



Implementation of POLTEKKES Aceh-DJJ (POLAC-D) for Maternal and Fetal Well-Being in Midwifery Services at Langsa Lama Health Center, Indonesia

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KEYWORDS

Prenatal Care, Fetal Heart Rate Monitoring, Poltekkes Aceh-DJJ (PolAc-D) Midwives Training, Maternal Health.

ABSTRACT

Background: Prenatal visits play a crucial role in the early detection of pregnancy complications, significantly reducing maternal and neonatal morbidity and mortality. These visits provide vital information about warning signs and care for potential complications, thereby contributing to lower maternal mortality rates. One important aspect of monitoring is the assessment of fetal heart rate (FHR), which indicates fetal well-being. The Poltekkes Aceh-DJJ (PolAc-D) is a tool designed for monitoring fetal well-being through FHR. This study aimed to implement the PolAc-D tool to improve maternal and fetal health services in the working area of the Health Center Langsa Lama.

Methods: Using a Mixed Method Research approach, the study employed a Cross-Sectional design with a One Group Pretest-Posttest technique. The population included all midwives in the Puskesmas Langsa Lama area. Variables assessed included midwives' knowledge, skills, behavior, and attitudes toward providing prenatal care, measured through checklists, interviews, and questionnaires. Data analysis utilized both Parametric (Paired T-test) and Non-Parametric (Wilcoxon Test) methods.

Results: Results indicated significant improvements: midwives' knowledge scores increased from 8.05 to 12.37 (p-value = 0.000), skills improved from 43.79 to 83.53 (p-value = 0.000), behavior scores rose from 6.39 to 12.08 (p-value = 0.000), and attitudes increased from 6.50 to 12.08 (p-value = 0.000). These findings suggest that the implementation of the PolAc-D tool effectively enhances midwives' competencies in delivering prenatal care, thus fostering better maternal and fetal health outcomes.

Conclusions: Prenatal visits and the use of the Poltekkes Aceh-DJJ (PolAc-D) tool for monitoring fetal heart rate (FHR) significantly enhance midwives' competencies in providing prenatal care. The results indicate improvements in midwives' knowledge, skills, behavior, and attitudes.

1. Introduction

Data on maternal and infant mortality in Indonesia highlights serious challenges in public health (Stiyaningsih et al., 2017; Titalley et al., 2008). The Maternal Mortality Ratio (MMR) in 2020 was estimated to be around 305 per 100,000 live births, with the primary causes linked to pregnancy complications such as bleeding, infections, and hypertension (Ahmed et al., 2019; Sheiham & Watt, 2000; Syairaji et al., 2024). Meanwhile, the Infant Mortality Rate (IMR) was approximately 24 per 1,000 live births, caused by complications at birth and other health issues. One effort to reduce maternal and infant mortality is through monitoring via prenatal visits. These visits play a crucial role in the early detection of pregnancy complications. During these visits, information about danger signs and care for complications is provided, which can help reduce morbidity and mortality rates among mothers and infants, significantly lowering the maternal mortality rate (Faradisa et al., 2017; Situmorang et al., 2022; Wayan et al., n.d.)

Fetal health monitoring, also known as fetal well-being monitoring, is vital for managing pregnancy and childbirth to minimize the risk of fetal death. This monitoring enables healthcare providers to predict the appropriate timing for pregnancy termination if necessary. Key indicators of fetal well-being include breathing movements, fetal movements, fetal tone, fetal heart rate, and amniotic fluid volume (Hamelmann et al., 2020; Matonia et al., 2020; Utomo et al., 2021). One important method of fetal well-being monitoring is through the assessment of fetal heart rate (FHR). FHR serves as a crucial indicator of life within the womb and provides vital information about the health status of the fetus (Aplikasi et al., 2022; Chiera et al., 2020; Triyuliandari et al., 2023). Monitoring FHR not only helps identify whether the fetus is developing properly but also allows for the early detection of potential problems, such as fetal distress or growth disorders. The process of evaluating FHR can be conducted by trained healthcare professionals, including doctors and midwives, using techniques such as Doppler ultrasound (Chiera et al., 2020; Rahmawati et al., 2019). Typically, fetal heartbeats can be detected starting around the 11th week of gestation. One device currently being developed to detect fetal heart

rate is the Poltekkes Aceh-DJJ (PolAc-D).

This tool is designed for monitoring fetal well-being and measuring fetal heart rate. It has been developed and tested according to its intended functions and has proven effective for use by pregnant women. A key advantage of this device is that monitoring results are recorded directly into a web application, allowing pregnant women, midwives, and doctors to track fetal development at any time. The aim of this study is to evaluate the effectiveness of the implementation of the Poltekkes Aceh-DJJ (PolAc-D) fetal well-being monitoring tool in enhancing midwives' skills and the quality of maternal healthcare services, as well as to analyze the impact of using the web application for monitoring fetal development by pregnant women, midwives, and doctors.

2. Methodology

The research method employed in this study is a Mixed Method Research approach, which combines both qualitative and quantitative methods. The study utilizes a Cross-Sectional design with a One Group Pretest-Posttest technique. Research was conducted in the working area of the Langsa Lama Health Center. The population for this study consists of all midwives in the Langsa Lama region. The variables observed include the knowledge of midwives (assessed through a checklist of 15 questions), skills (15 questions), behaviors (15 questions), and attitudes (15 questions) related to midwifery services. Data collection techniques involved observations using checklists, interviews, and the distribution of questionnaires. Data analysis was conducted using Parametric Tests (Paired T-test) or Non-Parametric Tests (Wilcoxon Test). In the first year, the validity of the instruments was tested, and necessary improvements were made.

The initial distribution of the questionnaire (pretest) was followed by training on the use of the Poltekkes Aceh-DJJ (PolAc-D) tool. This process aimed to evaluate the effectiveness of using the Poltekkes Aceh-DJJ (PolAc-D) through qualitative methods, specifically in-depth interviews. After the training, the questionnaire was distributed again (posttest) to assess any changes. In the second year, the implementation of the Poltekkes Aceh-DJJ (PolAc-D) tool by midwives focuses on monitoring the well-being of mothers and fetuses. This initiative aims to enhance the quality of maternal and fetal care by providing midwives with an effective tool to assess and monitor health parameters. Midwives will utilize the PolAc-D tool during routine prenatal visits, enabling them to track vital signs and other health indicators. The goal is to ensure early detection of any potential complications, thereby improving maternal and fetal health outcomes. Training sessions will continue to support midwives in effectively using the tool and interpreting the collected data.

3. Result

Data Analysis Results

The analyzed data is presented in the table below:

Table 1. Frequency Distribution of Respondent Characteristics by Age, Education, and Years of Service

Characteristics	f	%
Age		
21-30 Years	7	18.4
31-40 Years	21	55.3
41-50 Years	10	26.3
Education		
Diploma Midwifery	26	68.4
Bachelor Midwifery	12	31.6
Years of Service		
10-20 Years	23	60.5
21-30 Years	11	28.9
31-40 Years	4	10.5

Based on the table above, it can be observed that the majority of the midwives are aged between 31-40 years, accounting for 55.3%. Regarding educational background, the majority have a D3 Midwifery degree, representing 68.4%. In terms of years of service, most midwives have worked for 10-20 years, which accounts for 60.5%.

Table 2. Normality Test for Pretest and Posttest Data on Knowledge, Skills, Behavior, and Attitude Variables

Variable	Group	df	Sig.	Description
Knowledge	Pretest	38	.127	Normal
	Posttest	38	.048	Not Normal
Skills	Pretest	38	.587	Normal
	Posttest	38	.066	Normal
Behavior	Pretest	38	.002	Not Normal
	Posttest	38	.092	Normal
Attitude	Pretest	38	.053	Normal
	Posttest	38	.059	Normal

Based on the table above, it can be seen that for the knowledge variable, the pretest data is normally distributed, as indicated by a p-value greater than 0.05. However, the posttest data for knowledge is not normally distributed, as the p-value is less than 0.05. For the skills variable, both the pretest and posttest data are normally distributed, with p-values greater than 0.05. In the case of the behavior variable, the pretest data is not normally distributed, with a p-value less than 0.05, while the posttest data is normally distributed, with a p-value greater than 0.05. For the attitude variable, both the pretest and posttest data are normally distributed, as the p-values are greater than 0.05.

Table 3. The Impact of Polac-D Implementation Training on Respondents' Knowledge, Skills, Behavior, and Attitude

Variable	Group	Mean	Difference	Sig.
Knowledge	Pretest	8.05	-4.316	0.000
	Posttest	12.37		
Skills	Pretest	43.79	-39.737	0.000
	Posttest	83.53		
Behavior	Pretest	6.39	-5.684	0.000
	Posttest	12.08		
Attitude	Pretest	6.50	-5.579	0.000
	Posttest	12.08		

Based on the table 3 above, it is evident that: For the knowledge variable, the mean score during the pretest was 8.05, which increased to 12.37 after the training. This indicates that the training effectively enhanced the midwives' knowledge in providing antenatal care using the Polac-D approach. The statistical test yielded a p-value of 0.000, leading to the conclusion that the Polac-D implementation training significantly influenced the midwives' knowledge. Regarding the skills variable, the mean score during the pretest was 43.79, which rose to 83.53 after the training. This suggests that the training effectively improved the midwives' skills in providing antenatal care using the Polac-D approach. The statistical test yielded a p-value of 0.000, confirming that the Polac-D implementation training had a significant impact on the midwives' skills. For the behavior variable, the mean score during the pretest was 6.39, which increased to 12.08 after the training. This indicates that the training effectively enhanced the midwives' behavior in providing antenatal care using the Polac-D approach. The statistical test yielded a p-value of 0.000, supporting the conclusion that the Polac-D implementation training significantly influenced the midwives' behavior. Regarding the attitude variable, the mean score during the pretest was 6.50, which rose to 12.08 after the training. This suggests that the training effectively improved the midwives' attitudes in providing antenatal care using the Polac-D approach. The statistical test yielded a p-value of 0.000, confirming that the Polac-D implementation training had a significant impact on the midwives' attitudes.

4. Discussion

The research results indicate that for the knowledge variable, the mean score during the pretest was 8.05, which increased to 12.37 after the training. This suggests that the training effectively enhances midwives' knowledge in providing maternity care during pregnancy using the Polac-D method. The statistical test yielded a p-value of 0.000, allowing us to conclude that the implementation training of Polac-D significantly affects midwives' knowledge. For the skills variable, the pretest mean score was 43.79, which rose to 83.53 following the training. This indicates that the training improves midwives' skills in delivering maternity care during pregnancy with the use of Polac-D. The statistical analysis also resulted in a p-value of 0.000, confirming that the

implementation training of Polac-D has a significant impact on midwives' skills. Regarding the behavior variable, the mean score in the pretest was 6.39, which increased to 12.08 after the training. This implies that the training enhances midwives' behavior in providing maternity care during pregnancy with Polac-D. The statistical test provided a p-value of 0.000, leading to the conclusion that the Polac-D implementation training positively influences midwives' behavior.

Lastly, for the attitude variable, the pretest mean score was 6.50, which increased to 12.08 after the training. This indicates that the training improves midwives' attitudes in providing maternity care during pregnancy using Polac-D. The statistical analysis yielded a p-value of 0.000, confirming that the implementation training of Polac-D significantly affects midwives' attitudes. The Poltekkes Aceh-DJJ (PolAc-D) is a fetal well-being monitoring device that assesses fetal heart rate. This health tool has been designed and constructed in accordance with its intended functions. It has undergone trials and evaluations, demonstrating its effectiveness for use with pregnant women. While the functionality of this device is similar to other fetal heart rate monitors for monitoring the well-being of both the fetus and the mother, a distinguishing feature of the PolAc-D is its ability to record monitoring results directly into a specially designed web application. With this system, pregnant women, midwives, and doctors can monitor health developments in real-time, facilitating early detection of potential issues. The better the role of healthcare providers in educating about fetal movement monitoring, the more effective the self-assessment conducted by pregnant women, which in turn can enhance fetal well-being. Various studies in the health field indicate that many frontend Healthcare Intelligence System applications have been developed and have undergone Blackbox Testing, as well as being adjusted based on data obtained from prototypes (Assadullah, 2019; Bote-Curiel et al., 2019). This application is integrated with the backend through a designed API, allowing for efficient and secure data exchange. With this system, both pregnant women and midwives can effectively monitor the health of mothers and children, improving communication and collaboration in healthcare (Balakrishnan et al., 2016; Chib, 2010; Rowe BA et al., 2002). The counseling activities conducted also showed significant results in enhancing the knowledge of pregnant women. This is evident from the evaluations carried out through question-and-answer sessions with participants, where pregnant women could ask questions and receive clarification about the importance of health monitoring during pregnancy (Chang et al., 2018; Ten Hoop-Bender et al., 2014). This increase in knowledge not only contributes to better self-assessment but also equips pregnant women with the necessary information to make informed decisions regarding their health and that of their fetus.

5. Conclusion and future scope

The implementation of the Poltekkes Aceh-DJJ (PolAc-D) tool has significantly improved the knowledge, skills, behavior, and attitudes of midwives in providing prenatal care, as shown by the training outcomes. To sustain these improvements, ongoing training and regular refresher courses are essential. Additionally, continuous monitoring and evaluation of the tool's impact on maternal and fetal health should be established. Engaging the community to raise awareness among pregnant women about the importance of prenatal care is crucial. Furthermore, integrating the PolAc-D tool into standard healthcare practices across all facilities will enhance its accessibility. Finally, further research should investigate the long-term effects of this training on midwives' practices and health outcomes, allowing for potential scaling in other regions. By adopting these measures, healthcare providers can significantly enhance maternal and fetal care quality, ultimately improving health outcomes for mothers and their infants.

Ethical statement

This study was performed with approval from the Ethics committee of the Health Polytechnic of the Ministry of Health Aceh

Reference

- [1] Ahmed, S., Tholandi, M., Pedrana, A., Zazri, A., Parmawaty, N., Rahmanto, A., & Sethi, R. (2019). Changes in obstetric case fatality and early newborn mortality rates in hospitals after the implementation of the Expanding Maternal and Neonatal Survival program in Indonesia: Results from a health information system. *International Journal of Gynecology & Obstetrics*, 144, 13–20. <https://doi.org/10.1002/IJGO.12731>
- [2] Aplikasi, P., Pemantauan, U., Ibu, K., Anak, D., Aplikasi, P., Muhammad, F., Naufal, A., Muklason, A., Vinarti, R. A., Tyasnurita, R., & Riksakomara, E. (2022). Pengembangan Aplikasi Healthcare Intelligence System Untuk Pemantauan

- Kesehatan Ibu Dan Anak: Perancangan Aplikasi Frontend. JATISI (Jurnal Teknik Informatika Dan Sistem Informasi), 9(2), 1038–1052. <https://doi.org/10.35957/JATISI.V9I2.1902>
- [3] Assadullah, M. M. (2019). Barriers to Artificial Intelligence Adoption in Healthcare Management: A Systematic Review. SSRN Electronic Journal. <https://doi.org/10.2139/SSRN.3530598>
- [4] Balakrishnan, R., Gopichandran, V., Chaturvedi, S., Chatterjee, R., Mahapatra, T., & Chaudhuri, I. (2016). Continuum of Care Services for Maternal and Child Health using mobile technology - a health system strengthening strategy in low and middle income countries. BMC Medical Informatics and Decision Making, 16(1), 1–8. <https://doi.org/10.1186/S12911-016-0326-Z/TABLES/4>
- [5] Bote-Curiel, L., Muñoz-Romero, S., Gerrero-Curieses, A., & Rojo-álvarez, J. L. (2019). Deep Learning and Big Data in Healthcare: A Double Review for Critical Beginners. Applied Sciences 2019, Vol. 9, Page 2331, 9(11), 2331. <https://doi.org/10.3390/APP9112331>
- [6] Chang, Y. S., Coxon, K., Portela, A. G., Furuta, M., & Bick, D. (2018). Interventions to support effective communication between maternity care staff and women in labour: A mixed-methods systematic review. Midwifery, 59, 4–16. <https://doi.org/10.1016/J.MIDW.2017.12.014>
- [7] Chib, A. (2010). The Aceh Besar midwives with mobile phones project: Design and evaluation perspectives using the information and communication technologies for healthcare development model. Journal of Computer-Mediated Communication, 15(3), 500–525. <https://doi.org/10.1111/J.1083-6101.2010.01515.X>
- [8] Chiera, M., Cerritelli, F., Casini, A., Barsotti, N., Boschiero, D., Cavigioli, F., Corti, C. G., & Manzotti, A. (2020). Heart Rate Variability in the Perinatal Period: A Critical and Conceptual Review. Frontiers in Neuroscience, 14, 561186. <https://doi.org/10.3389/FNINS.2020.561186/BIBTEX>
- [9] Faradisa, I. S., Sardjono, T. A., & Purnomo, M. H. (2017). TEKNOLOGI PEMANTAUAN KESEJAHTERAAN JANIN DI INDONESIA. Prosiding SENIATI, 3(1), B32.1-6. <https://doi.org/10.36040/SENIATI.V3I1.1769>
- [10] Hamelmann, P., Vullings, R., Kolen, A. F., Bergmans, J. W. M., Van Laar, J. O. E. H., Tortoli, P., & Mischi, M. (2020). Doppler Ultrasound Technology for Fetal Heart Rate Monitoring: A Review. IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control, 67(2), 226–238. <https://doi.org/10.1109/TUFFC.2019.2943626>
- [11] Matonia, A., Jezewski, J., Kupka, T., Jezewski, M., Horoba, K., Wrobel, J., Czabanski, R., & Kahankowa, R. (2020). Fetal electrocardiograms, direct and abdominal with reference heartbeat annotations. Scientific Data 2020 7:1, 7(1), 1–14. <https://doi.org/10.1038/s41597-020-0538-z>
- [12] Rahmawati, A., Catur, R., & Wulandari, L. (2019). Influence of Physical and Psychological of Pregnant Women Toward Health Status of Mother and Baby. JURNAL KEBIDANAN, 9(2), 148–152. <https://doi.org/10.31983/JKB.V9I2.5237>
- [13] Rowe BA, R. E., Garcia, J. B., Macfarlane, A. J., Dip Stat Stat HonMFPHM, B. C., Davidson FRCPH FRCP MFPHM, L. L., & Rachel Rowe, C. E. (2002). Improving communication between health professionals and women in maternity care: a structured review. Health Expectations, 5(1), 63–83. <https://doi.org/10.1046/J.1369-6513.2002.00159.X>
- [14] Sheiham, A., & Watt, R. G. (2000). The Common Risk Factor Approach: a rational basis for promoting oral health. Community Dentistry and Oral Epidemiology, 28(6), 399–406. <https://doi.org/10.1034/J.1600-0528.2000.028006399.X>
- [15] Situmorang, H. E., Sweet, L., Graham, K., & Grant, J. (2022). Health care provider’s perceptions of factors that influence infant mortality in Papua Indonesia: A qualitative study. Women and Birth, 35(2), 201–209. <https://doi.org/10.1016/J.WOMBI.2021.04.007>
- [16] Stiyaningsih, H., Wicaksono, F., Tinggi, S., & Statistik, I. (2017). Impact of Women’s Empowerment on Infant Mortality in Indonesia. Article in Kesmas National Public Health Journal. <https://doi.org/10.21109/kesmas.v1i1i4.1259>
- [17] Syairaji, M., Nurdianti, D. S., Wiratama, B. S., Prüst, Z. D., Bloemenkamp, K. W. M., & Verschueren, K. J. C. (2024). Trends and causes of maternal mortality in Indonesia: a systematic review. BMC Pregnancy and Childbirth, 24(1), 1–14. <https://doi.org/10.1186/S12884-024-06687-6/FIGURES/4>
- [18] Ten Hoop-Bender, P., De Bernis, L., Campbell, J., Downe, S., Fauveau, V., Fogstad, H., Homer, C. S. E., Kennedy, H. P., Matthews, Z., McFadden, A., Renfrew, M. J., & Van Lerberghe, W. (2014). Improvement of maternal and newborn health through midwifery. The Lancet, 384(9949), 1226–1235. [https://doi.org/10.1016/S0140-6736\(14\)60930-2](https://doi.org/10.1016/S0140-6736(14)60930-2)

- [19] Titaley, C. R., Dibley, M. J., Agho, K., Roberts, C. L., & Hall, J. (2008). Determinants of neonatal mortality in Indonesia. *BMC Public Health*, 8(1), 1–15. <https://doi.org/10.1186/1471-2458-8-232/TABLES/4>
- [20] Triyuliandari, N., Adila, D. R., & Putri, D. K. (2023). Hubungan Peran Tenaga Kesehatan dengan Self Assessment Pemantauan Gerak Janin Pada Ibu Hamil. *HealthCare Nursing Journal*, 5(1), 601–609. <https://doi.org/10.35568/HEALTHCARE.V5I1.2860>
- [21] Utomo, B., Suahya, P. K., Romadlona, N. A., Robertson, A. S., Aryanty, R. I., & Magnani, R. J. (2021). The impact of family planning on maternal mortality in Indonesia: what future contribution can be expected? *Population Health Metrics*, 19(1), 1–13. <https://doi.org/10.1186/S12963-020-00245-W/TABLES/7>
- [22] Wayan, I., Anak, D., Istri, A., & Marhaeni, N. (n.d.). FACTORS AFFECT OF INFANT AND MATERNAL MORTALITY RATES IN WEST NUSA TENGGARA PROVINCE. *South East Asia Journal of Contemporary Business, Economics and Law*, 20.