The correlation between occurrence of dental caries and oral health-related quality of life on elderly population in Yogyakarta Special Region

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DOI: http://dx.doi.org/10.19106/JMedSci005002201808

ABSTRACT

Dental caries is the most common oral disease affecting humans. Based on Indonesia Basic Health Research in 2013, dental caries prevalence increased up to 53.2\% compared to 43.4\% in 2007. One of the two most increasing prevalence occurred in population of more than 65 years. This disease might affect oral health-related quality of life (OHRQoL) since it causes pain, physical and psychological discomfort. The aim of study was to investigate the correlation between occurrence of dental caries and OHRQoL of elderly population in Yogyakarta Special Region. Occurrence of dental caries and OHRQoL were determined using Decay-Missing-Filling Teeth (DMFT) Index and Geriatric Oral Health Assessment Index (GOHAI), respectively for 118 elderly aged 60-84 years consisting 73 female and 45 male. The data then were classified into very low, low, moderate and high DMFT and low, moderate and high GOHAI. Spearman’s rank correlation test was conducted to determine correlation between occurrence of dental caries and OHRQoL. Mean scores of DMFT Index and GOHAI were 16.61 ± 7.16 and 47.97 ± 9.03, respectively. Very low, low, moderate, and high DMFT Index were experienced by 4 (3.38\%), 13 (11.02\%), 25 (21.19\%) and 76 (64.41\%) of 118 elderly, respectively. Low, moderate and high GOHAI were experienced by 71 (60.17\%), 25 (21.19\%) and 22 (18.64\%) of 118 elderly, respectively. The significantly correlation between dental caries and OHRQoL was observed in this study (r = -0.265; p = 0.004). In conclusion, there is a negative moderate correlation between the occurrence of dental caries and OHRQoL of elderly population in Yogyakarta Special Region.

ABSTRAK

INTRODUCTION

Despite advancements in oral disease science, dental caries continues to be a worldwide health concern, affecting humans of all ages. Approximately 2.3 billion people (32% of the population) have dental caries in their permanent teeth worldwide. Dental caries is one of the most common oral diseases and it is linked to bacteria in the dental plaque overlying the dental hard tissue. Although acid generating bacteria are the etiologic agents, dental caries has been thought of as multifactorial since it is influenced by dietary and host factors as well. In addition, the role of saliva as a defense system against dental caries is well documented. These defense systems include clearance, buffering, antimicrobial agents, and calcium and phosphate delivery for remineralization.

The first and most common symptom of dental caries is toothache. This is typically an infection or irritation of the tooth pulp usually causes the pain. Tooth pain or achy feeling, particularly after sweet, hot, or cold foods and drinks are first indicator. If dental caries is more severe, it can cause eating difficulty. Dental caries can also cause bad breath and foul tastes. In highly progressed cases, an infection can spread from the tooth to the surrounding soft tissues. Complications may include inflammation of the tissue around the tooth, tooth loss, and infection or abscess formation. The earliest sign of a new carious lesion is the appearance of a chalky white spot on the surface of the tooth, indicating an area of demineralization of enamel. Visible pits or holes in the teeth are strong positive indicator of tooth decay.

Recently, health is defined by a complete physical, mental and social well-being, not merely the absence of disease. Thereby the quality of life of a patient is taken into account. Oral health-related quality of life (OHRQoL) is defined as a multidimensional construct that reflects people’s comfort when eating, sleeping, and engaging in social interaction; their self-esteem; and their satisfaction with respect to their oral health. Oral health-related quality of life is a more holistic approach in health care, in order to improve the oral related satisfaction and quality of life of patients, and not merely the eradication of disease.

The elderly population have significantly increased in recent years. About 80% of the world elderly population is found in developing countries. World Health Organization (WHO) predicted that the population of elderly in Indonesia will reach 11.34% or 28.8 million
people in 2010. It is also predicted that the population of elderly in Indonesia will be up to 25% in 2050. Amongst 33 provinces in Indonesia, Yogyakarta Special Region is a province with the highest number of elderly that reaches up to 14.02% in 2010. Moreover, Yogyakarta Special Regions is a province with the longest life expectancy as well i.e. up to 74.2 years in 2010 and in 2035 will be predicted up to 75.5 years. The longer life expectancy of population in Yogyakarta Special Region is contributed by following factors: (i) comfortable environment; (ii) very good social support for elderly activities; (iii) very good community care; (iv) a relative cheap of life expenditure; (v) adequate health care facilities for elderly; (vi) accessible health care facilities.

Health problem of elderly varies as consequences of physiologic or pathologic processes. Elderly people prone to chronic diseases and acute infections. This condition is deteriorated by decreasing immune system in elderly. Elderly at least have one chronic medical disturbance, so increasing elderly population might increase percentage of chronic diseases as well. It is common that polymedication is experienced by elderly. Majority of elderly at least is taking one prescribed medication. Polypathology and polymedication result from aging and disease processes. Medication for systemic diseases and systemic disease itself in elderly might cause hyposalivation either with or without xerostomia. It has been reported that 80% of prescribed medication cause xerostomia.

On the other hand, oral health and function deteriorate as long as getting older. Poor oral health in elders is caused by edentulism, dental caries, periodontal disease, xerostomia, dysfunction of salivary gland and oral mucosal lesion including oral precancer. All these findings may give badly impact for daily life of elderly that results in decreasing of oral function, self-confidence and social life that eventually affect OHRQoL. According to report of Indonesia Basic Health Research in 2013, prevalence of dental caries in Indonesia in 2013 increased up to 53.2% compared to 43.4% in 2007. One of the two most increasing prevalence occurred in population of more than 65 years. The aim of this research was to evaluate the correlation between occurrence of dental caries and OHRQoL of elderly population in Yogyakarta Special Region.

MATERIALS AND METHODS
Subjects
This was an observational community-based cross-sectional study. A total of 118 elderly (60-84 years) consist of 45 males and 73 females from six representative urban and rural areas of Yogyakarta Special Region participated in this study. Three community health station for elderly (Posyandu Lansia) representing urban area i.e. Wirobrajan, Sewon and Minomartani and rural area i.e. Pundong, Moyudan and Berbah were randomly chosen for this study participants recruitment. Fifty nine subjects were recruited from each area. Rural-urban characteristic was based on the criterions published by the Indonesian National Board of Statistics in 2010. A scoring technique which corresponds with the population density, proportion of agricultural-related profession, and the existence of public-leisure facilities was used to establish the criterion. The protocol of the study was approved by the Medical and Health Research Ethics Committee (MHREC) of Faculty of Medicine, Universitas Gadjah Mada and Dr. Sardjito General Hospital, Yogyakarta (Approval number: KE/FK/441/EC/2016).
Protocol of study

Subjects were gathered and explained concerning the goal, the significance and the course of the study. Subjects who willing to participate in the study were given written informed consent to be signed. The subjects were then conducted clinical intraoral examination to determine DMFT index (the total number of decayed/D, missing/M and filled/F permanent teeth in an individual) using dental diagnostic instrument. Intraoral examination was carried out by four trained dentists under sufficient illumination with artificial light. Dentition status to measure the DMFT was examined using the procedures guided by the WHO Basic Oral Health Survey 2013 method. The examiners were calibrated before and during the survey, and inter-examiner reliability was assessed. According to replicated examinations of 10 patients, the Kappa value ranged from 0.75 to 0.9 which corresponds with substantial to almost perfect agreement according to the WHO Basic Oral Health Survey Method. The classification of DMFT index was very low (<5.0), low (5.0–8.9), moderate (9.0–13.9), and high (>13.9). The maximum score of DMFT index is 32 whereby a higher score indicates a more prevalence of dental caries (WHO, 2013).

Data analysis

Data were presented as mean ± standard deviation (SD) or percentage. Spearman’s rank correlation test was conducted to determine the correlation between occurrence of dental caries and OHRQoL using software of SPSS of 16.0 version by computer. A p value < 0.05 was considered as significant.

RESULTS

Clinical intraoral examination to determine DMFT index was conducted to all subjects using dental diagnostic instrument. The DMFT index value are presented in TABLE 1. Mean of DMFT index for all subjects was 16.61 ± 7.16 with the range between 2 up to 32.

<table>
<thead>
<tr>
<th>DMFT index</th>
<th>Classification</th>
<th>Number of subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 5.0</td>
<td>Very low</td>
<td>4</td>
</tr>
<tr>
<td>5.0 – 8.9</td>
<td>Low</td>
<td>13</td>
</tr>
<tr>
<td>9.0 – 13.9</td>
<td>Moderate</td>
<td>25</td>
</tr>
<tr>
<td>&gt; 13.9</td>
<td>High</td>
<td>76</td>
</tr>
</tbody>
</table>

Oral health-related quality of life determined based on GOHAI score is presented TABLE 2. Mean of GOHAI score for all subjects was 47.97 ± 9.03 with the range between 5 up to 60.

<table>
<thead>
<tr>
<th>GOHAI score</th>
<th>Classification</th>
<th>Number of subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤50</td>
<td>Low</td>
<td>71</td>
</tr>
<tr>
<td>51 - 56</td>
<td>Moderate</td>
<td>25</td>
</tr>
<tr>
<td>57 - 60</td>
<td>High</td>
<td>22</td>
</tr>
</tbody>
</table>
Spearman’s rank correlation test showed a negative moderate significant correlation between the occurrence of dental caries and OHQoL of elderly population in Yogyakarta Special Region (r = -0.265; p = 0.004).

DISCUSSION

Majority of subjects (64.41%) had high DMFT index (≥13.9) with the mean value of 16.61 ± 7.16. This DMFT index was higher than that in New Delhi’s elderly (13.8) that obtained from total of 452 participants.20 Other DMFT index of New Delhi’s elderly that obtained from 448 people aged ≥60 years was 14.4.21 According to Indonesia Basic Health Research the prevalence of dental caries in Indonesia in 2013 increased up to 53.2% compared to 43.4% in 2007. The two most increasing prevalence occurred in population of more than 65 years (14.3%) and in children of 12 years (13.7%).

Oral and dental disease is the most disease suffered by people with the prevalence up to 61%. Dental caries and periodontal (tooth supporting tissue) disease were the two most oral and dental diseases experienced by Indonesian population.17 These diseases are caused by dental plaque (biofilm) as a result of poor oral hygiene which leads to bacteria spreading across the tooth’s surface. Biofilm accumulates in the oral cavity causes dental caries and periodontitis.22

Only a few countries have national data on oral hygiene habits among older people. Tooth brushing remains the most popular oral hygiene practice worldwide. However, according to the country reports this practice is less frequent in developing countries than in developed countries. Meanwhile, traditional oral self-care by use of chew sticks or powder is common in developing countries. Within regions, substantial variation is reported in the percentage of older people performing regular oral hygiene.23

Aging is a natural and progressive process capable of producing limitations and changes in the functioning of the body making the individual more vulnerable and susceptible to chronic diseases such as osteoarthritis, osteoporosis or Parkinson’s disease.24 Severity of osteoarthritis in the hands is correlated with impaired functional ability resulting in unable to maintain proper oral hygiene that leads to plaque accumulation which increases the likelihood of dental caries.25,26 Parkinson’s disease is characterized by dementia and loss of cognitive abilities cause patients having difficulties to memorize oral hygiene practice.27 In addition, in the early stages patients may present the inability to perform functions and their motor skills that makes patients have difficulty to maintain the oral health care.28

Other commonly oral problem experienced by elderly is xerostomia. Xerostomia is subjective feeling of dry mouth either accompanied with hyposalivation (saliva secretion per minute <0.1 mL) or not.29 It is estimated that about 30% of the population older than 65 suffer from xerostomia.30 Medications and systemic disease are aggravating factors that contribute to xerostomia in the elderly.31 Xerostomia has a variety of possible causes. In recent years, the most common cause of xerostomia is medications. Xerostomia has been associated with more than 500 medications. Xerostomia can be caused by many factors such as diseases, medications, complications of radiation-therapy or chemotherapy, dehydration, psychological conditions such as anxiety and stress, complication of chronic graft-versus host disease (cGVHD), malnutrition and mouth breathing.32,33 Xerostomia-associated diseases could be Sjogren syndrome, sarcoidosis, diabetes mellitus, primary biliary cirrhosis,
rheumatoid arthritis, stroke, Alzheimer’s, depression, and chronic anxiety. Some medication that can cause xerogenic effects such as analgesics, antianxiety/ sedative/ hypnotics, anticonvulsants, antidepressants, antihypertensives, antihistamines, bronchodilators, diuretics, gastrointestinal drugs, antispasmodics, cytotoxic drugs, skeletal muscle relaxants. Patient with hyposalivation or xerostomia also are susceptible to oral infection including candidiasis, dental caries, periodontal disease and tooth loss. Without enough saliva, oral environment cannot be maintained in optimal pH, so the mouth is colonized rapidly with cariogenic bacteria and oral self-cleansing cannot be implemented that causes bad oral hygiene. In turn, someone will be more susceptible having dental caries. So, the high prevalence of dental caries in this study might be contributed as well by medications consumed and diseases experienced by the subjects. In this study 19 subjects consumed antihypertensives, eight subjects consumed analgesics/anti-inflammatory medications. Six subjects consumed antihistamines and five subjects consumed gastrointestinal drugs. Besides that, it was detected that eight subjects suffered from diabetes mellitus. Osteoarthritis, rheumatoid arthritis and stroke, each was also experienced by one subject. Another cause of dental caries is poor oral hygiene since the biofilm will more accumulated in oral cavity. In this study, 51 of 118 subjects (43.22%) had poor oral hygiene that made them prone experiencing dental caries.

The majority of elderly (60.17%) had low OHRQoL that might be caused by poor oral health condition in this study (TABLE 2). This findings supported the statements that deterioration of oral health and function go along with the increasing age of people. From this result it seemed that the care towards oral health was still low in elderly in which this condition was probably influenced also by ageism concept that was believed by almost all elderly. In this concept, elderly believes that deterioration of oral condition was natural process and occurs for all elderly, so it makes elderly having less effort to improve their oral condition.

To assess OHRQoL in this study was something so difficult since concept of quality of life is elusive and abstract. Quality of life can be intuitively understood however, it is very difficult to be defined. Perception of quality of life is influenced by many factors such as socio-economic condition, level of education, cultural, political, practical contexts in where the quality of life is implemented and measured. Talking about quality of life, someone should think with multidimensional and complex orientation since quality of life does not have a clear border and is very subjective. Quality of life assessment is full of life values. A negative moderate significant correlation between the occurrence of dental caries and OHRQoL of elderly population in Yogyakarta Special Region was observed in this study. It indicates that an increase score of DMFT index declines in the OHRQoL. The negative moderate significant correlation meant the more dental caries the more impact on GOHAI score by decreasing the OHRQoL. Or it can be concluded that the higher score of DMFT, the lower the OHRQoL of the elderly population in Yogyakarta Special Region.

Person with dental caries will have a symptom of pain. The pain is getting severe along with the more progressive caries process. When the enamel and dentin are destroyed, the cavity becomes more noticeable. Once the decay passes through enamel, the dentinal tubules, which have passages to the nerve of the tooth, become exposed, resulting in pain that can be transient, temporarily worsening
with exposure to heat, cold, or sweet foods and drinks. A tooth weakened by extensive internal decay can sometimes suddenly fracture under normal chewing forces. When the decay has progressed enough to allow the bacteria to overwhelm the pulp tissue in the center of the tooth, a toothache can result and the pain will become more constant. Death of the pulp tissue and infection are common consequences. The tooth will no longer be sensitive to hot or cold, but can be very tender to pressure. Dental caries can also cause bad breath and foul tastes. In highly progressed cases, an infection can spread from the tooth to the surrounding soft tissues.3

By understanding the chronological process of tooth decay, it was clear that dental caries will cause pain and the pain will influence the GOHAI assessment. There was three dimensions of OHRQoL i.e. physical function, pain or discomfort and psychosocial function that was assessed in GOHAI. If the dental caries was still untreated, the dental pulp will be non vital, and then the infection will spread to the periodontal tissue causing of tender to pressure. The latter will result in eating difficulty that was associated with the oral dysfunction. Dental caries becomes area of focal infection if still untreated. And it has to be extracted to prevent the spreading of the infection. Dental caries and periodontal disease is the two most oral disease that cause tooth loss. Tooth loss will impair mastication function of oral tissue. Unrehabilitated tooth loss may influence psychological condition of someone. Psychosocial aspect includes a lower self esteem, restrictions to daily life and worrisome towards oral problems. In the psychosocial aspect, speech and eating difficulties can impair social interactions which may cause some patients to avoid social engagements where it affects the OHRQoL.30 Social interactions may also be affected due to a decreased self-esteem caused by difficulties in speech and mastication.39 All of those impacts of dental caries in turn affect OHRQoL negatively.

This is the first study conducted in Yogyakarta Special Region to correlate the occurrence of dental caries and OHRQoL in elderly population. The results of this study might be considered by Indonesian government especially in Yogyakarta Special Region to plan the better oral health management for elderly, in turn, it can increase OHRQoL. To improve the oral health or to reduce the occurrence of dental caries in elderly requires inter-professional collaboration of health personnel since dental caries is a multifactorial disease modulated by many aspects of health and behavior not only oral ecology.

Finally, the limitations of our study should be taken into consideration. The exact mechanism of this relationship was not clarified in this study and it needs to be further explored in longitudinal studies. Since this study was a cross sectional, which was conducted on modest sample size of 118 subjects, study with larger sample sizes needs to be carried out in the future to endorse the results observed in our study. Future work with larger, more diverse populations and more complete information would be essential to complete our findings. Furthermore, as the nature of the sample size used in this study, the result generalisability might not be completely dependable.

CONCLUSIONS

In conclusion, there is a negative moderate significant correlation between the occurrence of dental caries and OHRQoL of elderly population in Yogyakarta Special Region. The higher score of DMFT index, the lower the OHRQoL of the elderly population in Yogyakarta Special Region.
ACKNOWLEDGEMENTS

This study was supported by a research grant from the Ministry of Research, Technology and Higher Education, Republic of Indonesia under the scheme of High Education Institution Excellence Research (Penelitian Unggulan Perguruan Tinggi) 2016. We would like to thank all participants who have involved in this study.

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https://doi.org/10.1023/A:1023938108988


https://doi.org/10.3109/17482620903189476 https://doi.org/10.3402/qhw.v4i4.5020