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Prevalence of Secondary Caries Among Different Restorations

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ABSTRACT

Introduction: Secondary caries is an unfortunate occurrence that occurs immediately adjacent to the restoration, usually caused by inadequate extension of the restoration, microleakage or improper excavation of caries from the original lesion.
Aims: The aim of this study was to assess the prevalence of secondary caries among different restorations.
Materials and methods: This were a comparative, descriptive study, where all the data of the patients who reported to the dental clinics in saveetha dental college, SIMATS, Chennai, India, was obtained from the dental information archiving software (DIAS). Patient records were collected between March 2020 and March 2021. Data was collected and tabulated. The collected data was further analysed, recorded in Microsoft Excel software and was subjected to statistical analysis using IBM SPSS statistics analyser v.23.0.
Results and discussion: The total sample size of the current study was 126 cases. In this study, we observed that the restoration most frequently associated with secondary caries was composite. We also observed that the secondary caries occurred more frequently in females in the age group of 36 to 45 years.
Conclusion: Within the limitations of the current study, we observed that the most common restoration involved with secondary caries was composite and the most common age group which presented with secondary caries was 36 to 45 years.

Key words: Secondary caries, Restoration, Composite, Amalgam, Full veneer crowns

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INTRODUCTION

Secondary caries is an unfortunate occurrence that occurs immediately adjacent to the restoration, usually caused by inadequate extension of the restoration, microleakage or improper excavation of caries from the original lesion. Secondary caries occurs along an old restoration over a period. Bacterial accumulation or contamination occur due to improper isolation, inoculation, and micro cracks. Demineralisation of the tooth structure presents as a radiolucency below the restoration radiographically. The control of micro cracks, use of topical fluoride, proper oral hygiene and regular check-ups can aid in the reduction of secondary caries.

In other studies of similar nature, it was found that the use of fluoride releasing restorative materials such as GIC reduced the incidence of secondary caries and the replacement of restoration when compared to conventional treatment modalities [1]. It was found that marginal ditching, especially in the case of class 2 restorations, regardless of the type of restoration, microbial accumulation was seen. Mutans streptococci and lactobacilli were most commonly present and are the leading cause of secondary caries. Under the ditches, a large amount of bacterial accumulation was observed [2]. It was observed in a recent study that, among the general population, the prevalence of secondary caries was highest in composite [3]. Secondary caries was also found to be the leading cause for the replacement of amalgam restoration [4]. Proper clinical diagnosis and radiological assessment is essential to properly treat secondary caries and to prevent recurrence.

In previous studies, it was found that the major reason for replacement of a restoration was due to the presence of secondary caries [5]. In a practice-based study, it was found under clinical observation that gingival location was the primary site of origin for secondary caries in both composite and amalgam restorations [6]. It was also stated in another study that the presence of marginal staining could serve as an effective predictor for secondary caries, thereby preventing excessive loss of tooth structure [7,8]. Replacement or repair of an existing restoration must be carefully planned, to prevent leakage. It was found in a study that the bond strength is severely affected when a new material is placed over an old restoration or over unprepared tooth structure [2,9]. In another study, it was

found that the replacement of all types of restorations in permanent and primary teeth was consistently about 50 percent, indicating a severe lack of awareness and precautions to be taken for the prevention of secondary caries [10–13].

Previously our team had a rich experience in working on various research projects across multiple disciplines [14–29]. Now the growing trend in this area motivated us to pursue this project. This research is needed to gain better understanding of the various restorations and the prevalence of secondary caries among them. This will also help in the understanding of micro leakages and ways to prevent them. On review of literature, it was observed that there was a limited number of clinical research based on the prevalence of secondary caries among different restorations and gaining an understanding on how to better treat a patient. The aim of the current study is to assess the prevalence of secondary caries among different restorations.

MATERIALS AND METHODS

This research study was defined as a descriptive study where all the patient's data who reported to saveetha dental college and hospitals, SIMATS, Chennai, India and were diagnosed with secondary caries were obtained from the dental information archiving software (DIAS).

This study setting was an institutional setting, and the research study was conducted in the undergraduate and postgraduate dental clinics of saveetha dental college. This setting came with various pros and cons. The pros included the presence of a larger population and an abundant availability of data. Some of the cons included the study taking place in an unicentred setting and possessing a very limited demographic. The dependent variables in this study included the type of restoration and the presence or absence of secondary caries. The independent variables include the age of subject and gender of the subject. The selection of the study population was performed at random. This population was selected from the patients who visited the undergraduate and postgraduate dental clinics in saveetha dental college. The approval to undertake this research study had been approved by the ethical board of saveetha university (applied). n=126 cases were reviewed, and cross verification was performed by an additional reviewer. The minimisation of sample bias was performed by an additional reviewer, acquiring all the data from within the university and as an additional measure, simple random sampling was performed. There was a presence of high internal and low external validity. Sample collection was performed from March 2020 to March 2021.

The data was then arranged in a methodical manner using Microsoft Excel software and was tabulated based on 3 parameters namely, age of subject, gender of subject and the type of restoration. The data was validated by an additional reviewer. Any incomplete or censored data that was present in the collected data was excluded from the study.

Statistical analysis of the compiled data was performed using IBM SPSS statistical analyser. Chi square test was done for statistical analysis. The inclusion criteria for this study were outpatients with secondary caries irrespective of their age or gender. The exclusion criteria included outpatients who did not have the presence of secondary caries.

RESULTS AND DISCUSSION

The data was collected and sorted based on the 3 parameters mentioned previously. Table 1 and Figure 1 explains about the distribution of secondary caries among different age groups. The total sample size of this study was 126 cases out of which, the most common age group of 36-45 years consisted of 32.5%, followed by 26 to 35 years with 31.7%, 46-55 years with 17.4%, 18 to 25 years with 14.2% and patients above 56 years with 3.9%. We also found that the age group of 36 to 45 years were 8.3 times more than the patients older than 56 years of age. In another study it was observed that the mean age of the patients with secondary caries was 36.7 years suggesting that the results of our study are in concordance with literature [30].

Table 1: Age.

Age		Frequency	Percent	Valid percent	Cumulative percent
Valid	18-25	18	14.3	14.3	14.3
	26-35	40	31.7	31.7	46
	36-45	41	32.5	32.5	78.6
	46-55	22	17.5	17.5	96
	Above 56	5	4	4	100
	Total	126	100	100	

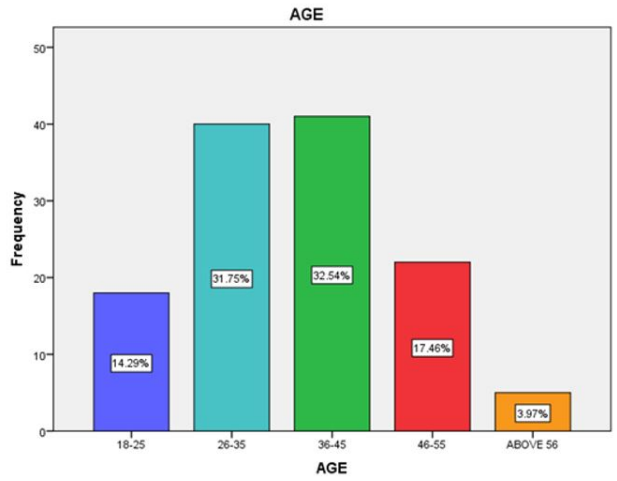

Figure 1: Bar graph showing frequency and distribution of secondary caries among different age groups with age in x axis and frequency in y axis.

Nearly 32.5% of the secondary caries was found to be in the age group of 36 to 45 years which is the most common followed by 26 to 35 years with 31.7%, 46 to 55 years with 17.4%, 18 to 25 with 14.2% and finally patients above 56 years with 3.9%.

Table 2 and Figure 2 demonstrated the frequency and distribution of secondary caries between different genders. We observed that out of 126 cases, more prevalence was observed among females with 52.3% followed by males with 47.6%. This may be associated with differences in tooth morphology and oral hygiene practices between genders, but further research is required to prove this. In a recent study conducted by Ponnudurai Arangannal et al, it was found that the highest prevalence of secondary caries was observed in women, suggesting that the results of the current study are in concordance with literature [31].

Table 2: Gender.

Gender		Frequency	Percent	Valid percent	Cumulative percent
Valid	Male	60	47.6	47.6	47.6
	Female	66	52.4	52.4	100
	Total	126	100	100	

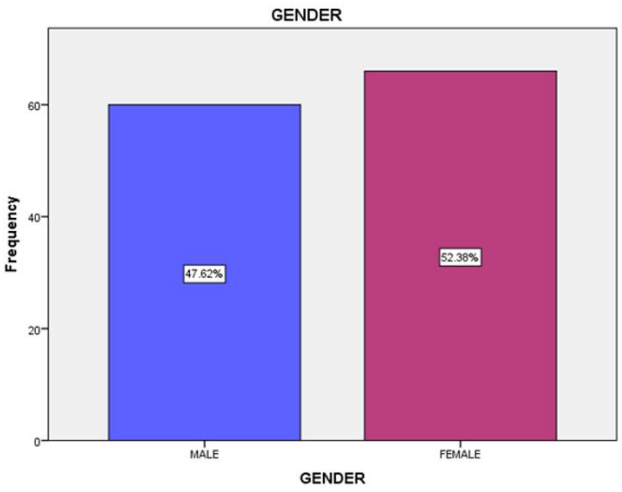

Figure 2: Bar graph showing frequency and distribution of secondary caries between different genders with gender in x axis and frequency in y axis. Nearly 52.3 % of the secondary caries was found to be in Female patients which is the most common followed by Male patients with 47.6 %.

Table 3 and Figure 3 demonstrated the frequency and distribution of secondary caries among different restorations. Here we found that, among 126 restorations, the most common restoration affected with secondary caries was composite with 52.3% followed by amalgam with 32.5%, RCT (root canal treatment) with 11.1% and FVC with 3.9%. We observed that the prevalence of secondary caries in composite was 13.4 times higher compared to FVC. The reason could be due to the poor bond between the restoration and the tooth structure, microleakage, improper removal of caries, improper curing, etc. on review of literature, it was found that, in a study conducted by Nedeljkovic, Ivana, et al, there was significantly higher rate of microleakage compared to amalgam in composite restorations (60µm) and that composite restorations showed the highest rate of secondary caries (59.8%). In another study by A Mjör, Ivar et al, composite restorations showed a higher rate of replacement due to secondary caries compared to amalgam restorations (80:20) suggesting that the results of the current study are in concordance with literature [32–35]. Our institution is passionate about high quality evidence-based research and has excelled in various fields [36–42]. We hope this study adds to this rich legacy.

Table 3: Restoration.

		Frequency	Percent	Valid percent	Cumulative percent
Valid	Amalgam	41	32.5	32.5	32.5
	Composite	66	52.4	52.4	84.9
	FVC	5	4	4	88.9
	RCT	14	11.1	11.1	100
	Total	126	100	100	

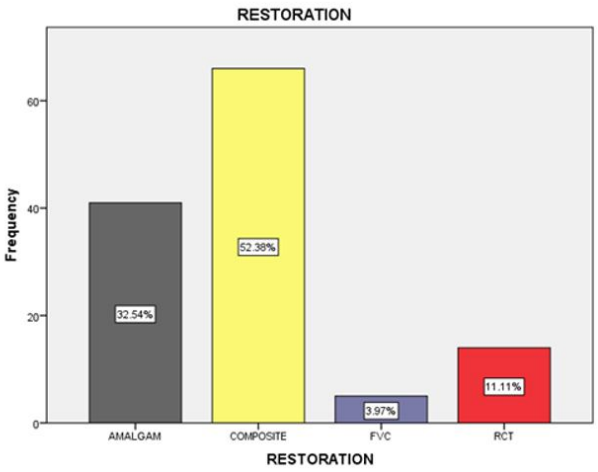

Figure 3: Bar graph showing frequency and distribution of secondary caries among different restorations with restorations in x axis and frequency in y axis. Nearly 52.3% of the secondary caries was found to be in composite restorations which is the most common followed by amalgam restorations with 32.5 %, RCT with 11.1% and FVC with 3.9%.

Study limitations: presence of a smaller sample size, along with the study being a unicentered study with a limited demographic and a lack of variety in the data collected.

Future scope: this study could pave the way for new research with development of newer materials which show better physical properties and chemical properties, less microleakage and overall better prognosis.

CONCLUSION

Within the limitations of the current study, the most common restoration involved with secondary caries was composite which occurred predominantly in females. The most common age group which presented with secondary caries was 36 to 45 years.

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