

RESEARCH ARTICLE

Risk factors for dental caries in adults aged 35-44 years in DKI Jakarta: a cross-sectional study using the 2018 national Riskesdas data

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ABSTRACT

Caries, an oral cavity disease with several causes, is significantly increasing. According to the 2018 Basic Health Research, 92.2% of adults between the ages of 35 and 44 had dental caries. In DKI Jakarta, the prevalence of oral health issues reached a percentage of 59.1%. The purpose of this study was to determine the risk factors for dental caries in adults aged 35-44 years in DKI Jakarta. This research is descriptive observational research with a cross-sectional design. This research uses secondary data from the 2018 Riskesdas. The final total of the respondents was 1,100 after considering the inclusion and exclusion criteria. Based on the results of the research, respondents who were at higher risk of caries development were female (52.2%), employed (68.3%), and had intermediate education (46.3%). Based on certain habits, groups of risk factors that have a high frequency are incorrect time to brush teeth (97.2%), consuming sweet food 1-6x per week (48.5%), consuming sweet drinks $\geq 1x$ per day (64.3%), consuming soft drinks (89.6%) and energy drinks (93.9%) $\leq 3x$ per month, not consuming alcoholic beverages (96.8%), and smoking (51.9%). Overall, the prevalence of caries in adults aged 35-44 years in DKI Jakarta is 45%, with a high frequency of various risk factors. Risk factors that are related to the incidence of dental caries are intermediate level of education (OR = 1.19573), high level of education (OR = 1.58056), unemployed (OR = 0.78646), consumption of sweet foods $\geq 1x$ per day (OR = 0.71107), and smoking (OR = 0.72334).

Keywords: adults; caries; prevalence; risk factors

INTRODUCTION

Dental and oral health problems are common in adults. Caries is one of the most common dental and oral health problems that the general public seem to underestimate.^{1,2} The prevalence of caries in Indonesia remains high, reaching 88.8%, according to data from the 2018 Indonesia Basic Health Research (Riskesdas).³ Measured using the DMF-T value, caries significantly increased from 4.6 in the 2013 Riskesdas⁴ to 7.1 in the 2018 Riskesdas.³

Caries is a disease that affects the oral cavity and is mostly caused by a complex interaction between the flora and the fermentation of food-derived carbohydrates that are on the surface of the teeth after a certain period of time. The beginning of caries appears as a white spot, which is part of the enamel demineralization process.^{5,6}

Because the causes of caries are multifactorial, they are separated into two basic categories: primary factors and secondary factors. Primary factors are factors that have an immediate impact on the development of caries and consist of hosts, substrates, microorganisms, and time. Risk factors are factors that do not have an immediate impact on the development of caries and consist of age, gender, occupation, education, environment, behavior, culture, heredity, and systemic disease.^{5,7,8}

It has been widely reported that caries increases as people age. This is because the longer the teeth are in the oral cavity, the more frequent the interactions with the factors that cause caries. The results of the research by Costa et al showed that adults older than 33.4 years had higher DMF-T than those between 19 and 33.4

years.^{9,10} According to the WHO, the standard age for measuring the state of oral health in adults is 35-44 years old. This age is quite important in terms of providing design and analysis of cumulative caries damage to adult oral health, especially in the later years.^{11,12} Lee et al found that women are 2.25 times at higher risk than men.¹³ Harada et al found that 68.8% more caries occurred in the group of working women than in the group of non-working women.¹⁴ Abbass et al found that low education levels have the highest average of DMF-T of 9.48.¹⁵

Tanu et al. showed that respondents who brushed their teeth once a day had an average DMF-T that was two teeth larger than that of respondents who brushed their teeth twice a day.¹⁶ Based on Junarti and Santik's research, it is revealed that respondents with high consumption of sweet foods are 1.5 times at higher risk of developing caries compared to those with a low consumption of sweet foods.¹⁷ Purnamasari showed that frequent consumption of sweet drinks has a negative impact on the development of caries.¹⁸ According to Fitriati's research, respondents who consumed soft drinks on a frequent basis had a pH that was 1.2 times more acidic than the group that was not at risk.¹⁹ According to Abbass et al, drinking energy drinks 1-6 times a day may result in high DMF-T score of 6.25.¹⁵ Research by Priyanka et al showed that people who drank alcohol had higher DMF-T values than those who did not. There is a substantial difference in the missing component of the DMF-T.²⁰ Jovina and Suratris research found that smokers and active smokers had higher DMF-T values for caries than non-smokers.²¹

Based on the 2018 Riskesdas, the percentage of dental and mouth problems in DKI Jakarta are quite high (59.1%). DKI Jakarta is ranked 15th in Indonesia out of 34 provinces and third in Java.^{3,4} To the best of our knowledge, no research has been conducted on caries risk factors in adults aged 35-44 years in DKI Jakarta. Thus, in the present study the authors would like to further address this issue.

MATERIALS AND METHODS

This is observational analytic research with a cross-sectional design. The research was conducted using secondary data from the 2018 Riskesdas, which was conducted in 34 provinces in Indonesia from April to May 2018. This research used DKI Jakarta provincial data. This research was conducted at Trisakti University from August-December 2022 by submitting an application to obtain data and permission from the Health Research and Development Agency of the Ministry of Health of the Republic of Indonesia from June-August 2022. The 2018 Riskesdas population was used in this study, which included all Indonesian households. Sample selection used total sampling method by examining all of the respondents according to the inclusion and exclusion criteria. The total number of prospective subjects qualified for the inclusion and exclusion criteria was 1,100. The inclusion criteria for this study were: 1) respondents who answered "yes" for the question "damaged teeth, cavities, or disease," in the 2018 Riskesdas questionnaire, 2) respondents with an age range of 35-44 years, and 3) respondents were from the DKI Jakarta province. The exclusion criteria for this study were missing data. Data analysis, namely univariate analysis, was carried out to provide an overview of the distribution of data in the tables. The variables used in this study are age, gender, occupational status, educational level, time of day to brush teeth, consumption of sweet foods, consumption of sweet drinks, consumption of soft drinks, consumption of energy drinks, alcohol consumption, and smoking.

The research began by sending a letter to request data to the Research and Development Agency of the Secretary of the Health Development Policy Agency of the Republic of Indonesia. A letter of receipt related to the data request proposal file and approval from the Secretary of the Health Development Policy Agency of the Republic of Indonesia Research and Development Agency was then sent to the researchers. The researchers continued by submitting an application for an

ethical approval to the Trisakti University FKG Ethics Commission. Proposals for creating data subsets were examined by Badan Penelitian dan Pengembangan Kesehatan (Agency of Health Research and Development) for approximately 14 days. The researcher then provided the Health Research and Development Agency with a statement letter on the use of data and signatures. Finally, the data were obtained and processed. Ethical approval for this study was obtained from the Ethics Commission of the Faculty of Dentistry, University of Trisakti (approval number 552/S1/KEPK/FKG/7/2022).

RESULTS

This study uses secondary data from the 2018 Riskesdas. According to Figure 1, the initial total number of respondents was 2,477. After the cleaning process had been completed twice, the

final total number of respondents in the research was 1,100.

According to Table 1, the average age of the respondents was 39 years. Based on gender, the participation rate for women was higher (52.2%), compared to 47.8% for men. Based on employment status, the working group was higher at 68.3%, while the non-working group was 31.7%. Table 1 shows that in terms of the educational level, the intermediate group had the highest frequency with 46.3%.

Table 2 shows that respondents who brushed their teeth every day at the wrong time had a frequency of 97.2%, while the percentage of those who brushed their teeth every day at the correct time was 2.8%.

Table 3 shows that the percentage of respondents who consumed sweet foods 1-6 times per week was 48.5%, while the percentage of respondents who consumed sweet drinks,

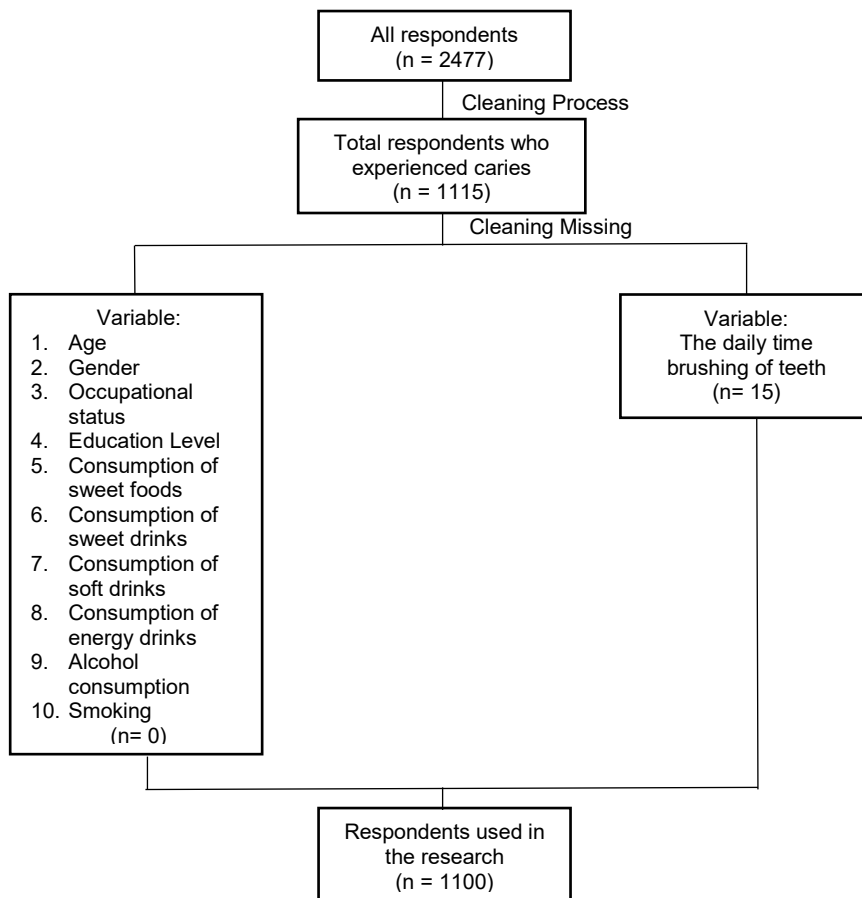


Figure 1. Flow of research management

Table 1. Frequency distribution of respondents who experienced caries based on age, gender, employment status, and education

Variable	Frequency (%)	Mean	SD	Min-Max
Age	39.24		2.887	35-44
Gender				
Male	526 (47.8)			
Female	574 (52.2)			
Occupational status				
Employed	751 (68.3)			
Unemployed	349 (31.7)			
Education Level				
Low	430 (39)			
Intermediate	509 (46.3)			
High	161 (14.7)			

Table 2. Frequency distribution of respondents who experienced caries based on the time they brush their teeth every day

The daily time brushing of teeth	Frequency (%)
Correct	31 (2.8)
Incorrect	1069 (97.2)

Table 4. Frequency distribution of respondents who experienced caries based on the habit consuming alcoholic beverages

Alcohol consumption (in the last 1 month)	Frequency (%)
Yes	35 (3.2)
No	1065 (96.8)

Table 3. Frequency distribution of respondents who experienced caries based on the habit of consuming sweet foods, sweet drinks, soft drinks, and energy drinks

Variable	≥ 1x per day	1-6x per week	≤ 3x per month
Consumption of sweet foods	388 (35.3)	534 (48.5)	178 (16.2)
Consumption of sweet drinks	707 (64.3)	292 (26.5)	101 (9.2)
Consumption of soft drink	18 (1.6)	96 (8.7)	986 (89.6)
Consumption of energy drinks	17 (1.5)	50 (4.5)	1033 (93.9)

Table 5. Frequency distribution of respondents who experienced caries based on smoking habits

Smoking	Frequency (%)
Yes	529 (48.1)
No	571 (51.9)

Table 4 shows that respondents who did not consume alcoholic beverages in the previous month had a higher frequency with 96.8%, while respondents who consumed alcoholic beverages had a lower frequency with 96.7%.

Table 5 shows that respondents who did not smoke had a higher percentage (51.9%), while the percentage for respondents who smoke was 48.1%. As seen on the Table 6, factors that were significantly associated with the risk of caries were intermediate level of education and higher

≥ 1x per day, was 64.3%. The percentage of respondents who consumed the most soft drinks and energy drinks, ≤ 3x per month, was 89.6% and 93.9% respectively.

Table 6. Multivariate analysis of caries risk factors

Variable	Coeffisien	p-value	OR	95% CI
Constants	0.36394	0.000263		
Intermediate education level	0.17876	0.049603	1.19573	1.00040-1.42955
High education level	0.45778	0.000157	1.58056	1.24781-2.00629
Unemployed	-0.24021	0.01713	0.78646	0.64536-0.95806
Consumption of sweet foods ≥ 1x per day	-0.34098	0.000239	0.71107	0.59269-0.85282
Smoking	-0.32388	0.000497	0.72334	0.60257-0.86771

education. Meanwhile, protective factors were unemployment, consumption of sweet foods ≥ 1x per day and smoking.

The caries risk prediction method in this study is described as follows:²²

$$\text{Probability:} = \frac{1}{1 + e^{-\text{logit}(\text{caries}=1)}}$$

Logit (caries = 1) = 0.3694 + (0.17876 x intermediate level of education) + (0.45778 x higher education) - 0.24021 (unemployed) - 0.34098 (consumption of sweet food ≥ 1x per day) - 0.32388 (smoking).

DISCUSSION

This research is a descriptive observational study with a cross-sectional design. The purpose of this study was to describe the risk factors of dental caries in people aged 35-44 years in DKI Jakarta. This research was conducted with approval from the Health Research Ethics Commission of the Faculty of Dentistry, Trisakti University.

The results of the study by Kahar et al. found that the caries prevalence for adults aged 35-44 was higher compared to that of the younger age group.²³ This is similar to the results of the study by Bidjuni and Mamonto, which showed that old age can result in a longer dental interaction with cariogenic foods. Therefore, if it is not followed by good dental and oral hygiene, it can cause dental caries.²⁴ This also accords with the 2018 Riskesdas data, which shows that ages 35-44 have higher caries percentage when compared to younger ages. The difference in percentage with the younger age group is also quite large,

which indicates a significant increase. Bidjuni and Mamonto’s study showed that the prevalence of caries by sex was higher in females. This is due to differences in the eruption period of the teeth. Because the eruption of teeth in females is usually earlier than in males, females’ teeth will be exposed to caries-causing factors longer.²⁴ Research by Rahardjo et al also showed that the percentage of those who had caries was higher in females.²⁵ This is in line with the results of this study, which showed that caries rates were higher in women with 52.2%.

Based on research by Harada et al, working individuals tend to experience stress. Stress can cause a decrease in salivary flow, which causes caries to develop more easily.¹⁴ According to research by Suratri et al, 97,415 respondents who work indicate a higher frequency of dental caries.²⁶ This is consistent with the findings in this study, which showed that 31.7% of respondents who were unemployed had a lower caries risk compared to respondents who worked (OR = 0.78646). A possible explanation for this is respondents who are unemployed tend to have low stress levels. In addition, daily lives of respondents who do not work are more flexible, so they have higher frequency to clean their teeth more effectively.^{14,27} Suryani’s research found that a person with higher educational level is likely to receive and give information more easily.²⁸ Research by Idon et al. shows that someone who has a high level of education will seek preventive care, and thus they have a lower DMF-T score compared to those who have a low level of education. This can be seen prominently in the decay component, which has a

lower value than the filling component in someone with a higher educational level.²⁹ The results of these studies, however, contradict the results of this research, where intermediate educational level has the highest frequency of caries and has 1.2 times more risk of caries occurrence (OR = 1.19573). This finding is broadly supported by the fact that half of the respondents in this study had intermediate educational levels. The uneven number of respondents at the beginning may have caused this to happen.

The ideal frequency of brushing teeth is twice a day, which is after breakfast and before going to bed at night. Research by Susilo et al. showed that only 11.48% of the respondents brushed their teeth at the right time. The majority of respondents in this study knew that brushing their teeth in the morning was right, but the majority did not understand that the right time in the morning was after breakfast.³⁰ This finding is similar to that of Rahardjo et al, which found that only 12% of respondents with caries brushed their teeth twice a day.³¹ This supports the findings of this study, which showed that 97.2% of the respondents had a higher prevalence of brushing teeth at the incorrect time.

Based on the research by Jovina and Suratri, the respondents who frequently consume sweet foods have a higher caries severity level than respondents who rarely or never consume sweet foods.²¹ According to the study by Regiawan et al, respondents who consumed cariogenic food three times per week had the highest dental caries rates, two teeth, of all the respondents.³² This is consistent with the findings in this study, which indicated that respondents who consumed sweet foods 1-6 times per week had higher caries percentage at 48.5% compared to those who rarely consumed sweet foods per month. Based on the results, the respondents who consumed sweet foods ≥ 1 times per day (OR = 0.71107) had a protective factor against caries compared to those who consumed them 1-6 times per week. According to the 2018 Riskesdas data, the reason is because the frequency of respondents aged 35-44 years who consumed sweet foods \geq

1 times per day was fewer than the frequency of those who consumed sweet foods 1-6 times per week. Based on the same data, the frequency of consuming sweets ≥ 1 times per day decreased as age increased. Therefore, the caries rate will also be lower. Matsuoka and Fukai found that individuals who consume sweet drinks more than twice a day have a 33% higher increase in DMF-T than individuals who do not drink sweet drinks.³³ In addition, research by Skinner et al showed that respondents who did not consume sweet drinks every day had a lower average of DMF-T value than respondents who consumed one glass or more of sweet drinks every day.³⁴ This also accords with the results of this study, which showed that the respondents who had the highest prevalence of caries were those who consumed sweet drinks ≥ 1 times per day (64.3%).

According to Santoso et al, frequent consumption of soft drinks will cause the pH of the saliva to become more acidic, which can accelerate the development of caries.³⁵ In addition, Nabila et al. found that the pH of saliva before drinking soft drinks is neutral, whereas the pH after drinking soft drinks is acidic.³⁶ By contrast, Asriawal and Johnny found that respondents with a low frequency of consuming soft drinks have a high DMF-T value and vice versa.³⁷ This supports the results of this study, which showed that respondents who consumed soft drinks the most had a consumption frequency of ≤ 3 times per month with 89.6%. This is probably because the majority of respondents in the 2018 Riskesdas data reported drinking soft drinks ≤ 3 times per month. Based on research by Ulva et al, the enamel surface hardness decreases after being soaked in an energy drink due to demineralization process in the teeth.³⁸ Al-Zahrani et al found that a high level of consumption of energy drinks can lead to twice greater chance of caries development.³⁹ This, however, is in contrast to the findings of this study, which revealed that 93.9% of respondents reported taking energy drinks ≤ 3 times per month. This is possibly because the majority of the respondents had never consumed energy drinks; therefore, only a small percentage of them had a risk of developing caries.

According to research by Kaurow et al, drinking alcohol can decrease salivary pH, thereby triggering xerostomia. Xerostomia in the oral cavity can cause the tooth surface to be susceptible to caries.⁴⁰ This contradicts the findings of Mthethwa and Mahomed's study, which reported a higher frequency of caries among respondents who did not drink alcohol at 70%.⁴¹ The findings of this study are consistent with those of Huang et al, who discovered that the prevalence of caries decreased significantly with increasing frequency of alcohol consumption.⁴² This is also similar to the findings of this study, which indicated that 96.8% of the respondents who did not drink alcohol had a higher incidence of caries than those who did. The majority of respondents in the 2018 Riskesdas data did not consume alcoholic beverage; therefore, this could be one of the reasons for the higher percentage of caries frequency among respondents who did not consume alcoholic beverages.

The prevalence of smokers with high DMF-T values is higher (57.9%), according to research by Lestari et al. Their study found that smokers typically have a higher chance of developing caries because the acidity of their saliva is enhanced by exposure time to smoke and the number of cigarettes they smoke.⁴³ This study, on the other hand, observed major differences with this finding. Respondents who smoked had fewer caries than those who did not smoke, which was 48.1% (OR = 0.72334). Other data in the 2018 Riskesdas show a decrease in the proportion of the population aged 35 to 44 who smoke in DKI Jakarta compared to those who do not smoke. Quantifying the caries level of people who smoke cannot only be seen from their smoking habits because many studies have found that smoking is not related to the development of caries but rather their daily habits that trigger the onset of caries.⁴⁴ Thus, it might be quite difficult to achieve if the data is collected subjectively, as in this research.

The limitation of this study is that the data on caries prevalence is subjective. This is because based on the results of the interview with the respondents and the data collection process, information bias could occur. However, this is

beyond the researchers' control because the researchers could only use the data obtained. In addition, the variables of "consuming sweet food," "consuming sweet drinks," "consuming soft drinks," and "consuming energy drinks" did not include types of food or drinks that fell into those categories.

CONCLUSION

In conclusion, based on the 2018 Riskesdas data, the percentage of respondents aged 35-44 years in DKI Jakarta is 45%. From the results of the study, it was found that several groups of risk factors had a high prevalence of caries. Groups of risk factors that have a high frequency are female (52.2%), employed (68.3%), intermediate educational level (46.3%), incorrect time to brush teeth (97.2%), consuming sweet food 1-6x per week (48.5%), consuming sweet drinks \geq 1x per day (64.3%), consuming soft drinks (89.6%) and energy drinks (93.9%) \leq 3x per month, not consuming alcoholic beverages (96.8%), and smoking (51.9%). Risk factors that are related to caries incidence are intermediate level of education (OR = 1.19573), high level of education (OR = 1.58056), unemployed (OR = 0.78646), consumption of sweet foods \geq 1x per day (OR = 0.71107), and smoking (OR = 0.72334).

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CONFLICT OF INTEREST

The authors declare no conflict of interest with the data contained in the manuscript.

REFERENCES

1. Emdi ZS, Djafri D, Hidayati H. Hubungan pola makan anak terhadap tingkat kejadian karies rampant di Kelurahan Kampung Jao Kota Padang. *Andalas Dent J.* 2017; 5(1): 71-77. doi: 10.25077/adj.v5i1.72

2. Wiantari N, Anggaraeni P HS. Gambaran perawatan pencabutan gigi dan tingkat pengetahuan masyarakat tentang kesehatan gigi dan mulut di Wilayah Kerja Puskesmas Mengwi II. *Bali Dent J*. 2018; 2(2): 100–104. doi: 10.51559/bdj.v2i2.116
3. Kemenkes RI. Laporan Nasional Hasil Riset Kesehatan Dasar (Riskesdas) Indonesia tahun 2018. *Riset Kesehatan Dasar 2018*; 2018. 179-342.
4. Kemenkes RI. Laporan Nasional Hasil Riset Kesehatan Dasar (Riskesdas) Indonesia tahun 2013. *Ris Kesehat Dasar 2013*. 2013;127(3309):1275–9.
5. Luis F, Moncayo G. *Textbook of Operative Dentistry 3rd Edition*. 2015.
6. Gugnani N, Pandit IK, Gupta M, Josan R. Caries infiltration of noncavitated white spot lesions: A novel approach for immediate esthetic improvement. *Contemp Clin Dent*. 2012; 3(6): 199–202. doi: 10.4103/0976-237X.101092
7. Ritter A V, Boushell LW, Walter R. Dental caries: Etiology, clinical characteristics, risk assessment, and management. *Sturdevant's Art and Science of Operative Dentistry*; 2018. 40–50.
8. A'yun Q, Hendrartini J, Supartinah A. Pengaruh keadaan rongga mulut, perilaku ibu, dan lingkungan terhadap risiko karies pada anak. *Majalah Kedokteran Gigi Indonesia*. 2016; 2(2): 86-93. doi: 10.22146/majkedgiind.11267
9. Herawati D, Hidayah N, Faridah U. Hubungan antara jumlah anak, usia dan pola gosok gigi dengan karies gigi pada wanita usia subur di RSU Kumala Siwi Kudus. *Indones J Perawat*. 2020; 5(2): 27. doi: 10.26751/ijp.v5i2.1348
10. Costa SM, Martins CC, Pinto MQC, Vasconcelos M, Abreu MHNG. Socioeconomic factors and caries in people between 19 and 60 years of age: An update of a systematic review and meta-analysis of observational studies. *Int J Environ Res Public Health*. 2018; 15(8): 2-17. doi: 10.3390/ijerph15081775.
11. Organization WH. *Oral Health Surveys Basic Methods-5th Ed*. World Health Organization. 2013; 5: 15.
12. Urzua I, Mendoza C, Arteaga O, Rodríguez G, Cabello R, Faleiros S, Carvajal P, Muñoz A, Espinoza I, Aranda W, Gamonal J. Dental caries prevalence and tooth loss in Chilean adult population: First national dental examination survey. *Int J Dent*. 2012; 2012: 1-6. doi: 10.1155/2012/810170
13. Lee HY, Choi YH, Park HW, Lee SG. Changing patterns in the association between regional socio-economic context and dental caries experience according to gender and age: A multilevel study in Korean adults. *Int J Health Geogr*. 2012; 11: 1–10. doi: 10.1186/1476-072X-11-30
14. Harada Y, Takeuchi K, Furuta M, Tanaka A, Tanaka S, Wada N, Yamashita Y. Gender-dependent associations between occupational status and untreated caries in Japanese adults. *Ind Health*. 2019; 56(6): 539–544. doi: 10.2486/indhealth.2018-0062
15. Abbass MMS, Abubakr N, Radwan IA, Dina R, Moshy SE, Ramadan M, Ahmed A, Jawaldeh AA. The potential impact of age, gender, body mass index, socioeconomic status and dietary habits on the prevalence of dental caries among Egyptian adults: a cross-sectional study. *F1000Res*. 2019; 8: 1–27. doi: 10.12688/f1000research.17892.1
16. Tanu NP, Manu AA, Ngadilah C. Hubungan frekuensi menyikat gigi dengan tingkat kejadian karies. *Dent Ther J*. 2019; 1(1): 39–43. doi: <https://doi.org/10.31965/DTJ>
17. Junarti D, Santik YDP. Perilaku pemeliharaan kesehatan gigi dan status karies. *J Public Heal Res Dev*. 2017; 1(1): 87.
18. Purnamasari NL, Hartini TNS, Herawati H. Perilaku menggosok gigi kebiasaan makan dan minum tinggi sukrosa dengan kejadian karies gigi pada siswa di MIN Jejeran. *J Nutr*. 2017; 19(2): 106-112. doi: 10.29238/jnutri.v19i2.19
19. Fitriati N, Elly Trisnawati E, Hernawan AD. Perilaku konsumsi minuman ringan (softdrink)

- dan pH. *Unnes J Public Heal.* 2017; 6(2): 114-122.
20. Çetinkaya H, Romaniuk P. Relationship between consumption of soft and alcoholic drinks and oral health problems. *Cent Eur J Public Health.* 2020; 28(2): 94–102. doi: 10.21101/cejph.a5745
 21. Jovina TA, Suratni MAL. The relationship between toothbrush behavior, smoking, and diabetes mellitus with dental and oral health status in Indonesia: The Analysis Data of Indonesian National Basic Health Research (Riskesmas) 2013. *J Penelit dan Pengemb Pelayanan Kesehatan.* 2019; 3(1): 57–66. doi: 10.22435/jpppk.v3i1.1571
 22. Healy LM. Logistic regression: an overview. Eastern Michigan College of Technology; 2006.
 23. Kahar P, Harvey IS, Tisone CA, Khanna D. Prevalence of dental caries, patterns of oral hygiene behaviors, and daily habits in rural central India: a cross - sectional study. 2016; 14(4): 389–396. doi: 10.4103/2319-5932.195828
 24. Bidjuni Mustapa MR. Prevalensi karies gigi pengunjung poliklinik gigi di Rumah Sakit Umum Daerah Bolang Mongondow Selatan Tahun 2018. *J Ilm Gigi dan Mulut.* 2021; 4(1): 47-52. doi: 10.47718/jgm.v4i1.1825
 25. Rahardjo AK, Widjiastuti I, Arif E. Prevalensi karies gigi posterior berdasarkan kedalaman, usia dan jenis kelamin di Rsgm Fkg Unair Tahun 2014 (Prevalence of Posterior Teeth Caries by The Depth of Cavity, Age and Gender at RSGM FKG UNAIR in 2014). *Conserv Dent J.* 2016; 6(2): 66–70. doi: 10.20473/cdj.v6i2.2016.66-70
 26. Suratni MAL, Indirawati TNVS. Correlation between dental health maintenance behavior with Dental Caries Status (DMF-T). *Bali Med J.* 2018; 7(1): 56–60. doi: 10.15562/bmj.v7i1.836
 27. Irie K, Tsuneishi M, Saijo M, Suzuki C, Yamamoto T. Occupational Difference in Oral Health Status and Behaviors in Japanese Workers: A Literature Review. *Int J Environ Res Public Health.* 2022; 19(13): 1-10. doi: 10.3390/ijerph19138081
 28. Suryani L. Hubungan tingkat pendidikan dan penghasilan kepala keluarga dengan karies gigi anak pada masyarakat Desa Seibun Ayon Kecamatan Lhoknga Aceh Besar Tahun 2019. *J Aceh Med.* 2020; 4(1): 85–93.
 29. Idon PI, Ikusika OF, Ogundare TO, Yusuf J, Enone LL, Aliyu AB. Associations of untreated caries and experience among WHO - recommended adult age groups. *Niger J Med.* 2022; 31(1): 59–67. doi: 10.4103/NJM.NJM_171_21
 30. Susilo FS, Aripin D, Suwargiani AA. Practices of oral health maintenance , caries protective factors and caries experience in adults. *Padjadjaran J Dent.* 2021; 33(2): 170–180. doi: 10.24198/pjd.vol33no2.28419
 31. Rahardjo A, Maharani DA, Kiswanjaya B, Idrus E, Nicholson J. Measurement of tooth brushing frequency, time of day and duration of adults and children in Jakarta, Indonesia. *J Dent Indones.* 2014; 21(3): 85-88. doi: 10.14693/jdi.v21i3.251
 32. Regiawan R, Yenni Hendriani Pratiwi, Tiurmina Sirait MHP. Kebiasaan buruk yang menimbulkan karies pada santri pondok pesantren. *J Kesehatan Siliwangi.* 2021; 2(1): 347–351. doi: 10.34011/jks.v2i1.1843
 33. Matsuoka Y, Fukai K. Adult dental caries and sugar intake. 2015; 15(1): 22-29.
 34. Skinner J, Byun R, Blinkhorn A, Johnson G. Sugary drink consumption and dental caries in New South Wales teenagers. *Aust Dent J.* 2015. 169–175. doi: 10.1111/adj.12310
 35. Santoso TLA, Wicaksono DA, Gunawan PN. Effects of carbonated soft drink on saliva ph in the occurrence of dental caries. 2022; 10(30): 66–74. doi: 10.35790/eg.v10i1.37606
 36. Nabila A, Siti Sulastri A. Pengaruh sebelum dan sesudah minum minuman bersoda terhadap (pH) saliva pada mahasiswa asrama. *J Gigi dan Mulut.* 2016; 3(1): 17–22.

37. Angki JA. Hubungan frekuensi minum soft drink (bersoda) terhadap pH Ssaliva dan angka DMF-T pada mahasiswa D-IV Jurusan Keperawatan Gigi. 2019; 18(2): 22–31.
38. Ulva P, Purnakarya I, Pudjiastuty A. Effect of energy drink on microhardness of dental enamel (in vitro). *Andalas Dent J.* 2018; 6(1): 32–41.
39. Al-zahrani A, Al-qahtani M, Al-barti M, Bakhurji EA. Dietary determinants of dental caries prevalence and experience in Saudi Schoolchildren: frequency versus quantity. *ScientificWorldJournal.* 2022; 2022: 5447723. doi: 10.1155/2022/5447723
40. Kaurow C, Wowor VNS, Pangemanan DHC. Gambaran status karies peminum alkohol di Desa Paku Weru Dua. *J Ilm Farm.* 2015; 4(4): 305–311. doi: 10.35799/pha.4.2015.10402
41. Mthethwa J, Mahomed O. Prevalence and demographic predictors of adult dental caries among at public oral health facilities in two districts In Kwazulu-Natal, South Africa: a cross sectional study. *Int J Dent Oral Sci.* 2021; 8(7): 3341–3346. doi: 10.19070/2377-8075-21000680
42. Huang X, Liang Y, Fan W, Liu W, Wu B, Li J. Relationship between Chinese Baijiu consumption and dental caries among 55- to 74-year-old adults in Guangdong , southern China: a cross-sectional survey. *BMC Geriatr.* 2021; 21(506): 1–9. doi: 10.1186/s12877-021-02453-x
43. Lestari WD, Edi IS, Mahirawatie IC, Gigi JK, Kesehatan P, Surabaya K. Hubungan antara pH saliva perokok dengan kejadian karies (studi pada anggota karang taruna Medayu Utara RW 15 Tahun 2022). *J Ilm Keperawatan Gigi.* 2022; 3(2): 272–279. doi: 10.37160/jikg.v3i2.908
44. Pindobilowo, Ariani D, Herawati M, Akhvina N. Kontribusi durasi merokok sebagai penyebab terjadinya karies gigi pada penghuni panti sosial. *e-GiGi.* 2023; 11(2): 134–142. doi: 10.35790/eg.v11i2.44924