IMPROVING DIABETIC NEUROPATHY KNOWLEDGE IN AN URBAN ELDERLY POPULATION: A COMMUNITY-BASED INTERVENTION STUDY

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ABSTRACT
The global population ages quickly, older individuals are facing a rising burden of chronic diseases, particularly diabetes mellitus. In Indonesia, diabetes among the elderly poses a significant public health concern, often complicated by under-recognized conditions like diabetic neuropathy.. This study aimed to assess the effectiveness of a community-based intervention focused on targeted health education on diabetic neuropathy among elderly residents in urban area.. A pre- and post-test design was used to assess the intervention's effectiveness. In collaboration with local health cadres and facilities, participants completed identical questionnaires on diabetic neuropathy before and after the health education session to measure improvements in knowledge. A total of 143 elderly participants (median age: 65 years) were enrolled, with 73.4% being female. Post-education test scores showed a statistically significant improvement compared to pre-test scores (p < 0.001, Wilcoxon test). Of the participants, 22.4% were newly identified as having diabetes, and another 22% fell into the prediabetes range. Despite some variations in learning outcomes, 84.6% showed improved scores, indicating high effectiveness of the health education session. This study demonstrates that a community-based approach combining early diabetes screening and health education significantly improves elderly participants' knowledge about diabetes and diabetic neuropathy.

Introduction

The world is experiencing unprecedented demographic aging, with the proportion of individuals aged ≥ 60 years increasing at an accelerated rate. By 2020, the global population of older adults surpassed the number of children under five years of age.(1) Projections indicate that between 2015 and 2050, the proportion of the world's elderly population will nearly double, rising from 12% to 22%.(2) Indonesia exemplifies this trend, ranking among the top eight countries with the largest elderly population globally. With 8.2% of its population aged 60 years or older in 2015, Indonesia has officially transitioned into an aging society.(3)

Aging is associated with a progressive decline in physiological resilience, leading to increased susceptibility to chronic diseases and organ dysfunctions. Immunosenescence—the age-related weakening of the immune system—increases vulnerability to infections, malignancies, and inflammatory conditions, particularly cardiovascular diseases.(4,5) Furthermore, degenerative disorders such as Alzheimer's disease, Parkinson's disease, and osteoarthritis are characterized by chronic inflammation that exacerbates tissue damage.(6) These age-related changes underscore the need for targeted healthcare strategies to mitigate morbidity in older populations.

Diabetes mellitus is one of the leading health problems affecting older adults in Indonesia. According to Riskesdas 2018, diabetes prevalence in individuals aged 55–64, 65–74, and ≥75 years was 6.3%, 6.0%, and 3.0%, respectively.(7) Moreover, diabetes can lead to serious complications such as diabetic neuropathy. Although common among people with diabetes, diabetic neuropathy is often under-recognized and poorly understood by both patients and caregivers. This lack of awareness can delay diagnosis and management, ultimately worsening the patient's quality of life.

The government has launched several initiatives, such as Gerakan Masyarakat Hidup Sehat (Germas); however, public awareness of diabetes as a non-communicable disease and its complications remains inadequate. Studies indicate that knowledge levels among urban diabetics are predominantly low, with limited formal education identified as a key contributing factor.(8,9) This knowledge gap persists even in urban areas with greater access to health care.(10) There is no doubt that diabetes education is essential for establishing foundational knowledge about diabetes management, both at the time of diagnosis and throughout the patient's journey as treatment needs and preferences evolve.(11) Evidence demonstrates that such education significantly improves glycemic control, as measured by reductions in HbA1c levels.(12) However, the brevity of clinical encounters often restricts healthcare providers to superficial interventions, such as medication adjustments, glucose monitoring guidance, and behavioral recommendations, tasks hindered by varying levels of patient health literacy. Sustainable lifestyle modifications and community-based health promotion require extended support beyond clinical settings, necessitating collaborative programs tailored to high-risk and marginalized groups.(13)

Faculty of Medicine at Universitas Pembangunan Nasional "Veteran" Jawa Timur launched a health education program focused on diabetes education for elderly residents in Gunung Anyar District. Such interventions are vital for bridging the gap between clinical care and sustainable health outcomes in the aging population.

Methodology

Study Design and Participants

This study recruited individuals aged 60 years and above who attended the Gunung Anyar District Office on June 15th, 2025. A pre-test/post-test design was implemented. This one-group experimental approach involves taking measurements before and after an intervention to assess changes in knowledge level. We excluded individuals who could not complete both the pre- and post-test sessions, as well as those with severe cognitive impairment (defined as an Abbreviated Mental Test score ≤ 3). The sample size was calculated based on the mean difference and deviation standard between pre- and post-test values based on previous study.(14) The estimated minimum sample size was 83 subjects. A two-way hypothesis test was employed, with alpha and beta values set at 5% and 10%, respectively. Ethical approval was obtained from the Research Ethics Committee at the Faculty of Medicine, Universitas Pembangunan Nasional "Veteran" Jawa Timur.

Baseline Data and Follow-up

Baseline data were collected using questionnaires at the start of the recruitment process. Data obtained from history-taking included: (i) demographic data (sex, age, educational background); (ii) diabetes status, categorized as diabetes, prediabetes, or normal; (iii) hypertension status, categorized as hypertensive or normal; (iv) cognitive function, assessed using the Abbreviated Mental Test (AMT) and classified as cognitive impairment (score 0–6) or normal (score 7–10); (v) polypharmacy, defined as the daily use of five or more medications; and (vi) pre-test and post-test scores, obtained from a self-reported questionnaire completed by the participants.

Statistical Analysis

Data were analyzed using SPSS software version 24.0 (IBM, Armonk, New York, USA). First, a descriptive analysis of all variables was performed, including demographics and pre- and post-test scores. The paired t-test was used to compare scores if the data were normally distributed; otherwise, the Wilcoxon signed-rank test was applied. A further analysis was conducted to determine the proportion of participants who showed an improvement in their post-test scoreclassifying journal articles according to inclusion criteria and those that do not meet exclusion criteria. Compiling the results and conclusions of several journal articles in the form of a research table consisting of the author's name, journal title, journal period, research results, research conclusions, and journal article database.

Characteristics	n, %
Pre-DM	31 (21.7)
Normal	80 (55.9)
Polypharmacy (>5 drugs)	
Yes	20 (13.79)
No	128 (86.4)
Using Diabetes Medication	
Yes	4 (2,8)
No	139 (97,2)

Results and Discussion

Characteristics of the subjects

A total of 143 participants from the Gunung Anyar District attended the program. The median age of the participants was 65 (60-83) and most of the participants were female (73,4%). (**Table 1**) Most participants were not previously diagnosed with diabetes.

Table 1 Characteristics of The Subjects

Characteristics	n, %
Gender	
Male	38 (26,6)
Female	105 (73,4)
Age (Median, min-max)	65 (60-83)
Marital Status	
Married	114 (79,7)
Divorce	8 (5,6)
Divorced by death	21 (14,7)
Education	
Elementary school	12 (8,4)
Junior high school	42 (29,4)
Senior high school	69 (48,3)
Undergradute above	20 (14)
Cognitive status	
Normal	128 (86.48)
Mild Cognitive Impairment	20 (13.5)
Random blood glucose (Median, min-max), mg/dL	138 (81-565)
Hypertension	
Yes	68 (45.9)
No	80 (54.05)
Diabetes mellitus status	
Diabetes	32 (22.4)

Knowledge Level Before and After Health Promotion and Education

Based on **Table 2**, there was a significant increase in knowledge level after health promotion and education (p< 0,001 Wilcoxon test).

Table 2. Score before and after Health Counselling

Pre-test score	Post-test score	P value
70 (0-100)	90 (40-100)	0,000*

*Wilcoxon test

Further analysis of the Wilcoxon test (**Table 3**) revealed that 121 (84,6%) subjects had an increased knowledge score, with a mean rank after health counselling 61,79. The mean rank before health counselling was 27.

Table 3. Further Analysis of Wilcoxon Test

	N	Mean Rank

Negative Ranks	1[a]	27.00
Positive Ranks	121[b]	61.79
Ties	21[c]	
Total	143	

[a] post-test score < pre-test score

[b] post-test score > pre-test score

[c] post-test score = pre-test score

With the rapid growth of information accessibility today, people can obtain knowledge through various means. However, acquiring health information directly from healthcare facilities offers distinct advantages. Unlike unverified sources, guidance from medical professionals is evidence-based and tailored to individual needs. Additionally, health education empowers patients, improving their health-seeking behaviors (15). Counseling further enhances this process by addressing specific concerns, enabling clients to resolve their issues effectively (16).

The present study showed a statistically significant improvement in participants' knowledge. This was evidenced by a notable increase in post-test scores, as analysed using the Wilcoxon test ($p < 0.05$). These findings indicate that the educational intervention successfully enhanced the community's understanding of diabetes complications, particularly diabetic neuropathy. This result aligns with previous studies demonstrating that community-based health education can effectively increase health literacy and awareness of chronic complications of diabetes. (17)

Subsequent analysis indicated that one participant demonstrated a decline in performance, with a lower post-test score compared to the pre-test, while 21 participants exhibited no change in their test scores. These findings may be attributed to several factors, including limited motivation to engage with the educational material, low levels of formal education that may have impeded comprehension, or the use of health counselling

methods that were not optimally aligned with individual learning needs. It is well recognized that different educational approaches may be more effective for specific groups, depending on factors such as age, gender, educational background, and occupation. (18)

Our community development program served as an example of a Community-Based Health Intervention (CBHI). The involvement of older adults living inthe community in this program showed encouraging outcomes, suggesting that they engange in proactive health-seeking behaviors. Their involvement in such programs was significantly associated with higher odds of undergoing regular blood pressure monitoring (adjusted odds ratio [OR], 3.09; 95% confidence interval [CI], 2.67–3.58) and blood glucose testing (adjusted OR, 1.88; 95% CI, 1.58–2.23) (19). From a community development perspective, the active engagement of local health cadres and community members plays a critical role in strengthening local capacity for managing chronic diseases.(20)

However, this study has limitations in terms of follow-up duration and did not assess long-term behavioral changes. Knowledge alone is insufficient to improve health behavior. The six steps of behavioral change are pre-contemplation, contemplation, preparation, action, maintenance, and termination. Knowledge from health counselling helps individuals recognize the need for change, helps individuals recognize the need for change, which is essential for moving from precontemplation (not considering change) to contemplation (thinking about change).(21) Moreover, changing behavior itself depends not only on a patient's individual capacity to regulate impulses but also on ecosystems, including shared structural affordances and impediments, social norms, culture-wide practices, and more. Further research is needed to evaluate the sustained impact of health counselling on community practices and the incidence of diabetic neuropathy over time. (22)

Health counselling faces several challenges. In general, there are two obstacles from the perspective of patients with diabetes regarding educational training. First, patients sometimes found it difficult to understand the material given by the healthcare team, and the topic of the counselling was boring and repeated. In addition to boring material, patients are sometimes afraid to ask. This problem also becomes an obstacle to receiving materials delivered during education. Thus, two-way interactive health counselling is needed, and the health counselling should consider patients' prior knowledge. [23]

Overall, this study highlights that early detection and targeted health counselling on diabetic neuropathy are effective strategies to improve public awareness and community readiness in managing one of the most debilitating complications of diabetes.

Conclusion

Our intervention effectively enhanced participants' knowledge of diabetes and its associated neurological complications. These short-term outcomes underscore the importance of collaborative efforts in promoting diabetes awareness and facilitating early diagnosis among elderly populations. To evaluate the long-term impact, future studies should include structured follow-up assessments to measure sustained knowledge retention, compliance with preventive practices, and potential declines in the incidence of diabetic neuropathy.

Acknowledgments

Conflict of Interest

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