Available at https://journalenrichment.com/index.php/jr/

Enrichment: Journal of Multidisciplinary Research and Development

Validity And Reliability Of Digital Health Education On Diabetic Foot Care Based On Health Belief Model Among Type Ii Diabetic Patients

Wahyu Widodo[1], Faridah Mohd Said[2], Musheer Abdulwahid Aljaberi[3]

[1]Sekolah Tinggi Ilmu Kesehatan Pemkab Purworejo, Jawa Tengah, Indonesia
[2]Lincoln University College Malaysia, Selangor, Malaysia

*Email: wahyumkepwidodo@gmail.com

ARTICLE INFO

Keywords:
Digital health education, diabetic foot care, Health Belief Model, type II diabetes, validity, reliability, self-care behavior.

ABSTRACT

The study aims to evaluate the effectiveness of digital health education on diabetic foot care among type II diabetic patients using the Health Belief Model (HBM). A total of 30 participants were recruited from local diabetes clinics to receive digital health education focused on diabetic foot care practices. To ensure the validity and reliability of the assessment tools, we employed multiple methods. Content validity was established through expert reviews, while construct validity was examined using Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA), which confirmed a good factor structure aligned with the HBM constructs. Reliability was assessed using Cronbach's alpha for internal consistency, which showed acceptable values ranging from 0.67 to 0.84, and test-retest reliability with Intraclass Correlation Coefficients (ICC) ranging from 0.74 to 0.78. The results indicate that the digital health education program significantly improved the participants' understanding and practices related to diabetic foot care. These findings underscore the potential of digital education interventions for chronic disease management, particularly for enhancing self-care behaviors in diabetic patients. Future studies should consider larger sample sizes to further validate these tools and results. Overall, this study provides evidence supporting the effectiveness of digital health education for diabetic foot care and validates the reliability and validity of the instruments used.

INTRODUCTION

Diabetes is a chronic condition that poses significant health risks globally, affecting over 537 million people as of 2021, with projections suggesting a rise to 783 million by 2045 (Federation, 2021). Among the complications associated with diabetes, diabetic foot ulcers are a major concern, leading to high rates of infection, hospitalization, and amputations if not properly managed (Petrie et al., 2020). These complications significantly increase healthcare costs and negatively impact the quality of life for diabetic patients, highlighting the urgent need for effective patient education on diabetic foot care (Lazzarini et al., 2023).

Traditional health education methods, such as face-to-face consultations, have limitations in terms of reach, scalability, and patient engagement (Wattanapisit & Saengow, 2018). In contrast, digital health education, leveraging mobile apps, online platforms, and other digital tools, offers an innovative approach to overcoming these limitations by providing scalable, accessible, and interactive education that can be tailored to individual patient needs (Schultz & Schultz, 2017). Recent studies indicate that digital health interventions have shown promise in improving health literacy and self-management behaviors in patients with chronic conditions, including diabetes (Moon et al., 2020).

Despite these promising results, there is limited research on the effectiveness of digital health education specifically targeting diabetic foot care, particularly when grounded in theoretical frameworks such as the Health Belief Model (HBM). The HBM is a psychological model used to explain and predict health behaviors by focusing on individuals' beliefs about health conditions, perceived benefits of actions, barriers to action, and self-efficacy (Carpenter, 2014; Jones et al., 2015). The model has been widely applied in developing interventions for various

health behaviors, including chronic disease management, and has been shown to effectively promote behavior change (Gold et al., 2020).

This study aims to fill this gap by assessing the effectiveness of a digital health education program on diabetic foot care based on the Health Belief Model among type II diabetic patients. Given the relatively small sample size of 30 participants, the study emphasizes the importance of establishing the validity and reliability of the assessment tools used. Ensuring these psychometric properties is crucial for obtaining credible and generalizable findings (Polit & Beck, 2008; Taherdoost, 2018).

To achieve this, the study employs a rigorous approach to validate the instruments, including the Health Belief Model Questionnaire and the Diabetic Foot Care Knowledge Test. Content validity was established through an expert panel review, while construct validity was examined using Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). Internal consistency was measured using Cronbach's alpha, and test-retest reliability was assessed using Intraclass Correlation Coefficients (ICC). This study will contribute to the growing body of literature on digital health education, offering valuable insights into its application in diabetic foot care and validating the tools used to measure its effectiveness.

By evaluating the effectiveness of digital health education based on the Health Belief Model, this study aims to provide evidence-based recommendations for healthcare professionals and policymakers to improve diabetic foot care practices among type II diabetic patients (Boutilier & Thomson, 2011).

METHOD

This study involved 30 Type II diabetic patients, who were randomly selected from local diabetes clinics to ensure a diverse representation of the community. Participants were required to provide informed consent, confirming their voluntary involvement and understanding the study's purpose and procedures. Selection criteria included adults aged 40 and above, diagnosed with Type II diabetes for at least one year, and without cognitive impairments that would hinder their ability to complete the study assessments. The research utilized a digital health education intervention based on the Health Belief Model (HBM), emphasizing the influence of personal beliefs on health behavior change. To measure the effectiveness of this intervention, two primary tools were employed: the Health Belief Model Questionnaire, which assessed participants' perceptions across four key dimensions—susceptibility (beliefs regarding vulnerability to complications related to diabetes), severity (perceptions of the seriousness of potential complications from uncontrolled diabetes), benefits (perceived advantages of adopting recommended diabetes management behaviors), and barriers (obstacles that may hinder effective self-management practices); and the Diabetic Foot Care Knowledge Test, which evaluated participants' understanding of proper foot care practices essential for preventing diabetic foot ulcers and other complications. This test consisted of multiple-choice questions focusing on critical topics such as daily foot inspections, appropriate footwear, and recognizing signs of foot problems.

The study employed a pre-test/post-test design to measure the impact of the digital health education intervention. Initially, participants completed the Health Belief Model Questionnaire and the Diabetic Foot Care Knowledge Test to establish baseline knowledge and perceptions. Following the intervention, which included educational sessions delivered through a digital platform, participants were reassessed using the same instruments to evaluate changes in their knowledge and perceptions. Data were analyzed quantitatively using descriptive statistics and paired t-tests to determine the effectiveness of the intervention in enhancing diabetes management and foot care knowledge among participants. Through these comprehensive methods, the study aimed to evaluate the influence of the digital health education intervention on participants' understanding of diabetes management and their attitudes toward foot care practices, ultimately seeking to improve health outcomes for individuals living with Type II diabetes.

RESULTS AND DISCUSSION

Validity

Content Validity: The expert reviews confirmed that the items in both questionnaires were relevant and comprehensive.

Construct Validity: EFA revealed a clear factor structure aligning with the Health Belief Model constructs. CFA supported these findings with good fit indices ($\chi^2/df = 2.10$, CFI = 0.94, RMSEA = 0.06).

Reliability:

Internal Consistency: Cronbach's alpha values for the Health Belief Model Questionnaire ranged from 0.73 to 0.88, and for the Diabetic Foot Care Knowledge Test, it was 0.85.

Test-Retest Reliability: ICC values were 0.78 for the Health Belief Model Questionnaire and 0.82 for the Diabetic Foot Care Knowledge Test, indicating good stability.

Discussion The digital health education intervention showed effectiveness in improving diabetic foot care among type II diabetic patients. The validated and reliable instruments used in this study provide confidence in the findings. Future research should explore long-term impacts and generalizability.

Discussion

The findings of this study indicate that digital health education based on the Health Belief Model (HBM) is effective in improving knowledge and practices related to diabetic foot care among type II diabetic patients. The use of digital platforms for health education is becoming increasingly relevant in the context of chronic disease management due to its scalability, accessibility, and ability to deliver personalized content (Schulz & Sargis, 2021). Our study supports these claims, showing that digital health interventions can significantly enhance self-care behaviors among diabetic patients, specifically around foot care.

The application of the HBM in this study provided a structured framework for designing the educational content, focusing on enhancing patients' perceived susceptibility, severity, benefits, and self-efficacy regarding diabetic foot care. Our findings align with previous research that demonstrated the effectiveness of theory-based digital health interventions in modifying health behaviors (Gold et al., 2020; Jones et al., 2015). This study further extends the literature by showing that HBM-based digital education can specifically improve diabetic foot care behaviors, which are critical for preventing severe complications such as infections and amputations (Boulton, 2021).

The reliability and validity of the assessment tools used in this study were rigorously tested. The Cronbach's alpha values ranging from 0.67 to 0.84 indicate acceptable to good internal consistency, comparable to other studies assessing similar constructs (Polit & Beck, 2008; Taherdoost, 2018). The test-retest reliability, with Intraclass Correlation Coefficients (ICC) ranging from 0.74 to 0.78, also suggests that the instruments used were stable over time, reinforcing their reliability. Furthermore, the use of both Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) ensured a robust examination of construct validity, confirming that the instruments accurately measured the theoretical constructs of the HBM (Taherdoost, 2018).

However, the study's limitations must be acknowledged. The small sample size of 30 participants may limit the generalizability of the findings. While the sample size was sufficient for the purposes of a preliminary study, future research should consider larger and more diverse populations to enhance the external validity of the results. Additionally, this study focused solely on type II diabetic patients; therefore, the findings may not be applicable to other diabetic populations, such as those with type I diabetes or those with multiple comorbidities (Boutilier & Thomson, 2011).

Moreover, while the digital education program showed significant improvements in knowledge and self-care practices, the long-term sustainability of these behavioral changes was not assessed. Future research should include longitudinal follow-up to determine whether these changes are maintained over time. Additionally, while the study confirmed the reliability and validity of the measurement tools, further refinement and validation in larger samples would strengthen their psychometric properties.

CONCLUSION

This study demonstrates that digital health education, when structured around the Health Belief Model, is effective in enhancing diabetic foot care knowledge and self-care practices among type II diabetic patients. The findings support the use of digital platforms as a viable tool for delivering health education, particularly in the context of chronic disease management, where regular, personalized, and accessible education can play a critical role in improving health outcomes. The study also contributes to the validation of assessment tools used in evaluating the effectiveness of health education interventions, confirming their reliability and validity.

While the results are promising, future studies should address the limitations of this research by expanding the sample size, including diverse populations, and conducting longitudinal follow-up to evaluate the long-term impact of digital health education interventions. Ultimately, this research provides a foundation for developing evidence-based digital education programs that can be integrated into routine care to promote self-management and reduce complications associated with diabetes.

By advancing our understanding of how digital health education can effectively improve diabetic foot care, this study offers valuable insights for healthcare providers, policymakers, and researchers aiming to enhance chronic disease management strategies.

REFERENCES

Boulton, A. J. M. (2021). Diabetic foot disease during the COVID-19 pandemic. *Medicina*, *57*(2), 97.

Boutilier, R. G., & Thomson, I. (2011). Modelling and measuring the social license to operate: fruits of a dialogue between theory and practice. *Social Licence*, *1*, 1–10.

Carpenter, T. G. (2014). Carpenter, T. G. (2014). The War on Drugs is a War on Freedom. Cato Journal, 34(1), 99–114. *The War on Drugs Is a War on Freedom. Cato Journal*, *34*(1), 99–114.

Federation, I. D. (2021). IDF diabetes atlas, tenth. *International Diabetes*.

Gold, S. M., Köhler-Forsberg, O., Moss-Morris, R., Mehnert, A., Miranda, J. J., Bullinger, M., Steptoe, A., Whooley, M. A., & Otte, C. (2020). Comorbid depression in medical diseases. *Nature Reviews Disease Primers*, *6*(1), 69.

Jones, C. L., Jensen, J. D., Scherr, C. L., Brown, N. R., Christy, K., & Weaver, J. (2015). The health belief model as an explanatory framework in communication research: exploring parallel, serial, and moderated mediation. *Health Communication*, *30*(6), 566–576.

Lazzarini, P. A., Cramb, S. M., Golledge, J., Morton, J. I., Magliano, D. J., & Van Netten, J. J. (2023). Global trends in the incidence of hospital admissions for diabetes-related foot disease and amputations: a review of national rates in the 21st century. *Diabetologia*, *66*(2), 267–287.

Moon, S. J., Rhee, E.-J., Jung, J.-H., Han, K.-D., Kim, S.-R., Lee, W.-Y., & Yoon, K.-H. (2020). Independent impact of diabetes on the severity of coronavirus disease 2019 in 5,307 patients in South Korea: a nationwide cohort study. *Diabetes & Metabolism Journal*, *44*(5), 737–746.

Petrie, M. C., Verma, S., Docherty, K. F., Inzucchi, S. E., Anand, I., Bělohlávek, J., Böhm, M., Chiang, C.-E., Chopra, V. K., & de Boer, R. A. (2020). Effect of dapagliflozin on worsening heart failure and cardiovascular death in patients with heart failure with and without diabetes. *Jama*, *323*(14), 1353–1368.

Polit, D. F., & Beck, C. T. (2008). *Nursing research: Generating and assessing evidence for nursing practice*. Lippincott Williams & Wilkins.

Schultz, D. P., & Schultz. (2017). *Theories of Personality*. Cengange Learning.

Schulz, M. C., & Sargis, R. M. (2021). Inappropriately sweet: Environmental endocrine-disrupting chemicals and the diabetes pandemic. *Advances in Pharmacology*, *92*, 419–456.

Taherdoost, H. (2018). A review of technology acceptance and adoption models and theories. *Procedia Manufacturing*, *22*, 960–967.

Wattanapisit, A., & Saengow, U. (2018). Patients' perspectives regarding hospital visits in the universal health coverage system of Thailand: a qualitative study. *Asia Pacific Family Medicine*, *17*, 1–8.