Distribution of Third Molar Impactions Among Rural and Urban Dwellers in the Age Group of 22–30 years in South India: A Comparative Study

K. Venu Gopal Reddy

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Abstract

Objectives (1) To collect the data related to distribution of third molar impactions among rural population by clinical and radiological examinations. (2) To collect the information on distribution of third molar impactions among urban population by clinical and radiological examinations. (3) To compare the patterns of distribution of third molar impactions among rural and urban residents with respect to type of impaction, arch, gender and age.

Method A cross-sectional study was conducted in Dharwad district of Karnataka state located in South India involving 630 rural and 270 urban subjects as per demographic profile of India. A two stage sampling procedure was adopted in the selection of the sample.

Statistical Analysis Data was analyzed using STATISTICA-6.0. χ^2 test was used to explore the association between different variables and third molar impactions. A $P \leq 0.05$ was considered statistically significant.

Results 14.92% of rural subjects and 27.40% urban subjects were reported to be suffering from third molar impactions.

Conclusions The overall prevalence of third molar impactions among the study subjects was found to be 18.67%. A significant association was noticed between the 'different arches' and distribution of third molar impactions in both rural and urban population. Subjects with vertical impactions were found to be most common in both the groups.

Keywords Third molar impaction · Cross-sectional study · Demographic profile · Rural · Urban · Vertical impaction

Introduction

Modern man is the result of a long experiment by nature known as evolution. This evolutionary process along with other anatomical changes had contributed to significant changes in the orofacial structures. Premaxilla became fused to maxilla and mandible became slender and light with a distinct chin. The alveolar arches become parabolic with relatively less/absence of spacing between the teeth due to increased reliance on manufactured tools, and acquisition of fire for cooking [1]. The lack of spacing between the teeth along with the tendency of third molars to erupt late in the chronology of human dentition explains the fact that the third molars are the most frequently 'Impacted teeth'. Impacted third molars are considered as the developmental, pathological medical deformities characteristic of a modern civilization. Third molar impaction is becoming a major oral health problem in modern India. It is ranking next to that of dental caries and periodontal disease in its occurrence. The condition in its most severe state prevents an individual from carrying out his routine activities and thus gaining public health importance.

The recent surveys have reported that the third molar impaction has been documented in countries with high standard of living with a prevalence ranging from 9.5 to 25% [2]. In India, the documented studies on third molar impactions are few and were done on urban communities where only a minority of Indian population resides [3]. There were no well-documented studies on third molar impactions among the rural communities where majority of the Indian population resides with very poor access to

K. Venu Gopal Reddy (✉)
Department of Public health dentistry, People's college of dental sciences & Research centre, Karond-Bhanpur by pass road, Bhopal 462037, Madhya Pradesh, India
e-mail: venureddy2@in.com; venureddy2@sify.com

dental care and thus leading to an insufficient data. So the present study was undertaken with an aim to determine the distribution of third molar impactions among rural and urban dwellers of South India and to compare the impaction patterns among both the communities with respect to type of impaction, arch, gender and age so that the data can be utilized by the policy makers or the decision makers to implement appropriate measures.

Method

The present study was conducted in rural and urban areas of Dharwad district of Karnataka state which is located in South India. Dharwad district comprised of 396 rural areas and seven urban areas [4]. The study subjects were adult population of Dharwad District (rural and urban) in the age limit between 22 and 30 years and the selection of age group was based on the chronological table of human dentition given by Logan and Kronfeld [5]. The ethical clearance was obtained from the institutional ethics committee. As there was no information from the district statistics office about the population in the age group of 22–30 years, a pilot study was conducted to determine the prevalence of third molar impactions and to get acquainted with the study. A Prevalence rate of 22% was obtained. Then a sample of '872' subjects were derived by subsisting the values in the following formula.

$$n = \frac{Z^2 PQ}{e^2}$$

where, n is the desired sample size, Z is the standard normal variate at a given confidence level ($= 1.96$) at 5% level of significance (or) 95% confidence level, P is the sample proportion i.e. 0.22, Q is the alternate proportion ($1-P$) i.e. 0.88, e acceptable error (the precision) i.e. 2.75.

For statistical ease, the final sample size was adjusted to '900'. From a total sample of 900, rural and urban samples were calculated as per demographic profile of India characterized by 70% of rural population and 30% of urban population [6]. Thus, 630 (70% of 900) rural subjects and 270 (30% of 900) urban subjects were included in the final study. A two stage sampling procedure was followed [7]. The information on the total number of rural (396) and urban (7) areas in Dharwad district was collected from the District statistics office. All these rural and urban areas were listed out and out of which 21 rural and five urban areas were selected randomly in the first stage. In the second stage, a systematic sample of 630 rural subjects aged between 22 and 30 years living in the selected house holds (30 house holds in each rural stratification) and 270 urban subjects

of the same age living in the selected households (54 households in each urban stratification) were included in the study. In the absence of selected households, individuals of age between 22 and 30 years from an adjacent household were considered for the study. Since a single examiner carried out the examination, intra-examiner calibration was performed [8]. 95% reproducibility of the recorded scores was found in all the subjects. (κ statistic was 0.92). The clinical examinations were carried out after obtaining a written permission from concerned authorities in both rural and urban areas. Visits to different areas for data gathering were scheduled accordingly. The oral examination was carried out by single trained and calibrated examiner with recording assistant in the houses of the study subjects. Prior to clinical and radiological examination, written informed consent was obtained from study subjects. Examinations were conducted under the artificial light and some times in open areas (in front of the house) under the natural day light. All the instruments used for oral examination were autoclaved before proceeding for the study. The information was entered in the pre-designed proforma. The subjects were made to sit in a chair in upright position. The examiner stood on the right side, slightly in front of the patient during examination. The person recording the data was positioned to be seated on the left side of the patient close to the examiner, so that the data recorder was able to hear the examiner and also the examiner was able to see the data being entered correctly. The oral examination was performed to assess the status of only third molars i.e. to look out for their presence (or) absence in the oral cavity (without the history of extractions). For confirming their absence clinically, palpation was done. Third molars which were partially visible and failing to reach the occlusal plane were recorded as partially erupted. A third molar was diagnosed as impacted, when it could not undergo full eruption beyond the chronological age of tooth eruption due to an obstruction in its path. After examination, the subjects with clinically absent/partially erupted third molars were educated regarding third molar impactions and their consequences with the help of display charts and radiographs (IOPA and OPG). Once convinced, the subjects were advised to undergo radiological investigations, preferably on the same day at the dental college. The IOPA/OPG radiographs of the third molars of the study subjects were analyzed further for the type of impaction. George Winter's (1926) classification [9] was used to assess the position of impacted third molar with the long axis of the completely erupted adjacent second molar. Appointments were arranged in the Department of Oral and Maxillofacial Surgery of the institution for those study subjects, who were willing to undergo treatment.

Statistical Analysis

The collected data was analyzed using STATISTICA-6.0. Association between independent variables and the third molar impactions were tested using χ^2 test [10]. $P \leq 0.05$ was considered as statistically significant.

Results

In the present study, 630 rural and 270 urban subjects were clinically examined. Then the subjects having partially/unerupted (in the absence of history of extraction) third molars were sent for radiological examination. The magnitude of various types of impactions in both the communities is presented in Table 1. Vertical impactions were found to be the most common among both the rural and urban communities. χ^2 test when applied to know the difference between rural, urban areas with respect to the distribution and type of third molar impactions, it was found to be non-significant ($P > 0.05$). The arch wise distribution of third molar impactions among rural as well as urban subjects had shown a greater predilection towards mandible and can be illustrated in Table 2. The χ^2 analysis has shown a significant difference with respect to the jaws in both rural and urban population ($P < 0.05$). The gender wise distribution of third molar impactions has revealed different results in both rural and urban population and can be represented by Table 3. The χ^2 analysis revealed a non-significant association in rural subjects whereas a significant association in urban subjects. The distribution of study subjects having third molar impactions with respect to the age as shown in Table 4 has revealed that both rural and urban subjects of 25 years age suffered more third molar impactions than other ages. But the χ^2 analysis has proved a non-significant association between both the groups.

Table 1 Impaction status of third molars among study population after radiological examination

SI. No	Impaction status of third molars	Rural	Urban
1	Mesioangular	30 (4.77)	19 (7.03)
2	Distoangular	11 (1.75)	12 (4.45)
3	Vertical	33 (5.23)	23 (8.51)
4	Horizontal	15 (2.38)	15 (5.56)
5	Unusual	05 (0.79)	05 (1.85)
Total		94 (14.92)	74 (27.40)
		$P > 0.05$ (non significant)	

Figures in parenthesis are percentages

Table 2 Arch wise distribution of third molar impactions among study Population

SI. No	Type of impaction	Rural		Urban	
		Maxilla	Mandible	Maxilla	Mandible
1	Mesioangular	07 (1.12)	23 (3.65)	02 (0.74)	18 (6.67)
2	Distoangular	05 (0.80)	06 (0.95)	02 (0.74)	10 (3.70)
3	Vertical	17 (2.70)	16 (2.54)	17 (6.30)	06 (2.22)
4	Horizontal	–	15 (2.38)	01 (0.37)	13 (4.81)
5	Unusual	–	05 (0.79)	05 (1.85)	–
Total		29 (4.63)	65 (10.31)	27 (10.00)	47 (17.40)
		$P < 0.05$ (significant)		$P < 0.05$ (significant)	

Figures in parenthesis are percentages

Table 3 Gender wise distribution of third molar impactions among study subjects

SI. No	Type of impaction	Rural		Urban	
		Males	Females	Males	Females
1	Mesioangular	20 (3.18)	10 (1.58)	13 (4.81)	06 (2.22)
2	Distoangular	05 (0.79)	6 (0.95)	7 (2.60)	05 (1.85)
3	Vertical	22 (3.50)	11 (1.74)	17 (6.29)	06 (2.22)
4	Horizontal	10 (1.59)	5 (0.79)	10 (3.70)	05 (1.85)
5	Unusual	5 (0.79)	–	–	05 (1.85)
Total		62 (9.85)	32 (5.07)	47 (17.40)	27 (10.00)
		$P > 0.05$, Non-significant		$P < 0.05$, Significant	

Figures in parenthesis are percentages

Table 4 Age wise distribution of third molar impactions among study subjects

SI. No	Age (in years)	Rural subjects with impactions	Urban subjects with impactions
1	22	10 (1.58)	17 (6.29)
2	23	11 (1.74)	14 (5.18)
3	24	17 (2.69)	13 (4.81)
4	25	19 (3.01)	15 (5.55)
5	26	15 (2.38)	6 (2.22)
6	27	6 (0.95)	3 (1.11)
7	28	7 (1.11)	3 (1.11)
8	29	5 (0.79)	2 (0.74)
9	30	4 (0.63)	1 (0.37)
Total		94 (14.92)	74 (27.40)
		$P > 0.05$, Non-significant	

Figures in parenthesis are percentages

Discussion

The total number of subjects included in the present study were 900, comprising of 630 rural and 270 urban subjects.

The unequal distribution of the study subjects was as per demographic profile of India [6] i.e., 70:30. The subjects of the age above 21 years were preferred keeping in view the chronology of eruption of third molars [5] i.e., 17–21 years. At the same time, there was a need to compensate for the huge sample size of 900. Therefore, a sampling frame with a large age interval (22–30 years) was selected. On clinical examination of the study subjects, it was found that the proportion of partially erupted (or) unerupted third molars were considerably high in the mandible when compared with the maxilla in both the groups. This can be attributed to the variations in the mesio-distal diameter of the maxillary and mandibular permanent posterior dentition (mandibular > maxillary) contributing for inadequate space for the late erupting mandibular third molars resulting in a greater chance for being impacted [5]. The radiological investigation had revealed vertical impaction to be the most common of all types among rural and urban subjects. This finding is in agreement with that of Olosoji and Odusanya [2] who noticed vertical impaction to be most frequent from their study. The present study findings are also in agreement with those of Schersten et al. [11] (Swedish dental students), Haider and Sulliman [12] (Saudi community), Rajdan [3] (Indian population) who from their studies reported vertical impaction to be most common in its occurrence among various groups of population. But the findings from the study of Tudri [13] (Thai community) were showing mesioangular impaction to be the most common in its occurrence and thus, are not in agreement with the present study findings. This can be attributed to racial variations. The arch wise distribution of third molar impactions among study subjects had shown a predilection towards mandible than to maxilla ($P < 0.05$) among both rural and urban subjects. This can be probably due to compactness of the mandibular bone and variations in the mesio-distal diameter of the maxillary and mandibular permanent posterior dentition (mandibular > maxillary) contributing for inadequate space for the late erupting mandibular third molars [5]. These findings are coinciding with those of Olosoji and Odusanya [2] (Nigerian population), Muthe, Kedar and Nanavati [14] (Indian population), Chu et al. [15] (Hong Kong Chinese population), Quek et al. [16] (Singapore Chinese population), Saglam and Tuzum [17] (Turkish population), But the present study findings are not coinciding with those of Dachi and Howell [18] who reported that third molar impactions were more frequent in maxilla compared to mandible. In the present study, the distribution of third molar impactions were comparatively more in the males than in females in both rural and urban subjects. These observations are not in favour of Hellman's [19] theory which says that the jaws of the females stop growing when the third molars just begin

to erupt, whereas in males the growth of the jaws continues beyond the time of eruption of the third molars resulting in decreased incidence of third molar impactions in males compared to females. The 'Age wise' distribution of third molar impactions in the present study were pointing towards younger age groups with majority (70%) of them being noticed among the subjects of 22–25 years. The present study findings are in agreement with those of Olosoji and Odusanya [2]. There are established facts about role of diet in the incidence of third molar impactions. The type of diet might hasten or retard the growth of the jaws by influencing the masticatory muscles. Further studies are recommended by including diet as one of the variables.

Conclusions

The prevalence of third molar impactions among the study subjects was found to be 18.67%. There were 14.92% of the rural and 27.4% of the urban subjects with third molar impactions. Vertical type of impaction was the most common in its occurrence among both the groups. Third molar impactions were noticed more in the mandible than in the maxilla in both the groups and the difference was statistically significant. There was significant 'gender' wise difference among urban subjects but not among rural subjects. A non significant association was noticed between both the groups in respect of age.

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