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RESEARCH ARTICLE

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# Frequency of Vital Versus Non-Vital Tooth Preparation for Fixed Partial Denture- A Retrospective Study

**Aniruddh Menon[1], Kiran Kumar Pandurangan[2*], Jayanth Kumar Vadivel[3]**

[1]Research Associate,Saveetha Dental College and Hospitals,Saveetha Institute of Medical and Technical Sciences,Saveetha University,Chennai-600077
Email:151501006.sdc@saveetha.com

[2]Senior Lecturer,Department of Prosthodontics,Saveetha Dental College and Hospitals,Saveetha Institute of Medical and Technical Sciences,Saveetha University,Chennai-600077
Email : kirankumar.sdc@saveetha.com

[3]Reader,Department of Oral Medicine and Radiology,Saveetha Dental College and Hospitals,Saveetha Institute of Medical and Technical Sciences,Saveetha University,Chennai-600077
Email:jayanthkumar@saveetha.com

**ABSTRACT**

Tooth loss is one of the most common conditions that is treated by a dentist. With the advent of time, there has been an increase in the practice of fixed Prosthesis as well. There are various approaches towards tooth preparation as well, such as vital and non vital preparation. It plays an important vital role to understand the decision process to avoid the dilemma as to which technique to follow and which one gives a better success and survival rate. Hence,the aim of the present study is to evaluate the frequency of vital versus non vital tooth preparation for fixed partial denture. A retrospective study was conducted among patients who underwent fixed dental prosthesis and reported to private dental hospitals between the age of 18 - 80 years of age. Data was obtained by reviewing the 86,000 patients records between June 2019 to March 2020 were included in the study and A total of 791 patients who had undergone tooth preparation for replacement of missing teeth with fixed dental prosthesis were included in the study. The collected data was statistically analyzed using SPSS by IBM version 20. Majority of tooth preparations were performed on vital teeth (77.2%). Within the limits of the present study, it can be concluded that the most common type of tooth preparation was vital tooth preparation for fixed partial denture. Among all the age groups the most commonly performed tooth preparation was vital tooth preparation. There was no difference in the frequency of vital and non vital tooth preparation based on gender.

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*Contact: Kiran Kumar Pandurangan, *Senior Lecturer,Department of Prosthodontics,Saveetha Dental College and Hospitals,Saveetha Institute of Medical and Technical Sciences,Saveetha University,Chennai-600077*
, kirankumar.sdc@saveetha.com

## INTRODUCTION

With recent trends towards oral hygiene practices [1,2], the need for prosthetic rehabilitation has increased[3,4]. There has been an increased spread of knowledge regarding the same as well as increase in treatment choice for the same [5–8] with a recent uproar of knowledge in implants [9–11] and fixed dental prosthesis [11,12]. However, before concluding on a treatment modality, various factors are to be considered [13–15].

Fixed prosthodontics has been practiced in its current form since the introduction of the modern dental equipment and the usage of lost-wax casting technique [16]. Despite the stressing of importance on conservative preparation methods, there still exist various noxious threats to the integrity of the pulpal tissue that exists during the course of creation of fixed prosthetic restorations [17]. Preparation of the dental structures involves cutting dentin and odontoblastic processes. Impression techniques that are used to replicate the same and exist in current use necessitate maintaining a dry fluid free surface of the exposed dentin region [18]. Self curing resin material is used to line the metallic shell used for the temporary closure of the prepared surfaces of the teeth; dental cements are used to lute the temporary and permanent restorations. [19]. Many teeth underwent pin placement, bases, composite and even amalgam restorations prior to the fixed prosthesis in order for retention. Through the course of the procedure, microbiological species present in the saliva in oral cavity and thus intern form a precursor for caries formation [20].

Literature demonstrates that each step in the fabrication of a fixed partial denture is a source of potential insult to the pulp [21–30]. Seigel and von Fraunhofer[31] had analysed the cutting efficiency of diamond burs on a programmed enamel matrix using various handpiece loads and a regulated water coolant at the rate of 15 mL/min. They arrived at the conclusion that [21] dental debris lodged between the diamond flutes was a major factor governing the cutting efficiency of the bur; [22] at the 5 minute mark, the ledgement of the debris was significant enough to hamper the functional efficacy of the bur; [23] the cutting efficiency was regained for a short period of time with the aid of ultrasonic cleaning but it was short lived as the debris was not removed readily [27].

In a clinical setup, the operator often increases the pressure on the handpiece when a decrease in speed or dullness of the bur is sensed [25] the least accumulation of debris occurred at 2.4 oz of pressure and all of these can negatively affect the pulp.Previously we have focused our research on various invitro and invivo studies. [32–51] We have currently shifted our focus to this retrospective analysis. Thus, the present study aim was to evaluate the frequency of vital as well as non vital tooth preparation procedures for fixed dental prosthesis.

## MATERIALS AND METHODS

A retrospective study involved a total of 792 patients that underwent fixed partial denture procedures, out of which 454 were males and 337 were females aged between 18- 80 years old. The study was performed in a Private Dental Hospital, Chennai and ethical approval was obtained from the Institutional Review Board (IRB Approval No: SIHEC/2020/DIASDATA/0619-0320). The data were reviewed of 86,000 patient records between 1st June 2019 to 31st March 2020 based on data availability from Dental Information Archiving Software (DIAS). Patients were segregated into five age groups; Group 1- 18 to 30 years ; Group 2- 31-40years; Group 3- 41-50 years ; Group 4 - 51 to 60 years; Group 5- 61 to 70 years. Patient records of those who underwent vital or non vital tooth preparations for fixed partial denture were included in the study. Incomplete data were excluded from the study. Informed consent was obtained from the patients. The data was verified using intraoral photographs by two external reviewers. The data segregation was done according to various parameters such as treatment, age of the patient, gender of the patient, and the site of the procedure.The data was then tabulated and was exported to SPSS Software by IBM Version 20 for Statistical Analysis. Descriptive statistics and Chi square test was used to determine the correlation between the variables where a P value $< 0.05$ is considered as statistically significant with a confidence interval of 95%.

## RESULTS AND DISCUSSION

A total of 791 patients who had undergone tooth preparation for replacement of missing teeth with fixed partial denture. Out of the total study population 454 (57.4%) were males and 337(42.6%) were females. Majority of tooth preparations that were performed on vital teeth (77.2%) (Figure 2). The most widely prepared sextant was second quadrant (36.6%) followed by sixth quadrant (13.78%), fifth quadrant (13.65%), third quadrant (13.15%), fourth quadrant (13.02%) and the least prepared quadrant is Quadrant one (9.8%) (Figure 3). The most common age group who underwent fixed partial denture is between 31 to 40 years of age (30.63%) and least prevalent age groups among 71-80 years (1.52%) (Figure 4). Based on gender distribution, males were more commonly underwent tooth preparation for fixed partial denture in comparison to females in the age group of 18-30 years whereas females more underwent

replacement with fixed partial denture between 41-60 years and there is a significant correlation between the gender and age of the patient (p=0.000) (Figure 5). According to the age wise distribution, the maximum number of non vital tooth preparations was performed between the age group of 18-30 years (41%) whereas most number of vital preparations were seen between 31-40 years (33.5%). A strong and positive correlation was seen between age of the patient and vitality of the tooth (p=0.001) ( Figure 6).

Pulpal necrosis was observed in 3-25 % of the teeth prepared for complete coverage according to a review between 1970 - 1977 [52–54]. Many researchers considered the heat produced due to friction as the governing factor for pulpal injury, but also agreed that many other essential procedures largely contributed to the necrosis.The various aspects that were studied include heat from friction, desiccation, application of pressure during tooth reduction, injury due to chemicals, ill-fitting provisional restorations, bacterial infection, cementation, and occlusal disharmonies [27,55,56].

In the present study,we observed that vital preparations are more prevalent than Non vital preparations. This can be attributed to the fact that practitioners could have considered the root canal treatment unnecessary in the particular case. In the present study, we found that more non vital preparations are observed in younger patients than in older patients, this can be attributed to the position of the pulp chamber and pulp horn in younger patients, closer to the occlusal surface than in older patients. A study of 42 teeth prepared with the help of diamond instruments post extraction after 48 hours, on histological study revealed a cascade of inflammatory responses on usage of pressure above 8oz, despite the use of coolants in order to minimise the burns. Maximum load of 4oz was seen to be biologically acceptable [56]. A postal scale was used to measure the force given to the cutting tool on the tooth surface set up on a bracket table Stanley and Swerdlow came to the conclusion that “heavy pressure, whether or not continuous, even with the use of an adequate coolant, produces more damage than light continuous pressure does,” and that pressure on its own possibly is responsible in contributing to the incidence and degree of inflammatory reaction in the pulpal tissue.

Jeserich et al.,[57] in a study revealed that direction of the force on the pulpal wall would result in the production of heat on a portion of the dentin in close proximity to the pulp than on the lateral wall. Walsh and Symmons[58] stated that a force of under 1 oz was adequate to remove enamel at an average rotational speed of 60,000 rpm.Peyton and Henry et al., [59] showed that an increase in the applied force may cause a greater degree of temperature rise on the surface of the tooth than an increase in rotational speed, but the aspect of reduced force would not reduce temperature rise accordingly to eliminate the need for a coolant. All authors are not in agreement that air-water spray is essential in the process of preventing pulp injury during the course of tooth preparation. Thus it is important to raise awareness regarding all of the above and appropriate clinical alterations are to be made in the future. The limitations of the present study included that it was a single centered study, limited sample size and thus all the patients were geographically isolated and clinical parameters were not assessed.

## CONCLUSION

Within the limits of the present study, it can be concluded that the most common type of tooth preparation was vital tooth preparation for fixed partial denture. Among all the age groups the most commonly performed tooth preparation was vital tooth preparation. There was no difference in the frequency of vital and non vital tooth preparation based on gender.

## AUTHOR CONTRIBUTIONS

Author 1 (Anirudh Menon), carried out the study by collecting data and drafted the manuscript after performing the necessary statistical analysis. Author 2 (Dr. Kiran Kumar Pandurangan) aided in conception of the topic, has participated in the study design, statistical analysis and has supervised in preparation of the manuscript. Author 3 (Dr. Jayanth Kumar Vadivel) has coordinated in developing the manuscript. All the authors have discussed the results among themselves and contributed to the final manuscript.

## CONFLICT OF INTEREST

No conflict of Interest.

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Self.

## ETHICAL CLEARANCE

It is taken from “Saveetha Institute Human Ethical Committee” (Ethical Approval Number-SDC/SIHEC/2020/DIASDATA/0619-0320)

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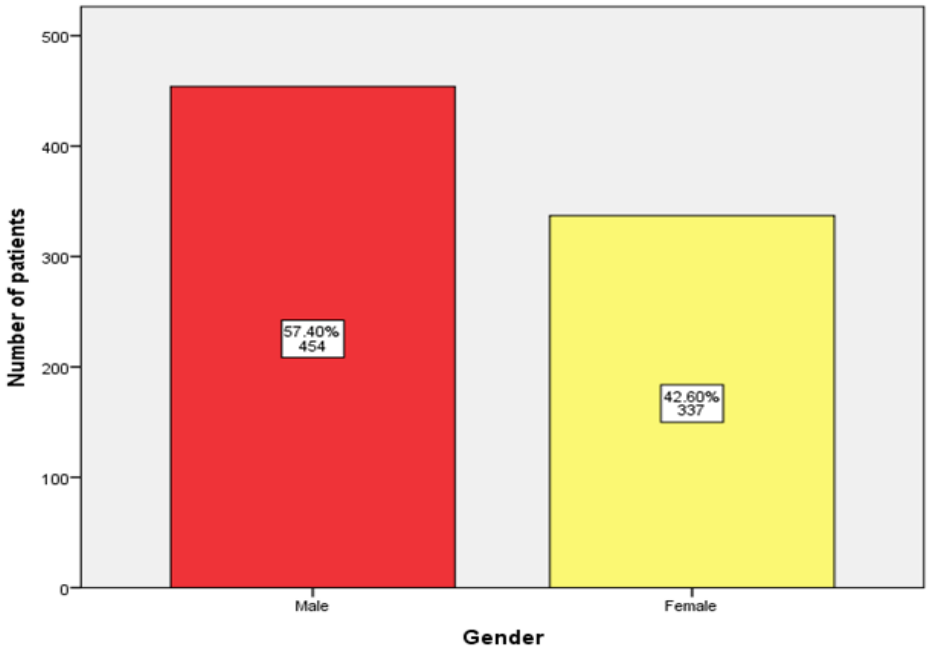


**Figure 1: Bar Chart depicting the gender wise distribution of fixed partial denture. X axis denotes the Gender and Y axis denotes the number of patients. Males (Red) reported more commonly for tooth preparations than females (Yellow) for fixed partial denture.**

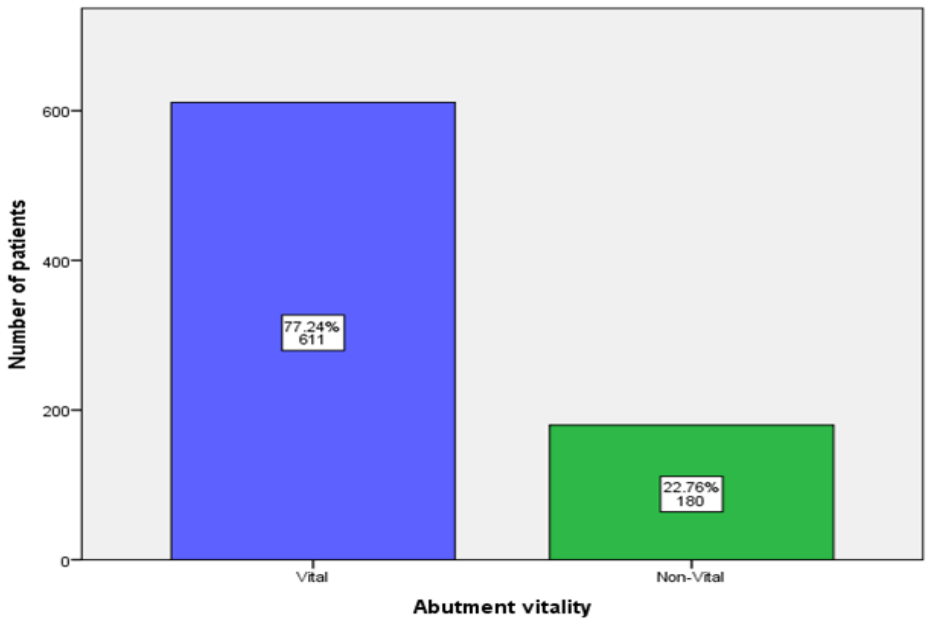


**Figure 2: Bar chart depicting type of tooth Preparation for fixed partial denture. X axis denotes type of preparation and Y axis denotes number of patients. Vital tooth preparation (Blue) was preferred over non vital tooth preparation (Green) for fixed partial denture.**

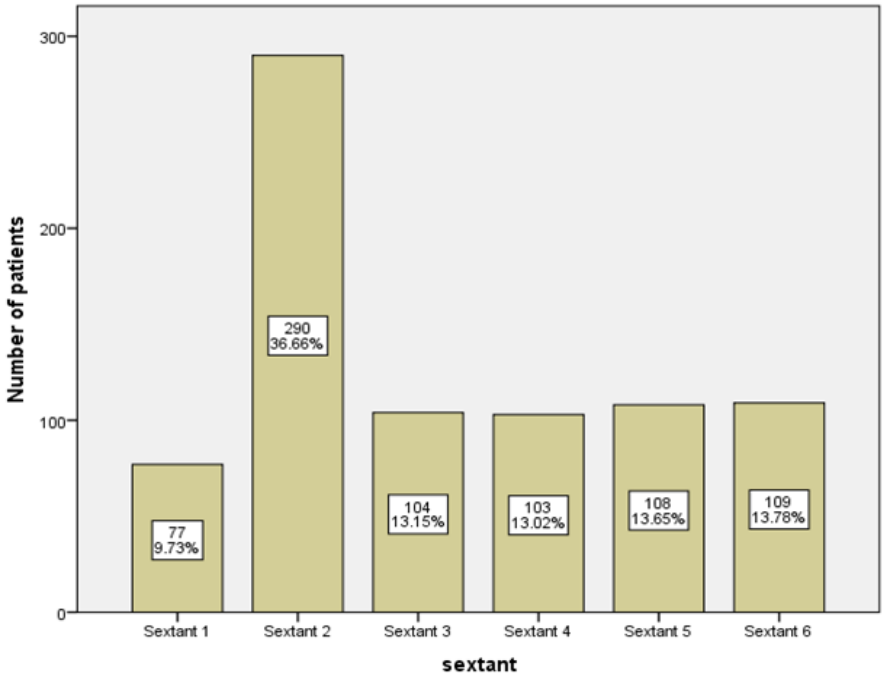


**Figure 3: Bar chart depicting the different sextants undergoing Fixed Partial Denture. X axis denotes the sextants and Y axis denotes the number of patients. The most common sextant where tooth preparation was done was Sextant 2 for fixed partial denture.**

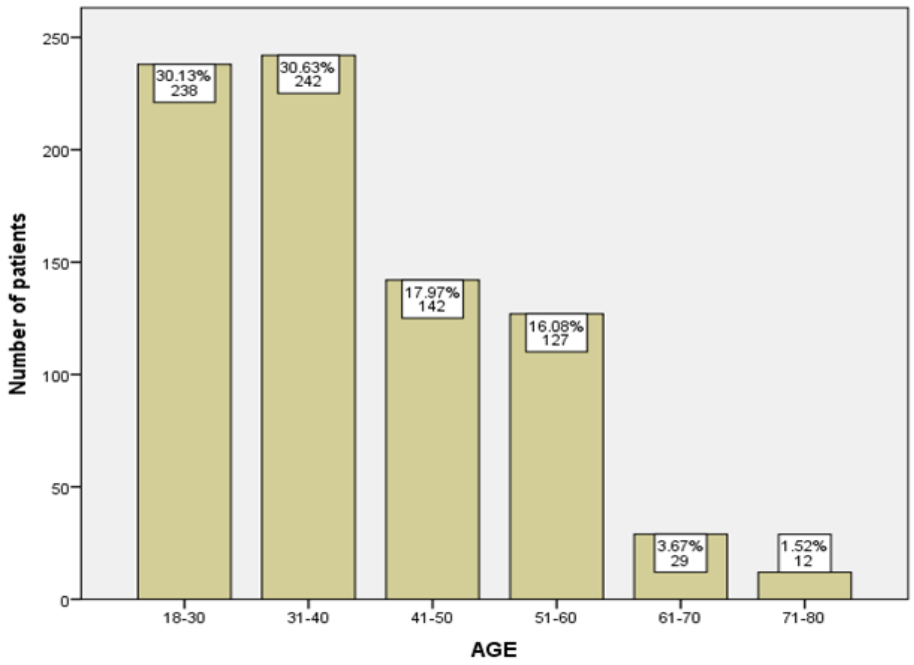


**Figure 4: Bar chart depicting the age wise distribution undergone Fixed Partial Denture.X axis denotes the age groups of the patients and Y axis denotes the number of patients.The most common age group where tooth preparation was done for fixed partial denture was 18 - 30 years and 31-40 years.**

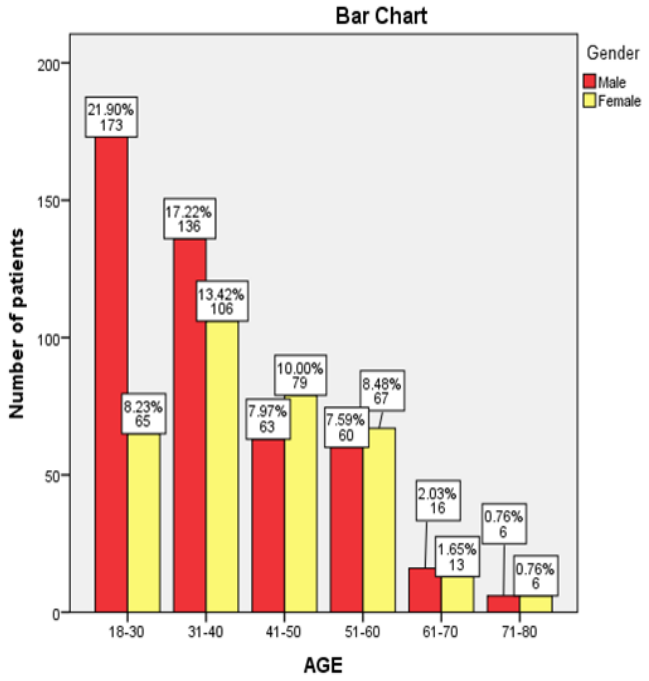


**Figure 5: Bar chart depicting the association between gender and age of patient reporting for fixed partial denture. X axis denotes the age of the patient and the Y axis denotes the number of patients. Males (Red) more commonly undergo tooth preparation for fixed dental prosthesis in comparison to females (Yellow) in the age group of 18-40 years. Females more commonly undergo replacement with fixed dental prosthesis between 41-60 years. Pearson's Chi Square Test value of 38.459, df=5, p=0.000; (P < 0.05 which shows statistically significant)**

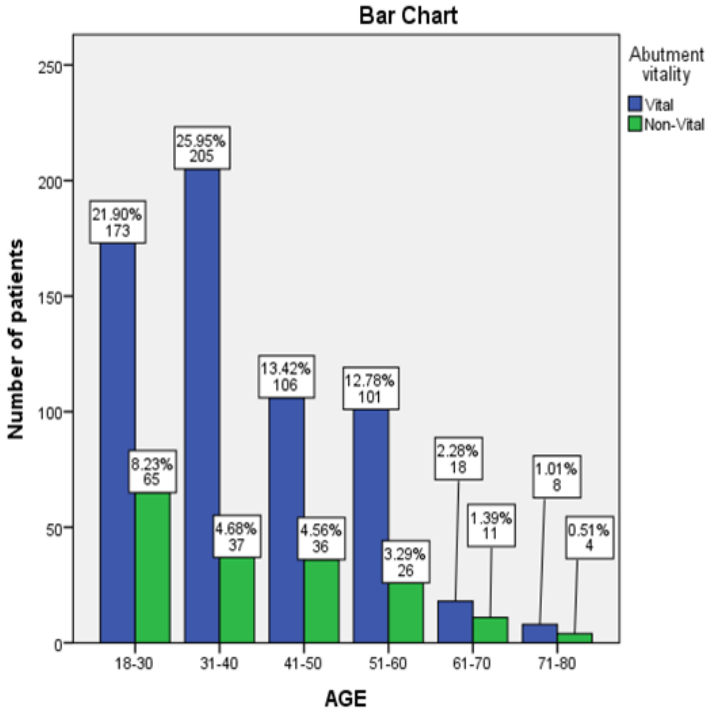


**Figure 6: Bar chart depicting the association between vitality of tooth preparation and age of the patient, where X axis denotes age of the patient and Y axis denotes the number of patients. Among all the age groups the most commonly used tooth preparation was vital tooth (Blue) preparation for fixed partial denture.Pearson's Chi Square Test of value=16.031, df=5, p=0.001; (P < 0.05 which shows statistically significant)**

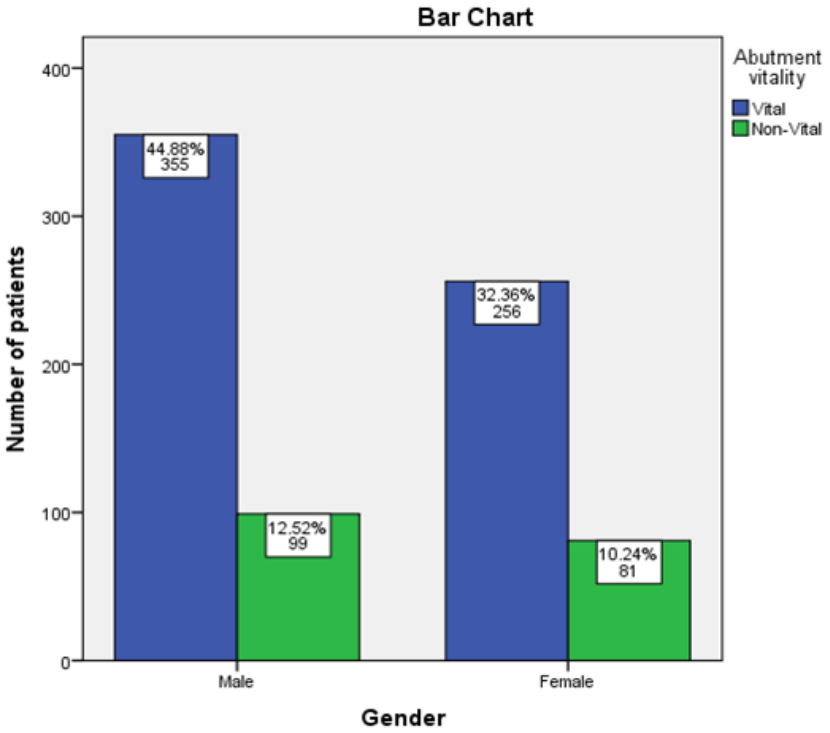


**Figure 7: Bar chart depicting the association between the type of tooth preparation and the gender of the patient. X axis represents gender and Y axis represents the number of patients. In both males and females the most common type of tooth preparation is Vital Preparation (Blue). Non vital tooth preparation (Green) is performed more commonly in males than in females. However, there is no statistically significant association between the gender of the patient and the type of tooth preparation (Chi Square Test, Value=.0547,df=1,p=0.46), p>0.05 Infers statistically not significant.**