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Development of a Family-Centered Hypertension Education Module to Prevent Cardiovascular Complications in Community Settings

Dian Emiliasari[1], Aris Citra Wisuda[2], Citra Suraya[3]
[1,2,3] Nursing Study Program, Sekolah Tinggi Ilmu Kesehatan Bina Husada Palembang, Indonesia
Email: dianemiliasari.ners@gmail.com, ariscitrawisuda.edu@gmail.com, citrasuraya.edu@gmail.com

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ABSTRACT

Hypertension is a major risk factor for cardiovascular complications and remains a prevalent public health concern, particularly in community settings. Family involvement plays a vital role in supporting lifestyle modifications and treatment adherence. However, educational tools tailored to family support in hypertension management are still limited. This study aimed to develop a family-centered hypertension education module designed to enhance knowledge, promote behavioral changes, and prevent cardiovascular complications among hypertensive patients in the community. A research and development (R&D) design was employed using the ADDIE (Analysis, Design, Development, Implementation, Evaluation) model. The study was conducted at Puskesmas (Community Health Center) 23 Ilir Palembang from May to June 2025. Data were collected through interviews, expert validation, and pre-post tests involving 30 families of hypertensive patients. Validation involved a panel of experts in nursing, cardiology, and health education. Descriptive and paired t-test analyses were applied. The developed module consists of five core sections: understanding hypertension, healthy diet, physical activity, medication adherence, and family roles in disease management. Expert validation showed high content validity (CVI = 0.94). Post-intervention testing revealed a significant improvement in family knowledge and engagement ($p < 0.05$), indicating the module's effectiveness. The family-centered hypertension education module is feasible, valid, and effective in improving family support and awareness to prevent cardiovascular complications. Implementation of the module is recommended in community health centers to strengthen family involvement in hypertension management. Further research with larger samples and long-term follow-up is advised to evaluate its sustained impact.

Corresponding Author:
Dian Emiliasari,
Nursing Study Program, Sekolah Tinggi Ilmu Kesehatan Bina Husada Palembang, Indonesia
Email: dianemiliasari.ners@gmail.com

1. INTRODUCTION

Hypertension is one of the most significant modifiable risk factors for cardiovascular disease (CVD), which remains the leading cause of death globally [1],[2]. The World Health Organization estimates that over 1.28 billion adults aged 30 to 79 years suffer from hypertension worldwide, yet nearly half are unaware of their condition. Alarmingly, only about 21% of hypertensive individuals achieve optimal blood pressure control, despite the availability of effective medications and lifestyle interventions. The global burden of hypertension is expected to rise due to aging populations, unhealthy diets, physical inactivity, and increased exposure to stress [3],[4].

In the Asia-Pacific region, the prevalence of hypertension has grown substantially over the past decade, driven by rapid urbanization, dietary shifts high in sodium and fat, and increasing obesity rates. Studies from the Asia Pacific Cohort Studies Collaboration reveal that hypertension contributes to more than 60% of stroke-related mortality in low- and middle-income countries in Asia [5],[6]. Public health systems in many Asian nations are

underprepared to deliver consistent community-level education and support for long-term hypertension control, especially through non-pharmacological means [7].

Indonesia faces a similarly urgent challenge. According to the 2022 Basic Health Research (Riskesdas), the national prevalence of hypertension among adults aged 18 years and over was 34.1%, with higher prevalence observed among the elderly and urban populations [8]. In South Sumatera Province, particularly in Palembang City, the prevalence reaches 37.2%, surpassing the national average. Despite various national initiatives such as the Posbindu program, adherence to treatment and healthy lifestyle behaviors among patients remains low, and family participation in disease management is minimal [9].

Primary health care centers such as Puskesmas 23 Ilir in Palembang serve as the frontline in managing chronic diseases like hypertension. However, existing health promotion efforts are often individual-focused and lack structured, family-based education modules. Family involvement has been shown to improve medication adherence, dietary compliance, and physical activity, yet it is not routinely integrated into hypertension care at the community level. This gap highlights the need for culturally relevant and evidence-based educational tools that empower families to take an active role in supporting hypertensive patients.

Given this context, the present study aims to develop a family-centered hypertension education module tailored for use in community health settings. By involving families as partners in care, this module seeks to improve hypertension management outcomes and reduce the risk of cardiovascular complications among patients in the Puskesmas 23 Ilir service area. The module is expected to provide a structured framework for nurses and health workers to educate, engage, and empower families in managing hypertension more effectively at home and in daily life.

2. METHOD

2.1. Study Design

This study employed a Research and Development (R&D) design guided by the ADDIE instructional model, which consists of five systematic stages: Analysis, Design, Development, Implementation, and Evaluation. The ADDIE model was selected due to its structured and iterative approach that facilitates the creation of effective, need-based educational interventions [10],[11]. This model allows for the integration of learner needs, expert validation, and continuous evaluation, ensuring the development of a high-quality and context-appropriate education module.

2.2. Study Setting and Duration

The study was conducted at Puskesmas 23 Ilir, a government-funded community health center that serves as a primary health care provider in Palembang, South Sumatra, Indonesia. This facility is part of Indonesia's public health system, which offers promotive, preventive, curative, and rehabilitative services at the community level. The research activities took place from May to June 2025.

2.3. Participants and Sampling

The study involved 30 families with at least one member diagnosed with hypertension. Participants were selected through purposive sampling, guided by inclusion criteria as follows: (1) having a family member diagnosed with hypertension for at least six months, (2) residing within the catchment area of Puskesmas 23 Ilir, and (3) providing informed consent and committing to participate throughout the study period. Purposive sampling was chosen to ensure the selection of information-rich cases relevant to the module's intended users [12].

2.4. Data Collection Procedure

Data collection followed the five stages of the ADDIE model:

a. Analysis: Initial data were obtained through semi-structured interviews with hypertensive patients and their family members to identify knowledge gaps, health beliefs, and barriers in hypertension self-management. These findings informed the learning objectives and content framework of the module.
b. Design and Development: A draft education module was constructed based on evidence-based guidelines and national hypertension protocols. The content was organized into five core topics: (1) understanding hypertension, (2) healthy dietary practices, (3) physical activity recommendations, (4) medication adherence,

and (5) family support strategies. Visual aids and culturally sensitive language were used to enhance accessibility and comprehension.

c. Validation: The module underwent expert review by a panel of five professionals in nursing, cardiology, and public health education. The Content Validity Index (CVI) was calculated to assess the relevance, clarity, and accuracy of the material [13],[14]. Items with a CVI below 0.80 were revised accordingly.
d. Implementation and Evaluation: The final module was delivered through structured group education sessions led by trained community nurses. A pre-test and post-test were administered to measure changes in family members' knowledge and engagement levels. Each session included interactive discussions and printed materials for home reinforcement.

2.5. Data Analysis

Quantitative data from the pre- and post-tests were analyzed using descriptive statistics (mean, standard deviation) and paired t-tests to determine the statistical significance of knowledge improvement among participants. A p-value < 0.05 was considered statistically significant. Validation data were analyzed using the Item-Level Content Validity Index (I-CVI) and Scale-Level Content Validity Index (S-CVI) to ensure expert consensus on the quality of module content.

2.6. Ethical Considerations

This study received ethical approval from the Institutional Review Board of the Medical and Health Research Ethics Commission, Faculty of Medicine, Universitas Sriwijaya, under ethical certificate number 0129-2025, ensuring adherence to ethical research standards. All participants signed informed consent forms prior to data collection. Participants' confidentiality and anonymity were maintained by using coded identifiers and secure data storage.

3. RESULTS AND DISCUSSION

3.1 RESULT

3.1.1. Module Development Process

The development of the family-centered hypertension education module adhered to the five phases of the ADDIE model:

a. Analysis**:** Semi-structured interviews with 10 hypertensive patients and 10 family members at Puskesmas 23 Ilir identified several key gaps: limited understanding of hypertension as a chronic condition, misconceptions about long-term medication use, and insufficient knowledge of non-pharmacological lifestyle changes. These insights informed the module's learning objectives.
b. Design and Development**:** Based on the needs assessment findings and aligned with the national hypertension management guidelines issued by the [15], the educational module was systematically structured into five core thematic units: (1) comprehensive understanding of hypertension as a chronic condition, (2) nutritional management including salt intake reduction, (3) recommended physical activity tailored to patient capability, (4) strategies for promoting medication adherence, and (5) the pivotal role of family involvement in supporting lifestyle modification and monitoring. To enhance learning effectiveness, the module integrated interactive visual aids, guided reflection activities, and culturally responsive language tailored to the literacy and sociocultural context of the target population. These instructional design strategies are supported by educational theory emphasizing the importance of learner-centered, culturally appropriate materials to improve engagement and health literacy [16],[17].

3.1.2. Expert Validation

The draft module was reviewed by a panel of five experts in nursing education, cardiology, and public health. Using the Content Validity Index (CVI) methodology:

Table 1. Content Validity Index Scores for Module Items

Validation Aspect	I-CVI Range	S-CVI/Ave	Interpretation
Relevance	0.80–1.00	0.94	High Content Validity
Clarity	0.85–1.00	0.94	Clear and understandable content
Accuracy	0.80–1.00	0.93	Scientifically accurate material

Table 1 shows the Content Validity Index (CVI) scores across three key aspects of the module: relevance, clarity, and accuracy, as evaluated by a panel of five experts. The Item-Level Content Validity Index (I-CVI) ranged from 0.80 to 1.00 for all aspects, indicating a strong level of agreement among evaluators regarding each item's quality. The Scale-Level CVI (S-CVI/Ave) for relevance and clarity was both 0.94, reflecting that the module content was perceived as highly pertinent and easy to understand. The S-CVI/Ave for accuracy was 0.93, suggesting the module content was scientifically sound and aligned with current clinical guidelines.

These findings demonstrate strong overall content validity. All expert recommendations, including the simplification of medical terminology, the enhancement of visual aids, and the inclusion of culturally relevant examples, were incorporated into the final version. This collaborative validation process ensured that the educational module is not only evidence-based but also contextually appropriate for family caregivers at the community level.

3.1.3. Participant Characteristics

Thirty family caregivers participated in the module implementation phase. The demographic profile is summarized below:

Table 2. Demographic Characteristics of Participants (n = 30)

Variable	Frequency (%)	Mean (SD)
Female caregivers	22 (73.3%)	
Age (years)		41.6 (9.2)
High school education	18 (60.0%)	
Living with hypertensive patient	26 (86.7%)	
Duration of hypertension (years)		4.8 (±2.1)

Table 2 presents the demographic characteristics of the study participants, which consisted of 30 families involved in the implementation phase of the family-centered hypertension education module. The majority of caregivers were female (73.3%), indicating that women predominantly play a central role in family health management. The mean age of the caregivers was 41.6 years (SD = 9.2), suggesting that most participants were in their productive age range, potentially contributing to better understanding and application of educational content.

Regarding educational background, 60% of caregivers had completed high school, which may support adequate literacy for comprehending the module materials. A significant proportion (86.7%) lived in the same household as the hypertensive patient, which is favorable for direct involvement in daily caregiving and monitoring activities. The average duration of hypertension among patients was 4.8 years (SD = 2.1), indicating that most families had considerable experience managing the condition, though further structured education was still needed to enhance outcomes.

3.1.4. Effectiveness of the Module

The module's impact on caregiver knowledge and engagement was evaluated through pre-test and post-test scores. Results are presented in the table below:

Table 3. Pre- and Post-Test Scores on Hypertension Knowledge

Test Phase	Mean Score	SD	t-value	p-value
Pre-Test	61.3	9.4		
Post-Test	81.7	7.8	9.45	< 0.001

Table 3 presents the comparison between pre-test and post-test scores assessing participants' knowledge on hypertension before and after exposure to the family-centered education module. The mean pre-test score was **61.3** (SD = 9.4), indicating a moderate baseline understanding of hypertension among family caregivers. Following the intervention, the mean post-test score significantly increased to 81.7 (SD = 7.8), suggesting a substantial improvement in knowledge.

The paired t-test yielded a t-value of 9.45 with a p-value of < 0.001, indicating that the difference in scores was statistically significant. This result confirms the effectiveness of the developed module in enhancing participants' understanding of hypertension-related concepts. The improvement demonstrates that educational strategies integrating family involvement can lead to meaningful knowledge gains that may contribute to better disease management and prevention of cardiovascular complications in community settings.

3.1.5. Feasibility and Participant Feedback

Table 4. Feasibility and Participant Feedback on the Family-Centered Hypertension Education Module (n = 30)

Aspect Assessed	Feedback Result	Interpretation
Ease of Understanding	90% participants agreed	The majority of participants found the module language and visuals easy to grasp.
Relevance to Caregiving Role	87% participants agreed	The content was perceived as directly applicable to daily caregiving practices.
Appreciation of Family-Centered Approach	Frequently expressed in open responses	The module fostered shared responsibility and encouraged family involvement.
Feasibility for Health Workers (e.g., nurses)	Reported as feasible by community nurses	Nurses found the module easy to deliver during routine sessions at Puskesmas.
Visual and Cultural Adaptability	Positively highlighted by nurses & users	Illustrations and local examples enhanced comprehension and cultural relevance.

Table 4. illustrates the strong positive reception of the family-centered hypertension education module among both participants and health workers. A substantial proportion of caregivers (90%) acknowledged the ease of understanding, indicating that the module's design using simple language, visual aids, and locally contextual content effectively supported learning. Furthermore, 87% of participants affirmed the relevance of the module to their caregiving roles, particularly in encouraging dietary control, medication adherence, and active blood pressure monitoring. Qualitative responses emphasized the added value of the family-oriented approach, which promoted collaborative care at the household level. Community nurses confirmed the feasibility of integrating the module into routine health promotion activities at Puskesmas due to its clarity, structure, and visual engagement. These findings support the module's scalability and usefulness in strengthening family engagement in hypertension management in community settings.

3.2 DISCUSSION

The present study successfully developed, validated, and tested a family-centered hypertension education module tailored for use in primary healthcare settings, specifically Puskesmas 23 Ilir. The ADDIE model guided a systematic process of module creation, beginning with an in-depth needs analysis involving hypertensive patients and their families. The findings of this phase revealed critical gaps in knowledge and misconceptions regarding hypertension, medication adherence, and lifestyle modifications. These insights aligned with prior studies that highlight the limited awareness of chronic disease management in community-dwelling populations, especially in low-resource settings [18]. By targeting both patients and caregivers, the module addresses a recognized need for inclusive education that fosters household-level disease control.

Expert validation demonstrated high content validity, with S-CVI/Ave scores of 0.94 for both relevance and clarity, and 0.93 for accuracy. These results affirm that the module content was scientifically grounded, comprehensible, and aligned with national hypertension guidelines. Similar approaches in health education emphasize the importance of expert review to ensure the instructional integrity and cultural relevance of educational materials [19],[20]. The inclusion of visual aids and localized terminology was instrumental in enhancing clarity, particularly for participants with only high school education, thereby supporting health literacy development in underserved populations.

The intervention yielded a significant increase in hypertension knowledge, with post-test scores improving from a mean of 61.3 to 81.7 ($p < 0.001$). This finding supports the effectiveness of structured, family-oriented education in improving health literacy, a concept also underscored by Nutbeam's health promotion model, which emphasizes participatory learning and empowerment. The module's success in improving knowledge is consistent with earlier interventions showing that engaging families in chronic disease management can lead to better adherence and clinical outcomes [21].[22]. Moreover, the improvement reflects not only cognitive gains but also the impact of culturally adapted, visually engaging content in reinforcing learning.

Feedback from participants and community nurses underscored the module's feasibility and acceptability. A high proportion of caregivers (90%) found the module easy to understand, and 87% perceived it as highly relevant to their caregiving role. Open-ended feedback further emphasized appreciation for the family-centered approach, which fostered shared responsibility and motivation. Nurses found it practical to integrate into routine health promotion sessions at the Puskesmas. These findings align with evidence suggesting that health education is more effective

when it reflects cultural norms, family dynamics, and the practical realities of caregiving in local communities [23],[24].

Overall, the study demonstrates that a carefully developed, validated, and contextually adapted educational module can effectively enhance caregiver knowledge and support hypertension management at the family level. The integration of caregivers as active participants in health education represents a promising strategy for chronic disease control in primary care, especially within resource-limited settings. Future studies are recommended to explore the module's impact on behavioral outcomes and blood pressure control over longer follow-up periods to further evaluate its long-term effectiveness and sustainability.

4. STRENGTHS AND LIMITATIONS

This study's primary strength lies in the systematic development and validation of a culturally tailored, family-centered hypertension education module using the ADDIE model, which ensures both theoretical rigor and practical relevance. The integration of qualitative needs assessment, expert validation through CVI scoring, and empirical evaluation via pre-post testing provides a comprehensive framework for module effectiveness and feasibility. Moreover, the module's design accommodates low-literacy populations through visual aids and culturally relevant content, enhancing its accessibility. However, the study is limited by its small sample size and single-site implementation, which may restrict the generalizability of findings. Additionally, the study focused on short-term knowledge gains without assessing long-term behavioral outcomes or clinical improvements in blood pressure control.

5. CONCLUSION AND SUGGESTIONS

The development and implementation of the family-centered hypertension education module proved effective in enhancing caregiver knowledge, with strong content validity, cultural relevance, and feasibility for community-based health promotion. The significant improvement in post-test scores and positive participant feedback highlight the module's potential to strengthen family involvement in hypertension management. To maximize its impact, future efforts should focus on scaling up the module across multiple community health centers, incorporating digital formats for broader reach, and conducting longitudinal studies to evaluate long-term behavioral and clinical outcomes. Strengthening partnerships with local health workers is also recommended to ensure sustainability and integration into routine public health education.

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CONFLICT OF INTEREST

The author declares no conflict of interest.

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