Meta-Analysis: Application of Health Belief Model on the Adherence to Antihypertensive Medication

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ABSTRACT

Background: Non-adherence to treatment and lack of understanding of the use of antihypertensive drugs resulted in uncontrolled hypertension. Antihypertensive compliance as a top priority in the treatment of hypertensive patients through the implementation of the Health Belief Model. The purpose of this study was to analyze the effect of perceived benefits and received cues to act on antihypertensive medication adherence.

Subjects and Method: This meta-analysis was conducted using the PRISMA flowchart guideline. The study was conducted using the PICO model, Population: hypertensive patients, Intervention: perceived benefits were strong and received cues to act, Comparison: perceived benefits were weak and did not receive cues to act, Outcome: adherence to antihypertensive medication. The article search process was carried out between 2012 and 2022 using databases from Pub¬Med, Google Scholar, ScienceDirect and ProQuest. Search keywords included "health belief model" OR "perceived benefit" OR "cues to action" AND "adherence antihypertensive" OR "compliance antihypertensive" AND "hypertension" OR "high blood pressure". Based on the database, there were 13 articles that met the inclusion criteria. Research analysis was carried out using RevMan 5.3 software.

Results: There are 13 articles from the continents of Africa and Asia. There are 9 meta-analysis articles showing that a strong perceived benefit of hypertension treatment is 1.60 times more likely to adhere to antihypertensive treatment than a weak perception of benefit and is statistically significant (aOR = 1.60; 95% CI = 1.06 to 2.41; p = 0.020), and there were 8 articles discussing the effect of getting cues to act on hypertension treatment on 1.52 times more likely to adhere to antihypertensive medication than not getting cues to act and statistically significant (aOR = 1.52; 95% CI = 1.02 to 2.27; p = 0.040).

Conclusion: Strong and signaled benefit perception for hypertensive patients improves adherence to antihypertensive medication.

Keywords: hypertension, health belief model, perceived benefits, cues to action.

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BACKGROUND

Hypertension as a silent killer disease. The disease does not show any indication, complications and mortality can occur (Rachman et al., 2021). There are 1.28 billion aged 30-79 years suffering from hypertension worldwide. Individuals who are not aware of having symptoms are 46%, diagnosed with hypertension and taking

treatment 42%, only 21% are able to control hypertension (WHO, 2021).

Hypertension is not controlled due to non-adherence to antihypertensive drugs and lack of understanding of drug use (Kamran et al., 2014). Patients with hypertension do not feel symptoms, so they do not comply with treatment (Alam and Jama, 2020). WHO provides pharmacological treatment guidelines to health workers to improve the detection and management of hypertension (WHO, 2021). Compliance with antihypertensive drug consumption has always been a problem because it requires behavioral changes that may be difficult to implement. Changes in individual behavior are caused by personal characteristics such as beliefs, attitudes, knowledge and motivation (Madebo et al., 2018).

Pharmacological therapy provides effective treatment in lowering blood pressure, reducing the burden of disease and mortality (Oparil et al., 2019). WHO identified antihypertensive compliance as a top priority for treating hypertensive patients through the Health Belief Model (Arindari and Suswitha, 2020).

Relevant primary research related to the implementation of the Health Belief Model on antihypertensive medication adherence states that the perceived benefits are strong and get cues to act can change individual beliefs to carry out antihypertensive medication adherence (Obirikorang et al., 2018; Tsadik et al., 2020). Perceived benefit has a relationship with adherence to antihypertensive medication. Individuals have a strong perception of the benefits of antihypertensive medication adherence (Girma et al., 2014; Li et al., 2017). Cues to action related to medication adherence in hypertensive patients. Individuals take action and make changes in health behavior regarding adherence to antihypertensive medication from the motivation of the surrounding environment (Hareri et al., 2013; (Helal et al., 2019).

Based on problems related to the importance of understanding each individual's perception of adherence to antihypertensive medication to control blood pressure and prevent complications, the researcher is interested in conducting a meta-analysis of the application of the Health Belief Model on adherence to antihypertensive medication. This study aims to analyze the effect of perceived benefits and getting cues to act on antihypertensive medication adherence.

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 PubMed, Google Scholar ScienceDirect and ProQuest databases. The keywords used were "health belief model" OR "perceived benefit" AND "adherence antihypertensive" OR "compliance antihypertensive" AND "hypertension" OR "high blood pressure" and "health belief model" OR "cues to action" AND "adherence antihypertensive" OR "antihypertensive compliance" AND "hypertension" OR "high blood pressure".

2. Inclusion Criteria
The inclusion criteria for this research article were cross-sectional study design articles, English articles, articles published in 2012-2022, adjusted Odds Ratio (aOR) relationship size, hypertensive patient subjects, perceived benefits of intervention and received cues to act, outcomes of antihypertensive medication adherence.

3. Exclusion Criteria
The exclusion criteria for this research article were duplicate articles, non-full-text articles and statistical results of bivariate analysis.

4. Operational Definition of Variables

The articles included in this study were PICO-adjusted. The search for articles considered eligibility criteria determined using the following PICO model: Population= hypertensive patients. Intervention= perceived benefit was strong and received cues to act. Comparison= perceived benefit was weak and did not receive cues to action. Outcome= adherence to antihypertensive medication.

Perceived benefit is the belief that hypertensive patients will benefit from adherence to antihypertensive medication. Perceived benefits are categorized as strong benefit perception and weak benefit perception. The measurement scale is categorical.

The cue to action is that hypertensive patients get cues to act about antihypertensive medication adherence from information and motivation of others. Cues to act are categorized as getting a cue to act and not getting a cue to act. The measurement scale is categorical.

Adherence to antihypertensive treatment is obedient behavior to antihypertensive medication as the main determinant in the success of healing hypertensive patients. The measurement scale is categorical.

The 12 cross-sectional study questions used are as follows:

1. Do the study objectives clearly address the study problem?
2. Are study methods appropriate in providing answers to study questions?
3. Is the study subject selection method clearly written?
4. Does sampling create bias?
5. Can the study sample be representative of the designated population?
6. Is the sample size determination based on pre-study considerations?
7. Is the measurement method achievable?
8. Are the study instruments valid and reliable?
9. Is there a value of statistical significance?
10. Is a Confidence Interval (CI) assigned to the main outcome?
11. Are there any confounding factors that have not been taken into account?
12. Can the results be implemented in your study?

6. Data Analysis

Research data were analyzed using the RevMan 5.3 application, to calculate the effect size and heterogeneity of the study. 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 PubMed, Sciencedirect, Googlescholar, ProQuest it can be seen usingthe PRISMA FLOW flowchart shown in Figure 1.

The primary research that met the criteria consisted of 9 articles from 3 continents namely Asia consisting of the Taiwan, China, Vietnam, and Afrika consisting of countries (Ethiopia, Ghana, Egypt) (Figure 2).

Table 1 showed the research quality assessment of 13 articles using the Critical Appraisal Checklist for Cross-sectional. Table 2 shows a summary of the articles of Cross-sectional that were included in the meta-analysis.

Table 1. Assessment of the Quality Studies by Center for Evidence Based Management (CEBM, 2014)

Primary Study	Criteria												Total
	1	2	3	4	5	6	7	8	9	10	11	12	
Li *et al.* (2012)	2	2	2	2	2	2	2	2	2	2	2	2	24
Hareri dan Abebe (2012)	2	2	2	2	2	2	2	2	2	2	2	2	24
Hareri *et al.* (2013)	2	2	2	2	2	2	2	2	2	2	2	2	24
Girma *et al.* (2014)	2	2	2	2	2	2	2	2	2	2	2	2	24
Yue *et al.* (2015)	2	2	2	2	2	2	2	2	2	2	2	2	24
Li dan Huang (2016)	2	2	2	2	2	2	2	2	2	2	2	2	24
Li *et al.* (2017)	2	2	2	2	2	2	2	2	2	2	2	2	24
Madebo *et al.* (2018)	2	2	2	2	2	2	2	2	2	2	2	2	24
Obirikorang *et al.* (2018)	2	2	2	2	2	2	2	2	2	2	2	2	24
Helal *et al.* (2019)	2	2	2	2	2	2	2	2	2	2	2	2	24
El Nahhas *et al.* (2019)	2	2	2	2	2	2	2	2	2	2	2	2	24
Tay (2019)	2	2	2	2	2	2	2	2	2	2	2	2	24
Gtsadik *et al.* (2020)	2	2	2	2	2	2	2	2	2	2	2	2	24

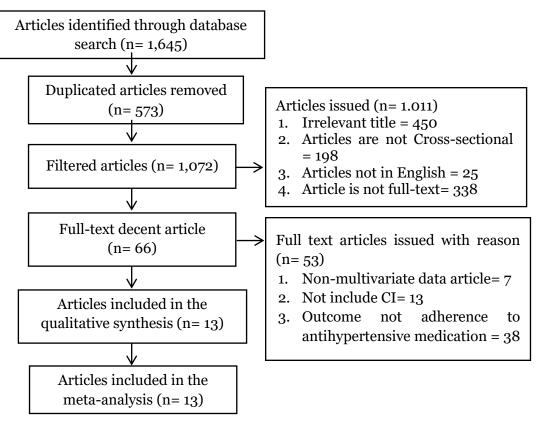Note: Answer: Yes=2, No =1, Can't tell=0

Figure 1. Results of Prisma Flow Diagrams

Figure 2. Resarch Distribution Map

1. The Effect of Perceived Benefits on Antihypertensive Medication Adherence.

Table 2 showed 9 articles of cross-sectional study from Taiwan, Ethiopia, China, Vietnam, Ghana on the effect of perceived benefits on antihypertensive medication adherence.

a. Forest plot

The forest plot in Figure 3 shows that the effect of perceived benefit on antihypertensive medication adherence shows that hypertensive patients who have a strong perceived benefit of hypertension treatment are 1.60 times more likely to adhere to antihypertensive medication than hypertensive patients who have a weak perception of benefit from hypertension medication. The results of the study on the effect of perceived benefits on adherence to antihypertensive medication were statistically significant (aOR = 1.60; 95% CI = 1.06 to 2.41; p= 0.020).

b. Funnel plot

The funnel plot in Figure 4 on the effect of perceived benefits on antihypertensive medication adherence shows that there is no publication bias as indicated by a fairly symmetrical distribution between the right and left plots. There are 4 plots on the right and 5 plots on the left.

2. Effect of Getting Signals to Act on Antihypertensive Medication Adherence

Table 3 shows 8 cross-sectional study articles from Ethiopia, Ghana, Egypt, China about the effect of getting cues to act on antihypertensive medication adherence.

a. Forest plot

Based on Figure 5, it can be seen that hypertensive patients who received cues to act on hypertension medication were 1.52 times more likely to adhere to antihypertensive medication than hypertensive patients who did not receive cues to act on hypertension medication and it was statistically significant (aOR= 1.52; 95% CI= 1.02 to 2.27; p= 0.040).

b. Funnel plot

The funnel plot in Figure 6 on the effect of getting cues to act on antihypertensive medication adherence has an overestimated publication bias characterized by an asymmetric distribution between the right and left plots. There are 5 plots on the right with standard error between 0.1 and 0.2 and 3 plots on the left with standard error between 0.2 and 0.4.
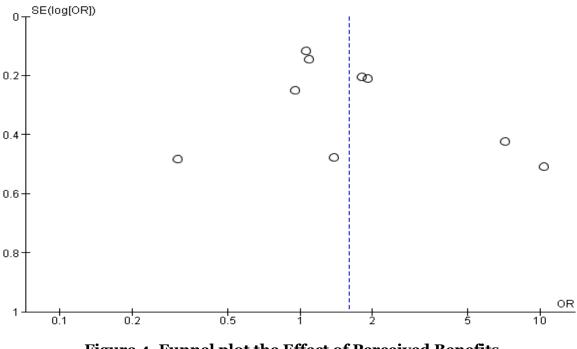
Table 2. Description of Primary Research included in the Meta-Analysis

No	Author	Country	Study Design	Sample	Population	Intervention	Comparison	Outcome	aOR (CI 95%)
1.	Li et al., (2012)	Taiwan	Cross-sectional study	200	Hypertension Patient	Strong benefit perception	Weak benefit perception	Antihypertensive medication adherence	0.95 (0.58 to 1.56)
2.	Girma et al. (2014)	Ethiopia	Cross-sectional study	2237	Hypertensive patient at Jimma University Hospital	Strong benefit perception	Weak benefit perception	Antihypertensive medication adherence	10.3 (3.8 to 27.8)
3.	Yue et al. (2015)	Cina	Cross-sectional study	256	Hypertensive patient at Shanghai Hospital	Strong benefit perception	Weak benefit perception	Antihypertensive medication adherence	1.06 (0.84 to 1.33)
4.	(Li dan Huang (2016)	Cina	Cross-sectional study	200	Chinese immigrant hypertension patient	Strong benefit perception	Weak benefit perception	Antihypertensive medication adherence	0.31 (0.12 to 0.76)
5	Li et al. (2017)	Vietnam	Cross-sectional study	100	Vietnam Police hypertension patient	Strong benefit perception	Weak benefit perception	Antihypertensive medication adherence	1.91 (1.26 to 2.90)
5.	Madebo et al. (2018)	Ethiopia	Cross-sectional study	416	Hypertensive patient at Arebaminch Hospital.	Strong benefit perception	Weak benefit perception	Antihypertensive medication adherence	7.1 (3.1 to 15.7)
6.	Obirikorang et al. (2018)	Ghana	Cross-sectional study	678	Kintampo Clinic hypertension patient	Strong benefit perception	Weak benefit perception	Antihypertensive medication adherence	1.81 (1.21 to 2.77)
7.	Tay (2019)	Ghana	Cross-sectional study	300	Hypertensive patient at Kwahu Hospital	Strong benefit perception	Weak benefit perception	Antihypertensive medication adherence	1.38 (0.54 to 3.52)
8.	Gtsadik et al. (2020)	Ethiopia	Cross-sectional study	1030	Hypertensive patients at Bishoftu Hospital, Adama, Asella, Shashemene	Strong benefit perception	Weak benefit perception	Antihypertensive medication adherence	1.09 (0.82 to 1.46)

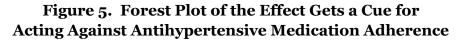| No	Author	Country	Study Design	Sample	Population	Intervention	Comparison	Outcome	aOR (CI 95%)
9.	Hareri dan Abebe (2012)	Ethiopia	Cross-sectional study	1700	Hypertensive patients at Tikur Anbesa Special Kidney Unit Hospital	Get a cue to action	Not getting a cue to act	Antihypertensive medication adherence	2.84 (1.47 to 5.50)
10.	Hareri *et al.* (2013)	Ethiopia	Cross-sectional study	286	Hypertensive patient at Black Lion Hospital Addis Ababa, Ethiopia	Get a cue to action	Not getting a cue to act	Antihypertensive medication adherence	2.84 (1.47 to 5.49)
11.	Yue *et al.* (2015)	Cina	Cross-sectional study	256	Outpatient hypertension patient at Shanghai Hospital, China	Get a cue to action	Not getting a cue to act	Antihypertensive medication adherence	1.30 (1.02 to 1.66)
12.	Helal *et al.* (2019)	Mesir	Cross-sectional study	350	Mansoura outpatient polyclinic hypertension patient	Get a cue to action	Not getting a cue to act	Antihypertensive medication adherence	2.25 (1.4 to 3.5)
13.	Obirikorang *et al.* (2018)	Ghana	Cross-sectional study	678	Kintampo Clinic hypertension patient	Get a cue to action	Not getting a cue to act	Antihypertensive medication adherence	0.59 (0.38 to 0.90)
14.	El-Nahhas *et al.* (2019)	Mesir	Cross-sectional study	409	Hypertensive patient at Sohag University Hospital	Get a cue to action	Not getting a cue to act	Antihypertensive medication adherence	2.94 (1.53 to 5.55)
15.	Tay (2019)	Ghana	Cross-sectional study	300	Hypertensive patient at Kwahu Hospital	Get a cue to action	Not getting a cue to act	Antihypertensive medication adherence	0.25 (0.11 to 0.59)
16.	Gtsadik *et al.* (2020)	Ethiopia	Cross-sectional study	1030	Hypertensive patients at Bishoftu Hospital, Adama, Asella, Shashemene	Get a cue to action	Not getting a cue to act	Antihypertensive medication adherence	0.89 (0.69 to 1.15)

Figure 3. Forest Plot the Effect of Perceived Benefits on Antihypertensive Medication Adherence
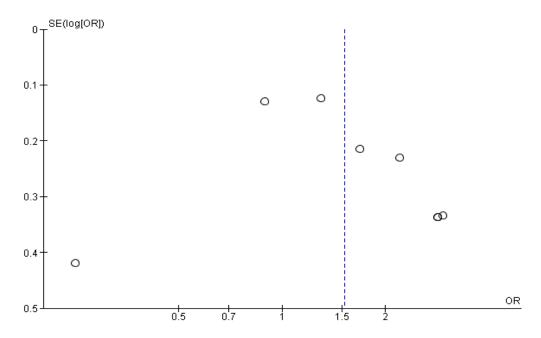

Figure 4. Funnel plot the Effect of Perceived Benefits on Antihypertensive Medication Adherence

Study or Subgroup	log[Odds Ratio]	SE	Weight	Odds Ratio IV, Random, 95% CI
El-Nahhas et al. 2019	1.0784	0.3332	11.2%	2.94 [1.53, 5.65]
GTsadik et al. 2020	-0.1165	0.1299	15.0%	0.89 [0.69, 1.15]
Hareri and Abebe 2012	1.0438	0.3371	11.1%	2.84 [1.47, 5.50]
Hareri et al. 2013	1.0438	0.336	11.2%	2.84 [1.47, 5.49]
Helal et al. 2019	0.7885	0.2306	13.3%	2.20 [1.40, 3.46]
Obirikorang et al. 2018	0.5247	0.2145	13.6%	1.69 [1.11, 2.57]
Tay 2019	-1.3863	0.4189	9.6%	0.25 [0.11, 0.57]
Yue et al. 2015	0.2624	0.1238	15.1%	1.30 [1.02, 1.66]
Total (95% CI)			100.0%	1.52 [1.02, 2.27]

Heterogeneity: Tau² = 0.26; Chi² = 47.36, df = 7 (P < 0.00001); I² = 85%
Test for overall effect: Z = 2.04 (P = 0.04)

Figure 5. Forest Plot of the Effect Gets a Cue for Acting Against Antihypertensive Medication Adherence

Figure 6. Funnel Plot of the Effect Gets a Cue for Acting Against Antihypertensive Medication Adherence

DISCUSSION

This systematic review research and meta-analysis raised the theme of the effect of the Health Belief Model on adherence to antihypertensive medication. The independent variables analyzed were the Health Belief Model theory on perceived benefits and cues for action. The dependent variable analyzed was adherence to antihypertensive medication.

The primary studies that met the criteria were 13 articles, there were 9 studies from the African continent in Ethiopia, Ghana, Egypt and 4 studies from the Asian continent in China, Vietnam. This study showed that perceived benefits and received cues to action were statistically significant in influencing antihypertensive medication adherence.

The effect of perceived benefits on adherence to antihypertensive medication

from 9 cross-sectional studies conducted according to the hypothesis that there is an effect of perceived benefits on adherence to antihypertensive medication. Forest plot results from 9 relevant primary studies showed that hypertensive patients who had a strong perceived benefit of hypertension treatment were 1.60 times more likely to adhere to antihypertensive medication than hypertensive patients who had a weak perceived benefit of hypertension medication. The results of this study were statistically significant (aOR= 1.60; 95% CI = 1.06 to 2.41; p = 0.020).

Individuals believe that adherence to medication is a savior for healing from hypertension and its complications. Hypertensive patients who have a strong perception of the benefits of hypertension medication adherence are more likely to adhere to antihypertensive medication (Girma et al., 2014). Another study by Li et al. (2017) revealed that a strong perceived benefit can increase awareness and cure complications of hypertension patients. The results of the study were in line with that of Obirikorang et al. (2018) stated that perceived benefits can change individual beliefs to carry out antihypertensive medication adherence.

The effect of getting cues to act on antihypertensive medication adherence from 8 cross-sectional studies conducted according to the hypothesis that there is an effect of getting cues to act on antihypertensive medication adherence. Forest plot results from 8 relevant primary studies showed that hypertensive patients who received cues to act about hypertension treatment were 1.52 times more likely to adhere to antihypertensive treatment compared to hypertensive patients who did not receive cues to act about hypertension treatment. The results of this study were statistically significant (aOR= 1.52; 95% CI = 1.02 to 2.27; p= 0.040).

Cues to act related to medication adherence of hypertension patients (Hareri et al., 2013; Helal et al., 2019). Cues to act can change individual beliefs to carry out antihypertensive medication adherence (G/Tsadik et al., 2020; Obirikorang et al., 2018). Provide clear and direct messages and involve support from family members to ensure medication adherence (Helal et al., 2019).

This research is in line with Ulfah (2018) revealing that having family or close people provides motivation for blood pressure control and taking medication regularly. Health practitioners should pay attention to the risk factors of hypertensive patients by determining intervention programs to improve medication adherence.

The conclusion from the results of this meta-analysis shows that a strong perceived beneficial effect on hypertension adherence has the possibility to adhere to antihypertensive treatment and get cues to act about hypertension adherence have the possibility to adhere to antihypertensive treatment.

AUTHOR CONTRIBUTION

Eltigeka Devi Apriliani is the principal researcher who selects the topic, searches for and collects research data. Hanung Prasetya and Bhisma Murti analyzed data and reviewed research documents.

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CONFLICT OF INTEREST

There is no conflict of interest in this study.

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