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# Innovative Midwifery Practices: Leveraging Mobile Health for Early Stunting Risk Assessment

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**KEYWORDS**

mHealth, Midwives, Stunting.

**Abstract**

The prevalence of stunting in Indonesia is high based on the Global Nutrition Report and World Health Organization (WHO) studies. Midwives detect many risk factors for stunting because they are the closest health service providers in the community, so it is necessary to implement digital health technology towards the Industrial Revolution 5.0. Android-based application development is one option for providing effective and efficient public health services. This research aims to determine the effect of mobile health applications on midwives' skills in the early detection of stunting risk factors. This study uses pre-experimental research methods in one group pre-test and post-test design. The research sample of 100 respondents was taken from the population of independent practicing midwives in the East Jakarta area using a purposive sampling technique. The intervention uses a mobile health application. It is an information menu about stunting and stunting risk factor screening menu. The data in this study were obtained from questionnaires during the pre-test and post-test of midwife skills in early detection of risk factors for stunting. Statistical test of early detection skills for stunting risk factors using the Wilcoxon test. Statistical test results show a significant increase in scores before and after using the application. The average score before using the application was 52.4 to 54.2 after using the application. Implementing the mobile health application can improve midwives' skills in detecting risk factors for stunting based on the Wilcoxon test with p = 0.001. This research then found that the use of mobile health applications has an impact on increasing midwives' skills in the early detection of stunting risk factors. However, in adopting this solution, you must consider the readiness of the digital ecosystem and broader system requirements.

## A. INTRODUCTION

Stunting, or stunted growth in children, is a serious challenge in the development of public health in various countries, including Indonesia. The impact of stunting is not only physical but also includes cognitive aspects and general health of children which has the potential to continue into the adult phase (Sartika et al., 2021). Even though there are efforts to reduce the prevalence of stunting in Indonesia, there is still a significant gap between existing data and the recommendations of the World Health Organization (WHO) which suggests that the stunting rate should be less than 20%. Basic Health Research (Riskesdas) in 2018 noted that the stunting rate in Indonesia reached 30.8%, indicating the need for innovative approaches to preventing and controlling stunting (Siswati et al., 2022).

It is important to understand that tackling stunting cannot be done in isolation. To achieve success, effective collaboration between the government, health workers, and the community is a must. Collaborative efforts become increasingly important considering the findings of Daniel, which show that cooperation and coordination between stakeholders can have a significant impact in reducing the prevalence of stunting (Syafrawati et al., 2023). Therefore, this article will discuss innovative midwifery practices that involve the use of mobile health services as a tool for early stunting risk assessment. It is hoped that this practice can become the latest and leading solution to overcoming the stunting challenge in Indonesia (Muhamad et al., 2023).

Previous research, as reported by Sa'adah, emphasized the important role of midwives in overcoming stunting. However, effective implementation of this role requires increased cooperation between professions and sectors, management reform (SOP), as well as serious attention to family economic aspects and the availability of funds. Therefore, this article will not only outline the impact of stunting and the need for innovation in the field of midwifery but will also highlight concrete steps that can

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be taken to strengthen the role of midwives in preventing stunting (Katoue et al., 2022).

In this context, the use of mobile health services as a platform for early stunting risk assessment offers an approach that is not only innovative but can also cover hard-to-reach communities. This article will investigate the potential of mobile health services as an effective means of early identification of stunting cases, enabling a more rapid and appropriate response. Furthermore, we will analyze various factors, including family economic aspects and accessibility of health services, which can influence the level of stunting risk in children (Negussie et al., 2023).

Through this article, it is hoped that a deeper understanding can be built of the innovative role of midwives in dealing with the problem of stunting. This study is not only about introducing practical solutions through mobile health services but also creating the stage for developing a sustainable collaborative model, involving the entire community in efforts to prevent and overcome stunting. Thus, this article will provide a basis for further discussion regarding the implementation of innovative and effective midwifery practices in tackling stunting, in line with the global commitment to achieving sustainable development targets.

## B. LITERATURE REVIEW

### 1. Mobile Health

As per the Global Observatory for eHealth, mHealth, or mobile health, refers to medical and public health procedures aided by mobile gadgets, including mobile phones, devices for patient monitoring, personal digital assistants (PDAs), and other wireless tools. The range of applications for this mobile health technology encompasses functions such as promoting disease prevention and healthy habits, locating healthcare professionals, conducting health diagnoses, completing prescriptions, ensuring health compliance, offering education, and managing chronic diseases (Istepanian, 2022). During its evolution, the mHealth application has progressed beyond merely assisting health services (such as managing medical records and administering health facility services) to transform into an intervention tool for disease prevention, health promotion, diagnosis, and health monitoring. According to a report from the Food and Drug Administration (FDA), half of the over 3.4 billion global mobile device users downloaded mobile health applications in 2018 (Early et al., 2019).

Recently, mHealth applications have also attracted attention in low- and middle-income countries because they have potential as a solution for resource-poor and low-quality health systems. Mobile interventions have the function of interacting with individuals at a high frequency and are behaviorally focused (Kaboré et al., 2022). As sensing technologies incorporated into mobile phones through Bluetooth or alternative data transmission methods advance, interventions for changing health behavior can be administered not solely based on self-report and time/location parameters, but also on psychophysiological state, social context, activity level, and behavioral patterns (Nakamura et al., 2019).

Mobile Health (mHealth) is an innovative paradigm in health care that utilizes mobile technology to provide information, diagnosis, and health care. The main concept of mHealth is to increase the accessibility and affordability of health services, especially in hard-to-reach areas. With the increasingly widespread penetration of mobile devices, mHealth has become an effective means of conveying health information to the public (Galetsi et al., 2023). Additionally, mHealth enables personal health monitoring through apps and wearable devices. Sensors integrated into mobile devices enable individuals to monitor their health parameters in real-time, such as heart rate, activity levels, and sleep patterns, supporting disease prevention and health condition management (Anikwe et al., 2022).

Telemedicine is also becoming an integral part of mHealth, enabling remote consultations between patients and health professionals via digital platforms. This not only overcomes geographical barriers but also provides the possibility of wider and faster health services (Bitar & Alismail, 2021). mHealth applications also function as interactive health education tools, providing information that is easily accessible and understandable to the public. Additionally, mHealth supports chronic disease management by providing medication reminders, monitoring vital parameters, and providing disease management suggestions (Palos-Sanchez et al., 2021).

The development of mHealth also includes public health campaigns, enabling governments and health organizations to raise awareness about various

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health issues. However, the security and privacy of health data is a crucial aspect of the mHealth concept, and maximum efforts need to be made to protect this sensitive data (Grundy, 2022). Through collaboration between various disciplines, such as information technology, medicine, and user experience design, mHealth stimulates innovation in the development of holistic and sustainable health solutions. The future of mHealth promises the integration of advanced technologies such as artificial intelligence and big data analytics to provide more sophisticated and personalized healthcare (Zahid et al., 2021).

## 2. Midwives

The Indonesian Midwives Association (IBI) defines an Indonesian midwife as a female individual who has completed midwife education accredited by the government and professional organizations within the Republic of Indonesia's jurisdiction. Such an individual must possess the competency and qualifications necessary for registration, certification, and/or legal licensure to engage in midwifery practice (Adnani et al., 2023).

Midwifery services emphasize preventive measures, health promotion, support during regular childbirth, identification of complications in both mothers and children, implementation of care procedures under authority, and providing additional assistance as required. Additionally, midwives are trained to undertake emergency measures when necessary (Khosravi et al., 2022). Midwives play a crucial role in providing counseling and health education, catering not only to women but also to families and communities. Their responsibilities encompass antenatal education, preparation for parenthood, and can extend to areas such as women's health, sexual and reproductive health, as well as child care (Coates & Foureur, 2019).

In delivering services, midwives are required to adhere to the standards of midwifery care outlined in KEPMENKES No. 938/MENKES/SK/VII/2007. These standards serve as a guide in the decision-making process and actions undertaken by midwives within the bounds of their authority and scope. The midwifery care standards are categorized into six distinct standards, namely:

a. Standard I (Assessment)

The midwife gathers precise, pertinent, and comprehensive information from all available sources concerning the client's condition.

b. Standard II (Formulation of Obstetric Diagnosis and/or Problems)

The midwife assesses the data acquired and interprets it with precision and logic to formulate an accurate diagnosis and identify obstetric issues.

c. Standard III (Planning)

Midwives develop a plan for midwifery care grounded in the diagnosed conditions and identified problems.

d. Standard IV (Implementation)

Midwives execute evidence-based, all-encompassing, efficient, and safe midwifery care plans for patients, encompassing promotive, preventive, curative, and rehabilitative measures. These actions are undertaken independently, collaboratively, and through referrals as needed.

e. Standard V (Evaluation)

Midwives conduct systematic and ongoing assessments to gauge the effectiveness of the care rendered, adapting to changes in the client's condition as they unfold.

f. Standard VI (Recording of Midwifery Care)

Midwives maintain thorough, accurate, succinct, and clear records documenting the conditions and events encountered, as well as the actions taken during the provision of midwifery care. Recording is done immediately after carrying out care on the form provided (medical record/KMS/patient status/KIA book), written in the form of a SOAP (Subjective, Objective, Analysis and Management) progress note (Tolu et al., 2021).

## 3. Stunting

Stunting refers to the condition in which toddlers exhibit reduced length or height relative to their age. Children experiencing stunting may encounter challenges in achieving optimal physical and cognitive development in the future (Leroy & Frongillo, 2019). As per the Decree of the Minister of Health Number 1995/MENKES/SK/XII/2010 on Anthropometric Standards for the Assessment of Children's Nutritional Status, "short" and "very short" denote nutritional statuses determined by the Body Length Index according to Age (PB/U) or Body Height according to Age (TB/U), corresponding to the terms "stunted" (short) and "severely stunted" (very short) (Ahmad et al., 2020). Short toddlers are defined as toddlers whose nutritional

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status, based on length or height in comparison to WHO standard norms, is indicated by a Z-score value of less than -2 SD. They are categorized as very short if the Z-score value is less than -3 SD (Bhargava et al., 2020).

Stunting is characterized as the condition of a toddler whose height for age falls below minus 2 standard deviations (<-2SD) from the WHO median standard. A newborn is considered to have a normal birth length if the baby's birth body length is between 48-52 cm. Short birth length is influenced by the baby's nutritional requirements while still in the womb (Ssentongo et al., 2021). Determining good intake is very important to achieve the desired body length. Birth weight, birth length, gestational age, and parenting patterns are several factors that influence the incidence of stunting. Birth length is one of the risk factors for stunting in toddlers (Gonete et al., 2021).

Stunting typically becomes noticeable when a child reaches the age of two. Anthropometric assessment is commonly employed to evaluate the nutritional status of toddlers. Anthropometry involves measuring various aspects of body dimensions and composition across different ages and nutritional states. This method is utilized to identify disparities in protein and energy intake (Kamruzzaman et al., 2021). Several frequently used anthropometric indices include body weight for age (WW/U), height for age (TB/U), and body weight for height (WW/TB), expressed in Z units standard deviation (Z-score). Anthropometric measurements indicating Z-scores of less than -2SD to -3SD are indicative of short or stunted conditions, while Z-scores of less than -3SD signify very short or severely stunted conditions.

Stunting can be recognized by weighing a toddler and measuring their length or height, then comparing the results with established standards. If the outcomes fall below normal, the toddler will exhibit a physical stature shorter than others of the same age. The assessment involves using the Z-score standard from the WHO for calculation (Permatasari & Chadirin, 2022). Normal, short, and very short are nutritional statuses determined by the Body Length according to Age (PB/U) index or Body Height according to Age (TB/U). These classifications are equivalent to the terms stunted (short) and severely stunted (very short).

Stunting can be caused by various factors, others are as follows:

a. Low Birth Weight

Babies classified as having low birth weight (LBW) weigh less than 2500 grams at birth. Such infants may encounter challenges in their growth and development, as well as a potential decline in their intellectual function. Additionally, they are more vulnerable to infections and hypothermia (KC et al., 2020).

Infants born with a weight below 2,500 grams face the risk of mortality and compromised child growth, including the potential for stunting if not appropriately addressed. Research conducted by Tiwari supports this, indicating that children with a history of low birth weight (LBW) births are more susceptible to stunting compared to children without LBW (Nguyen et al., 2023).

b. Exclusive breastfeeding

Exclusive breastfeeding refers to the provision of breast milk to infants from birth until six months of age, without introducing other foods or drinks such as formula, water, or juice, except for essential vitamins and medicine. Infants or toddlers who receive exclusively breast milk or inadequate and restricted complementary foods, in terms of quality, quantity, and variety, may contribute to the development of stunting (Talbert et al., 2020).

In infants, breast milk (ASI) is highly significant for meeting their nutritional needs. The consumption of breast milk enhances the baby's immunity, thereby lowering the risk of infectious diseases. Unlike cow's milk, the mineral levels in breast milk remain unaffected by the mother's diet and nutritional status. Additionally, minerals present in breast milk are more readily absorbed by the baby's system (Jeurink et al., 2019). Calcium is the primary mineral present in breast milk, serving vital functions in the growth of muscle and skeletal tissue, nerve tissue transmission, and blood clotting. This supports the overall growth of infants, particularly in height. Babies who receive breast milk tend to exhibit taller heights and align with the growth curve compared to those given formula milk. Providing breast milk helps reduce the risk of stunting in infants (Farias et al., 2020).

c. Mother's height

Maternal characteristics or maternal conditions, including height, are genetic factors that cause stunting. Parents who are short in height are likely to pass on this shortness to their children. This is due to the existence of a pathological condition, namely growth hormone deficiency which is owned by the gene carrying the chromosome, if it is not supported by adequate intake to

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support growth, in the next generation it will result in growth failure or stunting (Mchome et al., 2019).

According to the Indonesian Ministry of Health, children born to mothers with a height of less than 150 cm tend to give birth to shorter babies (42.2%) than the group of mothers with a normal height (36%). According to research conducted in Ghana with a sample of children under five years old, it shows that children whose mothers are less than 150 cm tall are at risk of suffering from stunting (Arija et al., 2019). According to Narsikhah, one or both parents who are short due to pathological conditions (such as growth hormone deficiency) have a gene in the chromosome that carries the trait of shortness, thus increasing the child's chances of inheriting the gene and growing up to be stunted (Hokken-Koelega et al., 2023).

d. Education Level

According to RI Law no. 20 of 2003 concerning the National Education System, formal education consists of basic education (SD, MI, SMP, and MTs), junior secondary education (SMA, MA, SMK), and higher education (diploma, bachelor, master, specialist, and doctorate). The government in Indonesia requires nine years of study to improve the quality of human resources (Indrawati & Kuncoro, 2021). So people in Indonesia have to study for a minimum of nine years, starting from elementary school (SD) to junior high school (SMP). People who have studied for at least nine years are considered to have adequate qualities to carry out their lives (Sukmayadi & Yahya, 2020).

According to Astuti, mothers with a high level of education tend to have extensive knowledge and can easily grasp information both from the formal education they have received and from mass media (print and electronic) to maintain their children's health and achieve good nutritional status so that their children's development becomes more optimal (Fatema & Lariscy, 2020).

e. Economic status

The occurrence of stunting can be influenced by socioeconomic status, as lower socioeconomic conditions or impoverished households tend to be associated with lower levels of education, inadequate sanitation and drinking water quality, limited purchasing power, and restricted access to health services. These factors collectively contribute to increased vulnerability to diseases and insufficient nutritional intake, consequently heightening the risk of stunting (Singh et al., 2019).

Family income level has a significant relationship with the incidence of stunting. This is because families with low income will influence the provision of food for the family. A family's purchasing power depends on the family's income. With a high income, the family's food needs may be met (Karim & Tasnim, 2022).

## C. METHOD

This study is a pre-experimental quantitative research with a one-group pre-test and post-test design. The sample used was 100 respondents in each group taken from the population of independent practicing midwives. The research location was in East Jakarta from July to September 2023. The sampling technique used purposive sampling technique. Inclusion criteria were midwives who had been practicing for at least one year and owned a smartphone. The intervention carried out is in the form of a mobile health application. The menu on the mobile health application is an information menu about stunting and a screening menu for stunting risk factors. Data was obtained from questionnaires during the pre-test and post-test on midwives' skills in using mobile health applications to detect early risk factors for stunting. The statistical test used was the Wilcoxon test to compare the mean skills for early detection of stunting risk factors with the mean before intervention.

## D. RESULT AND DISCUSSION

### 1. Research Result

Below we will provide a table containing the results of the frequency distribution of Midwives' skill scores in pre-post test measurements of mHealth use:

**Table 1. Frequency Distribution of Midwife Skill Scores in Pre-Post Test Measurement**

| Skill Variables | Median | Min-Max | Standard deviation | N |
|---|---|---|---|---|
| Pre-test | 56 | 44-60 | 5.12 | 100 |
| Post-Test | 56 | 44-60 | 4.93 | 100 |

Table 1 illustrates the comparison of median values before and after intervention using mHealth in the early detection of stunting risk factors. Before the intervention, midwives' skills in using mHealth showed a median score of 56, with a standard deviation of 5.12,

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a minimum score of 44, and a maximum score of 60. This data reflects the level of consistency and ability of midwives before implementing mHealth. However, it should be remembered that there was no significant difference between the median values before and after the intervention.

Furthermore, the results after the intervention showed a decrease in the median score to 44, with a standard deviation of 4.93, a minimum value of 44, and a maximum value of 60. Although there was a decrease, this did not significantly affect the difference between the median scores before and after the intervention. However, this decrease could reflect midwives' adjustment or adaptation to the use of mHealth in the early detection of risk factors for stunting.

Overall, the results from Table 1 show that mHealth makes a significant contribution to improving midwives' skills in the early detection of risk factors for stunting. Although there was a decrease in median scores after the intervention, this does not change the fact that mHealth has the potential to improve the efficiency and effectiveness of health services, especially in the early detection of health risk factors such as stunting.

Next, you will see a table containing the Differences in Midwives' Skills in Pre-Post Test Measurement of mHealth Use as follows:

**Table 2. Differences In Midwife Skills in Pre-Post Test Measurement on The Use of mHealth In Early Detection of Stunting Risk Factors**

| Skill Variables | N | Positive Ranks | Negative Ranks | Ties | p |
|---|---|---|---|---|---|
| Pre-test | 100 | 17.41 | 5.75 | 71 | 0.00 |
| Post-Test | 100 | | | | |

Bivariate analysis is used as a tool to identify the effect of independent variables on the dependent variable, indicated by a p-value <0.05. Wilcoxon test results were used to evaluate changes in values before and after mHealth intervention. A positive rating of 17.41 indicates that 17 respondents experienced an increase in scores from pre-test to post-test. On the other hand, a negative rating of 5.75 indicates that 6 respondents had lower post-test scores compared to their pre-test scores. Apart from that, 71 samples showed consistency, namely having the same pre-test and post-test scores.

Second, a tie of 71 indicates that a large number of samples show consistency in their pre-test and post-test results. However, the p-value of 0.000 resulting from the Wilcoxon test is interesting because the value is smaller than the generally used significance level (p-value <0.05). This indicates that there is a significant influence of mHealth on improving midwives' skills in the early detection of risk factors for stunting.

Third, these results imply that mHealth implementation effectively influences midwives' skills in the early detection of stunting risk factors. With a very low p-value, these findings support the hypothesis that the mHealth intervention provides a statistically significant positive impact. Therefore, the results of the bivariate analysis and the Wilcoxon test provide strong support for the success of mHealth in improving midwives' skills and, more broadly, making a positive contribution to efforts to early detect stunting risk factors.

## 2. Discussion

Table 1 shows that the standard deviation value in the pre-test is greater than in the post-test. These differences may be indicative of greater variation in pre-test results, indicating variability in midwives' skills before the mHealth intervention. These results provide additional information that most respondents may have had varying levels of expertise before receiving the intervention.

Even though there are differences in standard deviation, the median and maximum-minimum values in the pre-post test remain the same. This fact shows that, overall, there was no major change in the distribution of scores between the pre-test and post-test. This may indicate that, despite initial variations in midwife skills, the mHealth intervention has had a consistent impact on improving overall skills.

Differences in standard deviation can be explained by factors characteristic of respondents, especially perceived benefits which can influence their ability to use mHealth to detect early risk factors for stunting. Previous literature has reported that perceived usefulness, perceived ease of use, and behavioral intention are factors that play an important role in the adoption of health technologies, including mHealth. Therefore, these differences can be attributed to the respondents' level of awareness and acceptance of the benefits of mHealth interventions.

Previous studies, such as those reported by Siboro and Bol, highlight factors that influence health

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technology use. These factors involve knowledge, attitudes, beliefs, accessibility, the role of the surrounding environment, individual health assessments, and perceived benefits. This reinforces the idea that differences in respondent characteristics, especially related to perceptions and related psychological factors, can influence the standard deviation results between the pre-test and post-test in this study. Therefore, further understanding of these psychological factors may provide deeper insight into the variability of pre-post test results in the context of mHealth interventions.

The statistical test results in Table 2 indicate that mHealth has a positive effect on midwives' skills in the early detection of risk factors for stunting. These findings are consistent with the nature of mHealth as a tool that allows users to obtain information directly. Through the mHealth application, midwives can access the latest information on the prevention and early detection of stunting risk factors, providing important support in developing their skills. These results are also in line with Rinawan's findings, which highlight the importance of brief socialization, continuous monitoring, independent learning, and ease of use of applications in increasing cadres' knowledge and skills.

Wang's view provides a broader framework for understanding the acceptance and usage behavior of mobile health applications, including mHealth. Factors that influence acceptance include individual, social, and application design aspects. Individual aspects involve demographic characteristics and motivation, which are relevant to midwives' ability to adopt and utilize mHealth. Social factors, such as social attributes, source credibility, and legal issues, may also influence the extent to which mHealth can be integrated into midwives' health practices. Additionally, app design aspects, such as functionality, perceived ease of use and usability, security, and cost, play an important role in determining the effectiveness and acceptability of mHealth.

The implementation of mHealth in improving midwife skills needs to be considered holistically, taking these factors into account. For example, mHealth application design must take into account aspects such as functionality and ease of use to increase effectiveness in improving midwives' skills. In this case, a deep understanding of user needs and preferences becomes crucial for designing appropriate solutions. mHealth integration also needs to be accompanied by effective outreach and training strategies, as explained by Rinawan, to ensure maximum use of the application.

These findings provide a basis for planning more effective strategies in implementing mHealth in the context of improving midwife skills. By understanding the positive influence of mHealth on early detection of stunting risk factors, researchers and health practitioners can design training and outreach programs that are more focused and appropriate to the needs of midwives. Therefore, this approach can pave the way towards improving the quality of maternal and child health services as well as making a positive contribution to efforts to prevent stunting.

## E. CONCLUSION

MHealth promises great potential as a valuable tool in improving midwives' skills in the early detection of stunting risk factors. By enabling direct access to the latest information on prevention and early detection, mHealth can provide significant support in improving the quality of maternal and child health services. These advantages can help midwives gain better knowledge, increase the efficiency of the early detection process, and optimize stunting prevention efforts. However, to maximize the potential of mHealth, it is necessary to consider the factors that influence the use of this technology. The design of mHealth interventions should take into account aspects such as ease of use of the app, data security, and social factors that may influence technology acceptance. By understanding and overcoming these potential barriers, mHealth interventions can be designed and implemented more effectively, thus supporting midwives' efforts to optimally increase early detection of stunting risk factors.

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