

Evaluation of The Utilization of The iPosyandu Application in Enhancing Midwives' Competence in Early Pregnancy Detection Services: Mixed Methods Study

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Introduction: Health programs in Indonesia are expanding annually, thereby augmenting the workload of midwife's. Consequently, mobile health (mHealth) solutions, such as the iPosyandu application, are essential to assist midwife's in delivering maternal and child health services and enhancing their competence for early detection in pregnant women.

Purpose: This study seeks to examine the evaluation of the iPosyandu application on midwife's proficiency in early pregnancy identification.

Patients and Methods: The research employed a convergent mixed-method approach, incorporating quantitative analysis involving 120 village midwives in Purwakarta Regency, divided into intervention (n = 60) and control (n = 60) groups. Questionnaires on early pregnancy detection were administered, and the data were analyzed using STATA software version 16.0, while the results of the mHealth App Usability Questionnaire (MAUQ) were processed with Winstep. Qualitative research employed interview protocols for in-depth interviews (n = 8), and the results were analyzed using NVivo software version 1.6.1.

Results: The quantitative research findings indicated that the utilization of the iPosyandu application significantly impacted midwife's competence in the early detection of pregnancy care (p-value <0.05). The usability of the iPosyandu program among midwife's is considered satisfactory, with average scores of 48.65 for ease of use and satisfaction, 36.02 for information system settings, and 41.78 for utility. Qualitative research results indicate that the iPosyandu application is user-friendly for midwife's, hence enhancing their competency in early pregnancy identification.

Conclusion: This study finds that the iPosyandu application for midwives demonstrates a high usage level, hence enhancing midwife's inclination to utilize the application to augment their competence and deliver optimal midwifery care.

Keywords: early detection, competence, mHealth, midwives, iPosyandu midwife's, Indonesia, level of usability

Introduction

Pregnancy is a criterion for assessing the health status of both the mother and the infant.¹ The Ministry of Health advises a minimum of six prenatal examinations: twice during the first trimester, once in the second trimester, and thrice in the third trimester.² However, this number of visits differs from the World Health Organization (WHO) standard of eight visits.³ Differences in Antenatal Care (ANC) visits in Indonesia are influenced by demographic factors such as population size and geographic location. Geographic location contributes to ANC service utilization. Rural areas often face significant challenges regarding accessibility and availability of health services, with long distances from health facilities, lack of reliable transportation, and limited infrastructure being significant barriers for rural women, making it

difficult for them to attend ANC. In addition, the socioeconomic status of rural women, which may be lower than urban women may exacerbate the challenges they face in utilizing ANC health services.⁴ Regular prenatal examinations can identify and mitigate numerous complications throughout gestation.⁵ The 2017 Indonesian Demographic and Health Survey (IDHS) indicates that 23.2% of pregnant women do not adhere to ANC visit guidelines. Furthermore, mothers from lower middle economic backgrounds fail to adhere to normal ANC visit guidelines 35.1%.⁶ This leads to delayed diagnosis of difficulties in pregnant women, culminating in maternal and newborn fatalities due to the inability to manage issues during labor.⁵

Pregnant women who do not consistently engage in ANC will elevate the risks during delivery, including premature birth, the birth of a low birth weight (LBW) infant, and fetal demise.⁷ Consequently, prenatal examinations are crucial for women, necessitating that midwives deliver comprehensive and continuous antenatal services to ensure high-quality midwifery care. To attain this objective, midwives must possess fundamental competencies, encompassing knowledge, abilities, and professional conduct.⁸

Essential competencies are those that enable midwives to deliver competent, evidence-based, and complete midwifery care for mothers and infants.⁹ The Lancet Series on Midwifery delineates that a proficient midwife is one who is educated, trained, licensed, and operates in an environment that mitigates 30–80% of difficulties for mothers and infants. This aligns with the objectives of the United Nations Population Fund (UNFPA) and the WHO to enhance the capabilities of midwives in delivering excellent services for mothers and infants.¹⁰

The WHO asserted that a requisite competency for midwives is the ability to conduct early diagnosis of problems in pregnant women to enhance the health of both mother and child.^{9,11} The WHO advocates for the early identification of pregnancy through laboratory and ancillary examinations to diagnose anemia, hypertension, preeclampsia, gestational diabetes mellitus, HIV, tuberculosis, syphilis, Hepatitis B, tetanus diphtheria (TD) immunization status, and mental health conditions.^{5,11,12} Early detection will enhance mother and child health quality and prevent maternal and fetal mortality.¹³

Presently, effective health services are shaped by technological advancements.^{14–16} The WHO elucidates that digital technology, particularly smartphones, can address difficulties within the healthcare system, consequently enhancing the accessibility, and quality of health services.¹⁷ Smartphones can serve as a means for early disease identification, facilitate remote intervention at minimal expense, and function as a communication conduit between patients and healthcare professionals.¹⁸ The utilization of the Maternal and Child Health (MCH) guidebook has not achieved maximum results due to the conventional documentation system, which causes the midwives to be constrained by time in the recording. Additionally, filling out the MCH guidebook does not necessarily show the results of the examination performed by midwives comprehensively. Hence, midwives only conduct routine examinations.¹⁹ Therefore, it is necessary to utilize technology to maximize the documentation and delivery of comprehensive antenatal care. Technological developments have successfully contributed to education and training, maternity care, and lifetime learning. The effective integration of technology into professional healthcare training can improve clinical skills and enhance the learning experience of healthcare workers, as well as facilitate documentation.²⁰

Digital technology in the health sector is a mobile health (mHealth) application designed for Android devices, utilized by healthcare professionals and the community. The mHealth application offers convenient access and platform services for community health.²¹ Globally, the utilization of mobile applications (mHealth) has increased. Midwifery-related apps are essential to healthcare apps, which effectively provide appropriate maternal and child healthcare.²² According to previous research, there are several applications used by midwives to support midwives in conducting antenatal care, for instance, E-Midwife as a digital health learning tool with a focus on South Asian culture to improve knowledge in the management of obstetric complications. In addition, in Rwanda, there is a Safe Delivery mHealth Application (SDA) designed to strengthen midwives' competencies in managing Basic Emergency Obstetric and Neonatal Care through a learning platform.²³ In Indonesia, one mHealth application is iPosyandu, utilized by midwives to deliver ongoing MCH services encompassing pregnancy, childbirth, neonatal care, and postpartum support. Furthermore, the iPosyandu midwife application functions as a mobile learning (mLearning) platform, enhancing midwife competency via training modules. Furthermore, midwives are capable of conducting early detection, offering counseling, and implementing interventions for patients based on the integrated recording and reporting outcomes from the iPosyandu application utilized by cadres, parents, and midwives.²⁰

Alongside the iPosyandu application, the Indonesian Ministry of Health has developed an e-cohort website utilized by midwives to document and report MCH from pregnancy to the mother's usage of contraception.²⁴ The e-cohort application is an integrated monitoring system for mothers, infants, and toddlers that includes the implementation of electronic recording, electronic monitoring, and electronic reporting of MCH services based on information technology designed by the Indonesian government. However, the e-cohort application is more complicated to use, for instance in accessing the application. The e-cohort application information system is insignificant to health workers' task completion. They feel the e-cohort application is ineffective and does not affect midwives' productivity.²⁵ Qualitative research in Indonesia reveals that there are obstacles and potential issues adversely affecting the efficacy of the e-cohort application, as it fails to streamline and expedite midwives' tasks, is ineffective, and does not enhance productivity performance.²⁵ If midwives encounter challenges in utilizing mHealth, they perceive an increase in their responsibilities within maternal and child health services.²⁶ Consequently, mHealth exhibits a high degree of usability, enabling healthcare professionals to utilize the application for delivering health services.²⁷ Key attributes of effective usability in an application encompass efficiency (completeness of the product), satisfaction, learnability (ease of learning the product), memorability (ease of recalling the product), and a low mistake rate (few errors).²⁸ Furthermore, this e-cohort lacks a training menu similar to that seen in the iPosyandu midwife application. The findings of a study by Abejirinde et al indicate that the utilization of mHealth influences midwife's competency, hence impacting their performance in delivering KIA services.²⁷ Therefore, this study examines the impact of the iPosyandu midwife application on the proficiency of early pregnancy identification.

Material and Methods

This research method employs a convergent mixed approach by gathering quantitative and qualitative data while interpreting the data independently. This research was performed on 120 village midwives employed at 15 health Centers in Purwakarta Regency from February to March 2023. Determination of the number of quantitative samples based on the effect size divided by the Standard Deviation number from previous similar studies. Based on previous research.²⁹ The effect size (E/S) was 0.60, so based on the Hulley diagram, the sample needed was 60 samples for 1 group of midwives.³⁰ Therefore, the number of midwife samples for the intervention group using the iPosyandu application and the control group using e-cohort was 120 samples.

Table 1 explains the research method that has used mixed method convergent by conducting quantitative research with a sample of 120 respondents consisting of an intervention group of 60 respondents who used the midwife iPosyandu application and a control group of 60 respondents who used e-cohort. In addition, qualitative research was also conducted on 8 informants who had used the midwife iPosyandu application. The sampling technique in quantitative research and qualitative research used purposive sampling. Quantitative research data collection used a questionnaire tested for validity with the Rasch model software and reliability using Confirmatory Factor Analysis (CFA) with STATA 16.0

Table 1 The Convergent Mixed Methods Design

Components	Quantitative Research	Qualitative Research
Research sample	One hundred twenty respondents	Eight informants
• Intervention group	Respondents utilize the iPosyandu midwife application (n=60)	Informants utilizing the iPosyandu midwife application
• Control group	Respondents utilizing e-cohort (n=60)	
Sampling techniques	Purposive sampling	
Procedure	- Performing validity assessments of questionnaire utilizing Rasch model software. The reliability of the questionnaire is assessed using STATA 16 software through the Confirmatory Factor Analysis (CFA) approach. - Quantitative data analysis with the paired t-test statistical method.	- Formulate comprehensive interview protocols. - Utilize NVivo 1.6.1 software to analyze qualitative data resulting themes, categories, and coding.
Output	Analytical statistics	Conceptual model of themes

software. Quantitative research data analysis used the paired *t*-test. Qualitative research data collection used, interview guidelines and data analysis using NVivo 1.6.1 software to create a model of themes.

The sample in this study consisted of respondents who met specific inclusion criteria: they were village midwives operating within the jurisdiction of the Health Center in Purwakarta Regency, possessed an operational Android cellphone with internet connectivity, and had completed both the iPosyandu Midwife training and early detection training for pregnancy care. The exclusion criteria for this study sample included respondents who had not performed their duties for one month, those reluctant to complete the informed consent form, and respondents who were ill or had obtained permission to be absent from the training. This study employed a questionnaire to obtain data on the knowledge and utilization of the iPosyandu midwife application within a quantitative research framework.

This quantitative research employs a quasi-experimental design utilizing a pretest and posttest methodology to examine the disparities in midwives' knowledge regarding early pregnancy care detection between the intervention group using the midwife iPosyandu application and the control group employing e-cohort. Respondents were administered a posttest and a questionnaire regarding the usability of the midwife iPosyandu application. Simultaneously, qualitative research seeks to ascertain the midwife's experience using the midwife iPosyandu application to get knowledge regarding early pregnancy detection.

In Table 2 all pre-test and post-test items regarding midwife's knowledge of early pregnancy detection are deemed valid, as they satisfy the validity criteria based on the Mean-Square Fit Statistic parameter, which falls within the range of 0.5 to 1.5. All items of the mHealth App Usability Questionnaire (MAUQ) questionnaire are deemed valid as they satisfy the validity criteria with a loading factor value over 0.3.³¹

Table 3 indicates that the knowledge and MAUQ surveys regarding the utilization of the midwife iPosyandu application are deemed reliable, with a Cronbach's alpha value over 0.7. Subsequently, both questionnaires were employed for data gathering. Bivariate data analysis was conducted subsequent to the normality test results for the

Table 2 Questionnaire Validity Test Results

Questionnaire	Method	Validity Test Value		Test Results	Software
Knowledge (n=50)					
Pre-Test	Rasch Model	Parameter-level Mean- Square Fit Statistic	0.5–1.5	Valid	Winstep
Post-Test			0.5–1.5	Valid	
mHealth App Usability Questionnaire (MAUQ) (n=50)					
Easy of use and satisfaction	Confirmatory Factor Analysis (CFA)	Factor loading > 0.3	0.85–0.96	Valid	STATA version 16
System information arrangement			0.75–0.96	Valid	
Usefulness			0.81–0.98	Valid	

Table 3 Questionnaire Reliability Test Results

Questionnaire	Method	Results	Reliability Level	Test Results	Software
A. Knowledge					
Pre-Test	Cronbach Alpha Score	0.92	Very reliable	Reliable	STATA version 16
Post-Test	Cronbach Alpha Score	0.88	Very reliable	Reliable	
B. mHealth App Usability Questionnaire (MAUQ)					
MAUQ items	Cronbach Alpha Score	0.9875	Very reliable	Reliable	STATA Version 16

intervention group (utilizing the midwife iPosyandu application) in the pre-test (p-value = 0.28) and post-test (p-value = 0.06). The normality test results for the control group (utilizing e-cohort) indicated a pre-test p-value of 0.12 and a post-test p-value of 0.22. The normality test findings for both groups indicated that the data was normally distributed (p-value > 0.05). Subsequently, univariate data analysis was conducted by descriptive analysis, followed by bivariate data analysis utilizing the Paired *T*-Test statistical method. This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Ethical approval was obtained from the Health Ethics Committee of The Faculty of Medicine, Universitas Padjadjaran Bandung, with approval number 699/UN6.Kep/EV/2023. All participants provided informed consent, which included publication of anonymised responses and direct quotes. The ethics of this research include the procedure of consent from the research subjects by explaining the purpose and objectives of the research, as well as the benefits of the research for the research subjects who will gain knowledge and skills about early pregnancy detection competency. In addition, the disadvantage for the research subjects is the time used for interviews or filling out questionnaires. After that, the research subjects were given an informed consent sheet to ask for their willingness to become respondents in this study. The participation of respondents in this study is voluntary, with responsibility until the completion of this study. As long as the respondents participate in this study, all information and data from this study will be treated confidentially and anonymized so that others will not know.

Results

Figure 1 about attributes of midwives indicates that the majority of respondents in the intervention group were aged 30–40 years (42 individuals), possessed a D3 level of education (53 individuals), and had over 6 years of job experience (59 individuals). It shows that midwives have different final education, from D3 (Associate Degree), D4 (Bachelor of Applied), S1 (Bachelor Degree), and S2 (Master Degree) education levels. Therefore, midwives have different experiences. However, education is also influenced by experience based on the midwife's work period.³²

Table 4 presents the mean value is the average value of both the pre-test and post-test where respondents have increased knowledge about early detection of complications during pregnancy after using the Midwife iPosyandu application on the training menu. Thus, most of the question items show an increase mean value of 15 questions.

Table 5 indicates an increase in midwives' knowledge regarding early detection of pregnancy care before implementing the midwife iPosyandu application (mean = 62.6; SD = 12.12) and following its use (mean = 67.13; SD = 14.79). The Midwife iPosyandu application significantly affects midwives' competence in detecting early pregnancy (p-value < 0.05;

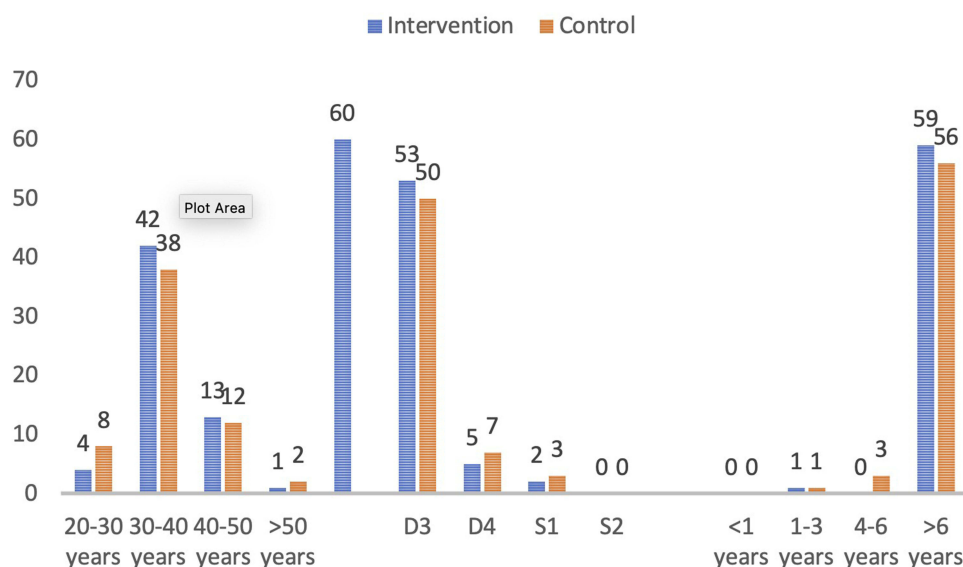


Figure 1 Attributes of Midwives: this figure indicates that the majority of respondents in the intervention group were aged 30–40 years (42 individuals), possessed a D3 level of education (53 individuals), and had over 6 years of job experience (59 individuals). It showed that midwives had different final education, from D3 (Associate Degree), D4 (Bachelor of Applied), S1 (Bachelor Degree), and S2 (Master Degree) education levels. Therefore, midwives had different education and experience based on their work period.³²

Table 4 Analysis of Pre-Test and Post-Test Question Items

Question No.	Question Topics	Mean	
		Pre-Test	Post-Test
A. Tetanus (Td) Immunization for Pregnant Women			
3	Td Immunization	0.17	0.72
4	Td immunization interval	0.83	0.54
8	Td immunization interval	0.83	0.46
B. Pregnant Women's Nutritional Status			
19	Nutrition for Pregnant Women	0.07	0.65
24	Nutrition for Pregnant Women	0.59	0.74
20	Nutritional status of pregnant women	0.42	0.51
10	Body Mass Index (BMI) of Pregnant Women	0.55	0.77
11	Body Mass Index (BMI) of Pregnant Women	0.84	0.75
12	Weight gain during pregnancy	0.52	0.85
25	Weight gain during pregnancy	0.29	0.87
C. Early Identification of Chronic Energy Deficiency in Pregnant Women			
2	Pregnant women with Chronic Energy Deficiency	0.61	0.74
9	Diagnosis of Chronic Energy Deficiency based on LILA	0.93	0.91
13	Counseling to prevent Chronic Energy Deficiency in pregnant women	0.96	0.33
D. Pregnancy Early Detection			
21	Early detection of integrated antenatal examination	0.36	0.32
1	Giving iron tablets	0.53	0.88
17	Anemia in pregnant women	0.68	0.7
18	Anemia in pregnant women	0.87	0.84
14	Risk of preeclampsia	0.85	0.15
7	High-risk preeclampsia	0.07	54
6	Vertical transmission of HIV, Syphilis, Hepatitis B and other STIs	0.76	0.98
22	HIV disease	0.63	0.78
E. Early Identification of Pregnant Women's Mental Health			
23	The mental health of pregnant women	0.28	0.11
15	Screening (early detection) of mental health problems	0.92	0.93
16	When to screen for mental health problems	0.73	0.58
5	Mental health disorders in pregnant women	0.35	0.78

Notes: The values in bold are the average value increases. Source: Guidelines for Integrated Antenatal Care Ministry of Health Indonesia.²

Table 5 The Impact of the iPosyandu Midwife Application on Midwives' Proficiency in Early Pregnancy Care Detection

Application	Early Detection Competence of Pregnancy Care		p-Value*	Effect Size*
	Pre-Test (n=60)	Post-Test (n=60)		
iPosyandu Application for Midwives				
• Mean	62.6	67.13	0.017	0.33
• SD	12.12	14.79		
• 95% CI	59.47–65.73	63.31–70.95		
e-cohort Application				
• Mean	58.53	61.67	0.069	0.26
• SD	11.31	12.99		
• 95% CI	55.61–61.46	58.31–65.02		

Notes: *Paired T-Test.

effect size = 0.33). Meanwhile, midwives who used e-cohort did not show an increase in knowledge about early pregnancy detection compared to post-intervention results (p-value > 0.05; effect size = 0.26).

Table 6 shows that of the 60 midwives in the intervention group, the average usability score in the ease of use and satisfaction dimension was 48.65, with a variation of 1.89, the average usability score in the system information arrangement dimension was 36.02, with a variation of 0.98, and the average usability score in the usefulness dimension was 41.78, with a variation of 1.35. Thus, the iPosyandu application is easy to use and has a useful information system that satisfies application users.

Based on the interview results regarding experience using the application, midwives considered that the application was easy to use (Table 7).

Table 7 showed themes and subthemes concerning pregnancy care competency, pregnancy examination standards, and the quality of the midwife iPosyandu application serve as evaluative measures to enhance the iPosyandu application, addressing anticipated challenges such as signal issues and application errors that prevent data from being saved.

Table 6 Distribution of Usability Dimension Variables/Utility Level of the iPosyandu Midwife Application

Usability Dimension	Mean	SD	Min-Max	95% CI
Easy of Use and Satisfaction	48.65	1.89	47–56	48.16–49.14
System Information Arrangement	36.02	0.98	34–42	35.76–36.27
Usefulness	41.78	1.35	39–49	41.43–42.13

Notes: Source: mHealth Usability Questionnaire (MAUQ)³³.

Table 7 Themes and Subthemes of Midwives' Experiences Utilizing the iPosyandu Midwife Application

No.	Theme	Sub Theme	Quotations
1	Pregnancy care competence	Midwife knowledge, about: a. Midwifery Services b. Education Menu	"In my view, this already fosters competence as it targets health services." (IB8) "If it is intended to support competence, this is also the case, as there is already a module in place. It is already available for education" (IB7)
2	Standards pregnancy checks	Anamnesis, examination, diagnosis, recording, and reporting of data	"...the data of the pregnant woman appears..." <i>Once the civil registration number is included, the examination is complete. The laboratory results are available, and a referral form is also provided, indicating whether to refer to a health center or hospital. It's straightforward; we simply click, and it appears automatically</i> ". (IB1)

(Continued)

Table 7 (Continued).

No.	Theme	Sub Theme	Quotations
3	Application quality	a. Quality Management System • The language is comprehensible. • Application velocity	"That is all. It aligns with the guidelines for pregnancy care. It's clear and straightforward, just like that." (IB5) "The language is sufficient. It is suitable." (IB7) "In general, completing it is straightforward. It's user-friendly and concise, making it extremely straightforward to navigate." (IB7) "...Inputting all the data is quite straightforward, facilitating our work as village midwives." (IB4) "For instance, when we access the pregnant women's menu, the data is already available, allowing us to simply add the necessary information. To complete the visit results, we only need to input the data." (IB7) "If feasible, connect it to another application." (IB2)
		a. Unanticipated challenges • Issues with signals • Unable to save data	"If the signal is strong, it's quite straightforward; however, the main issue is that the signal tends to be weak in Sukasari village. That's all there is to it; if you're already in the Kota Baru Area, you can input the data in that manner." (IB6) "There is just one issue; perhaps when the anamnesis is feasible, yes. It cannot be restored. I have attempted it once more, I have reinstalled it, and it still does not function. It appears that there is no data available." (IB3)
		a. Quality of Information • Data availability • Data completeness • Comprehensive information	"Everything is accessible. beginning with examination, then anamnesis, followed by examination again, and of course. lab work as well, along with counseling." (IB3) "...It is thorough and comprehensive; immunization details are included, and lab tests and other information are also fully provided. For the triple elimination program, it's already in place. This information is extremely beneficial for the data required for pregnant women." (IB7) "The outcomes of pregnant women and those in labor are clearly evident there. Opening it is quite straightforward, to say the least." (IB3) "...E-module menu. For instance, we can also gain further insights here, right? The content there is quite comprehensive, similar to what is found in the e-module. There is also an aspect here that contributes to learning." (IB7) "....With the e-module, we can read on our mobile devices." (IB4)

Furthermore, the knowledge presented through e-modules is crucial for midwives to enhance their competencies, necessitating updates in alignment with advancements in midwifery science. The iPosyandu application facilitates midwives in performing their responsibilities, particularly in documenting and reporting data related to anamnesis, physical examinations, diagnostic formulation, and laboratory assessments.

Figure 2 about the competence of midwives in pregnancy services, evaluated through the quality of the iPosyandu midwife application presents a conceptual map derived from qualitative data. The researcher initially identified the code highlighted with a pink oval. This code served as the foundation for categorization shown by a yellow box shape. Subsequently, these divisions were consolidated into subthemes delineated by a green box. Additionally, they were consolidated into three primary topics highlighted within a blue box, representing the central topic of Midwife Competence in Pregnancy Services as informed by the quality of the iPosyandu Midwife Application.³²

The midwife iPosyandu application is used as mobile Health (mHealth) in midwifery services to document the results of MCH examinations carried out by midwives. In addition, the midwife iPosyandu application is also a mobile Learning (mLearning) with a training menu containing training e-modules and e-learning videos on early detection of

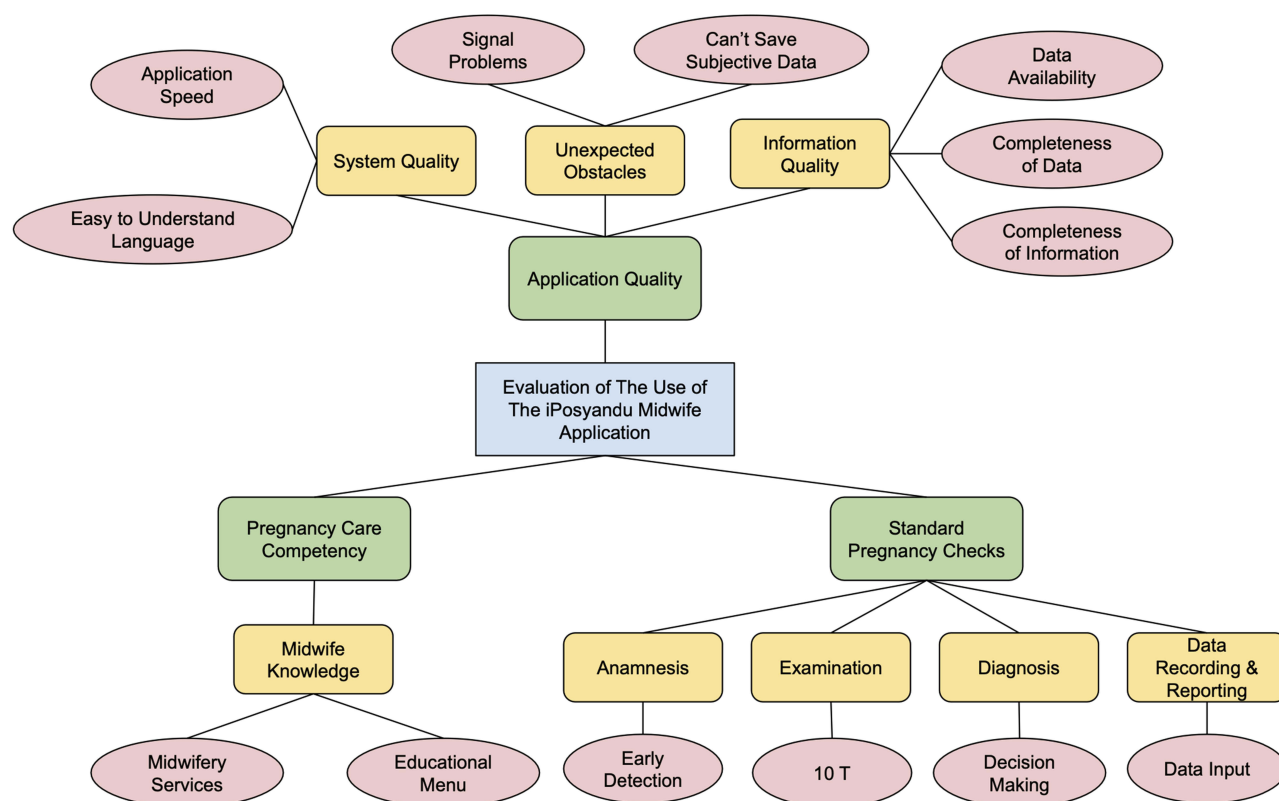


Figure 2 Competence of Midwives in Pregnancy Services Evaluated Through the Quality of The iPosyandu Midwives Application: This figure is about the competence of midwives in pregnancy services, evaluated through the quality of the iPosyandu midwife application presents a conceptual map derived from qualitative data. The researcher initially identified the code highlighted with a pink oval. This code served as the foundation for categorization shown by a yellow box shape. Subsequently, these divisions were consolidated into subthemes delineated by a green box. Additionally, they were consolidated into three primary topics highlighted within a blue box, representing the central topic of Midwife Competence in Pregnancy Services as informed by the quality of the iPosyandu Midwife Application.³²

complications during continuity of care from pregnancy, childbirth, newborns, and postpartum. In this study, an evaluation was conducted on the use of the midwife iPosyandu application regarding pregnancy care competency based on the authority of midwives, standard pregnancy checks based on the Ministry of Health in Indonesia, and the quality of the application based on the MAUQ. The results of qualitative research found that one of the pregnancy care competencies is midwife knowledge about midwifery services in the form of maternal and child health examination data as a basis for midwives in providing interventions in services and educational menus regarding the development of science and updated information about MCH services. In the iPosyandu midwife application, there is a menu for pregnant women that is made based on standard pregnancy checks consisting of anamnesis to detect early complications during pregnancy, physical and laboratory examinations, making a diagnosis to make decisions in providing midwifery care, and documentation based on inputted anamnesis and examination data. In addition, an evaluation of the use of the iPosyandu midwife application was carried out based on (1) system quality regarding application speed in the data input process and easy-to-understand language in this application using Indonesian, (2) Unexpected obstacles regarding signal problems where this application cannot be used and cannot save subjective data if there is no internet signal, (3) Information quality regarding data availability, completeness of pregnancy screening data from anamnesis, physical and laboratory examination results, and completeness of information contained in the educational menu and training menu.

Figure 3 iPosyandu midwife application interface presents midwives can document and report data using the iPosyandu midwife application, which includes menus for pregnant women (ibu hamil), mothers in labour (bersalin), postpartum care (nifas), infants (bayi), toddlers (balita), and family planning (KB).²⁰ Subsequently, midwives can

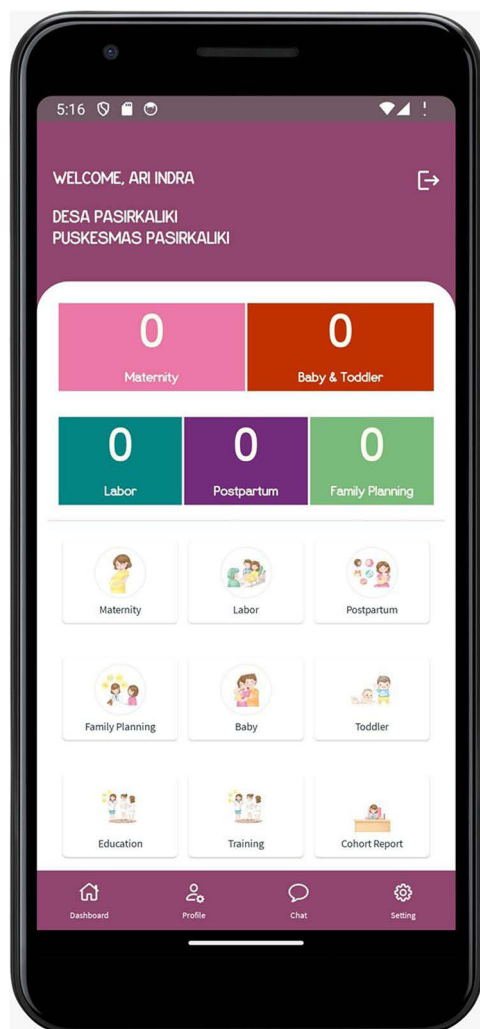


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download all data as a report from the cohort report option. Furthermore, Figure 4 Training fitur presents an educational menu (edukasi), and a training menu (pelatihan) consisting of e-modul, online test, and simulation video designed to enhance midwives' understanding of their competencies in delivering KIA services.²⁰

Discussion

A systematic review found a gap between midwife competence and pregnancy services.³⁴ Midwives in Indonesia carry out early detection and early treatment of pregnancy complications by their authority but are not yet competent. The delay in the initial handling of pregnancy with complications indicates this. Therefore, this condition can be overcome through interprofessional collaboration when midwives have detected pregnancy complications early.²⁰

Consequently, a technology strategy utilizing mHealth applications is essential to enhance the quality of prenatal care.³⁵ Moreover, mHealth applications can enhance the quality of continuous care provided by health workers throughout pregnancy, childbirth, and the postpartum period, hence aiding in the reduction of maternal morbidity.^{36,37}

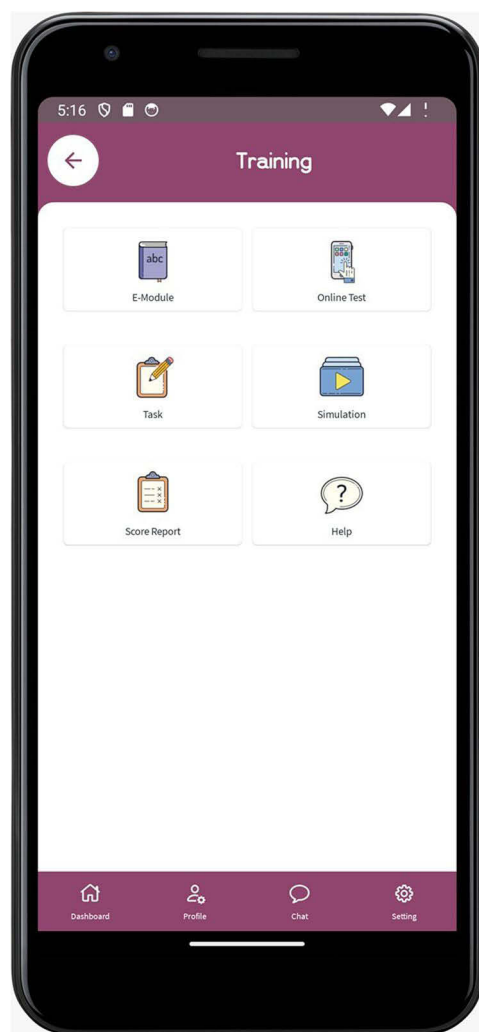


Figure 4 Training Program: This figure shows the training fitur presents an educational menu (edukasi), and a training menu (pelatihan) consisting of e-modul, online test, and simulation video designed to enhance midwives' understanding of their competencies in delivering KIA services.²⁰

The mHealth application enhances mother and child health care by facilitating the early detection of challenges in pregnant women through the identification and analysis of health issues.³⁸

The iPosyandu application serves as a digital tool for mHealth and mLearning in Indonesia, utilized by midwives for the online recording and reporting of maternal and child health examination findings at the basic service level. The iPosyandu program has a training e-module menu that midwives can utilize to enhance their knowledge regarding early detection during pregnancy, childbirth, infancy, and the postpartum period.²⁰ This is in line with the findings of a qualitative study showing that the e-module feature is more often used by midwives to review midwifery materials and improve their skills. One of the results of a study conducted in Indonesia showed that the iPosyandu midwife application has an e-module training menu that covers several topics of midwifery care, including pregnancy, childbirth, neonatal care, and postpartum care. This is so that midwives can learn anywhere through the e-module training menu so that midwives can provide sustainable and quality midwifery care.³⁹

mHealth is one of the tools used to detect early pregnancy problems.⁴⁰ This makes it easier for midwives to recognize indications of complications that are dangerous for pregnant women,⁴¹ to influence the health quality of pregnant women and infants.⁴⁰ The findings of this study indicate that the utilization of the iPosyandu midwife application positively impacts midwives' knowledge of early detection competencies during pregnancy. The mHealth application has the potential to enhance midwifery expertise^{27,42} and to enhance the efficacy of midwives in delivering healthcare services.²⁷

Consequently, the use of mHealth can enhance midwives' self-confidence, thereby assisting them in recognizing difficulties and managing client circumstances.⁴³

According to the International Confederation of Midwives (ICM) and the WHO, midwives must possess competencies for managing pregnancy care, including the early identification of issues to enhance the health of both mother and infant during gestation.^{9,44} The findings of a systematic study indicate that mHealth applications incorporating a health information system and digital recording facilitate early identification in pregnant women, enabling midwives to make clinical decisions more swiftly.^{45,46}

The systematic study concluded that the application must be user-friendly, meaning it should be easy to use, comprehend, and learn, in order to enhance service quality for patients and boost user engagement for future utilization of the program.⁴⁷ If the application is deemed user-friendly, health workers will utilize it as a tool to enhance their job performance in delivering health services due to its high usability.^{27,41} The findings of this study indicate that the iPosyandu program is user-friendly, accessible, and easy to use, hence motivating midwives to utilize it again, particularly for pregnancy care provision. The midwife iPosyandu application includes pregnant features that align with the requirements for supporting prenatal care, adhering to ANC service standards. The iPosyandu application is user-friendly for midwives, facilitates practical usage, and eliminates the necessity of transporting data for recording and reporting maternal and child health.²⁰

This qualitative analysis indicates that the e-cohort application is more challenging to utilize than the iPosyandu program, from the login process to data entry. The mHealth application utilized by midwives must be user-friendly, facilitating ease of use and comprehension to enhance service quality.⁴⁷ User-friendly applications can enhance midwives' engagement with the tool, hence augmenting their proficiency in delivering healthcare services. The mHealth application that enhances midwife competency, particularly in pregnancy care, will influence clinical decision-making. The mHealth application will enhance patient confidence in midwives by delivering accurate data, particularly about examination outcomes.⁴⁸ Functional applications will enhance midwives' knowledge, confidence, and proficiency in delivering pregnancy care, particularly in early detection.⁴⁹ Applications characterized by inadequate quality and effectiveness will impede their utilization, thereby obstructing midwives in delivering maternal and child health services.⁵⁰

This study aimed to assess the usability of the iPosyandu midwife application (Table 6) utilizing the MAUQ questionnaire, which comprises three dimensions: ease of use and satisfaction (8 items), system information organization (6 items), and utility (7 items).³³ The MAUQ questionnaire is designed to evaluate the usability of mHealth application.²⁸ The MAUQ questionnaire is a rigorously validated instrument and has received endorsement in numerous studies, making it a suitable option for assessing the usability of an application.³³

The findings of this quantitative study are corroborated by the qualitative research illustrated in the idea map, indicating that the quality of the application system is affected by data availability, completeness, and information thoroughness. The informant's assertion that "it is easy to fill in, easy to use." (IB 7) and "It can be understood, it is easy." (IB 5) substantiates this claim. Consequently, consumers express satisfaction with the mHealth application, which affects their inclination to utilize the application persistently.⁵¹ User-friendly applications will influence midwives' expertise and confidence in delivering health services.⁴⁹

Moreover, from the perspective of system information organization, it possesses a significant cognitive dimension in mHealth applications. This pertains to the presentation of information, navigation systems, prompt feedback, and the enhancement of decision-making processes. Consequently, it influences the outcomes of user engagement with effective technology.⁵² The information system within the mHealth application is integral to a framework that facilitates decision-making and offers constructive feedback.⁵³ Research findings in Low and Middle-Income Countries (LMIC) indicate that mHealth technology will enhance traditional service systems by augmenting the quality of data and information collection to improve prenatal services.⁵⁴

The final dimension is the utility dimension, which asserts that the program is not just beneficial but also usable, ensuring that user interaction is safe, error-free, and efficient.⁵² mHealth applications deemed beneficial by users will enhance trust and promote sustained usage of the application.⁵⁵ The midwife iPosyandu program demonstrates a commendable level of usefulness, as indicated in Table 7. Elevated usability in mHealth influences competency,

hence enhancing health care.⁵⁶ Midwife's will select mHealth applications with good usability for the provision of maternal and child health services.⁵⁷

Conclusion

This study evaluated the use of the iPosyandu mobile application on midwives' competence in early pregnancy diagnosis, highlighting the important role of mHealth technology in improving maternal and child health services. The results showed that midwives who used the iPosyandu application significantly increased their knowledge and skills in early pregnancy detection services compared to those who used the e-cohort system.

Although the results were positive, obstacles such as limited internet connectivity in remote areas and periodic technical problems must be continuously improved. These obstacles can be overcome by developing an application that can be used to enter data even when there is no internet signal. However, the data is inputted into the application when there is an internet signal. For this reason, it is necessary to collaborate with telecommunications providers to increase internet availability in remote areas, especially in health facilities and clinics so that midwives can use the iPosyandu application features smoothly.

iPosyandu application-based training sessions can be conducted continuously to improve midwives' knowledge and skills. This can include updates on new health features or protocols, ensuring that midwives remain informed and proficient in using the application for early pregnancy detection and other maternal health services. The application training module can be updated periodically to include feedback from midwives, ensuring alignment with best practices and current clinical guidelines, particularly for early prenatal care and risk assessment in pregnancy. Midwives who have received iPosyandu application-based training can share information about the materials and use of the iPosyandu application to foster a collaborative environment where midwives share insights from their experiences. Improvements to the application are made periodically based on feedback from midwives to improve user experience and reduce errors so that the application can be used better. Therefore, the Ministry of Health, which created the e-cohort system, can consider integrating the midwife iPosyandu application with the e-cohort based on standard protocols for maternal and child health services throughout Indonesia so that it can improve early pregnancy detection services.

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Disclosure

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