

# Effectiveness of P3KU Mersion App on First Aid Drug Knowledge Among the Cadres of Nasyiatul 'Aisyiyah Gamping

*Vella Lailli Damarwati*<sup>1</sup>, *Muhammad Thesa Ghozali*<sup>1\*</sup>, *Nanang Kurniawan*<sup>2</sup>, *Riyanti Rafal Dini*<sup>1</sup>, *Ghaida Rahmani Putri Abidin*<sup>1</sup>, *Anita Agustina Styawan*<sup>3</sup>, *Salmah Orbayinah*<sup>1</sup>, *Ahdiana Yuni Lestari*<sup>4</sup>

<sup>1</sup>Pharmacist Professional Study Program, Faculty of Medicine and Health Sciences, Universitas Muhammadiyah Yogyakarta, Yogyakarta, Indonesia

<sup>2</sup>Department of Pharmacy, Faculty of Medicine and Health Sciences, Universitas Muhammadiyah Yogyakarta, Yogyakarta, Indonesia

<sup>3</sup>Study program of Pharmacist, Faculty of Health and Technology, Universitas Muhammadiyah Klaten, Central Java, Indonesia

<sup>4</sup>Law Study Program, Faculty of Law, Universitas Muhammadiyah Yogyakarta, Yogyakarta, Indonesia

**Abstract.** Improving community-level knowledge on emergency drug use is essential, particularly in settings with limited access to trained healthcare professionals. This study evaluates the effectiveness of the P3KU Mersion mobile application in enhancing knowledge of simple emergency medications among young female health cadres affiliated with Nasyiatul 'Aisyiyah, Gamping Subdistrict, Special Region of Yogyakarta, Indonesia. A pre-post single-group design was employed, involving 42 participants aged 18–40 years. Participants completed a validated knowledge questionnaire before and after a 1–2-week intervention using the app, which included multimedia modules, quizzes, and reading materials. Data were analyzed using descriptive statistics and paired samples t-tests. Results indicated a significant improvement in total knowledge scores (mean difference: +19.5;  $p < 0.001$ ), with the greatest gains observed in the domains of safety and contraindications, dosage knowledge, and drug function. These findings suggest that the P3KU Mersion app is an effective, accessible educational tool for non-professional health workers. Despite limitations such as a small sample size and lack of control group, the intervention demonstrates the potential of mobile health (mHealth) applications to support scalable, community-based health education. Future studies should assess long-term retention and explore broader implementation across diverse public health domains.

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\*Corresponding author: [ghozali@umy.ac.id](mailto:ghozali@umy.ac.id)

## 1 Introduction

Improving access to reliable information on emergency medications is a pressing concern in community-level health care systems, particularly in regions where access to trained professionals remains limited. In such contexts, lay health workers, particularly young female health cadres, play an increasingly critical role in bridging knowledge gaps and delivering basic medical care [1]. These individuals often serve as the first point of contact in health emergencies within rural or semi-urban communities, where scarcity of medical infrastructure and healthcare professionals is more pronounced. Despite their growing responsibilities, a number of cadres lack formal training, specifically in the domain of pharmacological first aid. As a result, they are often ill-equipped to make informed decisions about the administration of emergency drugs, which can significantly impact health outcomes in time-sensitive situations [2].

Emergency drugs, also referred to as simple first aid medications, include substances – e.g., oral rehydration salts (ORS), paracetamol, antiseptic solutions, antihistamines, and antacids. These drugs are commonly used to manage conditions like dehydration, fever, wounds, allergic reactions, and gastrointestinal distress –health conditions that constitute a significant proportion of preventable morbidity and mortality at the community level. The effectiveness of these medications hinges not only on their availability but also on proper knowledge of indications, dosages, and contraindications. Misuse or delayed administration due to lack of training remains a persistent issue in low-resource settings [3]. The challenges underscore the urgent need for scalable educational interventions that can equip non-professional health workers with accurate and actionable knowledge.

In recent years, digital health technologies have emerged as promising solutions to address such educational deficits. Mobile health apps, in particular, offer scalable, cost-effective platforms for health education. The interactivity and accessibility of mobile-based learning can help facilitate improved knowledge retention and behavioral change, particularly among the younger, tech-literate populations. The theoretical framework underlying such interventions draws on principles of adult learning theory and digital pedagogy, suggesting that mobile learning enhances self-directed education, engagement, and motivation. As smartphone app penetration increases even in low- and middle-income countries, these tools become increasingly viable for grassroots capacity-building in public health [4].

In this context, the P3KU Mertion mobile app was developed to provide user-friendly, modular education on simple emergency drug use for non-professional health workers [5]. This app includes interactive modules, quizzes, and multimedia content aimed at reinforcing practical knowledge. Its design prioritizes accessibility and local relevance, making it particularly suitable for use among young female health cadres who may lack formal training but possess high motivation to learn. This present study particularly aims to evaluate the effectiveness of the P3KU Mertion app in improving the knowledge of simple emergency drugs among young female health cadres in the Nasyiatul ‘Aisiyyah Cabang Gamping Subdistrict, Special Region of Yogyakarta, Indonesia.

## 2 Material and methods

### 2.1 Study design and participants

This study employed a pre-post single-group design to evaluate the effectiveness of the P3KU Mertion app as an educational intervention. Practically, the design was chosen to assess knowledge improvement in a real-world setting, community-based setting where the

inclusion of a control group may present logistical and ethical constraints. As a pilot initiative targeting grassroots health empowerment, the single-group design was deemed sufficient to detect meaningful changes in the knowledge levels while maintaining ethical feasibility and participant acceptability.

The population of this study consisted of young female health cadres affiliated with the Nasyiatul ‘Aisyiyah, Gamping Subdistrict, Special Region of Yogyakarta, Indonesia. Inclusion criteria were: female participants aged 18 to 40 years old, active engagement in community health promotion activities, and ownership of a smartphone capable of running the P3KU app. Participants who had previously received formal education in pharmacology, nursing, or other related clinical disciplines were specifically excluded to ensure the focus remained on lay health volunteers. A purposive sampling technique was employed to recruit 30 to 50 eligible participants. Informed consent was obtained from all participants prior to data collection, in accordance with ethical research practices involving human subjects.

## 2.2 Instruments

A structured questionnaire was developed to assess the participant’s knowledge of simple emergency drugs. The instrument included multiple-choice and true/false items covering four primary domains, e.g., drug function, clinical indications, proper dosage, and safety considerations. The content of the questionnaire was validated by a panel of experts in community medicine and pharmacology. To ensure internal consistency, the instrument underwent pilot testing and reliability analysis, yielding a Cronbach’s alpha coefficient of  $\geq 0.70$ , indicating acceptable reliability for the educational assessments [6]. The same instrument was used in both pre-test and post-test phases to allow for direct comparison of scores.

## 2.3 Intervention

The intervention involved a 1–2-week engagement period with the P3KU Merton app. As shown in Figure 1, the app was particularly designed to be intuitive and user-friendly, incorporating a range of multimedia educational tools including video tutorials, textual reading materials, and interactive quizzes. Educational content focused on key aspects of emergency drug use relevant to community-level first response. Participant engagement with the app was encouraged through daily reminders and monitored through built-in usage logs, which tracked login frequency and module completion rates.

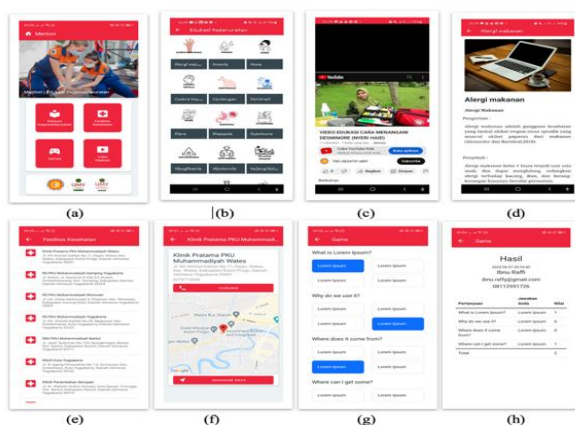


Fig. 1. Screenshots of the P3KU Merton app user interface.

## 2.4 Data collection and analysis

Data collection was conducted in two sequential phases. In the first phase, participants completed the pre-test questionnaire prior to accessing the P3KU Merton app. Following the intervention period, participants completed the post-test using the same instrument. Additionally, participants were invited to complete an optional user experience survey to capture feedback on the usability and perceived effectiveness of the mobile application. Data collection was supervised by trained facilitators to ensure protocol adherence and data integrity.

Additionally, the obtained data were analyzed using IBM SPSS Statistics version 26. Descriptive statistics, i.e., means, standard deviations, and frequencies, were computed to profile participant demographics. The main outcome – knowledge score improvement – was assessed using a paired samples t-test to determine the significance of pre- and post-intervention differences. Statistical significance was set at a p-value < 0.05. The effect size of the intervention was quantified using Cohen’s d, where values of 0.2, 0.5, 0.8, and  $\geq 1.0$  are interpreted as small, medium, large, and very large effects.

## 3 Results

### 3.1 Study participants

As presented in Table 1 below, a total of 42 young female health cadres from the Nasyyiatul ‘Aisyiyah, Gamping Subdistrict, Special Region of Yogyakarta, participated in the study and completed both pre- and post-tests. The participant’s mean age was 26.4 years (SD = 4.5), with most having completed senior high school (52.4%) or diploma-level education (38.1%). Approximately 64.3% of the cadres reported having participated in prior general health training sessions, although none had received formal instruction in pharmacology or drug safety.

**Table 1.** Demographic information of the study participants (n=42).

Demographic Information	Value (%)
<b>Age</b>	
18 – 22	8 (19.0)
23 – 27	16 (38.1)
28 – 32	11 (26.2)
33 – 35	7 (16.7)
<b>Education Level</b>	
Senior High School	22 (52.4)
Diploma	16 (38.1)
Bachelor	4 (9.5)
<b>Prior Health Training</b>	
Yes	27 (64.3)
No	15 (35.7)
<b>Mobile App Experience (Self-rated)</b>	
Never Used	5 (11.9)
Rarely Used	12 (28.6)
Often Used	25 (59.5)

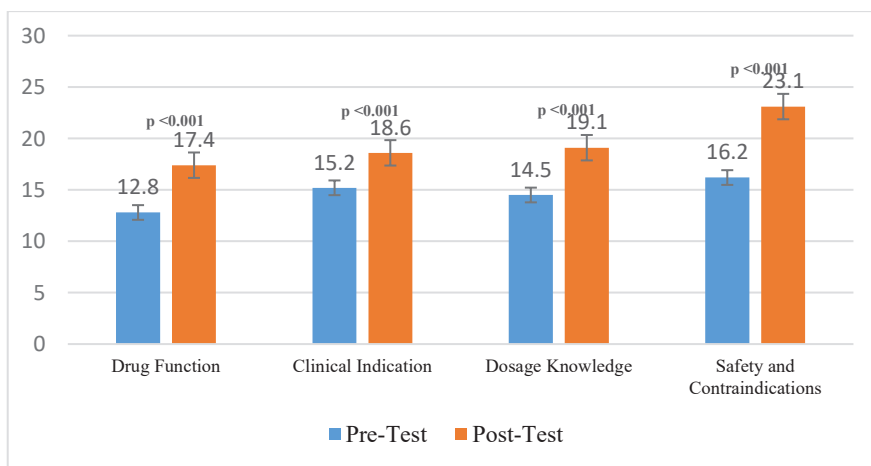
### 3.2 Pre- and post-test knowledge scores

The knowledge scores improved significantly following the intervention. The mean pre-test score was 58.7 (SD = 9.8) out of a maximum of 100, while the mean post-test score increased to 78.2 (SD = 7.5). A paired samples t-test indicated a statistically significant improvement in overall knowledge scores ( $t = 14.67$ ,  $df = 41$ ,  $p < 0.001$ ), suggesting the P3KU Mersion app effectively enhanced understanding of emergency drug use among participants. The effect size, measured by Cohen’s  $d$  (2.23;  $\geq 1.00$ ), indicated a very large practical impact of the intervention. The details of the results were shown in Table 2.

**Table 2.** Pre- and post-knowledge comparison of the study (n=60).

Knowledge Domain	Pre-test Mean (SD)	Post-test Mean (SD)	Mean Difference	Cohen’s d	p-value
Drug Function	12.8 (±3.1)	17.4 (±2.5)	+4.6	1.63	<0.001
Clinical Indication	15.2 (±2.8)	18.6 (±2.1)	+3.4	1.38	<0.001
Dosage Knowledge	14.5 (±3.6)	19.1 (±2.9)	+4.6	1.41	<0.001
Safety and Contraindications	16.2 (±2.5)	23.1 (±2.0)	+6.9	3.05	<0.001
<b>Total Knowledge Score</b>	<b>58.7 (±9.8)</b>	<b>78.2 (±7.5)</b>	<b>+19.5</b>	<b>2.23</b>	<b>&lt;0.001</b>

Among all domains, the largest gain was observed in the “Safety and Contraindications” category, with an average improvement of 6.9 points, as shown in Figure 2 below. It was followed by improvements in dosage knowledge and drug function, underlining the app’s effectiveness in clarifying practical and critical aspects of drug usage.



**Fig. 2.** Comparison of Pre- and Post-Test Scores by Knowledge Domain

### 3.3 Discussion

#### 3.3.1 Interpretation of key findings

This present study aimed to evaluate the effectiveness of the P3KU Mersion mobile app in enhancing the knowledge of simple emergency drug use among young female health cadres

from the Nasyiatul ‘Aisyiyah, Gamping Subdistrict, Special Region of Yogyakarta. The findings demonstrated a statistically significant improvement in knowledge scores from pre- to post-intervention, suggesting that the app functioned effectively as a digital health education tool. Notably, the largest gains were observed in the domains of safety and contraindications, followed closely by dosage knowledge and drug function. These results align with the intended design of the app, which emphasized critical thinking and implemented understanding through interactive content and scenario-based quizzes.

The observed improvements, notably in safety and contraindications, are significant in the context of lay health workers who frequently administer or recommend over-the-counter medications. Prior research has revealed that lack of training in drug safety is a persistent barrier to effective community-level healthcare delivery, often leading to avoidable adverse drug events [7]. The increased post-test scores in this domain suggest that digital tools such as the P3KU Mertion app can meaningfully bridge knowledge gaps that traditional, infrequent in-person training sessions may fail to address. Furthermore, the platform’s modern interactive nature likely contributed to improved retention and understanding, as supported by evidence that engagement-enhancing digital features lead to better learning outcomes [8].

These findings are consistent with similar mHealth app interventions implemented in low- and middle-income countries (LMICs), where the platforms have proven effective in disseminating health knowledge among community health workers. In Indonesia, a study evaluating a smartphone app-based maternal health education program represented significant improvements in midwife’s knowledge and service quality [9]. Similarly, in rural Bangladesh, a mobile decision-support tool significantly improved the accuracy of diagnosis and medication administration by the community health assistants [10]. These interventions reinforce the notion that mobile app platforms are uniquely positioned to address educational deficiencies among lay health workers operating in settings where traditional medical infrastructure is scarce.

Moreover, the success of the P3KU Mertion app in improving knowledge outcomes aligns with global trends in digital transformation of healthcare education. A systematic review and meta-analysis of mHealth interventions for maternal, newborn, and child health in LMICs settings found modest evidence of improvements in intermediate health outcomes, e.g., timely initiation of breastfeeding, though noted weak methodological quality across studies [11]. The present study adds to this growing body of evidence by demonstrating that even short-term engagement with a well-structured educational app can yield measurable improvements in knowledge, particularly when targeting specific, actionable skills such as emergency drug administration.

### **3.4 Practical implications**

From a practical standpoint, the study findings have many implications for public health education. First, the integration of mobile app like P3KU Mertion into community health cadre training programs can complement existing face-to-face instruction, ensuring that volunteers have ongoing access to validated information. Given the increasing ubiquity of smartphones and mobile data access in Indonesia, digital training can be feasible and sustainable [12]. Second, the app’s modular design allows for content expansion, making it adaptable to the other priority health topics, including maternal care, infectious disease prevention, or child nutrition – areas that frequently fall within the remit of community health workers. Furthermore, the success of the app suggests it could be scaled and adapted for use in other regions or by similar organizations. For instance, health-focused non-governmental organizations (NGOs) working with female youth in rural settings could integrate this model into their programming. User feedback from this study indicated high acceptability and

usability, which are essential precursors to long-term adoption and sustainability [13]. However, successful scaling would require collaboration with local health authorities to ensure content accuracy and cultural relevance, as well as robust training for first-time users unfamiliar with mobile learning tools.

### **3.5 Strengths and limitations of the study**

Despite the strengths of this study, several limitations should be acknowledged. The real-world community setting enhanced the ecological validity and participant engagement; however, the absence of a control group limits the ability to attribute knowledge gains solely to the intervention. Future studies employing randomized controlled trial (RCT) designs would provide more robust evidence of efficacy. In addition, the recent study was confined to a relatively small, non-random sample of study participants from a single geographic area, which may limit the generalizability of findings. While the short-term knowledge improvements are encouraging, the study did not assess long-term retention or behavioral change, both of which are critical metrics for evaluating the true impact of health education interventions [14].

Another limitation relates to the reliance on self-reported data for app engagement, which may be subject to bias. Although usage logs were employed, they were limited to frequency and completion metrics, lacking detail on the depth of content interaction or comprehension. Additionally, variations in baseline digital literacy may have influenced learning outcomes, as more “tech-savvy” study participants could navigate and absorb the material more effectively. Addressing this issue in future iterations of the intervention may involve incorporating introductory digital literacy modules or in some cases, offering offline versions of the app to accommodate low-connectivity environments [15].

### **3.6 Future directions**

Future research should explore the incorporation of follow-up assessments to evaluate knowledge retention over longer periods, such as three- or six-months post-intervention. This would help determine the durability of learning and the need for refresher modules. Moreover, qualitative methods such as focus group discussions or in-depth interviews could enrich the understanding of user experiences, barriers to app usage, and contextual factors influencing learning. Expanding the app’s content to include other public health modules could also facilitate continuous learning and multi-topic training pathways for cadres. A gamified rewards system may further increase engagement and motivation over extended periods.

## **4 Conclusion**

The P3KU Mertion app demonstrated substantial effectiveness in improving knowledge of emergency drug use among young female health cadres from the Nasyiatul ‘Aisyiyah, Gamping Subdistrict, Special Region of Yogyakarta. The app’s success underscores the promise of mHealth tools in democratizing health education, particularly in resource-constrained settings where in-person training is infrequent or logistically challenging. With appropriate scaling, continuous content updates, and the incorporation of user feedback, tools like P3KU Mertion can serve as cornerstones in strengthening grassroots health systems. Furthermore, the app’s modules could be expanded to include other community health topics such as nutrition, infectious disease prevention, and maternal and child health, thereby broadening its educational impact and relevance for community health cadres.

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