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Published since 2025, the *Journal of Public Health Science and Practice (JPHSP)* is a scientific journal that publishes original research articles and review papers focusing on the advancement of public health science and its practical applications. The journal covers a broad range of topics including epidemiology, public health policy and management, health promotion and behavior, biostatistics and population health, environmental health, public health nutrition, occupational health and safety, and other related public health disciplines. All manuscripts submitted to JPHSP undergo a rigorous peer-review process conducted by experts in the relevant fields.

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CV. Scientia Litera
Deandles Street, RT 001/RW 009, Wadeng, Sidayu, Gresik, East Java 61153, Indonesia.
Phone : +62856-4527-5979 (Scientia Litera), +62857-9144-6720 (JPHSP)
Email : sciencelitera@gmail.com ; jurnaljphsp@gmail.com

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GUIDELINES FOR AUTHORS

A. Nature of the Articles

The *Journal of Public Health Science and Practice (JPHSP)* publishes original research articles and review papers that contribute to the advancement of public health science and its practical implementation. Manuscripts should address contemporary public health issues and provide scientific evidence relevant to policy, practice, and community health improvement.

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   The introduction should clearly describe the background and context of the study, articulate the research problem, and present a concise review of relevant and up-to-date literature. It must also state the research objectives and highlight the novelty or contribution of the study to public health science and practice. This section is generally written in 3–6 coherent paragraphs.

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Overview of Diarrhea Case Surveillance Based on The Implementation of The Surveillance System at The Public Health Center X City

Najwa Azzahra[1], Jihan Fadhillah[2], Khadijah Azzahra[3], Sarah Agustina[4], Zakia Rahmah[5], Rizky Aditya Hutomo[6]

[1-6]Public Health Science Study Program, Faculty of Public Health, State Islamic University of Sumatra, Medan 20134, Indonesia

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ABSTRACT

Diarrhea is still a serious public health problem in Indonesia. Based on the highest disease distribution data in Indonesia in 2025, acute diarrhea ranks second with a total of 2,372,498 cases, which shows that diarrhea is still a significant public health problem. The high prevalence of diarrhea in North Sumatra (4.7%) emphasizes the importance of evaluating the surveillance system at First Level Health Facilities (FKTP). The purpose of this study aims to describe the implementation of the diarrhea case surveillance system at the Community Health Center, X City. This descriptive qualitative research method uses in-depth interviews with Community Health Center surveillance officers. Data are analyzed qualitatively to obtain an overview of the implementation of diarrhea surveillance analysis remains simple descriptive. Follow-up and evaluation of the diarrhea surveillance system at the X Community Health Center (Puskesmas) has met the requirements for data collection and routine reporting as per regulations, but requires improvements in the quality of data analysis and strengthening of feedback mechanisms, supported by increased human resource capacity, so that the resulting data can be used more effectively in diarrhea control.

Corresponding Author:

Najwa Azzahra
Public Health Science Study Program, Faculty of Public Health, State Islamic University of Sumatra, Medan 20134, Indonesia
Email: rahmahzakia011@gmail.com

1. INTRODUCTION

Integrated surveillance also plays a crucial role in improving the quality of health services. Surveillance data can be used to monitor the performance of health programs, identify weaknesses in the service system, and measure the impact of interventions. Health surveillance is crucial for preventing disease outbreaks and is crucial for planning and decision-making regarding medium- and long-term strategic health programs. Tools are needed to facilitate the implementation of public health surveillance, including data calculation and analysis. To produce accurate data that can be used for health programs.

In the implementation of surveillance, there are several methods used, namely, Routine Reporting System, Sentinel Reporting System, Survey and Special Study, Outbreak Investigation,

Vital Registration System, Census (1). Effective surveillance activities can reduce the number of illnesses and detect disease trends. Surveillance activities can be carried out efficiently with a strong implementation system. An effective surveillance system consists of input, processing, and output components. The collected data will be a strong basis for decision-making on health program planning, implementation, and evaluation.

Furthermore, integrated surveillance serves as an early warning system for extraordinary events (KLB). By closely monitoring disease incidence, changes in distribution patterns, and the emergence of new diseases, surveillance can detect significant increases in cases early. This enables a rapid and appropriate response to prevent the spread of disease outbreaks. Furthermore, surveillance can identify vulnerable population groups, allowing for effective targeting of health interventions.

Integrated Disease Surveillance is a continuous cycle that includes data collection, analysis, interpretation, and dissemination. Through this process, we can gain a better understanding of disease trends, risk factors, and the effectiveness of health interventions. With integrated surveillance of this disease, the epidemiological picture of the disease will be known - the diseases with the most cases. Furthermore, plans can be developed for appropriate and effective programs tailored to the disease burden in the community. Diarrheal disease is also a public health problem in developing countries like Indonesia, due to its high morbidity and mortality (2). Diarrheal disease is endemic in Indonesia and is also a potential outbreak (KLB) disease that is often accompanied by death.

Diarrhea is defined as a disease characterized by changes in the shape and consistency of stools from soft to liquid and an increase in the frequency of bowel movements more than usual, namely 3 or more times a day, which may be accompanied by vomiting or bloody stools.

Health Surveillance is a systematic and continuous observation activity of data and information about the occurrence of diseases or health problems and conditions that influence the increase and transmission of diseases or health problems to obtain and provide information to direct control and mitigation measures effectively and efficiently.

Based on data on the distribution of the highest diseases in Indonesia in 2025, acute diarrhea ranked second with a total of 2,372,498 cases, indicating that diarrhea remains a significant public health problem. This high incidence is related to various factors, particularly the unequal availability of clean water, inadequate environmental sanitation, and suboptimal clean and healthy living practices, including in food and beverage processing. Vulnerable groups such as toddlers are at higher risk of experiencing acute diarrhea, which can result in dehydration and impaired nutritional status if not treated appropriately. From a health surveillance perspective, the large number of cases also reflects the still high burden of diarrheal disease in the community, so that sustainable prevention efforts are needed through improving sanitation, increasing access to clean water, and strengthening health education to reduce the incidence of diarrhea sustainably (3).

Figure 1. Developments of National Disease Situation (Ministry of Health, BKPK RI, 2023)

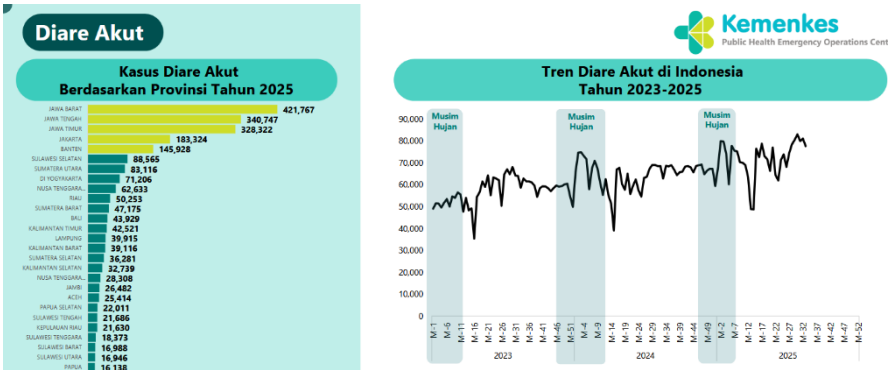

Figure 2. Acute Diarrhea Cases by Province in Indonesia (Ministry of Health, BKPK RI, 2023)

In Indonesia, diarrhea is a public health problem with a high prevalence. The 2023 Indonesian Health Survey found that the prevalence of diarrhea based on symptoms or diagnosis across all ages in Indonesia was 4.3%. One region showing a significantly high prevalence of diarrhea is North Sumatra. The prevalence of diarrhea based on diagnosis/symptoms in North Sumatra Province remains above the national prevalence of 4.7% (4).

Based on data on acute diarrhea cases in 2025, North Sumatra Province recorded 83,116 cases, placing it among the provinces with a relatively high burden of acute diarrhea compared to several other provinces in Indonesia. This figure indicates that acute diarrhea remains a public health problem that requires attention, especially considering the characteristics of the North Sumatra region, which has varied geographical conditions, population density, and disparities in access to sanitation and clean water between urban and rural areas. The high number of diarrhea cases in North Sumatra may be influenced by environmental factors, such as drinking water quality that does not fully meet health standards, suboptimal basic sanitation, and community clean and healthy living behaviors that still need to be improved (3).

Furthermore, climatic conditions and the rainy season have the potential to exacerbate the risk of diarrhea transmission through contaminated water sources. From a health surveillance perspective, the number of recorded cases also reflects the importance of strengthening monitoring and reporting systems at the health service level. Therefore, diarrhea control efforts in North Sumatra need to be integrated through improving environmental sanitation, providing safe, clean water, and strengthening public health education to sustainably reduce diarrhea incidence.

2. METHOD

This study employed a qualitative research method with a descriptive analysis approach. The aim of the study was to describe the implementation of the diarrheal disease surveillance system at the Community Health Center in X City. Data collection was conducted through in-depth interviews using interview guidelines developed based on the components of the surveillance system, including data collection, data processing and analysis, data interpretation, information dissemination, and follow-up and evaluation. The subjects were community health center surveillance officers directly involved in the implementation of diarrheal disease surveillance and were selected purposively. The data obtained were analyzed qualitatively through the stages of data reduction, data presentation, and conclusion drawing to obtain an overview of the implementation of the diarrheal disease surveillance system at the community health center.

3. RESULTS AND DISCUSSION

3.1 Collection of Diarrhea Case Surveillance Data

In this study, all research subjects have collected data on all elements of data collection, including:

3.1.1 People

People Includes characteristics of diarrhea sufferers, such as age, gender, risk age groups (especially toddlers), and the general condition of the sufferer related to susceptibility to disease.

3.1.2 Place

Place Includes the location where diarrhea cases occur based on administrative areas, such as villages/sub-districts, districts, cities/regencies, provinces, as well as the working areas of health service facilities.

3.1.3 Time

Relating to the time of occurrence and reporting of diarrhea cases, including the onset date, epidemiological week, and pattern of occurrence over time to see the trend of increasing or decreasing cases.

This is in line with the results of interviews conducted with surveillance officers at the Community Health Center in X City. The interviews stated that diarrheal disease surveillance data collection is carried out at the community health center through routine recording of all patients who come for treatment and are diagnosed with diarrhea, according to the operational definition of the surveillance disease. The data collected focuses on diseases that are a priority for surveillance, particularly diarrhea, by taking into account the number of cases reported in the community health center's work area.

Each case is systematically recorded based on the time of occurrence, allowing the collected data to reflect the magnitude and distribution of diarrhea cases at the primary healthcare level(5). Data recording and processing are conducted periodically, weekly, by summarizing patient data for one week(6). This weekly data is used to monitor the development and trends of diarrhea cases over time and to support early detection of potential increases in cases. The results of this surveillance are then used as reporting material to the health office and serve as the basis for planning and implementing diarrheal disease control and prevention efforts in the community health center (Puskesmas) work areas.

3.2 Surveillance Data Processing and Analysis

Based on Regulation of the Minister of Health of the Republic of Indonesia Number 45 of 2014, surveillance data processing is carried out through the stages of recording, recording, validating, and grouping data based on variables of person, place, and time(5). Data analysis is carried out to generate information on the distribution and trends of disease incidence. These stages aim to ensure that surveillance data can be used as a basis for decision-making and health program planning.

Interviews with surveillance officers at the Community Health Center in X City indicate that diarrhea case surveillance data processing at the center is carried out through routine recording of the number of patients diagnosed with diarrhea and is summarized weekly. This data is reported through the Early Warning and Response System (SKDR) and communicated to cross-sector stakeholders using *WhatsApp*. This implementation is in accordance with Minister of Health Regulation No. 45 of 2014, particularly in the aspects of recording, data processing, and surveillance reporting. However, data processing is still limited to a recapitulation of the number of cases and has not been fully presented in tables, graphs, or epidemiological measurements as recommended in surveillance guidelines.

The surveillance data analysis conducted at the community health center is still simple descriptive, simply monitoring the number of diarrhea cases over time as the basis for reporting. This condition is essentially in accordance with the provisions of Minister of Health Regulation No. 45 of 2014, but its implementation is not optimal due to limited human resources, where surveillance officers have dual duties *and* have not received special training. These limitations have the potential to impact the quality of analysis and utilization of surveillance data in diarrheal disease control efforts.

3.3 Analysis and Interpretation of Surveillance Data

Surveillance data analysis and interpretation are conducted to assist with weekly monitoring, monthly reporting, identification of at-risk areas, and the distribution of cases based on individual characteristics, time, and location (7). Surveillance data analysis and interpretation also aim to generate meaningful information as a basis for decision-making and determining follow-up actions.

Based on interviews with surveillance officers, it was discovered that the analysis and interpretation of surveillance data at the community health center was based on the types of diseases under surveillance, the number of cases, and disease incidence trends, which were inputted weekly. After processing the data, analysis and interpretation were conducted to obtain more complete information regarding diarrhea cases in the area.

3.4 Dissemination of Information and Feedback

Dissemination of information in line with surveillance guidelines which emphasize that surveillance data must be distributed in a hierarchical and timely manner to relevant parties, including across sectors, to support the early warning system and prevention of outbreaks of infectious diseases such as diarrhea.

Based on interviews with surveillance officers, dissemination of diarrheal disease surveillance information at the Community Health Center in X City is carried out through a routine reporting mechanism using the Early Warning and Response System (SKDR). Reporting is carried out weekly, by sending data on the number of cases and the number of sufferers through the SKDR, supported by cross-sector communication through WhatsApp groups, each of which has the contact number of the relevant officer. After the data is submitted, the system will provide a notification as a sign that the report has been received. However, feedback based on guidelines should be carried out periodically and in a structured manner, in the form of report attendance, data quality corrections, and follow-up recommendations to improve the quality of surveillance at the community health center level.

Interviews revealed that surveillance feedback was not yet optimal. Surveillance data was obtained from patient case records at community health centers and a weekly recap of patient visits based on priority surveillance diseases, including diarrhea. However, this was not accompanied by an explanation of written feedback, routine evaluations, or recommendations for data improvement from higher levels (e.g., district/city health offices).

Limited human resources (HR) are a major obstacle, as surveillance officers generally hold second jobs and not all have specialized surveillance backgrounds. Furthermore, there is a lack of specialized surveillance training. Consequently, officers' ability to analyze data and provide optimal feedback remains limited. Therefore, although information dissemination mechanisms are in place, the quality of diarrheal disease surveillance feedback still needs to be improved through human resource development and specialized surveillance training.

3.5 Follow-up and Evaluation

Action, or response, is the use of information obtained from the surveillance process to guide appropriate public health interventions. Without action, surveillance has no practical purpose. Evaluation is the process of assessing the effectiveness, efficiency, and quality of the surveillance system itself to ensure its objectives are achieved and resources are optimally utilized. Based on the interview results, the Community Health Center in X City implemented integrated follow-up actions aimed at relevant parties in diarrhea control efforts, including reporting case incidents through the SKDR and cross-sectoral coordination. The Community Health Center's internal system is designed to monitor service quality indicators.

Evaluations that can be conducted at this community health center include recruiting competent surveillance personnel in their respective areas of expertise, as well as providing ongoing training for Human Resources (HR) requiring skill enhancement. This data is then processed, analyzed, and communicated as constructive feedback to all staff for continuous improvement.

4. CONCLUSSION

Data collection includes elements of Person (patient characteristics, at-risk groups such as toddlers), Place (administrative area), and Time (onset date, epidemiological week). Recording is routinely conducted on patients diagnosed with diarrhea (8). This implementation is in accordance with the basic principles of surveillance, which include data collection based on epidemiological characteristics (person, place, time)(9).

The implementation of recording, processing, and reporting is in accordance with the Minister of Health Regulation No. 45 of 2014. However, data processing is not yet optimal because it is still limited to the recapitulation of the number of cases, and has not been presented completely in the form of tables, graphs, or epidemiological measurements.

Analysis is not optimal due to limited human resources; surveillance officers are double-tasked and lack specialized training. Information is disseminated routinely weekly through SKDR reporting and cross-sector communication via *WhatsApp* . This aligns with surveillance guidelines, which emphasize the timely and hierarchical distribution of data to relevant parties, including across sectors, to support early warning.

During the follow-up and evaluation phase, the Community Health Center in X City consistently reports diarrhea cases weekly to higher-level health authorities. Based on a comprehensive evaluation conducted by the Health Office, obstacles encountered in implementing diarrhea case surveillance have been identified and reviewed. In response, the Community Health Center has taken strategic steps to address these obstacles, including recruiting competent surveillance personnel in their respective areas of expertise and providing ongoing training for Human Resources (HR) requiring skill enhancement(10). With the implementation of an effective and robust feedback surveillance system, the Rambung Community Health Center is optimistic about increasing public trust, achieving the highest accreditation standards, and making improving public health a top.

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Knowledge and Motivation of Cadres in Efforts to Prevent Stunting During Postpartum and Breastfeeding Periods in Leminggir Village, Mojosari District, Mojokerto Regency

Elies Meilinawati SB[1], Nunuk Nurhayati[2]

[1]Midwifery, Sunan Gresik University, Gresik, Indonesia
[2]Midwifery, Artha Bodhi Iswara College of Health Sciences, Surabaya, Indonesia

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ABSTRACT

Maternal and child nutritional and health status are critical determinants of human resource quality. The periods of postpartum and breastfeeding are particularly vulnerable stages in the prevention of stunting. Posyandu cadres play a strategic role as frontline community health workers who directly assist postpartum and breastfeeding mothers through health education and community-based services. Adequate knowledge and strong motivation among cadres are essential to effectively support stunting prevention efforts. This study aimed to examine the relationship between knowledge and motivation of cadres in stunting prevention during the postpartum and breastfeeding periods in Leminggir Village, Mojosari District, Mojokerto Regency. This study employed a cross-sectional design. The population consisted of all maternal and child health cadres in Leminggir Village, with a total sampling technique involving 30 respondents. Data were collected using structured questionnaires measuring cadres' knowledge and motivation. Statistical analysis was conducted using the Spearman Rank test with SPSS. The results demonstrated a statistically significant association between cadres' knowledge and their motivation to prevent stunting during the postpartum and breastfeeding periods ($p = 0.02$; $p < 0.05$). Cadres who possessed greater knowledge were more likely to exhibit higher levels of motivation in carrying out stunting prevention interventions. Knowledge and motivation among Posyandu cadres are significantly associated with stunting prevention efforts during the postpartum and breastfeeding periods. Strengthening cadres' knowledge through continuous education and enhancing their motivation may improve the effectiveness of community-based stunting prevention programs.

Corresponding Author:

Elies Meilinawati SB
Midwifery, Sunan Gresik University, Gresik, Indonesia
Email: eliesmsb@gmail.com

1. INTRODUCTION

Maternal and child health and nutritional conditions play a fundamental role in shaping the quality of human capital. A mother's nutritional status, from pre-pregnancy through pregnancy, postpartum, and breastfeeding, is a critical period because it directly impacts a child's growth and development. Nutritional deficiencies during this period can have long-term consequences, including stunting. Stunting, a form of growth failure caused by chronic, long-term malnutrition, differs from acute malnutrition. This condition can begin during pregnancy due to inadequate

nutritional intake, suboptimal parenting patterns, poor dietary quality, and a high frequency of infections, all of which hinder a child's linear growth.(1) The effects of stunting generally begin to appear when a child is over two years old. Factors contributing to stunting include dietary intake, birth weight, medical history, breastfeeding, parental education level, the toddler's age, and the family's socioeconomic status.(2) Stunting continues to be a major global nutrition challenge. According to the World Health Organization (WHO), an estimated 148 million children under five years of age were affected by stunting in 2022, representing a global prevalence of 22.3%, while approximately 45 million children experienced wasting, with a prevalence of 6.8%. These figures underscore the persistent burden of malnutrition during early childhood. In Indonesia, the prevalence of stunting has demonstrated a consistent decline, decreasing from 24.4% in 2021 to 21.6% in 2022, and further to 15.8% in 2023. Similarly, East Java Province recorded a reduction in stunting prevalence from 23.5% in 2021 to 19.2% in 2022, and based on the 2023 Indonesian Health Survey (SKI), the rate further declined to 13.8% (3,4) Meanwhile, At the district level, Mojokerto Regency showed a marked improvement, with stunting prevalence falling sharply from 27.4% in 2021 to 11.6% in 2022, indicating substantial progress in addressing child undernutrition.

The impact of stunting is very serious because it not only inhibits physical growth but also affects a child's cognitive development, learning ability, and future productivity. In the short term, stunting can cause impaired brain development, intelligence, physical growth, and metabolism. In the long term, stunting increases the risk of cognitive decline, low academic achievement, weakened immune systems, and the risk of degenerative diseases such as diabetes, cardiovascular disease, obesity, and disability in adulthood. These impacts indirectly reduce the quality of human resources and the nation's competitiveness.(5)

Stunting prevention efforts are carried out through specific and sensitive nutrition interventions, with a primary focus on the First 1,000 Days of Life (HPK), which includes pregnancy, postpartum, and breastfeeding, up to 23 months of age. This period is considered a golden period (window of opportunity) because appropriate nutrition interventions have proven to be most effective in preventing stunting.(6) The government has launched various stunting prevention programs, including providing iron supplements to pregnant women, fulfilling the nutritional needs of pregnant and breastfeeding mothers, delivering babies by health workers, early initiation of breastfeeding, exclusive breastfeeding, providing appropriate complementary feeding (MP-ASI), complete basic immunizations, monitoring growth at integrated health posts (Posyandu), and implementing clean and healthy living behaviors.(2) In Mojokerto Regency, various regional innovations such as the Sehati Program (Selasa Sehat Turunkan AKB dan AKI/Healthy Tuesdays Reduce IMR and MMR) and Sejoli (Selasa Sehat Jaga Lansia Mandiri/Healthy Tuesdays Protect Independent Elderly) have been developed as an effort to accelerate stunting reduction.

Integrated health post (Posyandu) cadres play a strategic role at the forefront of public health services, interacting directly with postpartum and breastfeeding mothers through Posyandu activities and mothers' classes. Cadres' success in stunting prevention is strongly influenced by their knowledge and motivation. Strong knowledge enables cadres to convey health information accurately and comprehensively, while strong motivation encourages them to actively provide ongoing support and education. Cadres serve as extensions of community health centers (Puskesmas) in optimizing promotive and preventive programs in the community. (7) Therefore, increasing the knowledge and motivation of cadres is an important factor in supporting the success of stunting prevention programs, especially during the postpartum and breastfeeding periods.

Based on this background, this study aims to determine the relationship between knowledge and motivation of cadres in efforts to prevent stunting during the postpartum and breastfeeding periods in Leminggir Village, Mojosari District, Mojokerto Regency, which until now has not been widely studied in this area.

2. METHOD

This research is a quantitative study using a cross-sectional design. The population of this study were maternal and child health cadres in Leminggir Village, Mojosari District, Mojokerto Regency. The sample was taken using a total sampling technique with 30 respondents. The study was conducted on July 12, 2025. The independent variable was the cadres' knowledge in efforts to prevent stunting during the postpartum period and breastfeeding. The dependent variable was the

cadres' motivation in efforts to prevent stunting during the postpartum period and breastfeeding. The instrument used was a questionnaire about the cadres' knowledge and motivation. Data processing was carried out by editing, coding, scoring, data entry, and data tabulation. Bivariate analysis was performed using the Spearman Rank test.

3. RESULTS AND DISCUSSION

This research was conducted in Leminggir Village, Mojosari District, Mojokerto Regency, involving 30 health cadres as respondents. The variables studied included their knowledge and motivation in preventing stunting during the postpartum and breastfeeding periods. The following are the research results.

3.1 Knowledge of Cadres in Efforts to Prevent Stunting During Postpartum and Breastfeeding Periods in Leminggir Village, Mojosari District, Mojokerto Regency

Table 1. Cadres' Knowledge in Stunting Prevention During the Postpartum and Breastfeeding Period in Leminggir Village, Mojosari Subdistrict, Mojokerto Regency

No	Cadres' Knowledge	Frequency	Percentage (%)
1	Good	8	26.7
2	Fair	19	63.3
3	Poor	3	10.0
	Total	30	100

Based on Table 1, it can be seen that the majority of health cadres in Leminggir Village, Mojosari Subdistrict, Mojokerto Regency had a fair level of knowledge regarding stunting prevention during the postpartum and breastfeeding period, accounting for 63.3% of the respondents.

The results of this study demonstrate that the majority of community health cadres possessed a fair level of knowledge regarding stunting prevention during the postpartum and breastfeeding period. This finding indicates that cadres generally have sufficient baseline knowledge to support stunting prevention activities, particularly related to maternal nutrition during the postpartum period, optimal breastfeeding practices, and early monitoring of infant growth and development. These aspects are widely recognized as key determinants in preventing stunting during the first 1,000 days of life (8)(9).

The predominance of cadres with fair knowledge aligns with previous studies conducted in Indonesia, which reported that most health cadres demonstrate moderate knowledge levels as a result of routine training provided by primary healthcare centers and experiential learning in the community (10). However, moderate knowledge may not always translate into optimal performance, especially when cadres are required to provide individualized counseling or address complex maternal and infant nutrition problems (11,12).

Furthermore, the presence of cadres with poor knowledge, although limited in number, is a critical concern. Previous research has shown that inadequate knowledge among community health workers is associated with reduced effectiveness in delivering health education and lower confidence in counseling mothers during the postpartum and breastfeeding period (13). This gap may ultimately hinder the success of stunting prevention programs at the community level, particularly in rural settings where cadres serve as the primary source of health information for mothers (14).

These findings are consistent with behavioral health theory, which emphasize that knowledge functions as a predisposing factor influencing attitudes, motivation, and health-related behaviors (15). In the context of stunting prevention, cadres with better knowledge are more likely to provide accurate information, encourage appropriate breastfeeding practices, and promote adequate maternal nutrition, thereby supporting improved maternal and child health outcomes (8), (9).

Therefore, strengthening cadres' knowledge through continuous, structured, and needs-based training programs is essential. Evidence suggests that regular refresher training, supportive supervision, and the use of standardized educational materials significantly improve cadres' competencies and effectiveness in maternal and child health interventions (15). Enhancing cadres' knowledge is also expected to reinforce their motivation and commitment, which are crucial for sustaining community-based stunting prevention efforts during the postpartum and breastfeeding period.

3.2 Motivation of Cadres in Efforts to Prevent Stunting During Postpartum and Breastfeeding Periods in Leminggir Village, Mojosari District, Mojokerto Regency

Table 2. Cadres' Motivation in Stunting Prevention During the Postpartum and Breastfeeding Period in Leminggir Village, Mojosari Subdistrict, Mojokerto Regency

No	Cadres' Knowledge	Frequency	Percentage (%)
1	Good	13	43.3
2	Fair	15	50
3	Poor	2	6.7
	Total	30	100

Based on Table 2, half of the cadres (50.0%) demonstrated a fair level of motivation in implementing stunting prevention efforts during the postpartum and breastfeeding period in Leminggir Village, Mojosari Subdistrict, Mojokerto Regency.

Furthermore, most of the other cadres demonstrated good motivation, so it can be generally said that cadres have a relatively positive drive in carrying out their roles at the integrated health post (Posyandu). The adequate to good motivation of cadres in this study can be influenced by several factors. First, intrinsic motivation, namely the cadres' desire to voluntarily participate in Posyandu activities. Second, age, as most cadres are adults and older, still possess a high work ethic and commitment to carrying out their duties. Third, almost all cadres have participated in cadre training, which contributes to increased self-confidence and readiness in carrying out their role as health cadres. Furthermore, most cadres have more than five years of work experience, thus understanding their duties and responsibilities in Posyandu services. This is reinforced by the respondents' educational level, the majority of whom have a high school diploma or equivalent, which allows cadres to more easily access and understand information related to maternal and child health, including stunting prevention (16).

Good cadre motivation is a crucial factor in the successful implementation of Posyandu activities. Motivated cadres will be more active in Posyandu (Integrated Health Post) visits, more consistent in providing services, and more optimal in carrying out their educational and promotive roles for postpartum and breastfeeding mothers. Positive impacts of high motivation include improved quality of Posyandu services and a tangible contribution to improving the health of mothers, infants, and toddlers in the community (16), (17)

Empirical evidence suggests that work experience and age are associated with increased practical skills, confidence in clinical and counseling tasks, and consistency in task performance; these, in turn, contribute to stronger motivation and improved performance in public health services. Cross-site studies and systematic reviews have found that demographic factors such as age and experience influence CHWs'/posyandu cadres' ability to record, use work aids, answer mothers' questions, and effectively implement maternal–child health interventions. (18)

Overall, motivation is a key driving factor influencing cadre behavior and performance in integrated health post (Posyandu) services. Cadres with high motivation tend to exhibit more active, enthusiastic, and responsible behavior in efforts to prevent stunting during the postpartum and breastfeeding periods. Therefore, efforts to increase cadre motivation need to be continuously implemented through training, ongoing coaching, and support from community health centers and relevant policymakers to achieve optimal cadre performance.

3.3 Knowledge and Motivation of Cadres in Efforts to Prevent Stunting During Postpartum and Breastfeeding Periods in Leminggir Village, Mojosari District, Mojokerto Regency

Table 3. Relationship between Cadres' Knowledge and Motivation in Stunting Prevention During the Postpartum and Breastfeeding Period in Leminggir Village, Mojosari Subdistrict, Mojokerto Regency

No	Cadres'Knowledge	Good Motivation		Fair Motivation		Poor Motivation		Total	
		Frequency	(%)	Frequency	(%)	Frequency	(%)	Frequency	(%)
1	Good	5	62.5	3	37.5	0	0.0	8	100
2	Fair	8	42.1	11	57.9	0	0.0	19	100
3	Poor	0	0.0	1	33.3	2	66.7	3	100
	Total	13	43.3	15	50.0	2	6.7	30	100

Based on the results of the study on table 3, cadres with good knowledge were predominantly found to have good motivation (62.5%). Cadres with a fair level of knowledge were mostly found to have fair motivation (57.9%). Most cadres with low levels of knowledge also exhibited low motivation (66.7%). Moreover, the Spearman rank correlation analysis performed using SPSS yielded a p-value of 0.02 ($p < 0.05$), indicating a statistically significant association between cadres' knowledge and motivation in stunting prevention efforts during the postpartum and breastfeeding periods in Leminggir Village, Mojosari Subdistrict, Mojokerto Regency.

The findings of this study indicate that the majority of community health cadres possessed a fair level of knowledge and fair to good motivation in implementing stunting prevention efforts during the postpartum and breastfeeding period. Furthermore, statistical analysis demonstrated a significant association between cadres' knowledge and motivation, indicating that higher levels of knowledge tend to be accompanied by stronger motivation in carrying out cadre roles.

Knowledge is widely recognized as a fundamental determinant influencing motivation and behavior in health service delivery. Cadres with adequate knowledge are better equipped to understand the importance of maternal nutrition during the postpartum period, optimal breastfeeding practices, and early monitoring of infant growth. This understanding fosters confidence and internal motivation to actively engage in counseling, education, and community outreach activities related to stunting prevention (15), (8). Conversely, cadres with insufficient knowledge may experience uncertainty and reduced self-efficacy, which can negatively affect their motivation and performance in providing maternal and child health services (19).

The results of this study are consistent with previous research showing that moderate knowledge alone does not always translate into optimal performance, particularly when community health workers are required to deliver individualized counseling or manage complex maternal and infant nutrition issues. Studies conducted in low- and middle-income countries have reported that cadres with limited or moderate knowledge often struggle with problem-solving and effective communication during counseling sessions, leading to reduced confidence and motivation (12), (19), (20). This finding underscores the importance of strengthening cadres' technical knowledge to support sustained motivation and effective service delivery.

Overall, the significant relationship between knowledge and motivation observed in this study supports behavioral health theories that identify knowledge as a predisposing factor for motivation and action. Improving cadres' knowledge through structured training, regular refresher courses, and supportive supervision is therefore essential not only to enhance technical competence but also to strengthen motivation and commitment. Integrated capacity-building approaches that address both knowledge and motivational aspects are likely to improve cadres' performance and contribute to more effective stunting prevention during the critical postpartum and breastfeeding period.

4. CONCLUSION

This study concludes that the majority of community health cadres in Leminggir Village, Mojosari Subdistrict, Mojokerto Regency demonstrated a fair level of knowledge and fair to good motivation in implementing stunting prevention efforts during the postpartum and breastfeeding

period. These findings indicate that cadres generally possess adequate baseline capacity to support postpartum and breastfeeding interventions aimed at reducing the risk of stunting.

The results also reveal a statistically significant relationship between cadres' knowledge and motivation, suggesting that improved knowledge is associated with stronger motivation to actively engage in stunting prevention activities. Cadres with better knowledge tended to demonstrate higher motivation, while those with limited knowledge were more likely to exhibit lower motivation in performing their roles.

Overall, the findings highlight the importance of strengthening cadres' knowledge as a key strategy to enhance motivation and optimize their contribution to stunting prevention during the critical postpartum and breastfeeding period. Continuous education and capacity-building initiatives are therefore essential to ensure effective and sustainable community-based stunting prevention efforts.

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Evaluation of the Tuberculosis (TB) Epidemiological Surveillance System at Matsum City Health Center

Raudhiyah Hasanah Rambe[1], Azra Muzaiyana Nasution[2], Arini Dwi Rahmadani[3], Dinda Purnama Sari[4], Rizky Aditya Hutomo[5]

[1-5]Public Health Study Program, Faculty of Public Health, State Islamic University of North Sumatra, Medan, Indonesia

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ABSTRACT

Tuberculosis (TB) is an infectious disease that remains a global public health challenge, including in Indonesia, requiring control through an effective epidemiological surveillance system at the primary health care level. This study aims to evaluate the TB surveillance system at Matsum City Health Centerbased on input, process, and output components, as well as surveillance attributes that include simplicity, flexibility, timeliness, data quality, and stability. The study used a descriptive qualitative approach with data collection through in-depth interviews and observations. The results showed that TB surveillance had been implemented in accordance with national guidelines and reporting was carried out in a timely manner, but there were still limitations in terms of the number of officers, funding, and operational facilities. Data quality and completeness are not yet optimal, and data analysis is still simple, so that output is limited to routine reports. The attributes of simplicity and timeliness are good, while flexibility, data quality, and system stability still need to be strengthened. Overall, the TB surveillance system at Matsum City Health Centeris functioning, but requires strengthening of resources and analytical capacity to support more effective TB control.

Corresponding Author:

Raudhiyah Hasanah Rambe
Public Health Study Program, Faculty of Public Health, State Islamic University of North Sumatra, Medan, Indonesia
Email: raudhiyahrambe@gmail.com

1. INTRODUCTION

Tuberculosis (TB) is one of the infectious diseases that remains a significant challenge to global public health, including in Indonesia (1). The Global TB Report 2023 shows that in 2022, tuberculosis was the second leading cause of death worldwide after COVID-19, with 1.3 million deaths. Globally, more than 10 million people are infected with tuberculosis each year, indicating the high rate of transmission and epidemiological burden of this disease (2). The situation in Indonesia is equally alarming, with the country ranking second in 2023 as the country with the highest number of TB cases in the world after India. The estimated number of TB cases reaches 824,000, with a death toll of around 93,000 per year, or the equivalent of 11 deaths every hour (3). Thus, tuberculosis remains a significant health challenge and threat both globally and

nationally, making its control a top priority on the global health agenda and one of the key targets of the Sustainable Development Goals (SDGs)(4)

Despite various control programs being implemented, TB remains high on the list of causes of death, especially in areas with high population density. This situation shows that control efforts need to be continuously optimized, one of which is through strengthening the epidemiological surveillance system. TB surveillance is the systematic and continuous monitoring of case data and transmission factors to provide accurate, complete, and timely information to support effective and efficient TB control (5). The implementation of this surveillance is regulated in Minister of Health Regulation No. 67 of 2016 as a guideline for health care facilities (6).

However, the effectiveness of the TB surveillance system is highly dependent on the quality of its implementation at the primary care level. Evaluation is important to assess program performance, review achievements, and identify obstacles in the implementation of surveillance. This assessment covers input, process, and output indicators, where inputs include the 5M components (man, money, material, machine, method, and market), while processes and outputs are tailored to management needs to ensure overall surveillance quality(5). In addition, the evaluation also considers surveillance attributes according to the Centers for Disease Control (CDC), which include simplicity, flexibility, data quality, acceptability, sensitivity, positive predictive value, representativeness, timeliness, and stability (7). This evaluation is generally conducted over a longer period of time, usually every 6 months to 1 year (8).

At the primary care level, Matsum City Health Centeris one of the health facilities in the Medan Area Subdistrict that plays a strategic role in the implementation of tuberculosis (TB) epidemiological surveillance. The puskesmas's service area is one of the contributors to TB cases in the city of Medan, so the quality of surveillance implementation is very important to ensure the accuracy of case detection, completeness of records, and timeliness of reporting. However, to date, research specifically evaluating the TB surveillance system at this health center has been limited. Therefore, this study aims to evaluate the implementation of the TB epidemiological surveillance system at Matsum City Health Centerbased on five surveillance attributes, namely simplicity, flexibility, timeliness, data quality and stability, and to assess performance through input, process, and output indicators.

2. METHOD

This study used a qualitative approach with a descriptive study design to gain an in-depth understanding of the implementation of the TB epidemiological surveillance system at Puskesmas Kota Matsum. Informants were selected through a purposive sampling technique and consisted of TB program officers who had knowledge and direct involvement in monitoring TB cases, including recording, analysis, and reporting activities (9). This selection was intended to ensure that the data obtained accurately and comprehensively reflected the actual conditions of TB surveillance implementation. Primary data were collected through in-depth interviews, observations, and documentation reviews. Interviews were conducted using a semi-structured guideline developed based on input, process, and output components, as well as five surveillance attributes: simplicity, flexibility, timeliness, data quality, and stability. Observations and documentation reviews were carried out to verify the implementation of case monitoring, recording, analysis, and reporting, as well as the availability of facilities and the completeness of program documents.

3. RESULTS AND DISCUSSION

The results of interviews with one informant regarding the implementation of the Tuberculosis (TB) surveillance system at Matsum City Health Centerwere summarized based on three indicators, namely input, process, output, and compared with the ideal conditions based on the applicable guidelines, namely the Decree of the Minister of Health/KMK No. 1116 of 2003 and Regulation of the Minister of Health/PMK No. 67 of 2016 in Table 1.

Table 1. Research Results Matrix

Indicators	Existing Conditions	Ideal
Condition Input		
a. Man	Number of TB officers: 1 person	There must be at least one fully responsible/trained officer, for example one trained TB Program Manager.
	Training for TB program officers was conducted properly	Initial training (comprehensive training) and periodic refresher training (at least every 5 years) to strengthen skills.
b. Money	Funding source: funds used for TB surveillance activities at the Community Health Center from BOK (Health Operational Assistance)	Funding sources: State Budget, Regency/City Budget, Provincial Budget, Foreign Aid, National and Regional Aid, and community self-help.
	Fund allocation: The distribution of funds from the BOK is often cut or allocated to other important activities, thereby limiting active monitoring activities.	Fund allocation: Sufficient and adequate to support active and passive surveillance activities, as well as TB case finding.
c. Material	Available resources: Computers, internet network, TCM tools, TB forms	Means used: Electromedia network, communication tools, library resources, TB surveillance implementation guidelines and their application program, surveillance equipment, surveillance forms.
	Vehicles: No official vehicles are available for active surveillance/home visits to patients. Officers use their personal vehicles.	Adequate transportation is available for conducting active surveillance and home visits.
d. Method	Implementation guidelines, technical instructions, and SOPs for TB surveillance activities are available and refer to the latest regulations (PMK No. 67 of 2016).	Guidelines/Technical Guidelines: Implementation guidelines, technical instructions, decrees, etc.
e. Market	The targets for information dissemination include cross-program parties (MCH, Nutrition), cross-sector parties (Village Heads/Sub-district Heads), cadres, and communities in the Puskesmas working area.	Information dissemination targets: Cross-program and cross-sector parties, policy makers, the public.
Process		
a. Data Collection	Methods used: Active surveillance (visits to patients) and passive surveillance (receiving reports from other health facilities/patient visits to community health centers).	Methods used: Active and passive surveillance.
	Completeness of reports (reporting units): 90% sent by health facilities/Puskesmas to the District Health Office.	Completeness of reports: 100%.
	Timeliness of reporting (reporting unit): on time	Reporting timeliness: 100%.
	Data recording, validation, coding, transformation, and grouping based on place, time, and person were carried out.	Data processing: Data recording, validation, coding, transformation, and grouping based on place, time, and person.
b. Data Analysis and Interpretation	Data analysis: Descriptive univariate analysis (by gender, age, and location) was performed using Microsoft Excel.	Data analysis: Descriptive and/or analytical epidemiological methods.
	Data interpretation results: presentation format, e.g., in the form of monthly tables/graphs]	Data interpretation results: Presented in infographics (tables, graphs, maps) according to gender, location, and time variables.

c. Dissemination of Information	Dissemination is carried out in the form of: internal meetings, feedback to relevant cadres/units, periodic reports. Feedback to data sources/related units: achieved 90%	Dissemination is carried out in the form of: Meetings and periodic reports, including feedback to data sources. Feedback to data source/related unit: 100%.
Output		
a. Information	Surveillance output: Output in the form of Monthly TB Reports and Patient Cohort Records used for internal evaluation.	Surveillance output: Epidemiological Surveillance Profile (for the district/city level) or specific, comprehensive, and clear periodic reports.

Based on Table 1 above, it can be seen that the implementation of the TB surveillance system at Matsum City Health Centerstill shows differences between the current conditions and the expected conditions. These differences are seen in the input, process, and output components that affect the implementation of TB surveillance.

3.1 Input Components

3.1.1 Man

The implementation of TB surveillance at Matsum City Health Centeris supported by only one TB officer who performs several program tasks. This condition is not ideal because the high workload has the potential to reduce the quality of recording and reporting, as well as limiting the implementation of active surveillance such as home visits and contact tracing. The limited number of officers also impacts the suboptimal supervision and assistance provided to health facilities partnered with the health center, including clinics and hospitals. These findings are in line with the research by Pradipta et al. (2022), which states that limited health personnel and high workloads are major obstacles to the implementation of TB surveillance and services in primary health facilities (10). The WHO (2023) also emphasizes that a shortage of trained personnel can reduce the quality of surveillance data, especially in terms of completeness and timeliness of reporting (11).

3.1.2 Money

The results of the study show that funding for TB surveillance at Matsum City Health Centercomes from Health Operational Assistance (BOK). However, the allocation of these funds is often limited because they must be shared with other program needs, so that active surveillance activities cannot be carried out optimally. This condition is not in line with the ideal condition which requires adequate funding support to support sustainable TB surveillance activities. These findings are in line with the Joint External Monitoring Mission Indonesia report, which states that limited budgetary support at the regional level remains a major challenge in strengthening the TB surveillance system (12). Other studies also show that active case finding requires relatively large costs and tends to be hampered when funding support is insufficient (13,14).

3.1.3 Material

In terms of facilities and infrastructure, the results of the study show that the Puskesmas already has basic facilities such as computers, internet networks, TB forms, and Rapid Molecular Tests (RMT). However, limited diagnostic facilities and the lack of operational transportation for active surveillance and home visits are major obstacles. This situation does not meet the ideal standards for TB surveillance. These findings are in line with previous studies which state that limited diagnostic and operational facilities can hinder accurate diagnosis and slow down TB case reporting, thereby impacting the effectiveness of TB control (15).

3.1.4 Method

From a methodological perspective, the results of the study indicate that guidelines for TB surveillance, technical instructions, and SOPs are available and refer to Minister of Health Regulation No. 67 of 2016 (6). The availability of these guidelines supports the uniformity of surveillance implementation and serves as a reference for case recording and reporting. This condition is in line with the WHO (2024) recommendation, which emphasizes that compliance with

standard guidelines is an important factor in maintaining the quality and comparability of TB surveillance data between regions (16). Previous studies have also shown that non-compliance with guidelines and SOPs in surveillance implementation has an impact on the low quality of TB data produced (17).

3.1.5 Market

The results of the study show that the dissemination of TB surveillance information has reached across programs, sectors, cadres, and communities. This coverage supports the use of surveillance data as a basis for program planning and decision-making. These findings are in line with WHO guidelines (2022), which emphasize that the widespread dissemination of surveillance results to stakeholders is an important component of TB control (16).

3.2 Process Components

3.2.1 Data Collection

Based on the results of the study, TB surveillance data collection was conducted through both active and passive surveillance. Reporting timeliness has generally been achieved; however, based on interview findings with TB officers, the completeness of reports was estimated at approximately 90%, which is still below the ideal target of 100%. This condition is influenced by staff turnover and limited technical capacity in data management. These findings indicate that although timeliness is relatively good, data quality still requires improvement. This is consistent with the study by Ferizqo et al. (2024), which highlights that staff assignment stability and training significantly affect the completeness and timeliness of TB surveillance reporting (18).

3.2.2 Data Analysis and Interpretation

The results of the study show that the analysis and interpretation of TB surveillance data are still largely descriptive, limited to the distribution of cases by person, place, and time, so that its use for identifying risk factors and planning interventions is still limited. This condition is in line with the WHO (2023) recommendation, which emphasizes the importance of strengthening data analysis capacity at the health service level so that surveillance data can be optimally utilized in evidence-based decision making (11).

3.2.3 Information Dissemination

The dissemination of TB surveillance information is carried out through routine reports, internal meetings, and feedback to reporting units, but the coverage of feedback has only reached 90%. In addition, the use of digital media and data visualization is still limited. This condition is in line with the findings of Pratiwi et al. (2025), which show that communicative and visual-based presentation of surveillance data plays an important role in increasing the use of information by health program stakeholders (19).

3.3 Output Components

3.3.1 Information

The results of the study show that the main output of TB surveillance is still in the form of monthly TB reports and patient cohort records, which are mainly used for internal evaluation. However, the lack of comprehensive, specific, and structured TB surveillance reports means that the information produced is not optimal in supporting program planning and evaluation. This situation is in line with the WHO (2022) recommendation, which emphasizes the importance of specific, systematic, and structured disease surveillance reports so that they can be used effectively in TB control (16).

3.3.2 Evaluation of the TB Epidemiological Surveillance System

Based on the discussion of input, process, and output components, it is known that the implementation of the TB epidemiological surveillance system at Matsum City Health Centerhas been running, but various obstacles that affect the overall performance of the system are still found. To obtain a more comprehensive picture of the quality and effectiveness of the surveillance system, further evaluation using surveillance attributes is needed. Therefore, the following section

evaluates the TB epidemiological surveillance system based on five surveillance attributes, namely simplicity, flexibility, timeliness, data quality, and stability.

a. Simplicity

The simplicity of the TB surveillance system at Matsum City Health Centerhas been conceptually supported by the availability of national guidelines and SOPs. However, the results of the study show that the limited number of officers has made surveillance in the field more complex, especially since officers have to perform multiple program tasks. This condition has increased their workload and made it difficult to implement surveillance procedures consistently. These findings are in line with the World Health Organization (WHO, 2022) guidelines, which emphasize that the simplicity of a surveillance system is not only determined by the clarity of the guidelines, but also by the adequacy of human resources so that procedures can be carried out effectively at the primary care level (20). In addition, research by Wafiroh et al. (2024) shows that the limited number of TB officers in health centers causes the surveillance system to be less simple in practice, even though the recording and reporting flow has been standardized (17). The study by Sihaloho et al. (2025) also found that the complexity of TB recording and reporting in health centers increases when staff workload is high and operational support is limited (21). This reinforces the research findings that the simplicity of the TB surveillance system is greatly influenced by the balance between staff workload and available resource support.

b. Flexibility

The results of the study show that the TB surveillance system at Matsum City Health Centerhas implemented active and passive surveillance. However, the flexibility of its implementation is still limited due to funding constraints and the availability of operational facilities, especially for active case finding activities in the community. These limitations mean that the system's ability to adapt to field requirements and changes in the epidemiological situation is not yet optimal. These findings are in line with the research by Zahrah and Ekaputra (2025), which shows that the flexibility of the TB surveillance system at the primary health care level is greatly influenced by the adequacy of the budget and support for operational facilities (22). These resource constraints have a direct impact on the low intensity of active surveillance activities and the use of data for TB control in the community. In addition, Benu et al. (2024) also reported that the TB surveillance system at the district level tends to be less flexible when it comes to adjusting activities due to resource constraints and cross-program coordination (23). Therefore, the flexibility of the TB surveillance system at Matsum City Health Centerstill needs to be strengthened, especially in terms of input components.

c. Timeliness

The timeliness of TB surveillance reporting at Matsum City Health Centerhas been running well and in accordance with the established reporting schedule. This condition shows the commitment of officers in carrying out their reporting obligations on a regular basis despite facing resource constraints. The results of this study are in line with the findings of Benu et al. (2024), who stated that the timeliness of reporting is one of the attributes of TB surveillance that is relatively easy to achieve compared to other attributes, as long as the reporting flow is clear and officers understand the applicable recording mechanisms (23). Another study by Syahreni et al. (2023) also shows that timely TB reporting at the provincial level can be achieved well despite obstacles in data quality and utilization (24). This reinforces the finding that timeliness is one of the strengths of the TB surveillance system at Puskesmas Kota Matsum.

d. Data Quality

Although reporting has been carried out in a timely manner, the quality of TB surveillance data at Matsum City Health Centerstill faces challenges, particularly in terms of data completeness and utilization for program planning. Limited capacity of officers in data analysis and validation has resulted in suboptimal information. These findings are in line with the research by Zahrah and Ekaputra (2025), which shows that the quality of TB surveillance data in primary health care facilities is still influenced by limitations in training, supervision, and data validation processes that are not yet running optimally (22). In addition, Ke lele et al. (2024) also reported that the low quality of TB surveillance data has an impact on the suboptimal use of information in program

decision-making (25). Thus, improving data quality by strengthening staff capacity and routine supervision is an important requirement in the TB surveillance system at Puskesmas Kota Matsum.

e. Stability

The stability of the TB surveillance system at Matsum City Health Centeris still vulnerable due to its dependence on a single officer and limited funding. This condition has the potential to disrupt the continuity of the surveillance system in the event of staff turnover, increased workload, or delays in budget support. This is in line with the research by Syahreni et al. (2023), which states that TB surveillance systems that are not supported by a clear organizational structure and sustainable funding tend to be unstable and difficult to maintain in the long term (24). In addition, Kalali et al. (2021) emphasized that the stability of the TB surveillance system is greatly influenced by the continuity of funding and institutional support, where weak support can hamper the long-term operational sustainability of the system (26). Therefore, the TB surveillance system at Matsum City Health Centerstill needs to be strengthened in terms of human resources, institutional aspects, as well as policy support and sustainable funding.

Analysis of the TB surveillance system at Matsum City Health Centerbased on five surveillance attributes shows that system performance is influenced by resource limitations, analytical capacity, and sustainability of activities. These findings are consistent with various studies in the last five years which confirm that the effectiveness of TB surveillance at the primary care level is highly dependent on the strength of input, process, and output components.

4. CONCLUSION

The implementation of the tuberculosis (TB) epidemiological surveillance system at Matsum City Health Centerhas been running smoothly and adheres to national guidelines, but its performance has not been fully optimized. Evaluations indicate that the input component still faces limitations, particularly in human resources, funding, and operational facilities, which impact the limited implementation of active surveillance. In the process component, reporting timeliness has been achieved, but report completeness, data analysis and interpretation capacity, and information dissemination still need improvement. Meanwhile, in the output component, the surveillance information produced is still limited to routine reports and has not been comprehensively organized to support optimal TB control program planning and evaluation.

Based on an evaluation of five surveillance attributes, the TB surveillance system at Matsum City Health Centerdemonstrates strengths in timeliness, but still has weaknesses in simplicity, flexibility, data quality, and stability, which are influenced by limited resources and technical capacity of staff. The policy implications of these findings emphasize the need for stronger support from local governments and relevant stakeholders, particularly in providing adequate surveillance personnel, allocating sustainable funding, and strengthening the capacity of officers through regular training and supervision. In addition, the development of a more integrated reporting system and optimal utilization of surveillance data is expected to increase the effectiveness of decision-making and program planning, so that TB control at the primary health care level can run more effectively and sustainably.

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Overview of Preconception Education Knowledge of Prospective Brides of Childbearing Age in the KUA Area of Sidoarjo District

Winda Nur Musfiroh Agustin[1], Yuninda Loviana Ersianti[2]

[1,2]Midwifery Department, Faculty of Health Sciences and Psychology, Universitas Sunan Gresik

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ABSTRACT

Preconception health is a critical component of reproductive health that influences maternal and neonatal outcomes. Adequate knowledge during the preconception period enables women to prepare physically and mentally for pregnancy, reducing the risk of adverse outcomes such as anemia, prematurity, and low birth weight. However, women's understanding of preconception care remains suboptimal due to limited access to information and health services. This study aimed to describe the level of knowledge of women of childbearing age regarding preconception care. This descriptive study employed a survey design and was conducted at the Office of Religious Affairs (KUA) in Sidoarjo District. A total of 32 prospective brides were recruited using a total sampling technique. Data were collected using a 20-item questionnaire adapted from Fyzria Qudratullah (2021). Instrument validity was tested using the Rasch Model, while reliability was assessed using Cronbach's Alpha and Composite Reliability. Data were analyzed using univariate analysis with SPSS version 27. Findings showed that almost all respondents (97.2%) had a low level of knowledge regarding preconception care, while only 2.8% demonstrated moderate knowledge. Despite the provision of reproductive health education by health workers, knowledge related to preconception health, pregnancy preparedness, and risk factors remains insufficient. The study highlights a substantial gap between the need for preconception health information and the level of knowledge among prospective brides. Strengthening structured and continuous educational interventions, including the use of digital-based approaches, is essential to improve preconception health literacy and promote preventive behaviors. Enhancing the capacity of healthcare providers to deliver effective preconception counseling also plays a strategic role in improving reproductive health outcomes.

Corresponding Author:

Winda Nur Musfiroh Agustin
Midwifery Department, Faculty of Health Sciences and Psychology, Universitas Sunan Gresik
Email: wnm.agustin@lecturer.usg.ac.id

1. INTRODUCTION

Women's reproductive health is a crucial component in improving the quality of life within the community, especially in efforts to prepare for an optimal pregnancy. The preconception period, which refers to the time before pregnancy occurs, plays an important role in determining the health status of both the mother and the baby in the future. During this phase, appropriate

planning and education can help women prepare themselves physically and mentally before conceiving, thereby reducing the risk of various complications during pregnancy and childbirth (1).

Although the Ministry of Health Regulation No. 97 of 2014 has established guidelines for pre-pregnancy health services, its implementation in the field has not been optimal. Various pre-pregnancy health problems such as Chronic Energy Deficiency (CED), anemia, and HIV infection—are still frequently encountered. Moreover, newborn conditions such as prematurity, low birth weight (LBW), and congenital anomalies remain significant issues that require greater attention (2).

Data from the 2023 Indonesia Health Survey (SKI) show that several maternal and newborn health indicators in Indonesia are still at a concerning level. The prevalence of stunting among children under five reached 21.5%. Approximately 17% of pregnant women experienced CED, a condition that can lead to complications such as preterm birth and LBW. The rate of anemia among pregnant women was also high, at 28%, contributing to the high proportion of LBW infants, which reached 6.1%. In addition, the preterm birth rate of 11.1% further increases the risk of health problems in newborns, both at birth and thereafter. Meanwhile, detailed data on the prevalence of congenital anomalies have not yet been published (3–5).

Preconception education forms an essential part of promotive and preventive efforts in health services. The program aims to identify and reduce various risk factors that may affect pregnancy, thereby contributing to the reduction of maternal and infant mortality rates. Preconception services are particularly beneficial for prospective brides or couples of reproductive age, as they provide opportunities to evaluate and improve health conditions prior to conception. Comprehensive preconception interventions—including physical examinations, medical screening, nutritional supplementation, and immunization—can help prospective mothers enter pregnancy in a healthier and safer condition (6–9).

Several studies have revealed that women's knowledge of preconception health remains relatively low. Research conducted at a maternal health clinic in Kelantan, Malaysia, showed that participants' preconception knowledge was categorized as adequate, with a mean score of 11.7 ± 3.8 (51.9%), although understanding of ideal birth spacing and the risks of maternal anemia to the fetus remained low.[10] Another study found that the knowledge of women of reproductive age regarding the benefits of folic acid supplementation reached only 47.2% (10).

Limited understanding of preconception care is largely due to inadequate information and limited access to these services. Many women have not optimally utilized health facilities to obtain education. In fact, sources of information on preconception health can be accessed from various media outside of government or healthcare services (11).

This study aims to describe the level of knowledge of women of reproductive age regarding preconception care.

2. METHOD

This study is a descriptive research with a survey design aimed at identifying the knowledge of women of reproductive age regarding preconception. The study was conducted at the Office of Religious Affairs (KUA) in Sidoarjo District. The population consisted of 35 prospective brides who had registered at the KUA Sidoarjo. The sample comprised 32 women of reproductive age, selected using a total sampling technique.

The research instrument was a questionnaire on reproductive health knowledge and pregnancy readiness adapted from Fyzria Qudratullah (2021), consisting of 20 items. Prior to use, the questionnaire underwent validity testing using the Rasch Model and reliability testing through Cronbach's Alpha and Composite Reliability (CR). Rasch analysis was also used to assess item and respondent reliability, including the separation index, with the aid of Ministep software.

The validity test results showed that all items had Infit and Outfit MNSQ values within the acceptable range of 0.5–1.5 and PTMea Corr ≥ 0.30, indicating good construct validity. In the reliability test, Person Reliability values were 0.59 (Real) and 0.61 (Model), with a Cronbach's Alpha of 0.49, suggesting that the instrument's ability to differentiate respondent knowledge levels

remained limited. However, item reliability was very good, as demonstrated by an Item Reliability value of 0.95 and an Item Separation index of 4.41.

The unexplained variance in the first contrast was 3.13, which is still acceptable, indicating the instrument's unidimensionality. Overall, the questionnaire exhibited good construct validity and high item reliability, making it suitable for use despite the moderate respondent reliability.

Data processing and analysis were conducted through editing, coding, and data entry into SPSS version 27. The data were analyzed using univariate analysis.

3. RESULTS AND DISCUSSION

This study was conducted at the Office of Religious Affairs (KUA) of Sidoarjo District, located within the administrative area of Sidoarjo Regency, East Java Province. The office is situated at JL. Monginsidi 3, Sidoklumpuk Village, RT.03/RW.01, Sidoarjo District, Sidoarjo Regency, East Java, 61218.

KUA Sidoarjo District functions as a technical implementing agency under the Ministry of Religious Affairs, playing a significant role in providing services and guidance to prospective brides and grooms, including the implementation of premarital education and counseling for couples of reproductive age.

3.1 Respondent Characteristics

Of the 32 respondents, the majority were aged 21–30 years (84.4%), while only 1 respondent (3.1%) was under 20 years of age, and 4 respondents (12.5%) were over 30 years old. Most respondents had higher education (62.5%), whereas 37.5% had secondary education. Almost all respondents were employed, with 30 individuals (93.8%) reporting employment, and only 2 respondents (6.3%) being unemployed.

Table 1. Respondent Characteristics

Characteristics	Frequency (n)	Percentage (%)
Age		
<20 years	1	3.1
21-30 years	27	84.4
>30 years	4	4
Jumlah	32	100
Education		
Secondary Education (Junior/Senior High School)	12	37.5
Higher Education (University)	20	62.5
Jumlah	32	100
Job		
Employed	30	93.8
Unemployed	2	6.3
Jumlah	32	100

3.2 Knowledge Overview

The results of this study examined the knowledge of prospective brides of reproductive age. Almost all respondents (97.2%) had a low level of knowledge, while a small proportion (2.8%) demonstrated a moderate level of knowledge.

Table 2. Knowledge of Women of Reproductive Age (WRA)

Knowledge Level	Frequency (n)	Percentage (%)
Good	35	97.2
Fair	1	2.8
Poor	0	0
Total	36	100

Prospective brides represent a group in transition toward marriage and pregnancy, making this a strategic moment for educational intervention. Premarital knowledge plays an important role in shaping preventive behaviors and in preparing individuals physically and mentally for family life. According to a study by Abajobir et al. (2024), improving health literacy through digital interventions can positively influence long-term healthy lifestyle decisions. Providing preconception education from an early stage is therefore essential to ensure that prospective brides understand how to prepare for a healthy pregnancy and avoid risks during the gestational period (11,12).

Based on the findings from 36 respondents, the knowledge of women of reproductive age regarding preconception reproductive health was found to be low. Premarital reproductive health education delivered by health professionals includes information on reproductive health, pregnancy, and diseases of concern such as sexually transmitted infections, HIV/AIDS, and diabetes mellitus. In addition, the mental health of the bride-to-be is recognized as an important aspect that must be addressed to support the birth of healthy offspring (13,14).

Previous research has shown that the knowledge level of women of reproductive age regarding preconception care is generally at a moderate level, with 41.5% of respondents having adequate knowledge and only 25.6% classified as having good knowledge. These findings indicate that understanding of the goals, benefits, and essential components of preconception care remains suboptimal among women of reproductive age. This is consistent with other studies reporting low levels of knowledge due to limited access to information and preconception services, particularly in low- and middle-income countries (14).

The researcher views prospective brides as a strategic target population for educational intervention because they are in a transitional phase toward marriage and pregnancy. During this period, individuals tend to have high motivation to prepare themselves physically, mentally, and socially, suggesting that the delivery of reproductive health information has the potential to generate long-term impacts on preventive behavior and readiness for family life. Premarital education interventions also align with the demands of the digital era, in which improved health literacy through various media, including digital platforms, has been shown to influence long-term healthy lifestyle decision-making.

Based on the findings in this study, the low level of preconception reproductive health knowledge indicates a gap between the information needs and the educational exposure received by prospective brides. Although health professionals have provided information related to reproductive health, pregnancy, sexually transmitted infections, and mental health, this information does not seem to be fully understood or implemented by the target population. Such low knowledge may have future implications for maternal and fetal health, particularly if prospective brides do not understand basic concepts related to preparing for a healthy pregnancy.

These findings are consistent with previous studies reporting that women of reproductive age often have only moderate knowledge of preconception care, with a small proportion having good understanding. This condition suggests that comprehension of the goals, benefits, and essential elements of preconception care remains inadequate. Possible contributing factors include limited access to preconception services, lack of comprehensive educational resources, and the absence of integrated educational systems in public health programs.

Reflecting on these findings, the researcher argues that prospective brides require a more systematic, continuous, and contextual model of premarital education, so that their understanding becomes not only informative but also behaviorally impactful. Evidence-based health education interventions, including the use of digital technology, may serve as innovative approaches to enhance knowledge and skills in preparing for a healthy pregnancy. Moreover,

incorporating mental health aspects into preconception education is crucial, as psychological readiness is a key factor in ensuring healthy offspring and high-quality family life.

Overall, the researcher contends that low premarital knowledge is not merely an individual issue, but also a reflection of insufficient systemic attention to preconception reproductive health. Therefore, promotive and preventive efforts need to be strengthened through policy development, structured health education programs, and improved capacity of health professionals to provide preconception counseling effectively and inclusively.

4. CONCLUSION

This study indicates that the level of knowledge among prospective brides regarding preconception reproductive health remains relatively low. Nearly all respondents demonstrated insufficient understanding of fundamental aspects of reproductive health, pregnancy preparation, and risk factors that may affect the health of both mother and child in the future. This condition suggests a gap between the need for health information and the educational exposure received by prospective brides, despite the delivery of relevant materials through premarital services.

These findings reinforce previous studies that have shown suboptimal understanding of preconception care among women of reproductive age, primarily due to limited access, availability of services, and the absence of systematic preconception education programs within healthcare facilities. Low knowledge levels during the premarital phase may contribute to a higher risk of pregnancy complications, fetal abnormalities, and inadequate physical and psychological readiness for reproductive life.

Therefore, more structured, comprehensive, and sustainable educational interventions are needed to improve reproductive health literacy among prospective brides. Educational models that integrate evidence-based approaches and digital technologies are considered promising for expanding access to information and promoting healthy behavioral change. Additionally, strengthening the capacity of healthcare providers to deliver effective preconception counseling, along with integrating premarital programs into primary healthcare services, represents a strategic step toward enhancing reproductive readiness.

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Overview of the Malaria Surveillance System at the Sei Berombang Community Health Center, Labuhanbatu District

Rifqa Masry[1], Josepin Karolina[2], Windi Audina[3], Sry Wulan Silaban[4], Annisa Zahra[5], Rizky Aditya Hutomo[6]

[1-6]Fakultas Kesehatan Masyarakat, Universitas Islam Negeri Sumatera Utara Medan, Kabupaten Deli Serdang 20353, Indonesia

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ABSTRACT

Malaria continues to be a public health concern in several areas of Indonesia and requires a well-functioning surveillance system to enable early case detection and timely response, particularly at the primary health care level. Community health centers have a crucial role in implementing malaria surveillance as part of malaria control and elimination strategies. This study aimed to describe the implementation of the malaria surveillance system at the Sei Berombang Community Health Center in Labuhanbatu District. A qualitative descriptive design was applied, using primary data obtained from malaria surveillance officers selected purposively based on their involvement in surveillance activities. Data collection was conducted through in-depth interviews carried out online via WhatsApp calls using a semi-structured interview guide that explored surveillance inputs, processes, outputs, and implementation challenges. Data were analyzed descriptively through the stages of data reduction, data presentation, and conclusion formulation. The results indicated that malaria surveillance activities at the Sei Berombang Community Health Center were conducted through passive and active surveillance, case investigation, vector monitoring, cross-program and cross-sector collaboration, and routine reporting using the Malaria Surveillance Information System. Nevertheless, several obstacles were identified, including limited numbers and capacity of surveillance personnel, absence of specific malaria surveillance training, high workload, and limited analysis and utilization of surveillance data at the health center level. Surveillance data were primarily used for reporting and had not been optimally utilized to support local planning and evaluation of malaria control efforts. In conclusion, improving human resource capacity and strengthening the use of surveillance data are necessary to enhance the effectiveness of malaria surveillance and support sustainable malaria control at the Sei Berombang Community Health Center.

Corresponding Author:

Rifqa Masry
Fakultas Kesehatan Masyarakat, Universitas Islam Negeri Sumatera Utara Medan, Kabupaten Deli Serdang, Indonesia
Email: rifqacollege@gmail.com

1. INTRODUCTION

Malaria is an acute fever that can be life-threatening and is commonly found in tropical regions that are still endemic areas. The disease is caused by the Plasmodium parasite, which is transmitted by Anopheles mosquitoes, the vectors of malaria. If prevention efforts are not maintained, malaria can re-emerge(1). Malaria in humans can be caused by five different types of parasites, with Plasmodium falciparum and Plasmodium vivax being the two most dangerous types(2). Malaria remains one of the infectious diseases that poses a public health challenge in various regions of the world, including Indonesia. Indonesia is one of the countries endemic for malaria, with an uneven distribution of cases across regions. Several provinces and districts still report local transmission and imported cases, which have the potential to trigger extraordinary events if not detected and treated quickly. The Indonesian government has set a national malaria elimination target and developed various strategic policies, including strengthening the malaria surveillance system based on primary health care facilities. However, the achievement of elimination is highly dependent on the ability of community health centers to record, report, analyze, and follow up on malaria case data in a timely and accurate manner(3). Although Indonesia has committed to eliminating malaria, several endemic areas still show local cases and an increase in imported cases that have the potential to trigger re-transmission(4). The success of malaria control and elimination depends heavily on a surveillance system that can detect cases early, accurately, and continuously(5).

The malaria surveillance system in Indonesia is implemented in stages, starting from community health centers to the national level through the Malaria Surveillance Information System (SISMAL), which has now been developed in electronic form (e-SISMAL). Community health centers, as primary health care facilities, play a strategic role in recording, reporting, investigating cases, and responding to malaria cases found in their working areas(6)However, several studies indicate that the implementation of malaria surveillance at the community health center level still faces various obstacles, such as limited human resources, low reporting timeliness, and suboptimal use of data for decision-making(7).

Labuhanbatu Regency is one of the regions in North Sumatra Province that has a potential risk of malaria, especially in coastal areas and areas with high population mobility(8). The Sei Berombang Community Health Center, as an inpatient health center, has a major responsibility in supporting malaria control efforts through an effective surveillance system. However, to date, there has been little research specifically describing how the malaria surveillance system is implemented at the Sei Berombang Community Health Center, in terms of inputs, processes, and outputs(9). Several studies in Indonesia emphasize the importance of evaluating malaria surveillance systems to identify weaknesses in case recording and reporting flows. Other research also shows that integrating surveillance data with spatial mapping can help identify clusters of cases and areas at high risk for malaria. In addition, the use of mobile-based technology has been reported to improve the efficiency of data collection and the timeliness of malaria surveillance reporting at the primary care level(10).

Based on these issues, this study proposes a descriptive approach to describe the malaria surveillance system at the Sei Berombang Community Health Center through an analysis of the input, process, and output components of surveillance. This approach is expected to provide a realistic picture of the implementation of malaria surveillance and serve as a basis for formulating recommendations for system improvements. The results of this study are also expected to support improvements in the quality of surveillance data as a basis for decision-making in malaria control programs at the health center and district levels.

Therefore, this study aims to describe the malaria surveillance system at the Sei Berombang Community Health Center, Labuhanbatu District. This study is expected to provide a realistic picture of the implementation of malaria surveillance at the community health center level and identify aspects that need to be strengthened. The novelty of this study lies in the presentation of data and analysis of the malaria surveillance system specific to primary health facilities in the Labuhanbatu District, which has been limited in scientific literature. The results of this study are expected to serve as a basis for policy makers at the health center and health office levels in improving the malaria surveillance system and supporting sustainable malaria elimination efforts.

2. METHOD

This study is a qualitative study with a descriptive approach that aims to describe the malaria surveillance system at the Sei Berombang Community Health Center, Labuhanbatu District. The data sources in this study were primary data obtained from malaria surveillance officers who were directly involved in the implementation of surveillance at the health center. Informants were selected purposively, based on their roles and responsibilities in malaria surveillance activities. Data collection was conducted through in-depth interviews indirectly, without conducting field visits. Interviews were conducted via WhatsApp calls using a semi-structured interview guide. The interview questions focused on the implementation of the malaria surveillance system, including the process of data collection, case processing and reporting, utilization of surveillance data, obstacles encountered in the implementation of surveillance, and improvement efforts that have been or are being carried out at the health center. The data obtained from the interviews were recorded in the form of interview notes and then analyzed using qualitative descriptive analysis through the stages of data reduction, data presentation, and conclusion drawing. The entire research process was carried out in accordance with research ethics principles, whereby the informants' consent was obtained before the interviews were conducted and the confidentiality of the informants' identities was maintained.

3. RESULTS AND DISCUSSION

3.1 Overview of Malaria Surveillance Implementation

Malaria surveillance is an important component of the public health system that plays a role in early detection, monitoring disease trends, and determining rapid responses to malaria transmission in the working area of community health centers(11). Effective surveillance is expected to provide accurate, timely epidemiological data and information that can be used as a basis for decision-making in disease control programs. Based on interviews with surveillance officers, it was found that malaria surveillance activities at the Sei Berombang Community Health Center have been carried out in accordance with their basic functions, but still face various obstacles that affect their optimal implementation.

3.2 Malaria Surveillance Human Resources

Interviews with surveillance officers at the Sei Berombang Community Health Center revealed that their main tasks are to monitor, collect, process, and report disease data so that health problems can be detected and treated as early as possible. Malaria surveillance at the Sei Berombang Community Health Center is handled by only one officer who also serves as the surveillance team. This situation causes a high workload for the officer, especially when there is an increase in malaria cases in the community health center's working area. In addition to limited personnel, the surveillance officer also said that there is no formal training specifically related to malaria surveillance, so officers learn independently. This lack of training has the potential to affect the staff's ability to fully understand the concept of epidemiological surveillance, especially in terms of data analysis and interpretation. This finding is in line with the research by Desita et al. (2024), which states that limited human resources and staff capacity are still the main obstacles in implementing malaria surveillance in endemic areas in Indonesia(12).

3.3 Malaria Surveillance Input Components

Malaria surveillance activities are shaped by a system of inputs, processes, and outputs that support the objectives of the activities(13) Type Data collected in malaria surveillance activities includes epidemiological case data, clinical and laboratory data, treatment data, and environmental data obtained through epidemiological investigations. Malaria testing is carried out through community health center laboratory services, including blood smear testing of patients with fever symptoms. Support facilities such as recording forms, computers, and reporting information systems are available and used in surveillance activities. However, limited human resources remain a major challenge in terms of input. This condition has the potential to impact

the quality of data management and the effectiveness of malaria control program implementation, as also reported by Syahruddin et al. (2023)(14).

3.4 Data Collection Process and Types of Surveys

Public health surveillance is an important element of the health system, enabling it to detect, analyze, and respond to disease outbreaks quickly and accurately(15). Malaria surveillance data collection was carried out through case recording from routine health services at the health center and through epidemiological investigations in the patients' areas of residence when positive malaria cases were found. This pattern shows that malaria surveillance at the Sei Berombang Health Center includes passive and active surveillance mechanisms. In 2023, there was an increase in malaria cases in the working area of the Sei Berombang Community Health Center, prompting surveillance officers to conduct direct checks in the affected areas. This activity resulted in more malaria cases being identified during that period. The implementation of malaria surveillance also involved support from the health office in collecting epidemiological, clinical, laboratory, treatment, and environmental data. These results show that active surveillance plays an important role in increasing the detection of malaria cases that were previously undetected through passive surveillance, in line with the research by Andika et al. (2025) (16).

3.5 Case Tracking, Vector Surveys, and Risk Area Mapping

Malaria case tracking is conducted through direct interviews with communities around the case location to trace travel history and possible sources of transmission. However, this activity has not been fully implemented with standardized case investigation guidelines, so the quality of information obtained still varies between officers. This situation is in line with the findings of Ocvanirista et al. (2021), who stated that the implementation of malaria case tracking at the community health center level still faces limitations in terms of instrument standardization, thus requiring the use of standardized tracking forms to ensure more consistent data and support the surveillance system(17). In addition to case tracking, community health centers conduct vector surveys by monitoring the Larvae-Free Index (LFI) and mosquito larvae density as indicators of transmission risk. Research by Zafirah and Yamani (2024) shows that variations in larval density in the health center's working area reflect differences in the potential for malaria transmission, making the implementation of routine and structured vector surveys an important component of vector control(18).

Mapping of case locations and risk areas was conducted using a Geographic Information System (GIS) to identify case clusters and areas with high transmission potential. This spatial approach is in line with the research by Elieser et al. (2025), which emphasizes the importance of spatial analysis in understanding the distribution of malaria cases based on health center working areas, and is supported by the findings of Sunarsih (2022), which show the relationship between the distribution of malaria cases and geographical and environmental factors that support the existence of vectors(19,20).

3.6 Cross-Program and Cross-Sector Coordination

Coordination with vector control officers and health services is carried out through regular meetings to plan control activities, such as larval surveys and mosquito breeding site eradication. In addition, the Sei Berombang Community Health Center also collaborates with health cadres, integrated health service posts, neighborhood associations, and private clinics in reporting and detecting malaria cases in the community. Other health facilities in the health center's working area refer malaria cases to hospitals that have the capacity to treat malaria, so that continuity of service and case control is maintained. The importance of this cross-sectoral coordination is also emphasized by Syahruddin et al. (2023)(14).

3.7 Processing, Reporting, and Utilization of Surveillance Data

Malaria surveillance data collected is then reported monthly through the Malaria Surveillance Information System (SISMAL) application. However, data processing and analysis have

not been carried out in depth at the community health center level because the verification and validation processes are carried out entirely by the district/city health office. Community health center staff do not receive detailed information regarding the verification mechanism. This situation limits the feedback received by health center staff in evaluating data quality and the effectiveness of surveillance implementation. Malaria case reports are submitted regularly every month to the health office through the SISMAL application(21). The information generated includes the number of malaria cases and the results of field investigations into confirmed cases. Investigations into positive malaria cases are conducted immediately after diagnosis as part of a rapid response mechanism to prevent further transmission.

3.8 Rapid Response and Investigation of Extraordinary Events (KLB)

Based on the interview results, surveillance officers reported that a rapid response mechanism is also implemented when there is an increase in malaria cases leading to an Extraordinary Event (KLB). After one case is confirmed, the health system targets the implementation of rapid and scheduled actions to prevent further transmission and identify the source of transmission. The malaria EID investigation process is carried out by the surveillance team immediately after detecting an increase in cases that exceeds normal conditions in an area. The investigation aims to determine the source of transmission, the extent of the spread of cases, and the control measures needed to stop malaria transmission in the health center's working area. However, the limited number and competence of surveillance officers pose challenges in conducting comprehensive investigations in the field. These findings are in line with the results of a study by Aesum et al. (2024), which explains that rapid response and malaria outbreak investigation are key components of epidemiological surveillance, but their implementation at the primary care level is often hampered by limitations in human resources and the technical capacity of personnel(22). Another study by Enjelia et al. (2024) also shows that delays and incomplete investigations of outbreaks can occur when the number of surveillance personnel is not proportional to the workload in malaria-endemic areas(23).

3.9 Surveillance Output and Challenges in Information Utilization

During the investigation, surveillance officers treated patients and conducted epidemiological investigations by collecting information on the onset of symptoms, travel history to high-risk areas, and the environmental conditions of the patient's place of residence. Family members and the surrounding community were also examined using rapid tests to detect possible further transmission. In line with the research by Yuniarti et al. (2025), which shows that the accuracy of case management and the use of antimalarial drugs are important factors in supporting the success of malaria control(24). Although surveillance output has supported rapid response implementation, the information generated has not been optimally utilized for malaria control program planning and evaluation. Surveillance information has not been presented in detail based on characteristics of people, places, and time, so it does not fully describe the epidemiological patterns of malaria in the health center's working area. In addition, the dissemination of surveillance information to cross-sectors and the community is still limited, which has an impact on low community participation in malaria control efforts. This condition is in line with the findings of Andika et al. (2025), which emphasize the importance of community involvement in supporting the effectiveness of community-based malaria surveillance(25).

3.10 Problem Identification and Improvement Efforts

The final interview results show that surveillance officers still face various challenges in implementing malaria surveillance. One of the main obstacles is the difficulty of obtaining complete and timely data from health care facilities. Case reports are often late or incomplete, resulting in information received by surveillance officers and forwarded to higher levels being inaccurate and inconsistent with conditions in the field. These delays and incomplete data have the potential to hamper the process of analyzing the situation and determining a rapid response to malaria transmission. In addition to data issues, the limited number and capacity of surveillance personnel also pose a significant challenge. Surveillance officers at community health centers must handle large volumes of data with limited human resources, while at the same time they are also

burdened with other tasks outside of surveillance activities. This condition causes officers to be prone to work fatigue and overwhelm in managing data, especially during periods of increased malaria cases. Similar challenges were also identified by Desita et al. (2021), who stated that insufficient personnel and limited staff competence are major obstacles to strengthening the malaria surveillance system at the primary care level (12).

The ability of officers to operate online reporting systems and perform epidemiological data analysis is also uneven. Some officers still have difficulty in optimally utilizing the surveillance information system, so that the surveillance function as an early warning tool is not yet fully effective. This situation is in line with the findings of Syahruddin et al. (2023), which confirm that the success of malaria control policy implementation is greatly influenced by the technical capacity and ongoing support of field officers(14).

Solutions to the challenges of implementing malaria surveillance are not only related to improving regulations or reporting systems, but also concern aspects of support and appreciation for surveillance officers. Efforts to increase capacity through continuous training, a more proportional distribution of workloads, and the provision of adequate work facilities can help create a more conducive working environment. When surveillance officers feel supported, understood, and valued, their work motivation and the quality of surveillance implementation tend to improve. This approach is in line with the views of Andika et al. (2025), who emphasize that strengthening the role of human resources is key to the sustainability of disease surveillance systems at the community health center level (25). Support for these findings is also demonstrated in research published by researchers within the Ministry of Health through the Health Research Bulletin, which states that the quality of malaria surveillance is greatly influenced by the timeliness of reporting, data completeness, and the capacity of officers to utilize health information systems. The study confirms that improving the competence of officers and simplifying the reporting process contributes to increased data accuracy and the effectiveness of malaria control responses (26).

4. CONCLUSION

In accordance with the community health center's function as a primary health care facility in assisting early detection, recording, reporting, and initial response to malaria cases, the Sei Berombang Community Health Center in Labuhanbatu District has implemented its malaria surveillance system. Cross-program and cross-sector coordination, risk area mapping, vector surveys, epidemiological case investigations, and passive and active surveillance are all examples of surveillance implementation. However, the implementation of surveillance has not been as effective as it could be due to constraints in the quantity and capacity of human resources, the high workload of officials, the health center level's subpar data processing and analysis, and the underutilization of surveillance data as a foundation for planning and assessing malaria control initiatives. As a result, ongoing policy assistance is necessary to improve the skills of surveillance officials, deliver specialized training, improve the data feedback system, and increase the overall use of surveillance data to support long-term malaria control and eradication initiatives in the Labuhanbatu District.

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The Relationship Between Antenatal Class Participation with Antenatal Care (ANC) Compliance At The Puri Mojokerto Community Health Center

Pipit Sri Estuning Rahayu[1], Lidia Aditama Putri[2], Lukmi Wulandari[3]

[1.3] Department of Midwifery, Faculty of Health, Science and Physcology, Universitas Sunan Gresik, Gresik, Indonesia
[2]Department of Hospital Administration, Faculty of Health, Science and Physcology, Universitas Sunan Gresik, Gresik, Indonesia

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ABSTRACT

Antenatal Care (ANC) is an important service to ensure a safe pregnancy, but compliance with ANC visits remains a challenge. Antenatal class as a prenatal education program are expected to increase ANC compliance by improving mothers' knowledge and preparedness. An observational analytical study with a cross-sectional design was conducted on pregnant women registered at the Puri Mojokerto Community Health Center during the study period. The population consisted of all pregnant women in their third trimester during the data collection period. Total sampling was used, resulting in a sample of 43 respondents. Data were obtained secondarily from medical records, KIA books, and antenatal class attendance records. A total of 58% of respondents attended pregnancy class and 65% of respondents were compliant with ANC (at least 4 visits). ANC compliance was higher in the group that attended antenatal class (80%) than in those who did not attend (50%). The Chi-Square test showed a significant relationship between participation in antenatal class and ANC compliance (p=0.013). These results indicate a significant relationship between participation in antenatal classes and ANC compliance among pregnant women. Strengthening and expanding the implementation of antenatal class has the potential to increase ANC compliance as part of efforts to improve maternal and child health.

Corresponding Author:

Pipit Sri Estuning Rahayu
Faculty of Health, Science and Psychology, Department of Midwifery, Universitas Sunan Gresik, Gresik, Indonesia
Email: pipit.sri.estuning.rahayu@lecturer.usg.ac.id

1. INTRODUCTION

Maternal and child health is one of the top priorities in global health development, especially in developing countries such as Indonesia. Antenatal Care (ANC) serves as a fundamental element to ensure safe pregnancies, forming the cornerstone of maternal and child health. According to the World Health Organization (WHO), ANC standards necessitate at least four visits during pregnancy, encompassing routine examinations, health education, and early detection of complications (1). Global and national data indicate that inadequate ANC adherence contributes

significantly to elevated Maternal Mortality Rate (MMR) and Infant Mortality Rate (IMR). A 2022 WHO report highlights that approximately 295,000 women perish annually due to pregnancy and childbirth-related complications, with the majority of these cases being preventable through timely ANC (2). The Indonesian Ministry of Health's 2023 report reveals that merely 73% of pregnant women adhere to ANC standards, with this figure declining to 60% in rural regions (3). This low adherence correlates with an MMR of 305 per 100,000 live births and an IMR of 24 per 1,000 live births (4).

ANC compliance in Indonesia remains comparatively low. Key impediments to adherence include insufficient knowledge regarding the significance of ANC, geographical obstacles, transportation expenses, and cultural stigmas. Prior research in Semarang City demonstrated that only 65% of pregnant women adhered to scheduled ANC visits, primarily due to a lack of comprehension of ANC benefits and familial economic priorities (5). Prenatal education programs, such as antenatal class, address topics including nutrition, pregnancy risks, and childbirth preparation, and are regarded as a viable strategy to enhance ANC compliance. Existing studies reveal inconsistent associations between participation in these classes and improved compliance. Another study by Nguyen et al. (6) in Vietnam conducted in urban conducted in urban settings with advanced technological access, found that prenatal education interventions boosted ANC compliance from 60% to 85%, contrasting with Indonesia where most classes are conducted face-to-face at health centers or community venues. Additional data indicate that participation in prenatal classes increases ANC adherence by 2.3 times, albeit influenced by factors such as family support and proximity to healthcare facilities. In Indonesia, inadequate integration of antenatal class with routine ANC systems poses a distinct challenge, resulting in a disconnect between acquired knowledge and behavioral outcomes. The 2022 Riskesdas data show that 40% of pregnant women are unaware of the correct ANC schedule (3). Research in East Java indicates that pregnant women who do not attend classes face a 1.5 fold higher risk of non compliance with ANC (7).

Participation in antenatal class, a form of prenatal health education, is considered an effective intervention to bolster ANC compliance. These classes typically cover education on nutrition, pregnancy warning signs, childbirth readiness, and the importance of regular ANC visits (8–10). Despite widespread implementation across regions, the nexus between class participation and ANC compliance remains incompletely elucidated, especially in the Indonesian context. A primary issue is the disparity between knowledge imparted in classes and actual ANC compliance behaviors, shaped by social, economic, and healthcare accessibility determinants. Globally a positive correlation exists between prenatal education and ANC adherence, yet knowledge deficits persist in developing countries like Indonesia. Such gaps could be addressed through the provision of antenatal class, particularly in rural areas. This research, research aims to inform enhancements in maternal health programs, alleviate economic burdens from pregnancy complications, and advance Sustainable Development Goals (SDGs) focused on reducing maternal mortality

2. METHOD

This study uses an observational analytical design with a cross-sectional approach. This methodology was selected to examine the association between independent variables (participation in antenatal class) and dependent variables (ANC adherence) at a specific point in time, without any intervention, aligning with guidelines for epidemiological studies in maternal health (11). This method proves efficacious for assessing the link between prenatal education involvement and health behaviors, as demonstrated in comparable research by Nguyen et al. (6) and Rahman et al. (12), which identified a notable correlation between prenatal education and ANC via cross-sectional analysis.

The study population comprises all third-trimester pregnant women (gestational age 28-40 weeks) registered at the Puri Health Center in Mojokerto Regency, East Java, Indonesia, during the data collection period from September to November 2025. A total sampling technique was was applied, wherein all population members meeting the inclusion criteria were included as samples (13). Inclusion criteria encompass third-trimester pregnant women aged 18-40 years, possessing complete medical records, and lacking severe pregnancy complications necessitating hospitalization. Exclusion criteria include pregnant women with a history of chronic illnesses or

those lacking class attendance data. The total sampling ensures comprehensive representativeness and mitigates selection bias, particularly in smaller sample sizes (14).

Data were sourced from health center medical records and attendance logs for antenatal class, integrated with the Maternal and Child Health Book (KIA). Medical records or KIA books facilitate the identification of third-trimester pregnant women and ANC visit details (frequency, examination type, and dates). Attendance in antenatal class (yes/no, frequency) is derived from health center records integrated with the KIA Book, which documents routine ANC visits. Cross-validation between medical records and KIA Books was conducted to minimize inaccuracies. This procedure mirrors that employed by Rahman et al. (12) in secondary health data analysis, guaranteeing data precision without direct subject intervention. Data analysis was performed using SPSS software. Descriptive analysis was utilized to characterize sample attributes (frequency, percentage, mean). Given that both Since both primary variables are categorical (participation: nominal; adherence: nominal), the chi-square test was deemed appropriate to evaluate the relationship between independent and dependent variables.

3. RESULTS AND DISCUSSION

This study encompassed 43 third-trimester pregnant women at the Puri Health Center in Mojokerto Regency, Indonesia, derived through total sampling of medical records from the health center spanning September to November 2025.

Table 1. Characteristics of Respondents

Variable	Category	n	%
Age	20-35 years old	25	58,1
	<20 or >35 years old	18	41,9
Education	High School and below	26	60,5
	>High School	17	39,5
Family Income	<IDR 3,000,000,-/month	28	65,1
	>IDR 3,000,000,-/month	15	34,9
Gravida	Primigravida	30	69,8
	Multigravida	13	30,2

Source: Personal data

Among the sample, 58% were aged 20-35 years, 60% possessed a high school education or lower, 65% hailed from families with a monthly income below Rp 3,000,000, and 70% were primigravida. The distribution of participation in antenatal class indicated that 58% had attended prenatal classes. Data were gathered from medical records and attendance logs integrated with the Maternal and Child Health Book (KIA), achieving 100% completeness with no missing values.

Table 2. Cross-tabulation of Antenatal Class Participation with ANC Frequency of Visits

Pregnant Woman Class	≥4 Visits n (%)	<4 Visits n (%)	Total n (%)	Red ± SD
Follow	20 (80,0)	5 (20,0)	25 (100)	5.5 ± 0.5
Not following	8 (44,4)	10 (55,6)	18 (100)	3.3 ± 1.0
Total	28 (65,1)	15 (34,9)	43 (100)	

Source: Personal data

Cross-tabulation revealed that respondents who participated in antenatal class exhibited higher ANC compliance at 80%, in contrast to 50% among non-participants. The mean frequency of ANC visits was 5.5 times (SD = 0.5) in the attending group, compared to 3.3 times (SD = 1.0) in the non-attending group. ANC compliance was defined by a minimum of four visits per WHO standards. This association is underpinned by a theoretical framework wherein antenatal class enhance awareness of pregnancy risks, such as preeclampsia or anemia, thereby fostering preventive actions via regular ANC (15). Increase of visit contributes to 35% more effective early complication detection (1). This aligns with the Health Belief Model (HBM) by Rosenstock (1974), as referenced in recent studies like Nguyen et al. (6), where prenatal education shifts perceived susceptibility into action-oriented motivation, mitigating barriers like cultural stigma or economic priorities.

Table 3. Statistical Test Results

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.110	1	.013
Continuity Correction	4.458	1	.035
Lokelihood Ratio	6.454	1	.011
Linear-by-Linear Association	5.968	1	.015
N of Valid Cases	43		

Source: Personal data

The results of statistical testing employing the Chi-Square (Pearson) method demonstrated a significant association between participation in antenatal class and ANC compliance. The proportion of ANC-compliant respondents in the class-attending group was 80.0%, surpassing the 44.4% in the non-attending group. With chi-square assumptions met (no cells with expected counts < 5; minimum expected = 6.28), the Pearson Chi-Square test yielded with p = 0.013 (< 0.05), leading to rejection of the null hypothesis. Consequently, participation in antenatal class is significantly linked to enhanced ANC compliance.

These outcomes correspond with WHO guidelines, which stress that ANC quality encompasses not only clinical services but also timely, relevant information and emotional support for a positive pregnancy experience (16). Strong emotional support from families and healthcare providers can amplify positive pregnancy experiences, bolstering maternal engagement in antenatal care (17). The 2016 WHO ANC model positions counseling and education as core elements that promote maternal involvement, enhance risk comprehension, and facilitate informed decision-making in maternal health (18). Indonesia integrated antenatal service guidelines similarly underscore the necessity for comprehensive, high-quality ANC, targeting a minimum of six contacts inclusive of counseling components (19). Thus, antenatal class may be viewed as a mechanism to fortify informational and supportive aspects of maternal services, theoretically elevating maternal adherence to standardized ANC visits.

Sari et al. (5) documented a 25% rise in ANC adherence via general prenatal education (p = 0.02), though without specifying antenatal class. This study provides stronger quantitative evidence, suggesting that participation in antenatal class is more efficacious due to incorporated practical elements like breathing exercises and labor simulations, thereby augmenting ANC compliance through heightened maternal knowledge and readiness. A prior study in Bandung noted 50% class participation, with a 75% knowledge score among attendees (p < 0.05), yet did not assess ANC compliance impacts (20).

Research in East Java indicated a 1.5 times elevated risk of non-compliance among mothers not attending classes, aligning with our findings of a 36% compliance increase through participation. Non compliance with ANC correlates with persistently high maternal mortality rates in East Java, reaching 320 per 100,000 live births (7). Classes enhance maternal health literacy (encompassing knowledge, perceived benefits, and self-efficacy), thereby diminishing cognitive barriers (e.g., the notion that ANC is requisite only for symptomatic cases). Additionally, classes broaden social support and positive norms (e.g., exposure to peer experiences and reinforcement from health workers), which sustain routine visitation habits (21,22). This aligns with studies connecting cognitive factors like knowledge of warning signs to ANC compliance, where elevated knowledge correlates with improved adherence (23).

The results of this study show that mothers who attend classes have a much higher chance of compliance than those who do not attend classes. Finding indicate that class-attending mothers have markedly greater compliance odds, positioning antenatal class as a potential intervention for boosting ANC adherence (24). Such classes also foster maternal awareness of prenatal health check importance, yielding positive outcomes for maternal and infant well being (25). This resonates with international literature on antenatal education, which reports enhancements in adherence to prenatal practices and pregnancy experiences, albeit with variable outcomes across studies (26). In policy terms, heightened ANC compliance aids early risk detection, elevates pregnancy monitoring quality, and advances national guideline standards for maternal services (19). Consequently, expanding coverage and quality of antenatal class merits consideration as a promotive-preventive strategy, particularly for groups facing informational access barriers or visitation obstacles.

Theoretically, these findings bolster the Health Belief Model and Social Cognitive Theory, wherein antenatal class, through modeling and self-efficacy, enhance behavioral control (14). Practically, they endorse the 2023 Indonesian Ministry of Health policy to extend antenatal class to 80% of health centers, potentially reducing maternal mortality by 20–30% per WHO 2024 projections (3). The program is low cost effective and efficacious in rural settings, supporting SDG 3.1 by curtailing infant mortality from 24 per 1,000 live births (20). However, limitations warrant attention: the cross-sectional design constrains causal interpretations, as inherently health-conscious mothers may be predisposed to both class attendance and ANC adherence. A modest sample size may compromise estimate precision. Future research employing longitudinal or quasi-experimental designs, with confounding factor controls (e.g., service access, parity, family support, employment, facility distance), is advised to fortify causal inferences.

4. CONCLUSION

The analytical outcomes reveal a significant association between participation in antenatal class and adherence to antenatal care (ANC) visits. Respondents who attended these classes demonstrated a greater proportion of ANC compliance compared to those who did not, with this relationship statistically substantiated by the Pearson Chi-Square test ($p = 0.013 < 0.05$). Furthermore, the effect measure indicates that class participation correlates with enhanced likelihood of ANC compliance, underscoring the role of antenatal class as an educational initiative with potential to promote regular ANC attendance. Therefore, it can be inferred that participation in antenatal class is linked to improved ANC compliance among the study's respondents. Nevertheless, showing to the observational nature of the study design, these findings illustrate a correlation and do not yet permit conclusions regarding a complete causal relationship.

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Early Detection Of Fetal Well-Being Disorders Through Blood Pressure Monitoring And Pregnancy Danger Signs

Arisda Candra Satriawati[1], Niken Wahyu Hidayati[2], Dian Permatasari[3], Aulia[4]

[1-4]Faculty of Health Sciences, Universitas Wiraraja Madura, Indonesia

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ABSTRACT

Background: Fetal well-being disorders are one of the indirect contributors to increased perinatal morbidity and mortality. These conditions often originate from maternal problems that can actually be detected early through antenatal care services. **Objective:** To describe early detection of fetal well-being disorders through blood pressure monitoring and pregnancy danger signs among pregnant women. **Methods:** This study employed a descriptive design with a cross-sectional approach. The subjects were 15 pregnant women who attended antenatal care at the Banyuates Primary Health Center working area. Data were collected through blood pressure measurement, hemoglobin level assessment, maternal nutritional status evaluation, and fetal heart rate monitoring. Data were analyzed descriptively using frequency distributions and percentages. **Results:** The results showed that 40% of pregnant women had blood pressure ≥140/90 mmHg, 33.3% experienced anemia, and 13.3% of fetuses exhibited abnormal fetal heart rates. Overall, 40% of respondents were categorized as having a risk of fetal well-being disorders. **Conclusion:** Blood pressure monitoring and assessment of pregnancy danger signs can be used as an effective method for early detection of fetal well-being disorders in primary healthcare settings.

Corresponding Author:

Arisda Candra Satriawati[1]
Faculty of Health Sciences, Universitas Wiraraja Madura, Indonesia
Email: arisdacandra@wirarja.ac.id

1. INTRODUCTION

Maternal Mortality Rate (MMR) and Infant Mortality Rate (IMR) remain important indicators of public health status. One of the main causes of high MMR and IMR is delayed detection of pregnancy complications, particularly hypertension and anemia. These conditions directly affect uteroplacental perfusion and fetal well-being.

In Indonesia in 2019, the second-highest number of maternal deaths was caused by gestational hypertension, with 1,066 cases, followed by bleeding, and the third-highest cause was infection, with 207 cases. It is estimated that by 2024, the maternal mortality rate in Indonesia will decrease to 183 per 100,000 live births, and by 2030, it will decrease to 131 per 100,000 live births (1). Fandila stated that hypertension in pregnancy complicates 5-15% of pregnancies and is one of the three leading causes of maternal mortality and morbidity. In Indonesia, mortality and morbidity from hypertension in pregnancy remain quite high (2)

Nurhayati stated that hypertension in pregnancy is caused by several risk factors, namely age, use of hormonal contraceptives, history of hypertension, socioeconomic factors, salt consumption, smoking, and nutritional status (3). Hypertension in pregnancy can be prevented if risk factors can be controlled. These efforts include regular blood pressure monitoring, physical activity, and a healthy diet with balanced calories through consumption of high fiber, low fat, and low salt. Calcium deficiency in pregnant women increases the risk of hypertension in pregnancy, as calcium requirements increase during pregnancy for the formation of new tissue in the fetus. Adequate calcium intake can reduce the incidence of hypertension during pregnancy.

Fetal well-being reflects the fetus's ability to grow and develop optimally during pregnancy. Maternal disorders, such as hypertension and poor nutritional status, may reduce oxygen and nutrient supply to the fetus. Blood pressure monitoring and assessment of pregnancy danger signs are simple yet crucial components of antenatal care services. Preliminary observations in the Banyuates Primary Health Center working area indicated that awareness among pregnant women regarding routine antenatal check-ups was still relatively low. Therefore, this study aimed to describe early detection of fetal well-being disorders through blood pressure monitoring and pregnancy danger signs.

2. METHOD

This study was a quantitative descriptive study with a cross-sectional design. It was conducted in the Banyuates Primary Health Center working area in October 2025. The study subjects were 15 pregnant women who met the inclusion criteria and were selected using total sampling. Data collection was carried out through interviews and antenatal examinations, including blood pressure measurement, mid-upper arm circumference (MUAC), body mass index (BMI), hemoglobin level assessment, and fetal heart rate examination using Doppler. Data were analyzed descriptively and presented in frequency distribution tables.

3. RESULTS AND DISCUSSION

Tabel 1. Characteristics of Maternal Risk Factors

Characteristic	High Risk		Normal	
	n	%	n	%
High-risk age (<20 or >35 years)	3	20.0	12	80.0
Parity >2	5	33.3	10	66.7
Abnormal BMI	4	26.7	11	73.3
MUAC <23.5 cm	2	13.3	13	86.7
Anemia (Hb <11 g/dL)	5	33.3	10	66.7

Based on Table 1, most pregnant women were within the healthy reproductive age range (20–35 years). However, three women (20%) were classified as high risk due to age <20 or >35 years. Very young maternal age increases the risk of preterm labor and anemia due to immature reproductive organs, while maternal age above 35 years increases the risk of preeclampsia and metabolic complications (Cholifah & Rinata, 2022).

Tabel 2. Blood Pressure Monitoring and Fetal Well-Being

Variable	High Risk		Normal	
	n	%	n	%
Blood pressure ≥140/90 mmHg	6	40.0	9	60.0
Abnormal fetal heart rate	2	13.3	13	86.7

Six pregnant women (40%) showed blood pressure ≥140/90 mmHg, indicating a risk of hypertension or preeclampsia. Hypertension during pregnancy causes uterine artery vasospasm and placental insufficiency, which may inhibit fetal growth and trigger fetal distress (Hani, 2011).

Five respondents (33.3%) had a parity of more than two, indicating a potential risk of uterine fatigue and postpartum hemorrhage. According to Hanifah reaserch, women with high parity are more likely to experience decreased uterine contractions and anemia due to repeated blood loss (4). Frequent pregnancies, especially closely spaced pregnancies, can increase

pregnancy risks, one of which is hypertension. Therefore, it is important for mothers to maintain the spacing between pregnancies and pay attention to the number of children and the mother's age. Spacing can be achieved by using contraception. In addition to experiencing hypertension, pregnant women with high parity can also experience bleeding, anemia, congenital defects, and several other pregnancy risks.

Nutritional status based on BMI and MUAC showed that four respondents (26.7%) had an abnormal BMI and two respondents (13.3%) had a MUAC <23.5 cm, indicating chronic energy deficiency. These findings indicate that maternal malnutrition persists in the study area. Interviews with village midwives confirmed that some pregnant women rarely attend nutrition counseling sessions and do not regularly take iron tablets. Midwives can conduct home visits or mobilize Posyandu (Integrated Health Post) cadres to provide nutritional counseling to pregnant women with low MUAC values. They can also screen for anemia during Posyandu and integrated ANC sessions. If, after the counseling session, the mother's weight and mid-upper arm circumference do not increase, the pregnant woman should be immediately referred to the hospital for more intensive care and fetal monitoring. Weight gain is an indication of proper fetal growth and development. Pregnant women with a normal BMI will minimize risks during pregnancy and childbirth.

Five respondents (33.3%) had anemia (Hb <11 g/dL). Field observations showed that most of these women did not routinely check their hemoglobin levels at primary health centers and primarily relied on integrated health posts. This finding supports research by Prafitri, which reported that low maternal knowledge and poor adherence to antenatal care contribute to the high prevalence of anemia in rural areas (5)

In addition to hypertension, anemia in pregnant women plays a significant role in reducing oxygen delivery to the fetus. WHO states that anemia during pregnancy increases the risk of fetal hypoxia and poor perinatal outcomes. Therefore, the finding of an abnormal fetal heart rate in this study may serve as an early indicator of fetal well-being related to maternal health (6)

Midwives can conduct home visits or mobilize Posyandu (Integrated Health Post) cadres to screen for anemia if the mother does not attend Posyandu or integrated ANC. Iron supplementation is also recommended to reduce the incidence of anemia and prevent complications from anemia. In addition to FE tablets, mothers can also receive high-iron nutritional counseling, both individually and in groups. Prenatal classes can also be used as a platform for nutritional counseling during pregnancy, as well as teaching prenatal exercises to maintain maternal health and prepare for childbirth.

Hypertensive disorders in pregnancy are closely associated with impaired uteroplacental perfusion, which negatively impacts fetal well-being. International studies have reported that high maternal blood pressure contributes to fetal distress and intrauterine growth restriction (7)

Observations indicate that mothers with high blood pressure commonly report fatigue, high salt intake, and irregular antenatal visits. Some complain of headaches, blurred vision, and leg edema—classic symptoms of preeclampsia. Meanwhile, two mothers (13.3%) exhibited abnormal fetal heart rates, characterized by bradycardia (<110 beats/min) or tachycardia (>160 beats/min). Doppler examination revealed fetal heart rate fluctuations, and both cases were associated with maternal hypertension. These findings suggest a link between maternal hypertension and impaired fetal well-being, as decreased uteroplacental blood flow can trigger fetal hypoxia (4)

These results are consistent with research by Purwaningsih, which emphasizes the importance of real-time fetal monitoring to prevent delayed detection of fetal distress (8). Overall, the findings indicate that maternal blood pressure is one of the most significant early indicators of fetal well-being.

High salt intake, fast food, and ultra-processed foods, which are increasingly consumed in recent years, are among the triggers of hypertension before pregnancy and are only detected during prenatal checkups.

Hypertension has a significant impact on both the pregnant mother and the fetus. In addition to affecting the mother's condition, the fetus can also experience complications such as miscarriage and asphyxia. The mother can experience seizures and bleeding both during pregnancy

and during delivery. Hypertension can also persist for years after delivery if left untreated, and can even cause maternal and infant death. Therefore, regular checkups are crucial to control hypertension during pregnancy and ensure the safety of the mother and baby.

In addition to properly managing dietary intake, light exercise and stress management are also important. Constant communication with your partner, avoiding stressors, maintaining a positive mood, and partner support are all helpful in preventing hypertension, at least preventing excessively high blood pressure. Taking pregnant women for walks to relieve stress from their daily routines can help them better manage stress. Hypertension isn't just about lowering blood pressure with medication and food; it also involves self-acceptance and positive support from those closest to them. This can help avoid triggers and help pregnant women manage their hypertension.

Early detection in pregnancy is an important note for midwives and cadres to continue to carry out early detection in pregnant women not only at the community health center level but also at integrated health posts (posyandu), so that high-risk pregnant women can be detected immediately. According to Putri's research, early detection in pregnancy can be used as an effort to detect and treat high-risk pregnancies in pregnant women. High risk of pregnancy is a pregnancy where the life and health of the mother and or baby can be threatened. Risk pregnancy is a pregnancy that has a greater risk than usual (for both mother and baby), which can result in illness or death before and after delivery (9)

In addition to routine checkups, prenatal classes can also serve as a learning tool for early detection of pregnancy complications independently. Midwives and cadres can teach the danger signs in pregnant women and also the danger signs for the fetus. This means that if a mother's condition suggests an emergency, she can immediately seek optimal care. This is similar to Idai's research, which demonstrated a significant impact of implementing prenatal classes on the ability to detect pregnancy complications early (10)

4. CONCLUSION

Some pregnant women in the Banyuates Primary Health Center working area remain at high risk for fetal well-being disorders. Blood pressure monitoring and assessment of pregnancy danger signs are effective methods for early detection and should be optimized in antenatal care services.

Midwives are encouraged to strengthen routine blood pressure screening and education on pregnancy danger signs. Pregnant women are advised to attend regular antenatal care visits and adhere to nutritional recommendations during pregnancy.

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The Effectiveness of Perineal Massage in Preventing Perineal Tears in Third Trimester Pregnant Women in the Village of Tondomulyo, Pati

Naomi Parmila Hesti Savitri[1], Sri Wahyuni[2]

[1-2]Faculty of Health Sciences/Midwifery Diploma III Program/Safin University Pati

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ABSTRACT

Perineal tears are one of the causes of postpartum hemorrhage. There were 162 cases (58.69%) of perineal tears in the Tondomulyo area of Pati district out of a total of 276 (100%) mothers who gave birth in 2022. Perineal tears can cause deeper tears in the perineum, from the perineal muscles to the anal sphincter muscles, increasing the risk of bleeding and pain in the early postpartum period and causing infection, which delays wound healing. Perineal massage is recommended as a preventive measure against perineal tears and to reduce the need for episiotomy. The research method used was a quasi-experiment using a non-equivalent control group design. The sample in this study used total sampling of 40 respondents, divided into 20 respondents who received perineal massage and 20 respondents who did not receive the treatment. Data analysis used an independent t-test. The results showed that in the intervention group of 20 respondents, 12 had first-degree birth canal tears. There was a difference in perineal massage on birth canal tears in pregnant women in their third trimester between the intervention group and the control group with a p-value of 0.003 (p<0.05). The conclusion of the study is that perineal massage is effective in preventing birth canal tears in pregnant women in their third trimester in the village of Tondomulyo.

Corresponding Author:

Naomi Parmila Hesti Savitri
Faculty of Health Sciences/Midwifery Diploma III Program/Safin University Pati/Pati, Central Java, Indonesia
Email: naomi_parmila@usp.ac.id

1. INTRODUCTION

The Maternal Mortality Rate (MMR) and Infant Mortality Rate (IMR) are indicators of public health. The health status of a country is reflected in the increase in maternal and infant mortality rates. In Indonesia, the maternal mortality rate (MMR) was recorded at 189 deaths per 100,000 live births in 2023. This change represents an improvement in the Indonesian government's success in reducing maternal mortality rates, which are now lower than a decade ago, when they reached more than 200 deaths per 100,000 live births. However, Indonesia still has the third highest maternal mortality rate in Southeast Asia. (1)

One cause of MMR is postpartum hemorrage and birth canal tears. The incidence of perineal tears in women giving birth vaginally in Indonesia reaches 75%. The survey results found

that of a total of 1,951 women who gave birth vaginally spontaneously in 2020, 57% required perineal sutures, 28% due to episiotomy and 29% due to spontaneous tears. (2)

In Central Java Province, there were 416 maternal deaths in 2020, with 64.18% occurring during the postpartum period, 25.72% during pregnancy, and 10.10% during childbirth. The incidence of birth canal tears in the village of Tondomulyo, Pati District, was 178 people (45.99%) out of a total of 387 people (100%) of mothers who gave birth in 2021.

Childbirth can cause lacerations around the vagina, leading to bleeding. Infection of the perineal suture wound, which can spread to the urinary tract and even the uterus, is caused by a laceration of the perineum and has adverse effects on the mother. The risk of postpartum infection on the first day after birth is another consequence of more severe perineal tears that affect the perineal muscles and the anal sphincter. This condition can increase pain in the mother and prolong the healing of lacerations (3)

Efforts to prevent complications during childbirth, one of which is bleeding due to perineal tears, include maintaining the elasticity of the muscles and skin of the perineum and surrounding vaginal area so that vasodilation of the blood vessels in the perineal tissue and surrounding areas occurs. One action that can be taken is perineal massage. One of the preparations for childbirth that can be done is perineal massage during pregnancy, specifically in the third trimester at 34 weeks of gestation or more, or 1-6 weeks before delivery.. Perineal massage techniques are very safe and harmless, so they can be performed daily for 5-10 minutes. However, perineal massage is not recommended for mothers with urinary tract infections or sexually transmitted infections such as herpes and fungal infections (4)

Research conducted by Goh, R et al state that 50.9% of women who received perineal massage had a significantly intact perineum after giving birth (p value = 0.02) and a lower incidence of episiotomy, which was around 58.2% in women who received perineal massage (p value = 0.03). According to Rahayu et al (2015) in Kurniawan, et al, 77.8% of the group of mothers who underwent perineal massage experienced first-degree birth canal tears, while the rest experienced second- and third-degree lacerations (5)

2. METHOD

This study uses a quasi-experimental design.. In quasi-experiments, unequal control groups (pre-test and post-test) are often used, and the selection of control and experimental groups is not random, so that only the experimental group is given treatment with pre-tests and post-tests.. The treatment given was perineal massage to pregnant women in their third trimester.

The population in this study was estimated to be 40 pregnant women in Tondomulyo Village, Pati, from March to May 2024. The research sample was collected using total sampling technique or the entire population, That is, the 40 research subjects were divided into two groups, consisting of 20 subjects who received perineal massage and 20 subjects who did not receive perineal massage, referred to as the control group. The measuring instruments in this study used SOP (Standard Operating Procedures) on perineal massage and observation sheets on the degree of birth canal tears.

The difference in the effects of perineal massage between the control and intervention groups was determined using an independent t-test. To test the normality of the data, a Shapiro-Wilk test was performed before the independent t-test. The normality test for data to determine homogeneity or variance uses the F test or Lavene test. The same variance was found in both data groups, so the T test value was read in that variance.

3. RESULTS AND DISCUSSION

3.1. Analysis Univariat

3.1.1 Frequency Distribution of Respondents based on characteristics

Table 1. Frequency distribution of characteristics of pregnant women in the third trimester

No	Characteristics	Intervention group		Control Group	
		Frequency (N)	Percentage (%)	Frequency (N)	Percentage (%)
1	Age				
	< 20	8	40	5	25
	20-35	12	60	15	75
	Total	20	100	15	100
2	Education				
	junior high school	8	40	10	50
	high school	8	40	6	30
	Diploma	3	15	3	15
	Bachelor	1	5	1	5
	Total	20	100	20	100
3	Work				
	Housewife	12	60	10	50
	Civil servant	3	15	5	25
	Private employee	5	25	5	25
	Total	20	100	10	100

Based on Table 1 in the intervention group, most respondents were aged 20-35 years, totaling 12 people (60%). Based on educational level, 8 pregnant women (40%) had junior high school education and 8 (40%) had high school education. Based on occupation, 12 pregnant women (60%) were housewives. In the control group, most of the pregnant women were primigravida aged 20-35 years, totaling 15 people (75%). Based on education, most had a junior high school education, totaling 10 people (50%). And based on occupation, most were housewives, totaling 10 people (50%).

She rarely exercises and rarely has intercourse, she will be prone to perineal rupture. The flexibility of the birth canal can decrease if the mother-to-be does not exercise enough and her genitals are frequently infected. The high level of education among mothers was one factor influencing their willingness to perform perineal massage to prevent birth canal tears. A higher education will broaden a person's knowledge and understanding. In addition, there are other factors that can increase perineal elasticity through exercise. Based on research by Halimahi, which states that floor exercise programs also have an effect on perineal trauma (6).

Research conducted by Turiyani found that a significant relationship was observed between maternal age and perineal tears (P = 0.000 < α 0.05).(7)

The results showed that the respondents' prior knowledge was low before receiving health education on perineal massage, consisting of 27 respondents (58.7%) out of a total of 46 respondents. After being educated, the respondents' knowledge increased, with 33 respondents (71.7%) having good knowledge. Based on research by Andriani et al., conducted on women who gave birth spontaneously, parity and the incidence of perineal tears were found to have a significant relationship through the Kendall-Tau test with a p-value of 0.001 < 0.05. (8). Supported by another study also conducted on women with spontaneous deliveries at the Tegalrejo Community Health Center in Yogyakarta, it was found that perineal tears are closely related to parity and maternal age. (9).

Research on the relationship between age and the incidence of perineal tears yielded significant results based on the chi-square test with a ρ value of 0.038 < 0.05. (10)

Research involving nulliparous, primiparous, and multiparous women, with an average maternal age of 20-35 years, and third trimester pregnancies. Perineal rupture can be influenced by parity and maternal age. In nulliparous and primiparous women, the incidence of birth canal tears is higher because the perineum is not yet elastic and has not stretched compared to multiparous women (11)

3.1.2 Frequency Distribution of Respondents based on Birth Tears in Groups that Received Perineal Massage and those that did not receive Perineal Massage

Table 2. Frequency Distribution of Respondents Based on Birth Canal Tears

	Intervention group		Control Group	
Birth Canal Tears	Frequency (N)	Percentage (%)	Frequency (N)	Percentage (%)
Grade I	12	60	7	35
Grade II	8	40	10	50
Grade III	0	0	3	15
Grade IV	0	0	0	0
Total	20	100%	20	100%

Table 2 shows the intervention group consisting of 20 respondents, most of the mothers who underwent perineal massage experienced first-degree perineal tears, totaling 12 people (60%). In the control group, most mothers experienced second-degree perineal tears, totaling 10 people (50%).

Perineal rupture is closely related to the degree of laceration or tear that occurs in the mother's perineum during childbirth. The results of a study by Claudia & Adam state that of the 17 people who received perineal massage, 10 experienced grade 1 lacerations, 5 experienced grade 2 lacerations, and 2 experienced grade 3 lacerations. The analysis revealed a significant difference between the massage group and the control group in terms of the degree of perineal laceration, with an Independent T-Test statistical test yielding a P-value of 0.000 (< 0.05) (12).

Based on this study, primigravida women in both the control and intervention groups only experienced first- and second-degree perineal tears because they had undergone perineal massage during the third trimester of pregnancy. This occurs because the elasticity of the elastic connective tissue and collagen in the perineum that is massaged will increase blood flow in the perineal area so that the perineum will be softer and more flexible when the baby passes through. Perineal tears can be prevented and the perineum can remain intact during childbirth if its flexibility, softness, and elasticity are maintained despite extensive stretching during the delivery process. This will not happen if the perineum is stiff and thick with low elasticity, resulting in perineal tears that can even extend to the anal sphincter muscle (11).

The results of research on factors affecting perineal rupture show that statistical testing using chi-square revealed a significant relationship between parity and birth canal tears (p value= 0.006), no relationship between birth interval and birth canal tears (p value= 0.1000), there was a significant relationship between birth weight and the incidence of birth canal tears (p value = 0.008) (13).

Based on the results of the data analysis from this study, it was shown that the degree of perineal tearing was 100% for respondents who did not receive perineal massage, while 75% of those who did receive perineal massage had no tears or an intact perineum. Prevention of birth canal tears in primigravida women can be done through perineal massage, and this was proven to be significant (p = 0.008 < 0.05) (14).

The study was conducted on pregnant women in their third trimester, with the analysis results showing an OR value of 6.72, which means that primiparous pregnant women who did not undergo perineal massage were 6.72 times more likely to experience perineal rupture compared to primiparous pregnant women who underwent perineal massage (15).

The results of research using a literature review of 12 articles show that morbidity and mortality rates among pregnant women, including bleeding and infection, can be prevented if the perineal muscles have high elasticity and feel soft, indicating that the perineum is relaxed. This can be achieved through perineal massage. The 12 articles reviewed prove that perineal massage has an effect on preventing perineal tears using several techniques. Eight articles only describe perineal massage, three articles describe a combination of perineal massage and Kegel exercises, as well as risk factors for perineal tears and the midwife's work experience in performing perineal massage. However, one other article showed that perineal massage was not effective in preventing tears, but the massage was safe to perform both during pregnancy and childbirth (16).

The other research that one of the factors causing perineal tears, namely parity, showed insignificant results on the incidence of perineal tears at the Kassi-Kassi Community Health Center, Makassar City. Most respondents experienced perineal tears (76.7%), with 26.7% and 50% experiencing grade 1 and 2 tears, respectively. while only a small portion of respondents did not experience perineal tears, namely 23.3% with a p-value of 0.071 > 0.05 and the strength of the relationship between variables was relatively low, with a Phi coefficient (μ) value of 0.488 or 48.8% (17).

The degree of perineal tear in pregnant women in the third trimester who undergo perineal massage will reduce the risk of 3-4 degree tears by up to 21% and the risk of episiotomy by up to 13%. In addition to dynamic perineal massage, daily perineal massage has also been shown to significantly reduce the risk of first-degree tears by 416%, although perineal massage is generally performed 3-4 times a week (18).

Research conducted by Januarti on two groups of pregnant women in their third trimester (control and intervention) who underwent perineal massage found a P value of 0.000 (<0.05), The number of cases of tearing of the birth canal between pregnant women who received perineal massage and those who did not receive massage had a significant difference (19).

3.3. Analysis Bivariate

3.2.1 Data Normality Test

One of the requirements for performing a T-test is that the data must be normally distributed. Therefore, the Shapiro Wilk test is used to determine whether the data is normally distributed or not. The Shapiro Wilk test was chosen because the sample size in this study is classified as small.

Tabel 3. Data Normality Test **with Shapiro Wilk**

Perineal tear	Statistik	df	Asymp.Sig
Intervention group	0,951	20	0,449
Control group	0,952	20	0,463

Based on Table 3, it appears that the Shapiro Wilk test results for perineal massage data obtained an Asymp.sig value of 0.499>0.05, so H0 is accepted, meaning that the perineal tear data is normally distributed. For the control group data, the result obtained was an Asymp.sig value of 0.463>0.05, so H0 was accepted, meaning that the perineal tear data was normally distributed. Because both data groups were normally distributed, a statistical test could be performed using the compared mean Independent sample T-test or a test of difference between.

3.2.2 Analysis of the Effectiveness of Perineal Massage on Birth Canal Tears in Pregnant Women in Their Third Trimester

Tabel 4. Analysis of the Effectiveness of Perineal Massage on Birth Canal Tears in Pregnant Women in Their Third Trimester

Independent Sample Test						
		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig.(2-tailed)
Perineal massage - Birth Canal Tears	Equal variances assumed	.910	.347	3.666	40	.003
	Equal variances not assumed			3.666	40	.003

Analysis of research results based on table 4, the results of the Compared Mean Independent Sample t-test or the test of the difference between two unrelated samples show that the Levene's Test for Equality of Variances for both data groups, This means that respondents who received perineal massage and those who did not have a massage had the same variance with an asymp.sig value of 0.347>0.05.

The t-test value (df = 40) is 3.666 > t table 1.6909, meaning that there is a difference in birth canal tears between the intervention group and the control group. The p-value = 0.003 < 0.05, meaning that the result is significant. This means that perineal massage has a significant effect on birth canal tears in pregnant women in their third trimester in the village of Tondomulyo.

Several factors that cause perineal rupture based on the results of research by Hukubun et al. show that younger maternal age, low parity, and higher birth weight are associated with the degree of perineal rupture experienced by mothers, while the multivariate results obtained show that the baby's birth weight has a more dominant influence on the degree of perineal rupture. This is because the greater the birth weight, the more the perineum will stretch, making it thinner and increasing the risk of rupture. (20)

This research is supported by a study by Syamsiah & Malinda, The Mann Whitney statistical test was used to analyze it so that a significance value of ρ = 0.001 was obtained, The meaning that Ho is not accepted means that perineal massage does not affect the occurrence of birth canal tears in primigravida women in the working area of the Jagir Surabaya Health Center. (9)

Astuti's research results distinguishing between perineal massage and yoga exercises on perineal tears showed a p-value of 0.002 (p < 0.05) which is highly significant in distinguishing the effectiveness of perineal massage and yoga exercises, namely that pregnant women in their third trimester who do yoga exercises will experience perineal tears with a risk of 19.50 greater than pregnant women in their third trimester who do perineal massage with a risk of 11.50. (21). In line with Siregar's research on pregnant women in their third trimester who underwent perineal massage in a prenatal class, the results showed a correlation between the application of perineal massage to reduce perineal rupture during childbirth, as seen in the research results with a p-value of 0.002 (p<0.05) (22).

Perineal massage is a massage performed on the perineum, which is the organ located between the vagina and anus. Perineal massage can be performed daily for 5-10 minutes during the last 5-6 weeks of pregnancy. Perineal massage during pregnancy helps the tissues around the perineum become more elastic. In line with the results of this study, which proved that in the intervention group that underwent perineal massage, there were 21.4% fewer perineal ruptures compared to the control group that did not undergo perineal massage, which had 71.4% perineal ruptures (4).

A study by Anggraeni et al. showed that prevention of perineal rupture in mothers giving birth at the Nelis Anggraeni Klari-Karawang Maternity Hospital can be done by perineal massage in the third trimester of pregnancy (ρ=0.025 <0.05) (23).

Based on Biju,S.A.,et al research, prenatal perineal massage has beneficial the effect of reducing the duration of dilation and birth of the baby. Based on other studies, the results obtained from the two groups of respondents showed that in the first group there was a decrease in the risk of birth canal tears and episiotomy, as well as postpartum pain, and the degree of tearing was at Level 1 and 2 (p < 0.05). Due to the low incidence of postpartum pain in the first group, the use of analgesic injections during hospital care was reduced (p < 0.001). In the second group, respondents experienced a higher risk of perineal tears, namely > Grade 2, and greater use of analgesics. Based on these findings, it can be concluded that complications resulting from perineal tears can be managed through the administration of PMFT and perineal massage education during the antenatal period (24).

Research conducted by Sari found that mothers who underwent perineal massage had a 59% higher rate of intact perineum after giving birth matched to women who did not undergo birth canal massage, which was 29.1%, resulting in a significantly lower incidence of episiotomy in perineal massage. The reduction in episiotomy procedures can reduce pain and the incidence of flatus incontinence in postpartum mothers, thereby reducing the need for postpartum analgesia (25).

Based on a literature review of 10 articles, the results showed that gentle perineal massage was more effective than pelvic floor muscle tightening and supercrowning alone. Perineal massage is recommended to prevent tearing of the birth canal starting in the 8th month of pregnancy when relaxation hormones are increased, and continuing until 1-2 weeks before delivery.(11).

4. CONCLUSION

This study shows that perineal massage is effective in reducing the incidence of birth canal tears significantly in TM-3 pregnant women in Tondomulyo village. With these research results, it can be used as an educational method for pregnant women in their third trimester through interactive media about complementary care through perineal massage to prevent an increase in birth canal tears. For further research development, the intervention can be grouped according to respondent characteristics so that the obstacles to performing perineal massage and the evaluation of birth canal tears can be identified.

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Association of Maternal Age, Gravida, Birth Interval, Body Mass Index, and Mid-Upper Arm Circumference with Anemia in Pregnant Women in Tanjunganom, Nganjuk

Yuninda Loviana Ersianti[1], Winda Nur Musfiroh Agustin[2]

[1,2]Department of Midwifery, Faculty of Health Sciences and Psychology, Universitas Sunan Gresik, Gresik 61153, Indonesia

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ABSTRACT

Anemia in pregnancy remains a significant public health concern due to its impact on maternal and neonatal health. This study aimed to analyze factors associated with anemia among pregnant women. A cross-sectional study was conducted involving 40 pregnant women in Tanjunganom Primary Health Center, Nganjuk Regency, East Java. Data were collected on maternal age, gestational age, parity, interpregnancy interval, antenatal care (ANC) attendance, nutritional status measured by body mass index (BMI) and mid-upper arm circumference (MUAC), iron supplementation, dietary habits, and socioeconomic status. Hemoglobin levels were assessed to determine anemia status. Statistical analyses included Chi-square, Fisher's Exact, and Likelihood Ratio tests. The median maternal age was 30 years (range: 20–41 years). Median BMI was 26.2 kg/m² (16.7–42.1 kg/m²), median MUAC was 27.46 cm (21–55 cm), and median hemoglobin level was 10.8 g/dL (8.0–12.9 g/dL). Anemia was identified in 57.5% of participants, comprising 47.5% mild and 10.0% moderate anemia. Household income showed a significant association with anemia (p = 0.01), with the highest prevalence among women earning Rp. 1,000,000–2,500,000 per month. Parity (p = 0.07) and weekly consumption of coffee, tea, or chocolate (p = 0.054) demonstrated borderline associations. Other factors, including maternal age, gestational age, ANC frequency, interpregnancy interval, BMI, and MUAC, were not significantly related to anemia. In summary, more than half of the pregnant women in this study experienced anemia, with socioeconomic status identified as the primary contributing factor. These findings emphasize the importance of integrating economic considerations and nutritional support into maternal health interventions.

Corresponding Author:

Yuninda Loviana Ersianti
Department of Midwifery, Faculty of Health Sciences and Psychology, Universitas Sunan Gresik, Gresik 61153, Indonesia
Email: yl.ersianti@lecturer.usg.ac.id

1. INTRODUCTION

Globally, it is estimated that 1.9 billion people are affected by anemia, including 32 million (37%) pregnant women (1,2). Iron deficiency anemia in pregnant women accounted for 22% of maternal deaths worldwide in 2019 (3–5). Based on the results of the Basic Health Research (Riskesdas) and the Indonesian Health Survey (SKI), the prevalence of anemia among pregnant

women in Indonesia was estimated at 37.1% in 2013, 48.9% in 2018, and 27.7% in 2023 (6–9). Iron deficiency anemia in pregnant women contributed to 22% of global maternal deaths in 2019 (3–5). According to data from the Indonesian Ministry of Health in 2023, the Maternal Mortality Rate (MMR) in Indonesia reached 4,482 cases, with 360 deaths caused by obstetric hemorrhage (10). The prevalence of anemia among pregnant women in Nganjuk Regency in 2021 showed an increase, with a total of 1,809 pregnant women (18.09%) compared to 1,680 pregnant women (16.85%) in 2020 (11).

Anemia in pregnant women is associated with a range of unfavorable health outcomes for both mothers and infants, including increased maternal complications, low birth weight, premature delivery, intrauterine growth restriction (IUGR), and a heightened risk of death in both mothers and newborns (1,12,13). Furthermore, anemia during pregnancy increases the probability of anemia in newborns (14,15). In response to this public health concern, the Ministry of Health of the Republic of Indonesia implemented the Integrated Maternal and Child Health Guidelines in 2020, mandating hemoglobin examinations for pregnant women during early and late pregnancy at health service facilities (16). Despite the implementation of these screening measures, progress in reducing anemia prevalence has remained below the national targets (4).

The World Health Organization (WHO) defines anemia during pregnancy as a hemoglobin concentration of less than 11 g/dL (17). Based on hemoglobin levels, anemia is categorized as mild (10–<11 g/dL), moderate (7–<10 g/dL), and severe (<7 g/dL) (18). While hemoglobin assessment does not identify the specific etiology of anemia in pregnant women, it is widely accepted as an effective tool for anemia surveillance at the population level (19,20). The development of maternal anemia is influenced by multiple factors. According to the WHO conceptual framework (2023), anemia arises from immediate causes—such as obstetric and gynecological conditions, micronutrient deficiencies, infections, and genetic disorders—as well as a range of contributing risk factors, including proximal, underlying, and structural determinants (21).

Previous research has identified multiple factors that contribute to the development of anemia during pregnancy, including socioeconomic conditions, frequency of antenatal care visits, nutritional status, parity, gravidity, interpregnancy interval, gestational age, iron supplementation, and dietary patterns (22–24). Evidence from studies conducted by Derson (2017) and Deriba (2020) indicates that pregnant women with mid-upper arm circumference (MUAC) values below the recommended standard were 3.8 times and 5.0 times more likely to experience anemia, respectively (25,26). In light of these findings, the present study seeks to examine the relationship between maternal age, parity, birth spacing, body mass index (BMI), and mid-upper arm circumference (MUAC) and the occurrence of anemia among pregnant women.

2. METHOD

A cross-sectional study was conducted to examine the association between maternal age, parity, birth interval, body mass index (BMI), and mid-upper arm circumference (MUAC) with anemia among pregnant women. The study was carried out in the catchment area of Tanjunganom Primary Health Center, Nganjuk Regency, East Java, Indonesia, between September and November 2025.

The study population comprised all pregnant women in their second and third trimesters who attended antenatal care (ANC) services at the health center during the study period. A purposive sampling technique was employed to recruit 40 respondents who met the inclusion criteria. Eligible participants were second- or third-trimester pregnant women with singleton pregnancies, who had received ANC services, possessed a Maternal and Child Health (MCH) handbook, and provided informed consent. Exclusion criteria included a history of chronic medical conditions such as eclampsia, hypertension, hyperemesis gravidarum, diabetes mellitus, hypothyroidism, or renal disorders.

Data collection involved structured questionnaires to obtain demographic characteristics, ANC history, parity, and birth interval. Anthropometric measurements (BMI and MUAC) and hemoglobin assessment were performed by trained midwives. Hemoglobin concentration was measured using the HemoCue 301 analyzer, standardized according to World Health Organization (WHO) guidelines. Ethical approval for the study was granted by the Research Ethics Committee (Approval No. 258/UN6.KEP/EC/2025). Data were analyzed using STATA version 26 software.

3. RESULTS AND DISCUSSION

Table 1. Characteristics of study participants

Variable	Median (Min-Max)	n (%)
Maternal age (years)	30 (20-41)	
BMI at first ANC visit (kg/m^2)	26.2 (16.7-42.1)	
MUAC (cm)	27.46 (21-55)	
Hemoglobin level (g/dL)	10.8 (8-12.9)	
Gestational age		
Second trimester		17 (42.5%)
Third trimester		23 (57.5%)
Maternal age		
Not at risk		27 (67.6%)
At risk		13 (32.5%)
Formal education		
Junior/Senior High School		31 (77.5%)
Diploma (D1/D2/D3)		2 (5.0%)
Bachelor/Master/Doctoral		7 (17.5%)
Maternal occupation		
Housewife		33 (82.5%)
Civil serant/military/police		1 (2.5%)
Employee		4 (10.0%)
Entrepreneur		2 (5.0%)
Family income		
< Rp. 1.000.000		17 (42.5%)
Rp. 1.000.000- Rp. 2.500.000		16 (40.0%)
Rp. 2.500.000- Rp. 5.000.000		6 (15.0%)
> Rp. 5.000.000		1 (2.5%)
Number of antenatal care visits		
2-4 visits		23 (57.5%)
>4 visits		17 (42.5%)
Number of pregnancy (Gravida)		
Gravida 1-3		35 (87.5%)
Gravida ≥4		5 (12.5%)
Birth Interval		
<2 years		8 (20.0%)
≥2 years		32 (80.0%)
Iron supplementation (per week)		
1-3 times/week		8 (20.0%)
≥4 times/week		32 (80.0%)
Consumption of coffee/tea/chocolate (per week)		
No		13 (32.5%)
Yes		27 (67.5%)
MUAC status (cm)		
<23,5 cm (low)		16 (40.0%)
≥23,5 cm (normal)		24 (60.0%)
BMI at first ANC visit (kg/m^2)		
<18,5 (underweight)		6 (15.0%)
≥ 18,5 (normal)		34 (85.0%)
Anemia status		
Normal		17 (42.5%)
Anemia		23 (57.5%)
Mild		19 (47.5%)
Moderate		4 (10.0%)

A total of 40 pregnant women participated in this study. The median maternal age was 30 years (range: 20–41), with 67.5% classified as not at risk (<35 years) and 32.5% as at risk (≥35 years). Most respondents were in their third trimester (57.5%), and the remainder in the second trimester (42.5%). The median Body Mass Index (BMI) at the first antenatal care (ANC) visit was

26.2 kg/m² (range: 16.7–42.1), and the median mid-upper arm circumference (MUAC) was 27.46 cm (range: 21–55 cm). Hemoglobin levels ranged from 8 to 12.9 g/dL, with a median of 10.8 g/dL.

Regarding education, 77.5% of respondents had completed junior or senior high school, 17.5% held a university degree, and 5.0% had diploma-level education. Most participants were housewives (82.5%), while others worked in the private sector (10.0%), were self-employed (5.0%), or served as civil servants/military/police personnel (2.5%). Family income varied, with 42.5% earning less than Rp. 1,000,000 per month, 40.0% earning between Rp. 1,000,000 and Rp. 2,500,000, 15.0% earning between Rp. 2,500,000 and Rp. 5,000,000, and only 2.5% earning more than Rp. 5,000,000.

In terms of pregnancy-related indicators, 57.5% of respondents had 2–4 ANC visits, while 42.5% had more than four visits. Most women were gravida 1–3 (87.5%), and only 12.5% had four or more pregnancies. The majority had a pregnancy spacing of ≥2 years (80.0%), and 20.0% had spacing of less than 2 years. Iron supplementation was adequate in 80.0% of respondents (≥4 times/week), while 20.0% reported intake of 1–3 times/week. Additionally, 67.5% reported weekly consumption of coffee, tea, or chocolate, while 32.5% did not.

MUAC status showed that 60.0% had normal measurements (≥23.5 cm), and 40.0% were below the recommended threshold. BMI at first ANC visit indicated that 85.0% had normal nutritional status (≥18.5 kg/m²), while 15.0% were underweight. The prevalence of anemia was 57.5%, with 47.5% classified as mild and 10.0% as moderate; the remaining 42.5% had normal hemoglobin levels.

Table 2. Association of determinant factors with pregnancy anemia

Variabel	Anemia Status				Total		*p*
	Anemia		Normal				
	n	%	n	%	N	%	
Maternal age							0,408[a]
Not at risk	15	37.5	12	30.0	27	67,5	
At risk	9	22.5	4	10.0	13	32.5	
Gestational age							0.896 [a]
Second trimester	10	25.0	7	17.5	17	42.5	
Third trimester	14	35.0	9	22.5	23	57.5	
Family income							0.01[c]
< Rp. 1.000.000	6	15.0	11	27.5	17	42.5	
Rp. 1.000.000- Rp. 2.500.000	14	35.0	2	5.0	16	40.0	
Rp. 2.500.000- Rp. 5.000.000	3	7.5	3	7.5	6	15.0	
> Rp. 5.000.000	1	2.5	0	0	1	2.5	
Number of antenatal care visits							0.601[a]
2-4 visits	13	32.5	10	25.0	23	57.5	
>4 visits	11	27.5	6	15.0	17	42.5	
Number of pregnancy (Gravida)							0.07[b]
Gravida 1-3	19	47.5	16	40.0	35	87.5	
Gravida ≥4	5	12.5	0	0	5	12.5	
Birth Interval							0.690 [b]
<2 years	4	10.0	4	10.0	8	20.0	
≥2 years	20	50.0	12	30.0	32	80.0	
BMI at first ANC visit (kg/m²)							0.373[b]
<18,5 (underweight)	5	12.5	1	2.5	6	15.0	
≥ 18,5 (normal)	19	47.5	15	37.5	34	85.0	
Consumption of coffee/tea/chocolate (per week)							0,054[a]
No	5	12.5	8	20.0	13	32.5	
Yes	19	47.5	8	20.0	27	67.5	
MUAC status (cm)							0.114 [a]
<23,5 cm (low)	12	30.0	4	10.0	16	40.0	
≥23,5 cm (normal)	12	30.0	12	30.0	24	60.0	

*Data were analyzed using x^2 (a), Fisher's Exact Test (b), or Likelihood Ratio Test (c)

Table 2 presents the association between selected determinant factors and pregnancy anemia. There was no statistically significant association between maternal age and anemia status

(p=0.408[a]). Similarly, gestational age (trimester II vs III) showed no significant difference in anemia prevalence (p=0.896[a]). Family income was significantly associated with anemia (p=0.01[c]), where women with monthly income between Rp. 1,000,000–2,500,000 had the highest proportion of anemia (35.0%), compared to other income groups.

The number of antenatal care visits was not significantly associated with anemia (p=0.601[a]). Gravida status showed a borderline association (p=0.07[b]), with higher anemia prevalence among women with gravida 1–3 (47.5%) compared to those with ≥4 (12.5%). Interpregnancy interval and BMI were not significantly associated with anemia (p=0.690[b] and p=0.373[b], respectively). Consumption of coffee, tea, or chocolate more than once per week showed a near-significant association with anemia (p=0.054[a]), with 47.5% of anemic women reporting such intake. Mid-upper arm circumference (MUAC) was not significantly associated with anemia status (p=0.114[a]), although women with MUAC <23.5 cm had a higher proportion of anemia (30.0%) compared to those with normal MUAC.

In 2021, the prevalence of anemia among pregnant women in Nganjuk Regency was reported at 18.1% (11). This proportion is considerably lower than the regional estimate provided by the World Health Organization, which indicated that 47.8% of pregnant women in Southeast Asia were affected by anemia in 2019 (27). During the second and third trimesters, physiological changes such as hemodilution occur alongside increased nutritional requirements, thereby heightening the likelihood of reduced hemoglobin concentrations (28–31). Pregnancy is also accompanied by elevated erythropoietin (EPO) levels, which enhance erythropoiesis and consequently increase the body's demand for iron intake (32). Under normal physiological conditions in pregnancy, plasma volume expands by approximately 40–60%, leading to a state of hypervolemia, while red blood cell mass increases by only 20–50% (33). Because the expansion of plasma volume exceeds the rise in red blood cell mass, blood dilution occurs [34]. This imbalance results in what is known as physiological or dilutional anemia, typically reflected by a reduction in hematocrit levels to approximately 30–32% (33).

Hemodilution in pregnancy represents a normal physiological adaptation that supports the growth and development of the fetus and placenta. This adaptation is regulated in part by hormonal changes, particularly increased levels of estrogen and aldosterone, which promote fluid retention (34). Hemodilution provides several physiological advantages during pregnancy. One key benefit is the reduction of cardiac workload, as the maternal cardiovascular system must accommodate increased demands throughout gestation. The resulting hypervolemia enhances cardiac output, while decreased blood viscosity facilitates circulation and lowers peripheral resistance, contributing to better blood pressure regulation. Another advantage of hemodilution is the reduction of iron loss during the postpartum period. Maternal blood volume expansion typically begins around the tenth week of pregnancy and reaches its maximum between 32 and 36 weeks of gestation (35).

Pregnancy outcomes are generally more favorable when conception occurs between the ages of 20 and 35 years, as this period is associated with optimal reproductive health and a lower likelihood of obstetric complications (36). This advantage is closely linked to both the biological maturity and psychological readiness of the mother. Conversely, pregnancies occurring before the age of 20 are associated with an increased risk of anemia, largely due to the incomplete development of the reproductive system (37). During adolescence, higher nutritional intake is required to support ongoing physical growth and reproductive maturation; therefore, pregnancy at a young age imposes additional nutritional demands compared with pregnancies in women over 20 years of age (38). The risk of anemia also increases with a higher number of pregnancies. Women with multiple prior pregnancies are more likely to develop anemia during gestation than first-time mothers (39–41). In particular, mothers who have experienced more than three previous deliveries face a greater risk of serious obstetric complications, such as hemorrhage, and have an increased likelihood of anemia in subsequent pregnancies (42).

Short intervals between pregnancies have been linked to a higher likelihood of anemia among pregnant women (43). Women who conceive again within two years are particularly vulnerable, as insufficient time is available to restore nutritional stores depleted during the previous pregnancy. In such cases, maternal iron reserves must support both post-pregnancy recovery and the requirements of the subsequent gestation. A minimum interval of two years is generally needed to replenish iron levels through adequate intake of iron- and protein-rich foods

and to allow full physiological and anatomical recovery (44). In addition, higher consumption of green tea and coffee has been associated with an increased prevalence of iron deficiency. Women who consumed three or more cups per day exhibited significantly higher rates of iron deficiency compared with those who reported minimal intake ($p < 0.05$) (45). Pregnant women who regularly consumed beverages containing caffeine were found to have approximately double the risk of developing anemia, likely because caffeine inhibits the absorption of non-heme iron and reduces its bioavailability (46).

Body Mass Index (BMI) is a simple anthropometric indicator calculated from an individual's weight and height and is commonly used to assess nutritional status (47). BMI is generally classified into underweight (<18.5), normal weight (18.5–24.9), overweight (25.0–29.9), and obesity (≥30). This measure is particularly useful for evaluating adult nutritional conditions, including both insufficient and excessive body weight (48). Previous research conducted at the Sekapuk Ujung Pangkah Gresik Community Health Center demonstrated a significant association between BMI and the occurrence of anemia among pregnant women, with a reported p-value of 0.04 ($p < 0.05$) (49).

Mid-upper arm circumference (MUAC) is widely used as a rapid screening indicator for nutritional status and has been shown to correlate strongly with body mass index (BMI) (50). MUAC assessment reflects muscle mass and overall nutritional condition, as the measurement is relatively stable and less influenced by fluid accumulation compared with measurements taken from the lower limbs, which are more susceptible to edema (51,52). MUAC is commonly applied to identify chronic energy deficiency (CED), using a cutoff value of 23.5 cm (53). Based on this threshold, MUAC values are categorized as low (<23.5 cm) or normal (≥23.5 cm) (54). Evidence from a study on anemia prediction in pregnancy indicated that MUAC combined with iron supplementation status, using data from Riskesdas, produced a predictive model with high diagnostic performance, demonstrating a sensitivity of 94.3%, a specificity of 90%, and an area under the ROC curve of 60.7% (55).

4. CONCLUSION

Among the 40 pregnant women studied, the prevalence of anemia was 57.5%, comprising 47.5% mild and 10.0% moderate anemia. Family income was significantly associated with anemia ($p = 0.01^{c}$), with the highest prevalence (35.0%) observed among women earning Rp. 1,000,000–2,500,000 per month. Gravida status ($p = 0.07^{b}$) and weekly consumption of coffee, tea, or chocolate ($p = 0.054^{a}$) showed borderline associations with anemia. In contrast, maternal age ($p = 0.408^{a}$), gestational age ($p = 0.896^{a}$), frequency of antenatal care visits ($p = 0.601^{a}$), pregnancy spacing ($p = 0.690^{b}$), body mass index ($p = 0.373^{b}$), and mid-upper arm circumference ($p = 0.114^{a}$) were not significantly associated with anemia. These findings indicate that socioeconomic factors and certain dietary behaviors are more strongly associated with anemia during pregnancy than maternal age, parity, or anthropometric indicators of nutritional status.

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Analysis of the Tuberculosis Surveillance System at Madani Hospital in Medan Based on Input, Process, and Output Components

Rizky Aditya Hutomo[1], Alya Najwa[2], Jihan Nabila Ritonga[3], Aulia Zahra Ritonga[4], Rifa Dwi Ramadhani[5], Alfira Budiman[6]

[1-6]Faculty of Public Health/Universitas Islam Negeri Sumatera Utara, Medan, 20371, Indonesia

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ABSTRACT

Tuberculosis (TB) is a serious public health issue, with Indonesia ranking second in the world in terms of TB cases and North Sumatra Province yet to achieve its optimal case detection target. Hospitals play a crucial role in recording, reporting, and monitoring TB cases. This study aims to analyze the tuberculosis surveillance system at Madani Hospital, Medan, based on input, process, and output components. This study used a descriptive qualitative design, with data collected through interviews, observations, and document reviews. The informants were TB surveillance officers at Madani Hospital, Medan. The results showed that the input and output components generally met minimum standards, but there were still limitations in human resource capacity and supporting facilities for active surveillance. In the process component, TB surveillance has been implemented both actively and passively, but the completeness and timeliness of reporting have not yet reached optimal targets. Overall, the TB surveillance system at Madani Hospital, Medan, has been running quite well, but staff capacity building and reporting quality improvement are needed to support more effective TB control.

Corresponding Author:

Rizky Aditya Hutomo
Faculty of Public Health/Department of Public Health, University/Universitas Islam Negeri Sumatera Utara, Medan, 20371, Indonesia
Email : rizky.a.hutomo@gmail.com

1. INTRODUCTION

Tuberculosis (TB) is one of the leading causes of morbidity and mortality globally. The disease is caused by infection with the pathogenic bacterium *Mycobacterium tuberculosis*. Tuberculosis primarily affects the lungs (pulmonary TB) but can also involve other organs, a condition known as extrapulmonary tuberculosis(1). Globally, tuberculosis remains a major public health problem, with an estimated mortality rate of approximately 13 deaths per hour. Throughout 2020, an estimated 10 million people worldwide developed tuberculosis, resulting in approximately 1.5 million deaths. In the same year, 30 countries accounted for about 86% of new tuberculosis cases globally, with Indonesia ranking third among countries with the highest tuberculosis burden worldwide(2).

Tuberculosis (TB) remains one of the major public health problems worldwide. The World Health Organization (WHO) estimated that in 2023 there were approximately 10.8 million TB cases

globally, with TB continuing to be the leading cause of death from infectious diseases. The high burden of TB cases and mortality indicates that TB control efforts still face significant challenges, particularly in developing countries.

Indonesia is among the countries with the highest TB burden globally. According to the latest Global Tuberculosis Report, Indonesia ranks second after India in terms of the number of TB cases worldwide. It is estimated that more than one million TB cases occur annually in Indonesia, with a substantial number of TB-related deaths. This situation places TB as a national health priority, requiring an integrated and data-driven disease control(3).

At the regional level, TB also remains a serious public health concern. North Sumatra Province, including the city of Medan as a major referral center for health services, continues to experience a gap between the estimated number of TB cases and those successfully detected and reported. This condition indicates the need to strengthen the TB surveillance system to improve case detection, treatment monitoring, and program evaluation in a sustainable manner.

Epidemiological surveillance is a critical component of communicable disease control, including TB. Surveillance serves as a systematic and continuous process of data collection, processing, analysis, and dissemination, which provides the basis for planning, implementation, and evaluation of health programs. In the context of TB, an effective surveillance system supports early case detection, monitoring of disease trends, and evidence-based decision-making (3).

The implementation of TB surveillance can be analyzed using a systems approach consisting of input, process, and output components. Input components include the availability of human resources, financing, infrastructure, as well as guidelines and standard operating procedures. Process components involve data collection, data processing and analysis, and information dissemination. Meanwhile, output components consist of surveillance reports and information used to support policy formulation and health interventions. This approach is widely applied in surveillance system evaluations as it comprehensively describes the interrelationships among system components (4).

Hospitals play a strategic role in the TB surveillance system, particularly as referral health facilities that manage TB cases with higher severity and complexity. In addition to providing curative services, hospitals are responsible for recording and reporting TB cases through the Tuberculosis Information System (SITB) and coordinating with local health offices and networked health facilities. Therefore, the quality of TB surveillance implementation in hospitals significantly affects the overall quality of TB data(5).

Despite the establishment of various national policies and guidelines for TB control, studies evaluating hospital-based TB surveillance systems using an input–process–output approach remain limited. Most TB surveillance studies in Indonesia focus on primary healthcare centers or local health offices. Therefore, more in-depth research at the hospital level is needed to identify strengths and challenges in TB surveillance implementation.

Based on this background, this study aims to evaluate the TB surveillance system at RS Madani Medan using the input, process, and output components. The findings of this study are expected to provide valuable input for hospital management and relevant stakeholders to strengthen hospital-based TB surveillance systems and support the achievement of TB control targets at both regional and national levels.

2. METHOD

This study uses a qualitative approach with a descriptive design. The qualitative descriptive approach aims to describe and interpret the phenomena under study as they are in their natural context. This method is used to systematically examine specific situations or conditions and present the results in the form of a research report (Anggito & Setiawan, 2018; Arikunto, 2013). This research was conducted in a private hospital located in the city of Medan. Informants were selected using purposive sampling, which is the deliberate selection of samples by researchers based on certain considerations relevant to the research objectives, so that the selected informants are able to optimally represent the conditions being studied(6). There was one informant in this study, namely a tuberculosis surveillance officer at Madani Hospital in Medan who has been in office since 2021. The tuberculosis program officer has a role in recording cases, reporting through the Tuberculosis

Information System (SITB), coordinating with the Medan City Health Office, and being responsible for all tuberculosis control and prevention activities at the hospital. The inclusion criteria for selecting informants were officers responsible for tuberculosis recording and reporting activities, while the exclusion criteria included officers who were unwilling to become research informants. The data used were primary data collected through in-depth interviews and observation. Data collection focused on the input components (man, material, method, money, and market), the process (data collection, data analysis and interpretation, and information dissemination), and the output in the form of tuberculosis surveillance information.

3. RESULTS AND DISCUSSION

The results of interviews with informants were summarized based on three indicators, namely input, process, and output. The interview results were also compared with ideal conditions based on applicable guidelines (Table 1).

Table 1. Indicator Tuberculosis Surveillance System

Indicator	Existing Conditions	Ideal Conditions
Input		
a. Man	- Number of TB case investigators = 2 - TB program officer training consists of SITB training and contact investigation.	- Number of TB cases ≥ 2 - TB program officer training consists of SITB training, contact investigation, clinical understanding training, and PPI training.
b. Money	- Funding sources: Regional Public Hospital, Regional Budget, and NGOs - Advocacy is conducted regularly to the Health Office.	- Funding sources: Regional General Hospital Business Entity (BLUD RS), Regional Budget (APBD)/State Budget (APBN), NGOs, BPJS, Grants - Advocacy is conducted regularly to the Health Office.
c. Material	- Equipment used: computers, internet, office supplies, SITB, and TCM tools, microscopes, radiology equipment, standard recording forms, and PPE.	- Equipment used: computers, internet, office supplies, SITB, and TCM tools, microscopes, radiology equipment, standard recording forms, and PPE
d. Method	- The input method follows the 2023 national TB guidelines, technical instructions, and internal hospital SOPs, etc.	- The input method follows the 2023 national TB guidelines, technical instructions, and internal hospital SOPs, etc.
e. Market	- Information dissemination targets: hospital management, local health offices, networked community health centers, internal service units, the public	- Information dissemination targets: hospital management, health offices, networked community health centers, internal service units, the public
Process		
a. Data Collection	- -Methods used: passive & active surveillance - -Achievement of data collection process indicators: completeness of reports by reporting units 85%, timeliness of reporting by reporting units 80%, feedback 100% - Media used to send reports: SIBT	- -Methods used: passive & active surveillance - -Achievement of data collection process indicators: 100% completeness of reports by reporting units, 100% timeliness of reporting by reporting units, 100% feedback - Media used to send reports: SIBT, SIMRS, TB.01 Form, TB.03 Form
b. Data Analysis and Interpretation	- -Analysis of gender, time, and place was conducted using	- -Analysis of people, time, and place was conducted using descriptive epidemiological

			descriptive epidemiological analysis		analysis, frequency analysis, and proportion analysis.
		-	The results of data interpretation were presented in infographics (tables, graphs, maps) according to the variables of gender, place, and time	-	The results of data interpretation were presented in infographics (tables, graphs, maps) according to the variables of gender, place, and time.
c.	Information Dissemination	-	-Dissemination is carried out through: monthly, quarterly, and annual reports, as well as regular network meetings	-	-Dissemination is carried out through: monthly, quarterly, and annual reports, as well as regular network meetings.
		-	Dissemination activities involve internal hospital cross-program parties, cross-sectors, policy makers, and patients	-	Dissemination activities involve internal hospital cross-program parties, cross-sectors, policy makers, patients, and the general public.
Output					
a.	Information	-	Surveillance output generates monthly, quarterly, and annual SITB reports and hospital profile data.	-	Surveillance output generates monthly, quarterly, and annual SITB reports and hospital profile data.

Overall, a comparison between the existing conditions at Madani Hospital in Medan and the ideal conditions shows that there is a not-too-significant gap in several crucial components of the TB surveillance system. On the input side, the most notable gaps are in human resource limitations and the lack of special transportation facilities to support active surveillance. In the Process component, the methods used already include active and passive surveillance, although the indicators of timeliness and completeness of reporting have not yet reached the ideal target of 100%. However, the Method (guidelines) and Market (dissemination targets) aspects are relatively in line with the established standards.

This discussion elaborates the study findings by relating them to the implementation of tuberculosis surveillance at Madani Hospital, Medan, and relevant evidence from previous studies.

3.1 Input Components

The input components of tuberculosis surveillance include human resources, funding, facilities and infrastructure, methods, and information dissemination targets, which collectively determine the readiness and effectiveness of surveillance implementation.

3.1.1 Man (Human Resources)

The results of the study show that two Wasor TB individuals quantitatively meet the minimum standards. However, there are still qualitative competency deficiencies, especially in terms of the types of training received by officers. Training in clinical understanding of TB and Infection Prevention and Control (IPC) is not yet fully available, and the training that has been undertaken is still limited to SITB training and contact investigation.

The overall quality of the TB surveillance system can be affected by this situation. Surveillance officers not only record data but also act as initial analysts who must understand the diagnosis process, case classification, and the possible spread of tuberculosis in health facilities. A study conducted by Siregar and Lubis (2021) found that a lack of clinical and IPC training can lead to inaccurate TB case classification and delays in reporting confirmed cases. Hidayat et al. (2023) also reached similar findings. They concluded that the success of TB surveillance in health care facilities is greatly influenced by the competence of human resources(7). Limited human resources also affect the implementation of active surveillance, especially in contact investigations and tracing of defaulting cases. The situation is exacerbated by the unavailability of special transportation to support field surveillance activities, which hinders active case finding efforts.

3.1.2 Money

Funding for TB surveillance at Madani Hospital in Medan comes from the hospital's BLUD, the regional budget (APBD), and NGOs, and is supported by regular advocacy to the Health Office. This demonstrates institutional commitment to supporting TB surveillance. However, funding sources are still not fully diversified because the state budget (APBN), BPJS, and grant schemes are not yet being used optimally(8). According to Putri et al. (2022), the lack of funding sources directly hinders active surveillance activities, particularly in terms of financing for field supervision, human resource capacity building, and transportation. Therefore, although the current funding sources are sufficient to carry out routine surveillance, the sustainability and expansion of surveillance activities still require cross-sectoral funding support.

3.1.3 Materials (Facilities and Infrastructure)

The results of the study indicate that the material and procedural components are in line with ideal standards. At Madani Hospital in Medan, the TB surveillance system relies on the availability of facilities such as the SITB application, TB diagnostic tools (TCM, microscopes, and radiology), and standard recording forms. In addition, the implementation of monitoring has been within the appropriate regulatory framework, as indicated by the 2023 National TB Guidelines and internal SOPs. Available facilities include computers, internet networks, office stationery, access to the Tuberculosis Information System (SITB), and Molecular Rapid Test (TCM) kits. The availability of these facilities indicates that, in general, the implementation of TB surveillance at Madani Hospital in Medan is in accordance with the Guidelines for the Implementation of the Health Epidemiological Surveillance System as stipulated in the Decree of the Minister of Health of the Republic of Indonesia Number 1116 of 2003.

The availability of Molecular Rapid Test (MRT) equipment is an important component in supporting the TB surveillance system, considering that MRT is a diagnostic tool used to detect the presence of Mycobacterium tuberculosis bacteria in patient sputum. The use of TCM is a priority in TB testing because it has high sensitivity, relatively fast testing time, and the ability to simultaneously detect Drug-Resistant Tuberculosis (DR-TB)(5). Thus, the availability of TCM at Madani Hospital in Medan contributes positively to the implementation of TB surveillance. Limited transportation facilities have the potential to hamper active surveillance activities, such as case tracing and field coordination.

In addition, technical obstacles were also found in the use of the Tuberculosis Information System (SITB), particularly in relation to the speed of access to the application, which sometimes experienced slowdowns. The slow access to SITB was caused by the high number of health workers in Indonesia accessing the system simultaneously, which hampered the process of recording and reporting TB cases. This problem is a systemic obstacle originating from the SITB system itself. Therefore, TB officers at health care facilities are advised to provide feedback to provincial and central authorities regarding the technical obstacles encountered, so that this can serve as a basis for the development and improvement of the system by the central government and relevant authorities.

3.1.4 Method

The implementation of tuberculosis surveillance at Madani Hospital in Medan has been based on the 2023 National Guidelines for Tuberculosis Control and supported by the hospital's internal standard operating procedures (SOPs). These guidelines serve as the main reference for officers in carrying out systematic and standardized TB surveillance activities, from case detection and recording to reporting.

The guidelines used have comprehensively covered tuberculosis management, including aspects of detection, prevention, and case management, and have been compiled based on various TB classifications, such as TB with diabetes mellitus comorbidity, drug-sensitive TB, drug-resistant TB, TB with HIV, TB in children, and latent tuberculosis. The completeness of these guidelines supports the uniform implementation of TB control in accordance with the characteristics of cases found in health care facilities(9).

In addition, the implementation of TB surveillance has also been aligned with applicable national regulations, including Minister of Health Regulation No. 67 of 2016 concerning Tuberculosis Control and the 2020 Minister of Health Decree concerning the National Guidelines

for Medical Services for Tuberculosis Management and the National Formulary. This is in line with the research by Rahmawati et al. (2023), which states that methods and tools must comply with national guidelines for accurate and accountable TB surveillance(10).

3.1.5 Market

The results of the study show that from the perspective of information dissemination targets, surveillance information has been distributed to hospital management, the Health Office, networked community health centers, internal units, and the community. However, active community involvement needs to be increased so that surveillance data is not only administrative but also serves as a tool to promote and prevent tuberculosis.

The target audience for surveillance information dissemination, often referred to as the market, refers to parties who need and utilize surveillance information as a basis for decision-making in disease control. The surveillance information produced needs to be conveyed to relevant stakeholders so that it can be optimally used in the planning, implementation, and evaluation of health programs(7).

Information dissemination is carried out through regular coordination, both formally through network meetings and informally through communication media such as WhatsApp groups. These targets include parties directly involved in TB control efforts, particularly in the areas of case detection, treatment, and prevention of TB-related deaths.

With the fulfillment of TB surveillance information needs for the right targets, stakeholders are expected to understand the actual conditions in the field and provide appropriate input and feedback on program implementation. This information is an important basis for TB program managers in determining appropriate interventions that are in line with the epidemiological situation and existing risk factors, thereby supporting the improvement of TB control effectiveness(7).

3.2 Process Components

In the tuberculosis surveillance system, the process component plays a critical role in translating available inputs into usable information for program decision-making. This component encompasses a series of interrelated activities, including data collection, data processing, analysis, reporting, and feedback mechanisms. Effective implementation of these processes is essential to ensure that surveillance information is timely, complete, and accurate, thereby supporting evidence-based interventions in tuberculosis control.

3.2.1 Data Collection

Madani Hospital in Medan identified all TB cases through data collection via active and passive surveillance. The completeness rate of reports from internal reporting units reached approximately 85%. Most service units have recorded and reported TB cases through the Tuberculosis Information System (SITB). However, there are still incomplete reports, mainly due to the high workload in service units. This condition is in line with research findings in Indonesia which state that clinical service workload is one of the factors that affect the quality and completeness of TB surveillance data in referral health facilities (Simarmata et al., 2020).

The accuracy of TB case reporting at Madani Hospital in Medan is reported to be around ±80%. Delays in reporting generally occur due to internal data flows that are not always timely, as well as technical constraints in the SITB application, which sometimes experiences slowdowns or system disruptions. Similar problems have also been reported in the implementation of national TB surveillance, where the optimization of health information systems remains a challenge in ensuring the timeliness of case recording and reporting (Indonesian Ministry of Health, 2016; Indonesian Ministry of Health, 2019)(7). The 80% timeliness rate also indicates that the reporting process still faces several obstacles. According to Putri et al. (2022), many factors contribute to delays and incompleteness in SITB reporting. One of them is the high workload of officers, limited human resources, and suboptimal integration between SITB and the hospital information system (SIMRS). The results of this study are relevant because the reporting media used are still limited to SITB and are not yet fully integrated with manual forms and SIMRS.

Meanwhile, feedback on TB reports from within the hospital to the reporting unit has been optimally implemented with a 100% achievement rate. Every report that comes in is always followed up through direct coordination, communication via online media such as WhatsApp groups, as well as discussions in internal meetings and networks. A well-functioning feedback mechanism plays an important role in improving reporting compliance, improving data quality, and supporting more accurate decision-making in tuberculosis control at the hospital level.

3.2.2 Data Analysis and Interpretation

Data analysis and interpretation in hospitals is conducted based on variables of people, time, and place, using a descriptive epidemiological approach to analyze the data. This method is in line with TB surveillance data analysis standards and allows for the identification of case distribution patterns in a simple yet informative manner. It is very useful to present the analysis results in the form of tables, graphs, and maps as this makes it easier for stakeholders to understand TB incidence trends. According to research by Rahmawati et al. (2023)(10), surveillance data visualization is very important to assist evidence-based decision making, especially in determining intervention priorities. Conversely, data analysis is still limited to descriptive analysis and has not yet developed to support long-term strategic planning. This is because human resources are still limited to conducting in-depth analysis.

3.2.3 Dissemination of Information

Although TB surveillance information has been routinely disseminated through monthly, quarterly, and annual reports, as well as cross-program and cross-sector network meetings, public involvement remains limited. According to Nuraini and Hidayat (2024)(11), disseminating surveillance data to the public is crucial for increasing awareness, treatment adherence, and community participation in TB prevention. Therefore, more inclusive dissemination strategies should be used, such as through health promotion and community-based education media.

3.3 Output Components - Information

Monthly, quarterly, and annual SITB reports and hospital profiles have been regularly produced as a result of tuberculosis monitoring. This shows that the TB surveillance system at Madani Hospital in Medan is capable of producing the necessary epidemiological information. However, Wardani et al. (2020) state that the quality of surveillance is not only measured by the availability of reports, but also by how well the information is collected and analyzed(12).

4. CONCLUSION

The tuberculosis surveillance system at Madani Hospital in Medan has generally been running quite well and has covered the input, process, and output components in accordance with national guidelines. The availability of human resources, funding, infrastructure, as well as guidelines and standard operating procedures has supported the implementation of TB surveillance in hospitals. The surveillance process has been carried out through active and passive surveillance, accompanied by descriptive data analysis and dissemination of information through routine reports and networking activities. Surveillance outputs in the form of SITB reports and hospital profile data have been produced periodically. However, there are still several obstacles, particularly in terms of limited human resource capacity, variations in staff training, and constraints in the completeness and timeliness of reporting. To overcome these problems, Madani Hospital in Medan is advised to strengthen its human resources by adding personnel and providing regular training accompanied by clinical understanding and PPI training, clarifying internal reporting procedures, and optimizing data quality monitoring and coordination related to SITB constraints with the relevant central authorities. These efforts are expected to improve the completeness and timeliness of reporting and strengthen the role of hospital-based TB surveillance.

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