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Prevalence and extent of partial edentulism and its association with demographic variables- an epidemiological survey

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Abstract: Advances in preventive dentistry are not unknown to mankind despite that , edentulism is a major public health issue worldwide. Edentulism has been hallmarked as "final marker of disease burden for oral health." The objective of the present study is to determine the relationship between socio-demographic variables and partial edentulism. A Cross-sectional, descriptive study was conducted in an institution, on randomly selected individuals. The study group consisted of adult patients who attended the outpatient Department of Prosthodontics from June 2019- March 2020.Data collection was done by using college database and Chi-square test and frequency analysis was used to explore the relationship between two variables Males had more missing teeth in general compared to females.Males had more missing teeth in upper anterior region than females.Females had more missing teeth in upper posterior region.Males had more missing teeth in lower anterior region compared to females.Females had more missing teeth in lower posterior region.Age group(31-40) years had more missing teeth over all. Upper anteriors were more missing in Age group(31-40) years.Upper posteriors were more missing in Age group(31-40) years.Lower anteriors were more missing in Age group(31-40) years.Lower posterior were more missing in Age group(31-40) years.In general anterior teeth were more missing in males compared to posterior teeth which were more missing in females.Age group(31-40) years is more prone to missing teeth in partial edentulous cases. There was an increase in the number of missing teeth as the age advances.More awareness is needed among the population in order to maintain good oral hygiene.

Keywords: Kennedy's classification; Partial edentulism; Teaching institution; Tooth loss.

INTRODUCTION

Retention of teeth throughout life is one of the most important oral health indicators.Old age has been frequently associated with edentulousness. Previous studies have shown a positive correlation between edentulousness and its negative impact on overall health and quality of life of the elderly(Shamdol *et al.*, 2008; Ariga *et al.*, 2018). Previous studies have shown an association between socio-demographic factors, lifestyles, and tooth loss(Shamdol *et al.*, 2008),(Esan *et al.*, 2004),(Cunha-Cruz, Hujoel and Nadanovsky, 2007) Tooth loss is multifactorial, but is mainly attributed to dental caries and gum disease,neoplastic lesions,cystic lesions,supernumerary teeth (Abdel-Rahman, Tahir and Saleh, 2013; Jyothi *et al.*, 2017) According to (Prabhu *et al.*, 2009),(Reddy *et al.*, 2012),(Akinboboye, Azodo and Soroye, 2014) caries is the main causative agent for tooth loss. Dental caries and periodontal disease were the major causes of tooth loss in early childhood and adolescence (Abdel-Rahman, Tahir and Saleh, 2013; Duraisamy *et al.*, 2019). Sometimes the factors that lead to tooth extraction need not always be dental in origin. There is a complex interaction between the dental disease,dental care,dental attitude and affordability of non-extraction treatments (Gilbert *et al.*, 1999; Selvan and Ganapathy, 2016). Women with a low education level, low economic status and those who did not brush their teeth frequently on an average showed greater numbers of missing teeth(Lin *et al.*, 2001). Age, gender, low family income, and rural domicile have often been associated with edentulism(Medina-Solís *et al.*, 2006). Tooth loss plays an important role in impairing the quality of life, and also affects the well-being of the person. Missing teeth can interfere with chewing ability, diction, and esthetics. Low self-esteem related to tooth loss can hinder an individual's ability to socialize, hamper the performance of work and daily activities, and lead to absence from work(Batista, Rihs and Sousa, 2012; Ganapathy *et al.*, 2016).

Partial edentulousness is a dental condition in which one or more but not all natural teeth are missing.According to some studies age correlates positively with partial edentulism (Abdel-Rahman, Tahir and Saleh, 2013; Jain,

Ranganathan and Ganapathy, 2017). Partial edentulism leads to several drawbacks to the patients such as clinical challenges and lifestyle compromises. Clinically, partial edentulism results in drifting and tilting of adjacent teeth, supra eruption of opposing teeth, altered speech, changes in facial appearance and tempero-mandibular disorders(Abdurahiman, Abdul Khader and Jolly, 2013). It is difficult to achieve adequate restoration in partially edentulous patients due to continuous loss of alveolar bone, degradation of adjacent teeth and supporting structures(McGarry *et al.*, 2002; Subasree, Murthykumar and Dhanraj, 2016). Partially edentulous arches have been Classified by various methods. The possible combinations of partial edentulism are more than 65,000 depending on their incidence in maxillary and mandibular arches.The primary objective of the classification is to facilitate communication about the combination of missing teeth and edentulous ridge to students, dental practitioners and laboratory technicians(Abdel-Rahman, Tahir and Saleh, 2013),(Sadig and Idowu, 2002),(Curtis *et al.*, 1992). Among the various methods of classification like Kennedy, Applegates, Avant, Neurohar, Eichner, ACP (American College of Prosthodontics) etc, Kennedy's classification is widely studied and clinically accepted by the Dental Community. As per Kennedy's classification, there are four main types of partially edentulous arches as Class I, Class II, Class III and Class IV. Kennedy's classification is widely accepted due to its advantages of immediate visualization and recognition of prosthesis support.

Partial edentulism is one of the widely studied topics in dentistry. The pattern of partial edentulism has been evaluated in many selected populations in different countries. Several studies have analysed the correlation between partial edentulism and its influencing factors like socio-economic parameters, age, gender, etc,(Abdel-Rahman, Tahir and Saleh, 2013),(Sadig and Idowu, 2002)(Esan *et al.*, 2004; D′Souza and Aras, 2014),(Sapkota, Adhikari and Upadhaya, 2015). Few studies also have analysed the awareness among the subjects to replace the missing teeth.(Esan *et al.*, 2004; D′Souza and Aras, 2014),(Sapkota, Adhikari and Upadhaya, 2015) Surveying of RPDs, patients visiting clinics, clinical records and population in a particular locality have been the common method of evaluation of partial edentulism. Most commonly, studies have been done by recording patient details through questionnaire and then by clinical examination. The aim of this literature review was to analyse the prevalence of partial edentulousness and its correlation with gender, age, socio-economic factors, arch predominance and incidence of various Kennedy's Classes by reviewing various surveys to identify the factors of significant influences.

Dental neglect is a major problem in the developing and developed countries. The need and necessity for replacing missing teeth is so high in such situations that it can make dentists extremely busy. Although it is a known fact that there exists a truckload of patients who need replacement of missing teeth, little light is shed over a formidable number for dentists to work on.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)

This epidemiological study aims to determine the relationship between socio-demographic variables and partial edentulism.

MATERIAL AND METHODS

This retrospective study was performed in a university setting on Indian population to analyze correlation between demographic data and number of missing teeth. Approval for the study was taken from the ethical board of Saveetha Institute Of Medical and Technical Sciences(SDC/SIHEC/2020/DIASDATA/0619-0320). There were two reviewers involved to examine the results of the study. The data included in the study was from June 2019-March 2020. 86000 case sheets were reviewed.Cross verification of data was done through telephonic & photographic information. Measures which are taken to minimize sampling bias are simple random sampling and a second reviewer to evaluate the sample size which was selected was 1075.

Data collection from the database of Saveetha dental college after reviewing all the case sheets Patients who reported in the Department of Prosthodontics were selected for the study. Google sheet tabulation and SPSS importing of the data was done. Descriptive statistics tests were performed. Software used - SPSS version 26 was used. Independent variable being race and time; Dependent variable being Age, sex and socioeconomic status. Chi Square test and frequency analysis was used to evaluate the data.

RESULTS AND DISCUSSION

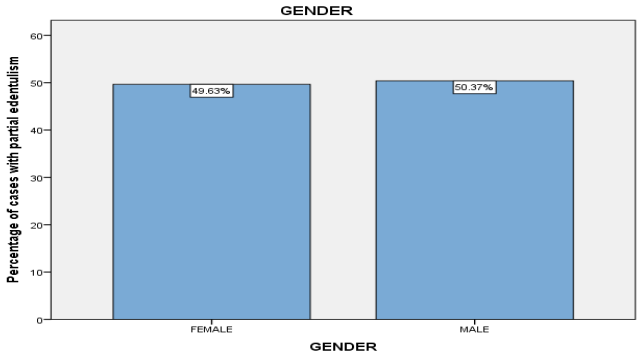

Fig.1: Bar graph depicting the prevalence of partial edentulism with gender. X axis represents gender(male/female) and Y axis represents the percentage of patients. There were more males(50.37%) in comparison to females(49.63%) with partial edentulism.

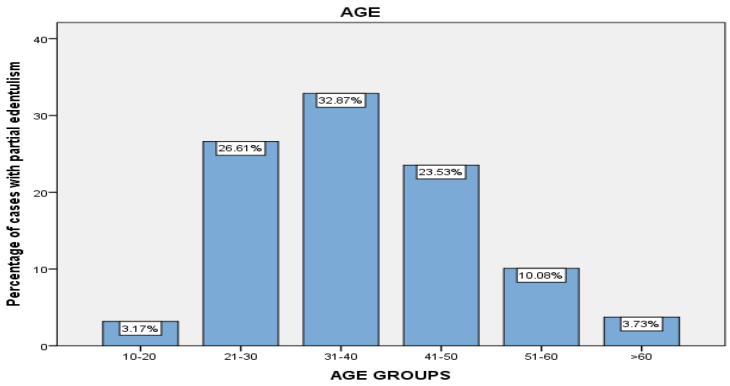

Fig.2: Bar graph depicting the prevalence of partial edentulism with age groups. X axis represents age groups and Y axis represents the percentage of patients. There were more percentage of patients in the age group (31-40)(32.87%) in comparison to other age groups.

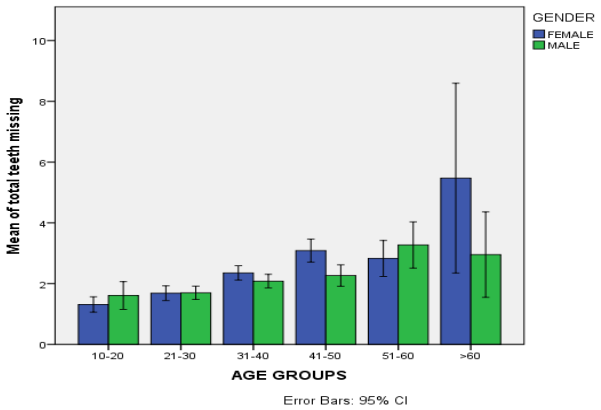

Fig.3: Bar graph depicting association of partial edentulism with age groups. X axis represents the age groups and Y axis represents mean of total teeth missing. There was an increase in the number of missing teeth as the age advances.

Table 1: This table represents correlation of different sites of partial edentulism with age groups.*P value<0.05 statistically significant; ** P value >0.05 statistically not significant.

	AGE GROUPS(N=1071)						CHI SQUARE VALUE	P VALUE
	10-20	21-30	31-40	41-50	51-60	>60		
TOTAL TEETH MISSING	34	285	351	252	108	40	206.2	0.001*
TEETH MISSING UPPER ANTERIORS	16	50	61	48	19	8	41.5	0.078**

TEETH MISSING UPPER POSTERIORS	2	82	167	130	65	28	71.2	0.002*
TEETH MISSING LOWER ANTERIORS	5	22	30	22	20	5	32.4	0.146**
TEETH MISSING LOWER POSTERIORS	14	177	208	171	65	29	84.9	0.001*

Table 2: This table represents correlation of different sites of partial edentulism with gender. *P value<0.05 statistically significant; ** P value >0.05 statistically not significant.

	GENDER(N=1071)		CHI SQUARE VALUE	P VALUE
	FEMALE	MALE		
TOTAL TEETH MISSING	531	540	29.4	0.009*
TEETH MISSING UPPER ANTERIORS	86	116	9.4	0.149**
TEETH MISSING UPPER POSTERIORS	266	208	7.8	0.449**
TEETH MISSING LOWER ANTERIORS	44	60	4.2	0.514**
TEETH MISSING LOWER POSTERIORS	355	309	23.9	0.001*

Males had more missing teeth in general compared to females(Figure 1). Age group(31-40) years had more missing teeth over all(Figure 2).There was increased in number of missing tooth as the age advances(Figure 3).Upper anteriors were more missing in Age group(31-40) years.Upper posteriors were more missing in Age group(31-40) years.Lower anteriors were more missing in Age group(31-40) years.Lower posterior were more missing in Age group(31-40) years but there is a statistically significant association between total teeth missing and teeth missing in upper and lower posteriors with age [$p<0.05$](Table 1).Males had more missing teeth in upper anterior region than females.Females had more missing teeth in upper posterior region.Males had more missing teeth in lower anterior region compared to femalesFemales had more missing teeth in lower posterior region but there is a statistically significant association between total teeth missing and teeth missing in lower posteriors with gender [$p<0.05$] (Table 2).

Loss of teeth reflects a major public health problem in many countries(Jaleel *et al.*, 2014; Vijayalakshmi and Ganapathy, 2016) .Edentulism has a significant impact on health and the overall quality of life(D′Souza and Aras, 2014; Jaleel *et al.*, 2014; Ganapathy, Kannan and Venugopalan, 2017) Studies on self-perception have shown that tooth loss is associated with aesthetical, functional,psychological, and social impacts on individuals.(Shamdol *et al.*, 2008),(Shimazaki *et al.*, 2001; Johnson, Glick and Mbuguye, 2006; Teófilo and Leles, 2007).

Sadiq WM et al., observed no significant gender differences for extension base RPDs with examination of 422 patients with 298 males and 124 females. However, the author has quoted a previous study in Saudi Arabia which reported that females had greater mandibular distal extension, which was reasoned with a higher rate of mandibular molar tooth loss. Further, the author has explained that differences in study findings may be due to the fact that the males outnumbered females by more than half in the study population (Sadig and Idowu, 2002; Ashok *et al.*, 2014; Ashok and Suvitha, 2016). Al Dwairi ZN et al.. noted that Kennedy's Class II and Class III patterns were more frequent among males than females(Sadig and Idowu, 2002; Niarchou *et al.*, 2011). Prabhu N et al., observed that there was statistically no significant correlation between gender and partial edentulism on examining 350 patients with 147 males and 203 females (Prabhu *et al.*, 2009; Venugopalan *et al.*, 2014). But there is statistically significant correlation between gender and various Classes of partial edentulousness in the upper and lower arch. Abdel Rahman HK et al.,, studied that gender has no statistically significant relation with prevalence of various Classes of partial edentulism (Prabhu *et al.*, 2009; Abdel-Rahman, Tahir and Saleh, 2013). Abdurahiman VT et al., studied that there was no significant gender difference observed in the frequency of occurrence of partial edentulism. However, the author has observed that men are more prone to partial edentulousness in maxillary posterior region and women in mandibular posterior region(Abdurahiman, Abdul Khader and Jolly, 2013; Basha, Ganapathy and Venugopalan, 2018; Kannan and Venugopalan, 2018). Sapkota B et al., observed that females are more edentulous compared to males but at the same time, opt for a higher level of replacement of missing teeth. This may be due to their dependency upon the males for their dental treatment to save the teeth. However, they are more conscious about their appearance, which explains their preference for replacement of missing teeth (Abdurahiman, Abdul Khader and Jolly, 2013; Sapkota, Adhikari and Upadhaya, 2015).

Among the various factors studied, age is the key factor found to have significant relationship with occurrence of partial edentulism and various incidences of Kennedy's Classes of partial edentulism Sadiq WM et al.,(Sadig and Idowu, 2002) found that Younger adults had more Classes III and IV RPDs. Older adults had more distal extension RPDs (Class I and II). (Manchikalapudi *et al.*, 2017), concluded that with an increase in age, there was an increase in Class I & Class II dental arch tendency and a decrease in Class III & Class IV. In younger age groups,

Incidence of Kennedy's Class III was found to be 49% in age group 20–29 years and above 55% in age group 30–39 years, which was relatively higher than that of any other Classes. This is due to the trauma to maxillary central incisors at early childhood stage Early loss of first molar due to caries may be the reason for higher

occurrence of Class III in younger age groups. When age increases, due to further loss of teeth, extension of existing saddle leads to Class I and Class II. Kennedy's Class IV was also found to be the most common incidence in the age group 20-29 years. The author has explained that at early childhood stage, maxillary central incisors are more prone to trauma, which leads to Class IV in younger age groups. Abdel Rahman HK et al., found that younger age group patients had more Class III and Class IV in both the arches and as age increases due to multiple teeth extraction, there was significant increase in Class I and Class II (Prabhu *et al.*, 2009; Abdel-Rahman, Tahir and Saleh, 2013) .

Several studies have observed that prevalence of partial edentulism is more common in mandibular arch than maxillary arch as follows. Curtis D et al., explained that a greater number of mandibular RPD was observed compared with maxillary RPDs and this is probably related to the general pattern of tooth loss and the many problems related with mandibular complete dentures (Curtis *et al.*, 1992). Sadiq WM et al., observed that the Classes of RPDs vary between maxillary and mandibular arch. Class I and Class II (distal extension RPDs) were predominant in mandibular arch, while Classes III and IV were common in maxillary arch(Sadig and Idowu, 2002; Ajay *et al.*, 2017) .Prabhu N et al., noted that partial edentulism was more common in the mandibular arch compared to maxillary arch. This is due to the fact that mandibular teeth erupt earlier in the oral cavity which is prone for higher carries rate and higher chance of the tooth to get extracted(Prabhu *et al.*, 2009) .Abdel Rahman HK et al., observed that even though mandibular RPDs are more common than maxillary RPDs, the difference wasn't statistically different (Prabhu *et al.*, 2009; Abdel-Rahman, Tahir and Saleh, 2013) . Sapkota B et al., studied that partial edentulousness was common in maxillary arch compared to mandibular arch (Sapkota, Adhikari and Upadhaya, 2015).

The limitation of this study was that it was done on a small subset of population which might not be the representative of this study.Hence further research on a large sample should be done to know the exact prevalence of the desired topic.In my opinion age and gender are correlated to edentulism there might be many factors which can lead to edentulism and a study should be done to evaluate those factors too which lead to edentulism.there is lots of further scope in this study as the most common missing tooth can be found.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

In general, predominance of partial edentulism in the anterior teeth was in males and posterior teeth in females and also in the age group of 31-40 years.There was increased in the number of missing teeth as the age advances.Interestingly, results in few studies are contrasting. This may be due to fewer sample sizes of the study, poor oral hygiene status of that particular locality, etc. Further evaluation based on bigger sample size, multicentric studies with details on the oral hygiene status of locality would be helpful.

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