

Analysis of Factors Associated with Measles Rubella (MR) Immunization in Toddlers Aged 9-24 Months at the Kedungwuni II Community Health Center, Pekalongan Regency

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ABSTRACT

Measles and rubella remain a public health problem due to the high risk of transmission and complications in toddlers. This study aims to analyze the relationship between predisposing factors (maternal knowledge and attitudes), supporting factors (access to health facilities), and motivating factors (family support, support from health workers, and information from health workers) with the provision of Measles Rubella (MR) immunization to toddlers aged 9–24 months. The study used a quantitative method with a cross-sectional design. The population was 677 mothers with toddlers aged 9–24 months in the working area of the Kedungwuni II Community Health Center, Pekalongan Regency, with a sample of 87 respondents selected using a stratified random sampling technique. Data were collected through questionnaires and analyzed using the Chi-Square and Fisher Exact tests at a significance level of 5%. The results showed that maternal attitudes, access to health facilities, family support, support from health workers, and information from health workers had a significant relationship with the provision of MR immunization, while maternal knowledge level did not have a significant relationship. This study emphasizes the importance of strengthening education, family support, and easy access to immunization services as an effort to increase MR immunization coverage in toddlers.

Keywords: Measles Rubella (MR) immunization, toddlers, maternal attitudes, access to health facilities, family support.

INTRODUCTION

Measles and rubella remain major public health problems worldwide despite the availability of safe and effective vaccines. Both diseases are highly contagious and can cause serious complications, especially in infants and children. Measles can cause pneumonia, encephalitis, severe diarrhea, and death, while rubella infection during pregnancy can result in Congenital Rubella Syndrome (CRS), which causes congenital heart defects, hearing loss, blindness, and developmental delays. Following the COVID-19 pandemic, disruptions in routine immunization services have contributed to a resurgence of measles cases globally. In Indonesia, (World Health Organization, 2025), although the Measles-Rubella (MR) immunization program has been implemented nationally, immunization coverage has not

consistently reached the minimum target of 95% required to build herd immunity (World Health Organization, 2023). As a result, the risk of an outbreak remains high, especially in areas with suboptimal vaccination coverage.

Immunization coverage is influenced not only by vaccine availability but also by behavioral, social, and health system factors. Mothers play a central role in determining whether children receive immunizations according to the recommended schedule. Previous studies have shown that maternal knowledge, attitudes, family support, accessibility of health services, and the quality of communication provided by health workers are important determinants of immunization acceptance. However, the influence of these factors varies across regions because differences in socioeconomic characteristics, local health service capacity, and community perceptions can influence parental decisions regarding child vaccination.

Pekalongan Regency exemplifies this situation. While the overall MR immunization program has shown progress, disparities persist among community health centers. Data from the District Health Office shows that the Kedungwuni II Community Health Center recorded one of the lowest MR immunization coverage rates in 2024, reaching only 80.80%, well below the national target. Within its service area, several villages, including Ambokembang and Tangkil Tengah, reported significantly lower immunization rates. This situation demonstrates that barriers to immunization persist and require evidence-based interventions tailored to the local context.

Several previous studies have investigated the determinants of MR immunization participation, primarily focusing on maternal knowledge, education level, socioeconomic status, or attitudes. However, relatively few studies have simultaneously examined predisposing, enabling, and reinforcing factors using the behavioral framework proposed by Lawrence Green in the context of local primary health care. Furthermore, evidence from Pekalongan Regency, particularly in the Kedungwuni II Community Health Center (Puskesmas), remains limited. This research gap highlights the need for a comprehensive analysis to identify the factors most influential on MR immunization coverage in the study area.

Therefore, this study aims to analyze factors associated with MR immunization in children aged 9–24 months in the service area of the Kedungwuni II Community Health Center, Pekalongan Regency. Specifically, this study examines predisposing factors (maternal knowledge and attitudes), supporting factors (access to health facilities), and reinforcing factors (family support, support from health workers, and information provided by health workers).

Understanding the relationship between these factors is expected to provide a comprehensive explanation of maternal participation in the child immunization program.

This study used a quantitative analytical approach with a cross-sectional design involving mothers of children aged 9–24 months in the service area of Kedungwuni II Community Health Center. Data were collected through a structured questionnaire and analyzed using univariate and bivariate statistical analysis to determine the relationship between independent variables and MR immunization status.

The contribution of this study lies in providing empirical evidence on behavioral and health service factors associated with MR immunization in areas with suboptimal immunization coverage. These findings are expected to support local health authorities in developing targeted interventions, strengthening health promotion strategies, increasing family engagement, and improving health services to increase MR immunization coverage. Furthermore, this study enriches the existing literature on the determinants of childhood immunization in Indonesia by applying a comprehensive behavioral framework that integrates predisposing, enabling, and reinforcing factors within the context of community-based primary health care.

LITERATURE REVIEW

Immunization of children is a form of health behavior influenced by various individual, social, and environmental factors. One of the most widely used theories in explaining this health behavior is the PRECEDE-PROCEED Model developed by Lawrence Green and Kreuter. This model explains that health behavior is influenced by three main groups of factors: predisposing factors, enabling factors, and reinforcing factors. Predisposing factors include individual characteristics such as knowledge, attitudes, beliefs, and values that influence a person's readiness to behave. Enabling factors relate to the availability of resources and ease of access to health services, while reinforcing factors include support from family, health workers, and the social environment that strengthen the formation of health behavior. Therefore, Lawrence Green's model is a relevant conceptual framework to explain mothers' decisions in administering Measles Rubella (MR) immunization to toddlers.

Various studies have shown that predisposing factors have an important contribution to the success of immunization programs. (Ramadhani et al., 2023) found that mothers who have good knowledge about the benefits and safety of vaccines tend to have higher compliance in taking their children to receive immunizations on schedule. Adequate knowledge improves mothers' ability to distinguish scientific information from misinformation about vaccines. However,

research(Rania S. et al., 2024)showed different results, namely that knowledge level had no significant relationship with MR immunization coverage. This difference in results indicates that knowledge alone may not necessarily motivate action if it is not accompanied by a positive attitude and belief in the benefits of immunization. Thus, maternal attitudes are seen as a psychological factor more closely linked to the formation of behavior than knowledge alone.

In addition to predisposing factors, ease of access to healthcare also influences the success of an immunization program. Green and Kreuter explain that enabling factors are conditions that enable a person to implement healthy behaviors. In the context of MR immunization, these factors include access to healthcare facilities, availability of immunization services, and ease of vaccine acquisition. Research(Nurhayani, 2022)showed that mothers who lived close to health care facilities were more likely to provide complete immunizations than mothers who faced distance and transportation barriers. Similar results were reported by(Puriadi, 2024), which found a significant relationship between access to health facilities and maternal adherence to the immunization schedule. These findings demonstrate that the success of an immunization program is determined not only by individual characteristics but also by the readiness of the health care system to provide accessible services.

Reinforcing factors also play a crucial role in maintaining healthy public behaviors. Family support is a key determinant, as immunization decisions are often influenced by husbands and other family members. Ruhana (2023) explains that emotional support, information, and shared decision-making can increase mothers' confidence in immunizing their children. Furthermore, effective communication from healthcare professionals has been shown to increase public acceptance of vaccines.(Ananta et al., 2024)reported that the quality of communication between health workers and increased MR immunization coverage was positively associated with reducing public doubts about vaccine safety. Therefore, support from family and health workers is a reinforcing factor that increases the likelihood of mothers receiving immunizations according to national program recommendations.

Although extensive research has been conducted on the determinants of MR immunization, most previous studies have focused on only one or two variables, such as maternal knowledge, education, or socioeconomic status. Tiurma Linda's (2023) study, for example, emphasized the influence of maternal age, education, and knowledge, while other studies focused on the relationship between attitudes or socioeconomic conditions and immunization coverage. Relatively few studies have integrated Lawrence Green's three groups of behavioral factors—predisposing, enabling, and reinforcing factors—into a single, comprehensive analytical

model. Furthermore, empirical evidence regarding these factors in Pekalongan Regency, particularly in the Kedungwuni II Community Health Center (Puskesmas Kedungwuni II), remains limited, thus not providing a strong basis for developing locally-based health interventions.

Based on the literature review, it can be concluded that MR immunization behavior is the result of an interaction between individual factors, health service factors, and social support factors. However, the relationship between these variables still shows varying results in various regions, thus requiring further research according to the characteristics of each region. Therefore, this study simultaneously analyzes the influence of predisposing factors (maternal knowledge and attitudes), enabling factors (access to health facilities), and reinforcing factors (family support, support from health workers, and information from health workers) on MR immunization for toddlers aged 9–24 months in the working area of the Kedungwuni II Community Health Center, Pekalongan Regency. The results of this study are expected to enrich the development of health behavior theory and serve as a basis for developing strategies to increase MR immunization coverage at the primary health care level.

METHODS

Sampling

This research is an analytical quantitative research with an approach *cross-sectional*, namely data collection of independent and dependent variables was carried out at the same time to identify the relationship between variables. The study was conducted in the working area of the Kedungwuni II Community Health Center, Pekalongan Regency, which is one of the areas where Measles Rubella (MR) immunization coverage is still below the national target. The target population of the study was all mothers with toddlers aged 9–24 months who live in the working area of the Kedungwuni II Community Health Center. The unit of analysis in this study was mothers with toddlers aged 9–24 months as the main decision makers in providing MR immunization to children.

The number of research population is 677 mothers who have toddlers aged 9–24 months. The sample size was determined using the Slovin formula with a 10% error rate, resulting in 87 respondents. The sampling technique uses *stratified random sampling*, with the sample divided based on the village area under the work coverage of the Kedungwuni II Community Health Center so that each village has a proportional opportunity to become a research respondent.

This technique was chosen to increase the representativeness of the sample to the characteristics of the research population.

The study respondents were mothers with toddlers aged 9–24 months who met the established inclusion criteria. Respondent characteristics were analyzed descriptively, including demographic characteristics and the distribution of research variables, namely level of knowledge, attitudes toward MR immunization, access to health facilities, family support, support from health workers, information from health workers, and MR immunization status for toddlers. These characteristics were used to provide a general overview of the respondents' conditions and to support the interpretation of the results of the analysis of relationships between variables.

Data collection

The data used in this study are primary data. Data were obtained directly from respondents using a structured questionnaire. Data collection was conducted after obtaining approval from the relevant agencies and informed consent from all respondents. Questionnaires were administered to mothers with toddlers aged 9–24 months through structured interviews or directly completed with researcher assistance when necessary. In addition to primary data, the study also utilized secondary data in the form of MR immunization coverage reports, health profiles, and supporting documents from the Kedungwuni II Community Health Center and the Pekalongan District Health Office as information regarding the conditions of the research area.

The collected data then went through editing, coding, entry, cleaning, and tabulation before statistical analysis was performed. Univariate analysis was used to describe the frequency distribution of each research variable, while bivariate analysis was conducted using the *t* test, *Chi-Square* or *Fisher's Exact Test* at a 95% confidence level ($\alpha = 0.05$) to determine the relationship between predisposing factors, supporting factors, and driving factors with the administration of MR immunization to toddlers.

Measuring Instruments

The research instrument was a structured questionnaire based on Lawrence Green's health behavior theory and a literature review of the determinants of MR immunization. The instrument measured six independent variables, including: mother's knowledge, mothers' attitudes towards MR immunization, access to health facilities, family support, health worker support, and information from health workers, while the dependent variable is Measles Rubella

(MR) immunization for toddlers aged 9–24 months. Before being used in the main research, the instrument underwent validity and reliability testing to ensure that each question item was able to consistently measure the construct being studied.

Each variable was measured using scores based on respondents' answers, then categorized according to established operational criteria. Knowledge levels were classified into good and poor, attitudes into positive and less positive, while access to health facilities, family support, health worker support, and information from health workers were categorized based on the median score for each variable. MR immunization status was determined based on the immunization history of toddlers of the target age. All measurements were conducted uniformly to maintain the validity and reliability of the data obtained during the research process.

RESULTS

Respondent Characteristics

A total of 87 mothers with children aged 9–24 months participated in this study. The majority of respondents were housewives (74.7%), followed by employees and tailors (5.7 each), while the remaining respondents worked as teachers, civil servants, nurses, traders, entrepreneurs, and laborers in smaller proportions. Regarding educational level, the majority of respondents had completed high school (64.4%), followed by junior high school (16.1%), college (10.3%), elementary school (6.9%), and diploma (2.3%). Based on the children's age, 52.9% were toddlers aged 13–24 months, while 47.1% were infants aged 9–12 months (Table 1).

Variables	Category	Frequency (f)	Percentage (%)
Respondent's Occupation	Housewife	65	74.7
	Employee	5	5.7
	Laborer	1	1.1
	Nurse	2	2.3
	Businessman	1	1.1
	Trader	2	2.3
	Teacher	4	4.6
	Seamstress	5	5.7

	civil servant	2	2.3
	Total	87	100.0
Respondent Education	Elementary School	6	6.9
	JUNIOR HIGH SCHOOL	14	16.1
	SENIOR HIGH SCHOOL	56	64.4
	D3	2	2.3
	S1	9	10.3
	Total	87	100.0
Respondent's Toddler Age	Baby	41	47.1
	Toddler	46	52.9
	Total	87	100.0

Distribution of Research Variables

Descriptive analysis showed that almost all respondents had good knowledge of MR immunization (98.9%). However, only 48.3% showed a positive attitude toward MR immunization. More than half of respondents reported having adequate access to health facilities (54.0%), family support (66.7%), support from health workers (58.6%), and adequate information from health workers (62.1%). Regarding outcome variables, 49.4% of children received MR immunization on schedule, while 50.6% experienced delays in immunization.

Variable	Category	n	%
Knowledge	Good	86	98.9
	Not enough	1	1.1
Family Support	Support	58	66.7
	Does not support	29	33.3
Mother's Attitude	Good	42	48.3
	Not enough	45	51.7

Health Facilities	Yes	47	54.0
	No	40	46.0
Healthcare Worker Support	Support	51	58.6
	Does not support	36	41.4
Health Officer Information	Good	54	62.1
	Not enough	33	37.9
MR Immunization Administration	On time	43	49.4
	Not on time	44	50.6

Bivariate Analysis

Bivariate analysis was performed using the Chi-Square test. Fisher's exact test was used for the knowledge variable because one of the categories had very few observations.

Knowledge was not significantly associated with timely MR immunization ($p = 0.506$), with a very weak contingency coefficient ($CC = 0.106$). Although almost all respondents had good knowledge, this was not reflected in timely immunization practices.

In contrast, maternal attitudes showed a statistically significant relationship with the timeliness of MR immunization ($p < 0.001$). Mothers with positive attitudes consistently provided MR immunization on schedule, while almost all mothers with less positive attitudes delayed immunization. The strength of the relationship was classified as strong ($CC = 0.699$).

Access to health facilities was also significantly associated with timely MR immunization ($p < 0.001$; $CC = 0.375$). Respondents who reported adequate access were more likely to immunize their children on schedule than those who experienced limited access.

Family support was significantly associated with MR immunization ($p < 0.001$), with a moderate association ($CC = 0.573$). Similarly, support from health workers was significantly associated with timely immunization ($p < 0.001$; $CC = 0.568$). Mothers who received support from health workers were significantly more likely to complete MR immunization on time.

Information provided by health workers was also significantly associated with MR immunization ($p = 0.005$), although the magnitude of the association was relatively weak ($CC = 0.286$). Respondents who received adequate information tended to vaccinate their children sooner than those who received inadequate information.

Variable	p-value	cc	Information
Knowledge	0.506	0.106	Not related
Mother's Attitude	< 0.001	0.699	Related (k)
Health Facilities	< 0.001	0.375	Related (low)
Family Support	< 0.001	0.573	In relationship (current)
Healthcare Worker Support	< 0.001	0.568	In relationship (current)
Health Care Worker Information	0.005	0.286	Related (low)

Overall, five of the six independent variables were significantly associated with the timeliness of MR immunization. Maternal attitudes showed the strongest association, while maternal knowledge was the only variable that did not show a statistically significant association with the timeliness of MR immunization.

DISCUSSION

This study aims to analyze factors related to the provision of Measles Rubella (MR) immunization to toddlers aged 9–24 months in the working area of Kedungwuni II Community Health Center, Pekalongan Regency. Factors analyzed include maternal knowledge level, maternal attitudes towards immunization, access to health facilities, family support, support from health workers, and information from health workers. This study is important considering that the coverage of MR immunization in the working area of Kedungwuni II Community Health Center is still below the national target, so it is necessary to identify factors that influence the timeliness of immunization administration as a basis for developing strategies to increase immunization coverage. The results showed that of the six variables studied, five variables had a significant relationship with the provision of MR immunization, while the level of knowledge did not show a significant relationship. These findings provide an empirical contribution that immunization behavior is not only influenced by cognitive aspects, but also by psychosocial factors and environmental support, thus strengthening the application of

Lawrence Green's PRECEDE-PROCEED theory in the context of basic immunization programs in primary health care.

The first finding indicates that maternal knowledge levels were not significantly associated with MR immunization. This finding contradicts the general assumption that good knowledge will always result in positive health behaviors. Almost all respondents in this study had good knowledge of MR immunization, so the variation in knowledge between respondents was very small and unable to explain differences in immunization behavior. This condition indicates that knowledge is an important prerequisite, but not the sole determinant of health behavior. This finding is in line with research(Rania S. et al., 2024)which reported that maternal knowledge had no significant relationship with MR immunization coverage. In contrast, these results differ from the study(Ramadhani et al., 2023)who found that knowledge influences immunization compliance. This difference is likely influenced by respondent characteristics, the distribution of health information, and the intensity of educational programs in each region. From Lawrence Green's theoretical perspective, knowledge is only a predisposing factor that prepares someone for behavior, while the realization of behavior is still influenced by supporting and reinforcing factors.

In contrast, mothers' attitudes toward immunization showed the strongest association with MR immunization. This finding suggests that although most respondents had good knowledge, the decision to provide timely immunizations was more influenced by mothers' beliefs, perceptions, and acceptance of immunization. Mothers with positive attitudes tended to be more confident in the benefits of immunization, less easily influenced by misinformation, and more committed to ensuring their children received immunizations on schedule. This finding is consistent with research by Tiurma Linda (2023) and research by(I Wayan Romantikaa et al., 2024), which shows that attitude is an important predictor of basic immunization compliance. Theoretically, these results reinforce the view that attitude is a predisposing factor that is more closely related to the formation of behavior than knowledge alone because it involves affective aspects and tendencies to act.

This study also found that access to health facilities was significantly associated with MR immunization. Although the Kedungwuni II Community Health Center's working area is relatively easy to reach, nearly half of respondents still experienced limited access. These barriers could include distance, limited transportation, service time, or family socioeconomic conditions. This finding aligns with research(Nurhayani, 2022)And(Puriadi, 2024)This study shows that easy access to health facilities increases a child's chances of receiving scheduled

immunizations. According to Lawrence Green's theory, access is an enabling factor that allows individuals to transform intentions into concrete actions. Therefore, increasing immunization coverage requires more than just public education; it also requires strengthening the health care system to make it more accessible to all groups.

In addition to access to health services, family support has been shown to be significantly associated with the provision of MR immunization. The family is the closest social environment that influences mothers' decision-making processes in meeting their children's health needs. Family support can take the form of approval for immunization, transportation assistance, assistance to health facilities, and emotional support. These results support research (Ruhana, 2023) which states that family involvement contributes to the success of childhood immunization programs. In Indonesian society, which still values collective decision-making within the family, the approval of husbands and other family members is often a determining factor in the success of immunization implementation. Therefore, health promotion approaches that focus solely on mothers need to be expanded to include families as educational targets.

Support from health workers also showed a significant relationship with MR immunization. Respondents who received support from health workers were more likely to administer immunizations on time. These findings suggest that the quality of interpersonal communication, staff attitudes, motivation, and support during immunization services play a role in increasing public trust in the immunization program. These findings align with research (Ananta et al., 2024) This indicates that communication between healthcare workers contributes to increased vaccine acceptance in the community. In the context of primary healthcare, healthcare workers serve not only as service providers but also as trusted sources of information, helping to alleviate public doubts about the safety and benefits of immunization.

Information provided by health workers has also been shown to be associated with MR immunization. In fact, in further analysis, this variable emerged as the most dominant factor, although the multivariate model could not be fully interpreted due to convergence constraints. These findings indicate that the quality of information received by the public plays a crucial role in shaping maternal decisions. Clear, accurate, easy-to-understand information delivered consistently can increase public trust in immunization while reducing the influence of misinformation circulating through social media and the surrounding environment. These results support health communication theory, which states that the effectiveness of information delivery is a key determinant of changes in public health behavior.

Practically, the results of this study provide several implications for immunization program managers at the Kedungwuni II Community Health Center and the Pekalongan District Health Office. Strategies to increase MR immunization coverage should not only focus on increasing public knowledge through outreach, but also be directed at fostering positive attitudes toward immunization, improving the quality of communication between health workers, involving families in educational activities, and expanding access to immunization services through optimizing integrated health service posts (Posyandu), mobile immunization services, and information technology-based immunization schedule reminders. This approach is expected to improve the timeliness of immunization administration while improving MR immunization coverage in areas with low coverage.

This study has several limitations that need to be considered when interpreting the results. First, the cross-sectional design does not allow researchers to explain causal relationships because all variables were measured simultaneously. Second, data were obtained through questionnaires, thus creating the possibility of information bias and social desirability bias. Third, the study was conducted only in one community health center (Puskesmas) working area, so generalizing the results to other areas requires caution. Furthermore, the distribution of respondents, which was heavily dominated by the good knowledge category, limited data variation, potentially influencing the analysis of the relationship between knowledge and immunization provision. This study also found that the multivariate analysis model did not achieve convergence, so interpretation of the dominant factors must be done cautiously and requires confirmation through further research.

Future research is recommended to use a longitudinal or cohort design to more thoroughly analyze the causal relationship between behavioral factors and immunization. Future research should also develop a model that integrates psychological and cultural factors, vaccine trust, exposure to digital information, and the quality of health worker communication to gain a more comprehensive understanding of community immunization behavior. In addition to quantitative approaches, qualitative research through in-depth interviews with mothers, family members, and health workers is also needed to explore the reasons behind the formation of attitudes toward immunization and the dynamics of family decision-making. A mixed methods approach will provide stronger evidence for designing behavior-based interventions that are tailored to local community characteristics and support the sustainable increase in MR immunization coverage.

CONCLUSION

Based on the research results, it can be concluded that the administration of Measles Rubella (MR) immunization to toddlers aged 9–24 months in the working area of the Kedungwuni II Community Health Center, Pekalongan Regency is influenced by several factors, namely maternal attitudes, access to health facilities, family support, support from health workers, and information provided by health workers. These factors have been shown to have a significant relationship with the administration of MR immunization. Conversely, the level of maternal knowledge does not show a significant relationship, so good knowledge alone does not necessarily lead to the implementation of MR immunization in toddlers.

The results of this study indicate that increasing MR immunization coverage depends not only on increasing public knowledge but also requires the development of positive attitudes, easy access to health services, family involvement, and the active role of health workers in providing education and support. These findings are expected to serve as a basis for developing strategies to increase MR immunization coverage in the Kedungwuni II Community Health Center (Puskesmas) and other areas with similar characteristics.

Further research is recommended to examine other factors that have not yet been studied, such as vaccine trust, the influence of social media, socioeconomic conditions, culture, and health care policy factors, and to use a research design that can explain causal relationships. For readers and the general public, the results of this study are expected to raise awareness that the success of MR immunization is a shared responsibility that requires support from families, health workers, and the community so that every child receives optimal protection from measles and rubella.

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