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Optimizing Surveillance for Early Detection of High-Risk Pregnancy, Neonatal, and Child Risks with Tinamila.com Application

Suhartini Suhartini[1]*, Ahmad Ahmad[2]
[1]Department of Midwifery, Poltekkes Kemenkes Banten, Banten, Indonesia
[2]Department of Medical Laboratory Technology, Poltekkes Kemenkes Banten, Banten, Indonesia

***Corresponding Author**: E-mail: tiensahmad1@gmail.com

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ABSTRACT

Introduction: In 2021, Indonesia recorded 2,982 maternal deaths related to Covid-19, highlighting a pressing health issue. The high maternal mortality rate underscores the need for innovation in the early detection of health risks for pregnant women and children. This study aims to evaluate the effectiveness of the tinamila.com application in the early detection of high-risk pregnant women, neonates, and high-risk children at the Mandala Community Health Center in 2023.
Methods: This study combines both quantitative and qualitative data. Quantitative data is collected through a cross-sectional approach using chi-square tests and secondary data from weekly reports submitted by Community Health Workers (Kader), while qualitative data is gathered through in-depth interviews and Focus Group Discussions (FGD) with healthcare professionals and Kader. The research population consists of ten respondents from the healthcare sector, including the Head of the Community Health Center, Puskesmas Administrative Staff, Surveillance Personnel, the Coordinator Midwife, and six Village Midwives, with 96 Kader selected as the sample. Data were analyzed using the Chi-Square test.
Results: Findings reveal cadre characteristics, with 76% demonstrating good to very good knowledge and 90.6% using the application. Bivariate analysis indicates a significant correlation between knowledge and application effectiveness (p-value = 0.000, OR value = 10.5) and between training and application effectiveness (p-value = 0.001, OR value = 12.5).
Conclusion: The study concludes that the tinamila.com application is effective in early detection, recommending its continued use for reporting morbidity and mortality rates. Suggestions include processing and analyzing reported data, providing feedback and rewards to cadres, and ensuring ongoing support for sustained application use.

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INTRODUCTION

The 2015 Inter-Census Survey (SUPAS) recorded the Maternal Mortality Rate (MMR) at 305 per 100,000 live births and the Infant Mortality Rate (IMR) at 20,154 in Indonesia. Data from the Indonesian Ministry of Health indicates that the number of maternal deaths in 2021 reached 7389, representing an increase from the previous year's figure of 4267 deaths. Additionally, there were 2982 maternal deaths related to Covid-19 in 2021 (1). In pursuit of achieving Sustainable Development Goal 2 by 2030, which aims to ensure healthy lives and promote well-being for all at all ages, a crucial target is set to reduce the Maternal Mortality Rate to below 70 per 100,000 live births and the Neonatal Mortality Rate to 12 per 1000 live births (1).

The profile of Mandala Community Health Center illustrates the number of maternal deaths in 2020, with one maternal death (174.2 per 100,000 live births) (2). The infant mortality rate is 1.4 per 1000 live births, stillbirths at 2.8 per 1000 live births, and neonatal deaths approximately 5.5 per 1000 live births. During the Covid-19 pandemic, Mandala Community Health Center reported 52 positive cases and one death in 2020, with 241 confirmed cases and six deaths as of April 2021 (2).

With the ongoing pandemic, the potential impact of Covid-19 on vulnerable groups, including high-risk pregnant women and neonates, is a cause for concern (3-8). Observations of maternal and infant morbidity reports at Mandala Community Health Center reveal limitations, as reports on high-risk pregnant women and neonates are currently only submitted through monthly Posyandu reports.

This study aims to evaluate the effectiveness of the tinamila.com application in the early detection of high-risk pregnant women, neonates, and high-risk children at the Mandala Community Health Center in 2023.

METHOD

Research Type

This study employs a research design that combines both quantitative and qualitative data. Quantitative data is obtained through a cross-sectional approach with chi-square tests, supplemented by secondary data derived from weekly reports submitted by Community Health Workers (Kader). Qualitative data is gathered through in-depth interviews and Focus Group Discussions (FGD) involving Healthcare Professionals and Kader who submit reports regarding high-risk pregnant women, neonates, and children.

Population and Sample/Informants

The research population encompasses the entire set of objects under investigation. In this context, the research subjects include ten respondents from the healthcare sector, comprising the Head of the Community Health Center (Puskesmas), Puskesmas Administrative Staff, Surveillance Personnel, the Coordinator Midwife, and six Village Midwives. Additionally, 96 Kaders are selected as the sample. Data collection is conducted through weekly reports generated by the Kaders. The study was conducted in the Mandala Health Centre, Lebak Regency, Banten, Indonesia.

Data Collection Procedures

Quantitative data is obtained through a cross-sectional approach with chi-square tests, supplemented by secondary data derived from weekly reports submitted by Community Health Workers (Kader). Qualitative data is gathered through in-depth interviews and Focus Group Discussions (FGD) involving Healthcare Professionals and Kader who submit reports regarding high-risk pregnant women, neonates, and children.

Data Analysis

Subsequently, the collected data were processed and analyzed using the Chi-Square test.

Ethical Approval

This study was approved by the Health Research Ethics Committee of Health Polytechnic of Health Ministry Banten. All participants, provided informed consent prior to participating in the study. The confidentiality of all participants was strictly maintained throughout the research process.

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RESULTS

Table 1. Overview of cadre characteristics in the Mandala Health Centre working area in 2023.

Variable	Category	Total	%
Age	< 35 year	34	35.4
	≥ 35 year	62	64.6
Education	< Junior High School (SMP)	52	54.2
	≥ Senior High School (SMA)	44	45.8
Length of time as a cadre	< 5 year	40	41.7
	≥ 5 year	56	58.3
Have attended training	Not yet	9	9.4
	Already	87	90.6
Knowledge	Less good <70	23	24
	Good-Very Good ≥70	73	76
Application Use	Not yet	9	9.4
	Already	87	90.6
Benefits of Application Use	No benefit	9	9.4
	Benefits	87	90.6

The research findings indicate that the majority of Kaders exhibit specific characteristics associated with the effectiveness of tinamila.com usage. Most Kaders are aged 35 years or older (64.6%), and a significant proportion (54.2%) have an educational background of junior high school or below. Additionally, 58% of Kaders have served in their role for more than five years.

Furthermore, the majority of Kaders (76%) demonstrate good to very good knowledge in using the tinamila.com application. A high percentage (90.6%) have utilized the application; however, a small portion (9.4%) reported issues related to incomplete or untimely usage.

Table 2. Relationship between Age Group and the Effectiveness of Using the tinamila.com Application

Age	Effectiveness of Using tinamila.com Application				Total		*p-value*
	Ineffective		Effective				
	F	%	F	%	F	%	
< 35 year	10	29.4	24	70.6	34	100	0.889
≥ 35 year	16	25.8	46	74.2	62	100	
Total	26	27.08	70	73.92	96	100	

Table 2 shows the correlation between age group and the effectiveness of tinamila.com application use. Cadres aged ≥ 35 years showed a higher proportion of application use, reaching 46 people (74.2%), compared to cadres aged < 35 years.

Table 3. Relationship between cadre education and the effectiveness of tinamila.com application use

Education	Effectiveness of Using tinamila.com Application				Total		p-value
	Ineffective		Effective				
	F	%	F	%	F	%	
≤ Junior High School (SMP)	16	30.8	36	69.2	52	100	0.514
> Senior High School (SMA)	10	22.7	34	77.3	44	100	
Total	26	27.1	70	72.9	96	100	

In Table 3, there is a correlation between cadre education level and effective use of the tinamila.com application. The proportion of cadres who used the app effectively was higher among those with more than a high school education (77.3%) compared to cadres with less than a junior high school education (69.2%). Chi-square statistical test results showed a p-value = 0.514, which is greater than or equal to the significance level α (0.05).

Table 4. Relationship between length of time as a cadre and effectiveness of tinamila.com application use

Length of time as a cadre	Effectiveness of Using tinamila.com Application				Total		p-value
	Ineffective		Ineffective				
	F	%	F	%	F	%	
<5 Years	12	30	28	70	40	100	0.756
≥5 years	14	25	42	75	56	100	
Total	26	27.1	70	72.9	96	100	

Table 4 shows that the proportion of cadres using the app effectively showed significant differences based on the length of time as a cadre. A total of 77.3% of cadres who had been cadres for ≥5 years effectively used the app, while a slightly lower proportion, 70%, was found among cadres with <5 years of cadre experience. Despite this difference, the Chi-square statistical test results showed a P value = 0.756, which is greater than or equal to the significance level α (0.05).

Table 5. The relationship between knowledge of application use and the effectiveness of using the tinamila.com application

Knowledge	Effectiveness of Using tinamila.com Application				Total		p-value	OR
	Ineffective		Ineffective					
	F	%	F	%	F	%		
<70	15	65.2	8	34.8	23	100	0.000	10.568 (CI 3.621-30.847)
≥ 70	11	15.1	62	84.9	73	100		
Total	26	27.1	70	72.9	96	100		

Table 5 illustrates the relationship between knowledge of application use and the effectiveness of tinamila.com application use among cadres. A higher proportion of cadres who used the app effectively was observed among respondents who scored ≥70 on knowledge of app usage (76.5%), compared to cadres who scored <70 on knowledge of app usage (53%). Chi-square statistical test showed a P = 0.000 (≤ α 0.05), indicating that there was a statistically significant relationship between knowledge score and effective use of tinamila.com. Further analysis showed an Odds Ratio (OR) value of 10.5.

Table 6. The relationship between training in the use of applications and the effectiveness of using the tinamila.com application

Training History	Effectiveness of Using tinamila.com Application				Total		p-value	OR
	Ineffective		Ineffective					
	F	%	F	%	F	%		
Not yet	7	77.8	2	22.2	9	100	0.001	12.526 (CI 2.402 - 65.337)
Already	19	21.8	68	78.2	87	100		
Total	26	27.1	70	72.9	96	100		

Table 6 illustrates the relationship between training in application usage and the effectiveness of tinamila.com application among Cadres. The proportion of Cadres who are ineffective in using the tinamila.com application is higher in those who have not undergone training (77.8%) compared to Cadres who have previously undergone training (21.8%). Through the Chi-square statistical test, a P-value of 0.001 (≤ α 0.05) was obtained, indicating that

statistically, there is a significant relationship between the history of training in using the tinamila.com application and the effectiveness of using the tinamila.com application. The analysis results show an Odds Ratio (OR) of 12.5.

DISCUSSION

Table 1 presents the research findings, indicating that most Kaders exhibit characteristics that correlate with the effectiveness of tinamila.com usage. A significant proportion of Kaders are aged ≥ 35 years (64.6%), aligning with the findings of Damayanti et al. (2023), who reported that 89.5% of respondents were between 20-40 years old (9). Additionally, 54.2% of Kaders have an educational level of junior high school or below, consistent with Lambang's (2020) study, which found that 73.7% of Kaders had an educational background of junior high school or lower (10), as well as Suhartini's (2018) study, which reported 75.8% (10, 11).

The research also reveals that 58.3% of Kaders have more than five years of experience, aligning with Lambang (2020) who noted that 63.2% of Kaders had extensive experience (10). These findings are further supported by Didah et al. (2021), which indicated that 51% of Kaders had 1 to 5 years of experience (12). In addition Sulaeman et al. (2022), which highlighted a significant relationship between cadre motivation and activity levels, influencing Posyandu cadre performance during the COVID-19 pandemic (13). Notably, this study found that 76% of Kaders demonstrated good to very good knowledge in using the tinamila.com application, suggesting that increased exposure to the application contributes positively to knowledge and awareness (14). However, 9% of Kaders reported issues related to incomplete or untimely usage, particularly among newly recruited and untrained Kaders.

Regarding the monthly surveillance reports, data fluctuated throughout the year, with the highest reporting rate in August (100%) and the lowest in May (28%). This variability in reporting underscores the importance of consistent application use and timely feedback. Notably, the correlation between higher reporting rates and the number of reported cases supports WHO recommendations for the timely analysis of maternal and child health (MCH) data to ensure accurate interventions. Despite these findings, there are concerns regarding the feedback mechanism in tinamila.com, as the application's ability to provide structured feedback from higher to lower levels still needs improvement, in line with WHO guidelines.

In terms of statistical analysis, Chi-square tests were employed to explore the relationships between age, education level, experience, and the effectiveness of tinamila.com usage. Table 2 reveals no significant relationship between age and effectiveness (p-value = 0.889), which is consistent with previous studies such as Wahyudi et al. (2023) (15) and Anggrain (2023) (16). Similarly, no significant relationship was found between education level and application effectiveness in Table 3 (p-value = 0.633) (17). This finding contrasts with Didah (2021), which reported a significant relationship between education level and application use ($p < 0.005$) (12). Similarly, Donsu (2016) found a significant correlation between education level and the utilization of MCH books (18). This suggests that the impact of education on the effectiveness of the application may be context-dependent.

Experience also did not show a significant relationship with the effectiveness of tinamila.com usage, as indicated in Table 4. This finding aligns with Sistiarani et al. (2013) (19), which also found no significant relationship between cadre tenure and MCH book utilization. However, Tables 5 and 6 suggest that Kaders' knowledge and training play a significant role in the effective use of the application. Table 5 shows that respondents with limited knowledge are ten times more likely to struggle with effective usage, a finding supported by Zolekhah (2020) and Zulmi et al. (2021) (20, 21). Moreover, Table 6 highlights that untrained Kaders are twelve times more likely to be ineffective in using the application, which is consistent with findings from Vidayanti (2022) (22) and Febrina et al. (2021) (23). These findings support Pering et al. (2022), who highlighted the crucial role of cadre knowledge in Posyandu activities, emphasizing that adequate knowledge enables cadres to perform effectively (24). Furthermore, Dianita (2022) found a significant relationship between knowledge and Posyandu activity (Chi-square test, $p = 0.015$, <0.05) (25). Multiple studies confirm that training enhances Posyandu cadre knowledge, reinforcing the effectiveness of tinamila.com application usage.

However, this study has several limitations. The focus on a specific population of Kaders limits the generalizability of the findings to other health worker groups or regions with different socio-economic and demographic characteristics. Furthermore, external factors such as internet accessibility, technical support availability, and regional health policy variations were not extensively analyzed, which may have influenced the effectiveness of tinamila.com usage.

CONCLUSION

The study concludes that the tinamila.com application is effective in early detection, recommending its continued use for reporting morbidity and mortality rates. Suggestions future research should consider these external variables to provide a more comprehensive understanding of the factors that affect the implementation of health technology in diverse settings.

AUTHOR'S CONTRIBUTION STATEMENT

All authors contributed equally to the conception and design of the study.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

I declare that generative AI and AI-assisted technologies were used only to support language refinement and improve clarity in the writing process. All ideas, analyses, and conclusions in this thesis are entirely my own, and no AI tools were used to generate research data or substantive academic content.

SOURCE OF FUNDING STATEMENTS

All relevant data are within the article.

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