

# Enhancing medicinal plant literacy for disease management through the MOTOGA application among community members of Sedayu 2 Health Centre, Bantul, Indonesia

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**Abstract.** Public literacy regarding medicinal plants remains low despite their increasing use across various societal groups. Digital technology offers opportunities as a convenient and efficient educational medium to support the improvement of herbal-based health knowledge. This study aims to evaluate the effectiveness of MOTOGA in increasing public knowledge about medicinal plants. The study employed a pre-experimental one-group pretest-posttest design with 42 respondents from the Sedayu 2 community health center area. The intervention was conducted utilizing MOTOGA for a period of two weeks. The level of knowledge was measured using a validated, standardized questionnaire, with subsequent analysis employing the Shapiro-Wilk normality test, followed by a paired t-test or the Wilcoxon test. The results at the implementation stage demonstrated a significant increase of 20% to 30% in knowledge scores. A significant increase was also found in gastrointestinal knowledge, with an average score rising from  $8.81 \pm 2.5$  to  $13.02 \pm 1.76$ ,  $p < 0.001$ . This finding supports the implementation of digital literacy programs to enhance community knowledge of herbal medicine.

## 1 Introduction

Using natural resources to address health concerns has been a longstanding belief in Indonesia. This conviction is deeply entrenched in tradition and Indonesia's abundant natural resources. The archipelago of Indonesia boasts a rich tapestry of herbal plants, diverse animal-based products, and minerals, collectively numbering approximately 20,000 types. These natural resources possess the potential to address a wide range of health concerns [1–

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3]. According to the Riset Kesehatan Dasar (RISKESDAS) report by Kementerian Kesehatan Republik Indonesia (2019), it was revealed that 31.4% of Indonesians utilize traditional health services. It was further determined that the most prevalent approach involves the use of 48 ready-made traditional herbal remedies, with a separate 31.8% of the population creating their own traditional herbal remedies; however, the knowledge related to herbal medicine remains very diverse within the community. Studies in the province of Yogyakarta's district revealed a wide variability in the results. A study by [5] shows that in the Prambanan district of Sleman, only 28.5% of the population reported having excellent knowledge of medicinal plants. Concurrently, in Pundong District, Bantul, it was reported that only 40% of the participants in the training possessed adequate knowledge regarding medicinal plants [5]. In another province, a study in the Klaten district of Central Java found that 61.3% of individuals who had used herbal medicines possessed good knowledge about their use, whereas 93.7% of those who had not used them had a low level of knowledge related to medicinal plants and herbal medicines [6]. Meanwhile, a study of rural residents in West Java showed that 72.1% of the population had good knowledge, compared to urban residents [7]. Although many studies have assessed knowledge of herbal medicine use, there are still limited digital interventions available at the primary care level to increase community understanding of medicinal plants.

A comprehensive understanding of medicinal plants directly enhances the quality of life in Indonesia. Moreover, it is anticipated that this initiative will contribute to preserving natural ecosystems and enhancing the economic well-being of the community. The realization of this objective hinges on the successful cultivation of increased literacy and heightened public awareness of the advantages inherent in herbal plants, which can be leveraged through digital technology that reaches a wide audience, primarily via mobile applications. Several studies have reported a positive correlation between the integration of digital technology in healthcare and notable enhancements in various domains of public health. These enhancements include, but are not limited to, improvements in quality of life, increased public knowledge regarding information filtration, enhanced medication adherence, and heightened public literacy and awareness [8-9].

To provide the community with increased knowledge and awareness of medicinal plants, Modul Tanaman Obat Keluarga (MOTOGA) was created. It is an Android application developed using a focus group discussion (FGD)-based methodology. MOTOGA is a comprehensive database with detailed information on various medicinal plants in Indonesia. The database encompasses multiple plant species, encompassing their nomenclature, botanical classification, and the active chemical compounds they contain. Additionally, it offers crucial insights into the therapeutic applications of these plants, including their intended uses, dosage guidelines, potential contraindications, and adverse effects. The database's comprehensive scope extends to respiratory tract disorders, gastrointestinal tract disorders, cardiovascular system disorders, and endocrine system disorders, making it a valuable resource for users. In this study, the efficacy of MOTOGA in enhancing the knowledge of medicinal plants will be determined through a one-group pre-test post-test design in the Sedayu 2 health centre. This study aimed to assess the effectiveness of the MOTOGA application in improving public knowledge of medicinal plants at Sedayu 2 Health Centre

## **2 Methods**

This research was conducted from December 2024 to February 2025, was carried out through a quantitative approach with a pre-experimental one-group pre-test and post-test design. This study, involving human participants, was reviewed and approved by the Health Research Ethics Committee at Universitas Muhammadiyah Yogyakarta (approval number: 314/EC-

KEPK FKIK UMY/XI/2024). This study was used purposive sampling technique with inclusion criterias: (1) The respondents are health cadres at the Sedayu 2 Community Health Centre; (2) The respondents have Android mobile phones; (3) The respondents are willing to download the MOTOGA E-Module application; (4) The respondents are willing to sign an informed consent form; (5) The respondents are cooperative and able to communicate well. The exclusion criteria: (1) Respondents who were unwilling to continue the study.

The respondents provided written informed consent to participate in this study. Forty-two respondents from the Sedayu 2 Health Centre area participated in this study. The respondents completed a pre-test before using the application and underwent a post-test two weeks after using the MOTOGA application. The evaluation instrument utilized in this study was a validated herbal knowledge questionnaire comprising 29 items, with an R-count of 0.995 exceeding the R-table value of 0.35 and demonstrating excellent internal consistency (Cronbach’s alpha = 0.998). The questions covering aspects of general knowledge, the general use of medicinal plants, and the indication of medicinal plants in five organ systems: respiratory, gastrointestinal, cardiovascular, nervous, and endocrine. Prior to its utilization, the questionnaire was found to be valid and reliable. Respondents filled in the test by giving a checklist (√) in the "yes", "no", or "don't know" column. The assessment in this knowledge level consists of 3 scales: yes (score: 3), no (score: 2), and don't know (score: 1). The higher the assessment score, the higher the level of knowledge regarding medicinal plants. The initial analysis stage will be undertaken by the Statistical Package for the Social Sciences (SPSS) Version 30, which will include a normality test using the Shapiro–Wilk, followed by either a paired sample t-test or a Wilcoxon

### 3 Results and Discussion

#### 3.1 Result

##### 3.1.1 Demographic characteristics of respondents

A total of 42 respondents, the age criteria are based on the age classification system established by the Kementerian Kesehatan Republik Indonesia (2009). The age classification system comprises the following categories: early adolescence (17 - 25 years), early adulthood (26 - 35 years), late adulthood (36 - 45 years), early elderly (46 - 55 years), late elderly (56 - 65 years), and seniors (> 65 years). Based on demographic data, this study is dominated by women in the early elderly age. Most respondents are working as healthcare professionals and hold university degrees. Income was based on the minimum wage in the Bantul district, where most respondents have lower incomes than the minimum wage. The demographic data are available in Table 1.

**Table 1.** Characteristic of respondents (n = 42)

Characteristics	Category	Frequency	%
Gender	Male	1	2,4
	Female	41	97,6
Age	Late adolescent	3	7,1
	Young adult	10	23,8
	Late adult	9	21,4
	Early elderly	15	35,7
	Late elderly	3	7,1
	Senior	2	4,8

Characteristics	Category	Frequency	%
Occupation	Unemployed	7	16,7
	Teacher	1	2,4
	Farmer	3	7,1
	Healthcare professional	16	38,1
	Herbal medicine seller	15	35,7
Education	Elementary school	9	21,4
	Junior high school	7	16,7
	Senior high school	7	16,7
	Bachelor's/master's/doctoral	19	45,2
Income (IDR)	≤ 2,360,544	25	59,52
	>2,360,544	17	40,48

### 3.1.2 Implementation analysis of MOTOGA

This study employed a pre-experimental one-group pre-test and post-test design to assess the impact of MOTOGA on knowledge. The 29 questions were divided into six parts: general knowledge of medicinal plants, and the use of medicinal plants in six organs: cardiovascular, endocrine system, gastrointestinal tract, respiratory tract, and nervous system. After using MOTOGA for 2 weeks, we found a significant result compared to the pre-test. The greatest improvement was found in gastrointestinal knowledge, with an average score increasing from  $8.81 \pm 2.5$  to  $13.02 \pm 1.76$ , followed by neurology knowledge, which improved from  $8.17 \pm 2.5$  to  $12.02 \pm 2.08$ . Other improvements in knowledge are shown in Table 2.

**Table 2.** Knowledge level evaluation after using MOTOGA

Type	Test	Mean	Median	Minimum	Maximum	St. Dev	P (Normality test)	P (Wilcoxon test)
General	Pre	9.40	10	4	12	1.849	0.024	0.000
	Post	10.86	11	7	12	1.117	0.000	
Cardiovascular	Pre	10.52	11	5	15	2.371	0.169	<0.001
	Post	13.74	14.5	7	15	1.822	0.000	
Endocrine	Pre	10.14	10	5	14	2.226	0.340	<0.001
	Post	12.67	13	7	15	1.618	0.001	
Gastrointestinal	Pre	8.81	9	5	15	2.521	0.099	<0.001
	Post	13.02	13.5	7	15	1.760	0.000	
Respiration	Pre	11.48	12	7	14	1.435	0.010	0.000
	Post	14.05	14	11	15	1.147	0.001	
Neurology	Pre	8.17	8	5	14	2.546	0.005	<0.001
	Post	12.02	13	6	15	2.089	0.001	

### 3.2 Discussion

Following two weeks of utilization, respondents exhibited increased levels of knowledge in the post-test compared to the pre-test. In Table 2, data showed an increase of 20 – 30% in mean and minimum scores. All p-values obtained were found to be less than 0.001 ( $p < 0.05$ ), indicating a statistically significant difference in knowledge levels.

Table 2 illustrates an increase in knowledge about each class of disease after using the MOTOGA application, indicating that using the MOTOGA application for public literacy related to medicinal plants can enhance their knowledge. This is because the interactive

features of MOTOGA include detailed information on various medicinal plants in Indonesia. The database includes visual information and data on various types of plants, their names, classifications, and active chemical compounds. It also provides important information on how these plants can be used to treat medical conditions, including instructions on how and when to use them, potential side effects, and adverse reactions. This finding suggests that MOTOGA can impart literacy in medicinal plants, thereby facilitating the acquisition of advanced knowledge in this field. These results align with the findings of other studies, which indicate that integrating technology significantly enhances users' knowledge, experience, and decision-making skills, while exerting a positive societal influence [10–11]. It is evident that a comprehensive understanding of medicinal plants, combined with the use of advanced health technologies, can improve users' quality of life. This enhancement is achieved by empowering individuals to make informed decisions about their health, such as using medicinal plants as a medium for self-medication and self-care. The implementation of herbal medicine initiatives also has the potential to contribute to the economic empowerment of communities by supporting local growers, generating employment opportunities, and facilitating greater affordability and accessibility of healthcare [12].

In addition to MOTOGA, numerous studies have been conducted on digital literacy, particularly in the broader context of digital literacy, encompassing areas such as social media, e-commerce, education, and labor. The key challenge was similar to other challenges, except for socioeconomic variation in MOTOGA. However, there are also challenges related to internet access limitations and sustaining engagement. The MOTOGA study represents a specialized and narrow scope of digital literacy related to a specific health domain using an app tailored for medicinal plant awareness in a rural Indonesian community. This contrasts with other broader digital literacy initiatives that focus on social media, labor, education, and general IT skills enhancement in rural contexts. Both approaches highlight the importance of digital interventions in empowering rural communities, with MOTOGA focusing on the preservation of health knowledge and traditional medicine, while others emphasize economic and educational improvements through digital inclusion [13]

However, this study had limitations, including the absence of a control group, a short intervention period, and potential bias due to the dominance of healthcare workers. The demographic data presented in Table 2 indicate that healthcare professionals were the most prevalent group in this study.

In practice, it is expected that the use of MOTOGA can help healthcare professionals choose appropriate and safe herbal therapies and medicinal plant information for patients. Several studies have been conducted on the current state of knowledge among health workers regarding medicinal plants. The findings of these studies indicate that health workers possess only a basic level of expertise in this area, primarily due to the impact of two main factors. Firstly, the phenomenon of cultural transmission loss has had a significant effect on the transmission of knowledge regarding medicinal plants. Secondly, the dominance of Western medicine in the field has also impacted the level of understanding among health workers [14]. It is recommended that a mobile application be utilized that is accessible, user-friendly, and evidence-based, not only for patients but also for healthcare professionals. A study conducted in Syria on the utilization of mobile applications in the context of community pharmacies revealed that the implementation of such applications has the potential to augment the knowledge of pharmacy professionals in the domain of herbal medicine and its interactions [15]. The MOTOGA application is an example of such a tool. Several studies have demonstrated that integrating digital technology, particularly in the field of herbal medicine, not only enhances professionals' knowledge but also enhances various aspects of patient care. These enhancements include improvements in patient monitoring, enhanced data collection, remote consultations, personalized treatment regimens, enhanced access to information, and streamlined decision-making processes. These developments are expected to increase patient

engagement, fostering a more dynamic and practical relationship between healthcare providers and their patients [13].

In the healthcare system, technological advancements have the potential to significantly benefit patients, particularly in rural regions. MOTOGA is an application that provides information on herbal medicine, aiming to enhance users' knowledge. This transformation enhances clinical outcomes and preserves traditional health knowledge, while strengthening healthcare systems in underserved rural regions. MOTOGA may serve as an alternative media for continuous herbal literacy among healthcare workers and patients.

## 4 Conclusion

Respondents demonstrated a high level of understanding of medicinal plants, indicating that MOTOGA is effective in increasing literacy.

## Acknowledgment

We hereby acknowledge the Lembaga Riset Inovasi Universitas Muhammadiyah Yogyakarta. We want to express our gratitude to the financial support and Sedayu 2 Health Centre for their invaluable assistance and collaboration during this study. We would also like to thank all respondents who participated in this research and provided us with valuable insights into their experiences. We are grateful for the guidance and input of our colleagues from the School of Pharmacy, Universitas Muhammadiyah Yogyakarta.

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