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Meta-Analysis
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Determinants of Dental and Oral Health Care Service: A Meta-Analysis

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ABSTRACT

Background: The limited utilization of dental and oral health services leads to poor dental and oral health status of both individuals and community. Regular visits to dentists can improve oral health status through early detection of dental and oral diseases. The study aims to systematically examine the factors that influence the utilization of dental and oral health services.
Subjects and Method: It was a systematic review and meta-analysis study using PRISMA and PICO diagrams. P= general population. I = women, higher education, high income, poor self-perception, and having health insurance. C= male, low education, low income, good self-perception, and no health insurance. O= utilization of dental and oral health services. Data collection was conducted using the PubMed and ScienceDirect databases. The inclusion criteria used were full, English, cross-sectional design articles in 2012-2023. The keywords used are "(Determinant OR Factor associated)" AND "Dental healthcare utilization". Data analysis was performed using the RevMan 5.3 application..
Results: There were14 primary articles as meta-analysis sources from Saudi Arabia, Indonesia, Iran, Korea, Thailand, Bosnia and Herzegovina, Sweden, the United States, Canada, and Brazil. Female (aOR= 1.13; CI 95%= 1.02-1.25; p= 0.020), higher education (aOR= 1.90; CI 95%= 1.40- 2.56; p<0.001), high income (aOR= 1.91; CI 95%= 1.55-2.35; p<0.001), and having health insurance (aOR= 1.68; CI 95%= 1.30-2.19; P<0.001) increased the utilization of dental and oral health services. Self-perception did not affect the utilization of dental and oral health services (aOR= 1.04; CI 95%= 0.81-1.33; p= 0.76).
Conclusion: Female, education, income, and ownership of health insurance influence the utilization of dental and oral health services.

Keywords: dental healthcare utilization, factor associated

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BACKGROUND

The World Health Organization (WHO) reports that 3.5 billion people in the world suffer from dental and oral diseases. The percentage of oral disease prevalence globally is 45% and it is estimated that the number of oral disease cases has increased by one billion cases from 1990 to 2019. The high increase in the number of oral disease cases poses a burden on the health system, which indicates

that oral disease prevention and control efforts have not been fully successful (WHO, 2022).

Oral health is closely related to overall human health. Oral health can affect the health of the body in general. Previous research has reported that there is a link between poor oral health and chronic health conditions such as diabetes, cardiovascular disease, and respiratory disorders. The utilization of oral health services has an important role in maintaining oral health and improving the oral health status of individuals. The utilization of oral health services that are still limited in some countries causes poor oral health status of individuals and communities to disrupt the quality of human life (Lee et al., 2015; Hariyani et al., 2021).

Regular visits to the dentist can improve oral health status through early detection of dental and oral diseases. Beigi et al. (2019) in Tehran reported that 43.8% of people do not make a visit to the dentist, 26.1% of people only visit the dentist once, and 30.1% of people visit the dentist twice during a 1-year period. Hariyani et al. (2021) in its study also reported that as many as 95.5% of people in Indonesia have never used dental health services (Beigi et al., 2019; Hariyani et al., 2021).

Women have the highest frequency of visits to the dentist. Average visits to the dentist are also high in individuals with higher education, high income, and poor self-perception of oral health conditions (Bahramian et al., 2015). The distribution of the utilization of dental health services is more in the elderly group with a high economic level than the elderly group with a low economic level (Somkotra, 2013). The utilization of dental and oral health services was low in the group of respondents aged less than 25 years, male, villagers, toothless, poorly educated, and had poor brushing habits (Hariyani et al., 2021).

Many factors affect the utilization of dental and oral health services by individuals. The high utilization of dental and oral health services will have a good impact on the dental and oral health status of individuals. Good dental and oral health will have a good impact on the overall health of the individual. Therefore, this study aims to determine the factors that affect the use of dental and oral health services by the general population, with a systematic review approach and meta-analysis.

SUBJECTS AND METHOD

1. Study Design

This study was conducted using systematic review and meta-analysis that used primary data from the results of previous similar studies. Article searches were conducted through PubMed and ScienceDirect databases published from 2012 to 2023. The keywords used in searching process were ("determinant" OR "factor associated") AND "dental healthcare utilization"..

2. Steps of Meta-Analysis

Meta-analysis analysis was carried out through 5 steps as follows:

1) Formulating study questions based on PICO format (Population, Intervention, Comparison, Outcome).
2) Searching for primary study articles from several databases, such as: Google scholar, PubMed, ScienceDirect.
3) Selecting primary studies based on inclusion criteria and selection criteria, as well as conducting critical assessments of study quality.
4) Conducting data extraction and effect size synthesis of each primary study using the RevMan 5.3 application
5) Interpret the results of the research analysis and draw conclusions.

3. Inclusion Criteria

The inclusion criteria were full text articles with a cross-sectional study design, the measure of association used was the adjusted odds ratio (aOR), the subject of the study was the general population, and the outcome of the study was the use of dental and oral health services.

4. Exclusion Criteria

The exclusion criteria were secondary study articles, and articles published in a non-English language.

5. Operational Definition

The utilization of dental and oral health services is to make visits and undergo health care until the fulfilment of health needs to dental and oral health services.

Sex is a biological and physiological difference that distinguishes men and women.

Education level is the stage of education that is applied based on the level of development of students, goals to be achieved, and developed abilities.

Income level is the level of income earned by an individual or family in one month of work.

Self-perception is an individual's opinion about the state of health of his/her personal oral cavity.

Health insurance ownership is a financial protection ownership status that guarantees the party who has insurance toward medical expenses and medical care.

6. Study Istruments

The assessment of the quality of primary study articles in this study was carried out using primary study quality assessment for cross-sectional study design in meta-analysis study sourced from the master program in public health sciences, graduate school, Universitas Sebelas Maret.

7. Data Analysis

The articles obtained in this study were subsequently collected using PRISMA flow diagrams, and analysed using the Review Manager 5.3 (RevMan) application by calculating the effect size and heterogeneity (I^2) of the study. The results of data analysis were presented in the form of forest plots and funnel plots.

RESULTS

Article searches were conducted through PubMed and ScienceDirect databases. The article search process can be seen in the PRISMA flow diagram in Figure 1.

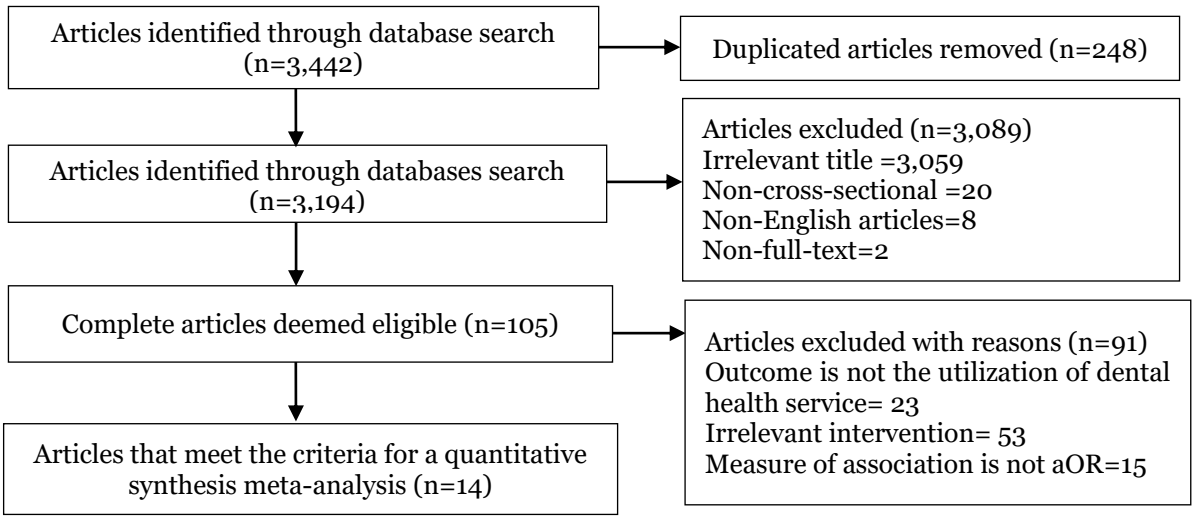


Figure 1. PRISMA Flow diagram

The initial search obtained 3,442 articles, and after a double article removal process, 3,194 articles were then screened again so that 105 articles were eligible for full text review. There were 14 articles that quantitatively eligible for meta-analysis.

Figure 2. Map of the distribution of research on determinants of dental and oral health care service

Figure 2 indicates the distribution of study locations of 14 articles used in this study, namely the America, Asia, and Europe. 3 articles came from the America, 9 studies came from the Asian continent, and 2 studies were from the European continent

Table 1. Assessment of cross-sectional study quality

Primary Study	Criteria													Total
	1a	1b	1c	1d	2a	2b	3a	3b	4	5	6a	6b	7	
(Bahramian *et al.*, 2019)	2	2	2	2	2	2	2	2	2	2	2	2	2	26
(Beigi *et al.*, 2019)	2	2	2	2	2	2	2	2	2	2	2	2	2	26
(Hakeberg & Boman, 2017)	2	2	2	2	2	2	2	2	2	2	2	2	2	26
(Hariyani *et al.*, 2021)	2	2	2	2	2	2	2	2	2	2	2	2	1	25
(Kim *et al.*, 2020)	2	2	2	2	0	2	2	2	2	2	2	2	2	24
(Lee *et al.*, 2014)	2	2	2	2	0	2	2	2	2	2	2	2	1	23
(Li *et al.*, 2023)	2	2	2	2	2	2	2	2	2	2	2	2	2	26
(Monteiro *et al.*, 2016)	2	2	2	2	2	2	2	2	2	1	2	2	2	25
(Rezaei *et al.*, 2018)	2	2	2	2	2	2	2	2	2	2	2	2	2	26
(Rezaei *et al.*, 2020)	2	2	2	2	2	2	2	2	2	2	2	2	2	26
(Sahab *et al.*, 2022)	2	2	2	2	2	2	2	2	2	2	2	2	2	26
(Santoso *et al.*, 2020)	2	2	2	2	0	2	2	2	2	2	2	2	2	24
(Šiljak *et al.*, 2019)	2	2	2	2	0	2	2	2	2	2	2	2	2	24
(Somkotra, 2012)	2	2	2	2	2	2	2	2	2	2	2	2	2	26

Description of the answer score:

2 = Yes

1 = Uncertain

0 = No

Question criteria descriptions:

1. **Formulation of study questions in the acronym PICO**

a. Is the population in the primary study the same as the population in the PICO meta-analysis?
b. Is the operational definition of the intervention, i.e. exposed status in the primary study the same as the definition intended in the meta-analysis?
c. Is the comparison, i.e. unexposed status used by the primary study the same as the definition intended in the meta-analysis?
d. Is the outcome variable studied in the primary study the same as the definitions intended in the meta-analysis?

2. **Methods for choosing a study subject**

a. In cross-sectional analytical studies, did researchers randomly select samples from the population?
b. As an alternative, if in an analytical cross-sectional study, the sample was not randomly selected, did researchers select the sample based on outcome status or based on intervention status?

3. **Methods for measuring exposure (intervention) and outcome variables (outcome)**

a. Were both exposure and outcome variables measured with the same instruments in all primary studies?
b. If variables were measured on a categorical scale, were the cutoffs or categories used identical across primary studies?

4. **Design-related bias**

If the sample was not randomly selected, had the researcher made efforts to prevent bias in choosing the study subject? For example, selecting subjects based on outcome status is not affected by exposure status (intervention), or in selecting subjects based on exposure status (intervention) is not affected by outcome status.

5. **Methods for controlling confusion (confounding)**

Has the primary study researcher made efforts to control for the effect of confusion (e.g., performed a multivariate analysis to control for the effect of a number of confounding factors)?

6. **Statistical analysis methods**

a. Did the researchers analyse the data in this primary study with multivariate analysis models (e.g., multiple linear regression analysis, multiple logistic regression analysis)
b. Does the primary study report effect sizes or association of the results of the multivariate analysis (e.g., adjusted OR, adjusted regression coefficient)?

7. **Conflict of interest**

Was there no conflict of interest with the study sponsor, which causes bias in concluding study results?

Table 2. Table PICO summary of the studies in the meta-analysis of the effect of sex category on the utilization of dental and oral health services

Author (Year)	Country	Sample	P	I	C	O
Bahramian et al.(2019)	Iran	20,320	Individuals aged 15-64 years	Female	Male	The utilization of oral dan dental health service
Hakeberg & Bosman (2017)	Sweden	3,500	Individuals aged ≥19 years	Female	Male	The utilization of oral dan dental health service
Hariyani et al. (2021)	Indonesia	79,322	individuals aged 25-50 years	Female	Male	The utilization of oral dan dental health service

Author (Year)	Country	Sample	P	I	C	O
Kim et al. (2020)	Korea	12,937	individuals aged 25-79 years	Female	Male	The utilization of oral dan dental health service
Lee et al. (2014)	United States	2,166	individuals aged ≥65 years	Female	Male	The utilization of oral dan dental health service
Li et al. (2023)	Cnada	37,935	individuals aged ≥12 years	Female	Male	The utilization of oral dan dental health service
Rezaei et al. (2020)	Iran	436	individuals aged ≥40 years	Female	Male	The utilization of oral dan dental health service
Santoso et al. (2020)	Indone-sia	16,860	individuals aged ≥15 years	Female	Male	The utilization of oral dan dental health service
Siljak et al. (2019)	Bosnia & Herzego-vina	4,128	individuals aged ≥18 years	Female	Male	The utilization of oral dan dental health service
Somkotra et al. (2012)	Thailand	10,096	individuals aged ≥60 years	Female	Male	The utilization of oral dan dental health service

Table 1 shows the results of the assessment of the quality of primary articles used in this study. Study quality assessment uses primary study quality assessment for cross-sectional design for meta-analysis research originating from master program in public health sciences, graduate school, Sebelas Maret University. The study quality assessment process was carried out by involving 2 assessors.

Table 2 indicates descriptions of 10 cross-sectional study articles as sources for meta-analysis of the effect of sex category on the utilization of dental and oral health service, originating from Indonesia, Iran, Korea, Thailand, Bosnia and Herzegovina, Sweden, the United States, and Canada.

Table 3. Data on adjusted odds ratio (aOR) and 95% confidence interval (CI 95%) on of the effect of sex category on the utilization of dental and oral health services

Author	Years	aOR	CI 95%	
			Upper Limit	Lower Limit
Bahramian *et al.*	2019	1.1	1.0	1.3
Hakeberg & Boman	2017	0.58	0.45	0.75
Hariyani *et al.*	2021	1.23	1.19	1.26
Kim *et al.*	2020	1.05	0.97	1.14
Lee *et al.*	2014	1.4	1.08	1.81
Li *et al.*	2023	1.51	1.06	2.16
Rezaei *et al.*	2020	3.15	1.21	8.16
Santoso *et al.*	2020	1.18	1.03	1.32
Siljak *et al.*	2019	1.30	1.16	1.47
Somkotra *et al.*	2012	1.01	0.86	1.20

Table 3 shows the results of a statistical summary of the effect estimates of the effect of female sex category on the utilization of dental and oral health services. The highest aOR was 3.15 and the lowest aOR was 0.58.

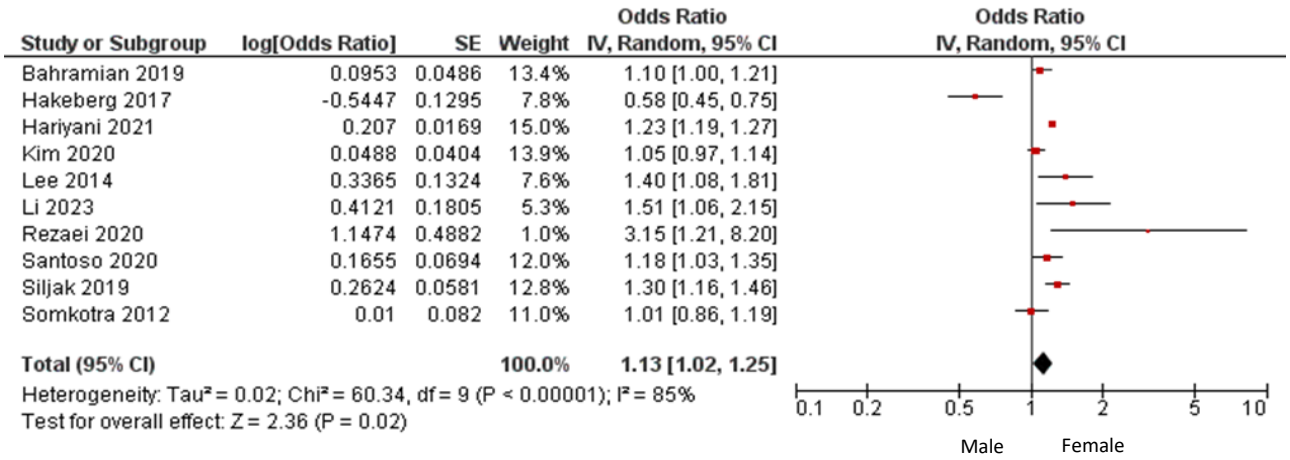


Figure 3. Forest plot of the effect of sex category on the utilization of dental and oral health services

a. Forest plot

The forest plot in Figure 3 shows an association between sex category and probability of utilizing dental and oral health services, and it was statistically significant. Women were 1.13 times more likely to utilize dental and oral health services than men (OR = 1.13; CI 95%= 1.02 to 1.25; p= 0.02). There was a high heterogeneity of effect estimates across studies (I2= 85%; p <0.001). So that the calculation of the average effect estimates was carried out with a random effect model approach.

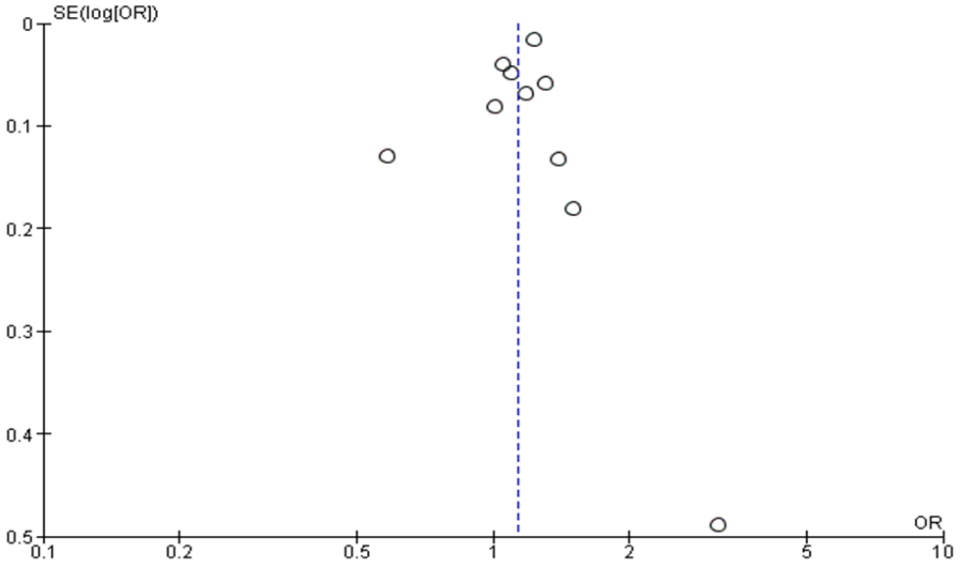


Figure 4. Funnel plot of the effect of sex category on the utilization of dental and oral health services

b. Funnel plot

The The funnel plot in Figure 4 shows a balanced distribution of effects to the right and left of the average vertical line of estimates. The funnel plot shows the absence of publication bias.

Table 4. PICO summary of the studies in the meta-analysis of the effect of education level on the utilization of dental and oral health services

Author (Year)	Country	Sample	P	I	C	O
Bahramian et al. (2019)	Iran	20,320	Individuals aged 15-64 years	University	<Secondary School	Oral dan dental health service use
Beigi et al. (2019)	Iran	17,252	Individuals aged 15-64 years	University	<Secondary School	Oral dan dental health service use
Hariyani et al. (2021)	Indonesia	79,322	Individuals aged 25-50 years	≥Secondary school	≤Secondary School	Oral dan dental health service use
Kim et al. (2020)	Korea	12,937	Individuals aged 25-79 years	University	Primary School	Oral dan dental health service use
Lee et al. (2014)	United States	2,166	Individuals aged ≥65 years	≥12 years	<12 years	Oral dan dental health service use
Li et al. (2023)	Canada	37,935	Individuals aged ≥12 years	University	<Secondary School	Oral dan dental health service use
Monteiro et al. (2016)	Brazil	3,271	Individuals aged 20-60 years	>12 years	0-3 years	Oral dan dental health service use
Rezaei et al. (2018)	Iran	894	Individuals aged ≥18 years	University	Primary school	Oral dan dental health service use
Rezaei et al. (2020)	Iran	436	Individuals aged ≥40 years	University	Primary school	Oral dan dental health service use
Santoso et al. (2020)	Indonesia	16,860	Individuals aged ≥15 years	>Secondary school	<Primary School	Oral dan dental health service use
Siljak et al. (2019)	Bosnia & Herzego-vina	4,128	Individuals aged ≥18 years	High	Low	Oral dan dental health service use
Somkotra et al. (2012)	Thailand	10,096	Individuals aged ≥60 years	>Secondary School	<Secondary School	Oral dan dental health service use

Table 4 shows the description of 12 cross-sectional study articles as a source of meta-analysis of the effect of education level on the utilization of dental and oral health services, originating from Indonesia, Iran, Korea, Thailand, Bosnia and Herzegovina, the United States, and Brazil

Table 5. Data of adjusted odds ratio (aOR) and confidence interval 95% (CI 95%) of effect of education level on the utilzation of dental and oral health services

Author	Year	aOR	CI 95%	
			Upper Limit	Lower Limit
Bahramian et al.	2019	1.4	1.2	1.7
Beigi et al.	2019	1.66	1.44	192

Author	Year	aOR	CI 95%	
			Upper Limit	Lower Limit
Hariyani et al.	2021	1.12	1.07	1.16
Kim et al.	2020	1.69	1.47	1.96
Lee et al.	2014	2.27	1.58	3.25
Li et al.	2023	1.18	0.79	1.75
Monteiro et al.	2016	6.6	4.3	10.1
Rezaei et al.	2018	2.37	1.00	5.60
Rezaei et al.	2020	0.52	0.17	1.63
Santoso et al.	2020	4.18	3.53	4.96
Siljak et al.	2019	3.22	2.63	4.00
Somkotra et al.	2012	1.04	0.87	1.21

Table 5 shows the results of a statistical summary of the effect estimates of education level on the utilization of dental and oral health services are presented in Table 5. The highest aOR was 6.6, and the lowest aOR was 0.52

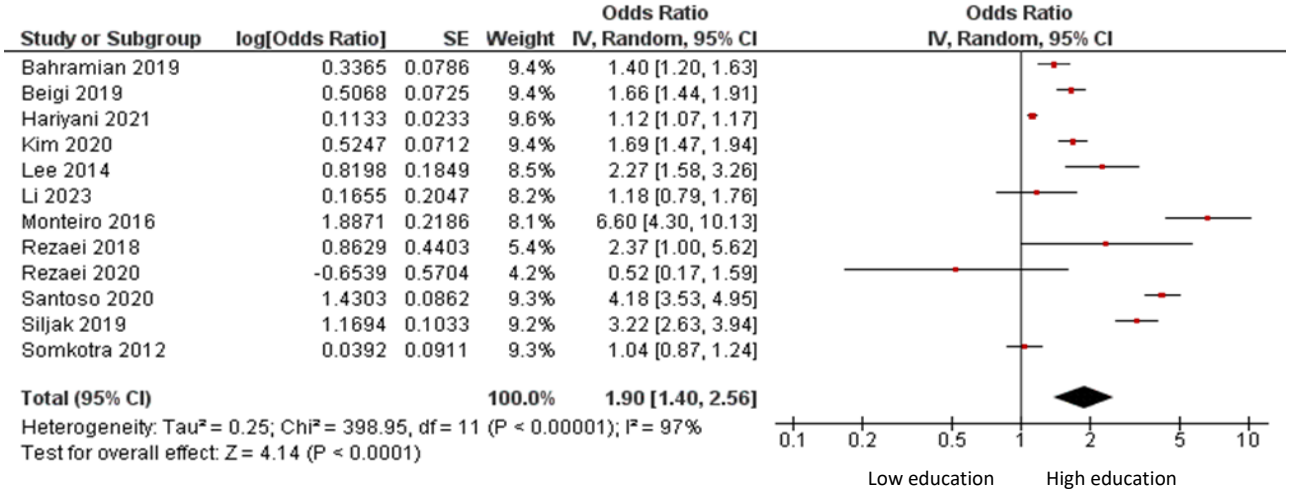


Figure 5. forest plot of the effect of education level on utilization of dental and oral health services

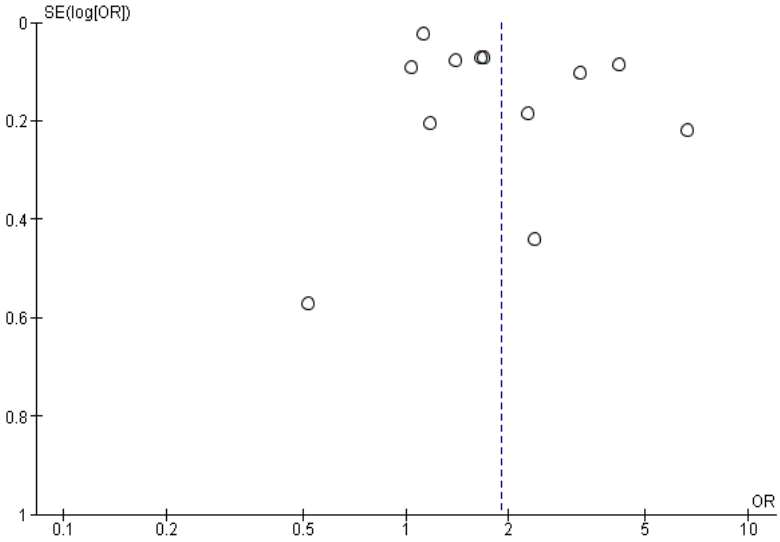


Figure 6. Funnel plot of the influence of the work environment on job satisfaction in health workers

c. Funnel Plot

The funnel plot in Figure 6 shows a roughly balanced distribution of effects to the right and left of the average vertical line of estimates. Thus the funnel plot did not indicate any publication bias.

d. Forest plot

The forest plot in Figure 3 shows an association between sex category and probability of utilizing dental and oral health services, and it was statistically significant. Women were 1.13 times more likely to utilize dental and oral health services than men (OR = 1.13; CI 95% = 1.02-1.25; p= 0.02). There was a high heterogeneity of effect estimates across studies (I^2= 85%; p <0.001). So that the calculation of the average effect estimates was carried out with a random effect model approach.

Table 6. PICO summary of the studies in the meta-analysis of the effect of income level on the utilization of dental and oral health services

Author (Year)	Country	Sample	P	I	C	O
Bahramian et al. (2019)	Iran	20,320	Individuals aged 15-64 years	High	Low	Oral dan dental health service use
Kim et al. (2020)	Korea	12,937	Individuals aged 25-79 years	High	Low	Oral dan dental health service use
Lee et al. (2014)	United States	2,166	Individuals aged ≥65 years	High	Low	Oral dan dental health service use
Li et al. (2023)	Canada	37,935	Individuals aged ≥12 years	≥$80,000	≤$39,999	Oral dan dental health service use
Monteiro et al. (2016)	Brazil	3,271	Individuals aged 20-60 years	≥6 mlw	≤1 mlw	Oral dan dental health service use
Rezaei et al. (2018)	Iran	894	Individuals aged ≥18 years	>40 million IR	<10 million IR	Oral dan dental health service use
Rezaei et al. (2020)	Iran	436	Individuals aged ≥40 years	>40 million IR	<10 million IR	Oral dan dental health service use
Sahab et al. (2022)	Saudi Arabia	8,535	Individuals aged 18-65 years	High	Low	Oral dan dental health service use
Santoso et al. (2020)	Indonesia	16,860	Individuals aged ≥15 years	High	Low	Oral dan dental health service use
Siljak et al. (2019)	Bosnia & Herzegovina	4,128	Individuals aged ≥18 years	High	Low	Oral dan dental health service use
Somkotra et al. (2012)	Thailand	10,096	Individuals aged ≥60 years	High	Low	Oral dan dental health service use

Table 6 shows the description of 11 cross-sectional study articles as a source of meta-analysis of the effect of income on the use of dental and oral health services, originating from Saudi Arabia, Indonesia, Iran, Korea,

Thailand, Bosnia and Herzegovina, the United States, Brazil, and Canada.

Table 1 Data of adjusted odds ratio (aOR) and confidence interval 95% (CI 95) of the effect of income level on the utilization of dental and oral health services

Author	Year	aOR	CI 95%	
			Upper Limit	Lower Limit
Bahramian et al.	2019	2.1	1.7	2.5
Kim et al.	2020	1.61	1.36	1.88
Lee et al.	2014	2.17	1.42	3.22
Li et al.	2023	1.60	1.07	2.39
Monteiro et al.	2016	3.3	2.0	5.4
Rezaei et al.	2018	1.00	0.41	2.42
Rezaei et al.	2020	3.71	1.30	10.57
Sahab et al.	2022	1.43	1.01	2.02
Santoso et al.	2020	2.03	1.68	2.45
Siljak et al.	2019	1.26	1.11	1.44
Somkotra et al.	2012	3.03	2.32	3.84

Table 7 shows a summary of the effect estimates of income level on the utilization of dental and oral health services. The highest aOR was 3.71 and the lowest aOR was 1.00.

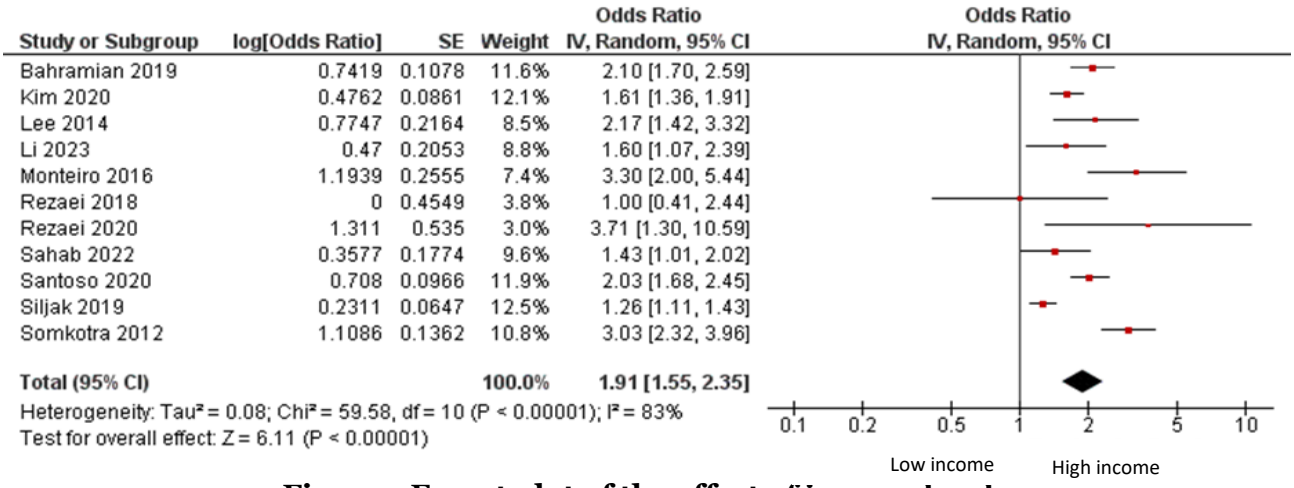


Figure 1 Forest plot of the effect of income levels on the utilization of dental and oral health services

e. Forest Plot

The forest plot in Figure 7 shows a statistically significant association between income level and probability of utilizing dental and oral health services. People with high incomes were 1.91 times more likely to utilize dental and oral health services than people with low incomes (OR= 1.91; CI 95%= 1.55 to 2.35; p<0.001). There was a high heterogeneity of effect estimates across studies (I^2= 83%; p< 0.001), so that the calculation of the average effect estimates was carried out with a random effect model approach.

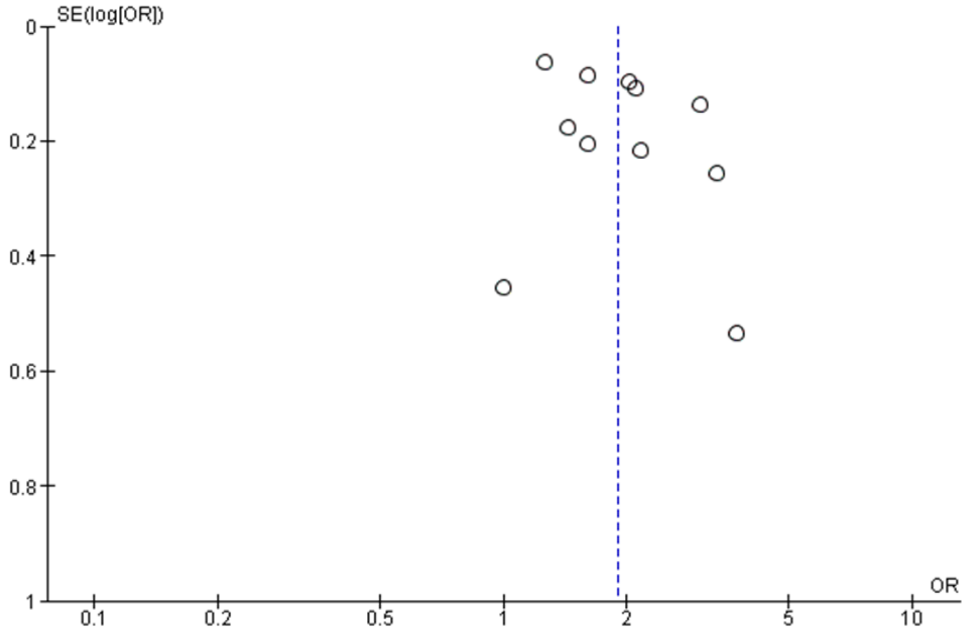


Figure 8 Funnel plot of the effect of income level on the utilization of dental and oral health services

f. Funnel Plot

The funnel plot in Figure 8 shows a roughly balanced distribution of effects to the right and left of the average vertical line of estimates. Thus, the funnel plot does not show any publication bias.

Table 8. PICO summary of the studies in the meta-analysis of the effect of self-perception on the utilization of dental and oral health services

Author (Year)	Country	Sample	P	I	C	O
Bahramian *et al.* (2019)	Iran	20,320	Individuals aged 15-64	Poor perception	Good perception	Oral and dental health service uptake
Hakeberg & Bosman (2017)	Sweden	3,500	Individuals aged ≥19	Poor perception	Good perception	Oral and dental health service uptake
Kim *et al.* (2020)	Korea	12,937	Individuals aged 25-79	Poor perception	Good perception	Oral and dental health service uptake
Li *et al.* (2023)	Canada	37,935	Individuals aged ≥12	Poor perception	Good perception	Oral and dental health service uptake
Rezaei *et al.* (2018)	Iran	894	Individuals aged ≥18	Poor perception	Good perception	Oral and dental health service uptake
Rezaei *et al.* (2020)	Iran	436	Individuals aged ≥40	Poor perception	Good perception	Oral and dental health service uptake
Santoso *et al.* (2020)	Indonesia	16,860	Individuals aged ≥15	Poor perception	Good perception	Oral and dental health service uptake

Author (Year)	Country	Sample	P	I	C	O
Siljak *et al.* (2019)	Bosnia & Herzego-vina	4,128	Individuals aged ≥18	Poor perception	Good perception	Oral and dental health service uptake

Table 8 shows the description of 8 cross-sectional study articles as a source of meta-analysis of the influence of self-perception on dental and oral health on the use of dental and oral health services, originating from Indonesia, Iran, Korea, Bosnia and Herzego-vina, Sweden, and Canada.

Table 2. Data of adjusted odds ratio (aOR) and confidence interval 95% (CI 95) of the effect of self-perception on the utilization of dental and oral health services

Author	Year	aOR	CI 95%	
			Upper Limit	Lower Limit
Bahramian *et al.*	2019	1.3	1.1	1.4
Hakeberg & Boman	2017	1.41	1.07	1.86
Kim *et al.*	2020	0.80	0.73	0.87
Li *et al.*	2023	0.75	0.49	1.14
Rezaei *et al.*	2018	1.91	1.42	2.57
Rezaei *et al.*	2020	0.42	0.23	0.76
Santoso *et al.*	2020	1.28	1.14	1.44
Siljak *et al.*	2019	0.81	0.62	1.06

Table 9 shows the results of the statistical summary of the estimated effect of self-perception on the use of dental and oral health services are shown in Table 9. The highest aOR value is 1.91, and the lowest aOR value is 0.42

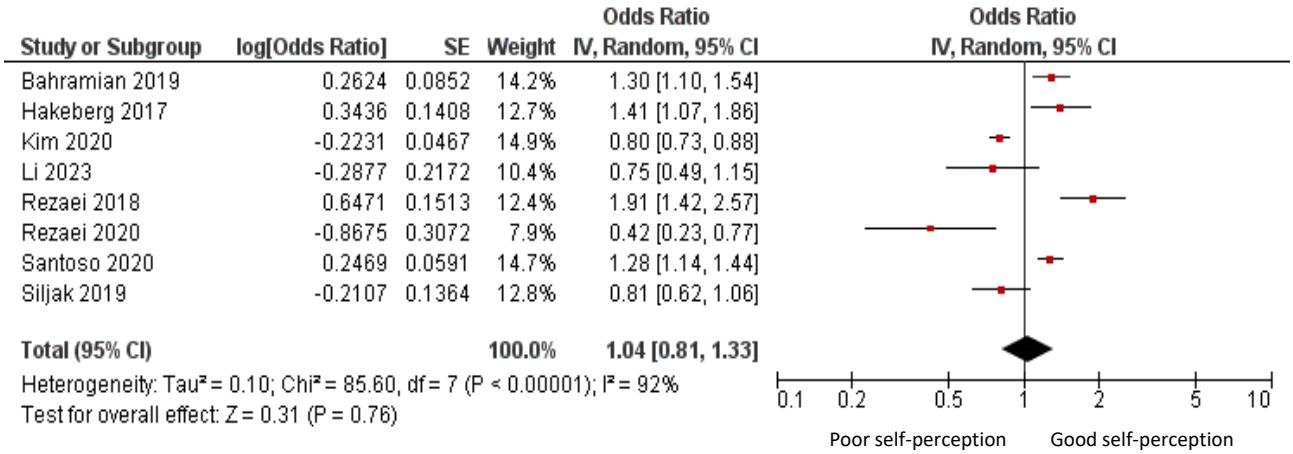
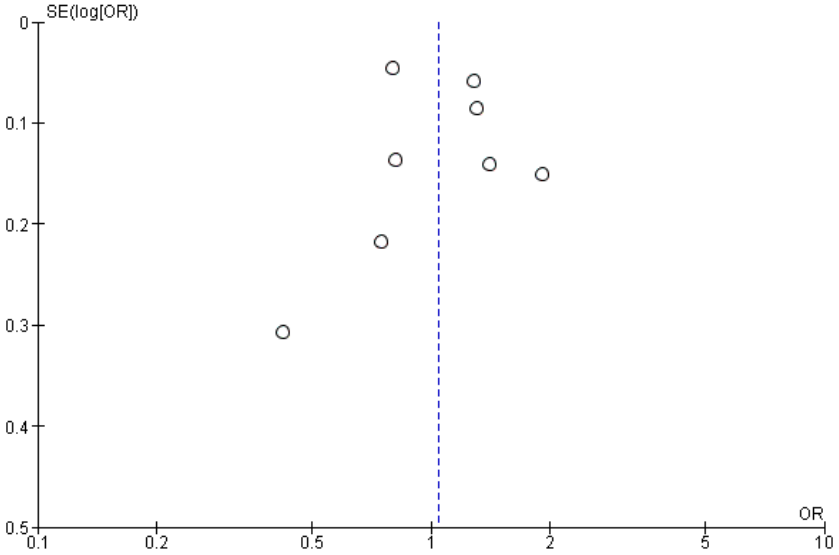


Figure 2 Forest plots of the effect of self-perception on the utilization of dental and oral health services

g. Forest Plot

The forest plot in Figure 9 shows no association between self-perception of oral health and the probability of utilizing dental and oral health services. People with poor self-perception were similar to those with good self-perception in utilizing dental and oral health services with (OR= 1.04; CI 95%= 0.81-1.33; p= 0.76). There was a high heterogeneity of effect estimates across studies (I^2= 92%; p< 0.001). So that the

calculation of the average effect estimates was carried out with a random effect model.



h. Funnel Plot

The funnel plot in Figure 10 shows an approximately balanced distribution of effect estimates to the right and left of the average vertical line of the estimates, thus the funnel plot does not show any publication bias.

Table 10. PICO summary of the study in the meta-analysis of the effect of health insurance ownership status on the use of dental and oral health services

Author (Year)	Country	Sample	P	I	C	O
Beigi et al. (2019)	Iran	17,252	Individuals aged 15-64 years	Having health insurance	Having no health insurance	Oral dan dental health service uptake
Lee et al. (2014)	United States	2,166	Individuals aged ≥65 years	Having health insurance	Having no health insurance	Oral dan dental health service uptake
Li et al. (2023)	Canada	37,935	Individuals aged ≥12 years	Having health insurance	Having no health insurance	Oral dan dental health service uptake
Monteiro et al. (2016)	Brazil	3,271	Individuals aged 20-60 years	Having health insurance	Having no health insurance	Oral dan dental health service uptake
Rezaei et al. (2018)	Iran	894	Individuals aged ≥18 years	Having health insurance	Having no health insurance	Oral dan dental health service uptake
Sahab et al. (2022)	Saudi Arabia	8,535	Individuals aged 18-65 years	Having health insurance	Having no health insurance	Oral dan dental health service uptake
Santoso et al. (2020)	Indonesia	16,860	Individuals aged ≥15 years	Having health insurance	Having no health insurance	Oral dan dental health service uptake

Author (Year)	Country	Sample	P	I	C	O
Somkotra et al. (2012)	Thailand	10,096	Individuals aged ≥60 years	Having health insurance	Having no health insurance	Oral dan dental health service uptake

Table 3. Data of adjusted odds ratio (aOR) and confidence interval 95% (CI 95) of the effect of health insurance ownership status on the utilization of dental and oral health services

Author	Year	aOR	CI 95%	
			Upper Limit	Lower Limit
Beigi *et al.*	2019	1.26	1.04	1.53
Lee *et al.*	2014	1.45	1.11	1.89
Li *et al.*	2023	4.16	3.03	5.88
Monteiro *et al.*	2016	2.4	1.9	3.1
Rezaei *et al.*	2018	1.66	1.13	2.45
Sahab *et al.*	2020	1.24	0.94	1.64
Santoso *et al.*	2020	1.30	1.17	1.44
Somkotra *et al.*	2012	1.38	0.85	2.17

Table 10 shows the description of 8 cross-sectional study articles as a source of meta-analysis of the effect of health insurance ownership status on the utilization of dental and oral health services, originating from Saudi Arabia, Indonesia, Iran, Thailand, the United States, Brazil, and Canada.

Table 11 shows the results of a statistical summary of the effect estimates of health insurance ownership status on the utilization of dental and oral health services. The highest aOR value was 4.16, and the lowest aOR value was 1.24.

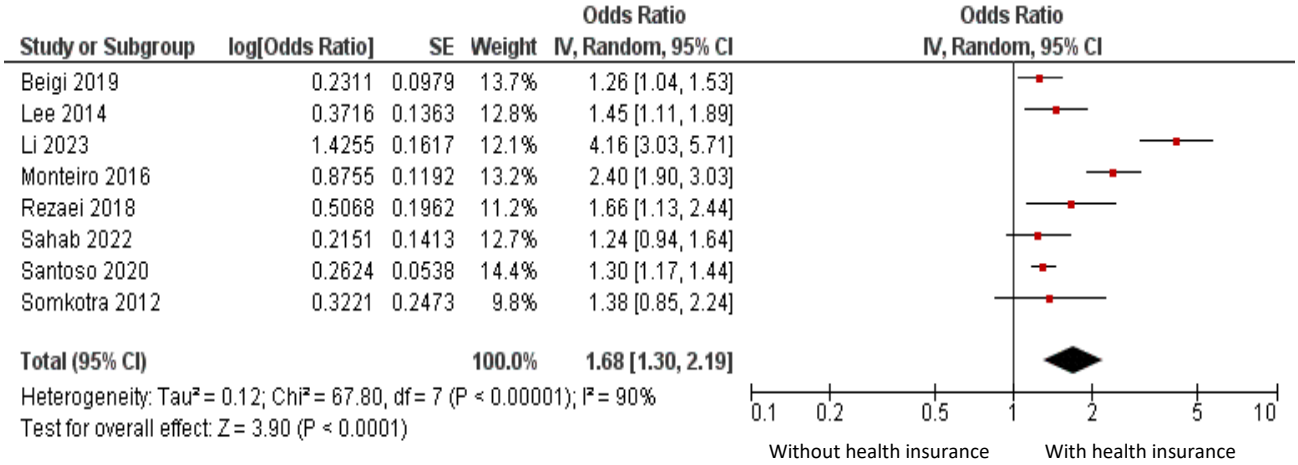


Figure 3. Forest plot of the effect of health insurance ownership status towards the utilization of dental and oral health services

Forest Plot

The forest plot in Figure 11 shows a statistically significant association between health insurance status and probability of utilization dental and oral health services. People with health insurance were 1.68 times more likely to utilize dental and oral health services than people with no health insurance (OR= 1.68; CI 95% = 1.30-2.19; p<0.001).

There was a high heterogeneity of effect estimates across studies (I^2= 90%; p< 0.001), so the calculation of the average effect estimates was carried out with a random effect model approach

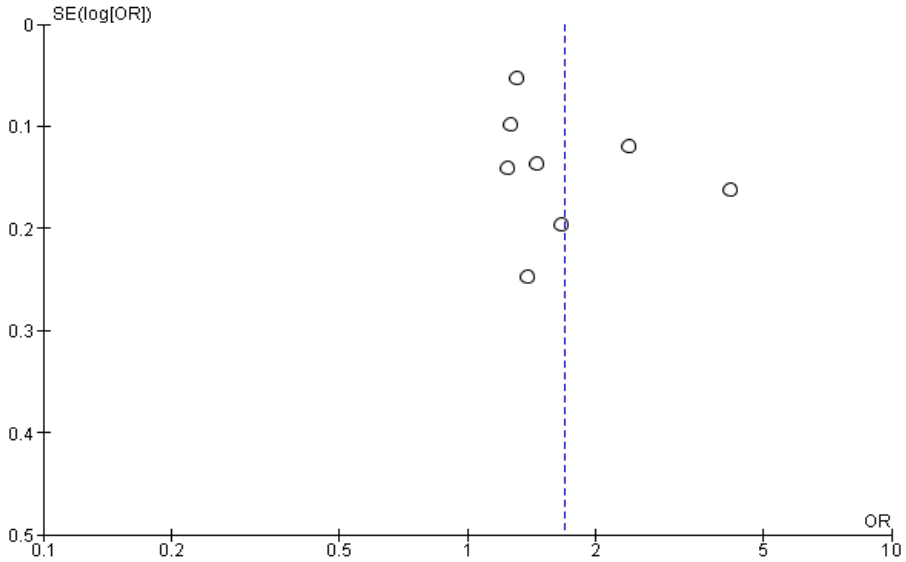


Figure 4 Funnel plot of the effect of health insurance ownership status towards the use of dental and oral health services

i. Funnel plot

The funnel plot in Figure 12 shows a distribution of effect estimates that is more on the left than on the right of the average vertical line of effect estimates, thus the funnel plot shows publication bias. The publication bias tends to minimize the actual effect (underestimated) because the distribution of the effect is more on the left and the diamond axis in the forest plot is located to the right of the vertical line.

DISCUSSION

1. The effect of sex category on the utilization of dental and oral health services

In general, women are more likely to use health services than men, such as the need for obstetrics and gynaecology services. Roles, attitudes, beliefs, and behaviors when experiencing pain or concern about health conditions cause women to use health services more. Women are considered to have more interest in the health condition of the oral cavity, and are able to spare the time to carry out treatment and use dental and oral health services (Sendino et al., 2006; Orbell, 2013; Hariyani et al., 2021).

Based on the results of a meta-analysis of 10 primary articles in this study, sex category significantly affected the utilization of dental and oral health services. Women were 1.13 times more likely than men to utilize dental and oral health services (aOR= 1.13; CI 95%= 1.02-1.25; p= 0.02).

The result of this study is in line with the result of a study by Chen et al., (2019) that reports that women are 1.44 times more likely than men to come to dental and oral health services (aOR= 1.44; CI 95%= 1.00-2.05). A study by Tan et al., (2021) also reports that women are 1.57 times more likely to utilize dental and oral health services than men (aOR= 1.57; CI 95%= 1.25-1.96).

2. The effect of education level on the utilization of dental and oral health services

Individuals with higher levels of education are more likely to visit the dentist than individuals with primary or secondary education (Pohjola et al., 2007). That low knowledge of oral health leads to unhealthy behaviors and lack of interest in preventive measures. Education can drive people to be more health conscious, and help them in making better and healthier lifestyle choices (Machry et al., 2013).

Based on the result of a meta-analysis of 12 primary articles in this study, education level significantly affected the utilization of dental and oral health services. Individuals with a higher level of education were 1.90 times more likely to utilize dental and oral health services than individuals with low education (aOR= 1.90; CI 95%= 1.40-2.56; p< 0.001).

The result of this study is in line with the results of a study by Tan et al., (2021) that individuals with higher education have a 2.21 times more likely to utilize dental and oral health services than individuals with low education (aOR= 2.21; CI 95%=1.23-3.99). A study by Piotrowska et al. (2018) also reports that education level significantly affects the utilization of dental health services in urban and rural areas. People in urban areas with the highest education are 1.58 times more likely to utilize dental and oral health services (aOR= 1.58; CI 95% = 1.17-2.13), and also people in rural areas with high education are 2.08 times more likely to utilize dental and oral health services than people with low education (aOR= 2.08; CI 95%= 1.48-2.91).

3. The effect of income level on the utilization of dental and oral health services

High income can influence individual or family decision-making in planning, finding, and using health services to improve their health status. People with high incomes have the ability to pay for medical expenses so that they have a better health status, and are less likely to suffer from illness. Poor economic status makes it difficult for individuals to reach quality health services, thus affecting the effectiveness of the utilization of health services (Napirah et al., 2016; Archibong et al., 2020; Zhang et al., 2020).

Based on the result of a meta-analysis of 11 primary articles in this study, income level significantly affects the utilization of dental and oral health services. Individuals with high income were 1.91 times more likely to use dental and oral health services than individuals with low income (aOR= 1.91; CI 95%= 1.55-2.35; p <0.001).

The result of this study is in line with the results of Piotrowska et al. (2013). Individuals in urban areas with the highest income are 3.26 times more likely to utilize dental and oral health services (aOR= 3.26; CI 95%= 2.21-4.83), and individuals in rural areas with the highest income are 2.07 times more likely to utilize dental and oral health services than individuals with the lowest income (aOR= 2.07; CI 95%= 1.51-2.85). A study by Tan et al. (2023) also reports that the group with the highest income (Q5) is 1.43 times more likely to utilize dental and oral health services than the group with the lowest income.

4. The effect of self-perception on the utilization of dental and oral health services

Self-perception is related to the health needs of the individual. Unmet health needs result in a person having a poor self-perception of his health condition, so individuals with poor self-perception seek treatment more to meet their health needs than individuals with good self-perception (Park dan Hong, 2019).

The results of this study showed that there was no effect of self-perception on the utilization of dental and oral health services.

Individuals with poor self-perception were equally likely to utilize dental and oral health services (aOR= 1.04; CI 95%= 0.81-1.33; p= 0.76).

This can be caused by changes in knowledge related to individual health status, which makes individuals feel compelled to come to health services to get treatment (Santos et al., 2023). Self-perception has a positive association with fear of dental care. An individual's poor oral health condition has a positive association with the individual's anxiety about dental and oral care. The anxiety that individuals feel about dental care and feelings of shame due to poor oral conditions cause individuals to delay or even be reluctant to come to dental and oral health services even though they need treatment (Pohjola et al., 2007).

5. The effect of health insurance ownership status on the utilization of dental and oral health services

Health insurance has a positive impact on national health and increases people's life expectancy, because health insurance removes economic barriers in obtaining treatment and increases the availability of health services. Health insurance significantly affects the probability to utilize health services by workers. Health insurance participation encourages individuals to not only seek treatment when the severity of the disease increases, but also increase their awareness by utilizing preventative health services (Zhang et., 2020).

Based on the results of a meta-analysis of 8 primary articles in this study, health insurance ownership status significantly affects the use of dental and oral health services. Individuals with health insurance were 1.68 times more likely to use dental and oral health services than individuals with no health insurance (aOR= 1.68; CI 95%= 1.30-2.19; p< 0.001).

This research is in line with a study (Chen et al., 2019) which reports that the ownership status of health insurance significantly affects the utilization of dental and oral health services. Individuals who have health insurance are 2.20 times more likely to use dental and oral health services than individuals who do not have health insurance (aOR= 2.20; CI 95%= 1.54-3.14).

AUTHOR CONTRIBUTION

Azilla Edsa Putri was the main researcher who selected topics, searched and collected materials, analyzed data and wrote manuscripts. Bhisma Murti and Eti Poncorini Pamungkasari assisted in analysing the data and reviewing the study documents.

CONFLICT OF INTEREST

There was no conflict of interest in this study.

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