



RESEARCH ARTICLE

Factors influencing the utilization of dental services in East Java, Indonesia [version 1; peer review: 1 approved]

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Abstract

Background: Despite high levels dental issues and insurance coverage in the East Java province Indonesia, the utilization of dental services is still low. This research aims to test some indicators for dental service utilization among East Java residents.

Methods: A secondary analysis was undertaken using data on the East Java province from the Indonesian Basic Health Research 2013, which included 90,551 randomly selected respondents aged 5–100 years old. Socio-demographic characteristics (age, sex, education and residential location), dental behavior (tooth brushing habit), and clinical (dental) condition were self-reported through a questionnaire. Multivariable models were generated to estimate prevalence ratios (PR), and 95% confidence intervals (95%CI).

Results: Prevalence of dental service utilization during the last 12 months in East Java province is only 9%. Respondents 25–50 years old showed the highest utilization of dental services. Being male, having lower education and living in a district (as opposed to municipalities) were indicators for having lower utilization of dental treatment (PR [95% CI] = 0.81 [0.79–0.84], PR [95% CI] = 0.89 [0.86–0.93] and PR [95% CI] = 0.91 [0.88–0.95], respectively). Respondents with poor tooth brushing habit showed lower utilization of dental services. Having teeth was associated with higher utilization of dental treatment (PR [95% CI] = 1.39 [1.16–1.66]).

Conclusions: Age, sex, education and residential location influence the utilization of dental services among Indonesia's East Java residents. Poor tooth brushing habits and being edentulous are also indicators of lesser utilization. These results call for urgent public health interventions to increase equitable dental care services utilization.

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report

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Any reports and responses or comments on the article can be found at the end of the article.

Keywords

dental service utilization, edentulism, tooth brushing habits, Indonesian, population-based study

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Introduction

Health is a fundamental right of every human being without discrimination related to race, religion, and socioeconomic status (World Health Organization, 2015). Oral health is integral to the overall health of human beings (Peres *et al.*, 2019; World Health Organization, 2020). However, in most countries, access to and utilization of oral health services are limited (Glick *et al.*, 2012; Petersen, 2003; Watt *et al.*, 2019). Lack of access to such services can have a detrimental impact on people's general health and quality of life (Petersen, 2003). Tooth loss is mainly the result of accumulated dental diseases as a product of low utilization of dental services (Petersen, 2003).

One of the commonly used indices to assess the utilization of dental services is the percentage of the population attending a dental visit in the previous year (Bayat *et al.*, 2008). The utilization of dental services is varied across countries. In developing countries, the majority of people only visits the dentist for pain relief rather than preventive care (Varenne *et al.*, 2006), while in developed countries about 40–80% of the adults visit a dentist in a given year (Bayat *et al.*, 2008).

Previous research has indicated certain factors that influence dental service utilization. For example, socio-demographic factors related to dental service use include age, sex, education, and residential location. Moreover, poor health behaviors are usually clustered in the same person wherein a person with a bad tooth brushing habit also rarely accesses dental treatments (Jordao *et al.*, 2018). Furthermore, dental clinical condition such as dental status (dentate vs edentulous) could influence the utilization of dental services as it differentiates the amount of dental treatment need. So far, utilization of dental services and factors related to it have been mainly reported in developed countries, while such reporting in developing countries has been limited.

Oral health is a much neglected field of research in developing countries, including in Indonesia. Indonesia is the fourth most populated country in the world after China, India, and the United States of America (United Nation, 2019). Cases of dental caries in this country is high; for example, more than 88% of the population has been estimated to have experienced caries, with 45% having untreated caries (The Ministry of Health, Republic of Indonesia, 2019). Currently, Indonesia is in the process of establishing universal health coverage through Jaminan Kesehatan Nasional (JKN), wherein basic dental health is included in the insurance coverage. This universal health coverage program was implemented as a capitation system whereby the dentists are paid a fixed amount for the number of people who were under their care (Deloitte Indonesia, 2019). The participants in the insurance scheme include Contribution Assistance Recipients (PBI) and non-PBI members (Deloitte Indonesia, 2019). PBI include poorer citizen whose insurance is funded by the government through taxes. Non-PBI members include other citizens not categorized as poor, who need to subscribe to the insurance scheme by paying for it monthly (e.g., through deduction directly from their income) (Deloitte Indonesia, 2019). A comprehensive assessment of the JKN

program conducted by the Government of Indonesia in 2017 found that JKN has managed to bring 76% of Indonesia's population under the program; this is considered an impressive coverage rate (Social Insurance Administration Organization, 2019).

Despite the high level of dental problems and the high insurance coverage, the use of dental treatment among the Indonesian population is very low (The Ministry of Health Republic of Indonesia, 2013b). Indonesian Basic Health Research (Riset Kesehatan Dasar/RISKESDAS) 2018 showed that only 8.1% of Indonesians used dental services (The Ministry of Health Republic of Indonesia, 2013b). In Indonesia, East Java is the second most populated province with a slightly below average national dentist-population ratio (The Ministry of Health Republic of Indonesia, 2013a). The insurance coverage in this province is 80%. However, treatment utilization for dental issues in this province is similar to the national estimate which is 8.6% vs 8.1%, respectively (The Ministry of Health, Republic of Indonesia, 2013b). Understanding the factors influencing dental service utilization among East Java residents is needed as a fundamental step to develop policy to increase the utilization of the services.

Therefore, this study aimed to explore the associations of socio-demographic characteristics, behavioral factors, and clinical condition on the utilization of dental services among East Java residents.

Methods

Study population and research design

This secondary data analysis used data from the 2013 Indonesian Basic Health Survey (Riskesdas 2013). Riskesdas 2013 was a cross sectional national survey. It was part of a serial Indonesian national basic health survey conducted every six years. As the latest Riskesdas data is not currently open to the public, the Riskesdas 2013 data was used in this analysis. Riskesdas 2013 used a three-stage, stratified cluster sampling design to select a representative sample of Indonesian residents. The sampling frame was households recorded in the 2010 bloc census database, revalidated by the 2013 enumerator team. Indonesia was stratified into metropolitan and non-metropolitan areas by provincial status, with clusters based on district or municipality, which were selected with probability proportional to size. All persons in the household were included in the census. Final respondents were 294,959 households with the mean number of residents equal to 3.8. Response rate for the Indonesian residents was 93%. Details of the 2013 Indonesian national basic health research report has been published elsewhere (The Ministry of Health, Republic of Indonesia, 2013b). For the purpose of this analysis, a subset of East Java participants 5 to 100 years old who participated in the survey was analyzed.

Data collection and management

Data was collected through a questionnaire in the Indonesian language. The outcome of interest was utilization of dental services. It was self-reported by respondents by answering a single question "Have you received dental treatment(s) during

the last twelve months?" The response options were yes or no. Indicators of the dental service utilization were socio-demographic characteristics, behavioral factors, and clinical condition. Socio-demographic characteristics included age, sex, education and residential location. The inclusion criteria for the analysis were respondent aged 5–100 years old and completed the Riskesdas 2013 oral examination. Age was then categorized into ≤ 25 years old, $25 < 50$ years old, and ≥ 50 years old. The choice of the cut-off points for the age categorization was based in the distribution of the age. Sex was recorded as male or female. Education was measured by the highest level of school, post-school, or tertiary educational attainment and dichotomized into junior high school or less vs senior high school or higher. East Java province consists of 29 districts and nine municipalities, which differ due to the size of the area, capital, and development such as in the economy and education (where municipalities are usually ahead of the districts). Thus, residential location was dichotomized into districts and municipalities. The behavioral factor was tooth brushing habit (self-reported by the respondents as good vs bad tooth brushing habit). Respondents were categorized as having a good tooth brushing habit if they answered yes to the question "do you brush your teeth daily?". Clinical condition was measured through dental status (self-reported by respondents as dentate (having one or more teeth) vs edentulous).

Statistical analysis

Statistical analysis was performed using SAS version 9.4-callable SUDAAN version 11.0.3 (Research Triangle Institute, North Carolina, USA). Characteristics of the study participants were presented using descriptive statistics. Bivariate analyses of the association between utilization of dental treatment and each of the potential indicators were performed using chi square tests. The potential indicators include socio-demographic characteristics (age, sex, education and residential location), dental behavior (tooth brushing habit), and clinical (dental) condition. Multivariable logistic regression analysis was conducted to model together these factors influencing dental treatment utilization; no imputation was done for missing data. The statistical significance of the associations was evaluated at $P < 0.05$.

Ethical review

Ethical approval of Riskesdas 2013 was granted by the Ministry of Health Republic of Indonesia's Human Research Ethics Committee. However, this particular study involved secondary analysis of anonymized data, and no new ethical clearance was required.

Results

A total of 90,551 respondents were included in this study. Study participants were aged between 5 and 100 years (mean: 36.9 [SD 20]) and comprised 48% males and 52% females. [Table 1](#) shows the characteristics of the study participants. Only 23% of the respondents had education equal to or higher than senior high school, and only 19% of the study participants lived in municipality areas. Some 7.4% of the

respondents reported having bad tooth brushing habit (rarely brushing their teeth) and 3% reported being edentulous. Only 9% of the respondents received dental treatment(s) during the last 12 months.

The results from the bivariate analyses are presented in [Table 2](#). All the indicators showed a significant relationship with the utilization of dental services. In terms of age, people over 50 years old showed the lowest utilization of dental treatment, followed by people less than 25 years old. Respondents that received the highest number of dental treatments were people between 25 and 50 years old. Furthermore, males, people with lower educational background, residents of districts, people reporting bad tooth brushing habit, and those with edentulism showed lower utilization of dental treatments compared to their counterparts.

The results of the multivariable model are presented in [Table 3](#). The model showed that dental services utilization differed by age. Respondents less than 25 years of age received lower dental treatment than respondents ≥ 50 years old (PR [95% CI] = 0.74 [0.71–0.78]). However, respondents 25–50 years old showed more utilization of dental treatments than respondents ≥ 50 years old (PR [95% CI] = 1.23 [1.18–1.28]). Being male and having lower education were indicators for having a lower utilization of dental treatment (PR [95% CI] = 0.81 [0.79–0.84] and PR [95% CI] = 0.89 [0.86–0.93], respectively). Similarly, people living in districts showed lower utilization of dental treatment than those living in municipalities. Respondents with bad tooth brushing habit showed lower utilization of dental treatment. Having teeth was associated higher utilization of dental treatment (PR [95% CI] = 1.39 [1.16–1.66]).

Discussion

This study showed that the utilization of dental services by East Java residents in Indonesia was very low. Only 9% of the East Java population received dental treatments during the last 12 months, which is slightly higher than the national average (8.1%) ([The Ministry of Health, Republic of Indonesia, 2013b](#)). Dental service utilization was low among the less than 25 years old respondents, male, district residents, edentulous people, and respondents with lower education and poor tooth brushing habit.

Among Indonesians, the fact that 95.5% of the population never utilize dental services was revealed in the 2018 national health survey ([The Ministry of Health, Republic of Indonesia, 2019](#)). The percentage of population that never access dental services in Indonesia was far higher than has been reported in India, another developing country ([Gupta et al., 2014](#)). Research in a rural population of western Rajasthan, revealed that around 55% of the population never visited a dentist while only 1.5% visited a dentist in the last 6 months ([Gupta et al., 2014](#)). However, these estimates contradict some research findings from economically developed countries where approximately 40%–80% of the population have accessed dental services within the last 12 months ([Brown & Lazar, 1999](#);

Table 1. Demographic and background characteristics of the study participants.

Characteristics	% of respondents [95% CI]
Outcome	
Dental services utilization	
Received dental treatment during the last 12 months	9 [8.8-9.2]
Did not receive dental treatment during the last 12 months	91 [90.8-91.2]
Indicators	
Socio-demographic characteristics	
Age	
<25 years old	31.9 [31.6-32.2]
≥25–<50 years old	39.6 [39.2-39.9]
≥50 years old	28.5 [28.2-28.8]
Sex	
Male	48.1 [47.8-48.4]
Female	51.9 [51.6-52.2]
Education	
Junior high school or less	77.4 [77.1-77.6]
Senior high school or higher	22.6 [22.4-22.9]
Residential place	
Districts	81.3 [81.0-81.6]
Municipality	18.7 [18.4-19.0]
Oral health behavior	
Tooth brushing habit	
Self-reported bad tooth brushing habit	7.4 [7.2-7.6]
Self-reported good tooth brushing habit	92.6 [92.4-92.8]
Clinical condition	
Dental Status	
Not edentulous	97.3 [97.2-97.4]
Edentulous	2.7 [2.6-2.8]

95% CI: 95% Confidence Interval

Kiyak & Reichmuth, 2005). Lack of awareness about oral health could be a reason behind the lower utilization of dental services in East Java province, Indonesia.

In East Java, utilization of dental services varied according to socio-demographic, behavioural, and clinical factors. People aged 25–50 years had the highest utilization of dental services in this study, followed by those ≥50 year old. Those less than 25 years old had the lowest utilization of dental treatment. Among Indonesians, people in 25–50 years of age are considered the productive workforce, at which point they have usually progressed in their careers to a point and are earning enough to allow them to have insurance or utilize dental services privately. This could be the reason for greater utilization of dental treatment in this age group.

This study finds that females have greater utilization of dental services, supporting previous studies (Emerich *et al.*, 2015; Green & Pope, 1999; Honkala *et al.*, 1997; Saintrain *et al.*, 2014),

while also contradicting another study (Akbar *et al.*, 2019). Women's greater use of oral health service providers is likely because they pay more attention to esthetics and oral hygiene. Research shows that women pay more attention to their appearance and health (Green & Pope, 1999). On the other hand, men tend not to seek dental service due to the lack of perception of their need (Kiyak, 1993).

Education is also an indicator for dental service utilization. People with lower educational background have lower access to dental treatment, supporting previous research. A study showed that higher educated individuals visited the dentist 10 times more than those with low education (Barros & Bertoldi, 2002).

East Java province is one of the provinces located in the main island, Java. Among other islands, the Java island is categorized as the most developed. Thus, socioeconomic inequality among each area in East Java could be considered lower than other less developed islands. However, this research still finds

Table 2. Bivariate analysis of the association between dental service utilization and each of the explanatory variables.

Indicators	Utilization of dental services (received dental treatment during the last 12 months)	
	% of respondents [95% CI]	PR [95% CI]
Socio-demographic characteristics		
Age		
<25 years old	8.4 [8.1–8.8]	0.83 [0.79–0.87]
≥25–<50 years old	10.5 [10.2–10.8]	1.40 [1.35–1.45]
≥50 years old	7.5 [7.2–7.9]	ref (1)
Sex		
Male	8.1 [7.9–8.4]	0.80 [0.78–0.83]
Female	9.8 [9.5–10.1]	ref (1)
Education		
Junior high school or less	8.7 [8.5–8.9]	0.82 [0.79–0.85]
Senior high school or higher	9.9 [9.5–10.4]	ref (1)
Residential place		
Districts	8.7 [8.5–8.9]	0.87 [0.84–0.91]
Municipality	10.2 [9.7–10.6]	ref (1)
Oral health behavior		
Tooth brushing habit		
Self-reported bad tooth brushing habit	4.1 [3.6–4.6]	0.45 [0.41–0.48]
Self-reported good tooth brushing habit	9.0 [8.8–9.2]	ref (1)
Clinical condition		
Dental status		
Not edentulous	8.7 [8.5–8.9]	2.70 [2.32–3.15]
Edentulous	3.2 [2.5–4.0]	ref (1)

Bold: indicator was significant; 95% CI: 95% Confidence Interval; PR: Prevalence Ratio; Bivariate analysis was conducted using chi-square

that dental service utilization is lower among the district residents than the municipality residents in East Java. This finding supports previous research (Akbar *et al.*, 2019). It is known that public transport networks are less developed in rural areas than in urban areas. Lack of transport access to dental facilities can be an obstacle to routine dental visit (Hamano *et al.*, 2017; Ogunbodede *et al.*, 2015). Moreover, the use of a service also depends on the perception of user's needs, influenced by their values, beliefs and cultures (Giordani *et al.*, 2010). A study in Istanbul (Ozkan *et al.*, 2011) found that more than half of the population surveyed did not feel the need or have the desire to visit a dentist, although their dental conditions were not ideal.

This study finds that people who have bad tooth brushing habit utilize dental services less, supporting previous research (Jordao *et al.*, 2018). Jessor's problem behaviour theory (Jessor, 1991) proposes that various risk behaviours are

inter-related. Research (Jordao *et al.*, 2018) has affirmed this theory in the dental behaviors field, finding that there are clustering patterns in dental health behaviors whereby less frequent tooth brushing is clustered with high sugar intake, current smoking, and lack of dental visits.

Moreover, dentate people in East Java utilize more dental services than edentulous people, similar with other research finding (Tuominen, 1987). In many countries, the reason for dental service use is to mainly undergo dental treatment. This is especially true in developing countries where most of the people visit dental care services only when they are in pain (Varenne *et al.*, 2006). Edentulousness in some parts of the world has been thought of as a healthy condition without pain even though this condition could reduce the ability to chew certain types of food, reducing the quality of life. Elders were also found to be more resilient to poor clinical status compared to younger people (Slade & Sanders, 2011).

Table 3. Multivariable analysis of dental services utilization.

Characteristics	Utilization of dental services (received dental treatment during the last 12 months)	
	PR	[95% CI]
Socio-demographic characteristics		
Age		
<25 years old	0.74	[0.71–0.78]
≥25–<50 years old	1.23	[1.18–1.28]
≥50 years old	ref (1)	-
Sex		
Male	0.81	[0.79–0.84]
Female (reference)	ref (1)	-
Education		
Junior high school or less	0.89	[0.86–0.93]
Senior high school or higher (reference)	ref (1)	-
Residential place		
Districts	0.91	[0.88–0.95]
Municipality (reference)	ref (1)	-
Oral health behavior		
Tooth brushing habit		
Self-reported bad tooth brushing habit	0.53	[0.48–0.59]
Self-reported good tooth brushing habit (reference)	ref (1)	-
Clinical conditions		
Dental status		
Not edentulous	1.39	[1.16–1.66]
Edentulous	ref (1)	-

Bold: indicator was significant; 95% CI: 95% Confidence Interval; PR: Prevalence Ratio; Multi variable analysis was conducted using logistic regression

The strength of this study lies in the nature of data collected in a national survey, allowing a representative data of the East Java population. The cross-sectional study design is a limitation as it precludes causal explanations. Self-reported utilization of dental services and lack of data on insurance coverage and income could be other limitations of this study as associations between lower socioeconomic status and decreased access to dental services have been found in several countries (Grytten *et al.*, 2012; Hjern *et al.*, 2001; Larson & Halfon, 2010; Listl, 2011; Murakami *et al.*, 2014; Tchicaya & Lorentz, 2014). However, the study findings are in agreement with prior research that assessed dental care utilization, and it provides avenues for future research.

Conclusions

This first detailed population-based study in the East Java province of Indonesia has demonstrated that the use of dental services is influenced by socio-demographic factors such as age, sex, education and residential location. Moreover, poor tooth

brushing habit and being edentulous are also indicators of lower dental service utilization.

Data availability

Data used for this analysis are available by a written request to the Ministry of Health Republic of Indonesia.

Source data

The available variables of Riskesdas 2013 dataset could be learnt from the national report of Riskesdas 2013 produced by Indonesian Ministry of Health, available online in http://labdata.litbang.kemkes.go.id/images/download/laporan/RKD/2013/Laporan_riskesdas_2013_final.pdf. A written request of a sub data set should be sent to the Ministry of Health Republic of Indonesia (sent to the head of research and development division of the Ministry of Health Republic of Indonesia at Jl. Percetakan Negara no 29 Jakarta Pusat, Indonesia) along with a proposal detailing the proposed analysis. After approval,

the proposal will be analyzed by the data management laboratory. Successful applicants will get the data by email after signing a letter of agreement about the data management, including an agreement to neither send the data to other party nor using

it for other reason than that has been agreed by the Ministry. The instruction of how to apply for the data are available from the Indonesian Ministry of Health's website: <http://labmandat.litbang.kemkes.go.id/images/download/peraturan/alur.pdf>

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The article is scientifically-well-written. No major issues related to methods or data analysis need to be highlighted. The authors have indicated the problem statement in the introduction on why they conduct the study. However, comments were given to improve the flow and content of the section.

The method is well-describe. The analysis performed is matched with the study design as recommended by others. The outcome measure of dental service utilization is following a well-versed definition by other researchers. However, there are some categorisations of independent variables that do not match the results. For example the age and dental status. The author stated that they are using ≤ 25 , $25 < 50$, and ≥ 50 years old. However, in the results it was mentioned differently (less than 25, 25-50, and ≥ 50). The age categorisation should not overlap thus I would like to suggest new categorisation < 25 , $25-50$, and > 50 . Whereas, the dental status was informed in methods was “dentate vs edentulous” but in the results it mentioned, “not edentulous vs edentulous”. Although it seems to give similar meaning but consistency in reporting is essential.

The rest including abstract, discussion, and conclusion is well-written. The citation provided is also updated evidence. I also have given some papers for citations to enrich the discussion part. Other related information such as data sources is also stated in the identification of originality of the data.

[Please see this annotated pdf.](#)

Is the work clearly and accurately presented and does it cite the current literature?

Yes

Is the study design appropriate and is the work technically sound?

Yes

Are sufficient details of methods and analysis provided to allow replication by others?

Yes

If applicable, is the statistical analysis and its interpretation appropriate?

Yes

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Dental Public Health

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

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