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Wisdom teeth extractions among Australian adults: Findings from the 2013 National Dental Telephone Interview Survey

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Abstract

Objectives: To identify, over the past 12 months, whether: (1) dental insurance is associated with a higher number of third molar extractions (TME); (2) single versus multiple TME is associated with self-rated oral health; and (3) TME when aged 18-25 years is associated with fewer days absent from work due to dental problems.

Methodology: Australia's 2013 National Dental Telephone Interview Survey which included: socio-demographics, in the past 12 months: number of extractions, extractions reasons, self-rated oral health and days absent from work due to dental problems.

Results: Most TME recipients were female (56.6%, SE=6.0%), aged 18-25 years (63.0%, SE=5.4%), hold a tertiary qualification (73.9%, SE=5.4%), with a total annual household income of ≥$60,000 (58.3%, SE=6.4%), dentally insured (52.6%, SE=6.2%) and received multiple TME (60.9%, SE=8.5%). Number of TME was associated with dental insurance (B=0.97: *95% CI:* 0.5 to 1.5) and days of work absence due to dental problems (*B*=1.10: *95% CI*: 0.26 to 1.94). Receiving single versus multiple TME was not associated with self-rated oral health (B=-0.25: *95% CI:* -.76 to 0.25). Receiving TME when aged 18-25 years versus older age groups was not associated with days absent from work due to dental problems (*B*=0.48:*95% CI: -0.37 to 2.33).

Conclusion: Dental insurance was associated with a higher TME count without improving self-reported oral health in the short-term. Using age as a justification for prophylactic TME might be questionable since, receiving TME when aged 18-25 years versus older age group did not reduce days absent from work due to dental problems.

Introduction

Australia has one of the highest rates in the world of hospitalization for third molar extractions (1) which might suggest that they are prophylactically removed. Third molar extractions are performed by an

experienced dentist or an oral surgery specialist. In Australia, the majority of dentists work in the private sector (2) while the majority of oral and maxillofacial surgeons work in both private and public sectors (3). Current figures indicate that 55% of Australians have "general treatment" private health insurance (4) which covers the surgeon fees for third molar surgery, while 47% of Australians have "hospital policy" insurance, which covers the hospitalization and anaesthetist fees for third molar surgery (5). While third molar patients eligible for public dental services face a long waiting list to be consulted and another waiting list for receiving third molar surgery (6), privately insured third molar patients face almost no waiting list to receive third molar extraction. Although the Australian Dental Association (7) does not refute or support prophylactic third molar removal, it recommends to leave the decision to patients to decide with their dentist. Considering that clinics are often over-booked (8), third molar patients might be hindered in being adequately informed (9). Additionally, evidence from a United States study shows that the privately insured are more likely to adhere to their dentist's recommendation for prophylactic third molar extraction (10). Furthermore, some dentists are encouraging their patients to use their dental insurance since they have paid for it and to avoid future out-of-pocket payments (11). Accordingly, it might be argued that the possession of dental insurance might be associated with a higher number of third molar extractions received.

Third molar surgery is the most commonly performed oral surgical procedure (12) and might be performed for several reasons: to eliminate a local problem such as pericoronitis, untreatable decay, periodontitis, association with pathology, facilitating orthodontic treatment or prophylactically to prevent future problems (10). The current evidence doesn't support the prophylactic removal of asymptomatic disease-free third molars (13, 14), with suggestions made for more research to evaluate the impact of retention versus extraction of asymptomatic third molars upon patient-reported outcomes in the short-term and long-term (14). The lack of evidence that supports prophylactic third molar extraction results in national

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guidelines in countries such as the United Kingdom (15) that prohibit the prophylactic extraction of asymptomatic disease-free impacted third molars. However, in Australia, it is argued that such guidelines were economically-driven and will defer the problem (16). Receiving multiple third molar extractions at a very short interval might suggest their prophylactic extraction. Therefore, identifying whether single versus multiple third molar extraction is associated with self-rated oral health might provide some evidence, in the short term (less than 1 year), from a population-based study, towards the benefit/risk for prophylactic third molar extractions.

Third molar surgery might be performed across a wide spectrum of age. Some dentists recommend their young adult patients to have their third molars prophylactically removed to get "peace of mind" of developing future infection (17). In addition, it is argued that age is a risk factor for post-operative complications (18) leading to a prolonged recovery (19). In contrast, others argue that the occurrence of these complications is attributed to the experience of the surgeon and the patients use of tobacco (20). Although Tolstunov (21) recommends the extraction of both symptomatic and asymptomatic third molars at age 16-25 years, Santosh (20) argues against the use of age as a reasonable justification for performing a prophylactic third molar removal. In addition, previous studies indicate that number of third molar extractions is significantly associated with prolonged recovery (19) because of increased surgical trauma. Developing problems such as infection before the surgery and/or post-operative complications in older age groups will have a reflection on the number of days absent from work/school due to dental problems. Therefore, further exploring the association between the age range in which third molar extractions are received and number of days absent from work/school due to dental problems will help in consolidating the current evidence and optimizing third molar extraction decision-making.

The aim of this study is to identify, over the past 12 months, whether: (1) having dental insurance is associated with a higher number of third molar extractions; (2) receiving single versus multiple third molar extractions is associated with self-rated oral health in the short term; (3) receiving third molar extractions when aged 18-25 years versus older age groups is associated with a fewer number of days absent from work/school due to dental problems.

Methodology

Data sources and ethical approval

This study utilises data from the 2013 National Dental Telephone Interview Survey (NDTIS) which is a random representative sample of residents of Australia aged 5 years and over who reside in a household that has a telephone line. Data were collected from June 2013 to March 2014. Only records representing adults aged 18 years and over were included in the current analysis. The 2013 NDTIS received ethical approval from the University of Adelaide Human Research Ethics Committee (HS-2013-014). The University of Adelaide HREC adhere to World Medical Association Declaration of Helsinki, the Australian Code for the Responsible Conduct of Research 2007 and National Health and Medical Research Council (NHMRC) guidelines. The targeted households were mailed an approach letter 10 days before the interview. The approach letter explained the purpose of the study, how the households were selected, that participation is voluntary, what does it involve and the participants' identity will be kept confidential.   In the interview, the interviewer explained the study again to the target person to obtain a verbal consent before proceeding to the questionnaire. If the target person accepted to participate, the interviewer asked them a series of questions. If the target person declined to participate, it was recorded as refusal outcome.

Sampling method

The 2013 NDTIS sampled Australia's residents using an overlapping dual sample frame design targeting residents in households that have a telephone line. The first sampling frame comprised sampling of households listed on the Electronic White Pages obtained from "Australia on Disc, 2012" supplied by

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United Directory System. Records from this frame were sampled using a two-stage stratified random sampling approach, where records were stratified by state/territory then by capital city or rest of the state. A specified sampling fraction was used for selecting records from each sub-stratum. The initial telephone contact was with an adult aged 18 year or over. To account for residential households that were not listed on the Electronic White Pages, a second sampling frame was used which comprised 20,000 randomly-generated mobile telephone numbers supplied by Sampleworx. The selected records from the mobile sampling frame were not stratified due to the lack of geolocation before establishing the initial contact. The sampling methods resulted in 6340 responses from adults aged 18 years and over with an average response rate of 34.4%. The 2013 NDTIS data were checked for quality and weighted (22).

Variables

The telephone interview asked participants to provide the number of dental extractions they had received over the past 12 months. The reason for such extractions were then asked, for example, wisdom teeth, orthodontic treatment, periodontal disease, etc. Data for this analysis were included if a response of 'yes' was provided for the question pertaining to third molar extraction only. A dichotomous variable was created for multiple third molar extraction, based on the number of third molar extractions received. Other variables included participants' socio-demographics (age in years, gender, total annual household income and highest level of education), dental insurance status and self-rated oral health (a global item with responses ranging from 1 for 'poor' to 5 for 'excellent'). Participants were asked "In the last 12 months, how many days have you stayed away from work/place of study for more than half the day because of any dental problems you had?".

Data analysis

Data analysis was conducted using the complex samples module (23) in SPSS statistics for Windows v. 23.0 (24). A specified sampling plan was provided by the 2013 NDTIS data custodian to account for the complex sampling design. The selected subpopulation was participants who responded "Yes" to "had third molar

extraction" in the past 12 months. Using the complex sample module, estimates of population size with standard error for these estimates were obtained. Generalised Linear Models were used to identify associations between: (1) dental insurance and third molar extractions; (2) Single or multiple third molar extraction with self-rated oral health (in the short term) and; (3) age (18-25 years versus 26+ years) and days absent from school/work due to dental problems.

Results

The unweighted count for those who responded 'yes' to third molar extraction was (n=120) participants representing a total population of (n=440026.6, SE=53722.7) with an estimated prevalence of 25.6% (SE=2.7%) among those who received dental extractions over the past 12 months. Most of those who received a third molar extraction were in the 18-25 years' age category (63.0%, SE=5.4), with a higher proportion of these being female (56.6%, SE=6.0%) (

Table 1). A higher proportion of those reporting a third molar extraction held a tertiary qualification (73.9%, *SE*=5.4%) and were living in households with a total income of ≥ $60,000 annually (58.3%, *SE*=6.4%). Just over half the respondents reporting third molar extractions had dental insurance (52.6, *SE*=6.2%). Around 60 percent of participants received multiple third molar extractions during the past 12 months (*SE*=5.8%).

Dental insurance and low education status were associated with a higher number third molar extractions when adjusted for gender and annual household income in multivariable modelling (Table 2). Each year increase in age was associated with a lower number of third molar extractions received. After adjusting for age, gender, income, education and dental insurance status, single versus multiple third molar extraction was not associated with self-rated oral health in the short-term (Table 3).

Receiving third molar surgery when aged 18-25 years versus older age groups was not significantly associated with work/school absenteeism when adjusted for in multivariable modelling (Table 4). However, the number of third molar extractions was significantly associated with the number of days absent from work/school due dental problems.

Discussion

Our findings suggest that having dental insurance was associated with increased number of third molar extractions received in the past 12 months among Australian dentate adults aged 18 years and over. This indicates that dentally insured adults might be subjected to over-management since there was no significant association between the number of third molar extractions and self-rated oral health. Although number of days absent from work/school due to dental problems was associated with number of third molar extractions, they were not associated with receiving third molar extraction when aged 18-25 years versus older age group.

The observed association between dental insurance status and third molar extractions might be due to the enabling effects of having dental insurance. The pattern of the association between dental insurance and third molar extractions was opposite to what has been previously reported for extractions in general in the Australian population (25). The observed difference might be due to the reason for extraction, which differs between third molars and other teeth. Extractions other than third molar or for orthodontic treatment are mainly related to untreatable decay or advanced periodontal diseases (26) which are known to be less prevalent among the dentally insured (27). While a previous Australian study indicates that hospitalization for third molar extraction is associated with socio-economic status (28), we observed that dental insurance was associated with a higher number of third molar extractions independent of where the surgery was performed. Our findings suggest that, on average, having dental insurance was associated with receiving an additional one third molar extraction when compared with the non-insured over the past 12 months. Evidence from a national dental survey in Australia indicated that dentally-insured make more visits and purchase prophylactic dental treatments at check-ups (29). This behaviour might be applied to third molar extractions (1). Despite insurance cover for third molar extraction varying based on selected policy, type of the chosen health and dental cover, some researchers suggest that dental insurance status makes most patients decide on third molar prophylactic extraction (10). In fact, some clinicians recommend their patients use their dental insurance cover since they have already paid for it (11). Some scholars recommend prophylactic third molar extraction when general anaesthesia is used if they are not associated with an anatomical risk (30). In addition, Steed (31) recommends prophylactic removal of the opposing third molar simultaneously in the same operation if there are no anatomic risks to avoid future super-eruption. Private health insurance is reported to have an association with increased utilization of health care system in other countries such as the United States (32) in general and at the dental service-level (33) after adjusting for health status.

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Multiple third molar extraction was more prevalent in our sample compared with single third molar extractions. Single versus multiple third molar extraction was found not to have a significant association with self-rated oral health in the short term. This adds to the ongoing argument regarding third molar prophylactic removal (13, 14). These findings might suggest the need to provide third molar patients with pre-consultation evidence-based resources and to investigate the association with third molar decision-making and decision-outcomes (currently in progress (34)), since previous studies indicate that clinics are over-booked (8) which might result in patients being inadequately informed (9).

The observed association between number of third molar extractions and number of days unable to work/attend school due to dental problems that served as a proxy for third molar extraction recovery is consistent with previous reports explained by the increase in surgical trauma (35) and consequently prolonged recovery period (19). It has been argued that performing prophylactic third molar extraction among those in younger age groups is not justified by the increased risk of developing post-operative dry socket which was found to be associated with lack of clinician experience and patient tobacco use (20). Although it might be argued that third molars' root development might have associations with post-operative complication in our sample, the age distribution in this study might suggest it to be minimal. This is because the probability of fully-developed third molar roots at the age of 18 years is 82-97% according to location (36) whereas the study's participants were aged 18 years or over. Our findings might suggest the need for further exploration of this area in a randomized controlled trial before making a clinical recommendation, since evidence from smaller studies suggests that patient's age does not significantly contribute to surgical difficulty in third molar removal (35).

A limitation of our study was possible recall bias associated with the extraction event and the reported number of third molar extractions received over the past 12 months (37). Although our sample is a sub-group analysis of a representative sample of Australia residents, the unweighted count of those who have received third molar extraction was small. Another limitation might be related to the use of the number of days absent from work/school due to dental problem as a proxy for pre-extraction problems and/or recovery period and the unavailability of data about life-threatening infection. On the other hand, our study has several strengths. It contributes to the field of health care quality by revealing the increased number of third molar extractions associated with dental insurance with no benefit upon the self-rated oral health in the short-term—A potential moral hazard that needs to be thoroughly investigated and supported by clinical data. Our study adds to third molar extraction decision-making by identifying the lack of association between multiple versus single third molar extraction and self-rated oral health in the short term.

In conclusion, being dentally insured versus non-insured was significantly associated with a higher number of third molar extractions reported by Australian adults aged 18 years or over. Receipt of single versus multiple third molar extraction was not significantly associated with self-rated oral health in the short term. This might question the benefit of receiving multiple third molar extractions in the short term which results in a significant increase in the number of days absent from work/school. Based on these findings, it is recommended to investigate whether the dentally insured participants might be over-managed in the dental setting supported by clinical data to avoid exposing them to unnecessary risks. Over-management associated with private insurance is discussed for health care services in general and on the service-level for dental procedures. In addition, there might be a need to improve pre-consultation patient understanding of the uncertainty related to prophylactic third molar extraction and investigate how this might affect third molar decision-making and decision-outcomes since previous studies suggest that third molar patients are not adequately informed. Although it is widely believed that performing third molar

extraction at the age of 18-25 years reduces risks of developing dentally-related problems and/or post-operative recovery when compared with an older age groups, we observed no significant association with the number of days absent from work/school due to dental problems. This might question the use of age as a justification for prophylactic third molar extraction. The need for further studies that address age optimization for third molar extraction is recommended.

Declaration of conflicting interests
The Authors declare that there is no conflict of interest.

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Table 1: Subpopulation characteristics of those who have received third molar extraction

	Population Size Unweighted count (*n*=120)		N %	
	Estimate	Standard Error	Estimate	Standard Error
Age group				
18-25 Years	277359.3	46194.5	63.0%	5.4%
≥ 26 years	162667.3	25271.8	37.0%	5.4%
Gender				
Male	193656.3	33314.8	44.0%	6.0%
Female	246370.3	40351.3	56.0%	6.0%
Had a tertiary qualification				
No	114747.5	27024.5	26.1%	5.4%
Yes	325279.0	44372.9	73.9%	5.4%
Household income				
< $60,000	153921.7	31122.5	41.7%	6.4%
≥ $60,000			58.3%	6.4%
Whether have private dental insurance				
Yes	203138.7	35145.6	47.4%	6.2%
No	225593.5	38329.0	52.6%	6.2%
Single or multiple third molar extraction				
Single TM extraction	170993.3	29231.7	39.1%	5.8%
Multiple TM extraction	265811.4	43244.1	60.9%	5.8%
Self-rated oral health				
Poor	23299.6	11611.3	5.3%	2.6%
Fair	51650.8	20624.7	11.7%	4.4%
Good	111623.2	28988.1	25.4%	5.6%
Very good	198538.3	33979.6	45.1%	6.1%
Excellent	54914.7	16060.2	12.5%	3.5%
Total	440026.6	53722.7	100.0%	0.0%

			95% Confidence Interval	
	Estimate	Standard Error	Lower	Upper
Mean number of days absent	2.1	0.4	1.3	2.9

Table 2: Complex samples general linear regression model for the number of third molar extractions

received in the past 12 months among Australian adults

Parameter		95% Confidence Interval		
	Estimate	Lower	Upper	*P*-value
(Intercept)	2.195	1.483	2.908	<.01
Had a tertiary qualification				
No	1.217	0.546	1.888	<.01
Yes	.000[b]			
Have a private dental insurance				
Yes	0.972	0.486	1.458	<.01
No	.000[b]			
Gender				
Male	0.377	-0.267	1.020	.251
Female	.000[b]			
Age (years)	-0.027	-0.045	-0.009	.003
Total household income	0.000	-0.058	0.059	.990

Subpopulation: Had extraction for wisdom teeth = Yes

a. Model: Number of TM extractions in the last 12 months = (Intercept) + had a tertiary qualification + dentally- insured + gender + age (years) + household income.

b. Set to zero because this parameter is redundant (reference category).

Table 3: Complex samples general linear model for self-rated oral health among Australian adults who received third molar extractions in the past 12 months

| Parameter | Estimate | 95% Confidence Interval | | P value |
		Lower	Upper	
(Intercept)	3.20	2.40	4.00	.013
Gender				
Male	.12	-.34	.59	.604
Female	.000[b]			
Had a tertiary qualification				
No	-.69	-1.29	-0.10	.022
Yes	.000[b]			
Have a private dental insurance				
Yes	.45	-.07	.97	.088
No	.00[b]			
Multiple third molar extractions				
No	-.25	-.76	.25	.325
Yes	.000[b]			
Age (years	.00	-.02	.01	.901
Total household income	.04	-.02	.10	.227

Subpopulation: Had extraction for wisdom teeth = Yes

a. Model: Self-rated dental health = (Intercept) + gender + had a tertiary qualification + dentally insured + received multiple third molar extractions+ age (years) + household income.

b. Set to zero because this parameter is redundant (reference category).

Table 4: Complex samples general linear model for the days abscent from work/school due to dental problems among Australian adults who received third molar extractions in the past 12 months.

95% Confidence Interval

Parameter	Estimate	Lower	Upper	*P* value
(Intercept)	-0.23	-5.89	5.42	.007
Have a private dental insurance				
Yes	-0.14	-2.08	1.81	.888
No	.000[b]			
Gender				
Male	-0.49	-2.24	1.25	.579
Female	.000[b]			
Had a tertiary qualification				
No	-2.51	-4.80	-0.23	.031
Yes	.000[b]			
Age group				
18-25 years	0.48	-1.37	2.33	.608
≥ 26 years	.000[b]			
Total household income	0.03	-0.19	0.25	.786
Third molar extraction count	1.10	0.26	1.94	.011
Self-rated oral health	0.03	-0.82	0.89	.942

Subpopulation: Had extraction for wisdom teeth = Yes

a. Model: Number of days missed from work/school/study for more than half a day due to dental problems = (Intercept) + dentally insured + gender + Had a tertiary qualification + age group + household income + third molar extractions count+ self-reported dental health.

b. Set to zero because this parameter is redundant (reference category).