

Edentulism and Factors Associated with Community Dwelling Elderly in Pasir Puteh, Kelantan, Malaysia

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ABSTRACT

Objective: To assess the prevalence of edentulism (total tooth loss) and factors associated with community dwelling elderly in Pasir Puteh, Kelantan, Malaysia.

Materials and Methods: A cross-sectional study has been conducted among community dwelling elderly in Pasir Puteh, Kelantan. Upon completion of a face-to-face administered questionnaire of participant's socio-demographic and oral health profiles, the edentulous state was examined and recorded. Data obtained was analyzed using SPSS version 22.0.

Results: A total of 600 elderly who participated in this study consist of 371 edentulous and 229 with at least one natural tooth. The prevalence of edentulism was 62.3% (95% CI: 58.3, 66.2). Age, level of education, last dental visit, fear of dental treatment, and denture wearing status were found to be associated with edentulism ($p < 0.05$).

Conclusion: Edentulism was found to be higher among community dwelling elderly in Pasir Puteh, Kelantan. Increasing in age, lower level of education, frequent dental visit, less fear of dental treatment, and wearing a denture were found to be associated with edentulism.

KEY WORDS

edentulism, community dwelling, elderly, risk factors, Malaysia

INTRODUCTION

Like other developing and developed countries in the world, increasing in an aging population also occurred in Malaysia (DSM, 2018). Aging is a normal physiological process affecting mankind. However, advanced technology innovation, knowledge, and medication have improved health and increased the life expectancy of human beings, bringing chronological human age exceeding 90 years old. A current report published by the Malaysia Department of Statistics, the life expectancy for Malaysian female was 77.6 and for the male is 73.2 years old (DSM, 2018a). However, physiological changes of an aging human body that affect the hormones and cellular structure, together with practicing unhealthy lifestyles, causing increasing in age will also increase the risk of other chronic diseases (Amiri *et al.*, 2014). This scenario manifested by a high prevalence of diabetes mellitus (11.5%), hypertension (46%) and heart-related diseases (Amiri *et al.*, 2014, Naidu *et al.*, 2019) and also oral diseases (Samson *et al.*, 2008).

We cannot ignore the elderly contribution to developing the nation previously. Therefore, the Malaysian government has taken initiatives to make sure the quality of life in the Malaysian elderly was at an optimum level. Malaysia's government has taken various measures, including formulating, adopting and implementing plans and policies toward health care addressing the needs of the elderly, and their oral health (MOH, 1997). The guideline toward oral health care for the elderly has been released and implemented since 1993 (Dental Services Division, MOH, 1993), to assist oral health care providers, especially the ministry of health personnel in delivering services and helping the elderly maintaining their oral health. The action was further acknowledged and empowered under the Malaysian National Blue Ocean Strategies (NBOS), which stated the importance of health sustainability among the elderly (JPA, 2016).

However, the oral health status among the elderly was not improved significantly from what has been reported previously (Rosli *et al.*, 2018) or as compared to 10 years ago (Shamdol *et al.*, 2008). In both studies, the reported prevalence of dental caries and periodontal diseases was 100%. Both common dental diseases, if not treated early will cause tooth loss. Total tooth loss is also known as edentulous. In both earlier studies also noted that the prevalence of edentulous reported was 18.3% of Rosli *et al.* in 2018 which is lower than Shamdol *et al.* finding of 55.9% in 2008. However, because of the high prevalence of both dental diseases, the difference needs further investigation.

Besides inconclusive findings in previous studies, what it has achieved for the past two decades put a question mark to be answered. The action must be taken to improve the already available government plan and policy. We have conducted this study to explore the edentulous prevalence as a perimeter to oral health status and associated factors among community-dwelling elderly in Kelantan, Malaysia. We hope, the findings from this study will add other information for future action, including oral health intervention and a baseline for research.

MATERIALS AND METHODS

A cross-sectional study has been conducted among community-dwelling elderly age 60 years old and above living in Pasir Puteh, Kelantan, Malaysia. Pasir Puteh district comprises eight sub-districts and has about 10 mukims per sub-districts. Within each mukims, there are three villages. In the present study, we selected participants using a multistage sampling technique. In the beginning, two sub-districts were randomly selected which is Bukit Jawa and Bukit Abal. Then from these two sub-districts, two mukims were randomly picked and from this mukim, we selected two villages each as our source population. Then

Table 1. The characteristics of community dwelling elderly in Pasir Puteh, Kelantan (n = 600)

Characteristics	Frequency (%)
Age (years)	70.26 (7.3) ^a
60 – 69	317 (52.8)
70 – 79	215 (35.9)
≥ 80	68 (11.3)
Sex	
Male	249 (41.5)
Female	351 (58.5)
Ethnic	
Malay	586 (97.7)
Chinese	5 (0.8)
Siamese	9 (1.5)
Household income (RM)	300.00 (300.00) ^b
Level of education	
No formal education	
Primary school	265 (44.2)
Secondary school	259 (43.1)
Higher education	72 (12.0)
Marital status	
Not-married	4 (0.7)
Married	369 (61.5)
Divorce/Widow	227 (37.8)
Living arrangement	
Alone	58 (9.7)
Spouse	110 (18.3)
Children/grandchildren/friends	428 (71.3)
Institutions/ <i>pondok</i>	4 (0.7)
Occupational status	
Unemployed	425 (70.8)
Self-employed	114 (19.0)
Employed	20 (3.3)
Retired	41 (6.8)
Dentate status	
Dentate	229 (38.2)
Edentulous	371 (61.8)

^aMean (SD); ^bMedian (IQR)

the name of the elderly from these four villages where retrieve from a local authority (penghulu/local leader) and the participants was randomly selected after inclusion and exclusion criteria were applied. In the present study, we include all Malaysian citizens and those with mental disorders and cannot respond to question ask were excluded.

The sample size was calculated before the study using a single proportion formula, which gives 600 subjects to determine the prevalence of edentulous. After we got informed consent, the socio-demographic characteristics of the respondents were collected using a guided questionnaire and followed by an intraoral examination. A single trained researcher collected all data. The researcher determined the edentulous state of the elderly as the outcome of the measurement.

Data obtained was analyzed using IBM SPSS version 22.0 license under the institution. Univariable and multivariable regression analysis was performed to determine the associated factors. All clinically important variables with a p-value < 0.25 derived from simple regression analysis were further analyzed using multiple logistic regression. Interaction between significant independent variables was checked, and we performed the multicollinearity test to get the best fit model.

RESULTS

The mean age of respondents in the present study was 71.5 years (SD = 7.51) which ranges from a 60-year-old to a 95-year-old. Most of them are; female (58.5%), married (61.5%) and staying with family

members (71.3%). The prevalence of edentulous found was 61.8% (95% CI: 58.3, 66.2), and 77.1% of the total number of edentulous (n = 371) wearing removable dentures (Table 1). They are in poor categories with 96.7% not working and 99.3% belong to low-level education.

Table 2 shows the results of the logistic regression analysis exploring the factors associated with edentulism. Age, level of education, last dental visit, fear of dental treatment, and denture wearing status were found to be associated with edentulism. The odds of the elderly with formal education is 0.59 (95% CI = 0.25: 0.67) lower to become edentulous than those with no formal education. The elderly who visited a dentist within the past 3 years have lower odds (0.93; 95% CI = 0.07: 0.37) of being edentulous compared to those who never visit a dentist at all. The odds of elderly who fear of dental treatment as being edentulous were lower (OR = 0.27; 95% CI = 0.15: 0.48) than those who were not feared of any dental treatment. The elderly aged 80 years and above and middle age group (70 - 79 years old) have higher odds of being edentulous about (1.70; 95% CI = 1.05: 2.78) and 2.63 (95% CI = 1.17: 5.91) compared to younger old (60 to 69 years) respectively. Denture wearer had 15.71 times higher odds of being edentulous compared to no denture wearer (95% CI = 9.76: 25.28).

DISCUSSION

The present study shows that the mean age (SD) of respondents was not differed from reporting Malaysia's life expectancy of 75 years old (world population review, 2019). This is slightly higher than the mean age of 63.2 (9.6) years old among Negeri Sembilan (Malaysia) elderly by Rosli *et al.* (2018) and Shamdol *et al.* (2008) finding among elderly in Kota Bharu (Kelantan, Malaysia) which is 72.3 (8.28) years old. However, this life expectancy is considered low as compared to other developed countries such as Japan (84.1), United Kingdom (81.9), and a neighbor country; Singapore (83.5), Brunei (77.6) but higher than Indonesia (69.6) (World Population Review, 2019). The increase in life expectancy around the globe has been reported before by the United Nations and the number will increase three times by the year 2050 (United Nations, 2017).

The prevalence of edentulous in the present study was high (61.8%) compared to Shamdol *et al.* (2008) which is 55.9% among the elderly in Kota Bharu and 18.3% of Negeri Sembilan elderly by Rosli *et al.* (2018). Comparing to other global studies, present finding was also high compared to Indonesia (28.9%) by Pengpid and Peltzer (2018), and other countries such as Finland (13.4%), Brazil (32.3%), Philippines (14.6%), India (13.0%) (Tyrovolas *et al.*, 2016), and 29.6% in New Zealand (Thomson, 2012). The main reason for this finding was unknown. Cultural diversity which shaped up food consumption, especially sugar in early consumption at an early age might contribute to this present finding as reported by Abdullah, Teo, and Foo (2016) which shows an unhealthy sugar consumed among Kelantanese (Abdullah, Teo, and Foo, 2016). Besides, the availability and accessibility of oral health care services to address the needs of dental treatment during the early stage of dental diseases also play a role in increasing the prevalence of edentulous among the elderly as suggested before by Pengpid and Peltzer (2018).

The present study also found a significant association between age and edentulism. Aging has always been linked to edentulism; a total loss of natural teeth, which is mainly attributed to dental diseases such as caries and periodontal disease. Several other studies elsewhere also have determined similar results (Petersen and Yamamoto, 2005, Kandelman *et al.*, 2008, Guiglia *et al.*, 2010, Nayar *et al.*, 2013). A previous study by Shamdol *et al.* (2008) shows that the older old age group had 4 times higher at odds of being edentulous compared to those in younger age groups. As suggested by Warren *et al.* (2002), tooth loss will continue to occur at very old age due to periodontal attachment loss. In contrast, according to Fure (2003), dental caries and its sequel are the most frequently associated with tooth loss because of tooth extraction (60%) compared to only 35% causes of periodontal disease in later stages of life.

In the present study, we also noted that the elderly with formal education were less likely to become edentulous compared to those with no formal education. Other authors (Adams *et al.*, 2003; Gilbert and Shelton, 2003; Islas-Granillo, 2011; Mitchell *et al.*, 2013) also reported the same finding. According to Thorstensson and Johansson (2010), elderly with higher levels of education can decide for better oral health status and therefore would keep their natural teeth throughout life. Exposure to at least quality primary education (UN, 2008) would probably increase the knowledge of basic oral health practice and skills which

Table 2. Factors associated with edentulous among community dwelling elderly (n = 600)

Characteristics	Crude OR (95% CI) ^a	Adj OR (95% CI) ^b	p-value ^b
Age (year)			
60–69	1.00	1.00	
70–79	2.30 (1.59, 3.33)	1.70 (1.05, 2.78)	0.089
≥ 80	3.60 (1.92, 6.74)	2.63 (1.17, 5.91)	0.038
Sex			
Male	1.00	-	
Female	2.62 (1.87, 3.68)		
Level of education			
No formal education	1.00	1.00	
Formal education	0.33 (0.23, 0.47)	0.41 (0.25, 0.67)	0.002
Marital status			-
Not married	1.00		
Married		0.49 (0.34, 0.70)	
Occupational status			-
Not working	1.00		
Working	0.51 (0.35, 0.76)		
Transportation			-
No	1.00		
Yes	0.67 (0.46, 0.99)		
Last dental visit			
Never	1.00	1.00	
≤ 3 year	0.40 (0.21, 0.73)	0.16 (0.07, 0.37)	< 0.001
> 3 years	1.79 (1.06, 3.00)	0.70 (0.37, 1.35)	0.380
Fear to dental treatment			
No	1.00	1.00	
Yes	0.28 (0.18, 0.43)	0.27 (0.15, 0.48)	< 0.001
Perceived oral health status			
Poor			
Fair	1.00		
Good	2.53 (1.00, 6.42)		
	4.06 (1.81, 9.11)		
Perceived treatment needs			
No	1.00		
Yes	0.70 (0.50, 0.97)		
Denture wearing status			
None	1.00	1.00	
Wearer	14.15 (9.41, 21.28)	15.71 (9.76, 25.28)	< 0.001

^a simple logistic regression; ^b multivariable logistic regression; Model is reasonably fits with no interaction and multicollinearity detected. Model assumptions are met. Hosmer-Lemeshow goodness-of-fit, $\chi^2 = 5.386$, $df = 7$, $p = 0.613$, area under the curve = 0.882

later improve the oral hygiene care, and this would prevent the likelihood of being edentulous at the other end of one age.

Regular dental attendance will help in maintaining good oral health and oral hygiene, including preserving the existing tooth among the elderly (Thomson *et al.*, 2010). Li *et al.* (2011) reported that having a regular dental visit at least annually since childhood will increase a better dentition for a person of their old age. Professional advice for a regular dental visit once or twice a year has been proven can prevent oral diseases. According to Dolan *et al.* (2005), access to dental care alone will have a major effect on determining the oral health status of the elderly.

Fear of dental treatment was found to be a protective effect of becoming edentulous. It was reported that regular dental attendees, especially among the elderly, were found to reduce fear toward dental treatment (Pohjola *et al.*, 2007). However, because of the few options of treatment left during their visit at this later stage, most of them come for tooth extraction (Seman *et al.*, 2007). Compared to the elderly who avoid visiting a dentist because of fear, usually, their remaining tooth was found to be in very poor conditions (Pohjola *et al.*, 2007; Meng *et al.*, 2007).

It is well known that denture wearers were high among the edentulous elderly (Esan *et al.*, 2004; Shah *et al.*, 2004). The same finding was also been noted in the present study. It was reported that wearing a denture will increase oral health-related quality of life among the elderly

(Shamdol *et al.*, 2008). It improves the ability to chew various types of food and become the main reason why the elderly wearing it (Prakash *et al.*, 2012; Shigli and Hebbal, 2012). However, poor denture hygiene may cause problems such as denture stomatitis and Candida colonization on the mucosal surfaces of the close-fitting area (Kulak-Ozkan *et al.*, 2002; Nevalainen *et al.*, 2004). Therefore, both good denture fabrication and oral hygiene, maintaining is important among the elderly to eliminate the associated problems (De Marchi *et al.*, 2012).

CONCLUSIONS

The prevalence of edentulism among elderly living in Pasir Puteh was high which is 62.3 % (95% CI = 58.3, 66.2). It was shown that an increase in age, no formal education, last dental visit, dental fear, and wearing a denture is associated with edentulism.

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REFERENCES

- Abdullah N F, Teo P S, Foo L H (2016). Ethnic Differences in the Food Intake Patterns and Its Associated Factors of Adolescents in Kelantan, Malaysia. *Nutrients*. 8, 551
- Adams C, Slack-Smith L, Larson A, O'Grady M (2003). Edentulism and associated factors in people 60 years and over from urban, rural and remote Western Australia. *Australian Dental Journal*.; 48(1): 10-4.
- Amiri M, Abdul Majid H, Hairi F M, Thangiah N, Bulgiba A, Su T T (2014). Prevalence and determinants of cardiovascular disease risk factors among the residents of urban community housing projects in Malaysia. *BMC Public Health* 2014, 14(Suppl 3): S3
- De Marchi R J, Hugo F N, Hilgert J B, Padilha D M P (2012). Association between number of teeth, edentulism and use of dentures with percentage body fat in south Brazilian community-dwelling older people. *Gerodontology*. 29(2): e69-e76.
- Department of Statistics Malaysia (DSM) (2018). Malaysian census 2018. url: <https://www.mycensus.gov.my> (access on 20 May 2019)
- Department of statistics Malaysia (DSM) (2018a). Abridged life tables, Malaysia, 2016-2018. url: <https://www.dosm.gov.my/v1/index.php?r=column/pdfPrev&id=aDV6TWxoU0NINVBYN1hXMIYOL2Jadz09> (access on 20 May 2019)
- Dolan T A, Atchison K, Huynh T N (2005). Access to dental care among older adults in the United States. *Journal of Dental Education*. 69(9): 961-74.
- Esan T A, Olusile A O, Akeredolu P A, Esan A O (2004). Socio-demographic factors and edentulism: the Nigerian experience. *BMC oral health*. 4(1):3.
- Fure S (2003). Ten-year incidence of tooth loss and dental caries in elderly Swedish individuals. *Caries Res* ; 37(6): 462-9.
- Gilbert G H, Shelton B J (2003). Social determinants of tooth loss. Health services research. 38(6p2):1843-62
- Islas-Granillo H, Borges-Yapñez S, Lucas-Rincón S, Medina-Solis C, Casanova-Rosado A, Márquez-Corona M (2011). Edentulism risk indicators among Mexican elders 60-year-old and older. *Arch of Gerontology and Geriatrics*. 53(3): 258-62.
- Jabatan Perkhidmatan Awam Malaysia (JPA) (2016). Malaysia National Blue Ocean Strategy for Public Sector. <http://www.mpc.gov.my/wp-content/uploads/2016/08/KPPA-for-APO-9Aug-2016-TKPPA-DATUK-JALIL.pdf> (access on 20 May 2019)
- Kandelman D, Petersen P E, Ueda H (2008). Oral health, general health, and quality of life in older people. *Spec Care Dentist*. 2008 Nov-Dec; 28(6): 224-36
- Kulak-Ozkan Y, Kazazoglu E, Arkan A (2002). Oral hygiene habits, denture cleanliness, presence of yeasts and stomatitis in elderly people. *Jour of Oral Rehab*. 29(3): 300-4.
- Li K Y, Wong M C, Lam K F, Schwarz E (2011). Age, period, and cohort analysis of regular dental care behavior and edentulism: A marginal approach. *BMC oral health*.11(1): 9.
- Malaysia Ministry of Health (MOH) (1997). Pelan Tindakan Program Kesihatan Warga Tua, 27 Mac 1997. url: https://www.mah.se/upload/FAKULTETER/OD/Avdelningar/who/WPRO/Malaysia/data/oral_healthcare_for_the_elderly_in_malaysia.pdf (access on 20 May 2019)
- Malaysia Ministry of Health (MOH) Dental Services Division (1993). Garispanduan Pelaksanaan Program Geriatrik Perkhidmatan Pergigian Malaysia, 1993. url: https://www.mah.se/upload/FAKULTETER/OD/Avdelningar/who/WPRO/Malaysia/data/oral_healthcare_for_the_elderly_in_malaysia.pdf (access on 20 May 2019)
- Meng X, Heft M W, Bradley M M, Lang P J (2007). Effect of fear on dental utilization behaviors and oral health outcome. *Comm Dent and Oral Epidemiol*. 35(4): 292-301
- Mitchell J, Bennett K, Brock-Martin A (2013). Edentulism in high poverty rural counties. *The Journal of Rural Health*. 29(1): 30-8.
- Naidu B M, Mohd Yusoff M F D, Abdullah S, Musa K I, Yaacobi N M, Mohamad M S, Sahril N, Aris T (2019). Factors associated with the severity of hypertension among Malaysian adults. *PLoS ONE* 14(1): e0207472.
- Nayar S S, Bhuminathan J, Nisha S, Rameshnd K G, Sujitha (2013). Edentulism and Public Awareness -An Epidemiological Study. *Biomedical & Pharmacology Journal*. 6(1), 77-81
- Nevalainen M, Närhi T, Ainamo A (2004). A 5-year follow-up study on the prosthetic rehabilitation of the elderly in Helsinki, Finland. *Journal of Oral Rehab*. 31(7): 647-52
- Pengpid S, Peltzer K (2018). The prevalence of edentulism and their related factors in Indonesia, 2014/15; *BMC Oral Health*; 18: 118
- Petersen P E, Yamamoto T (2005). Improving the oral health of older people: the approach of The WHO Global Oral Health Programme. *Community Dent Oral Epidemiol* 2005; 33: 81-92 Blackwell Munksgaard, 2005
- Pohjola V, Lahti S, Vehkalahti MM, Tolvanen M, Hausen H (2007). Association between dental fear and dental attendance among adults in Finland. *Acta Odontologica*. 65(4): 224-30.
- Prakash N, Kalavathy N, Sridevi J, Premnath K (2012). Nutritional status assessment in complete denture wearers. *Gerodontology*. 29(3): 224-30.
- Rosli T I, Mun C Y, Kadir R A, Abdul Hamid T A (2018). Oral status and its association with oral health-related quality of life in community-dwelling older adults. *Malaysian Journal of Public Health Medicine* 2018, Special Volume (1): 107-114
- Samson H, Strand G V, Haugejorden O (2008). Change in oral health status among the institutionalized Norwegian elderly over a period of 16 years. *Acta Odontologica Scandinavica*; 66(6). 368-373
- Seman K, Abdul Manaf H, Ismail A (2007). Dental caries experience of elderly people living in "Pondok" in Kelantan. *Arch of Orofacial Sci*.2:20-5.
- Shah N, Parkash H, Sunderam K (2004). Edentulousness, denture wear and denture need of Indian elderly-a community-based study. *Journal of Oral Rehab*. 31(5): 467-76.
- Shamdol Z, Ismail N M, Hamzah N T, Ismail A R (2008). Prevalence and Associated Factors of Edentulism among Elderly Muslims in Kota Bharu, Kelantan, Malaysia. *Journal of the Islamic Medical Association of North America*. 40(4)
- Shigli K, Hebbal M (2012). Does prosthodontic rehabilitation change the eating patterns among completely edentulous patients? *Gerodontology*. 29(1): 48-53.
- Thomson W, Williams S, Broadbent J, Poulton R, Locker D (2010). Long-term dental visiting patterns and adult oral health. *Journal of Dental Research*.89(3): 307-11.
- Thomson W M (2012). Monitoring Edentulism in Older New Zealand Adults over Two Decades: A Review and Commentary; *Int J of Dentistry*; Vol. 2012, 4 pages
- Thorstenon H, Johansson B (2010). Why do some people lose teeth across their lifespan whereas others retain a functional dentition into very old age? *Gerodontology*. 27(1): 19-25.
- Tyrovolas S, Koyanagi A, Panagiotakos D B, Haro J M, Kassebaum N J, Chrepa V, Kotsakis G A. (2016). Population prevalence of edentulism and its association with depression And self-rated health. *Scientific Reports*; 6, Article number: 37083.
- United Nation (2008). The Millennium Development Goals Report 2008; GOAL 2: Achieve universal primary education. In: UNDP editor. Committing to action: Background note by the Secretary-General for the High-level Event, *United Nations, New York*, 25 September 2008; MDG Monitor 2008
- United Nations (2017). World Population Ageing 2017. https://www.un.org/en/development/desa/population/publications/pdf/ageing/WPA2017_Highlights.pdf
- Warren J J, Watkins C A, Cowen H J, Hand J S, Levy S M, Kuthy R A (2002). Tooth loss in The very old: 13-15-year incidence among elderly Iowans. *Comm Dent Oral Epidemiol*. 30(1):29-37.
- World Population Review (2019). Malaysia Population 2019. <http://worldpopulationreview.com/countries/malaysia-population/> (access date: 9/7/2019)