

Meta Analysis: Application of Health Belief Model on Tertiary Preventive Behavior in Type 2 Diabetes Mellitus Patients

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ABSTRACT

Background: Tertiary prevention of DM is taking action on DM sufferers who experience complications to prevent further disability by providing health education to DM sufferers about the importance of drug compliance, diet and exercise. The study aimed to analyze the effectiveness of the Health Belief Model application in improving tertiary preventive behavior in type 2 diabetes mellitus patients.

Subjects and Method: This study is a systematic review and meta-analysis study using PICO. P: Patients with Diabetes Mellitus type 2; I: High perceived severity, high perceived benefit, high self-efficacy; C: Low perceived severity, low perceived benefit, low self-efficacy; O: Tertiary preventive behavior. Data collection was obtained from data bases, namely PubMed, Google Scholar, Elsevier and Springer Link. The inclusion criteria used were full-text articles with a cross-sectional design, published from 2013 to 2023, in English, the final results of the study were reported using the Adjusted Odd Ratio. The keywords used are "Health Belief Model" OR "HBM" AND "diabetes" AND "preventive behavior" OR "type 2" Health Belief Model" AND "type 2 diabetes mellitus" AND "Cross Sectional Study". Articles were analyzed using Review Manager 5.3.

Results: Meta-analysis showed the significant results. The study from Ethiopia, Nepal, and China concluded that high perceived severity had a 2.60 times higher influence than low perceived severity on tertiary preventive behavior (aOR= 2.60; 95% CI= 1.06 to 6.37; p= 0.040). Meta-analysis from Ethiopia, Malaysia, China, and Taiwan concluded that high perceived benefits had an influence of 1.76 times higher than low perceived benefits. (aOR= 1.76; 95% CI= 1.09 to 2.82; p= 0.020). The meta-analysis was obtained from Ethiopia, Sudan, India, and China it showed that high self-efficacy has an effect of 2.69 times higher than low self-efficacy (aOR= 2.69; 95% CI= 1.48 to 4.89; p= 0.001).

Conclusion: Perceived severity, perceived benefits and self-efficacy increase tertiary preventive behavior in diabetes mellitus.

Keywords: health belief model, perceived severity, perceived benefits, self-efficacy, diabetes mellitus.

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BACKGROUND

Diabetes Mellitus (DM) is a chronic disease that occurs because the pancreas does not produce enough insulin or when the body cannot effectively use the insulin it produces. This is characterized by high levels of glucose in the blood (Khairani, 2019). Diabetes is a disease among society that must be treated seriously. If it is not treated seriously there will be a spike in the number of DM sufferers in the future.

Based on International Diabetes Federation (IDF), approximately 463 million people worldwide were living with DM in 2019, and this figure is expected to increase to 700 million by 2045 (IDF, 2021). Meanwhile in Southeast Asia, from 82 million in 2017 to 151 million in 2045. Indonesia is the 7th country out of the top 10 countries which is estimated to have a number of DM sufferers of 5.4 million in 2045 and has low blood sugar control rates.

The report on the results of the Basic Health Research of the Ministry of Health of the Republic of Indonesia in 2013, shows that the average prevalence of DM in each Indonesian province based on doctor's diagnosis of residents aged ≥ 15 years old in 2013 reached 1.5% and increased in 2018 reached 2%. The smallest prevalence is in East Nusa Tenggara at 0.9%, while the largest prevalence is in the Special Capital Region (DKI) Jakarta at 3.4%.

Diabetes Mellitus prevention consists of three levels, namely primary prevention of DM, education and management of groups at high risk, one of the important aspects of primary prevention. Secondary prevention of DM is a secondary prevention effort for DM that can be carried out by community nurses, namely screening risk groups (Pakpahan et al., 2020). Tertiary prevention of DM is where the community nurses provide health education to DM sufferers about the importance of compli-

ance with therapy (medication, diet and exercise). Families are given health education on how to maintain DM stability and prevent hypoglycemia. Forms of tertiary prevention nursing intervention include counseling, wound care, foot exercises.

This research uses the Health Belief Model (HBM) approach developed by Rosentock and Becker in 1974. HBM is a theoretical model for understanding individual health behavior (Glanz et al., 2008). There are 4 main components of the HBM concept that can explain sufferers' non-compliance with treatment, namely perceived barriers, perceived benefits, perceived susceptibility, and perceived severity. This study aimed to analyze the effectiveness of the Health Belief Model application in improving tertiary preventive behavior in patients with type 2 diabetes mellitus.

SUBJECTS AND METHOD

1. Study Design

This study is a systematic review and meta analysis. The search for article sources carried out by researchers relied on online article searches. Researchers limited the research time to between 2013 and 2023. Data collection was obtained from three databases, namely Springer Link. Keywords used for data base searches are PubMed, Google Scholar, Elsevier and Springer Link. The keywords used in searching for articles were "Health Belief Model" OR "HBM" AND "diabetes" AND "preventive behavior" OR "type 2" Health Belief Model" AND "diabetes mellitus type 2" AND "Cross Sectional Study. This research analysis was carried out using the RevMan 5.3 application.

2. Step of Meta-Analysis

The meta-analysis was carried out in five steps as follows:

- 1) Formulate research questions in the PICO.

- 2) Search for primary study articles from various electronic and non-electronic databases. namely PubMed, Google Scholar, ScienceDirect, BioMed Central, and PLOS ONE.
- 3) Conduct screening and critical assessment of primary research articles.
- 4) Perform data extraction and synthesize effect estimates into RevMan 5.3.
- 5) Interpret and conclude the results.

3. Inclusion Criteria

Full-text articles with a cross-sectional design, published from 2013 to 2023, in English, the subjects of this study were type 2 Diabetes Mellitus patients, the final results of the study were reported using the Adjusted Odd Ratio.

4. Exclusion Criteria

Duplicated articles, research subjects <100, statistical results reported in bivariate analysis.

5. Operational Definition of Variables

Tertiary preventive behavior is preventive behavior taken by type 2 diabetes mellitus patients to prevent complications of the disease, such as diabetic nephropathy, diabetic retinopathy, diabetic neuropathy and heart disease.

Disease severity is the patient's perception of the severity of type 2 diabetes mellitus suffered.

Benefits of preventive measures is patient perceptions about the benefits of preventive measures to prevent or delay the possibility of disease complications due to type 2 diabetes mellitus.

Self-efficacy is the level of confidence of type 2 diabetes mellitus patients in their ability to carry out tertiary preventive measures independently in dealing with the complications of the disease they face.

6. Instruments

This review will be analyzed systematically using a meta-analysis guide, namely Preferred Reporting Items for Systematic Reviews and Meta Analysis (PRISMA) and using a critical assessment checklist Critical Appraisal Checklist for Cross-sectional Study.

7. Data analysis

The data in this study were analyzed using the Review Manager application (RevMan 5.4). Forest plots and funnel plots are used to determine the effect size and heterogeneity of the data. Data processing was carried out based on variations between studies, namely the random effect model.

RESULTS

Search articles in this research through databases including PubMed, Google Scholar, Elsevier and Springer Link. Keywords used in database searches include "Health Belief Model" OR "HBM" AND "diabetes" AND "preventive behavior" OR "type 2" Health Belief Model" AND "diabetes mellitus type 2" AND "Cross Sectional Study", and the process according to the PRISMA flow diagram can be seen in figure 1.

Figure 1 also showed the initial search process seen in Figure 1 displays a total of 901 articles. After the process of eliminating duplicate articles in more than one journal, 753 articles were obtained, 61 of which met the requirements for further full text review. Finally, there were 17 articles that met the requirements for full text review.

Figure 2 showed the research articles taken as a source of meta-analysis come from various country, which is included in Africa and Asia continent.

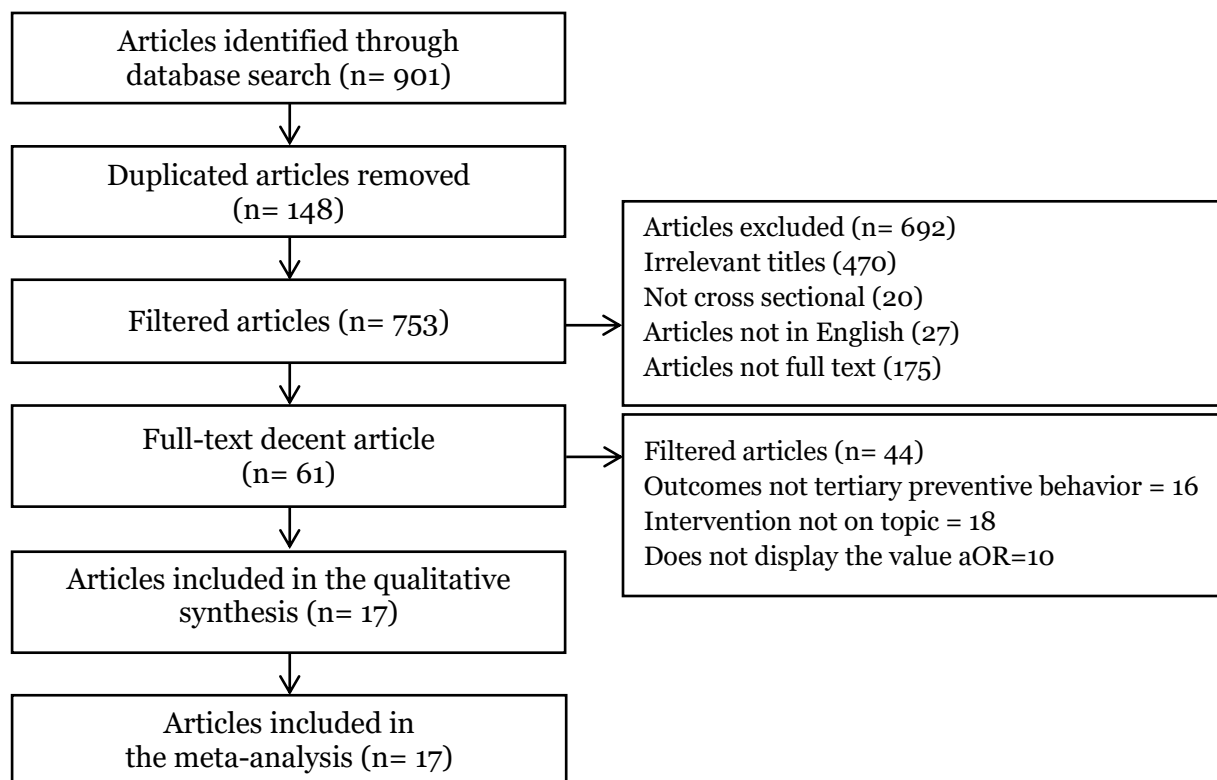


Figure 1. Results of PRISMA Flow Diagrams

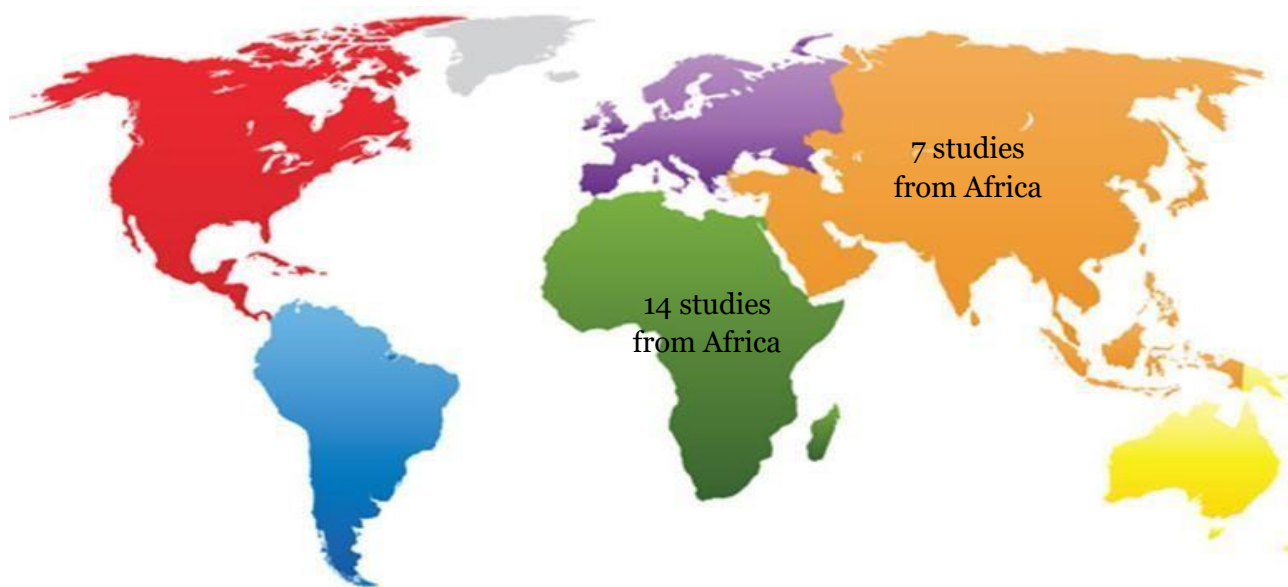


Figure 2. Research Distribution Map the application of health belief model on tertiary preventive behavior

Figure 2 showed a map of the distribution of research about the application of health belief model on tertiary preventive behavior in type 2 diabetes mellitus patients that will be included in the meta-analysis from 2

continents consisting of the Asian continent and the African continent. There were 14 articles from Africa, and 6 articles from Asia.

Table 1. The Quality Assessment Result of Articles with a Cross-Sectional Study.

Primary Study	Criteria												Total	
	1				2		3		4	5	6			7
	a	b	c	d	a	b	a	b			a	b		
Debalke et al. (2020)	2	2	2	2	2	2	2	2	2	2	2	2	2	26
Melkamu et al.(2021)	2	2	2	2	2	2	2	2	2	2	2	2	2	26
Tamirat et al. (2014)	2	2	2	2	2	2	2	2	2	2	2	2	2	26
Ayele et al. (2012)	2	1	2	2	2	2	2	2	1	2	2	2	2	24
Prakash et al. (2021)	2	2	2	2	2	2	2	2	2	2	2	2	2	26
Ghimire (2017)	2	2	2	2	2	2	2	2	2	2	2	2	2	26
Gizwa et al. (2017)	2	2	2	2	2	2	2	2	2	2	2	2	2	26
Gedamu et al. (2019)	2	2	2	2	2	2	2	2	2	2	2	2	2	26
Prakash et al. (2021)	2	2	2	2	2	2	2	2	2	2	2	2	2	26
Aris et al. (2017)	2	2	2	2	2	2	2	2	1	2	2	2	2	25
Hu et al. (2022)	2	1	2	2	2	2	2	2	2	2	2	2	2	25
Amer et al. (2018)	2	2	2	2	2	2	2	2	2	2	2	2	2	26
Gurmu et al. (2018)	2	2	2	2	2	2	2	2	2	2	2	2	2	26
Chali et al. (2018)	2	2	2	2	2	2	2	2	2	2	2	2	2	26
Vankataraman et al. (2012)	2	2	2	2	2	2	2	2	2	2	2	2	2	26
Tsai et al. (2021)	2	2	2	2	2	2	2	2	1	2	2	2	2	25
Mariye et al. (2018)	2	2	2	2	2	2	2	2	2	2	2	2	2	26

Description of the question criteria:

1. Formulation of research questions in PICO acronym:
 - a. What is the population in the study primary is the same as the population in PICO meta-analysis?
 - b. What is the operational definition of intervention (intervention), namely the status of exposure (exposed) in primary studies is the same as that definition intended in meta-analysis?
 - c. What is the comparison (comparison), namely status not exposed (unexposed) is used Primary studies are the same as that definition intended in meta-analysis?
 - d. What is the outcome variable being studied? in primary studies is the same as that definition intended in meta-analysis?
2. method for selecting research subjects:
 - a. Descriptive cross-sectional study (prevalence): Is the sample randomly selected?
 - b. Analytical cross-sectional study: Are samples randomly or purposively selected?
3. Methods for measuring comparisons (intervention) and outcome variables:
 - a. Are both exposure or intervention and outcome variables measured with the same instruments in all primary studies?
 - b. If variables are measured on a categorical scale, are the cut-offs or categories used the same across primary studies?
4. Bias of the design:
 - a. How much is the response rate?
 - b. Is non-response related to outcomes?
5. Methods to control confounding:
 - a. Is there any confusion in the results or conclusions of the primary study?
 - b. Have primary study researchers used appropriate methods to control the effects of confusion?
6. Method of statistical analysis:
 - a. In the cross-sectional study, is multivariate analysis performed?
 - b. Multivariate analysis includes multiple linear regression analysis, multiple

logistic regression analysis, Cox regression analysis.

7. Is there a conflict of interest with the research sponsor?

Description of scoring:

0= No; 1= Hesitate; 2= Yes.

Table 1 showed quality assessment result of articles with a cross-sectional study included in meta-analysis. Table 2 describes a

summary of primary research of perceived severity on tertiary preventive behavior, a meta-analysis was carried out on 7 articles originating from the country of Ethiopia, Nepal, and China. The largest research population was found in a study conducted by Hu et al. (2022), namely 1,140 type 2 diabetes patients, and the study with the smallest population, namely the study conducted by Ghimire (2017) as many as 197 type 2 diabetes patients.

Table 2. Description of the primary study with cross-sectional design of perceived severity on tertiary preventive behavior.

Author (years)	Country	Sample	P	I	C	O
Debalke et al. (2020)	Ethiopia	422	Type 2 diabetes patients aged 1 to 11 years old	High perceived severity	Low perceived severity	Tertiary preventive behavior
Melkamu et al.(2021)	Ethiopia	396	Type 2 diabetes patients aged 18 to 60 years old	High perceived severity	Low perceived severity	Tertiary preventive behavior
Tamirat et al. (2014)	Ethiopia	322	Type 2 diabetes patients aged 18 - 55 years old	High perceived severity	Low perceived severity	Tertiary preventive behavior
Ayele et al. (2012)	Ethiopia	222	Type 2 diabetes patients aged 18 to 55 years old	High perceived severity	Low perceived severity	Tertiary preventive behavior
Prakash et al. (2021)	Ethiopia	276	Type 2 diabetes patients aged 15 to 65 years old	High perceived severity	Low perceived severity	Tertiary preventive behavior
Ghimire (2017)	Nepal	197	Type 2 diabetes patients aged 18 to 55 years old	High perceived severity	Low perceived severity	Tertiary preventive behavior
Hu et al. (2022)	China	1140	Type 2 diabetes patients aged 36 to 65 years old	High perceived severity	Low perceived severity	Tertiary preventive behavior

Table 3. aOR and 95% CI data of perceived severity on tertiary preventive behavior.

(Author, year)	aOR	95% CI	
		Lower Limit	Upper Limit
Debalke et al. (2020)	0.58	0.350	0.950
Melkamu et al.(2021)	4.57	2.11	9.93
Tamirat et al. (2014)	7.30	0.19	2.80
Ayele et al. (2012)	5.50	0.54	54.76
Prakash et al. (2021)	8.30	1.19	16.25
Ghimire (2017)	1.39	0.72	2.70
Hu et al. (2022)	4.406	1.341	14.479

Table 3 showed the effect sizes of the primary studies used in the meta-analysis, with largest adjusted odd ratio conducted

by Prakash et al. (2021) is 8.30, and the lowest aOR conducted by Debalke et al. (2020) is 0.58.

Study or Subgroup	log[Odds Ratio]	SE	Weight	Odds Ratio IV, Random, 95% CI
ayele et al 2012	1.7047	1.1842	8.9%	5.50 [0.54, 56.02]
Debalke 2020	-0.5447	0.2577	20.7%	0.58 [0.35, 0.96]
ghimire 2017	0.3293	0.3356	19.8%	1.39 [0.72, 2.68]
hu et al 2022	1.483	0.6069	15.9%	4.41 [1.34, 14.48]
Melkamu et al 2021	1.5195	0.3943	19.0%	4.57 [2.11, 9.90]
prakash et al 2021	2.1163	0.991	10.9%	8.30 [1.19, 57.89]
Tamirat et al 2014	1.9879	1.8616	4.7%	7.30 [0.19, 280.50]
Total (95% CI)		100.0%		2.60 [1.06, 6.37]
Heterogeneity: Tau ² = 0.95; Chi ² = 29.60, df = 6 (P < 0.0001); I ² = 80%				
Test for overall effect: Z = 2.09 (P = 0.04)				

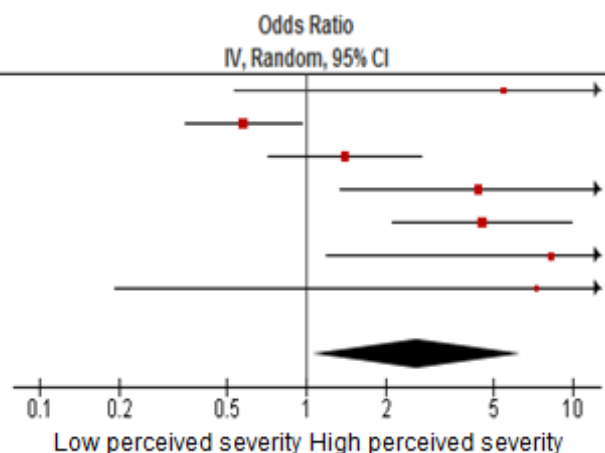


Figure 3. Forest plot of perceived severity on tertiary preventive behavior

The forest plot based on Figure 3 shows that those with high perceived severity have a 2.60 times higher influence than those with low perceived severity on tertiary preventive behavior. This result was statisti-

cally significant (OR= 2.60; 95% CI= 1.06 to 6.37; p=0.040). The forest plot showed high heterogeneity of effect estimates between primary studies I² = 80%; p<0.001).

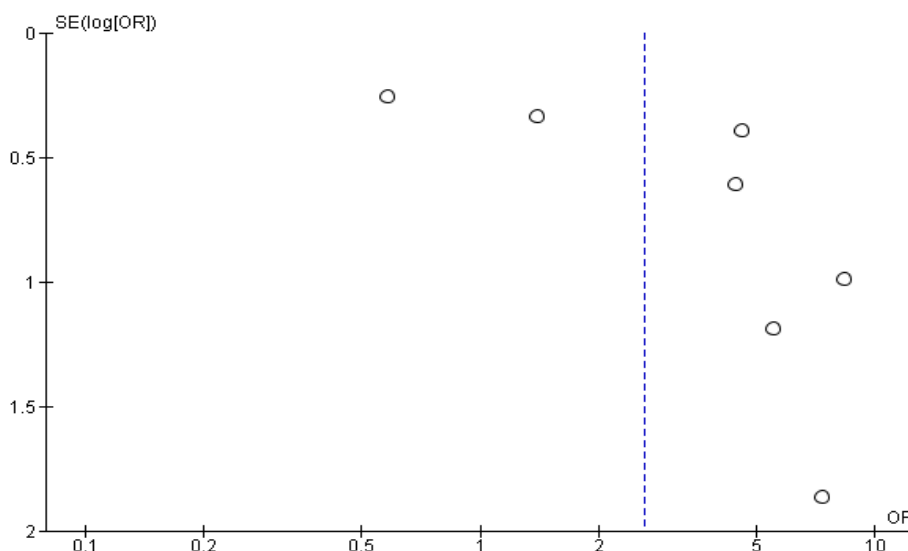


Figure 4. Funnel plot of perceived severity on tertiary preventive behavior

The funnel plot based on Figure 4 shows that the distribution of effect estimates from the primary studies of this meta-analysis lies more to the right of the vertical line of mean estimates than to the left, indi-

cating publication bias. Because the publication bias tends to be to the right of the average vertical line which is in the same direction as the location of the diamond shape in the forest plot, the publication bias

tends to increase the effect of actual high severity perceptions on tertiary preventive behavior (overestimate).

Table 4. PICO description of the primary study with cross-sectional design of perceived benefits on tertiary preventive behavior.

Author (years)	Country	Sample	P	I	C	O
Gizwa et al. (2017)	Ethiopia	322	Type 2 diabetes patients aged 42 to 65 years old	High perceived benefit	Low perceived benefit	Tertiary preventive behavior
Melkamu et al.(2021)	Ethiopia	396	Type 2 diabetes patients aged 18 to 60 years old	High perceived benefit	Low perceived benefit	Tertiary preventive behavior
Gedamu et al. (2019)	Ethiopia	278	Type 2 diabetes patients aged 36 to 70 years old	High perceived benefit	Low perceived benefit	Tertiary preventive behavior
Prakash et al. (2021)	Ethiopia	276	Type 2 diabetes patients aged 15 to 65 years old	High perceived benefit	Low perceived benefit	Tertiary preventive behavior
Aris et al. (2017)	Malaysia	159	Type 1 and 2 diabetes patients aged 18 to 40 years old	High perceived benefit	Low perceived benefit	Tertiary preventive behavior
Hu et al. (2022)	China	1,140	Type 2 diabetes patients aged 36 to 65 years old	High perceived benefit	Low perceived benefit	Tertiary preventive behavior
Tsai et al. (2021)	Taiwan	98	Type 2 diabetes patients aged 20 to 65 years old	High perceived benefit	Low perceived benefit	Tertiary preventive behavior

Table 5. aOR and 95% CI data of perceived benefits on tertiary preventive behavior.

(Author, year)	aOR	95% CI	
		Lower Limit	Upper Limit
Gizwa et al. (2017)	1.16	1.03	1.29
Melkamu et al.(2021)	0.26	0.09	0.73
Gedamu et al. (2019)	8.029	3.125	20.626
Prakash et al. (2021)	2.00	0.12	6.64
Aris et al. (2017)	2.681	1.060	6.779
Hu et al. (2022)	6.889	1.752	27.097
Tsai et al. (2021)	1.49	1.18	1.71

From table 4 it can be seen the summary of primary research regarding perceived benefits on tertiary preventive behavior, a meta-analysis was carried out on 7 articles originating from the country of Ethiopia, China, Malaysia, and Taiwan. The largest research population was found in a study conducted Hu et al. (2022), namely 1,140 type-2 diabetes patients, and the study with

the smallest population, namely the study conducted by Tsai et al. (2021) as many as 98 type-2 diabetes patients. Table 5 showed the effect sizes of the primary studies used in the meta-analysis, with largest adjusted odd ratio conducted by Gedamu et al. (2017) is 8.02, and the lowest aOR conducted by Melkamu et al.(2021) is 0.26.

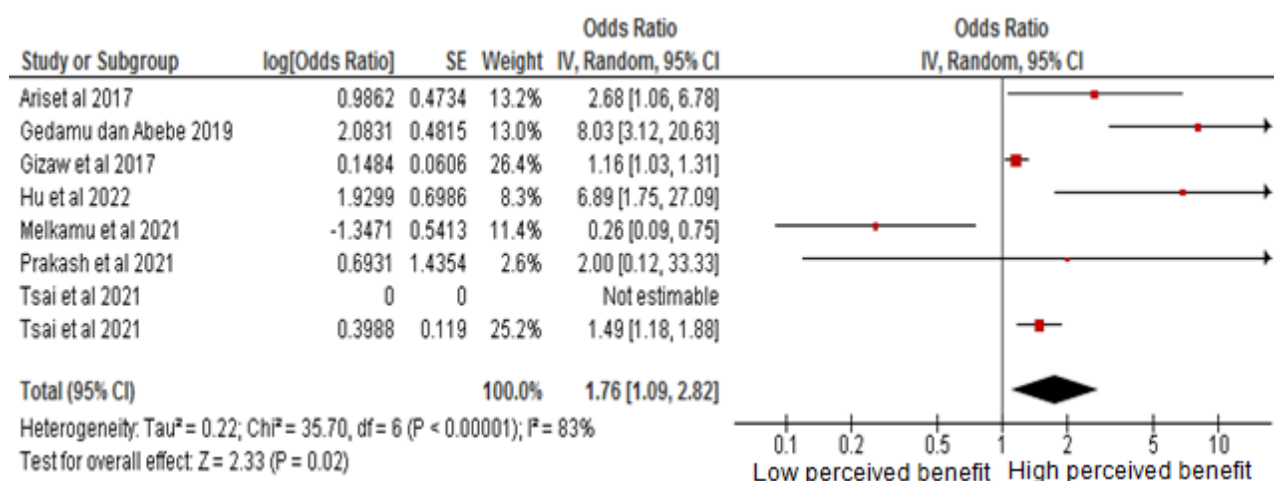


Figure 5. Forest plot of perceived benefits on tertiary preventive behavior

The forest plot based on Figure 5 showed that those with high perceived benefits have 1.76 times higher influence than those with low perceived benefits. This result is statistically significant (OR= 1.76; 95% CI= 1.09 to 2.82; p=0.020). The forest plot shows

high heterogeneity of effect estimates between primary studies I²= 83%; p<0.001. Thus, the calculation of the average estimated effect is carried out using a random effect model approach.

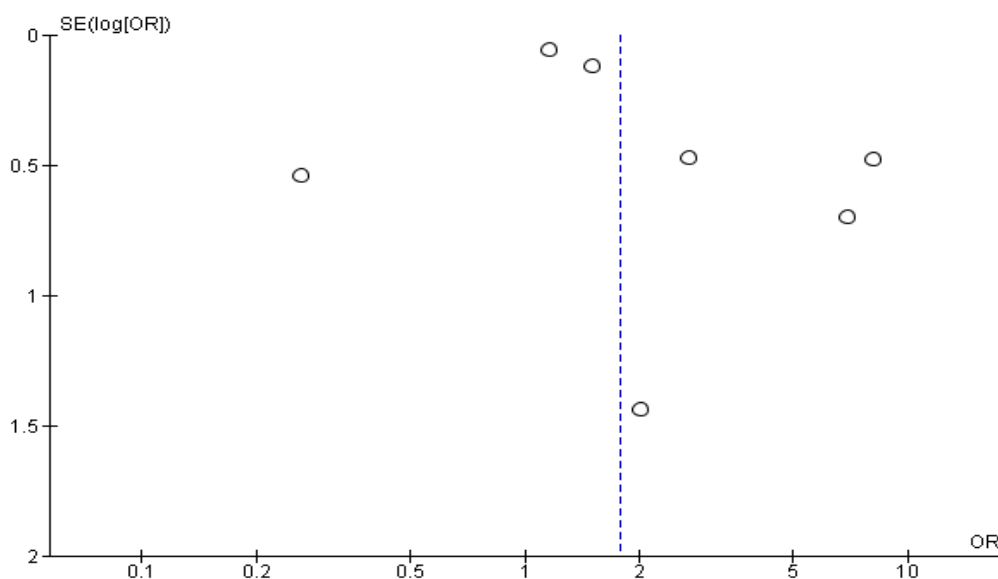


Figure 6. Funnel plot perceived benefits on tertiary preventive behavior

The funnel plot based on Figure 6 shows that the distribution of effect estimates from the primary studies of this meta-analysis lies more to the right of the vertical line of mean estimates than to the left, indicating publication bias. Because the publication bias tends to be to the right of the

average vertical line which is in the same direction as the location of the diamond shape in the forest plot, the publication bias tends to increase the effect of actual high perceived benefits on tertiary preventive behavior (overestimate).

Table 6. PICO description of the primary study with cross-sectional design of self-efficacy on tertiary preventive behavior.

Author (years)	Country	Sample	P	I	C	O
Melkamu et al.(2021)	Ethiopia	396	Type 2 diabetes patients aged 18 to 60 years old	High self-efficacy	Low self-efficacy	Tertiary preventive behavior
Amer et al. (2018)	Sudan	384	Type 2 diabetes patients aged 20 to 50 years old	High self-efficacy	Low self-efficacy	Tertiary preventive behavior
Gurmu et al. (2018)	Ethiopia	257	Diabetes patients aged 18-60 years old	High self-efficacy	Low self-efficacy	Tertiary preventive behavior
Chali et al. (2018)	Ethiopia	383	Diabetes patients aged 18-60 years old	High self-efficacy	Low self-efficacy	Tertiary preventive behavior
Tamirat et al. (2014)	Ethiopia	322	Type 2 diabetes patients aged 18 to 55 years old	High self-efficacy	Low self-efficacy	Tertiary preventive behavior
Vankataraman et al. (2012)	India	507	Type 2 diabetes patients aged 54 years old	High self-efficacy	Low self-efficacy	Tertiary preventive behavior
Yao et al. (2019)	China	2066	Type 2 diabetes patients aged 35 to 79 years old	High self-efficacy	Low self-efficacy	Tertiary preventive behavior

Table 7. aOR and 95% CI data of self-efficacy on tertiary preventive behavior.

(Author, year)	aOR	95% CI	
		Lower Limit	Upper Limit
Melkamu et al.(2021)	9.12	2.28	36.48
Amer et al. (2018)	2.10	1.3	3.5
Gurmu et al. (2018)	3.30	1.64	6.62
Chali et al. (2018)	3.01	1.76	5.12
Tamirat et al. (2014)	5.9	0.64	0.96
Vankataraman et al. (2012)	2.94	1.92	4.54
Yao et al. (2019)	1.06	1.04	1.08

Table 6 it can be seen the summary of primary research regarding perceived benefits on tertiary preventive behavior, a meta-analysis was carried out on 7 articles originating from the country of Ethiopia, China, India, and Sudan. The largest research population was found in a study conducted Yao et al. (2019), namely 2,066 type-2 diabetes patients, and the study with the

smallest population, namely the study conducted by Gurmu et al. (2018) as many as 257 type-2 diabetes patients. Table 7 showed the effect sizes of the primary studies used in the meta-analysis, with largest adjusted odd ratio conducted by Melkamu et al.(2021) is 9.12, and the lowest adjusted odd ratio conducted by Amer et al. (2018) is 2.10.

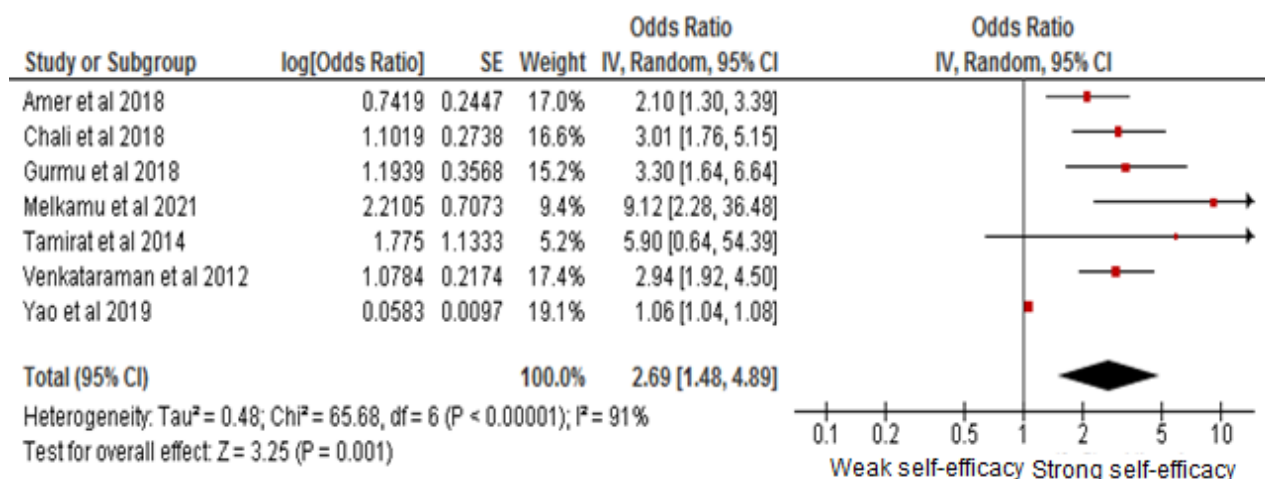


Figure 7. Forest plot of self-efficacy on tertiary preventive behavior

The forest plot based on Figure 7 shows that those with high self-efficacy have 2.69 times more influence than those with low self-efficacy. This result is statistically significant (OR= 2.69; 95% CI= 1.48 to 4.89; p=0.001). The forest plot shows high hete-

rogenity of effect estimates between primary studies I²= 91%; p<0.001. Thus, the calculation of the average estimated effect is carried out using a random effect model approach.

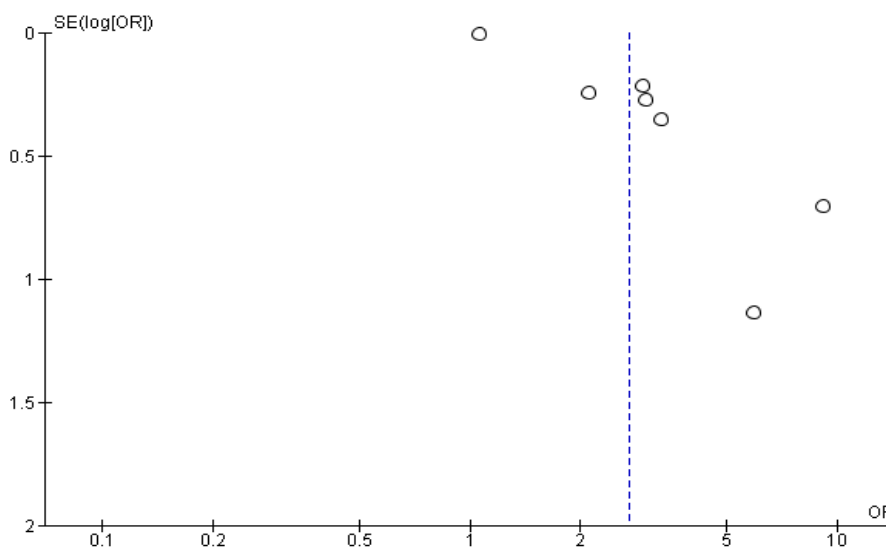


Figure 8. Funnel plot of self-efficacy on tertiary preventive behavior

The funnel plot based on Figure 8 shows that the distribution of effect estimates from the primary studies of this meta-analysis lies more to the right of the vertical line of mean estimates than to the left, indicating publication bias. Because the publication bias tends to be to the right of the

average vertical line which is in the same direction as the location of the diamond shape in the forest plot, the publication bias tends to increase the effect of actually high self-efficacy on tertiary preventive behavior (overestimate).

DISCUSSION

1. The effect of perceived severity on tertiary preventive behavior

A total of 7 observational research articles with a cross-sectional study design as a source of meta-analysis of the application of the Health Belief Model theory regarding tertiary preventive behavior for type 2 diabetes mellitus patients. This study showed that the higher the perception of severity in type 2 diabetes mellitus patients, the greater the implementation of the tertiary preventive behavior and the results were statistically significant (aOR= 2.60; 95% CI= 1.06 to 6.37; p= 0.040) showed a heterogeneous effect estimate $I^2= 80\%$.

Vazini and Barati (2014) showed that someone with a high perception of severity can influence DM treatment behavior. Severity influences self-care behavior with increasing perceived severity, then self-care also increases, threats or risks from severity such as high mortality rates can influence changes in behavior in care.

Karimy et al. (2015) stated that perceived severity could influence tertiary prevention practices for Type 2 Diabetes Mellitus. Sabhibi et al. (2017) stated that perceived severity was statistically significant ($p<0.001$). Tamarat et al. (2014) explained that individuals with high levels of disease severity and complications were 7.3 times more likely to undertake tertiary prevention ($p= 0.002$).

An individual's view of the seriousness of a particular condition and the condition's own consequences is called the perceived severity by the individual (Mohammadi et al, 2018). The severity felt by Type 2 Diabetes Mellitus patients make these patients more compliant to prevent complications, therefore the perceived severity of the disease helps the possibility of tertiary prevention itself (Karimy et al, 2015)

2. The effect of perceived benefit on tertiary preventive behavior

A total of 7 observational research articles with a cross-sectional study design as a source of meta-analysis of the application of the Health Belief Model theory regarding tertiary preventive behavior for type 2 diabetes mellitus patients. This study showed that the higher the perception of benefits in type 2 diabetes mellitus patients, the greater the implementation of the tertiary preventive behavior, and the results were statistically significant (aOR=1.76; 95% CI= 1.09 to 2.82; $p=0.02$) showed heterogeneous effect estimates $I^2= 83\%$.

Gizwa et al. (2017) stated that the perceived benefits were statistically significant ($p<0.000$) associated with recommended physical activity. These findings are also similar to research conducted in India. Diabetic patients perceived fewer barriers and high benefits from recommended physical activity.

Research conducted by Alatawi et al. (2016) showed that perceived benefits are related to behavior change. Perceived benefits influence changes in a person's attitude. A person will implement healthy behavior when he or she feels the behavior is useful for improving his or her health. Research conducted by Adejoh (2014), showed that there is a positive influence between perceived benefits and changes in DM behavior. Most research subjects felt that the benefits of implementing diabetes management affected their health and reduced pain. This arises because if someone feels that healthy behavior can improve their health status. The more someone has a high perceived benefits, the health behavior will also increase.

A study by Vahidi et al. (2015) used the health belief model as a basis for measuring a person's perception of behavior change. The results of the analysis show

that there is a significant relationship between the health belief model and behavior changes in type 2 DM patients. This study analyzed the importance of treating and overcoming complications of diabetes mellitus. Based on the data collected, most of the research subjects felt that the health program had benefits and could reduce morbidity and thus improve treatment behavior for type 2 DM.

3. The effect of self-efficacy on tertiary preventive behavior

A total of 7 cross-sectional studies showed that the higher the self-efficacy in type 2 diabetes mellitus patients increased implementation of tertiary preventive behavior, with high heterogeneity ($I^2= 91\%$).

Self-efficacy is one of the key factors for achieving behavior change. Patient self-efficacy is the patient's confidence in acting and behaving in accordance with the expectations desired by the patient and health workers. Self-efficacy can have a positive influence on changes in behavior such as thinking, motivating oneself and acting (Rahman and Sukmarini 2017). Someone with strong self-efficacy will be more likely to adhere to preventive behavior. Individuals with strong self-efficacy have high hopes for the success of achieving goals, while individuals with low self-efficacy have doubts about achieving their goal.

Ghimire (2014) stated that stronger self-efficacy increases the possibility of implementing tertiary prevention behavior for type 2 DM by 0.90 times. Another study explains that strong self-efficacy increases the possibility of implementing tertiary prevention behavior for type 2 DM by 5.9 times and significant with $p\text{-value}= 0.002$ (Tamarat, 2014). Individuals are advised to make plans that can be achieved by the individual and are realistic to build self-confidence and tend to be more effective in changing behavior patterns, because the

initial stage of behavioral adjustment important for increasing self-efficacy. Lack of energy or stamina and individual health problems are some of the barriers that affect self-efficacy (Ghimire, 2014).

AUTHOR CONTRIBUTION

Afifah Nur Halizah is the main researcher who selected the topic, searched and collected articles, analyzed the data and wrote the manuscript. Bhisma Murti and Didik Gunawan Tamtomo helped to analyze data and review research documents.

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CONFLICT OF INTEREST

There is no conflict of interest in this study.

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