Factors Related to Tooth Loss Due to Dental Caries among Workers in an Industrial Estates in Thailand

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Objective: *The present study aimed to evaluate the prevalence and factors related to tooth loss due to dental caries among workers in industrial estates in Pathumthani and Phranakhorn Si Ayutthaya provinces in central Thailand.*
Material and Method: *The present study utilized quantitative and qualitative methodologies. A quantitative study was done using a cross-sectional analytic method with a sample group of 457 adults (283 males; 174 females) between 19 and 53 years. Data were obtained through an oral examination and oral health behavior questionnaire. Data analyses were done using descriptive, bivariate and multivariable logistic regression statistics. In-depth interviews were used to collect qualitative data from 11 subjects.*
Results: *Most (62.2%) participants had tooth loss due to caries and findings from the final multivariable logistic regression model revealed that such loss was associated with education, residency, use of social security welfare, decayed teeth and filled teeth. Relatedly, the in-depth interview confirmed that tooth loss due to dental caries was related to (1) lack of time to visit a dentist (2) have a negative attitude toward or a phobia regarding dental treatment (3) inability to afford the high cast of dental treatment (4) lack of knowledge in regarding dental caries prevention, root canal treatment and the harmful effects of losing teeth (5) choosing to get an extraction upon having caries exposed pulp and (6) lack of oral health promotion programs provided by either the government or private sectors.*
Conclusion: *The government and non-government organizations should promote oral health in an industrial estates and provide services and welfare for dental health of workers in an industrial estate appropriate to their socio-economic needs.*

Keywords: *Tooth loss, Workers in an industrial estates, Thailand*

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Research around the world has correlated tooth loss to dental caries and a number of factors[1-9]. Caries is a major oral health problem among people of all ages in Thailand and epidemiological research indicates certain factors relate to dental caries and tooth loss among healthy Thai adults[6-11]. To the authors knowledge, there has not been any research to evaluate these factors among workers at industrial estates in Thailand or other countries, even though the prevalence of dental caries among this group is disproportionately higher according to a national health survey[12].

The aim of the present study was to determine the factors associated with tooth loss due to dental caries among workers in an industrial estates in Central Thailand and to investigate the lifestyle(s), attitude(s) and behavior(s) of these workers associated with their tooth loss.

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Objective

The present study was designed to evaluate the prevalence as well as factors related to tooth loss as a consequence of dental caries among workers in an industrial estates of Pathumthani and Phra Nakhorn Sri Ayutthaya provinces, Thailand.

Material and Method

This cross-sectional, analytic study was conducted among 277,471 workers at industrial estates in Pathumthani and Phra Nakhon Si Ayutthaya provinces, Thailand, in 2009. After calculating the required sample size[13], 457 workers (283 males; 174 females), between 19 and 53 years, were chosen as participants for both the interview and oral health examination. The present study protocol was reviewed then approved by the Human Research Ethics

Committee of Khon Kaen University, Thailand (HE532173).

Data collection among the workers was conducted at their workplaces after their signing informed consent. Baseline characteristics were obtained from the interview, including: sex, age, marital status, weight, height, body mass index (kg/m^2), systemic diseases, education level, types of work, position at work, working hours, length of time at this workplace, income, alcohol use, tobacco smoking, duration of alcohol use and/or tobacco smoking, exercise, tooth-brushing and other oral cleansing aids, problems with access to dental care, types of subsidized dental care, history of tooth loss, denture wearing and cleaning. The workers were then asked to undergo an oral examination, which was conducted to assess periodontal conditions as well as dental caries status and treatment needs based on WHO criteria[14]. A mouth mirror, an explorer and a WHO periodontal probe were the tools used.

Dental caries status was measured using the DMFT index on every tooth (decayed, missing and filled teeth) in which the criteria were coded as: 0 = normal tooth without caries (sound teeth); 1 = decayed; 2 = filled with decayed; 3 = filled with no decayed; 4 = missing due to caries; 5 = missing due to other reasons; 6 = fissure sealant; 7 = crown or bridge abutment; 8 = unseen in the oral cavity; 9 = fractured; 10 = abrasion or erosion; and 11 = status of teeth not included in the above. Treatment need was scored as: 0 = no need for treatment; 1 = prevention of caries; 2 = fissure sealant; 3 = one surface filling; 4 = two or more surface filling; 5 = crown; 6 = veneer; 7 = root canal treatment; 8 = extraction; 9 = need for other care (specify type of treatment).

Periodontal conditions and periodontal clinical attachment loss (CAL) were assessed using the WHO periodontal probe. The Community Periodontal Index (CPI) was used based on the following criteria: 0 = healthy gingival; 1 = bleeding gingival; 2 = calculus; 3 = calculus with bleeding; 4 = pocket 4-5 mm; 5 = pocket 6 mm or more; 9 = cannot be determined; and 10 = missing sextant/excluded.

Procedures to control the quality of data collection included: (1) training the examining dentist to assess the validity of the oral health indices and for consistency so that the kappa values were at least 0.80 for repeatability of the examination; (2) checking the kappa values of ~10% of the measurements; and, (3) training data entry staff to reduce errors in the data entry process (*e.g.*, independent double data entry was done by two staff).

Data management and analysis were performed using SPSS for Windows. Results were obtained by means of descriptive, bivariate and multivariable logistic regression analyses. Descriptive statistics (*viz*., mean, standard deviation and proportion) were used to analyze the basic information such as age, sex, marital status, education level, main occupation, average yearly income and oral health status. Bivariate statistics (*i.e*., χ^2-test, independent t-test, non-parametric tests) were employed based on the specific standard assumptions of each statistic to assess the preliminary relationship between tooth loss due to dental caries (defined as missing ≥ 1 tooth) and potential predictors, without adjusting for confounding factors. The final multivariable logistic regression model was achieved so as to define the set of variables related to tooth loss as a function of dental caries. The adjusted odds ratios along with their 95% CI were reported and a p-value of < 0.05 was considered statistically significant.

The qualitative study was conducted through in-depth interviews: 11 cases representing the study population were selected (from among the 457 cases) by purposive sampling (*i.e*., workers in various roles at industrial estates who had been there for more than 5 years and had lost at least 4 teeth). These persons were asked to describe in detail their lifestyle, attitudes and habitual behaviors.

Results

Descriptive statistics showed that 62.2% of people suffered from tooth loss due to dental caries (Table 1). The final multivariable logistic regression model regarding tooth loss due to dental caries as an outcome had an R^2 of 20.5%. Findings from the final model revealed that tooth loss due to dental caries among these workers was associated with education, residency, use of social security welfare, decayed teeth and filled teeth, with the respective adjusted odds ratios (95% CI) of 3.11 (1.67, 5.78) , 1.88 (1.16, 3.08), 1.95 (1.28, 2.99), 2.75 (1.67, 4.52), and 2.36 (1.52, 3.63) (Table 2).

Findings from the in-depth interviews confirmed that tooth loss due to dental caries among the workers in an industrial estates was related to: (1) lack of time to visit a dentist ["My work finishes at 18.00 and by that time clinics close, so I cannot go and see a dentist" (IDS1MO1)]; (2) have a negative attitude toward or a phobia regarding dental treatment ["I have had tooth abscess after dental care, so I fear going to the dentist" (IDL3MF03)]; (3) inability to afford the high

Table 1. Causes of tooth loss among industrial workers (n = 457)

Cause of tooth loss	Minimum	Maximum	Mean (SD)	Percent (%)
Dental caries	0	7	0.74 (1.32)	62.2
Other causes	0	8	0.45 (1.13)	37.8
Total	0	9	1.19 (1.67)	100

Table 2. Multivariable logistic regression analysis between tooth loss* and related factors among industrial workers (n = 457)**

Variable	β(SE)	p-value	Adjusted OR (95% CI)
Education level			
Below bachelor degree	1.13 (0.316)	0.001	3.11 (1.67 , 5.78)
Bachelor's degree or higher (reference group)			
Received dental care in the past year			
Yes	0.63 (0.24)	0.009	1.88 (1.16, 3.08)
No (reference group)			
Residence			
Other parts of Thailand (Northern, Eastern, Northeastern, or Southern region)	0.65 (0.22)	0.002	1.95 (1.28,2.99)
Central region (reference group)			
Dental caries			
Present (β1 carious teeth)	1.01 (0.25)	<0.001	2.75 (1.67, 4.52)
Absent (reference group)			
Filled teeth			
Present (β1 filled teeth)	0.86 (0.22)	<0.001	2.36 (1.52, 3.63)
Absent (reference group)			

* Tooth loss defined as missing ≥ 1 tooth. **Nagelkerke R^2 = 20.5%

cost of dental treatment ["Only 500 B a year is covered by health insurance, which means I have to pay more than I can afford earn only 8,000 per month" (IDE2F01)]; (4) lack of knowledge regarding dental caries prevention, root canal treatment and the harmful effects of losing teeth ["If I don't have tooth pain, I don't go to see the dentist" (IDL1F02) ["I lost my teeth, so it is very difficult for me to chew" (IDS101)]; (5) choosing to get an extraction upon having caries exposed pulp ["I had severe tooth pain,so I decided to go for an extraction" (IDE2F02)]; and (6) lack of oral health promotion programs either the government or private sector(s) ["I haven't heard any dental health promotion program in the industrial estates" (IDE3F04)] (Fig. 1).

Discussion

Dental caries is believed to be a rapidly increasing oral health problem in developing countries; by contrast, western industrialized nations are seeing a decline due to change in dietary patterns. A study done in Rajasthan, India, among marble mine workers[15] revealed significant unmet dental treatment needs, especially for caries. Among the present study population, only one-fourth (26.3%) of all participants were free from caries and none of them had any filled teeth. The prevalence of caries in the present sample population was high, as over half the population (57.3%) require attention and this also indicates a significant public health concern and disease burden. The present study differs from the Indian study[15] as the highest prevalence of tooth loss in the Rajasthan was amongst the oldest age group (45-54) while our study revealed that a large proportion (83.8%) of young adults (19-34 years) suffered from tooth loss due to dental caries.

The current study reveals the fact that tooth loss due to dental caries among workers in industrial estates is associated with education, residency, use of social security welfare, decayed and filled teeth. A Finnish study[16] that compared subsidized workers and controls without subsidy showed that the mean number

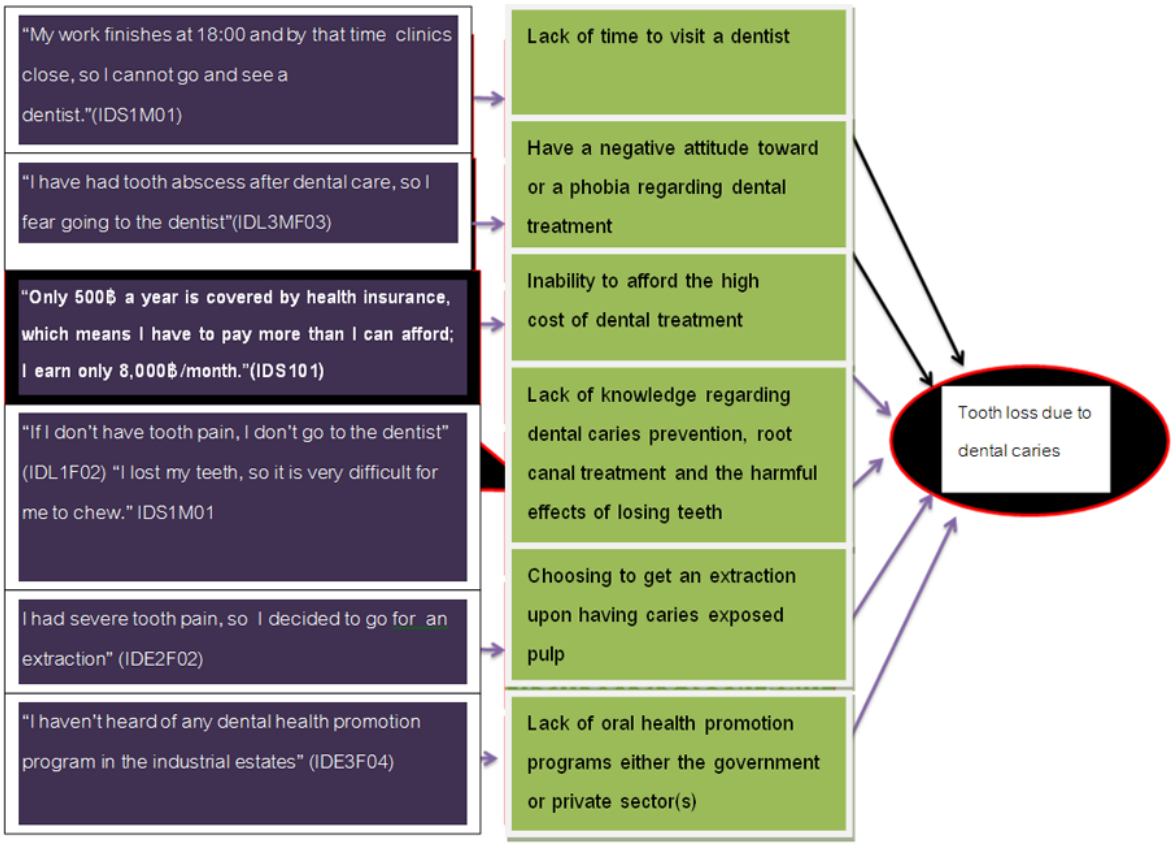

Fig. 1 Factors related to tooth loss data from in-depth interviews with workers

of carious teeth was significantly lower in the subsidized group (0.4, SD 1.2) than in the control group (1.7, SD 3.2) ($p < 0.001$). Moreover, 92.0% of the subsidized employees had visited a dentist within the past 2 years, while only 82.0% in the control group had done so ($p < 0.01$). These findings strongly suggest the need for a subsidized dental service in the industrial estates in order to prevent dental caries and its sequelae[16,17].

Conclusion

Tooth loss due to caries among these workers is related to a number of socio-economic and dental health variables. Poor socio-economic conditions result in dental care being given a low priority. In addition, poor knowledge regarding dental caries obfuscates the need and long hours of work prevent them from accessing dental health care. To reduce these problems, an effort should be made to raise awareness about oral health and hygiene among these workers. Government organizations and non-government organizations could provide affordable dental health services to such workers.

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Potential conflicts of interest

None.

References

1. Burt BA, Ismail AI, Morrison EC, Beltran ED. Risk factors for tooth loss over a 28-year period. J Dent Res 1990; 69: 1126-30.

2. Slade GD, Gansky SA, Spencer AJ. Two-year incidence of tooth loss among South Australians aged 60+ years. Community Dent Oral Epidemiol 1997; 25: 429-37.
3. Axelsson P, Paulander J, Lindhe J. Relationship between smoking and dental status in 35-, 50-, 65-, and 75-year-old individuals. J Clin Periodontol 1998; 25: 297-305.
4. Locker D, Ford J, Leake JL. Incidence of and risk factors for tooth loss in a population of older Canadians. J Dent Res 1996; 75: 783-9.
5. Ahlqwist M, Bengtsson C, Hollender L, Lapidus L, Osterberg T. Smoking habits and tooth loss in Swedish women. Community Dent Oral Epidemiol 1989; 17: 144-7.
6. Ploysangngam P, Subhakorn S, Pongnarisorn N, Jaturanon S, Chaisupamongkollarp S. Oral health status in the elderly priests in Bangkok. J Med Assoc Thai 2008; 91 (Suppl 1): S30-6.
7. Yiengprugsawan V, Somkotra T, Kelly M, Seubsman SA, Sleigh AC. Factors associated with self-reported number of teeth in a large national cohort of Thai adults. BMC Oral Health 2011; 11: 31.
8. Chatrchaiwiwatana S. Factors affecting tooth loss among rural Khon Kaen adults: analysis of two data sets. Public Health 2007; 121: 106-12.
9. Baelum V, Pongpaisal S, Pithpornchaiyakul W, Pisuithanakan S, Teanpaisan R, Papapanou PN, et al. Determinants of dental status and caries among adults in southern Thailand. Acta Odontol Scand 2002; 60: 80-6.
10. Chatrchaiwiwatana S, Ratanasiri A. Association between exhaled carbon monoxide and oral health status in active and passive smokers. J Med Assoc Thai 2011; 94: 601-9.
11. Chatrchaiwiwatana S. Dental caries and periodontitis associated with betel quid chewing: analysis of two data sets. J Med Assoc Thai 2006; 89: 1004-11.
12. Division of Dental Public Health, Ministry of Public Health, Thailand. The 6th National oral health survey in Thailand 2006-2007. Bangkok: The Veteran Organization Publishing; 2008.
13. Hulley SB, Cummings SR. Designing clinical research: an epidemiologic approach. Baltimore: Williams & Wilkins; 2000.
14. World Health Organization. Oral health surveys: basic methods. 4th ed. Geneva: World Health Organization; 1977.
15. Duraiswamy P, Kumar TS, Dagli RJ, Kulkarni S. Dental caries experience and treatment needs of green marble mine laborers in Udaipur district, Rajasthan, India. Indian J Dent Res [Internet] 2008 [cited 2012 May 17]; 19: 331-4. Available from: http://www.ijdr.in/text.asp?2008/19/4/331/44537
16. Ahlberg J, Murtomaa H, Meurman JH. Subsidized dental care associated with lower mutans streptococci count in male industrial workers. Acta Odontol Scand 1999; 57: 83-6.
17. Ahlberg J, Tuominen R, Murtomaa H. Subsidized dental care improves caries status in male industrial workers. Community Dent Oral Epidemiol 1996; 24: 249-52.

ปัจจัยที่สัมพันธ์กับการสูญเสียฟันจากโรคฟันผุ ของพนักงานโรงงานอุตสาหกรรมในนิคมอุตสาหกรรมประเทศไทย

สุภาภรณ์ ฉัตรชัยวิวัฒนา, อมรรัตน์ รัตนสิริ, จีรทีปต์ ใจดี, สุรศักดิ์ สุนทร

***วัตถุประสงค์**: การศึกษานี้มีวัตถุประสงค์เพื่อศึกษาหาความชุกของการสูญเสียฟันจากโรคฟันผุ และปัจจัยที่สัมพันธ์กับการสูญเสียฟันจากโรคฟันผุของพนักงานโรงงานอุตสาหกรรมในนิคมอุตสาหกรรม จังหวัดปทุมธานีและจังหวัดพระนครศรีอยุธยา ประเทศไทย*

***วัสดุและวิธีการ**: เป็นการศึกษาเชิงปริมาณและเชิงคุณภาพ โดยการศึกษาเชิงปริมาณเป็นแบบภาคตัดขวางเชิงวิเคราะห์ในกลุ่มพนักงานโรงงานอุตสาหกรรม ที่เป็นตัวอย่างทั้งหมดจำนวน 457 คน เป็นเพศชาย 283 คน และเพศหญิง 174 คน อายุ ระหว่าง 19-53 ปี เครื่องมือที่ใช้ คือ แบบตรวจสภาวะสุขภาพช่องปาก และแบบสอบถามพฤติกรรมทางทันตสุขภาพ การวิเคราะห์ข้อมูล ใช้สถิติเชิงพรรณนา สถิติเชิงวิเคราะห์ความสัมพันธ์ระดับสองตัวแปรและวิเคราะห์ความสัมพันธ์หลายตัวแปร โดยใช้สมการถดถอยพหุคูณลอจิสติก*

***ผลการศึกษา**: พบความชุกของการสูญเสียฟันเนื่องจากฟันผุทั้งหมดร้อยละ 62.2 ผลจากสมการถดถอยพหุคูณลอจิสติก พบว่าปัจจัยที่มีความสัมพันธ์กับการสูญเสียฟันจากโรคฟันผุ ได้แก่ ระดับการศึกษา ภูมิลำเนา การใช้สวัสดิการการรักษาทางทันตกรรม การมีฟันผุ และการมีฟันอุด ผลการสัมภาษณ์เชิงลึกยืนยันว่าปัจจัยที่สัมพันธ์กับการเสียฟันจากโรคฟันผุ ได้แก่ 1) พนักงานไม่มีเวลาเข้ารับบริการทางทันตกรรม 2) พนักงานมีทัศนคติและความเชื่อที่ไม่ถูกต้องต่อการรักษาทางทันตกรรม 3) พนักงานมีข้อจำกัดของค่าใช้จ่ายในการรักษาทางทันตกรรม 4) พนักงานขาดองค์ความรู้เกี่ยวกับการป้องกันโรคฟันผุ การรักษารากฟัน และผลเสียจากการสูญเสียฟัน 5) พนักงานเลือกที่จะถอนฟันเป็นอันดับแรกเมื่อมีอาการปวดฟันจากฟันผุทะลุโพรงประสาท 6) พนักงานเห็นว่าไม่มีกิจกรรมการส่งเสริมสุขภาพช่องปากของพนักงานในโรงงานอุตสาหกรรมจากทั้งภาครัฐและเอกชน*

***สรุป**: ผลจากการศึกษานี้ แนะนำให้ภาครัฐและเอกชนควรจัดกิจกรรมการส่งเสริมสุขภาพช่องปากพนักงานในโรงงานอุตสาหกรรม ร่วมกับการจัดชุดสวัสดิการบริการการรักษาทางทันตกรรมให้แก่พนักงานที่เหมาะสมกับสภาพเศรษฐกิจสังคม และวิถีการดำเนินชีวิตของพนักงานโรงงานอุตสาหกรรมในปัจจุบัน*