

Jordan Journal of Dentistry

www.jjd.just.edu.jo

Age and Gender Comparisons of Patient-related Factors and Clinical Characteristics of Surgically Removed Mandibular Third Molars among a Cohort of Sri Lankan Patients

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ARTICLE INFO

Article History:

Received: 25/10/2024

Accepted: 8/12/2024

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ABSTRACT

Objectives: The aim of this study was to compare selected patient-related factors and clinical characteristics of surgically removed mandibular third molars among a cohort of Sri Lankan patients. We hypothesized that age and gender of patients could be significantly associated with their medical conditions, life-style-related risk habits and clinical characteristics of surgically removed mandibular third molars.

Materials and Methods: A descriptive cross-sectional study was conducted with a sample of 715 patients who underwent mandibular third molar surgeries at the Department of Oral and Maxillofacial Surgery, Faculty of Dental Sciences, University of Peradeniya, Sri Lanka. Frequency distributions were presented as descriptive statistics with group comparisons made using chi-square and Fisher's exact test of statistical significance.

Results: There was a significant female preponderance, especially aged ≤ 40 years, among patients who underwent surgical removal of mandibular third molars, of whom 81.1% were impacted. Medical conditions were dominated by hypertension. Smoking was the most prevalent risk habit. These risk habits were significantly higher among patients aged >40 years compared to their younger counterparts ($p=0.001$). Moreover, beyond 40 years, patients had significantly higher vertical angulation according to Winter's classification ($p=0.002$), non-impacted status and Class-1 ramus classification by Pell & Gregory Classification ($p=0.001$) compared to the younger cohort.

Conclusions: There was a significant association between age, gender and life-style-related risk habits, impaction status, angulation and ramus relationship. Therefore, patient-related factors could be useful in ensuring optimal treatment outcomes in surgical removal of mandibular third molars. Studies conducted in other countries would be able to generate more conclusive evidence in this regard.

Keywords: Third-molar extraction, Impacted third molar, Mandibular third molar, Surgical removal of third molar.

1. Introduction

The mandibular third molar is the most commonly impacted tooth (1). Approximately 70% of modern humans suffer from impaction or agenesis of third molars. This is attributed to the evolving character of

humans, highlighting the relevance of evolutionary medicine (2). The global prevalence of impaction was estimated to be 24.40% (95%CI: 18.97%-30.80%), ranging from 3.08% to 68.60% (3). Moreover, sub-group analyses revealed that mandibular impaction was

57.58% more likely than maxillary impaction without gender predilection. Of angulation types, mesioangular impaction was the most common (3).

Impacted mandibular third molars (M3) are often associated with recurrent pericoronitis, dental caries and root resorption of adjacent teeth justifying their surgical removal (4). M3 surgeries could result in several post-operative complications, including sensory nerve damage, pain, swelling, infection and hemorrhage (5). Therefore, in addition to surgical techniques of clinicians and the severity of the impaction, patient-related factors, such as age, gender, general health status and life-style-related risk habits of patients, must be explored to improve treatment outcomes.

Life-style-related risk habits, such as smoking, betel quid chewing and the presence of medical comorbidities like diabetes mellitus and hypertension in patients undergoing M3 surgeries, impact their post-operative complications and treatment outcomes (6, 7). Moreover, gender could influence levels of dental anxiety of patients undergoing M3 surgeries, exaggerating post-operative complications (8). There is a notion that painful M3 are mostly a problem of late adolescence and early adulthood (4). In contrast, they can become symptomatic in older cohorts of patients.

Sri Lanka possesses a unique public healthcare delivery model providing services free of charge at the point of service delivery (8). Accordingly, there is an island wide network of 44 Oral and Maxillofacial Surgery (OMFS) units in public hospitals complemented by the private sector. Consequently, there is discernible local research conducted on surgical removal of mandibular third molars. Several studies explored the risk of nerve damage following M3 surgery in a Sri Lankan context (10, 11). In addition, innovative surgical flap closure techniques and the importance of psychological support during recovery from lingual nerve injury have been reported from Sri Lanka (12, 13). Furthermore, there is voluminous global research output on varying perspectives of impacted mandibular third molars, such as post-operative complications (5) and surgical difficulties (14).

Nevertheless, there is a comparatively lesser volume of research regarding the patient-related factors of M3 (15-17). The geographic regions and population groups could have epidemiological and clinical implications. Supporting this notion, subtle differences in impaction frequency depending on geographic region have been

reported (2). Given the dilemmas surrounding M3-treatment policy, understanding demographic and morphological differences in impaction rates becomes fundamental for evaluating appropriate treatment protocols (2). Moreover, paucity of randomized clinical trials representing general populations having M3 surgeries comprising of wider age groups, having medical co-morbidities, active infections and deep impactions have hampered making evidence-based recommendations on the best surgical techniques of M3 removal as highlighted by the recent Cochrane review (18). Therefore, cross-sectional descriptive studies provide the baseline epidemiological information to plan clinical trials comparing M3 surgeries and their outcomes. Against this backdrop, we aim to compare selected patient-related factors and clinical characteristics of surgically removed mandibular third molars among a cohort of Sri Lankan patients.

2. Materials and Methods

A descriptive cross-sectional study was conducted on patients who underwent M3 surgeries at the Department of Oral and Maxillofacial Surgery, Faculty of Dental Sciences, University of Peradeniya, Sri Lanka. The data collection period including patient follow-up, lasted two years from 20/05/2016 to 01/05/2018. The sample size was calculated using the formula estimating a single proportion with a requirement for 95% CI and 5% SE with estimated prevalence of any post-operative complication as 50% in the absence of previous studies in this regard in Sri Lankan context. The calculated minimum sample size of 384 was adjusted for 10% non-response as 438. However, the final sample was 715. Informed consent was obtained from the participants before inclusion in the study. The inclusion criteria were patients undergoing M3 surgeries under local anesthesia and willingness to participate in the study. Patients undergoing M3 surgeries under general anesthesia were excluded from the sample.

The data was collected using a pre-tested, validated questionnaire. The first part of the questionnaire comprised of socio-demographic information (age and gender), dental history, and complaints self-administrated prior to the surgery. The second part of the questionnaire was filled by trained data collectors before and after the surgery by extracting data from clinical records and radiological investigations.

The parameters recorded included type of impaction,

ramus relationship by Pell & Gregory Classification, Angulation by Winter's Classification, root morphology and details of surgery, such as bone removal, sectioning of roots and post-operative complications. Ethical accreditation for the study was obtained from the Ethical Review Committee, Faculty of Dental Sciences, University of Peradeniya, Sri Lanka. Any complications, if encountered, were reviewed in the Department of Oral and Maxillofacial Surgery. Data collection was carried out by dental surgeons attached to the Department and trained by the principal investigator. The data was entered and analyzed by Statistical Package for Social Sciences (SPSS) for Windows software, version 21.0 (SPSS Inc., Chicago). Frequency distributions are presented as descriptive statistics. Group comparisons are made using chi-square and Fisher's exact test of statistical significance.

3. Results

The response rate was as high as 98%. Table 1 demonstrates the socio-demographic profile and life-

style-related risk habits of the patients who underwent impacted mandibular third molar surgery. Of the total participants, 269 (37.6%) were males and 446 (62.4%) were females. Based on the age distribution, a little over a half, 367 (51.3%), of the participants were aged 21-30 years. About a third of the participants, 227 (31.7%), were in the age group of 31-40 years. These characteristics demonstrate a wide age distribution among the participants. Of 433 females, 13 (3.0%) were pregnant.

The distribution of the participants based on the dental profile has been illustrated in Table 2. 421 (58.9%) of individuals had a history of past dental extraction. Of those who underwent extraction, 386 (54.0%) had impactions on the left side and 329 (46.0%) on the right side. With regard to the type of infection related to the impacted third molar, more than a half of the individuals, 403 (56.4%), reported more than one non-recurrent episode. 509 (71.3%) of the impacted teeth were fully visible with partial bony or soft-tissue coverage (296 (41.6%) and 252 (35.4%)), respectively.

Table 1: Distribution of patients by socio-demographic profile and life-style-related habits

Socio-demographic profile	Number	%
Age distribution		
10-20 years	25	3.5
21-30 years	367	51.3
31-40 years	227	31.7
41-50 years	64	9.0
51-60 years	29	4.1
> 60 years	3	0.4
Gender		
Male	269	37.6
Female*	446	62.4
Life-style-related risk habits		
Not having any habit	608	85.0
Smoking	57	8.0
Alcohol consumption	25	3.5
Betel chewing	24	3.4

* Pregnant females: n=13 (3%).

Table 2: Distribution of patients by dental profile

Dental profile	Number	%
Past-dental extractions		
No	294	41.1
Yes	421	58.9
Total	715	100.0
Type of infection related to impacted third molar		
Severe single episode	61	8.5
Recurrent episodes	251	35.1
More than one, but not recurrent	403	56.4
Total	715	100.0
Side of impaction		
Right	329	46.0
Left	386	54.0
Total	715	100.0
Visibility		
Fully visible	509	71.3
Partially visible	162	22.7
Not visible	43	6.0
Total	714*	100.0
Type of impaction		
Not impacted	135	18.9
Soft-tissue impaction	252	35.4
Partial bony impaction	296	41.6
Full bony impaction	29	4.1
Total	712*	100.0

* Total <715 due to incomplete data.

Table 3 presents the distribution of the participants by complaint, medical condition and radiological profile of impaction. The leading presenting complaint, 339 (47.4%), was pain due to dental caries of lower third molar. A range of other complaints were also recorded. An overwhelming majority of participants, 635 (88.8%), were without any significant medical condition. 30 (4.2%) and 28 (3.9%) were with hypertension and allergies, respectively. The most common type of angulation noted was the vertical type, 232 (32.7%), followed by mesioangular and horizontal angulation of the impacted third molars. 427 (60.2%) and 448 (63.0%) of the participants had an impaction depth of Level A and the ramus relationship of Class I, respectively, based on the Pell and Gregory Classification.

Table 4 illustrates the age-group comparison of

patients who underwent mandibular third molar surgeries by selected personal and clinical variables. Accordingly, a significantly higher portion of females, especially aged ≤ 40 years, dominated in the sample compared to male counterparts ($p=0.044$). Moreover, medical conditions were dominated by hypertension, life-style-related risk habits were dominated by smoking being significantly higher among patients aged >40 years compared to their younger counterparts ($p=0.001$). However, risk habits were reported among younger patients as well. Moreover, the older group had significantly higher mandibular third molars Classified as vertical by Winter's Classification of angulation ($p=0.002$), non-impacted teeth and Class-1 ramus classification by Pell & Gregory Classification ($p=0.001$) compared to the younger cohort.

Table 3: Distribution of patients by presenting complain, medical condition, and radiological profile of impaction

Attribute	Number	%
Presenting complain		
Pain due to dental caries of lower third molar	339	47.4
Dental caries in lower second molar	39	5.5
Periodontal disease in lower third molar	10	1.4
Halitosis	3	0.4
Food packing	19	2.7
Not coming out	10	1.4
Ulceration	2	0.3
Trismus	1	0.1
Referred by a doctor	16	2.2
Recent episode of infection	276	38.6
Total	715	100.0
Medical condition		
Nothing significant	635	88.8
Allergies	28	3.9
Diabetes mellitus	8	1.1
Hypertension	30	4.2
Other	14	2.0
Total	715	100.0
Radiological profile of impaction		
Angulation (Winter's Classification)		
Mesioangular	188	26.5
Distoangular	92	13.0
Vertical	232	32.7
Horizontal	162	22.8
Buccolingual	10	1.4
Linguoangular	25	3.5
Inverted	01	0.1
Total	710*	100.0
Impaction depth (Pell & Gregory Classification)		
Level A	427	60.2
Level B	250	35.3
Level C	32	4.5
Total	711*	100.0
Ramus relationship (Pell & Gregory Classification)		
Class I	448	63.0
Class II	247	34.7
Class III	16	2.3
Total	711*	100.0

* Total <715 due to incomplete data.

Table 5 demonstrates the gender comparison of selected variables among the sample. Despite some females reporting life-style-related risk habits, such as betel quid; chewing, alcohol use, and smoking, males reported significantly higher practice of those habits ($p=0.001$). Furthermore, distoangular impactions were significantly more common among females than among males, whilst horizontal impactions depicted the opposite scenario ($p=0.001$). However, there were no significant differences in medical condition, impaction

depth and ramus relationship by Pell & Gregory Classification due to gender ($p>0.05$).

4. Discussion

Findings of the present study shed light on new insights into lesser explored dimensions of socio-demographic perspectives of surgical removal of mandibular third molars, as applied to Sri Lankan context. Hence, it is important to compare our findings with the global context. Accordingly, Kalai Selvan et al.'s

sample from Tamil Nadu, India consisted of patients', radiographs between the ages of 18 and 40 years with a mean age of 30.5 years (19). In the Finnish study conducted by Kautto et al., the mean age of patients undergoing third molar removal (both mandibular and maxillary) was slightly higher at 36.4 years, with the

highest prevalence (34%) in (20-29)-year age group, similar to the trend seen in our data (20). Interestingly, in their sample, 4% consisted of the (70-99)-year age group, affirming that painful wisdom tooth was not solely a problem of the young cohort (20).

Table 4: Age group comparison of patients by selected variables of mandibular third molar extractions

Variable	Age group				P-value
	≤ 40 years		> 40 years		
	N	%	N	%	
Gender					
Male	224	36.2	45	46.9	0.044
Female	395	63.8	5	53.1	
Medical condition					
Nothing significant	571	92.2	64	66.7	0.001
Allergies	23	3.7	5	5.2	
Diabetes mellitus	3	0.5	5	5.2	
Hypertension	13	2.1	14	14.7	
Other	9	1.5	5	5.2	
Life-style-related risk habits					
No habits	539	87.1	69	71.9	0.001
Smoking	45	7.3	12	12.5	
Alcohol consumption	16	2.9	7	7.3	
Betel chewing	18	2.6	8	8.3	
Other habits	01	0.1	0	0.0	
Type of impaction					
Not impacted	96	15.6	39	40.6	0.001
Soft tissue impaction	236	38.3	16	16.7	
Partial bony impaction	257	41.7	39	40.6	
Full bony impaction	27	4.4	2	2.1	
Impaction Depth (Pell & Gregory Classification)					
Level A	366	59.7	61	63.5	0.477
Level B	217	35.4	33	34.4	
Level C	30	4.9	2	2.1	
Ramus relationship					
Class I	373	60.7	75	78.2	0.001
Class II	227	36.9	20	20.8	
Class III	15	2.4	1	1.0	
Angulation (Winter's Classification)					
Mesioangular	164	26.7	24	25.0	0.002
Distoangular	87	14.2	5	5.2	
Vertical	184	30.0	48	50.0	
Horizontal	148	24.1	14	14.6	
Buccoangular	9	1.5	1	1.0	
Lingoangular	21	3.4	4	4.2	
Inverted	1	0.2	0	0.0	

* Total <715 due to incomplete data.

Female predisposition could be attributed to high utilization of dental services as was also seen in a study conducted by Jayasuriya et al. in the student oral surgery clinic of the same dental faculty (21). They suggested that these findings were because these patients received

high school education, but were unemployed. This could be due to the free education policy in Sri Lanka leading to a high literacy rate and free of charge or less expensive dental treatment provided, motivating female patients who were unemployed to seek dental care (21).

Kautto et al. reported an approximately even distribution of their sample among both genders (20). In contrast to our sample, Kalai Selvan et al, showed that significantly more males suffered an impacted mandibular third molar than females (19). The higher percentage of females (68%) indicates that clinicians may expect and be prepared to manage the rare complication of intermenstrual bleeding following wisdom tooth surgery. Jayasuriya et al. in a case report in this regard

noticed that female patients complained of intermenstrual bleeding for a duration of 4-5 days (22). This could be attributed to the use of corticosteroids post-operatively. In our study, it was found that pregnancy predisposed pericoronitis and problems with impacted third molars among young females. Food cravings, acidic environment and dental neglect may lead to wisdom teeth being badly broken down.

Table 5: Gender comparison of patients by selected variables of mandibular third molar extractions

Variable	Gender				P-value
	Male		Female		
	N	%	N	%	
Medical condition					
Nothing significant	244	90.7	391	87.7	
Allergies	8	3.0	20	4.5	
Diabetes mellitus	5	1.9	3	0.7	
Hypertension	9	3.3	21	4.7	
Other	3	1.1	11	1.6	0.257
Life-style-related risk habits					
No habits	187	69.5	421	94.4	
Smoking	45	16.7	12	2.7	
Alcohol consumption	23	8.6	2	0.5	
Betel chewing	14	5.2	10	2.2	
Other habits	0	0.0	1	0.2	0.0001
Type of impaction					
Not impacted	50	18.6	85	19.2	
Soft tissue impaction	93	34.7	159	35.8	
Partial bony impaction	113	42.2	183	41.2	
Full bony impaction	12	4.5	17	3.8	0.980
Impaction Depth (Pell & Gregory Classification)					
Level A	154	57.7	273	61.8	
Level B	101	37.8	149	33.7	
Level C	12	4.5	20	4.5	0.554
Ramus relationship					
Class I	166	62.2	282	63.5	
Class II	91	34.1	156	35.1	
Class III	10	3.7	6	1.4	0.127
Angulation (Winter's Classification)					
Mesioangular	79	29.6	109	24.6	
Distoangular	16	6.0	76	17.2	
Vertical	83	31.1	149	33.6	
Horizontal	78	29.2	84	19.0	
Buccoangular	5	1.9	5	1.1	
Lingoangular	6	2.2	19	4.3	
Inverted	0	0.0	1	0.2	0.001

In our sample, hypertension and allergies were the most common medical co-morbidities. Lakhani et al. also reported hypertension to be the most common medical co-morbidity (12.6%) in their sample of 1867 patients, all above the age of 35 years, awaiting tooth

extraction (23). A similar trend was evident in the comparative study of two hospitals in Australia of patients needing dentoalveolar surgery (24). Hypertension was the most prevalent co-morbidity in both hospitals (13% and 17%), followed by gastro-

oesophageal reflux and asthma. Not surprisingly, it is advised to assess hypertension prior to dental extraction in patients with diagnosed hypertension and pregnant women, minimizing the probability of intraprocedural cardiovascular events (25). Furthermore, dental surgeons must be mindful of the interactions and adverse effects of antihypertensives prior to planning third molar surgery.

Life-style-related health risk habits, such as smoking, Betel Quid chewing and alcohol consumption are observed in the Sri Lankan population. Somatunga et al. (2012) reported that 15.8% of Sri Lankans used smokeless tobacco. Alarmingly, there was a percentage of 8.5% in the age group of (13-15) years (26). However, an optimistic finding to note was that smoking prevalence among males had reduced by 10.6% from 2009 to 2015 (26). In the above sample, there was a statistically significant difference in life-style-related health risk habits by age group, as smoking, betel chewing and alcohol consumption were most common among middle-aged patients, whilst there were young patients as well indulging on those. Hence, this provides a window of opportunity for habit intervention and optimizing oral hygiene, as those patients could be at risk of developing periodontitis, oral mucosal diseases, oral potentially malignant disorders (OPMDs) and even oral cancer in the future (27, 28).

It was compelling to note a statistically significant difference in types of impactions among those patients aged ≤ 40 years and > 40 years, where notably, vertical impactions were most common among the latter group. This finding is in agreement with another study, on increased frequency of vertical impaction of lower third molars over 20 years with an increase in retromolar space (29). This can be speculatively attributed to spacing of the rest of the dentition, secondary to periodontal disease or tooth loss.

Ryalat et al. also reported an increasing prevalence of Pell- Gregory ramus class 1 with increasing age (29). A similar trend was seen in our data, with a greater percentage having Pell- Gregory ramus class 1 in the age category above 40 years of age. In Kumar et al.'s sample of 170 orthopantomograms, vertical impactions were the most prevalent impactions among females and horizontal impactions were the most prevalent impactions in males (30). While these findings were

corresponding for men in our sample, distoangular impactions were significantly more frequent in women.

Third molar surgery is often done with bone removal or bone removal with tooth sectioning. Liao et al. reported that tooth sectioning between the distal root and the rest of the tooth at the bifurcation was superior to sectioning the tooth at the level of the cement-enamel junction (31). In our sample, tooth sectioning was significantly higher among males compared to females. Cassetta et al. reported that males had a greater alveolar cortical bone thickness and density, ascribing this to the greater bite forces and prominent masticatory muscles in men. This perhaps is a reason why dental surgeons opted for tooth sectioning over bone removal more often in male patients than in females (32).

5. Conclusions

The present study concluded that mandibular third molars were problematic, not only for young people, but also for middle aged and older adults, needing surgical removal, dominated by females. Moreover, individuals above the age of 40 years had an increased frequency of life-style-related risk habits, medical conditions, and a significantly higher chance of vertically angulated third molars. Males demonstrate a higher frequency of habits and a higher probability of horizontal position of lower third molars. Our findings provide insights into implications of socio-demographic perspective in mandibular third molar surgeries. There is an emerging need for training and educating dental surgeons in Sri Lanka, and elsewhere, in performing wisdom-tooth surgery in older adults and successfully managing possible complications pertaining to medical comorbidities and denser cortical bone in this age group. However, further research is warranted in other countries to generate more conclusive evidence.

Conflict of Interests

There is no actual or potential conflict of interests to be declared by the authors regarding the present manuscript.

Funding Information

There was no funding for the present manuscript from any source.

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