduation levels and voids on finish line distribution of the impressions. X-Axis represents the voids on finish line group distribution of impressions and Y axis represents the number of impressions. Postgraduate impressions (18.6%) are good when compared with the undergraduates (16.3%) in terms of voids with a statistical significant difference. (Pearson Chi-square Test $p= 0.045$, $p<0.05$).

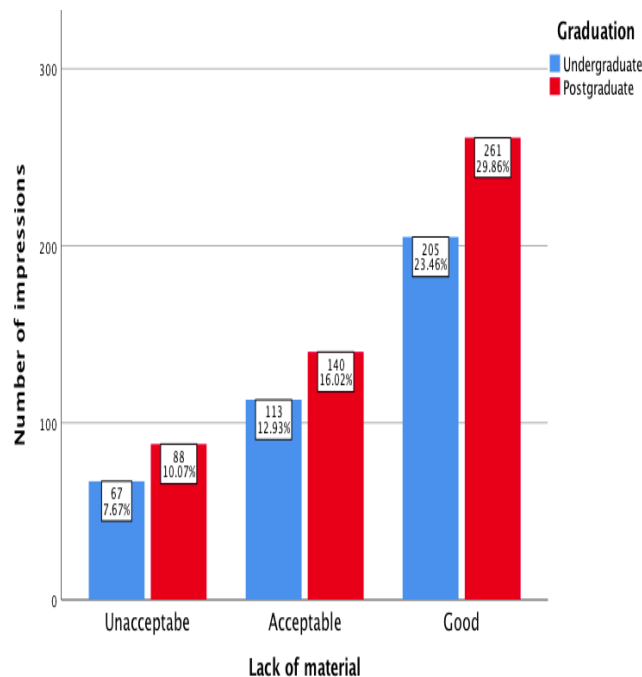


Fig.13: Bar diagram representing association between the graduation levels and lack of material distribution of the impressions. X-Axis represents the lack of material group distribution of impressions and Y axis represents the number of impressions. Postgraduate impressions (29.8%) are good when compared with the undergraduates (23.4%) in terms of lack of material but no statistical significant difference was observed. (Pearson Chi-square Test $p= 0.960$, $p>0.05$).

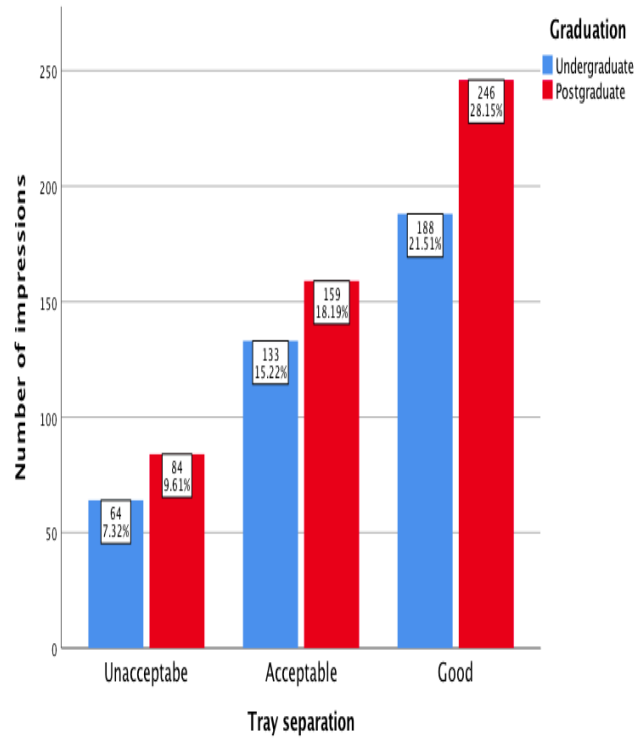


Fig.14: Bar diagram representing association between the graduation levels and tray separation distribution of the impressions. X-Axis represents the tray separation group distribution of impressions and Y axis represents number of impressions. Postgraduate impressions (28.1%) are good when compared with the undergraduates (21.4%) in terms of tray separation but no statistical significant difference was observed.(Pearson Chi-square Test $p= 0.819$, $p>0.05$).

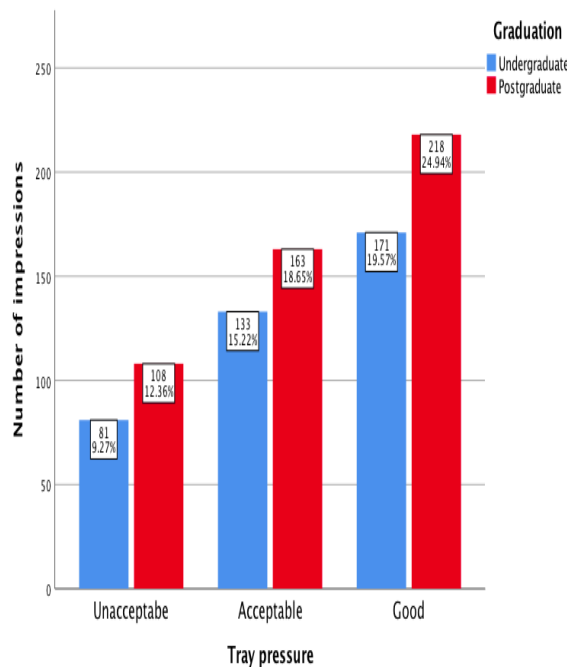


Fig.15: Bar diagram representing association between the graduation levels and tray pressure distribution of the impressions. X-Axis represents the tray pressure group distribution of impressions and Y axis represents number of impressions. Postgraduate impressions (32%) are good when compared with the undergraduates (19.5%) in terms of tray pressure but no statistical significant difference was observed.(Pearson Chi-square Test $p= 0.903$, $p>0.05$).

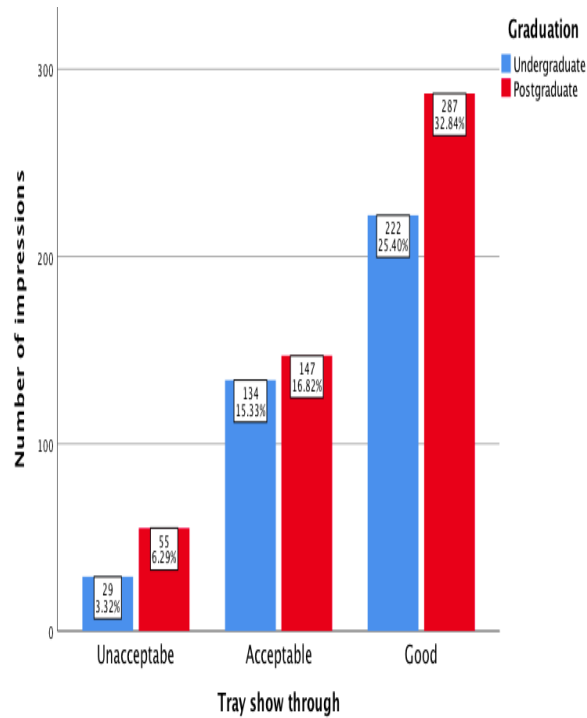


Fig.16: Bar diagram representing association between the graduation levels and tray show through distribution of the impressions. X-Axis represents the tray show through group distribution of impressions and Y axis represents the number of impressions. Postgraduate impressions (32.8%) are more good when compared with the undergraduates (25.4%) in terms of tray show through but no statistical significant difference was observed.(Pearson Chi-square Test $p = 0.098, p > 0.05$).

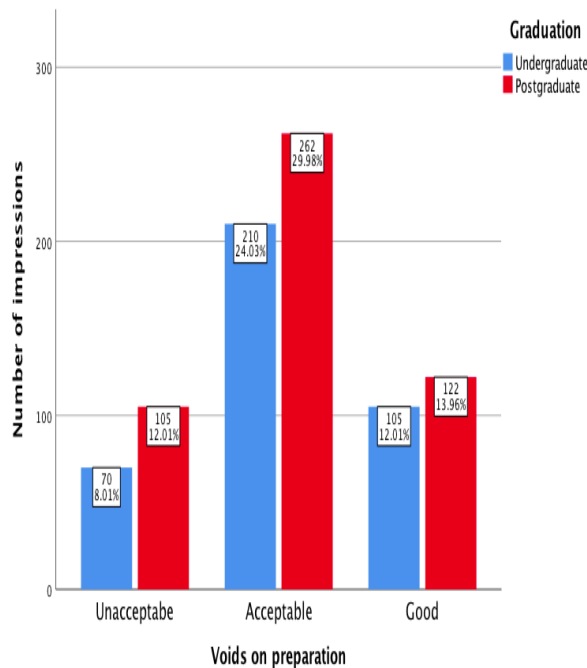


Fig.17: Bar diagram representing association between the graduation levels and voids on preparation distribution of the impressions. X-Axis represents the voids on preparation group distribution of impressions and Y axis represents the number of impressions. Postgraduate impressions (13.9%) are good when compared with the undergraduates (12%) in terms of voids on preparation but no statistical significant difference was observed.(Pearson Chi-square Test $p = 0.438, p > 0.05$).

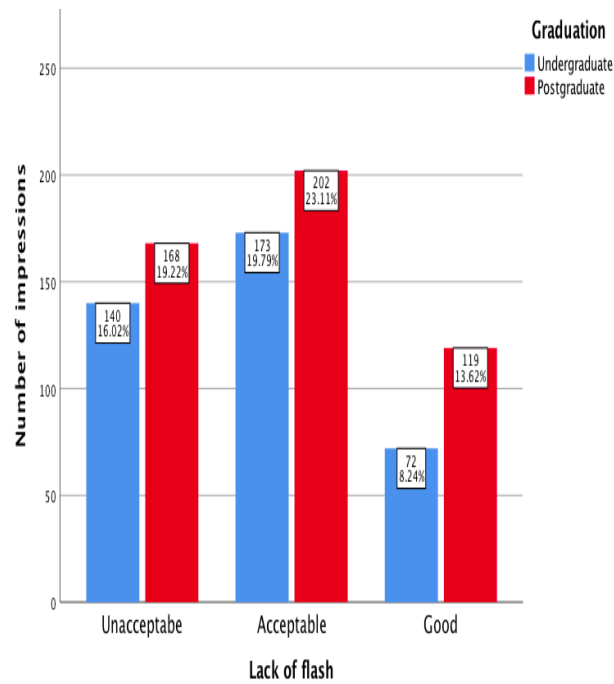


Fig.18: Bar diagram representing association between the graduation levels and lack of flash distribution of the impressions. X-Axis represents the lack of flash group distribution of impressions and Y axis represents number of impressions. Postgraduate impressions (13.6%) are good when compared with the undergraduates (8.2%) in terms of lack of flash with a statistical significant difference. (Pearson Chi-square Test $p= 0.04$, $p<0.05$).

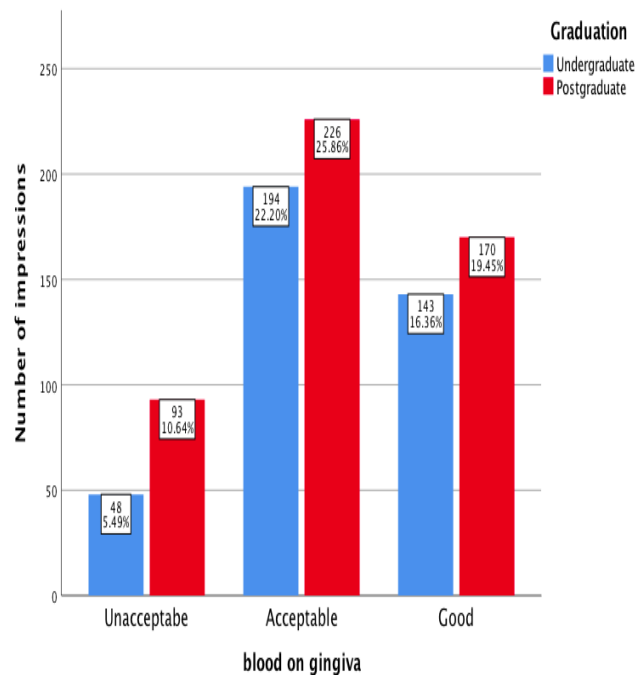


Fig.19: Bar diagram representing association between the graduation levels and blood staining in impressions. X-Axis represents the presence of blood stained impressions and Y axis represents the number of impressions. Postgraduate impressions (19.4%) are good when compared with the undergraduates (16.3%) in terms of blood staining in gingival areas with a statistical significant difference (Pearson Chi-square Test $p= 0.03$, $p<0.05$).

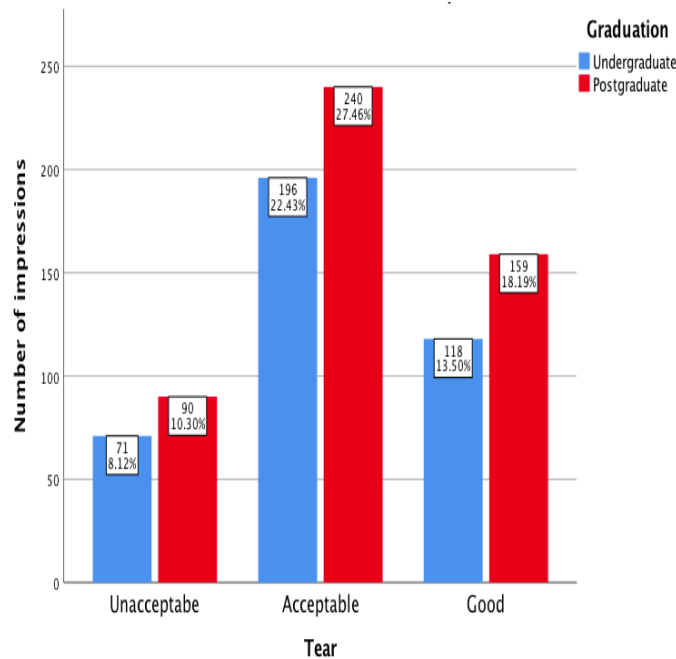


Fig.20: Bar diagram representing association between the graduation and presence of tear in the impressions. X-Axis represents the quality of impression with respect to tear and Y axis represents number of impressions. Postgraduate impressions (18.1%) are good when compared with the undergraduates (13.5%) in terms of tear but no statistical significant difference found. (Pearson Chi-square Test $p= 0.826$, $p>0.05$).

CONCLUSION:

The quality of impression making by the postgraduate students were better than undergraduates. This can be improved by attending short lectures or courses to update their knowledge and skills on current techniques in fixed prosthodontics. These courses may be organized by respected organizations for the betterment in successful clinical practice.

AUTHOR CONTRIBUTIONS:

Author 1 (Subashri.A) carried out retrospective study by collecting data and drafted the manuscript after performing the necessary statistical analysis. Author 2 (Dr.Dhanraj) aided in the conception of the topic, participated in the study design, statistical analysis and supervised in preparation of the manuscript and helped in study design and coordinated in developing the manuscript. All the authors have equally contributed in developing the manuscript.

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CONFLICT OF INTEREST:

There are no conflicts of interest.

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