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Meta-Analysis

Meta-Analysis: Application of Health Belief Model in Encouraging Preventive Behavior of Self-Care for Hypertensive Patients

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ABSTRACT

Background: Hypertension is one of the most critical public health problems and has affected more than 1.2 billion people worldwide. Risk factors for hypertension can be divided into two, namely factors that cannot be controlled (such as gender, genetics and age) and those that can be controlled such as obesity, excess BMI, smoking, and excessive salt and fat consumption. Hypertension prevalence in age groups productive tends to increase from year to year, especially in the elderly group which reaches 63.22%. This study aimed to investigate behavior change and prevention of hypertension is the Health Belief Model (HBM).
Subjects and Method: This article was compiled with a systematic review and meta-analysis study. This study uses the PICO Model as follows Population: Hypertension patients. Intervention: high self-efficacy and perceived susceptibility. Comparison: low self-efficacy and perceived susceptibility. Outcome: behavior change. The meta-analysis study was conducted by searching for articles from databases in electronic form including Google Scholar, PubMed, and Scopus. The keywords used are "hypertension" AND "health belief model (OR self efficacy OR perceived susceptibility)" AND "change behavior". The inclusion criteria for this study were full articles using a cross-sectional study, with the publication year 2012-2022. Analysis of articles in this study using RevMan 5.3 . software.
Results: A total of 10 articles reviewed in the meta-analysis showed that perceived susceptibility influenced behavioral changes in hypertensive patients (aOR= 2.16; 95% CI= 1.59 to 2.53; p<0.001) and self-efficacy also influenced behavioral changes in hypertensive patients (aOR= 1.37; 95% CI= 1.06 to 1.76; p= 0.020).
Conclusion: perceptions of vulnerability and self-efficacy affect behavior changes in hypertensive patients.

Keywords: hypertension, health belief model, self efficacy, perceived susceptibility.

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BACKGROUND

Hypertension is one of the most critical public health problems and has affected more than 1.2 billion people worldwide. Hypertension is a multifactorial disease that involves environmental and genetic factors together with risk-taking behaviors (Rossier, et al., 2017).

Hypertension is one of the most risk factors that can cause heart failure. Chronic

hypertension causes remodeling of the heart in the left ventricle which results in hypertensive heart disease, which ultimately manifests as heart failure (Di Palo, et al., 2020).

There are several factors that can increase a person's risk of suffering from hypertension. Risk factors for hypertension can be divided into two, namely factors that cannot be controlled (such as gender, genetics and age) and those that can be controlled (such as obesity, excess BMI, smoking, and excessive salt and fat consumption (Shen et al. 2017; Hu, et al., 2017).

The prevalence of hypertension in the productive age group tends to increase from year to year, especially in the elderly group. According to data from the National Riskesdas Report in 2018, the prevalence of hypertension in the Indonesian population in the age group above 18 years reached 34.11% where the prevalence of hypertension in the elderly group reached 63.22%.

Because hypertension is a disease with a high mortality rate and can kill silently, the only way that can be done is to take precautions. Efforts to prevent and control hypertension must begin with increasing public awareness. and make lifestyle changes towards a healthier one. To understand and practice the right lifestyle and avoid disease, individuals and society need to learn the right behavior (Ma., 2017; Fihtri, et al., 2021).

The model most often used to investigate behavior change and prevention of hypertension is the Health Belief Model (HBM). HBM reveals the relationship between health beliefs and self-care behavior, assuming that preventive behavior depends on an individual's beliefs (Ma., 2017; Najimi, et al., 2017).

Various theories have been applied to explain medication adherence in patients with hypertension. The theory of self-efficacy is well known in the field of health behavior research. According to Albert Bandura, self-efficacy is defined as "belief in one's ability to organize and carry out the actions necessary to manage prospective situations." In other words, self-efficacy is described as "a person's belief in their ability to succeed in a given situation." (Mostafavi, et al., 2016; Najimi, et al., 2017).

The concept of perceived susceptibility is a person's belief in assuming that suffering from a disease is the result of performing certain behaviors. Perceived susceptibility is also defined as "perceived susceptibility which refers to the possibility of a person being exposed to a disease" (Onorouiza, et al., 2015).

SUBJECTS AND METHOD

1. Study Design

This research was conducted using a meta-analysis research design with the PRISMA flowchart guideline. Article searches were performed using the following databases: PubMed, Google Scholar and Scopus. Some of the keywords used are: "hypertension" AND "health belief model (OR self-efficacy OR perceived susceptibility)" AND "change behavior".

2. Inclusion Criteria

The inclusion criteria for this research article are full paper cross-sectional study articles, articles using English, adjusted odds ratio relationship size, hypertensive patient subjects, behavior change results.

3. Exclusion Criteria

The exclusion criteria for this research article were the results of bivariate statistical analysis, and articles that did not use English.

4. Operational Definition of Variables

The articles included in this study were PICO-adjusted. The article search was carried out by considering the eligibility criteria determined using the following PICO

model: Population= Hypertension patients, Intervention= high self-efficacy and perceived susceptibility. Comparison = low self-efficacy and perceived susceptibility, Outcome= behavior change.

Hypertension is a condition when a person has high blood pressure measured at a value of 140/90 mmHg or higher, blood pressure can be interpreted as the force exerted by blood circulation on the walls of the body's arteries, namely the main blood vessels in the body. Asthma was categorized as hypertension and not hypertension. The measurement scale is categorical.

Self-efficacy is defined as self-confidence during the action or behavior needed to achieve certain results, Self-efficacy is categorized as high self-efficacy and low self-efficacy. The measurement scale is categorical.

Perceived susceptibility is defined as a person's subjective belief about a person about the risk of contracting a disease, the perceived possibility refers to a person's risk of contracting a particular disease or adverse health effects. Vulnerability perception is categorized as good vulnerability perception and bad vulnerability perception. The measurement scale is categorical.

5. Data Analysis

Articles were analyzed using the Review Manager (RevMan) 5.3 application to calculate effect size and heterogeneity, and form the final results of the meta-analysis. The results of data processing are presented in the form of forest plots and funnel plots.

RESULTS

Process of searching article wascarried out by searching several journal databases including Google Scholar, Pubmed, and Science Direct. it can be seen using the PRISMA FLOW flowchart shown in Figure 1.

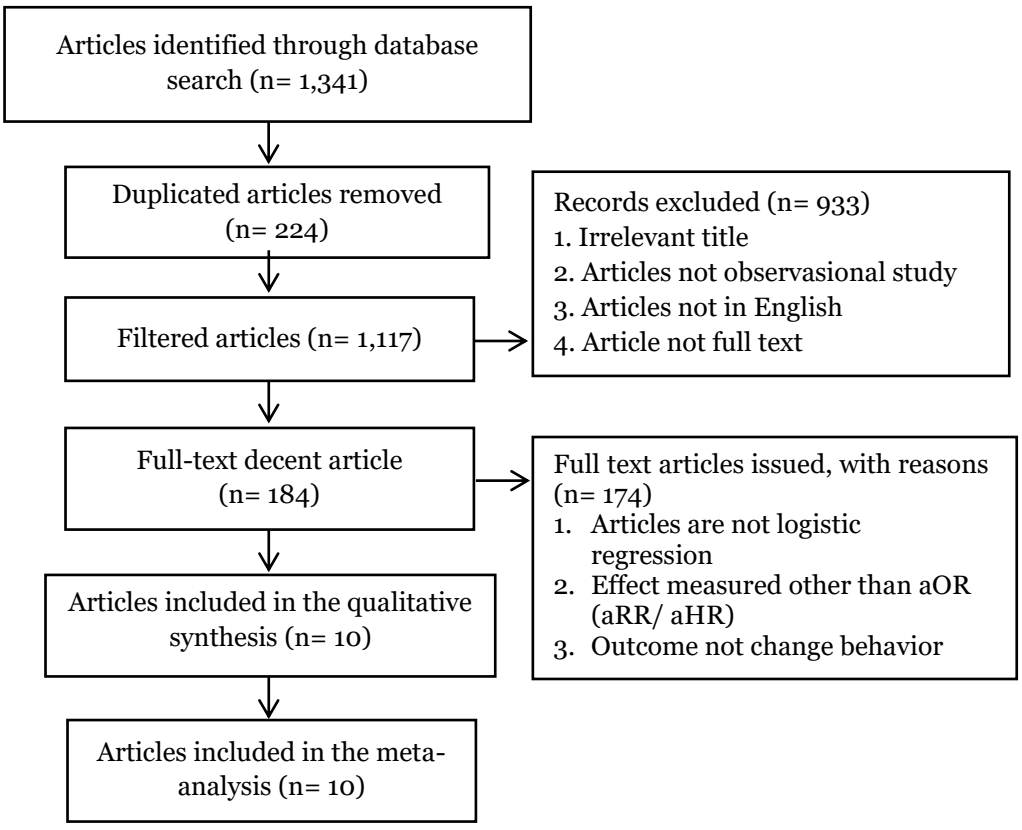

Figure 1. Results of Prisma Flow Diagrams

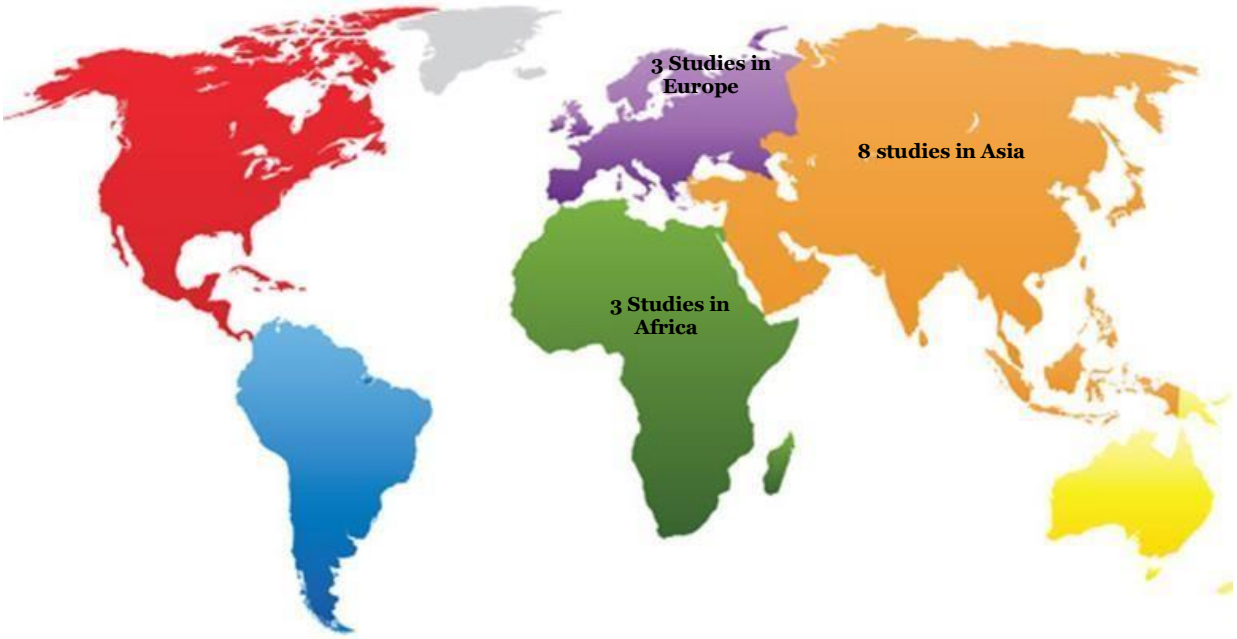

Figure 2. Research Distribution Map

Assessment of the quality of research articles using the Critical Appraisal Checklist for cross-sectional study which can be seen in table 1. The criteria for evaluating articles with cross-sectional study design are as follows:

1. Does the study address clearly focused questions/problems?
2. Is the research method (research design) appropriate to answer the research question?
3. Is the method Is the method of selecting subjects (hypertensive patients) clearly explained?
4. Are outcomes (behavioral changes) measured accurately to minimize bias?
5. Is the sample of subjects representative of the population to which the findings will be referred?
6. Was the sample size based on pre-study considerations of statistical power?
7. Was a satisfactory response rate achieved?
8. Is the measurement (questionnaire) possible valid and reliable?
9. Was statistical significance assessed?
10. Was a confidence interval given for the main outcome?
11. Could there be a confounding factor that has not been taken into account?
12. Can the research results be applied to your organization?

Table 1. Research Quality Assessment by Center for Evidence-Based Medicine (CEBM)

Primary Study	Criteria												Total
	1	2	3	4	5	6	7	8	9	10	11	12	
Crowley *et al.* (2012)	2	2	2	2	2	2	2	2	2	2	2	2	24
Findlow *et al.* (2015)	2	2	2	2	2	2	2	2	2	2	2	2	23
Hu *et al.* (2015)	1	2	2	1	2	1	2	2	2	2	2	2	21
Kamran *et al.* (2014)	2	2	2	2	2	2	2	2	2	2	2	2	24
Kasmaei *et al.* (2015)	2	2	2	2	2	2	2	2	2	2	2	2	24
Ketata *et al.* (2021)	2	2	2	1	1	2	2	2	2	2	1	2	21
Khorsandi *et al.* (2017)	2	2	2	2	2	2	2	2	2	2	2	2	24
Mariyasoosai *et al.* (2016)	2	2	2	1	1	1	2	2	2	2	1	2	20
Obirikorang *et al.* (2018)	2	2	2	1	2	2	2	2	2	2	1	2	22
Yue *et al.* (2015)	2	2	2	2	2	2	2	2	2	2	2	2	24

figure 1. Research related to application of health belief model in encouraging preventive behavior of self-care for hypertensive patients consisted of 10 articles from the initial search process yielding 1,341 articles, after the deletion process, articles were published with 184 requirements for full-text review more carry on.

A total of 12 articles that met the quality assessment were included in the quantitative synthesis using a meta-analysis.

It can be seen in Figure 2 that the research articles come from three continents, namely Africa (Ghana and Tunisia), Asia (Iran, Thailand, and China), and also Europe (US).

Table 2 showed the description of primary studies. A total of 10 articles were designed as a cross-sectional study that analyzed the application of health belief model in encouraging preventive behavior of self-care for hypertensive patients.

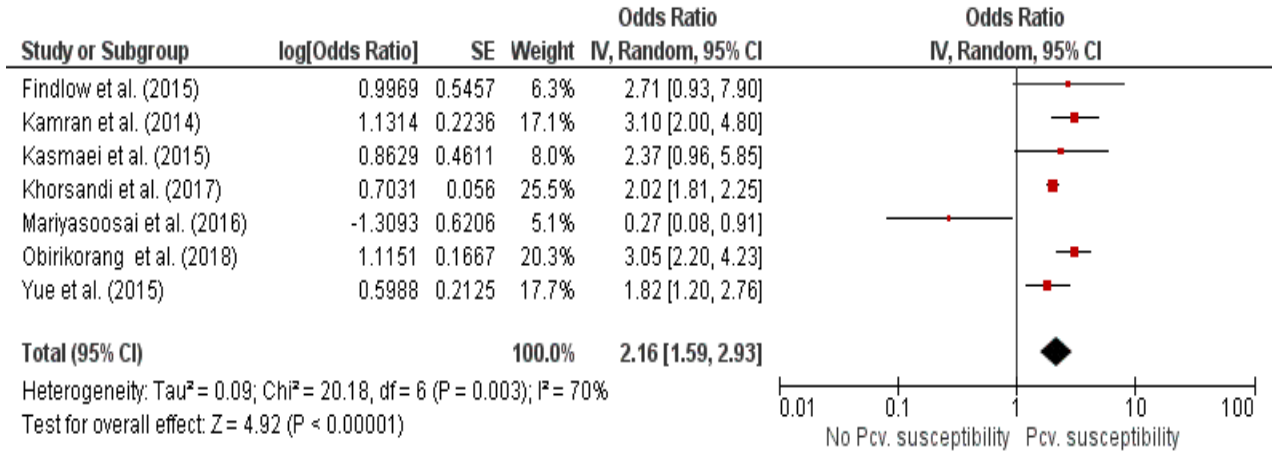

Figure 3. Forest plot Effect of Vulnerability Perception on Behavior Changes in Hypertensive Patients

The forest plot in Figure 3. showed that hypertensive patients with perceived susceptibility had 2.16 times the rate of behavioral change compared to hypertensive patients without perceived susceptibility (aOR= 2.16; 95% CI= 1.59 to 2.53), and the results were statistically significant (p< 0.001).

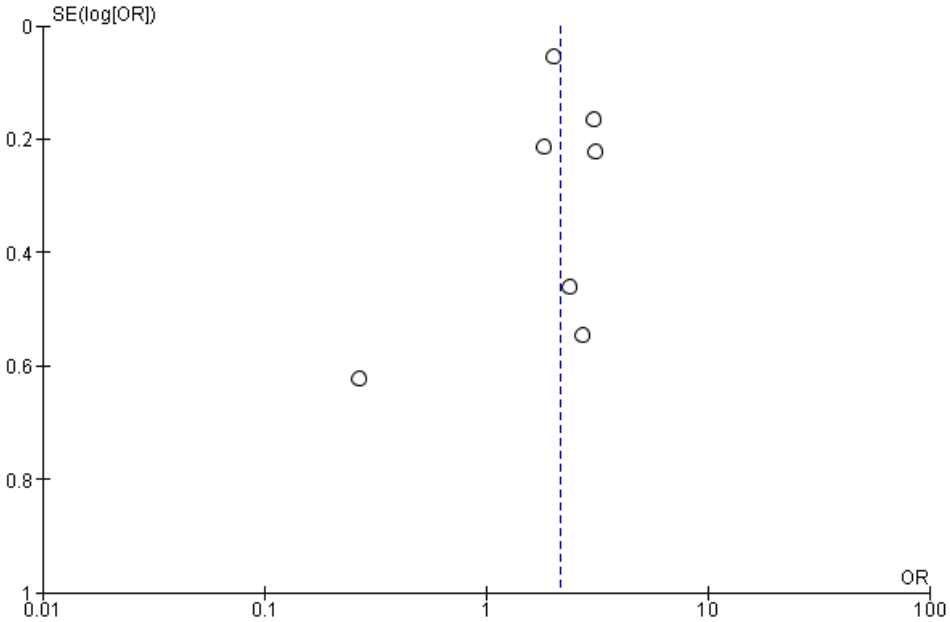

Figure 4. Funnel plot Effect of Vulnerability Perception on Behavior Changes in Hypertensive Patients

The funnel plot in Figure 4. showed publication bias with an overestimated effect characterized by an asymmetric distribution between the right and left plots. There are 3 plots on the right, 2 plots on the left, and 2 plots touching the vertical line. The plot on the right of the graph appears to have a standard error (SE) between 0 and 10. The plot on the left of the graph appears to have a standard error (SE) between 0 and 0.1

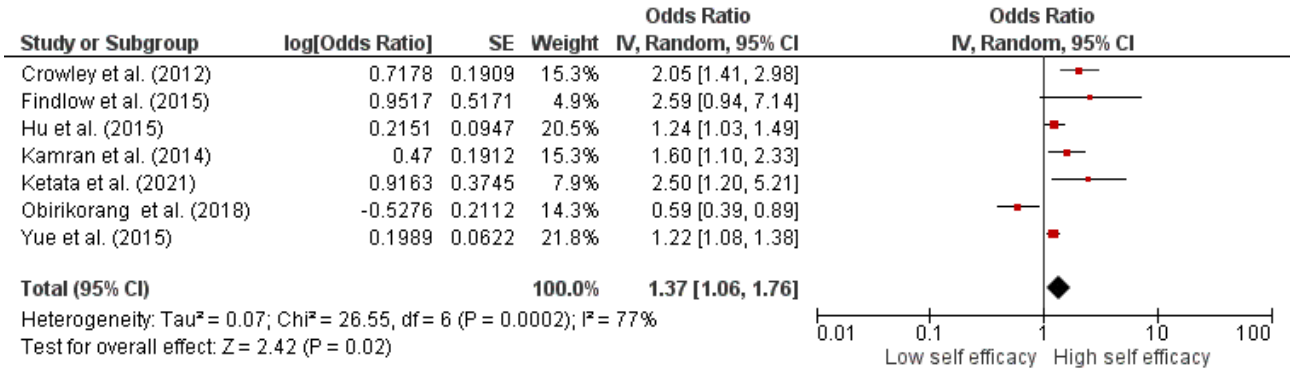

Figure 5. Forest plot Effect of Self-Efficacy on Behavior Changes in Hypertensive Patients

The forest plot in Figure 5 showed that hypertensive patients with self-efficacy had 1.37 times the rate of behavior change compared to hypertensive patients without self-efficacy (aOR= 1.37; 95% CI= 1.06 to 1.76), and the results were statistically significant (p= 0.020).

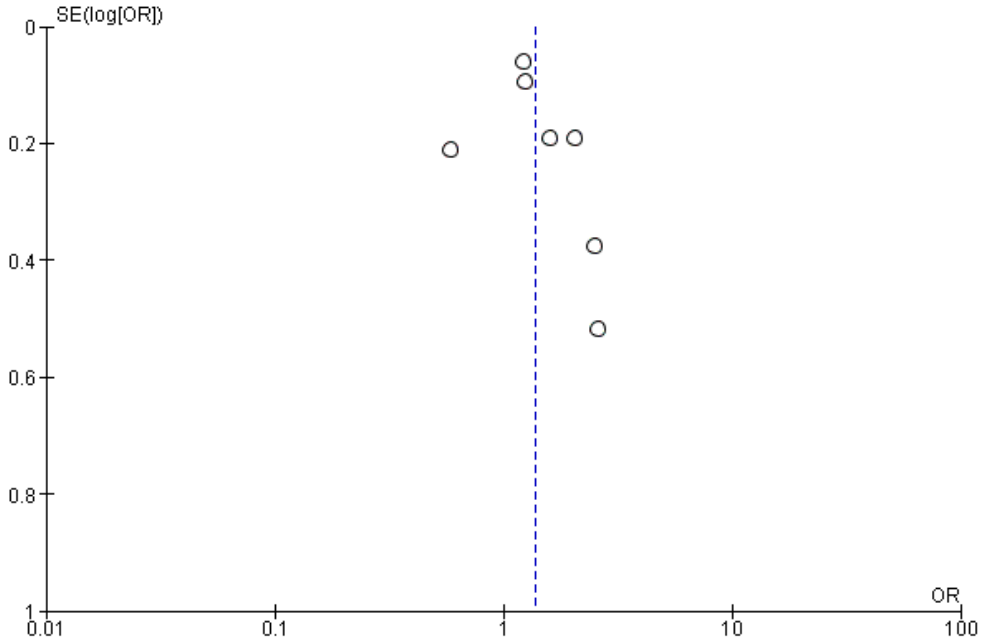

Figure 6. Funnel plot Effect of Self-Efficacy on Behavior Changes in Hypertensive Patients

The funnel plot in Figure 6. Showed publication bias with an overestimated effect characterized by an asymmetric distribution between the right and left plots. There are 4 plots on the right, and 3 plots on the left. The plot on the right of the graph appears to have a standard error (SE) between 0 and 10. The plot on the left of the graph appears to have a standard error (SE) between 0 and 0.1.

DISCUSSION

This systematic study and meta-analysis raised the theme of the application of the health belief model to behavioral changes in hypertensive patients. The independent variables analyzed were perceived susceptibility and self-efficacy. The dependent variable analyzed is behavior change.

The primary studies that met the criteria were 10 articles from 2 Americas, 6 from Asia, and 2 from Africa. This study shows that the perception of vulnerability and self-efficacy statistically significantly influence behavioral changes in hypertensive patients. The results of the forest plot show that the influence of perceived susceptibility to behavioral changes in hypertensive patients is 2.16 increasing behavioral changes in hypertensive patients (aOR= 2.16; 95% CI= 1.59 to 2.53) and the effect of self-efficacy on behavioral changes in hypertensive patients is 1.37 increasing behavioral changes in hypertensive patients (aOR= 1.37; 95% CI= 1.06 to 1.76). The heterogeneity of the research data shows I^2 = 0% so that the distribution of the data is declared homogeneous (fixed effect model) in both interventions.

Education Health Belief Models are effective in changing behavior, especially in increasing the perception of vulnerability and self-efficacy, and can even indirectly lower blood pressure. The results of the study were in line with that conducted by Kamran et al. (2014) which states that the perceived vulnerability and self-efficacy factors are effective factors in changing behavior. Other similar studies can be found in America (Warren-Findlow et al., 2015), Ghana (Obirikorang et al., 2018), and China (Yue et al., 2015).

Table 2. Description of the primary study of vulnerability perception included in the meta-analysis

No	Author (Year)	Country	Study Design	Sample	Population (P)	Intervention (I)	Comparison (C)	Outcome (O)	aOR (CI 95%)
1	Findlow *et al.* (2015)	The US	Cross-sectional	95	Hypertension Patient	High Perception of susceptibility, severity, benefits, and self efficacy	Low Perception of susceptibility, severity, benefits, and self efficacy	Changes in behavior	2.71 (0.93–7.95)
2	Kamran *et al.* (2014)	Iran	Cross-sectional	671	Hypertension Patient	High Perception of susceptibility, severity, benefits, barriers and self efficacy	Low Perception of susceptibility, severity, benefits, barriers and self efficacy	Changes in behavior	3.10 (2.0 – 4.8)
3	Kasmaei *et al.* (2015)	Iran	Cross-sectional	125	Hypertension Patient	High Perception of susceptibility, severity, benefits, and self efficacy	Low Perception of susceptibility, severity, benefits, and self efficacy	Changes in behavior	2.37 (0.96 – 6.23)
4	Khorsandi *et al.* (2017)	Iran	Cross-sectional	100	Elderly hypertensive patients	High Perception of susceptibility, severity, benefits, and self efficacy	Low Perception of susceptibility, severity, benefits, and self efficacy	Changes in behavior	2.02 (1.81 – 2.26)
5	Mariyasoosai *et al.* (2016)	Thailand	Cross-sectional	227	Outpatient Hypertension	High Perception of susceptibility, and barriers	Low Perception of susceptibility, and barriers	Changes in behavior	0.27 (0.08 – 0.92)
6	Obirikorang *et al.* (2018)	Ghana	Cross-sectional	678	Hypertensive patient diagnosed by doctor	High Perception of susceptibility, severity, benefits, and barriers	Low Perception of susceptibility, severity, benefits, and barriers	Changes in behavior	3.05 (2.20 – 4.25)
7	Yue *et al.* (2015)	China	Cross-sectional	232	Hypertension Patient	High Perception of susceptibility, severity, benefits, and self efficacy	Low Perception of susceptibility, severity, benefits, and self efficacy	Changes in behavior	1.82 (1.2 – 2.76)

Table 3. Description of the primary self-efficacy studies included in the meta-analysis

Author (Year)	Country	Study Design	Sample Size	P (Population)	I (Intervention)	C (Comparison)	O (Outcome)	aOR (CI 95%)
Crowley *et al.* (2012)	The USA	Cross-sectional	636	Hypertension Patient	The high factor of self-compliance and behavior management	Low self-compliance factor and behavior management	Changes in behavior	2.05 (1.41 – 2.99)
Findlow *et al.* (2015)	The USA	Cross-sectional	95	Hypertension Patient	High Perception of susceptibility, severity, benefits, and self efficacy	Low Perception of susceptibility, severity, benefits, and self efficacy	Changes in behavior	2.59 (0.94 – 7.12)
Hu *et al.* (2015)	China	Cross-sectional	318	hypertensive patients living in	High family social support, depression,	Low family social support, depression,	Changes in behavior	1.24 (1.03 – 1.48)
Kamran *et al. (*2014)	Iran	Cross-sectional	671	rural community	anxiety and self-efficacy	anxiety and self-efficacy	Changes in behavior	1.6 (1.1 – 2.3)
Ketata *et al.* (2021)	Tunisia	Cross-sectional	250	Hypertension Patient	High Perception of susceptibility, severity, benefits, barriers and self efficacy	Low Perception of susceptibility, severity, benefits, barriers and self efficacy	Changes in behavior	2.5 (1.2 – 5.1)
Obirikorang *et al.* (2018)	Ghana	Cross-sectional	678	Hypertensive patient	High compliance factor and	Low compliance factor and	Changes in behavior	0.59 (0.39 – 0.9)
Yue *et al.* (2015)	China	Cross-sectional	232	Hypertensive patient diagnosed by doctor	Self efficacy	Rendahnya Perception of susceptibility, severity, benefits, and self efficacy	Changes in behavior	1.22 (1.08 – 1.37)

AUTHOR CONTRIBUTION

Gusti Fathoni Firmansyah is the main researcher who chooses the topic, searches for and collects research data. Bhisma Murti analyzes data and examines research documents.

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This study is self-funded.

CONFLICT OF INTEREST

There is no conflict of interest in this study.

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