Mandibular Bone Osteoporosis and Oral Health-Related Quality of Life in the Elderly

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Abstract

Osteoporosis is a skeletal disease that is characterized by low bone density and the deterioration of micro architectural bone cells that cause an imbalance in bone formation by osteoblasts and bone resorption by osteoclasts. Mandibular bone osteoporosis can be measured by the mandibular bone density index, a tool for the early detection of osteoporosis in the mandibular bone that can be used by dentists. Early diagnosis of osteoporosis can reduce failure in prosthodontics treatment. The objective of this study was to analyze the relationship between mandibular bone osteoporosis and oral health-related quality of life in elderly patients. This was a cross-sectional study with 100 elderly people as subjects. Intraoral examinations to determine the subjects' mandibular bone density index and interviews using the oral health-related quality of life questionnaire were conducted. Statistical analysis indicated that there was no significant relationship between mandibular bone osteoporosis and oral health-related quality of life in elderly patients. However, this study did show a significant association between mandibular bone osteoporosis with sex (p = 0.00) and level of education (p = 0.018).

Introduction

Indonesia is among the top five countries with the largest elderly populations in the world. According to the 2014 census, the number of elderly people in Indonesia reached 18.781 million or about 7.6% of the total population.[1] Physiologic function declines with age due to the degenerative process, which makes the elderly a vulnerable group as they are affected by degenerative diseases.[2]

Osteoporosis is a skeletal disease that is characterized by low bone density and the deterioration of micro architectural bone cells, which cause an imbalance in bone formation by osteoblasts and bone resorption by osteoclasts. The unbalanced metabolism causes bone reduction, which is characterized by bone demineralization.[2,3] Osteoporosis causes decreased bone density throughout the body, including the maxilla and mandibular bones.[3] Several studies have been conducted to determine the relationship between osteoporosis and oral dental health, and they showed a positive association between osteoporosis in the mandibular bone and systemic osteoporosis.[4]

Osteoporosis can cause changes in alveolar bone mineral content and has ten the development of periodontal disease. Manifestations of osteoporosis in the jawbone include excessive alveolar bone loss, tooth loss, chronic periodontal disease, maxillary sinus pain, and fractures. Alveolar bone resorption becomes a problem in prosthodontics because it can affect a denture's quality.[5]

Osteoporosis can be preventable and treatable, but because osteoporosis is a silent disease, many patients are not diagnosed in time to get effective care. Densitometry is the gold standard of osteoporosis examination, but the availability of the device is still limited in major cities in Indonesia. Kusdhany (2005) developed mandibular bone density index for postmenopausal women and Harman (2015) developed the mandibular density index for

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elderly men, which is considered more practical and economical and can be used as an early detection tool to screen osteoporosis patients more widely, especially in remote areas of Indonesia. Kusdhany developed the mandibular density index for Deutero-Malay postmenopausal women in Indonesia.

The index has been validated and its accuracy has been tested using densitometry as the gold standard, proving that the index has 78.9% sensitivity and 80.34% specificity. The mandibular bone density index was developed by observing several risk factors for osteoporosis, such as menopause, age, body mass index, duration of exposure to the sun, scores of daily activity, calcium intake, and history of taking birth control pills that were tailored to the Indonesian people.[6] In 2015, Harman developed a mandibular density index that can be used for men based on an analysis of the decreased index level of total blood testosterone and other risk factors for osteoporosis in men. This index has a sensitivity of 82.2% and a specificity of 62.8%. Both of these questionnaires can be used to screen patients at risk for osteoporosis so the possibility of a fracture can be prevented. Fractures in elderly patients with osteoporosis can affect their quality of life.[7]

The World Health Organization defines the quality of life as "the individual's perceptions of their position in life, in the context of cultural and value systems in which they live and in relation to their goals, expectations, standards and concern"[8]. Perceptions about how oral health conditions affect daily activities and an individual's well-being are known as oral health-related quality of life (OHRQoL).[8]

Factors associated with OHRQoL are functional, social, and physiological, and the experience of pain or discomfort.[9] There are various oral-specific health status measures, such as the Social Impacts of Dental Disease, General Oral Health Assessment Index (GOHAI), Dental Impact Profile, Oral Health Impact Profile, Subjective Oral Health Status Indicators, Dental Impact on Daily Living, Oral Impacts on Daily Performance, and the OHQoL-UK.[10]

This study used GOHAI, which was translated into the Indonesian language by Wiyasmoro in 2015 and validated with a Cronbach's alpha value of 0.728. GOHAI was assessed as better in measuring elderly people's OHRQoL compared to other measurement instruments in detecting the influence of oral health conditions.[11]

The mandibular bone index for postmenopausal women and elderly men is a new index, so no studies have focused on this index yet. This index is a screening tool for mandibular bone osteoporosis. It can be used as an early detection tool for osteoporosis by dentists so that they can create a treatment plan and prevent the treatment failure that can occur with osteoporosis, especially in prosthodontic treatment. In this study, we investigated the relationship between osteoporosis in mandibular bones and OHRQoL.

Materials and Methods

This study was approved by the Ethical Committee of the Faculty of Dentistry Universitas Indonesia. This was a cross-sectional study that was done in Depok, West Java on people over 60 years old. The subjects were selected consecutively from the inhabitants of Depok District, West Java Province, Indonesia. The inclusion criteria were elderly men and women without systemic diseases other than osteoporosis who had not under gone diet treatment. The data about the subjects' perceptions of their oral health-related quality of life were collected using the GOHAI questionnaire. This questionnaire was translated into the Indonesian language and validated by Wiyasmoro (2015) with a Cronbach's alpha coefficient of 0.728.[11]

The GOHAI questionnaire consists of 12 questions that measure a person's subjective well-being associated with his or her oral health and functional status. The questionnaire usesa1-5 scale and every question consists of five possible answers: always (1), often (2), sometimes (3), seldom (4), and never (5). The subject's total score ranges from12 to 60, and is then divided into three categories: high (57-60), medium (50-56), and low (<50).

The data about each subject's mandibular bone osteoporosis level were collected using indexes for determining mandibular bone osteoporosis in post-menopausal women and elderly men developed by Kusdhany (2005) and Harman (2015). The indexes were developed based on the results of the final model of a multivariate analysis of osteoporosis risk factors.

All participants were interviewed and subjected to dental examination. All data analysis was performed and tabulated using statistical software, and chi-square analyses were conducted to evaluate the relationship between osteoporosis in the subjects' mandibular bones and their OHRQoL.

Results

A total of 100 elderly men and women agreed to participate and completed the informed consent form. The profiles of the subjects are presented in Table 1.

Table 1. Profiles of the subjects

Variable	Number	Percentage (%)
Age (years)		
60-65	57	57
>65	43	43
Sex		
Men	31	31
Women	69	69
Education		
Low (No education, Elementary school)	53	53
High (Junior high school, Senior high school, and University)	47	47
Number of missing teeth		
0-12	73	73
>12	27	27
Osteoporosis		
Mandibular bone osteoporosis	54	54
Normal mandibular bone	46	46
GOHAI score		
Low	85	85
Medium	15	15
High	0	0

The results of the correlation analysis between oral health-related quality of life, osteoporosis in mandibular bones, and other variables are presented in Table 2, and the results of the correlation analysis between oral health-related quality of life and other variables are shown in Table 3.

According to the results shown in Table 2, mandibular bone osteoporosis and oral health-related quality of life have no significant correlation (p>0.05). Mandibular bone osteoporosis does have a significant correlation with sex (p=0.00) and level of education (p=0.018).

According to the results shown in Table 3, oral health-related quality of life and other variables such as age, sex, education level, and number of missing teeth have no significant correlation (p>0.05).

Table 2. Correlation between osteoporosis in mandibular bones and other variables.

	Total (n=100)	%	Mandibular Bone Osteoporosis				p-Value
			Mandibular Bone Osteoporosis	%	Normal Mandibular Bone	%	
Age (years)							0.083
60-65	57	57	26	26	31	31	
>65	43	43	28	28	15	15	
Sex							0.000*
Men	31	31	7	7	24	24	
Women	69	69	47	47	22	22	
Level of education							0.018*
Low	53	53	35	35	18	18	
High	47	47	19	19	28	28	
Number of missing teeth							0.625
0-12	73	73	41	41	32	32	
>12	27	27	13	13	14	14	
GOHAI score							1.000
Low	85	85	46	46	39	39	
Medium	15	15	8	8	7	7	

*Variables with significant association (p < 0.05), *Chi-square analysis

Table3. Correlation between OHRQoL and other variables

	Total (n=100)	%	GOHAI Score				p-Value
			Low	%	Medium	%	
Age (years)							0.246
60-65	57	57	51	51	6	6	
>65	43	43	34	34	9	9	
Sex							1.000
Men	31	31	26	26	5	5	
Women	69	69	59	59	10	10	
Level of education							1.000
Low	53	53	45	45	8	8	
High	47	47	40	40	7	7	
Number of missing teeth							1.000
0-12	73	73	62	62	11	11	
>12	27	27	23	23	4	4	

*Chi-square analysis.

Discussion

In this study, mandibular bone osteoporosis was not related to OHRQoL in the elderly. This is supported by previous research that found that OHRQoL has a weak correlation with tooth loss[12]. The results of this study contradict the results of another study, which reported that systemic osteoporosis has a significant impact on the quality of life.[13] These contradictory results may be due to the mindset of Indonesian society, which still considers general health as more important than oral health so that oral and dental problems receive less attention. This study showed that mandibular bone osteoporosis is related to sex and education level. Another study in the United States found that the prevalence of osteoporosis

in women is higher than in men.[14] This is supported by the theory that due to menopause, the female hormone estrogen declines earlier than male hormones do. Also, osteoporos is in men is more often caused by secondary factors, such as excessive alcohol consumption, long-term use of glucocortico steroids, and hypogonadism.

This study shows that mandibular bone osteoporosis is related to education level. Many studies have shown that socioeconomic status and education are associated with chronic diseases such as obesity, diabetes, and cancer. In 2010, a study stated that low education levels were associated with low bone mineral density (BMD) and a higher prevalence of osteoporosis in Morocco.[15] A study in China also suggested that Chinese women with higher levels of education have higher BMD values and a low prevalence of osteoporosis.[16] Behavioral factors such as poor diet, low calcium intake, and lack of physical activity are experienced more often by lower socio-economic groups with no formal education.

This study found that there was no significant relationship between age and the number of missing teeth in people with mandibular bone osteoporosis. Contrarily, previous studies have found that age has a negative correlation with bone mineral density values when bone mineral density values decrease with age.[17] The different results from our study may be due to the lack of number uniformity in the age groups of the subjects.

This study used the GOHAI questionnaire to assess the relationship between quality of life with socio-demographic factors and the number of missing teeth. According to the results, there was no significant association between OHRQoL and these factors. This is in line with other studies that have suggested that in the elderly, there is no significant relationship between quality of life status with sex, age, and educationlevel.[18,12]

Conclusion

This study showed that osteoporosis in mandibular bones was not related to the elderly's oral health-related quality of life. In addition, there was no relationship between age and the number of missing teeth with mandibular bone osteoporosis or between socio-demographic factors and the number of missing teeth with elderly oral health-related quality of life. However, this study did show a significant association between sex and level of education with mandibular bone osteoporosis.

Acknowledgements

Declaration of Interest

The authors report no conflict of interest.

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