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Analysis of factors contributing to low vaccination coverage among school-aged children

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Abstract

Background: The School-Age Children Immunization Month program is an annual national vaccination initiative targeting school-aged children in Indonesia. However, a decline in vaccination coverage has been observed in recent years, influenced by both internal and external factors. Key contributing variables include maternal knowledge, maternal attitudes, cultural beliefs, and the roles of healthcare workers, teachers, and parents.

Purpose: To analyze the factors most significantly associated with low vaccination coverage among elementary school children.

Method: A quantitative, cross-sectional design was employed. A total of 142 respondents—mothers of elementary school students in grades 1, 2, and 5—were selected using simple random sampling. Data were collected using a structured questionnaire. Statistical analyses included univariate analysis, bivariate analysis using the chi-square test, and multivariate analysis using logistic regression.

Results: Five variables met the criteria for inclusion in the multivariate analysis ($p < .25$): maternal knowledge, maternal attitude, cultural beliefs, the role of healthcare workers, and the role of parents. Logistic regression analysis identified the parental role as the most significant predictor of vaccination coverage ($p = .000$; OR = 2.234), indicating that children were more than twice as likely to be vaccinated when parental involvement was strong.

Conclusion: Parental involvement emerged as the most influential factor affecting vaccination uptake among elementary school children. Strengthening parental support and engagement is crucial to improving vaccination coverage in school-based programs.

Keywords: Parents' Role; School-aged Children; Vaccination.

INTRODUCTION

Improving public health outcomes requires comprehensive strategies for preventing communicable diseases, with vaccination programs being among the most effective approaches. Vaccination has been proven to significantly reduce disease transmission, morbidity, and mortality, particularly among infants and young children (World Health Organization [WHO], 2022; Sekar, Raharjo, & Azam, 2023). The primary goal of vaccination is to minimize illness, disability, and death caused by

vaccine-preventable diseases such as tuberculosis, diphtheria, pertussis, polio, measles, tetanus, and hepatitis B (Ministry of Health of the Republic of Indonesia, 2022).

Globally, vaccination coverage has declined during the COVID-19 pandemic. Cases of measles and rubella (MR) surged in 2020, with 98 countries reporting increases compared to 2019. The Philippines and Ukraine, for example, experienced substantial spikes in MR cases. Globally, MR cases

rose from 9,665 (January–February 2021) to 17,338 during the same period in 2022, a trend linked to reduced immunization coverage (Irach, 2022; United Nations Children's Fund, 2024).

In contrast to the global trend, Indonesia experienced a decrease in reported suspected MR cases beginning in 2019, although there was a resurgence in 2022. Despite this, national vaccination coverage remains below the target of 95%. In 2020 and 2021, MR vaccination coverage in Indonesia fell dramatically to 46.5% and 42.4%, respectively (Ministry of Health of the Republic of Indonesia, 2021). In West Sumatra, coverage declined from 74.14% in 2019 to 37% in 2021. Similarly, in Padang City, MR vaccination coverage dropped from 66.4% in 2018 to 35.6% in 2022 (Widyawati, 2022; Health Office of West Sumatra Province, 2022).

To improve vaccination uptake among school-aged children, the Indonesian government has implemented the School-Age Children Immunization Month program, launched in 1987. This school-based immunization program delivers MR, DT, and Td vaccines to students in grades 1, 2, and 5, in accordance with Ministry of Health regulations (Ministry of Health of the Republic of Indonesia, 2017).

Despite its longstanding implementation, the program continues to face several challenges. These include logistical issues such as vaccine distribution delays, shortages of health personnel, and restricted activities during the pandemic. External factors such as geographical barriers and limited cross-sector collaboration also hinder program effectiveness. In addition, internal factors—including parental knowledge, perceptions of vaccine safety and halal status, and cultural beliefs—play a significant role in determining vaccination uptake (Deswita, Samidah, & Yulianti, 2023). A UNICEF (2020) survey further revealed that many parents were reluctant to take their children to health facilities due to fear of COVID-19 infection and concerns about the safety protocols and the vaccines themselves (United Nations Children's Fund, 2020).

In Pasaman Regency, data show a decline in MR vaccination coverage from 71.3% in 2022 to 58.73% in 2023. Coverage for DT and Td vaccines among students in grades 1, 2, and 5 also fell during the same period (Health Office of Pasaman Regency, 2023).

These findings underscore the urgent need to strengthen public education, raise awareness, and enhance intersectoral coordination to improve routine immunization coverage and achieve the measles and rubella elimination goals outlined in the WHO Immunization Agenda 2030.

RESEARCH METHOD

A quantitative approach with a descriptive-analytic design was employed to examine factors contributing to the low coverage of measles-rubella (MR) vaccination at the elementary school level.

The study was conducted from November 5 to 12, 2024, across three elementary schools in Pasaman District, identified based on their low vaccination coverage rates. The population consisted of 222 mothers of students in grades 1, 2, and 5. Using Slovin's formula with a 5% margin of error, a sample of 142 respondents was selected through proportional simple random sampling, applying a cluster sampling technique.

Inclusion criteria comprised mothers of students in grades 1, 2, or 5 who consented to participate. Exclusion criteria included mothers of students from other grades, parents of children with specific medical conditions, and respondents unwilling to cooperate.

Data were collected using a structured questionnaire and checklist, covering variables such as maternal knowledge, attitudes, cultural beliefs, and the perceived roles of healthcare workers, teachers, and parents. The questionnaire was developed based on previously validated instruments, with reliability confirmed by Cronbach's alpha coefficients ranging from .756 to .981. Primary data were obtained from the questionnaires, secondary data from the District Health Office, and tertiary data from scientific literature. Data processing involved editing, coding, entry, and cleaning procedures. Variables were recoded into binary formats to facilitate statistical analysis.

The dependent variable was MR vaccination coverage, coded as 0 (not vaccinated) or 1 (vaccinated). A respondent was categorized as vaccinated if at least one item was answered "Yes," and not vaccinated if all responses were "No."

The independent variables included: Maternal knowledge: Correct answers were scored as 1; incorrect answers were scored as 0. Scores were

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categorized as low if < 9.36 (mean) and high if ≥ 9.36 ; Maternal attitude: Measured using a Likert scale. For positive statements, responses ranged from Strongly Agree (4) to Strongly Disagree (1); for negative statements, scoring was reversed. Categorized as negative if < 27.56 (mean) and positive if ≥ 27.56 ; Cultural beliefs: Positive statements were scored Yes = 1, No = 0; for negative statements, Yes = 0, No = 1. Categorized as negative if < 9.2 (mean) and positive if ≥ 9.2 ; Role of healthcare workers: Positive responses were coded Yes = 1, No = 0; negative responses were reverse coded. Categorized as poor if < 7.66 and good if ≥ 7.66 ; Role of teachers: Scored

and categorized in the same manner, with a cutoff of 9.86; Role of parents: Also scored using the same method, with a cutoff of 5.16.

Univariate analysis was used to describe frequency distributions. Bivariate analysis was conducted using the chi-square test with a significance level of $\alpha < .05$. Variables with $p < .25$ were included in multivariate analysis using logistic regression.

The study followed ethical research principles, including obtaining informed consent, ensuring participant confidentiality, and providing equitable treatment to all respondents.

RESEARCH RESULTS

Table 1. Characteristics of the Respondents (N=142)

Variable	Results	Normality Test	
		Z	Remarks
Age (n/%) (Mean $\pm$ SD)(Range)(Year)	(30.57 $\pm$ 7.953)(25-45)		
> 35	53/37.33		
$\leq$ 35	89/62.27		
Education (n/%)			
Elementary	23/16.19		
Junior High	15/10.56		
Senior High	66/46.47		
College/University	38/26.78		
Occupation (n/%)			
Housewife	64/45.07		
Civil Servant	44/30.98		
Seller/Farmer	23/16.19		
Self-employed	11/7.76		
Vaccination (n/%)			
Yes	55/38.73	0.399	Normal
No	87/61.27		
Knowledge (n/%)			
Good	70/49.29	0.344	Normal
Poor	72/50.71		
Attitude (n/%)			
Positive	62/43.67	0.373	Normal
Negative	80/56.33		

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Variable	Results	Normality Test	
		Z	Remarks
Culture (n/%)			
Positive	78/54.93	0.366	Normal
Negative	64/45.07		
Healthcare Personnel's Role (n/%)			
Good	113/79.58	0.489	Normal
Poor	29/20.42		
Teachers' Role (n/%)			
Good	132/92.96	0.538	Normal
Poor	10/7.04		
Parents' Role (n/%)			
Good	64/45.07	0.366	Normal
Poor	78/54.93		

Table 1 presents the demographic and perception data of the respondents, the majority of whom were mothers aged ≤ 35 years (62.67%), with a high school level education (46.47%), and primarily working as housewives (45.07%). Of the 142 respondents, 87 individuals (61.3%) reported not having received vaccinations during their elementary school years. In terms of knowledge regarding vaccination, 72 respondents (50.71%) demonstrated a low level of understanding. Furthermore, 80 participants (56.33%) expressed negative attitudes toward the implementation of vaccination programs in elementary schools, whereas 62 (43.67%) held positive attitudes. Cultural perceptions toward school-based vaccination were also divided, with 64 respondents (45.07%) exhibiting negative cultural beliefs, while 78 (54.93%) held positive cultural views. When assessing the perceived role of health workers, 29 respondents (20.42%) believed health personnel had a poor role in supporting vaccination efforts in elementary schools. However, the majority (113 respondents or 79.58%) perceived their role as positive. Only 10 respondents (7.04%) perceived teachers as playing a poor role in vaccination programs, whereas the vast majority (132 respondents or 92.96%) viewed their role favorably. Interestingly, 78 parents (54.93%) were perceived as having a poor role in vaccination implementation, while 64 (45.1%) were considered to have played a supportive role.

A significance value greater than 0.05 was considered indicative of normally distributed data. The results of the normality test confirmed that the data were normally distributed, thereby satisfying the assumptions for proceeding with regression analysis.

Table 2. Results of the Regression Model Fit Test (Hosmer and Lemeshow Test)

Step	Chi-Square	Df	Sig
1	11.473	3	240

Table 2 presents the results of the Hosmer and Lemeshow test, the Chi-square value was 11.473 with 3 degrees of freedom (df) and a significance value (Sig) of 0.240.

Table 3. Overall Model Significance Table

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	134,135	357	476

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Table 3 presents the results of the logistic regression analysis. The -2 Log Likelihood value was 134.135, indicating a reasonably good model fit. The Cox & Snell R Square value was 0.357, while the Nagelkerke R Square value was 0.476, suggesting that the model explains approximately 47.6% of the variation in MR vaccination uptake among elementary school children.

Table 4. Wald Test Statistic (Partial t-test)

Independent Variable	Kof B	SE	Wald	Df	Sig	Ex (B)
Knowledge (1)	-,313	1,222	,066	1	,798	0.731
Attitude (1)	21,436	28324,510	,000	1	,023	0.869
Culture (1)	-,433	,707	,375	1	,541	0.649
Healthcare Personnel's Role (1)	1,171	,462	6,434	1	,061	0.224
Parents' Role (1)	-23,133	28324,510	,000	1	,000	2.234

Table 4 indicates that maternal attitudes and parental roles have a statistically significant effect on the low coverage of vaccination ($p < 0.05$), suggesting that these variables are meaningful influencing factors. In contrast, maternal knowledge, cultural beliefs, and the role of health workers did not show a significant effect ($p > 0.05$). Additionally, the odds ratio for the parental role variable is greater than 1, indicating that active parental involvement is associated with a higher likelihood of children receiving vaccination.

DISCUSSION

The findings of this study revealed that out of 142 respondents, 87 (61.3%) reported that their children did not receive MR vaccination at the elementary school level. This proportion underscores the persistently low vaccination coverage in schools. This observation aligns with previous studies suggesting that MR vaccination remains a topic of controversy within communities. Several key factors have been identified, including limited parental awareness of the importance of vaccination, concerns over potential side effects, and doubts regarding the vaccine's halal status. Moreover, a common misconception persists among parents that vaccinations are only necessary during infancy, rendering school-age immunizations unnecessary (Triana, 2016).

The study also found that a majority of respondents exhibited low levels of knowledge regarding vaccination. Specifically, 72 respondents (50.7%) lacked comprehensive understanding of the importance of school-age vaccinations. This included limited awareness of vaccine types, schedules,

benefits, and the risks associated with missed vaccinations. These results are consistent with prior research indicating that maternal knowledge significantly influences the completeness of a child's immunization status. Misconceptions about booster vaccines and the assumption that early-life vaccination suffices remain key contributors to poor school-based vaccination coverage (Septiani & Mita, 2020).

In addition to knowledge, maternal attitude was found to be a critical factor. The data showed that 80 respondents (56.3%) had negative attitudes toward school-based vaccination programs. Negative perceptions included fears that vaccination could cause illness, anxiety among children on vaccination days, and a belief that the practice was unnecessary. This is supported by research conducted in Wonokusumo Village, which found that maternal attitudes are often shaped by cultural norms, personal experiences, and misinformation (Dillyana & Nurmala, 2019). In addition, negative maternal attitudes are linked to incomplete immunization in children (Paramitha and Rosidi, 2022; Wibowo, Ashila, Aditya, Probo, Karima, Rino, & Sulistyarini, 2020).

Cultural beliefs also played a significant role in shaping vaccination behavior. In this study, 64 respondents (45.1%) were influenced by cultural norms that discouraged vaccination. These included generational beliefs, family-centered decision-making, and broader social values. For instance, in patriarchal societies, health decisions concerning children often rest with husbands or extended family members rather than mothers. A study conducted in Tambang Community Health Center confirmed that

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cultural and social values could either facilitate or hinder immunization efforts (Afiah & Mistadiana, 2019). Therefore, culturally sensitive approaches must be integrated into vaccination campaigns to enhance acceptance.

Healthcare workers were identified as key enablers of vaccination coverage. The majority of respondents (79.6%) stated that health workers played an active role in school-based vaccination efforts, providing education, outreach, and accessible services. This finding is consistent with rural studies that established a positive correlation between health worker support and child immunization completeness (Suraya, Hidayati, Putranti, Apriyanto, & Julia, 2019; Syahfitri, Ismah, & Susanti, 2024). Nevertheless, some respondents reported limited engagement from healthcare workers, highlighting the need for enhanced communication and outreach.

The role of teachers also emerged as a supportive factor in the successful implementation of school-based vaccination programs. A total of 132 respondents (93%) acknowledged that teachers actively facilitated vaccination efforts. Teachers serve a dual function as educators and intermediaries—informing students and bridging communication between schools, parents, and health personnel. A study in Cinere District, Depok City, corroborated this finding by showing that teacher involvement significantly improved parental participation in immunization (Kurnianty, 2019). However, contrasting results from South Jakarta indicated low readiness among teachers to serve as facilitators for HPV vaccination (Sasuwe, 2019), suggesting the need for targeted training to optimize their roles.

Parental involvement, particularly that of mothers, remains a decisive factor in vaccination uptake. In this study, 78 respondents (54.9%) were not actively involved in the vaccination process. This reflects a broader trend of parental disengagement, whether in granting permission, accompanying children, or providing health education. Common barriers include time constraints, lack of understanding, and fear of side effects. Active parental participation is associated with complete immunization status, while indifference increases the risk of vaccine-preventable diseases (Prihatin, 2022).

Collectively, these findings indicate that low vaccination coverage in elementary schools is

influenced by a complex interplay of knowledge, attitudes, cultural norms, and the roles of health workers, teachers, and parents. A collaborative, multisectoral approach is therefore essential. Ongoing public education, community engagement, and clear communication from schools and health services can help strengthen parental support and improve national immunization outcomes.

Bivariate analysis confirmed a statistically significant relationship between maternal knowledge and vaccination coverage. A study at Kawangkoan Health Center found that maternal understanding of measles vaccination was significantly associated with compliance (Momomuat, Ismanto, & Kundre, 2014), with a p-value of .014, demonstrating that informed mothers are more likely to vaccinate children aged 0–24 months.

Maternal attitudes also significantly influenced vaccination decisions. There was a strong association between positive maternal attitudes and the likelihood of completing basic immunizations in infants. Positive attitudes are predictive of supportive vaccination behaviors, while negative ones serve as barriers (Paramitha et al., 2022).

Cultural factors were likewise associated with immunization behavior. Research in the coastal and island areas of Tatinang reported a significant link between maternal attitudes and immunization efforts (Mayasari & Harmiyati, 2020), with a p-value of .000. This underscores the importance of local culture in shaping maternal perceptions and the value of involving community leaders in disseminating accurate vaccination information.

Healthcare workers also demonstrated significant influence. A study at Kabaena Health Center in Bombana Regency found that maternal knowledge was positively associated with complete infant immunization (Ayumar & Kasma, 2017), with a p-value of .003. Health workers play a critical role in providing accurate information, health education, and direct immunization services.

Lastly, parental involvement, especially from mothers, was shown to be a determining factor in immunization success. A study conducted at Kom Yos Sudarso Health Center in Pontianak reported that while maternal knowledge of adverse post-vaccination events was not directly linked to complete immunization, multivariate analysis revealed that

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maternal education was the most influential factor, with an odds ratio (OR) of 2.884 (Trisnawati, 2016). Higher maternal education is associated with greater awareness and commitment to child health practices.

Multivariate analysis in the present study identified parental role, particularly that of mothers, as the most influential factor affecting vaccination coverage. A study in Sukajaya Village, Tasikmalaya City, found no significant association between maternal knowledge, maternal characteristics, or family support and immunization completeness. However, maternal perception was significantly associated with vaccination status ($p = .05$), suggesting that positive perceptions encourage active parental participation and improved vaccination rates (Dewi, Wati, Assyfa, & Rae, 2024).

In conclusion, both bivariate and multivariate analyses confirm that maternal knowledge, attitudes, cultural beliefs, and the roles of healthcare workers and parents interactively contribute to school-based vaccination coverage. To address these multifaceted challenges, a holistic approach is required—one that engages families, schools, health professionals, and community stakeholders in collaborative efforts to raise awareness, dispel misinformation, and promote full participation in national vaccination programs.

CONCLUSION

Maternal knowledge regarding vaccination was generally low, with 50.7% of mothers demonstrating inadequate understanding. Additionally, a majority (56.3%) exhibited negative attitudes toward vaccination. Cultural factors also played a role, as 45.1% of respondents were influenced by cultural beliefs that discouraged vaccination. Although healthcare workers and teachers played relatively supportive roles, parental involvement emerged as the most influential determinant of vaccination coverage, showing a highly significant association ($p = .000$). Among all variables, parental role was the strongest predictor, with an odds ratio (OR) of 19.593.

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