

PREVALENCE OF EDENTULOUSNESS IN SOUTHERN JORDAN

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ABSTRACT

This study was undertaken to determine tooth loss, and associated factors in older individuals in southern Jordan. A cross-sectional study was done by means of an oral examination and questionnaire in Aqaba city. Data were collected from seven hundred and fifty subjects of both sexes (60% were females), aged 60 and above. Full records were obtained including demographic data, medical and dental histories, as well as oral hygiene practices.

26.7% of the subjects under study were totally edentulous while none was found with a full dentition or 28 teeth. Edentulousness was significantly associated with increasing age, female gender, living in rural area, low level of education, lower socioeconomic status, presence of systemic diseases, smoking and lack of regular oral hygiene practice. ($p < 0.05$). Factors that influence tooth loss may have implications for oral health care planners. Any modifications in these factors could reduce the number of missing teeth and improve oral health status, thus improving quality of life for the elderly.

Key words: prevalence, tooth loss, elderly, edentulousness, Jordan.

INTRODUCTION

The age distribution of the world's population is changing. The proportion of older people may continue to rise worldwide and faster than of any other age group¹ posing tremendous challenges in caring for the ageing population.

As people advance in age, their susceptibility to chronic and life-threatening diseases as well as acute infections increases, exacerbated by compromised immune systems.² Cancer, cardiovascular diseases, diabetes, infections and poor oral health, most notably tooth loss and severe periodontal conditions, are more prevalent in this age group. Loss of teeth not only adversely affects dietary intake with all its consequences but also leads to disabilities and psychological problems; the person becomes uncomfortable socialising, loses self-esteem and begins a spiral of decline. Therefore, tooth loss is considered to have a negative effect on the quality of life and health status.³

In many developing countries, access to oral health services is limited and teeth are often left untreated or are extracted because of pain or discomfort. Throughout the world, losing teeth is still seen by many people as a natural consequence of ageing. While in some industrialized countries there has been a positive trend of reduction in tooth loss among adults who try to keep natural teeth for long period.⁴

Although the prevalence of edentulousness and the frequency of missing teeth have markedly decreased in developed countries during the last decades,⁵ total tooth loss is still a major problem in people aged 65 or older, and the condition needs to be minimized.

Loss of teeth is mainly attributed to dental caries and periodontal diseases. Factors leading to tooth extraction are not, however, always dental in origin. Edentulousness and a small number of remaining teeth are associated with low level of education, low family income, and rural domicile.^{7,8} In some cases, people have preferred extractions to conservative treat-

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ment due to the long distance between home and dental services.⁷ The influence of these socio-economic and socio-demographic factors on edentulousness has been well documented.^{7,8} Other factors include age and gender. Although ageing itself does not cause tooth loss, the frequency of dental and general diseases and functional disabilities increase with advancing age, which may predispose older people to edentulousness.⁹

Epidemiological data on oral health and its related issues are very important in order to plan for future oral health care provision. Unfortunately, no recent data are available on the prevalence of edentulousness in Jordan, hence the current study was undertaken to determine the level of edentulousness and associated factors in older individuals (60+ years) in the South of Jordan and then to implement community-based strategies that aim to maintain healthy teeth for life to improve quality of life for elderly individuals.

METHODOLOGY

This study was conducted at Princess Haya Bent Al-Hussein Hospital located in Aqaba City in the southern part of Jordan during the period of June- November 2006. A cross sectional survey where the data were collected by means of an oral examination and an interviewer administered questionnaire was performed.

A total of 750 subjects of both sexes, aged 60 years and above who attended the hospital as escorts to/ or visiting admitted relatives or friends in different hospital outpatient clinics or wards, were invited to participate in the study. The aims of the study were explained to the subjects and consent forms were signed.

A questionnaire was given to each subject. It included personal data such as age, gender, socioeconomic status, and medical health history. Tooth brushing habit (regular/irregular), history of smoking, level of education attained (illiterate/high school/more than high school) and place of residency (rural/urban) were also recorded. In Jordan there has not been a consensus on various socio-economic classifications because of the unstructured nature of the society. Therefore, for the purpose of this study, a standard occupational classification system designed by Office of Population Census and Surveys, London (OPCS 1991)¹⁰ was used and subjects were classified into three socioeconomic groups:

Class 1: Skilled worker e.g. professionals and managerial officers and retirees of this cadre.

Class 2: Unskilled workers e.g. artisans and traders

Class 3: Dependents. e.g. retirees of class 2, those not on pensions, house wives of class 2 cadre, students whose parents were unskilled workers.

The clinical examination was carried out by a single dentist in the dental clinic with dental mirror and probe using artificial light to count the number of teeth present according to the standard methods and criteria of the World Health Organization 1997.¹¹ Complete edentulousness was recorded if 28 teeth or more were missing.

The collected data were entered on a PC and analyzed using a standard SPSS® statistical program version 11, software (SPSS Inc Chicago Illinois, USA). Descriptive statistics were applied and Pearson Chi-square test was used to test variables. The level of statistical significance was set to 95%.

RESULTS

A total of 750 elderly subjects aged 60 and above were included in the study. Of these, 400 (53.3%) were from the urban area and 350 (46.7%) were from the rural area. There were 350 (46.7%) males and 400 (53.3%) females. Age and sex distribution is shown in Figure 1. None of the studied group was in the Class 1 (skilled worker e.g. professionals and managerial officers and retirees of this cadre), or in the high literacy group (college or university level of education). Three hundred and fifty subjects (46.7%) were free of any systemic disease, while the remaining had one or more chronic systemic illnesses.

None of the study group had an intact dentition. Persons having less than four missing teeth were 6.7% and those who had five to 10 missing teeth were 13.3%. In 80% of elderly, more than 10 teeth were missing. The overall prevalence of total edentulousness among all subjects studied was 26.7%. No subject in the age group 60 to 64 years was completely edentulous.

When level of edentulousness was compared, a statistically significant difference ($p = 0.02$) was noted between urban and rural elderly. Complete edentulousness was more prevalent in urban (75%) compared with the rural elderly (25%) while all the subjects living in rural areas had lost four teeth or more. Total edentulousness was significantly more frequent in females (53.3%) when compared to males (46.7%) ($p = 0.00$) (Table 1). Seventy five percent of female subjects had lost fifteen teeth or more compared to 57.2% of males. Moreover, complete edentulousness was shown to increase with increasing age ($p = 0.00$).

Edentulousness was significantly associated with socio-economic status ($P < 0.05$). It was found that people in class three (lower socio-economic) group had a higher number of missing teeth (66.7%), than those in class two (higher socio-economic) group (33.3%). Impact of literacy was more direct than socioeconomic status on level of edentulousness ($P < 0.05$). Lower literacy level was found to be associated with higher number of missing teeth (Table 2). In contrast, elderly in the high literacy group had fewer numbers of missing teeth and none of these subjects had lost all of his teeth.

It is worth noting that smoking was significantly associated with edentulousness ($P < 0.05$). Most of the subjects under study (66.7%) were either previous or current smokers. What's more, none of the subjects who never smoked had lost all of his teeth compared to

26.7% of subjects who were either ex-smokers or are currently smoking. Most of the study population had one or more systemic diseases (53.3%). Subjects with good health lost fewer teeth than those who were medically compromised and the difference between the two groups was statistically significant ($P = 0.00$).

Edentulousness was associated with lack of oral hygiene practice ($P < 0.05$). Oral hygiene activity was not at all practiced by the majority of elderly subjects (60%). All of the totally edentulous subjects did not brush their teeth regularly. Never the less, all subjects who did not practice tooth brushing or any other oral hygiene method lost more than eleven teeth. The urban-rural difference in oral hygiene practice was statistically significant ($P < 0.05$). While almost 62.5% of urban elderly brushed their teeth regularly, only

TABLE 1: RELATIONSHIP BETWEEN EDENTULOUSNESS AND AGE, GENDER AND LOCATION
(ALL FIGURES IN %, FIGURES IN PARENTHESIS ARE THE NUMBER OF SUBJECTS)

	Age group (years)		Gender		Location	
	60-64	65+	Female	Male	Rural	Urban
≤ 4 teeth missing	20.0	0.0	12.5	0.0	0.0	12.5
5-10 teeth missing	0.0	20.0	0.0	28.6	14.3	12.5
11-15 teeth missing	20.0	10.0	12.5	14.3	14.3	12.5
> 15 teeth missing	60.0	30.0	50.0	28.6	57.1	25.0
Completely edentulous	0.0	40.0	25.0	28.6	14.3	37.5
Total	33.3 (250)	66.7 (500)	53.3 (400)	46.7 (350)	46.7 (350)	53.3 (400)

$\chi^2 = 60.00$, $P = 0.00$; $\chi^2 = 36.16$, $P = 0.00$; $\chi^2 = 26.12$, $P = 0.00$

TABLE 2: RELATIONSHIP BETWEEN EDENTULOUSNESS AND SOCIOECONOMIC STATUS, LITERACY LEVEL, SYSTEMIC HEALTH, SMOKING AND ORAL HYGIENE PRACTICE
(ALL FIGURES IN %, FIGURES IN PARENTHESIS ARE THE NUMBER OF SUBJECTS)

	Systemic		Oral hygiene		Literacy level		Socioeconomic status		Smoking history		
	Healthy	None	Yes	No	Illiterate	High school	Low	Medium	Never	Ex-	Current
≤ 4 teeth missing	0.0	12.5	16.7	0.0	7.7	0.0	0.0	20.0	0.0	0.0	33.3
5-10 teeth missing	0.0	25.0	33.3	0.0	7.7	50.0	0.0	40.0	20.0	14.3	0.0
11-15 teeth missing	0.0	25.0	16.7	11.1	15.4	0.0	20.0	0.0	20.0	14.3	0.0
> 15 teeth missing	57.1	25.0	33.3	44.4	38.5	50.0	60.0	0.0	60.	14.3	66.7
Completely edentulous	42.9	12.5	0.0	44.4	30.8	0.0	20.0	40.0	0.0	57.1	0.0
Total	46.7 (350)	53.3 (400)	40.0 (300)	60.0 (450)	86.7 (650)	13.3 (100)	66.7 (500)	33.3 (250)	33.3 (250)	46.7 (350)	20.0 (150)

$\chi^2 = 66.30$, $P = 0.00$; $\chi^2 = 73.61$, $P = 0.00$; $\chi^2 = 34.62$, $P = 0.00$; $\chi^2 = 105.00$, $P = 0.00$; $\chi^2 = 119.05$, $P = 0.00$

14.3% in rural area did so. A lower percentage of elderly women (37.5%) brushed their teeth compared with men (42.9%), however the difference was not significant, ($P > 0.05$). It was observed that age had the most significant impact on oral hygiene practice.

DISCUSSION

The world's population is ageing, and they are maintaining many of their natural teeth. Studies have shown that if older people have teeth, they tend to utilize dental services to a similar extent as younger cohorts.¹²

Tooth loss is a handicapping condition and the level of tooth loss in a population is a reflection of cultural values as well as the availability, accessibility, cost and appropriateness of preventive services and treatment. Changes in value systems, delivery systems, health care provider behaviors and individuals' appreciation of teeth may reduce tooth loss.²

Jordan is a small country with very limited natural resources and an estimated population of around seven million people. In Jordan as in the rest of the world, the lower the person's socioeconomic status, the more likely the absence of preventive measures will be taken. An unfounded belief by families and health-care practitioner that tooth loss is inevitable during aging, and poor access to dental service complete the picture. In a review of oral health in Jordan, Taani¹³ concluded that, despite the fact that improvements in oral hygiene, gingival status and dental caries, have been suggested in Jordanian children recently, more efforts are needed to achieve the level of dental health in developed countries.

Up to date, epidemiological data available in Jordan has attempted to describe the oral health status of mainly younger populations, however, the available data regarding oral health status of Jordanian elderly were scarce.^{13,14} Unfortunately, Jordan has no regular oral health recording system that provides information about the elderly age cohorts. In addition, no comparable studies were undertaken regarding prevalence of edentulousness, therefore it is not possible to make any conclusions about longer term changes in the oral health status of the Jordanian elderly.

The sample in this study was chosen randomly since Princess Haya Bent Al-Hussein Hospital located in Aqaba city is the only public hospital in the far South area of Jordan, where people come to it seeking

different medical and dental consultations and treatments. Thus confidence can be construed from this study especially in the absence of national listing of all Jordanian elderly which is not yet available. Therefore, this study may serve as a pioneer study for further studies in the area or the country in general.

Reasons for tooth loss were not investigated in this study, however Quteish¹⁵ showed that dental caries was responsible for the greatest tooth loss in Jordanian patients below 40 years of age, while periodontal problems were the most common cause above 40 years. On the other hand, Haddad et al¹⁶ reported that periodontal disease was the main cause of tooth loss in Jordan.

In the present study, the overall prevalence of edentulousness among all subjects studied was 26.7%. However, in a study by Hamasha et al¹⁴, with a random sample of 509 Jordanian adults (18-77 years), subjects in older age groups had an average of 11.2 teeth remaining, while it was 13.7 in this study. The number of retained teeth in Jordanian adults was found to be close to that of American 17 and the Finnish adults.¹⁸

Prevalence of edentulousness reported in this study was 26.7%, which is quite similar to studies done in different countries⁴ for similar age groups: e.g. Madagascar (25%), USA (26%), Denmark (27%), Poland (25%), Romania (26%), Indonesia (24%) and Singapore (21%). However, edentulousness in the present study was higher than reports from Gambia (6%), Egypt (7%), Austria (15%), Iceland (15%), Sri Lanka (17%)¹⁹, Hungary (19.8%)²⁰, Lebanon (20%), Lithuania (14%), Slovenia (16%), India (19%), Thailand (16%), Cambodia (13%) and China (11%). Moreover, prevalence of edentulousness was lower than reports from Canada (58%), Saudi Arabia (31-46%), Albania (69%), Bosnia and Herzegovina (78%), Bulgaria (53%), Finland (37%)²¹, Slovakia (44%), United Kingdom (46%), Germany (34%)²², Malaysia (57%) and Brazil (68%)²³ Data from studies included in the WHO Global Oral Data Bank (GODB) however, are not necessarily representative of a national situation for a given country since many studies have been done long time ago.

For the elderly subjects aged less than 65 years in this study, none of the subjects was completely edentulous. In addition, complete edentulousness was shown to increase with increasing age ($p = 0.00$). In a multivariate analysis of oral health survey conducted on the elderly in the UK, it was found that age had the largest

effect on level of edentulousness.²⁴ The role of age in edentulousness may partly be of biological origin, as older people suffer more from various diseases that also affect oral health compared with younger age groups. Additionally, the impact of age may be social, as oral health is less valued by older persons compared with younger people. Association of advanced age with edentulousness is also in agreement with other studies.^{14,19,21,25-27}

In this study there was a statistically significant gender difference where females lost more teeth than males. Female gender has been noted to be a risk factor for edentulousness in elderly cohorts in several studies.^{19,21,28,29} The role of gender may be biological and it may be connected to osteoporosis and estrogen deficiency among women which have been shown to increase periodontal diseases and tooth loss.³⁰ Other studies on the other hand showed that women had fewer teeth missing than men.^{14,31} Moreover, other studies^{25,26} found that gender variation was not related to edentulousness.

It was found that people in lower socio-economic group had a higher number of missing teeth (66.7%), than those in higher socio-economic group (33.3%). Edentulousness was significantly associated with socio-economic status ($P < 0.05$). This is expected since Jordan is considered a poor country where people give oral health care a low priority in their lives and cannot afford expensive dental treatment. However, it is possible that it reflects the philosophy of the dentist, who may prescribe and carry out more extractions rather than attempt to conserve the teeth of elderly persons. The impact of socio-demographical factors is a complex phenomenon including several issues such as attitudes and local culture, financial means to seek care and the availability of care.³² It has also been shown in the United States that subjects from lower social classes do not get treatment proposals similarly to those with better economy.³² Studies have long established a gradient relationship between socio-economic status and health.³³ Hunter and Arbona³⁴ found that environmental influences such as family poverty, and inadequate diet are of paramount importance in the cause of tooth loss.

The majority of this study population was unfortunately illiterate. Results showed that the level of education had an impact on edentulousness. The findings of the present study are in conformity with different studies. Haikola et al²¹ showed that education, as

one indicator of socio-economical status, had the most powerful impact on edentulousness. Education may associate with edentulousness, however, through socio-demographical status. Subjects having lower income are less educated and have lower esteem for their oral health. Shah et al²⁷ also found that persons with no qualification were nine times more likely to be edentulous than persons with higher qualification. In a study reported from Germany, Nitschke³⁵ found that low education level was associated with increased level of edentulousness. Esan et al²⁶ showed that the likelihood of retaining teeth in the mouth becomes higher as the educational level increases. Brodeur et al³⁶, showed that the proportion of completely edentulous adults in Quebec-Canada decreased from 26% in 1980 to 20% in 1993 due to improved income and educational status. The association between edentulousness and educational status may be as a result of improved dental health awareness, increased utilization of oral health facilities, proper oral hygiene habits acquired during learning process and peer group influence.

Oral hygiene activity was not widely practiced by the majority of elderly subjects (60%). All of the totally edentulous subjects do not brush their teeth regularly. Never the less, all the subjects who do not practice tooth brushing or any other oral hygiene practice lost more than eleven teeth. Similar to the results of Shah et al²⁷, edentulousness was associated with lack of oral hygiene practice ($P < 0.05$). The urban-rural difference in oral hygiene activity was statistically significant. While a lower percentage of elderly women brushed their teeth compared with men, however the difference was not significant. Moreover, most of the subjects in the lower socioeconomic class do not brush their teeth regularly compared with the higher socio-economic class. These results are in agreement with a study by Shah et al.²⁷

Association of smoking with edentulousness is in agreement with earlier findings³⁷ It is known that tobacco-smoking is deleterious to periodontal health.^{8,38,39} When compared with subjects without a smoking habit, smokers also tend to have other negative health behaviors such as a poorer standard of oral hygiene and less thorough tooth brushing practices, and are more likely to choose extraction as an acceptable dental treatment.³⁸ They also show more accumulation of plaque and calculus on tooth surfaces. Among patients with periodontal disease, smokers outnumber non-smokers and have more periodontally affected teeth and sites.³⁹ Female smokers have a lower number of

remaining teeth and are more often edentulous than female non-smokers.³⁷ In the present study, tobacco-smoking and systemic diseases were recorded merely as present or absent. Disease severity and duration, number of packs of cigarettes per day, and time association between tooth loss and disease diagnosis remained unknown, thus limiting further analysis and application of these results.

In this study, a statistically significant difference ($p = 0.02$) was noted between urban and rural elderly when level of edentulousness was compared. Complete edentulousness was more prevalent in urban (75%) compared with the rural elderly (25%) while all the subjects living in rural areas had lost four teeth or more. However Hamasha et al¹⁴, in their study in the north of Jordan, found difference in missing teeth between rural and city dwellers, which they attributed to the fact that Jordanians residing in small towns and cities are homogeneous, and can easily move from towns to cities, and services in small towns are available. In India Shah et al²⁷, found a gross disparity in oral health care provision between the urban and the rural population. Accordingly, tooth loss was found to be widely prevalent in the study population – more in rural than in the urban. Haikola et al²¹ also found a higher prevalence of edentulousness in the northern rural region of Finland than the southern, semi-urbanized area.

It is well known that diseases and medications are more common among older than younger persons and several drugs contribute to oral health problems by affecting saliva secretion. Most of our study groups were having one or more systemic diseases (53.3%). Subjects in good health had lost fewer teeth than medically compromised subjects and the difference between the two groups was statistically significant ($P = 0.00$). This is similar to Haikola et al²¹ who found that edentulousness as an indicator for poor oral health was associated with cardiovascular diseases. This result is in agreement with the results of Hung et al⁴⁰, who showed that incidental tooth loss was significantly associated with elevated risk for peripheral arterial disease. The connection of cardiovascular diseases with oral health and tooth loss has recently been extensively discussed^{40,41} and has shown to be a complex phenomenon. Moreover, investigating association of edentulousness with systemic factors in elderly people living at home, Xie and Ainamo²⁵ concluded that, in elderly people, history of bone fracture, tobacco-smoking, asthma, and advanced age were found to be related

to edentulousness. These associations indicate the effect of systemic condition on edentulousness.

CONCLUSION

Within the limitations of this study's design, prevalence of edentulousness for subjects under study was 26.7%, but does not show the entire picture of edentulousness for older adults in Jordan as only persons living in the southern parts were included. Edentulousness was positively associated with high age, female gender, living in rural area, low level of education, lower socioeconomic status, presence of systemic diseases, smoking and lack of regular oral hygiene practice. Thus modifications in these factors could reduce the number of missing teeth and improve oral health status, and eventually quality of life for the elderly.

A random sample of the entire population is required to provide a representative view for any country because oral health status was influenced significantly by factors such as age, domicile, educational and social levels, and income. Longitudinal follow-up studies are also needed to evaluate the development of edentulousness in the elderly population in southern part of Jordan.

There is a great challenge to the dental profession to teach people how to care for their teeth and avoid needless destruction of dentition by dental caries and periodontal disease. Moreover, development of government policy in terms of preventive programs and health education, as well as organization of care services is mandatory.

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