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Prevalence Of Secondary Caries In Children- Aretrospective Study

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Abstract: Background- Secondary caries develop perpendicular to the tooth surface and can be considered a primary lesion developing next to a restoration, and the wall lesions.Dental caries is the localised destruction of susceptible dental hard tissues by acidic byproducts from the bacterial fermentation of dietary carbohydrates.
Aim- To assess the secondary caries prevalence and its approach in children .
Results- The results prove that composite restoration has more prevalence of secondary caries which is about 69% and the most common class 2 restoration was affected which is about 79%.There is no statistical significant difference between the duration of the restoration and the material used ($p>0.05$).
Conclusion- Within the limits of the study, it can be concluded that secondary caries were commonly noticed in patients with composite restoration. There is no association between duration of restoration and material used for restoration.

Keywords- Secondary caries, restorative material, duration, children

INTRODUCTION

Dental caries is the localised destruction of susceptible dental hard tissues by acidic byproducts from the bacterial fermentation of dietary carbohydrates [(Kidd, 2001),(Christabel and Linda Christabel, 2015)].Primary caries is the term used to describe caries lesions developing on intact, natural tooth surface,as opposed to secondary or recurrent caries,which develops next to an existing restoration [(Dérand, Birkhed and Edwardsson, 1991; Govindaraju, Jeevanandan and E. M. G. Subramanian, 2017a)]. Two regions have been described when considering the process of the secondary caries; the surface lesion,which develops perpendicular to the tooth surface and can be considered a primary lesion developing next to a restoration, and the wall lesion, which develops perpendicular to the tooth/restoration interface [(Fontana, Gonzalez-Cabezas and Stookey, 2000)]. Secondary (recurrent) caries is the major etiologic factor in the failure of dental restorations, and dentists spend more time replacing restorations than placing new ones [(Gilmour, Edmunds and Dummer, 1990)]. Conventional clinical methods for evaluating demineralization surrounding restoration relay upon visible inspection for discoloration and gaps/microleakage, and tactile sensation with an explorer or periodontal probe. It is clear that neither discoloration nor ditching (for gap distance <500-nm,which are considerable) is a consistent indicator of the integrity of the enamel or dentin and a considerable number of restorations are unnecessarily replaced using such criteria [(Maske et al., 2019)]. Inspection via tactile examination also presents the risk of accelerating decay by damaging the protective lesion surface zone. New imaging methods that can discriminate between enamel and composite with high diagnostic performance for secondary caries lesions are needed. Secondary caries are responsible for 60% of all restorations replacement in the typical dental practice [(Krasse, 1986; Govindaraju, Jeevanandan and E. M. G. Subramanian, 2017b)]. The bacteria present in the dental plaque that are involved in the etiology of primary caries most likely also play a major role in the development of secondary caries [(Grieve, 1973)]. It has been reported that the material properties of the dental restorations influence plaque accumulation and development of secondary caries [(Neuhaus et al., 2012; Somasundaram et al., 2015)]. The percentage was somewhat more amalgam than for resin based composite restorations, and it was somewhat less for restorations in primary teeth and their short life spans. The ratio of restoration replacement to primary restoration in general dental practice has been reported to be as high as 80:20 for resin based composite restorations and 70:30 for amalgam restoration and even higher ratio, including the age of the population studied and the replacement ratios being higher in the permanent teeth of adolescents than in adults and being lower in the primary dentition [(Mjör and Toffenetti, 2000; Jeevanandan and Govindaraju, 2018)]. The status of patients oral health and dental care, including participation in caries prevention

programs,also plays a role. Secondary caries was seen predominantly on the gingival margins of all type 2 through type 5 restorations,while it was rarely associated with class 1 restoration or on the occlusal part of class 2 restoration [(Peck and Briggs, 1986)].Secondary caries was seen more often on the occlusal part of resin based composite restoration. Then on the amalgam restoration.Composite resins have been widely used to fulfill the growing concern with esthetics.However,despite the improvement of these materials,there are still some disadvantages to be overcome such as wear and secondary caries [(Hals and Halse, 1975)]. Secondary caries are the most frequent causes of restoration loss. The correct diagnosis of their condition is of key importance to determine the useful time of the restorations [(Xuedong, 2015; Jeevanandan, Ganesh and Arthilakshmi, 2019)]. The radiographic examination is the main method for detection of caries in posterior teeth [(Govindaraju, Jeevanandan and E. Subramanian, 2017),(Wu et al., 1983)].However,served factors may influence this exam, namely the proximity between lesion and restoration,lesion size,lesion orientation,incidence geometry from X-ray beam [(Roydhouse, 1982; Ravikumar, Jeevanandan and Subramanian, 2017)],and optical factors derived from difference in the radiopacity of the restorative material lesion and central structures . For better visualization of the secondary caries,fractures and imperfection, adaptation and contour,the restoration needs to have radiopacity similar to dental structures [(Casagrande et al., 2017; Panchal, Jeevanandan and Subramanian, 2019)].The restorative material should be more radiopaque than the dentine and preferably,with the same radiopacity of the enamel.However,the increase of the radiopacity of restorative material reduce caries detection,increasing the incidence of false positive results [(Kuper et al., 2012; Christabel and Linda Christabel, 2015)]. Materials that have greater radiopacity than dental structures,such as amalgam, can hide secondary caries and sometimes several different x-ray beam incidences are necessary for the detection of there lesions,only the clinical presence of ditches and bluish-gray colouring on the margins of occlusal amalgam restoration cannot predict the existence of the secondary carious lesion [(Gurunathan and Shanmugaavel, 2016; Demarco et al., 2017; Packiri, 2017)].Due to its importance to the longing of the restoration and human oral health,over the past few decades multiple of studies have been conducted both in vivo and in vitro to understand and prevent secondary cares, including the etiology and histopathology of secondary caries [(Rodrigues et al., 2010; Govindaraju and Gurunathan, 2017; Subramanyam et al., 2018)], the detective and diagnostic,the relationship between microleakage and secondary caries as well as cariostatic effects of various restorative materials [(Christabel and Linda Christabel, 2015; 'Fluoride, Fluoridated Toothpaste Efficacy And Its Safety In Children - Review', 2018; Nair et al., 2018)]. But there are fewer literature published on secondary caries prevalence and approach among children hence, the objective of the present study is to assess the prevalence of secondary caries among children.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 METHODS-

Ethical clearance for this study was obtained from the Institutional Ethical Committee SDC/SIHEC/2020/DIASDATA/0619-0320 . It is a retrospective study.Children less than 18years of age were included ,medically compromised and patients with special health care needs were excluded from the study.The data timeline included the patients who were with secondary caries between July 2019 to February 2020.Out of 5000 restoration of 400 case sheets reviewed 500 restoration were diagnosed with secondary caries . By 2 examiners cross verification of data was done by analyzing both radiographs and photographs to minimize the sampling bias. Data reviewed were chronologically recorded and tabulated in MS excel sheet.Parameters of age,gender,restorative material,type of cavity were assessed and duration of restoration was collected from the past dental history, tabulated and the data subjected to statistical analysis using SPSS version 20.O. Descriptive statistics were carried out, Chi-square test was applied and p value was set at $p<0.05$.

RESULTS AND DISCUSSION-

Overall prevalence of secondary caries among children is 10%. The distribution among the children was 6-17 years out of which, 6-10 years of age category was found to be high with secondary caries which is about 48.8%, 18.6% of secondary caries in 11-15 years of age category and 32.5% in 16-17 years of age category(Figure 1). Distribution of patients based on gender and recorded with secondary caries were 58% of male population and 49% of them were female population(Figure 2). Distribution of patients based on duration of restoration out of which 2 years of duration was found to be high with secondary caries which is about 39.5%, 23.2% presence of secondary caries in the past one year, 18.6% presence of secondary caries in the past 6 months and 18.6% presence of secondary caries in the past 3 months(Figure 3). Distribution of patients based

on type of cavity with secondary caries is 79% of the patients are reported with class 2 cavity and 20.9% of them with class1 cavity(Figure 4).Distribution of patients based on restorative material, 69.8% of the restoration with secondary caries was composite, 20.9%was amalgam restoration, 9.3% of them GIC restoration(Figure 5). Distribution of patients based on secondary caries present in upper arch/lower arch among which secondary caries is more present in lower arch which is about 69.% than upper arch which is about 30.2%(Figure 6). By comparing duration of restoration with the type of restorative material used it is evident that secondary caries occur within 1 year to 2 years irrespective of the material used , yet it is statistically not significant. Chi square test showing p=0.13 which found to be statistically not significant ,p>0.05(Figure 7). According to Isabel Metz et al., [(Metz et al., 2015)] there was much preventive measure taken after the primary restoration and yet there was prevalence of secondary caries 72.5% of the restoration failed within the first 2 years and most common restoration used during the primary restoration was composite According to Ivana Nedeljkovic et al [(Nedeljkovic et al., 2020)] that there was a significant presence secondary caries prevalence with composite restoration and class 2 restoration. Franziska Hetrodt et al [(Hetrodt et al., 2019)]., have investigated that secondary caries formation is more prevalent in composite restoration and prepared in standardized cavities.Haitham Askar et al [(Askar et al., 2020)]., have reviewed systematic and non-systematic performance of secondary caries.The objective of present study is to control detect and treat secondary caries. From the study, it is inferred that longer-term studies may be needed to identify difference in secondary caries risk between materials used.According to MB Dinniz et al [(Diniz, Cordeiro and Ferreira-Zandona, 2016)] that there was a significant prevalence of secondary caries in patients who had amalgam restoration,these caries were detected around the proximal surface of the restoration.According to J.L Ferracnae [(Ferracane, 2017)], that there was significant prevalence of the secondary caries in patients who has composite restoration to their primary restoration there was 67% of increase in secondary caries over 6 months of period.According to Gabricla Dos Santos Pinto [(Pinto et al., 2014)], that there was significant prevalence of secondary caries in boys aged between 7-16years and mostly glass ionomer clement had a higher risk of failure over time compared with composites and class 2 restorations showed lower survival rate than class1 restoration.Moreover, most of the studies compared above proves that there is significant prevalence of secondary caries in composite restoration and patients with class 2 restoration. Asbjorn Jokstad [(Jokstad, 2016)].,has experimented with ex vivo research to focus on secondary caries and also explained particular emphasis on microleakage and artificial caries-like lesions. It was concluded that patient demography as well as study methodology impact the incidence and prevalence of secondary caries.Lill-Kari Wendt et al., have presented the type of restorative material used and provided reasons for replacement of restoration in both primary and secondary dentition.From the experimental results ,it is inferred that the frequency of replacement is higher in primary dentition than in the secondary dentition. It has been concluded that secondary caries are more prevalent among children which was in accordance with our results .The proposed study is limited with small sample size and not considering different geographic locations.Future work can be extended with large sample size in various locations, in order to educate the patients about secondary caries and prevention and also instruct them to follow better restorative treatment and prevent secondary caries.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)

CONCLUSION-

Within the limits of the study, Overall prevalence of secondary caries among children is about 10%. Secondary caries prevalence was more commonly noticed among patients with composite restoration, and based on type of cavity ,it is proved that Class II cavity is more prone for secondary caries when compared to Class I. By taking further measurements for secondary caries like advancement in restorative material and better isolation method we can arrive at secondary caries free restoration.

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CONFLICT OF INTEREST:

Author has no known conflict of interest associated with this study.

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Figure Legends:

Fig 1- Prevalence of secondary caries based on age distribution
Fig 2- Prevalence of secondary caries based on gender
Fig 3- Prevalence of secondary caries based on duration
Fig 4- Prevalence of secondary caries based on type of cavity
Fig 5- Prevalence of secondary caries based on restorative material
Fig 6- Prevalence of secondary caries based on dental arch
Fig 7- Comparison between duration and type of material use

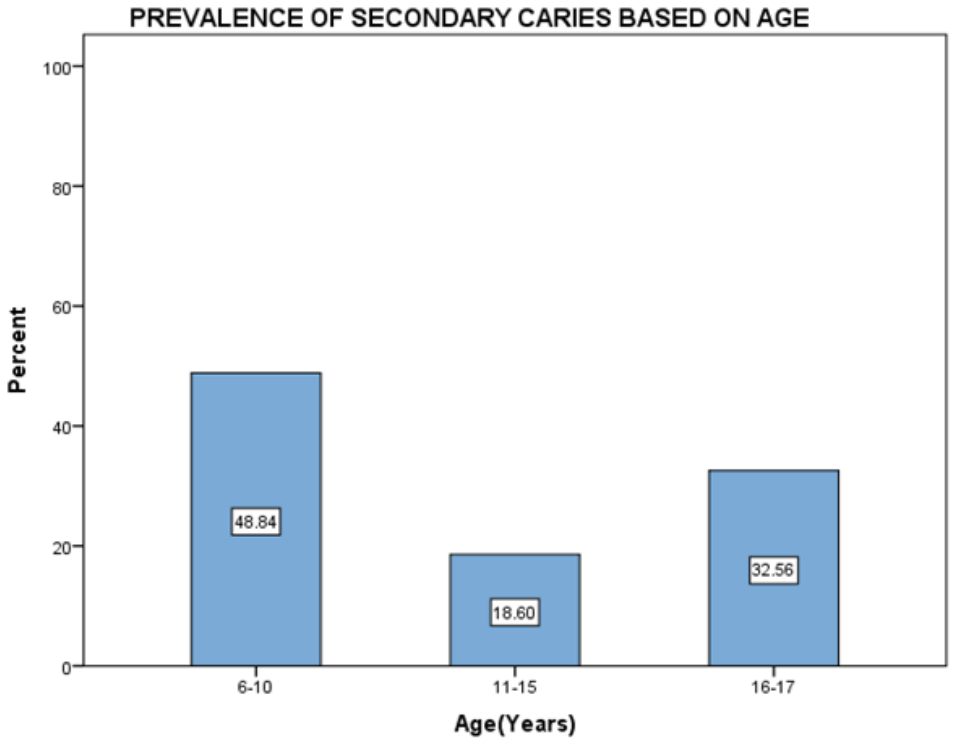

Fig.1:Prevalence of secondary caries based on age distribution. X axis represents the age distribution and Y axis represents the percentage of prevalence of secondary caries. Out of which 6-10 years of age category was found to be high with secondary caries which is about 48.8%. 18.6% of secondary caries in 11-15 years of age category and 32.5% in 16-17 years of age category.

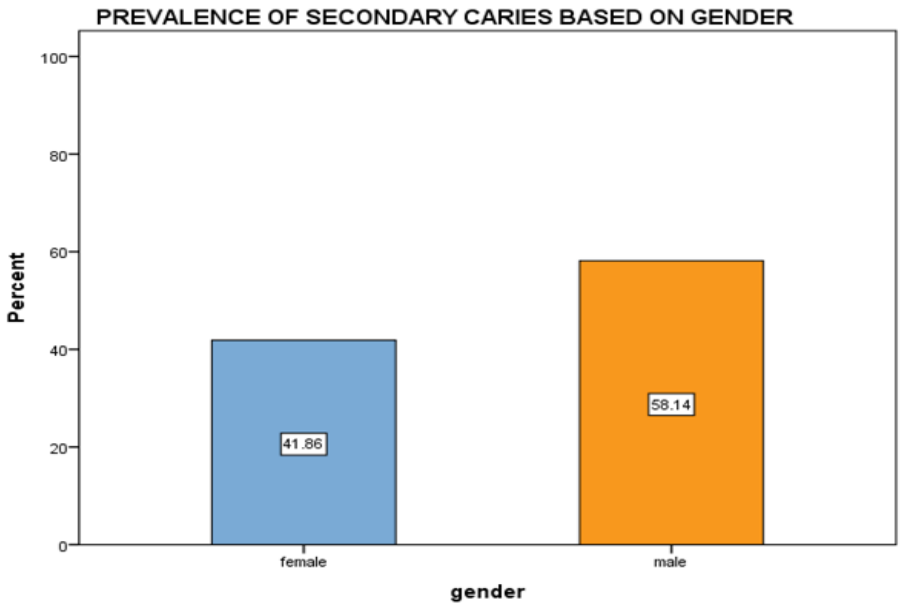

Fig.2:Prevalence of secondary caries based on gender. X axis represents the gender distribution and Y axis represents the percentage of prevalence of secondary caries. Out of which 41.8% are females and 58.1% are males. It is found that Males are more prevalent to secondary caries.

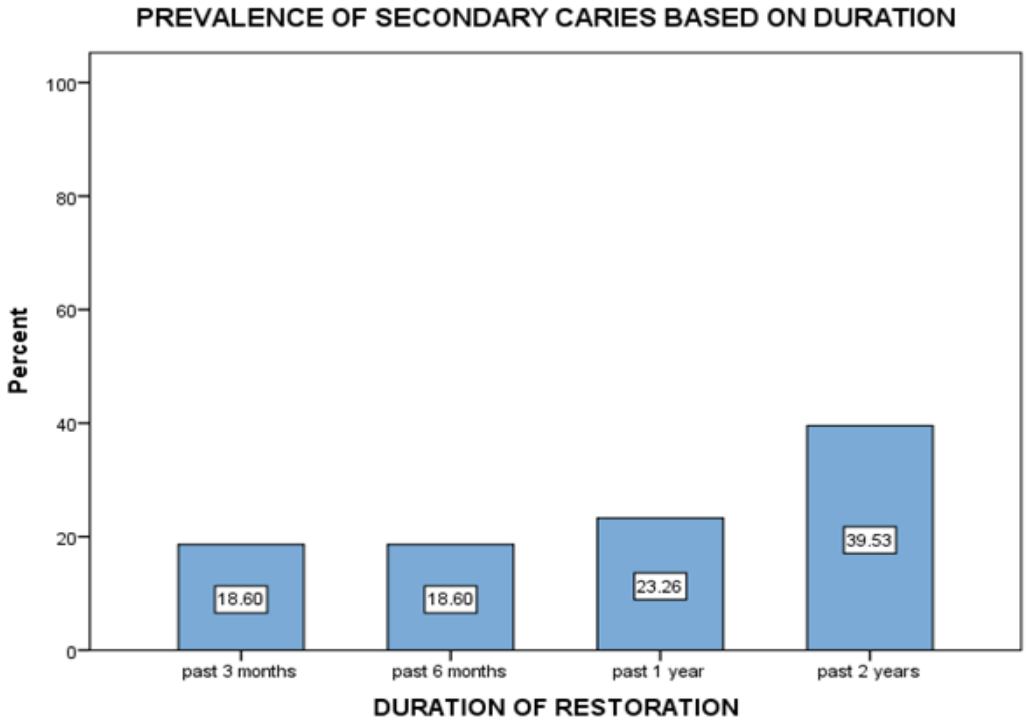

Fig.3:Prevalence of secondary caries based on duration . X axis represents the duration of restoration and Y axis represents the percentage of prevalence of secondary caries. Out of which 2 years of duration was found to be high with secondary caries which is about 39.5%, 23.2% presence of secondary caries in the past one year, 18.6% presence of secondary caries in the past 6 months and 18.6% presence of secondary caries in the past 3 months.

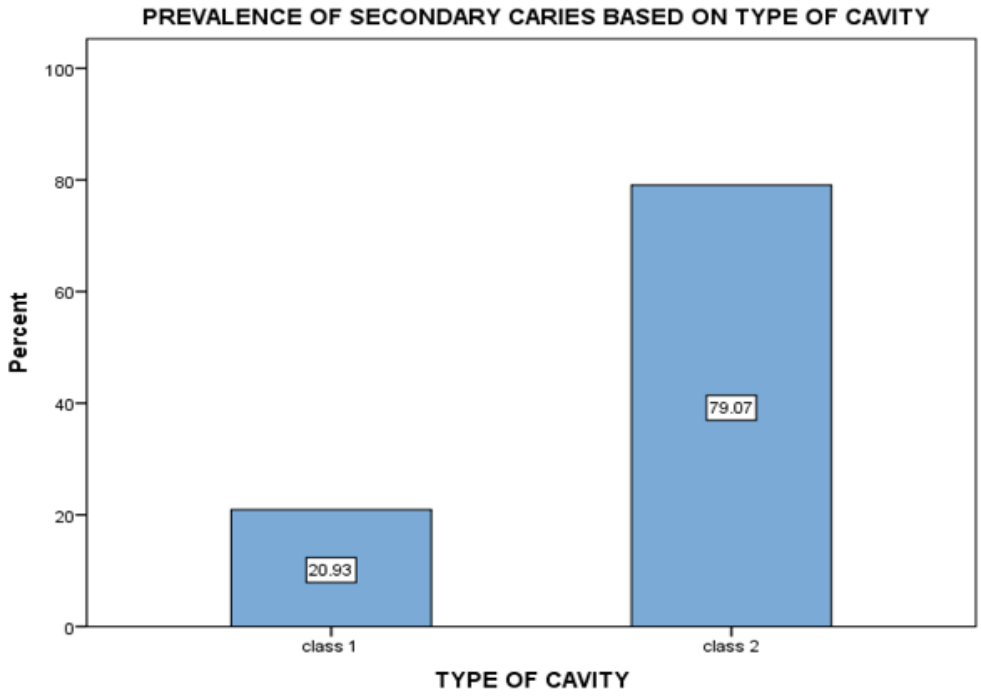

Fig.4: Prevalence of secondary caries based on type of cavity . X axis represents the type of cavity and Y axis represents the percentage of prevalence of secondary caries. Out of which class 2 cavity was found to be high with secondary caries which is about 79.07% and 20.9% is class 1 cavity.

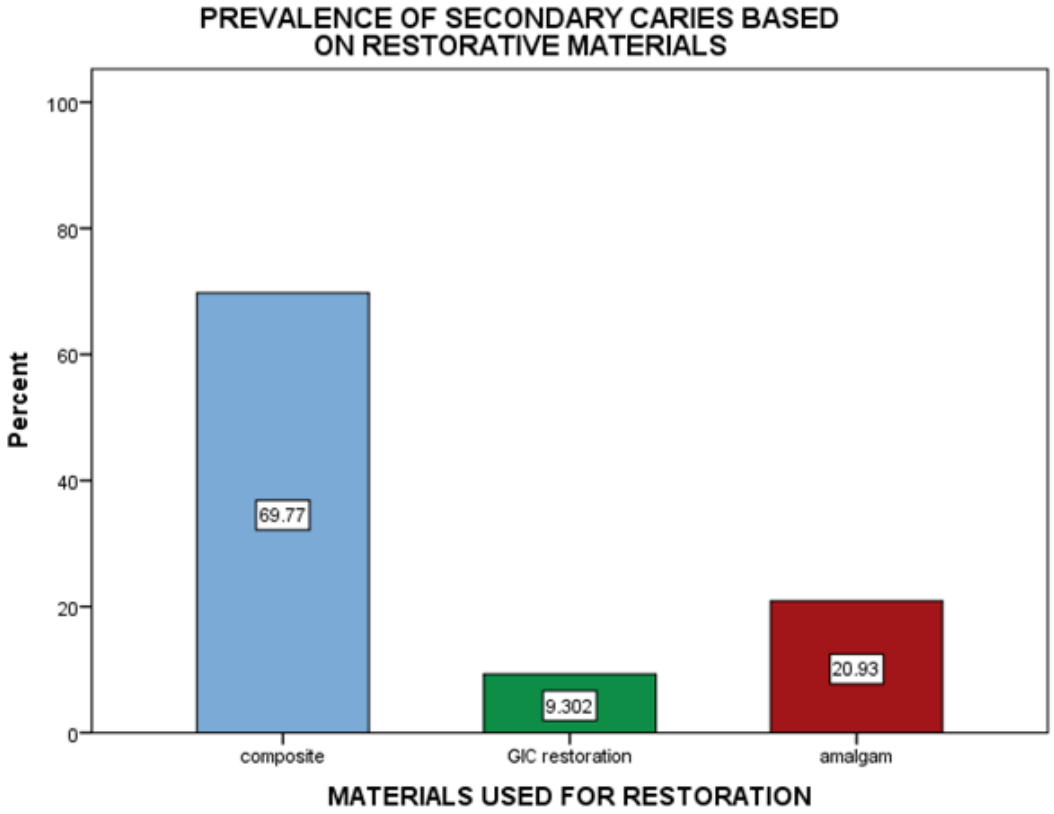

Fig.5:Prevalence of secondary caries based on restorative material . X axis represents the type of cavity and Y axis represents the percentage of prevalence of secondary caries. Out of which composite was found to be high with prevalence secondary caries which is about 69.7% , 20.89% is amalgam and 9.3% is GIC restoration.

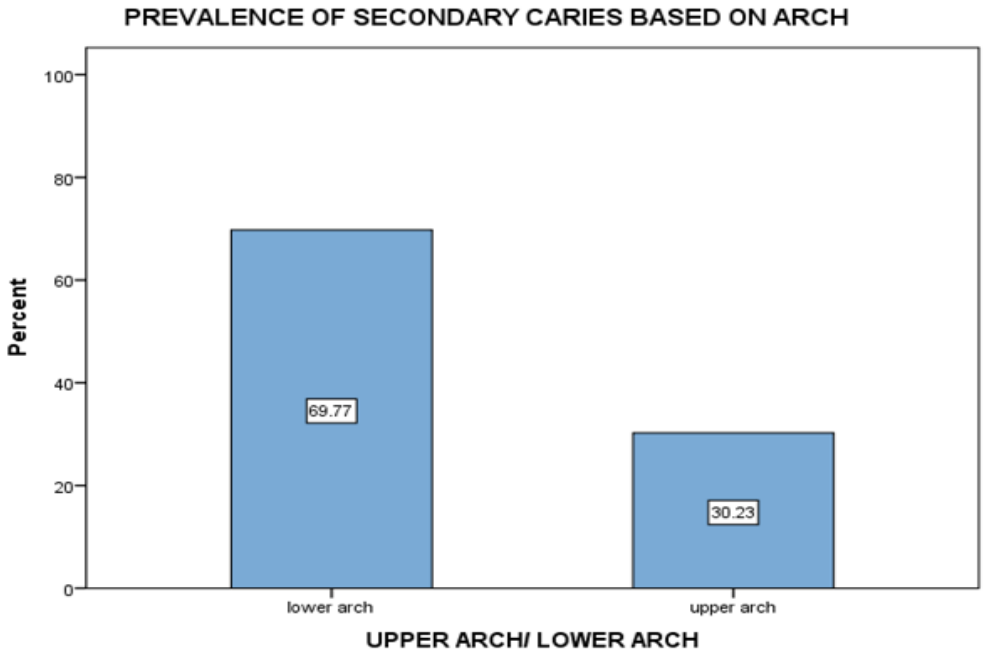

Fig.6:Prevalence of secondary caries based on dental arch . X axis represents the upper arch/lower arch distribution and Y axis represents the percentage of prevalence of secondary caries. Out of which lower arch is found to be high with secondary caries which is about 69.7% and 30.2% is upper arch.

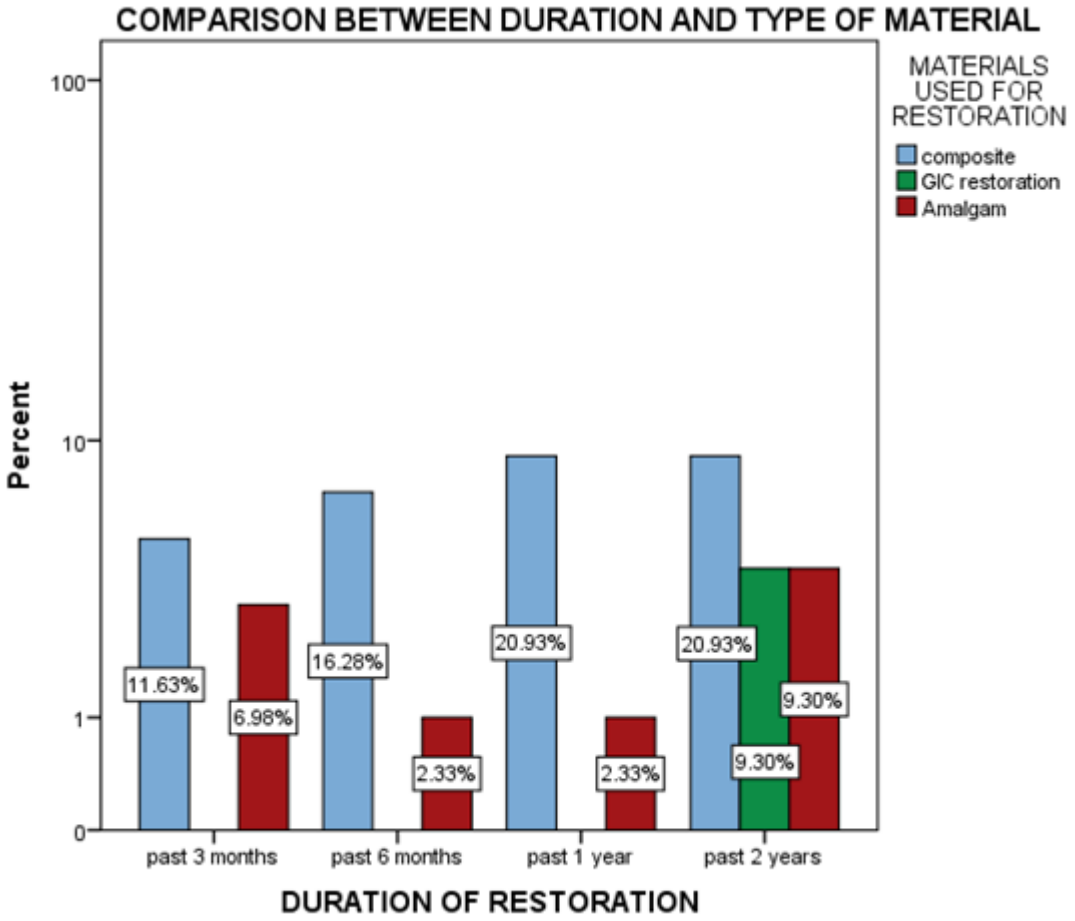

Fig.7: Comparison between duration and type of material used. The Bar chart shows the association between duration of restoration and materials used for restoration level . X-axis represents duration of restoration and Y-axis represents percentage of responses of participants. The duration is categorised into past 3 months,past 6 months ,past 1 year and past 2 years.The chi square test showed there is no significant association between the durations of the restoration and the restorative material,.Pearson's chi square value =9.672, df =6, p value = 0.135 (p>0.05)which is statistically not significant,however composite restorative material showed the maximum secondary caries when compared to the other material (66.77%).