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Demographic Profile of Patients Undergoing Orthodontic Extractions- An Institution Based Cross Sectional Study

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Abstract

Background: Extraction in Orthodontics has always been a topic of debate and is one of the controversies in Orthodontics. There are numerous studies available regarding the frequency of Orthodontic extraction in clinics, but very less such institution borne studies have been reported. It is important to have demographic data on the prevalence of extraction. The present study was aimed to determine the epidemiological data regarding the prevalence of extraction in Orthodontic patients with respect to various demographic features. **Material & Methods:** This cross sectional study was done over a period of five months prospectively. Prevalence of Orthodontic extractions was obtained with regard to Gender, Age group, Education level. Various Orthodontic extraction patterns and overall extraction frequencies in relation to malocclusions was evaluated. Chi-square test was used to determine correlations between variables, Shaperio- Wilk W test and independent 't' test was used for comparison between two groups. **Results:** Majority of the patients reporting for Orthodontic Extraction were females (65.1%).. Most of the patients belonged to ≤19 age group, with higher secondary education level and belonging to urban area. The most commonly extracted tooth for Orthodontic treatment was premolar and the most common extraction pattern was all first premolars which was seen in Class I malocclusion. Females underwent more Orthodontic extractions. **Conclusion:** The data from this study is a dental tertiary institution borne data and reveals the frequency of Orthodontic patients indicated and reporting for extraction. The epidemiologic data from this study has given a comparison of extraction rates among gender, age, education level, residence and provides an insight about the most commonly extracted tooth and extraction pattern in orthodontic patients with various malocclusions. This study revealed a more trend towards all four premolar extraction. Prevalence of Orthodontic extraction was more among females (65.1%). The mean rate of extraction was found to be 4.14 with standard deviation of 1.04.

Keywords:- Demographic profile, Orthodontic extractions.

INTRODUCTION

Since the time of Edward Hartley Angle, who strictly followed non- extraction treatment, the decision to extract permanent teeth for orthodontic purposes has been a debatable topic for more than a hundred years.[1,2] One of the first orthodontists to indicate permanent tooth extractions to correct malocclusions was Charles Tweed and is considered as one of the

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first Orthodontists to indicate extraction of permanent teeth to resolve malocclusions and found only 20% of his clinical cases without extractions were successful.[3] Calvin case was a strong supporters of extraction at the time of Angle. According to him, extraction was necessary in 3% of cases that presented Class I malocclusion, in 5% of Class II cases and nearly 0% of Class III cases.[3]

The era between 1950 and 1960 saw approximately 50% of patients who underwent Orthodontic treatment with teeth extractions were usually first premolars.[4] In 1960, dental extractions reached their peak and thereafter began to decrease considerably.[1]

Accordingly, the overall extraction frequency is best summarized as being highest at 37.4% in 2000 and then trending downward over the decade to a relatively consistent level near 25% from 2006 onward.[5] These frequencies fall below the rates as reported by Janson in Brazil over a similar time period ending in 2007.[6] It is interesting to note that from 1953 to 1993, the frequency of four first premolar extractions was reported as the prime determinant of the very large changes seen in the overall extraction rate at UNC,[1] varying from as low as 10% to a peak of 50%. From 2000 to 2011, the rate of four first premolar extractions remained more consistent, showing a slight downward trend and ranging only from 8.9% to 16.5%.

There are many treatment options in Orthodontics to create space for solving tooth size-arch length discrepancy but extractions always remain in list of Orthodontic treatment plan for correcting facial appearance and achieving stable results. Tooth extraction allows the remaining teeth to be moved into perfect alignment. Although the tooth misalignment problem occurs within the anterior aesthetic zone. Being close to the problem area, the first premolar is the first choice for removal, compared with the second premolar.[7]

A study was done to see the effect of race on the likelihood of extraction and concluded that the need for extraction was four times more in African-American participants as compared to Caucasian. For those subjects belonging to primarily Asian, Hispanic, and Native American race the rate of extraction was three times greater.[8,9]

The Data derived from surveys of practicing Orthodontists have been shown to be subject to significant inaccuracies.[10] For this reason, data generated from institutions where a large number of patients are treated using a variety of treatment philosophies are preferred because they can provide more meaningful epidemiologic information.[9]

Therefore, purpose of this study was to determine prevalence of Orthodontic extraction performed in Exodontia department, in a Dental teaching institute and its correlation with the demographic profile of patients with regard to Age, sex, malocclusion classification, extraction pattern, urban and rural population, education levels. This study doesn't evaluate the basis of extraction decision and is purely based on quantitative data.

MATERIAL AND METHODS

The permission and protocol for the study were obtained from the Institution Ethics Committee Vide no:IECGDC/20/2022

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This cross sectional and prospective study was carried out in five months. Sample selection included the patients reporting for Orthodontic extraction to Exodontia, Department of Oral surgery. Sample inclusion criteria were as follows: Patients reporting for Orthodontic extraction of permanent teeth referred from within institution as well as outside patient referrals (hospitals, clinics). The exclusion criteria were Orthodontic Patients referred for Extraction of Decayed teeth, RCT treated teeth, Deciduous teeth, Supernumerary teeth, patients with missing molars. The frequency of extractions was evaluated with regard to sex, different extraction patterns, Education levels, patients belonging to Urban and rural areas. Only relevant data was included to exclude bias and non-probability sampling method was done.

Case sheets of patients reporting for Orthodontic extraction included in this study were documented in a specific format in Microsoft excel spread sheets [Image 1] which included the demographic details (Name, Age, sex, Education, Residence), dental relationship, Extraction pattern indicated. All these details were documented regularly by a resident doctor. Patient consent for study participation was taken. The name of the patient was assured to be kept confidential.

S.no	Patient Name	Sex	Age	Residence	Education	Molar relationship	Extraction pattern

Image 1: Format for Documenting the case sheet of Patients

Statistical analysis:

Various statistical analysis were performed. The data derived was quantitative in nature. Excel spread sheet were used to tabulate data. Descriptive statistics was done and percentage wise data was obtained. Summarized data was presented using Tables and Graphs. Data was normally distributed and tested using the Shaperio- Wilk W test (p-value was more than 0.05). Therefore, analysis was performed using the parametric test "independent t test" (for comparing two groups). Chi square test was used for categorical variables. Level of statistical significance was set at p-value less than 0.05. The statistical software SPSS 22.0 ver 3.2.2 was used for the analysis of the data.

RESULTS

Most of the patients belonged to ≤ 19 age group (64.2%) as compared to ≥20 years age group (35.8 %) . Percentage wise, female patients were outnumbering the male patients which infers that more females have willed for Orthodontic treatment, as 65.1% of females and 34.9 % males were part of this study.[Table 1& 2, Figure 1]. The rate of Orthodontic extraction was seen differently according to Gender, Malocclusion, Education levels.

Gender wise, 51.2% females presented with Angle's Class I malocclusion followed by 37.7 % Angle's Class II Div 1 malocclusion, 7.2% in Angle's Class II Div 2 and 2.9% in Angle's Class III [Table 3, Figure 2]

In Males, 51.4% presented with Angle's Class II Div 1 malocclusion followed by Angle's Class I (32.4%), Angle's Class II Div 2 (8.1%) and Angle's Class III malocclusion (8.1%) [Table 3 & Figure 2]

Patients belonging to Urban area (52.8%) were more as compared to rural area (47.1%). [Figure 3]

Noting the Education levels, most of the patients were higher secondary (42.5%)

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followed by secondary (34.9%) and Graduate (22.6%).

Table 1: Demographic Profile of patients reporting for Orthodontic Extraction.

Demographic profile		**Number (n) of Patients**	**Percentage of Patients (%)**
Age	≤ 19 years	68	64.2 %
	≥20 years	38	35.8 %
Gender	Male	37	65.1 %
	Female	69	34.9 %
Residence	Rural	50	47.1 %
	Urban	56	52.8 %
Education	Secondary	37	34.9 %
	Higher Secondary	45	42.5 %
	Graduate	24	22.6 %
Malocclusion	Class I	48	45.3 %
	Class II div 1	45	42.4 %
	Class II div 2	8	7.5 %
	Class III	5	4.7 %

Table 2: Mean age of patients based on Gender.

	N	**Mean**	**Std. Deviation**	**Minimum**	**Maximum**
Male	37	17.649	3.1817	12.0	26.0
Female	69	19.159	3.1605	14.0	27.0
Total	106	18.632	3.2347	12.0	27.0

Table 3: Percentage of orthodontic patients according to malocclusion, gender, residence.

		n	**%**	**n**	**%**	**p value**
	Gender	**Male**		**Female**		
MALOCCLUSION	Class I	12	32.4	36	52.2	0.209,
	Class II div 1	19	51.4	26	37.7	
	Class II div 2	3	8.1	5	7.2	
	Class III	3	8.1	2	2.9	
	Residence	Rural		Urban		
MALOCCLUSION	Class I	19	38	29	51.8	0.044*
	Class II div 1	23	46	22	39.3	
	Class II div 2	7	14	1	1.8	
	Class III	1	2	4	7.1	

P<0.05 is significant

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Table 4: Prevalence of Extraction pattern and Malocclusion in patients reporting for Orthodontic Extractions.

	Extraction Pattern		Mal occlusion				Total
			Class I	Class II div 1	Class II div 2	Class III	
1.	SINGLE UPPER "3"	N	1	1	0	0	1
		%	6.3%	2.2%	0.0%	0.0%	3.8%
2.	SINGLE UPPER "4"	N	2	1	0	0	3
		%	4.2%	2.2%	0.0%	0.0%	2.8%
3.	BOTH UPPER "4"	N	1	29	8	1	39
		%	2.1%	64.4%	100.0%	20.0%	36.8%
4.	BOTH LOWER "4"	N	0	0	0	1	1
		%	0.0%	0.0%	0.0%	20.0%	0.9%
5.	BOTH LOWER "5"	N	0	0	0	1	1
		%	0.0%	0.0%	0.0%	20.0%	0.9%
6	ALL "4"	N	39	7	0	1	47
		%	81.3%	15.6%	0.0%	20.0%	44.3%
7.	BOTH UPPER "4" + BOTH LOWER "5"	N	1	7	0	0	8
		%	2.1%	15.6%	0.0%	0.0%	7.5%
8.	SINGLE UPPER "4" + BOTH LOWER "5"	N	0	0	0	1	1
		%	0.0%	0.0%	0.0%	20.0%	0.9%
9.	UPPER "4" + LOWER "1"	N	1	0	0	0	1
		%	2.1%	0.0%	0.0%	0.0%	0.9%
10.	BOTH UPPER "5" + BOTH LOWER "5"	N	1	0	0	0	1
		%	2.1%	0.0%	0.0%	0.0%	0.9%
Total		N	48	45	8	5	106
		%	100.0%	100.0%	100.0%	100.0%	100.0%
P value			0.0001*, sig				

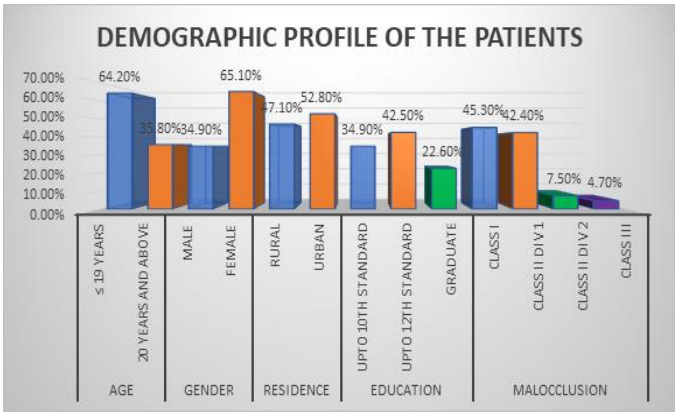

Figure 1: Distribution of patients reporting for Orthodontic Extraction

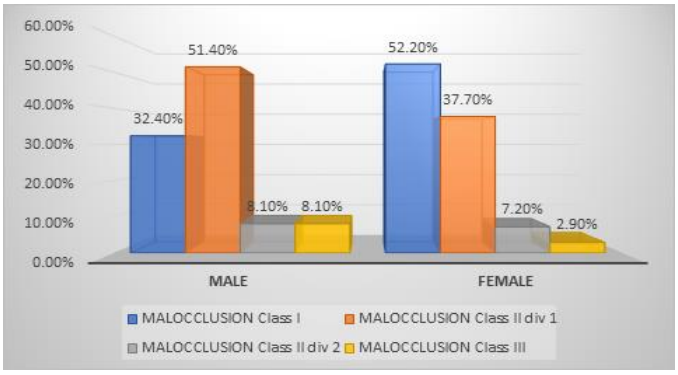

Figure 2: Distribution of patients reporting for Orthodontic extractions according to gender and malocclusion.

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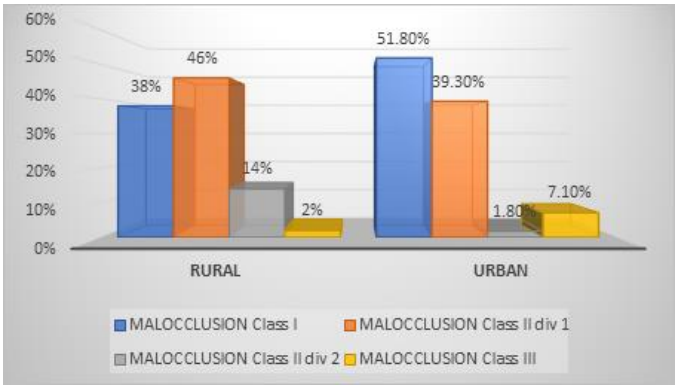

Figure 3: Distribution of patients reporting for Orthodontic extractions according to place of Residence and Malocclusion

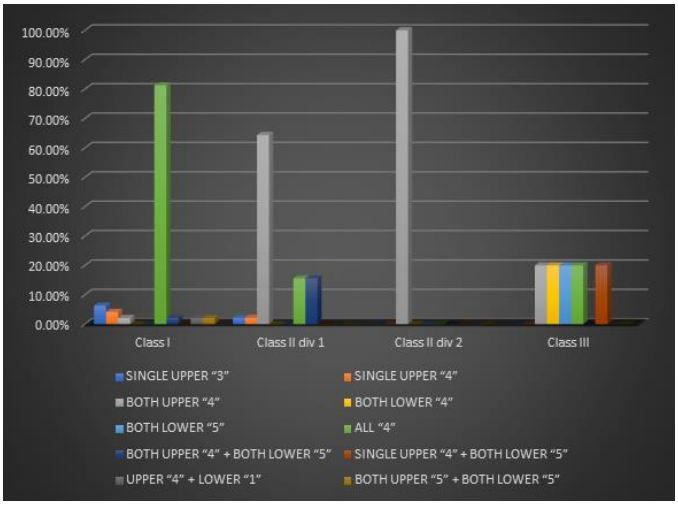

Figure 4: Frequency of various Extraction Patters in different Malocclusions

The prevalence of Orthodontic Extractions in various malocclusions were: Angle's Class I malocclusion was more prevalent (45.3%) followed by Angle's Class II Div 1 (42.4%) and Class II Div 2 (7.5%) and Class III (2.9%). [Table 4 & Figure 4]

The extraction of premolars was more prevalent in overall sample as compared to any other teeth [Figure 5]. The most prevalent pattern of extraction was all first four premolars (46 %), followed by upper premolar extraction (37%), upper four and lower five (8%) , single upper premolar extraction (3%) and (1%) others patterns. The mean number of extracted teeth was found to be 4.14 with standard deviation of 1.04. A total of 10 extraction patterns were seen.

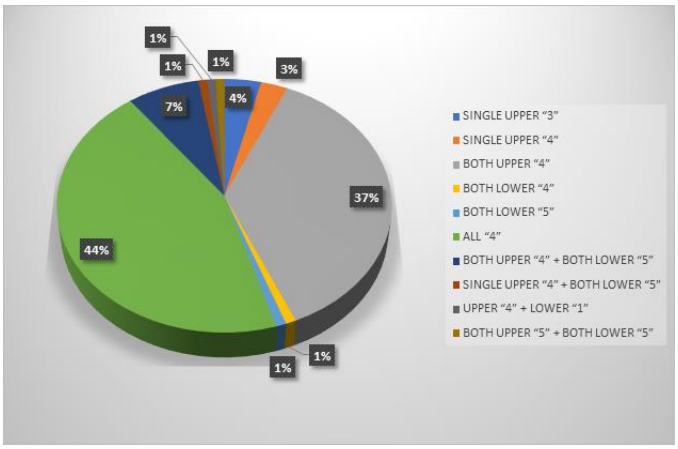

Figure 5: Overall prevalence of Orthodontic Extraction pattern in patients

DISCUSSION

The term 'adult' is taken to mean different age groups by different authors. According to Indian Majority act the age of majority is attained on completion of age of 18 years.[11] According to WHO, an adult is a person older than 19 years of age, an adolescent is a person aged 10 to 19 years.[12] Taking this information into account, our study included subjects which were divided into two age groups ≤19 and ≥20 below and above the adult age.

In our study most of the Orthodontic patients were in age group of ≤19 yrs (64.2%) which is in agreement with the results of study where it was reported that more patients pursued orthodontic treatment at 14 years of age,[9] as well as another study which concluded that

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maximum number of patients treated orthodontically was in the 16-20 year age group.[13]

In this study, the rate of Orthodontic extraction in females subjects (65.1 %) was higher as compared to males (34.9%), which infers more females were undergoing Orthodontic treatment which is in agreement with the study of Peck and Peck's study who also observed a higher frequency of extractions in female patients (44%),[14] while only 39% of male patients were treated with extractions and also other study who also noted extraction rates in females at 58.3% and males at 41.7%.[9] Contrary to various studies, who reported higher frequency of extractions in male patients (48%), while in female patients extractions were performed in 44% of cases as well as other two studies done by Portuguese researchers.[15,16]

In our study, first premolars were the most commonly extracted teeth which is in alignment with the other studies as well.[11,17,18,19,20,21,22] which may be due to location of these teeth close to the area of problem in the dental arch, which helps in the correction of midline deviations and space problems in the incisor region.[18]

Patients with Class I malocclusion presented the highest frequency of extraction (46%) which is in agreement with the Moreira's study,[20] where the Class I patients had the greatest frequency of treatment with extractions (68.6%) and is contrary to the findings of Camila de S,[23] study where Class I presented with the lowest number of Extractions. While as a Jackson TH,[9] et al reported the increase in extraction rate for Class II skeletal or dental relationship as compared to Class I participants.

A study reported that extractions were hardly ever indicated in cases of Class III malocclusion whereas in the present study also very less percentage of subjects 4.70% were indicated for extraction contrary to the findings of study where Class III patients reporting for extraction were 47% of cases.[9,23] In our study only 20% of the maxillary Ist premolars were indicated for extraction in class III, contrary to the study [12] where they had 31.3% cases of Ist premolar extractions in class III cases.

In the present study the subjects reporting for Orthodontic extractions belonging to Urban areas (52.8%) were more as compared to Rural areas (47.1%) which is in agreement with the study,[24,25,26] which concluded that information about the oral health knowledge, attitudes, and behaviour among Indian population is still very limited, especially for rural people, who constitute more than 70% of the population.

Only one case of lower central incisor extraction in a class I case was seen in the present study. This tooth is usually extracted in case of skeletal class III discrepancy to compensate for dental discrepancy, this trend was common in 1950's but now this trend is decreasing or negligible due to esthetic concerns caused by deviation in lower dental mid line caused due to such extraction.

The extraction of Second molar were indicated in UNC (University of North Carolina) sample but no such trend of any molar extraction was seen in the present study. The current study showed more trend towards premolar extraction which is in very much higher frequency being extracted for orthodontic reasons. Maximum number of teeth were extracted in Class I malocclusion and the mean

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number of extracted teeth was found to be 4.14 with standard deviation of 1.04. A total of 10 extraction patterns were noted in the present study.

CONCLUSIONS

- The most frequent extraction pattern was upper and lower first premolars followed by extraction of maxillary first premolars.
- Greatest number of extractions were reported in Class I followed Class II Div 1 malocclusion and Class III the lowest number of extractions.
- Greater number of extractions were observed in Females as compared to males.
- Such demographic data is the first of its kind in the region and can be used in oral health planning
- Such clinical epidemiological researches add to the eidemiological data for revealing the trend and rate of Orthodontic extractions

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