

Analysis of Composite Restorations in Patients below 21 Years of Age - A Retrospective Study

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ABSTRACT:

Caries is still quite prevalent, despite great measures taken to curb its incidence. Identifying the decay early and restoring them can have favourable prognosis and long term benefits. Addressing the caries early means treatment with less invasive treatment modalities by means of a restoration. The aim of this study was to analyze the number, gender and teeth distribution of composite restorations in patients below 21 years of age. This was a retrospective study conducted by evaluating data of patients below 21 years of age visiting a private dental college between June 2019 to March 2020. The following data were retrieved from the dental records: patient age, gender, tooth type with restoration and arch involved was analysed. The coding was done in MS excel. The data was transferred to a host computer and processed using SPSS software version 20.0 (SPSS Inc., Chicago, IL, USA) by tabulation and graphical illustration. Descriptive statistics was used to study the data collected and to analyse frequency and percentage distribution. Chi square test was used to assess association at 5% significance level ($P < 0.05$). The results showed that the permanent dentition age group (13-21 years) had a higher number of composite restorations than mixed dentition age group (6-12 years). Males had a higher number of restorations when compared to females. The molar teeth and mandibular arch had the maximum number of composite restorations. Our study also showed that the association between age, gender and arch with type of tooth restored with composite to be highly significant (P value- 0.000).

Keywords: Composite; decay; gender; restorations; tooth coloured

INTRODUCTION:

As stated by the World Health Organization [1], dental caries is a pandemic disease affecting all populations irrespective of gender, age, or socioeconomic status. This situation is more alarming in developing countries due to lack of access to oral health care services and preventive measures like fluorides. Dental caries is seen as the most common chronic disease of childhood (6-12 years) affecting more than 50% of school children [2]. It affects self-esteem, normal nutritional habits, leading to underweight children and abnormal cognitive development. It is multifactorial in origin involving host, agent, environment factors, age, race, ethnicity, cultural factors. Diet plays a pivotal role in the dental caries status [3]. Despite attempts to curb the incidence of caries, through water fluoridation, patient education, fluoridated dentifrices, oral rinses, and professionally applied topical fluorides, it is still the most prevalent infectious disease. However, the occlusal surfaces of teeth remain the most susceptible to caries. Data indicate that greater than 80 percent of dental treatment provided in a contemporary dental practice is attributed to pit and fissure caries [4]. Dental caries is highly prevalent among the younger group of people [5, 6]. Early carious lesions can be treated with remineralising agents [7]. If caries is not addressed in time, it will progress to pulpitis [8], associated with severe pain needing more invasive treatment like root canal therapy [9–11][2]. Chronic caries not treated for long periods of time can cause calcification or non vitality of the involved tooth [12],[13][12]. When neglected, it becomes impossible to restore the tooth, leading to exodontia [5, 6].

The pooled prevalence of dental caries was found to be highest in 15 year olds followed by 5 and 12 years (62%, 48% & 43.% respectively) in previous studies [14]. The index age group of 5, 12

and 15 years are of interest due to their relation to the level of caries in both primary and permanent age groups as they are global monitoring ages for dental caries [15]. High prevalence in 15 years could be attributed to the high intake of sweets, poor oral hygiene, and general negligence of oral health in this age group. High caries experience among 5-year-olds could be attributed to the factors such as a diet higher in sugars and/or the inability of a young child to properly brush teeth on their own. Besides this, lack of preventive measures in India could be another reason which increases the peril. The low caries experience was witnessed in the 12 year age group when compared to 5 year age group [16]. This can be ascribed to the fact that WHO index does not record incipient caries, but puts down only when the caries involves dentin, resulting in slight underestimation of caries in 12 year groups [17].

The advent of composite resins [18] along with acid etching technique [19], development of dentin bonding agents [20] and evolution of ultraviolet light curing [21] has made it possible to perform both esthetic and durable restorations [22]. This is because it is more resistant to staining because of better polishing characteristics and has high bond strength to resist fracture. Preventive resin restorations were introduced by Simonsen and play an important role in the practice of contemporary pediatric dentistry [23]. The use of contemporary resin based composites, due to bonding properties and acceptable wear resistance, allows for the cavity preparation to be minimized to include only caries affected tooth structures [24].

A number of clinical reports in the literature have discussed the durability of these restorations over long periods. The main reasons for failure in the long term are secondary caries, related to the individual caries risk, and fracture, related to the presence of a lining or the strength of the material used as well as patient factors such as bruxism [25]. In the year 2005, the United States reported to have done 166 million restorations (Beazoglou T et al., 2007) and it was also seen that more than half had to be replaced for failed restorations [26]. However, the prevalence of secondary caries was found to be reduced with the use of composites that released fluorides [27]. Post operative sensitivity was seen with composite restorations. [28]. Despite the concerns associated with resin-based dental restorative materials, their success has been nothing short of astounding. No other class of materials has promised and delivered such a wide range of restorative options to the clinician. Because of their development, dentists can implement preventive and minimally invasive techniques [29]. Our team has rich experience in research and we have collaborated with numerous authors over various topics in the past decade [30][31–53]. Even more important, patients can retain their teeth longer, with a more esthetic appearance, resulting in a healthier, more self-confident population. The aim of this study was to analyze the number, gender and teeth distribution of composite restorations in patients below 21 years of age.

MATERIALS AND METHODS:

Study setting:

In this retrospective study, data from 1836 patients below 21 years of age visiting the institution were collected from dental records. At data extraction, all information was anonymized and tabulated onto a spreadsheet. The study was commenced after approval from the Institutional Review Board. The ethical approval number for the study was SDC/SIHEC/2020/DIASDATA/0619-0320.

Data collection and / tabulation:

To fulfil the inclusion criteria, patients who had composite restorations and were below the age of 21 were included in the study. The tooth type and arch with the restoration was assessed in these patients. Patients who did not have composite restorations, composite restorations in primary teeth, those above 21 years and those records with incomplete data have been excluded.

Sampling:

Data were collected from June 2019 to March 2020. The total number of patients in our study was 1836, having an overall 5428 composite restorations. The patients were divided into two age groups - mixed dentition stage (6-12 years) and permanent dentition stage (13-21 years). The following data were retrieved from the dental records: patient age, gender, tooth type with restoration and arch involved and analysed.

Statistical analysis:

The data was transferred to a host computer and processed using SPSS software version 20.0 (SPSS Inc., Chicago, IL, USA). Descriptive statistics, Chi square test was used to compare the tooth type with restoration and arch involved with age and gender of the patient. The significance level was set at 5%.

RESULTS:

The data collected was analysed using IBM SPSS software. The results are as follows. The total number of patients in our study was 1836, having an overall 5428 composite restorations. The frequency distribution of age shows that 26.2% of the composite restorations were done in the Mixed dentition stage and 73.8% was done in permanent dentition [Figure 1]. The frequency distribution of Gender showed that 58% of the study population were males and 42% were females [Figure 2]. The frequency of teeth distribution showed 12% of restorations done in the anteriors, 5.7% in premolars and 82.3% molars [Figure 3]. It is also seen from the results of our study that mandible (53.2%) is more commonly restored than maxilla (46.8%) [Figure 4]. From the results of the study, it was found that permanent dentition age group (13-21 years) had more composite restorations than mixed dentition age group (6-12 years) and a highly significant association was found between age of the patient and tooth type involved (P value- 0.000 < 0.05; Chi square test) [Figure 5]. It was seen that males had more composite restorations than females and significant association was seen between gender and tooth type (P value- 0.000 < 0.05; Chi square test) [Figure 6]. The most commonly restored teeth were molars and mandible had more restorations than maxilla. The association between arch and tooth type was found to have a high statistical significance (P value- 0.000 < 0.05; Chi square test) (P value < 0.05) [Figure 7].

DISCUSSION:

The frequency distribution of age shows that 26.2% of the composite restorations were done in the mixed dentition stage and 73.8% was done in permanent dentition [Figure 1] This is similar to other studies that show an increase in caries with increase in age [5,6]. Our institution is passionate about high quality evidence based research and has excelled in various fields ([48, 49, 54–62]. Berman and Slack [63] found that occlusal caries were a problem in the initial years after tooth eruption, and that approximal caries became more prevalent than occlusal caries after 14 years of age. They also observed that occlusal surfaces that were sound 6 years after eruption

were likely to remain so. In our study, the association between age and tooth type involved was analysed using the Chi square test and was found to be statistically significant (P value- $0.000 < 0.05$) [Figure 5].

The frequency distribution of gender showed that 58% of the restorations were done in males and 42% were in females [Figure 2]. It has been reported in some studies that men had more decay than women [64]. However the results for studies on restorations among gender follows a different trend. One study found that female patients demonstrated more tooth coloured fillings compared to men which is contradictory to our results [65]. Another study also had results contradictory to ours, which reported males had lesser restorations than females [66]. It is also known that female gender is the main predictor for seeking dental therapy [67]. In our study, the association between gender and tooth type involved was analysed using the Chi square test and was found to be statistically significant (P value- $0.000 < 0.05$) [Figure 6].

The frequency distribution of teeth distribution showed 12% of restorations done in the anteriors, 5.7% in premolars and 82.3% molars (Figure 3). Richardson and McIntyre [68] found that the level of caries in premolars was low which is in accordance to our study. Teeth was grouped according to the order of susceptibility, from greatest to least, as follows: lower first and second molars, upper first molars; upper second molars; upper first premolars, upper and lower second premolars; upper incisors; upper canines, lower first premolars; and lower incisors, lower canines [69]. In our study, the association between arch and tooth type involved was analysed using the Chi square test and was found to be statistically significant (P value- $0.000 < 0.05$) [Figure 7].

Patients with a higher level of education preferred more expensive restorations due to aesthetics and better knowledge on oral health, whereas patients with a low level of education exhibited more inexpensive restorations due to economic status and concern over function than aesthetics [65]. Younger dentists (≤ 30 years) were more likely to choose composite restorations because of factors like excellent aesthetics and command set of composite resins. Amalgam was more likely to be chosen for patients with poor oral hygiene because there is minimal shrinkage and therefore less chances for secondary decay [70, 71] and with large cavity sizes because amalgam restorations have better load bearing capacity especially in posteriors. Tooth-coloured restorations were more likely to be chosen for cavities of smaller sizes due to better bonding achieved using composites over amalgam [72].

It is also seen from the results of our study that mandible (53.2%) is more commonly affected by caries and had composite restorations than maxilla (46.8%) (Figure 4). Mejare et al. [73] reported that the first permanent molar (lower) is the most caries-susceptible tooth, with the occlusal, mesial and distal surfaces of these teeth accounting for more than 60% of all restored surfaces at the age of 21 years. The traditional extension for prevention recommended for amalgam preparations is not necessary with resin restorations, due to the ability to place a sealant material over caries-susceptible pits and fissures that were not part of the preparation during caries removal. The overwhelming success of the preventive resin restoration makes it the treatment of choice for occlusal pit and fissure caries if the tooth can be adequately isolated [74].

Although it has many benefits, composites are known to have certain disadvantages. Shrinkage is always associated with the polymerized product [75]. All methacrylate-based polymerization reactions are exothermic [76]. which may affect pulpal health in certain situations, as when deep restorations are present and little dentin thickness remains to provide insulation [77]. Composite restorations are technique sensitive and are prone to sensitivity. This can be treated using a dentin desensitizing agent by occluding dentinal tubules and reducing permeability by causing the coagulation of plasma proteins in the dentinal tubules [78].

Composite restorations are the future of restorations replacing all other restorative materials. It is a necessity for a contemporary clinician who appreciates and understands the art and science of cosmetic dentistry. Composite bonding procedures are considered the most conservative and least invasive technique to replace tooth structure lost due to abrasions [79, 80], trauma [81] or caries. Composites' attractiveness and popularity are due to the excellent esthetic potential it offers. Composites are the most versatile restorative material available to the dental professional, especially for the esthetic-conscious patients as it mimics natural teeth similar to indirect laminates and veneers [82].

Small sample size, geographic isolation, status of family history, knowledge of oral hygiene status, habits, literacy and lack of inclusion of socio economic factors contribute to the limitations of the study. Our study was also limited by age factor (<21 years), did not analyse patients reporting with secondary caries, longevity of the restoration and did not include restorations done with other materials.

CONCLUSION:

Within the limitations of the study, it can be concluded that the permanent dentition was more susceptible to having a composite restoration than the mixed dentition stage. Males had a higher number of restorations when compared to females. The mandibular arch had a higher number of composite restorations than the maxilla. Our study also showed that the correlation between age and gender with arch and tooth type was found to be highly significant statistically.

AUTHOR CONTRIBUTIONS:

Author 1 (Jerusha Santa Packyanathan) carried out the retrospective study by collecting data and drafted the manuscript after performing the necessary statistical analysis. Author 2 (Sowmya K) aided in the conception of the topic, participated in the study design, statistical analysis, supervised in the preparation of the manuscript and author 3 (Ganesh Jeevanandan) 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 stated by the authors.

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FIGURES:

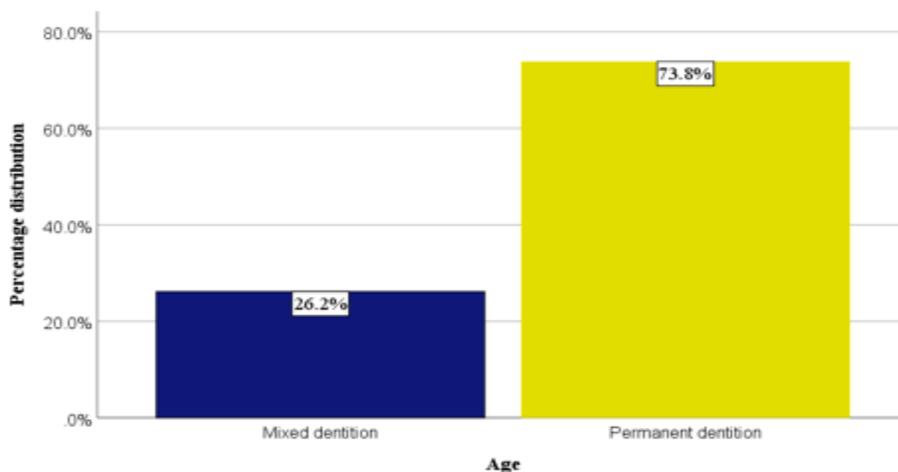


Figure 1: Bar diagram representing distribution of composite restorations according to age. X-Axis represents the age group distribution and Y-axis represents the percentage distribution of composite restorations. The percentage distribution shows the majority of the composite restorations (73.8%) belonged to the permanent dentition age group (Yellow) and only 26.2% were in the mixed dentition age group (Dark blue).

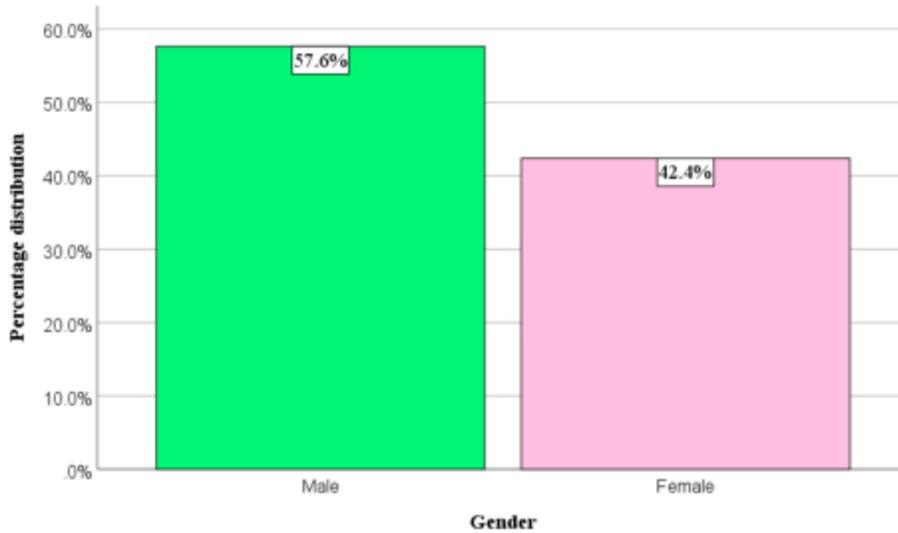


Figure 2: Bar diagram representing distribution of composite restorations according to gender. X-Axis represents the gender and Y-axis represents the percentage distribution of composite restorations. There were more male patients (57.6% ; Light green) with composite restorations than female patients (42.4% ; Pink).

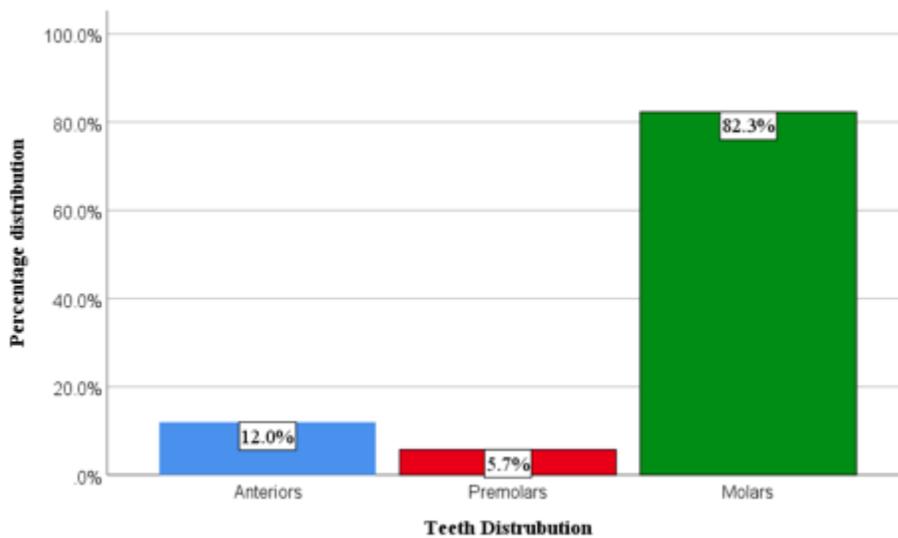


Figure 3: Bar diagram representing the distribution of teeth with composite restoration. X-Axis represents the tooth type and Y axis represents the percentage distribution of composite restorations. The graph shows that the majority of composite restorations (82.3%) were done in the molars (Green), followed by 12% in anteriors (Blue) and only 5.7% restorations in premolars (Red).

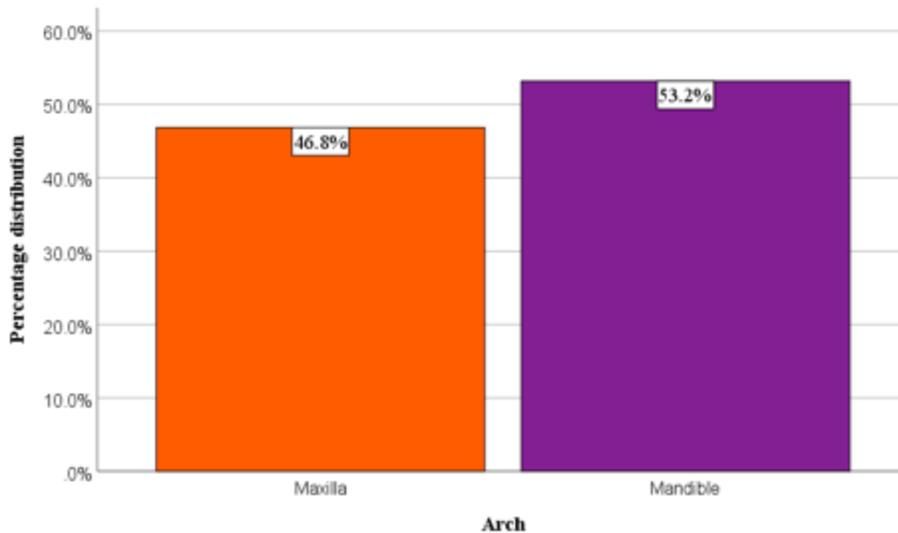


Figure 4: Bar diagram representing distribution of composite restorations according to arch. X-Axis represents the dental arch and Y-axis represents the percentage distribution of composite restorations. There were more composite restorations (53.2%) done in the mandible (Purple) than in the maxilla (46.8% ; Orange).

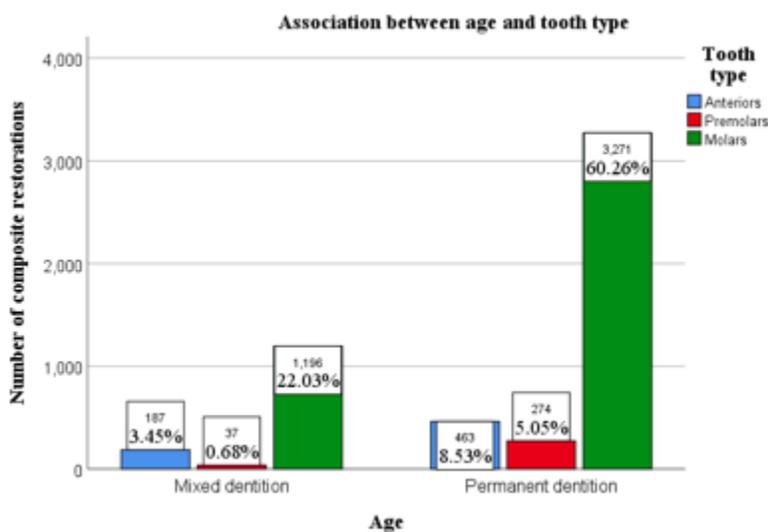


Figure 5: Bar diagram representing association between the age and tooth type having composite restorations. X-axis represents the age and Y-axis represents the number of composite restorations. Among the mixed dentition stage and permanent dentition, the molars (Green) had higher prevalence of composite restorations (22.03% and 60.26% respectively) than anteriors (Blue) and premolars (Red). Highly significant association was found between the age and the tooth type of the patients with composite restorations (Pearson's chi square value 35.915, df - 2, p value =0.000, p<0.05 significant).

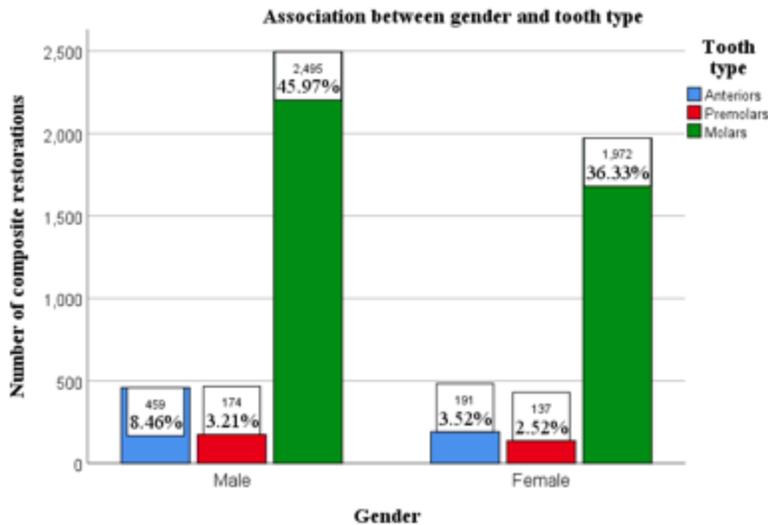


Figure 6: Bar diagram representing association between the gender and tooth type having composite restorations. X-axis represents the gender and Y-axis represents the number of composite restorations. Among the males and females, the molars (Green) had higher number of composite restorations (45.97% and 36.33% respectively) than anteriors (Blue) and premolars (Red). Highly significant association was found between the gender and the tooth type of the patients with composite restorations (Pearson’s chi square value 51.016, df - 2, p value =0.000, p<0.05 significant).

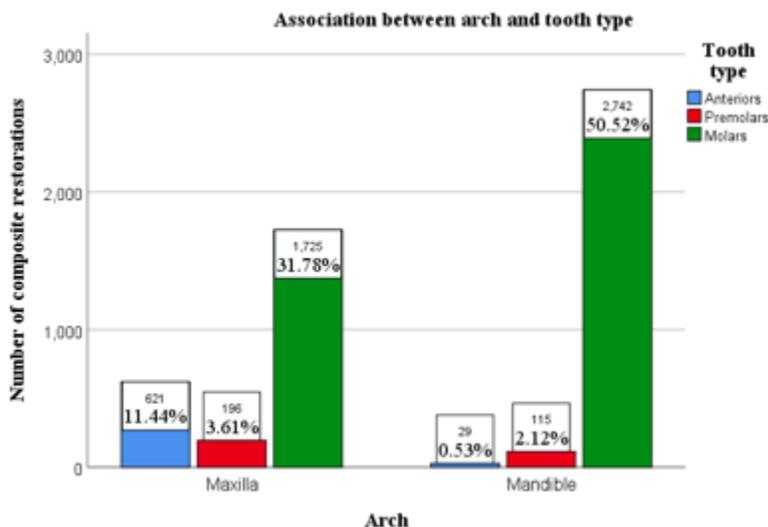


Figure 7: Bar diagram representing association between the arch and tooth type having composite restorations. X-axis represents the arch and Y-axis represents the number of composite restorations. Among the maxilla and mandible, the molars (Green) had higher number of composite restorations (31.78% and 50.52% respectively) than anteriors (Blue) and premolars (Red). Highly significant association was found between the arch and the tooth type of the patients with composite restorations (Pearson’s chi square value 773.116, df - 2, p value =0.000, p<0.05 significant).