



Integrating the Health Belief Model and Mobile Applications to Improve Knowledge and Medical Compliance in Diabetic Patients

Wahyu Widodo ^{1*}, Faridah Binti Mohd Said ², Musheer ²

Abstract

Background: Standard care for Diabetic foot ulcers (DFU) involves various interventions, but there is limited focus on patients' knowledge and medical compliance. The Health Belief Model (HBM) offers a promising framework to enhance patient knowledge and adherence to medical recommendations by addressing perceived susceptibility, barriers, severity, and benefits. However, its application through mobile technology remains underexplored. **Methods:** This study conducted a systematic literature review using online databases such as PubMed, ScienceDirect, EBSCO, Springer, Google, and Google Scholar. The search focused on studies published from 2000 to 2022, examining the use of HBM in diabetes care, specifically addressing patient knowledge and medical compliance, and the integration of mobile applications. **Keywords** included terms such as 'education HBM diabetes patient's knowledge' and 'mobile application HBM diabetes medical compliance.' After an initial yield of 168 articles, a rigorous screening process resulted in the inclusion of 9 relevant studies. **Results:** The review indicates that the HBM can effectively promote health behavior changes in diabetes care, improving self-efficacy,

knowledge, and medical compliance. Implementing HBM through education has shown benefits in foot care, adherence to medical advice, and the management of diabetes-related complications. However, studies integrating mobile applications with HBM in diabetes care are scarce, highlighting a significant gap in current research. **Conclusion:** Utilizing the Health Belief Model through mobile applications may offer clinical benefits in diabetes care by preventing severe complications such as DFUs. The role of technology experts is critical in developing effective HBM-based mobile applications.

Keywords: Diabetic Foot Ulcers, Health Belief Model, Mobile Applications, Patient Compliance, Diabetes Management

1. Introduction

Diabetic foot ulcers (DFU) is a full-thickness wounds having infection, and destruction of skin tissue due to neuropathy and/or peripheral artery disease in diabetic patients (van Netten et al., 2020). The International Diabetes Federation documented that 9.1 to 26.1 million people living with diabetes will have foot ulcers (Armstrong, Boulton, & Bus, 2017). Furthermore, the prevalence of DFU was documented at 7.3% and 24% in several hospitals in Indonesia (Soewondo, Ferrario, & Tahapary, 2013). DFUs progressively lead to chronic complications including infection, lower extremity amputation and fatality (Muduli, Panda, & Behera, 2015). Studies highlighted that DFU complications have a devastating impact on wound healing (Spampinato et al., 2020; Hurlow, Humphreys, Bowling, & McBain, 2018). Furthermore, the complication hampers wound closure by peripheral neuropathy

Significance | Evaluating mobile Health Belief Model applications can enhance diabetes care by improving patient knowledge, adherence, and preventing complications.

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Editor Noman Hossain, Ph.D., And accepted by the Editorial Board August 08, 2024 (received for review July 16, 2024)

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Please Cite This:

Wahyu Widodo, Faridah Binti Mohd Said et al. (2024). Integrating the Health Belief Model and Mobile Applications to Improve Knowledge and Medical Compliance in Diabetic Patients, *Journal of Angiotherapy*, 8(8), 1-5, 9847.

and atherosclerosis, impairing the skin cells' function recovery (Burgess et al., 2021). Also, chronic diabetes impacts patients' knowledge and medical compliance (Alemayehu, Dagne, & Dagne, 2020; Alqarni, Alrahbani, Qarni, & Qarni, 2018).

Recently, the standard care of DFU consist of dressing, debridement, wound off-loading, vascular assessment, infection control, and glycemic management (Everett & Mathioudakis, 2018). However, this approach has less discussion about the patients' knowledge and medical compliance as it is fundamental for basic human need fulfillment. The health belief model (HBM) seems to be a promising concept helping patients to cope with their daily needs. This model described the perceived susceptibility, perceived barriers, perceived severity, and perceived benefits of prevention (Rosenstock, 1974). Several studies have addressed these issues in patients with diabetes. For example, the efficiency of HBM in the prediction of self-care behaviors among patients with diabetes was proved (Dehghani-Tafti et al., 2015). Health education integrating HBM improves eye care in diabetic patients (Pezeshki, Karimi, Mohammadkhah, Afzali Harsini, & Khani Jeihooni, 2022). Education programs based on HBM improve self-management and prevent diabetes complications (Jalilian, Motlagh, Solhi, & Gharibnavaz, 2014). HBM may help to reduce nonadherence to medical compliance (Chao, Nau, Aikens, & Taylor, 2005). HBM improves adherence to medical compliance among patients with diabetes (Alatawi, Kavookjian, Ekong, & Alrayees, 2016).

The studies above highlighted that HBM has potential clinical benefits for patients with type 2 diabetes as it will improve knowledge and medical compliance. However, none of the studies described the use of mobile applications during the study. At this present, using the mobile application in health care will help to have faster access to care providers, improves medication adherence and enhance communication between nurses and patients. For this reason, the study is initiated and aimed at evaluating the use of HBM with mobile phones in patients with type 2 diabetes for knowledge and medical compliance improvement. We expected that the finding may increase the nurses' understanding of using mobile applications for patients with chronic illnesses such as diabetes.

2. Methodology

The study integrated a literature review design to reach the purposes of the study. All the literature was searched by using several online databases including PubMed, ScienceDirect, EBSCO, Springer, Google, and Google Scholar. The search criteria were studies using HBM in diabetes, English, and Bahasa language, experimental studies are the priorities, a complete study design, and publications dated 2000 to 2022. Keywords were as follows: *'education HBM diabetes patient's knowledge'*, *'education HBM diabetes medical compliance'*, *'mobile application education HBM*

diabetes patients' knowledge', *'mobile application HBM diabetes medical compliance'*, and *'foot care HBM education diabetes'*

A total of 168 articles were analyzed (Figure 1). The data selected from the studies were assessed according to the article detail (title, journal, year of publication) as well as research details. The search focused on the criteria to minimize duplication. The researcher performed a screening using four phases: first, relevant titles and potential abstracts were assessed for the main objective of the study. All studies focusing on HBM in diabetes care were collected (n = 168). In the first phase, several articles were excluded because of irrelevance to diabetes (n = 64). Second, the remaining articles (n = 104) were also screened and then disregarded after considering titles and abstracts (n = 59). Third, screening full text by criteria (n = 45), then articles were excluded as it failed to meet the criteria (n = 36). Finally, 9 articles discussing HBM in diabetes care were included, compared then analyzed (Table 1).

3. Results and Discussion

HBM help in preventing the illness when they regard a condition (perceived susceptibility), serious consequences (perceived severity), other positive outcomes (perceived benefits), and health action (perceived barriers) (Jones et al., 2015). this model has been used in various chronic illnesses including diabetes. For example, Teaching patients with diabetes using HBM improves several parameters such as follows self-efficacy (foot care), susceptibility, severity, perceived threat, and knowledge of benefits and barriers related to medical compliance (Shabibi et al., 2017; Jalilian, Motlagh, Solhi, & Gharibnavaz, 2014). In these studies, the ability to perform a self-care (e.g., foot care) activity is also increased due to the increased levels of patients' knowledge. What's more, by implementing HBM, patients with diabetes will adhere to treatment when they are worrying and believe the impact of diabetes (e.g., foot complication, serious consequences, medical recommendations and cost). Furthermore, using HBM in diabetes care increase the awareness of nutrition intake and physical activity as it helps to prevent neuropathy of the foot among patients (Sharifirad, Entezari, Kamran, & Azadbakht, 2009; Kashfi, Jeihooni, Rezaianzadeh, & Amini, 2012; Bayat et al., 2013).

Studies presented that using theory-based educational programs integrating cognitive frameworks can have a positive outcome. A few of these programs are currently part of diabetes care, for instance, the implementation of HBM increases the knowledge, physical activities, and control of blood sugar among patients (Khodaveisi, M., Azizpour, Jadidi, & Mohammadi, 2021; Zareban et al., 2013). As widely acknowledged, this model can be a guideline for health promotion and disease prevention programs (e.g., diabetes and its complications). Also, a study emphasized that health education is important of diabetes care management, so finding an appropriate method will improve self-efficacy and self-

Table 1. Summary of Studies Analyzing the Use of Health Belief Model (HBM) in Diabetes Care. An overview of nine selected studies discussing the implementation of the Health Belief Model in managing diabetes, highlighting the focus areas, study design, key findings, and conclusions related to patient knowledge and medical compliance.

| No | Author and year of publication | Participants | Method | Comparison therapy (If any) | Outcomes |
|----|---|------------------------|--------------------------|-----------------------------|---|
| 1 | Shabibi et al., 2017 | Patients with diabetes | Quasi-experimental study | Usual care | HBM improves knowledge and medication |
| 2 | Jalilian, Motlagh, Solhi, & Gharibnavaz, 2014 | Patients with diabetes | Quasi-experimental study | Usual care | HBM improves self-care knowledge and medication |
| 3 | Sharifirad, Entezari, Kamran, & Azadbakht, 2009 | Patients with diabetes | Quasi-experimental study | Usual care | HBM improves knowledge of nutrition |
| 4 | Kashfi, Jeihooni, Rezaianzadeh, & Amini, 2012 | Patients with diabetes | Quasi-experimental study | Usual care | HBM improves knowledge of behavior |
| 5 | Bayat et al., 2013 | Patients with diabetes | Quasi-experimental study | Usual care | HBM improves knowledge in self-efficacy |
| 6 | Khodaveisi, M., Azizpour, Jadidi, & Mohammadi, 2021 | Patients with diabetes | Quasi-experimental study | Usual care | HBM improves knowledge in physical activities |
| 7 | Zareba et al., 2013 | Patients with diabetes | Quasi-experimental study | Usual care | HBM improves blood sugar control and medication |
| 8 | Khosravizadeh, Ahadinezhad, Maleki, Vosoughi, & Najafpour, 2021 | Patients with diabetes | Review | None | HBM and technology are needed in diabetes care |
| 9 | Jiang, Liu, Li, Xie, and Jiang, 2021 | Patients with diabetes | Observational study | None | HBM improves knowledge and screening program |

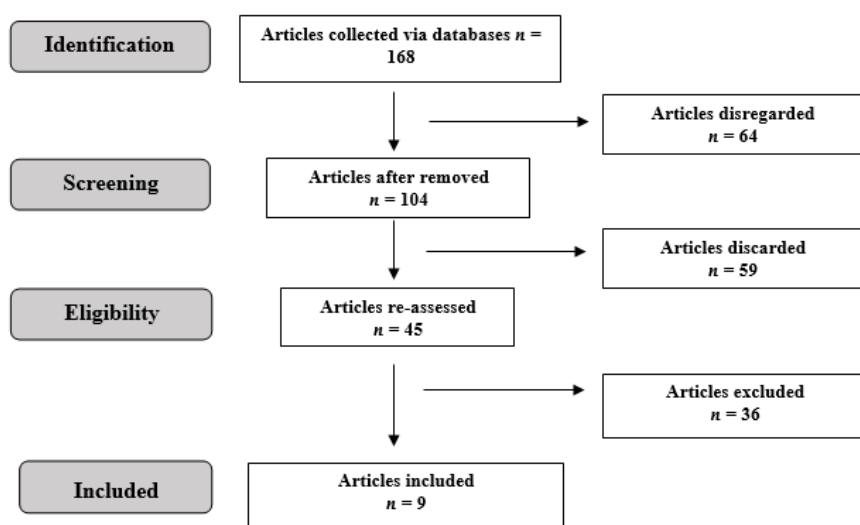


Figure 1. Flow Diagram of Article Selection Process for the Literature Review on HBM and Diabetes Care. The four-phase process used to screen and select relevant studies for the literature review. Out of 168 articles initially identified, 9 articles met the inclusion criteria and were analyzed. The diagram shows the number of studies excluded at each phase and the reasons for their exclusion.

management of this great importance (Martos-Cabrera et al., 2021). Clinical nurses also have significant roles in diabetes care and the use of HBM in hospitals or clinics.

Technology also contributes to the success of diabetes care such as utilizing mobile phone applications. Diabetes technologies offer opportunities to improve patient self-care which may have a challenge for patients and healthcare workers (Alcántara-Aragón, 2019). Thus, nurses should understand the need before implementing technology in diabetes management. Several studies documented that HBM should be developed and transformed into technology as it will increase the opportunity of screening patients with diabetes (Khosravizadeh, Ahadinezhad, Maleki, Vosoughi, & Najafpour, 2021; Jiang, Liu, Li, Xie, and Jiang, 2021). However, studies using mobile technology in HBM among patients are limited as these gaps will direct to a groundbreaking study in this area.

4. Conclusion

The integration of the Health Belief Model (HBM) with mobile phone applications presents a promising approach for improving diabetes management. This model promotes understanding of perceived susceptibility, severity, benefits, and barriers, which are crucial for enhancing patient knowledge and compliance. By incorporating mobile technology, healthcare providers can facilitate timely communication, support self-care activities like foot care, and reduce the risk of severe complications, such as diabetic foot ulcers (DFU). Nurses and caregivers must collaborate to maximize the benefits of HBM-based interventions, including improved patient education and adherence to medical recommendations. Health policymakers should consider embedding HBM into standard diabetes care to enhance outcomes. Additionally, information technology experts play a vital role in developing and refining these applications for broader use. Further studies are needed to assess the effectiveness and adaptability of HBM-based mobile applications in various cultural and healthcare settings, ensuring optimal diabetes care globally.

Author contributions

W. Widodo developed the initial draft of the review and served as the corresponding author. F.B.M. Said contributed to the conceptualization and supervision of the work. Musheer participated in data analysis and co-development of the draft.

Acknowledgment

The authors thank all the people who contributed to this study including faculty members of Akademi Keperawatan Pemerintah Kabupaten Purworejo, Indonesia and Lincoln University College of Malaysia.

Competing financial interests

The authors have no conflict of interest.

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