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Association of Geographic location and Dental Caries - A Retrospective Study

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Abstract: Dental caries is one of the most common global health problems today. Geographic variation in terms of culture and ethnicity plays an important role in oral health practices, which in turn contributes to major oral health diseases such as dental caries and periodontitis.This study was aimed to find the association between geographic location and dental caries.This retrospective study was conducted using records of patients visited private Dental College. A total of 150 consecutive case records of patient age ranging from 15-90 years were retrieved. Data on the number of "D" component of Decayed, Missing and Filled teeth Index from their records were entered and subjected to statistical analysis. Descriptive statistics was done to present the proportion of decayed teeth. Chi-square association was performed to find the association. A minimum of one to five decayed teeth was present in 32.67% of rural patients and 50% of urban patients. Seven to ten decayed teeth was more prevalent (16%) in rural patients and less prevalent (0.67%) in urban patients. A maximum of eleven to fifteen decayed teeth was seen only in rural patients. A statistical significant association was found between geographic location and dental caries (p=0.000). This necessitates to provide oral health awareness on food habits among people in the rural population.

Keywords: age, caries, gender, rural, urban

INTRODUCTION

Dental caries remain a global health care issue with eminent economic impact and skewed distribution across and within countries (Kassebaum *et al.*, 2015; Prabakar, John and Srisakthi, 2016). In India, with diverse food habits, socioeconomic and cultural variations, as well as skewed oral health care workforce, the impact on the incidence of dental caries is huge (Balaji, 2017). It is a localised destruction of susceptible dental hard tissues by acidic byproducts from the bacterial fermentation of dietary carbohydrates (Selwitz, Ismail and Pitts, 2007; Prabakar, John, Arumugham, Kumar and Srisakthi, 2018). The cause of dental caries includes three factors: host, bacteria and diet (Yadav and Prakash, no date).

There exists a difference in lifestyle between rural and urban people. The ability to lead a healthy lifestyle depends on various environmental factors, such as the level of nutrition education, access to medical and dental services, and eating habits. Compared to the subjects from the urban environment, the rural people consumed fewer meals daily and were more physically active (Sulibursk*a et al.*, 2012). The big cities have easier access to shopping malls, supermarkets, etc., which continually advertise unhealthy food and high-calorie products which subsequently leads to dental caries formation. Rural residents have a lower financial status, which often limits access to healthy food (Sygit *et al.*, 2003; Makara-Studzinska and Urbanska, 2007). Small towns have poor access to services compared to urban areas and also tend to have poor oral hygiene (Pateman, 2011).

In the prevention and management of dental caries, globally, inequalities persist between urban and rural communities (Prabakar, John, Arumugham, Kumar and Sakthi, 2018a). They include distribution of oral health services, accessibility, utilisation, treatment outcomes, oral health knowledge and practices, health insurance coverage,oral health selected quality of life (Kumar and Vijayalakshmi, 2017), prevalence of oral diseases (Ogunbodede *et al.*, 2015).

A major cause of limited oral care in rural areas is lack of manpower, inadequate planning of resources and unavailability of baseline data of dental caries (Kannan *et al.*, 2017) and treatment needs (Dhar and Bhatnagar,

2009). Rural areas are also often associated with lower education levels, which in turn have been found to be related to lower levels of health literacy and poor use of oral health care services due to Inverse Square Law (Ogunbodede *et al.*, 2015; Pradeep Kumar and Preethi, 2017). Lack of availability of quality food stores in rural populations can lead to early childhood caries and obesity (Mobley *et al.*, 2009). Food insecurity is pronounced in both rural and urban communities among poor and female headed households (Kropf *et al.*, 2007).

Despite greater health knowledge and resources among urban people (Samuel, Acharya and Rao, 2020), urban children's increased access to junk food and frequency of consumption was associated with higher prevalence and severity of caries compared to rural children (Folayan *et al.*, 2020; Mebin George Mathew *et al.*, 2020). Carbonated drinks are more consumed by urban people. The pH increases in oral cavity causing dental caries (Ashwatha Pratha and Prabakar, 2019).Usage of health care services was higher in urban areas compared to rural people. Many factors are contributing to dental caries in urban as well rural people. A comparison study on prevalence of dental caries between urban and rural areas has not been conducted among the Chennai population. 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, John, Arumugham, Kumar and Srisakthi, 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)

Thus this study was contemplated to find the association between geographical variation and dental caries among the Greater Chennai population.

MATERIALS AND METHODS

Study setting and design

A retrospective study was conducted by reviewing 86,000 patient records of the authors University hospital for a period of nine months from June 2019 to March 2020.

Case records selection

About 8564 consecutive case records of patients with age ranging from 18 - 81 years were sorted. 1289 case reports of patients with complete edentulism were excluded. Of 7275 patient records; 150 case records with recorded Decayed, Missing, Filled teeth Index were sorted and retrieved.

Permission

Prior permission to utilize and to analyze the data from the case records of patients was obtained from the administration of University.

Data Collection

Total number of decayed teeth as recorded under the Decayed criteria of Decayed, Missing and Filled Teeth (DMFT) index given by Klein, Palmer, Knutson (1938) was collected from the 150 patient records. Age of the patients in the case records were categorized as 18-33 years, 34-49 years, 50-64 years and 65-81 years for statistical convenience. The geographic location of 150 patients were categorised into rural or urban.

Statistical analysis

Statistical analysis was done using Statistical Package for the Social Sciences (SPSS) Version 23.0. Descriptive statistics was done to present the prevalence of decayed teeth based on geographic location, age and gender. Chi square association using crosstabs was done to find the association of geographic location with the number of decayed teeth. On significance of Chi-square association was performed to find the association. A p value <0.05 was considered to be significant.

RESULTS AND DISCUSSION

Final data set consisted of 150 patients of Indian origin who underwent treatment in University hospital. About 62 (41.3%) of patients were at the age group between 18-33 years, 57 (38%) belonged to the age range of 34-49 years, 25 (16.7%) belonged to the age range of 50-64 years and 6 (4%) were at age group between 65-81 years. Among the patients 92 (61.3%) were males and 58 (38.7%) were females. About 74 (49.3%) patients were from rural areas and 76 (50.7%) patients were from urban areas.

The age group 18-33 years had 30% males and 11.33% females; similarly 20% of males and 18% of females were at the age range of 34-49 years; the age group of 50-64 years had 9.33% of males and 7.33% of females. There were 2% males and 2% females belonging to the age range of 65-81 years.

It was found that 24% , 16.67%, 7.33%, 1.33% who were under the age group of 18-33 years, 34-49 years, 50-64 years, 65-81 years respectively belonged to rural areas. About 17.33% of age group 18-33 years, 16.67% of age group 34-49 years, 7.33% of age group 50- 64 years, 1.33% of age group 65-81 years are from urban areas.
Assessing the gender distribution according to geographic location, 31.33% males and 18% females belonged to rural areas; and 30% males and 20.67% females were from urban areas.
Figure 1 showed that 31.33%, 33.33%, 14.67%, 3.33% of patients of age ranging from 18-33 years, 34-49 years, 50-64 years and 65-81 years respectively had a minimum of 0-5 decayed teeth. About 9.33%, 4.67%, 2%, 0.67% of patients aged 18-33 years, 34-49 years, 50-64 years and 65-81 years respectively had six to ten decayed teeth; Maximum of eleven to fifteen decayed teeth was seen only in the age group of 18-33 years.
On analysing gender, a minimum of 0-5 decayed teeth were present in 50% of males and 32.67% of females. About 10.67% of males and 6% of females had six to ten decayed teeth. Only males had maximum of eleven to fifteen decayed teeth (Figure 2)
Figure 3 showed that a minimum of 0-5 decayed teeth was present in 32.67% of rural patients and 50% of urban patients. About 16% of rural patients and 0.67% of urban patients had 6-10 decayed teeth. A maximum of 11-15 decayed teeth was seen only in rural patients.
This study was based on individuals seeking treatment at University hospital. Our study showed that the number of decayed teeth to be significantly higher in rural populations. The prevalence of dental caries seems to be increased in the age group of 18-33 years with male predilection.
Our study in contrast with a study done by Benoit Varenne in Africa, which showed higher prevalence rate of dental caries among urban children compared to rural children ($p<0.01$) (Khatri *et al*., 2019). Another study in England showed that urban children had more caries compared to rural children ($p=0.001$) (Maserejian *et al.*, 2008) opposing our literature. Among 12yr and 15yr old school children of Bhopal, India, the prevalence of dental caries was 30.4% and 30.0% in the urban and rural school children (Harini. G, 2019) (Sharva *et al.*, 2017). This results of the study was in consistency with ours. Total percentage of prevalence of dental caries was higher (50.7%) among rural populations than among urban populations (49.3%). The reason for higher prevalence of dental caries in urban people according to our study can be due to their food habits, lifestyle habits and oral health practices, lack of awareness on preventive oral health services and less utilization of dental services which predisposes to caries formation..
A study done by Mohammed A. Al-Rafee was similar to our study, showing more caries rate in rural areas compared to urban areas in Saudi Arabia (Pavithra and Jayashri, 2019) (Al-Rafee *et al.*, 2019). In Scotland, children from rural areas have better dental health than urban areas (Neralla *et al.*, 2019). Prevalence of caries was lower and filled teeth was higher in urban children (Levin *et al.*, 2010). Rural children in Rajasthan had higher prevalence of dental caries (63%) [(Dhar and Bhatnagar, 2009)] which was in agreement with our study. In a study done by Abbas among school children of Iraq, the prevalence of dental caries in permanent teeth in urban and rural areas was 56.8 %, 77.6%, respectively. Also, the prevalence of dental caries in primary teeth in urban and rural areas was 96.1%, 96.4%, respectively (Abbas, 2018)(Prabakar, John, Arumugham, Kumar and Sakthi, 2018b). Takur et al showed that among 12 year old school children, dental caries level was significantly higher ($P < 0.03$) for rural children (Thakur *et al.*, 2017; Mohapatra *et al.*, 2019). All these study results were consistent with our study results. According to Borges, adolescents living in rural areas had a prevalence of 70.7% and 56.4% in the urban area (Borges *et al.*, 2017). Variation between the present study and other studies in literature can be due to physical and cultural anthropological variation. The present study has certain limitations that the results cannot be extrapolated to other populations with different cultural norms and practices. Further longitudinal prospective studies are needed to prove the hypothesis and find the predisposing and contributing factors for the high prevalence of dental caries in rural areas.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; M. G. Mathew *et al.*, 2020)

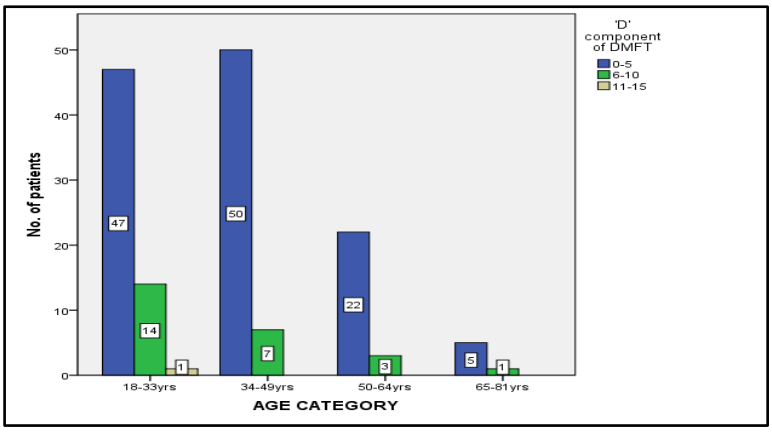

Fig.1: Bar chart showing association between "D" component of DMFT Index and age groups. X axis shows age group in years. The Y axis shows the number of patients. Chi- square association test was done between age groups and "D" components and was not significant. Pearson Chi-square p value = 0.480 (statistically not significant). Dental caries was seen more in the age group of 18-33 years compared to other age groups.

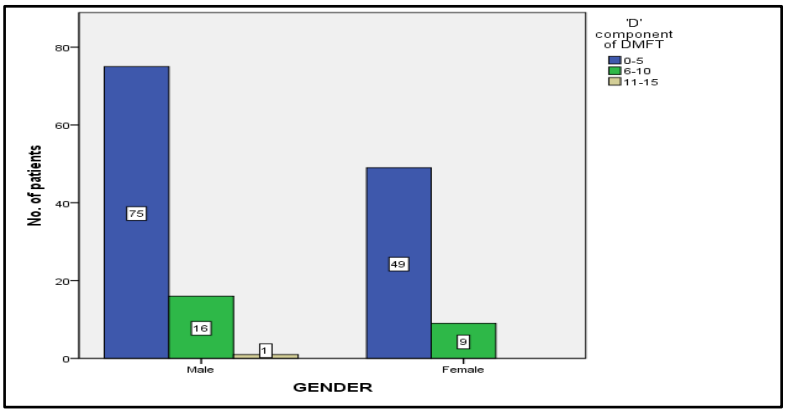

Fig.2: Bar chart shows association between the "D" component of DMFT Index and gender. X axis shows gender. The Y axis shows the number of patients. Chi- square association test done between gender and "D" component. Pearson Chi-square p value = 0.580 (statistically not significant). Number of dental caries was more in males compared to females.

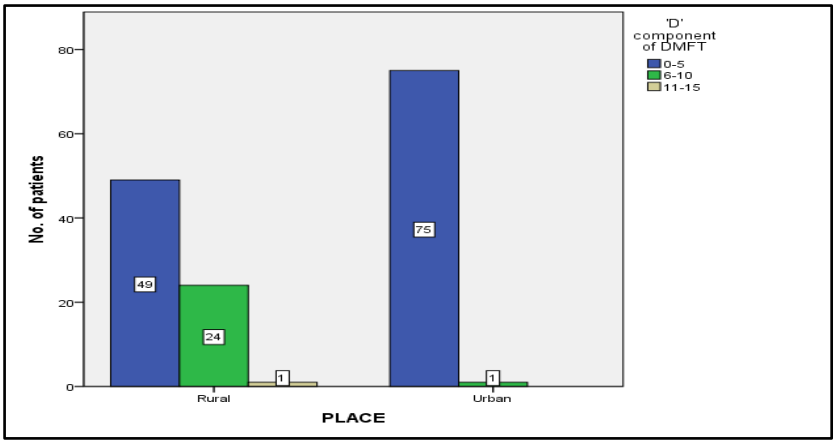

Fig.3: Bar chart shows the association of "D" component of DMFT Index and geographic location. X axis shows geographic location. Y axis shows the number of patients. Chi- square association test was done between geographic location and "D" component . Pearson Chi- square test p value = 0.000 (statistically significant). Dental caries was seen more in rural patients compared to urban patients.

CONCLUSION

Within the limitations of this study, it was found that the number of decayed teeth seems to be higher in rural populations compared to urban populations. More number of dental caries was seen in the 18-33 yrs age group with male predilection. This suggests the need to spread awareness among people about the necessary oral hygiene practices and diet counselling programs to be taken and use of preventive dental health services to prevent dental caries progressing towards tooth loss at its earlier stage.

AUTHOR'S CONTRIBUTION

First author A.Ashwatha Pratha performed data collection, analysis, and interpretation and wrote the manuscript. Second author Arthi Balasubramaniam contributed to conception, study design, analysis, interpretation and critically revised the manuscript
Third author (Jain) contributed to review the manuscript.
All the authors have discussed the results and contributed to the final manuscript.

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Conflict of interest

None

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