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The Role of Health Cadres in Promoting Child Vaccination in Areas with Low Education Levels

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ABSTRACT

Background: Disparities in basic childhood immunization coverage remain evident in communities with low education levels, often associated with limited health literacy, vaccine hesitancy, and barriers to accessing health services. In this context, the role of health cadres is considered crucial in supporting childhood vaccination uptake at the community level.
Method: This study employed a quantitative cross-sectional design involving 210 mothers with children aged 12–24 months. Data were collected using structured questionnaires and analyzed through binary logistic regression to examine the influence of health cadres' roles on the completeness of basic childhood vaccination.
Results: The findings indicate that health cadres' roles significantly influenced complete basic vaccination (OR = 3.08; p = 0.001) after controlling for maternal education and socioeconomic status. Schedule reminders and interpersonal communication emerged as the strongest dimensions of the cadres' role, while assistance during vaccination visits showed the weakest contribution due to logistical constraints.
Conclusion: The results demonstrate that achieving complete childhood vaccination depends not only on formal health system mechanisms but also on strengthening the role of health cadres as social and educational agents within the community. Enhancing persuasive communication skills, improving logistical support, and integrating cadres into community-based follow-up systems are essential to ensure sustainable improvements in basic childhood vaccination coverage.

Keyword: *Basic Vaccination, Children, Health Cadres, Health Literacy, Low Education*

INTRODUCTION

Achieving basic immunization coverage for children remains a global challenge, especially in low- and middle-income countries with high burdens of infectious diseases and large social disparities. Various reports show that basic immunization is one of the most effective public health interventions in preventing serious infectious diseases in children, but the success of immunization programs is highly dependent on community acceptance, access

to services, and the capacity of health systems at the community level. Forshaw et al. (2017), through a systematic review and meta-analysis, showed that maternal education has a significant influence on the completeness of child immunization, and the lower the level of education, the greater the likelihood that children will not receive complete basic immunization. This finding is reinforced by Hajizadeh (2018), who found clear socioeconomic disparities in child immunization coverage in low- and middle-income countries, where groups with low education and low socioeconomic status tend to have poor immunization status. In this context, efforts to increase immunization coverage cannot rely solely on health facilities, but also require a community-based social approach that is able to reach low-educated groups.

In Indonesia, various studies show that low parental education, especially among mothers, correlates with incomplete basic immunization of children. Arista and Hozana (2016) found that the level of education, family support, and the role of health workers had a significant relationship with the history of basic immunization in infants in the working area of the Paal V Community Health Center in Jambi City. Triana's (2016) research also showed that mothers' knowledge, support from health workers, and access to information related to immunization contributed to the provision of complete basic immunization in infants. More specifically, Asniwiyah, Wiyono, and Arisandy (2023) confirmed that the mother's level of education is related to compliance in providing basic immunizations to infants aged 0–9 months in Olung Hanangan Village, where mothers with low education levels were more often found to have children with incomplete immunizations. Surury et al. (2021) added that in the Greater Jakarta area, incomplete basic immunization is influenced by several risk factors, including parental knowledge, attitudes toward immunization, and limited access to health information. This shows that education is closely related to health literacy and influences how families make decisions regarding their children's immunization.

At the international level, similar patterns are also seen. De Cantuária Tauil, Sato, and Waldman (2016), through a systematic review, concluded that incomplete and delayed immunization of children in various countries is related to factors such as education, socioeconomic status, and barriers to accessing health services. Mora and Trapero-Bertran (2018), who studied the Spanish context, showed that education has a real influence on access to childhood immunization, with groups with low education having a greater probability of being late or incomplete in immunization. On the other hand, Das et al. (2017) explained that communities with low education levels tend to have low health literacy, making them more vulnerable to misinformation and less able to fully understand the benefits of vaccination. These findings confirm that in areas with low education levels, immunization programs require specific strategies that take into account barriers related to literacy, culture, and community beliefs.

In the context of primary health care in Indonesia, health cadres play a strategic role as they are the closest link between health facilities and the community. Health cadres are usually members of the local community who are

trained to assist in the implementation of health programs, including Posyandu, monitoring the growth and development of toddlers, and promoting immunization. Pawenrusi and Hatta (2020) show that cadres have an important role in the implementation of immunization programs at Posyandu, ranging from disseminating information on immunization schedules, reminding parents, to assisting with recording and reporting. Research by Sari and Hanifah (2018) proves that health education using leaflets increases Posyandu cadres' knowledge about MR booster immunization, enabling them to play a more effective role in conveying immunization information to the community. On the other hand, Hikmah (2024) describes how the role of Posyandu cadres in infant health checks contributes to regular Posyandu visits and child health monitoring at the hamlet level. The findings of Winandar et al. (2023) add that the behavior of health cadres in implementing Posyandu, including initiative, consistency, and communication with parents, influences family participation in utilizing toddler growth monitoring services.

The experiences of other countries also show that community health workers and frontline workers play a major role in the success of immunization programs. Tesema et al. (2020), through a multilevel analysis of survey data in East African countries, found that basic childhood immunization coverage is related to visits to health facilities and interactions with health workers. Huang et al. (2018), in a systematic review of community health workers in China, showed that they contribute significantly to the delivery of public health services, including immunization, through health education, home visits, and family support. Oyo-Ita et al. (2023) in a Cochrane review confirmed that interventions involving community-based communication and local health workers can increase child immunization coverage in low- and middle-income countries. Oku et al. (2016) specifically mapped communication strategies to increase childhood vaccination in Nigeria and found that community-based strategies tailored to the local context were effective in increasing immunization uptake in low-educated communities.

On the other hand, several studies describe structural challenges in promoting vaccination in low- and middle-income countries, including resource constraints, social resistance to vaccines, and the complexity of introducing new vaccines. Guignard et al. (2019) highlighted that the introduction of new vaccines in low-income countries faces several challenges, including limitations in infrastructure, logistics systems, and public skepticism influenced by a lack of information. Lyu et al. (2023) found that the vaccine recommendation behavior of public health workers is related to their attitudes, workload, and beliefs about vaccines, which ultimately influences how actively workers recommend non-immunization program vaccines to the public. Yemeke et al. (2021) showed that in some low- and middle-income countries, pharmacists who are empowered to provide vaccination services can expand access and increase vaccine coverage, especially when integrated with education. Lessons from these various contexts show that the role of frontline health workers, including cadres, is crucial to the success of vaccination promotion, especially among low-educated communities.

However, studies that specifically measure the influence of the role of health cadres on basic immunization coverage in low-education areas are still relatively limited. Arista and Hozana (2016) have shown the relationship between the role of health workers and basic immunization history, but have not separated and specifically measured the contribution of health cadres as a separate entity in immunization promotion. Pawenrusi and Hatta (2020) described the role of cadres in immunization programs at Posyandu, but their study was more descriptive in nature and did not quantitatively test the relationship between the intensity of the cadres' role and the basic immunization status of children. Winandar et al. (2023) studied the behavior of health cadres in monitoring toddler growth, but the focus of the study was not directed at promoting immunization in areas with low education levels. This research gap indicates that quantitative research is still needed to specifically analyze the role of health cadres in promoting child vaccination in populations with low education levels, so that the extent of the cadres' contribution to the completeness of children's basic immunization can be determined.

This study offers a novel approach by quantitatively analyzing the relationship between the role of health cadres and the completeness of basic immunization for children in areas with low education levels, using an analytical approach that measures the contribution of various dimensions of the cadres' roles, such as education, communication, and immunization assistance. Thus, this study not only describes the role of cadres descriptively but also empirically tests its influence on the basic immunization status of children. The objectives of this study are to measure the influence of the role of health cadres on the completeness of basic immunization for children in low-education areas and to identify the dimensions of the role of cadres that contribute most to increasing basic immunization coverage in communities with educational barriers.

METHOD

This study uses a quantitative method with a cross-sectional design to analyze the relationship between the role of health cadres and the completeness of basic immunization for children in areas with low education levels. A cross-sectional design was chosen because it allows for the simultaneous measurement of independent and dependent variables at a single point in time, making it suitable for describing the relationship between the role of cadres and immunization status in a particular population. According to Creswell (2018), a quantitative survey approach with a cross-sectional design is effective for testing relationships between variables in large populations efficiently. The study population consisted of mothers with children aged 12–24 months in the Puskesmas working area, where the majority of the population had low educational attainment, while the study sample consisted of 210 respondents selected using stratified random sampling based on Posyandu areas to ensure representativeness. A similar approach was used in the analysis of basic immunization for children in various countries, such as the study by Tesema et

al. (2020) in East Africa and the study by de Cantuária Tauil, Sato, and Waldman (2016), both of which used a cross-sectional design to identify factors related to children's immunization status.

The independent variable in this study was the role of health cadres, which was operationalized into several dimensions, namely education about immunization, interpersonal communication with families, assistance with attendance at Posyandu, and monitoring of children's immunization status. The role of cadres was measured using a questionnaire with a Likert scale compiled based on indicators of the role of cadres in the immunization program and Posyandu literature, including from the studies by Pawenrusi and Hatta (2020), Sari and Hanifah (2018), and Winandar et al. (2023), which highlighted the aspects of education, motivation, and assistance provided by cadres to mothers of toddlers. The dependent variable was the child's basic immunization status, which was categorized as complete and incomplete according to the national basic immunization schedule, with data obtained from the KIA book or Posyandu immunization card, as in the approach used in the studies by Arista and Hozana (2016), Triana (2016), and Surury et al. (2021).

The questionnaire instrument was tested for content validity by experts in community nursing and public health, while reliability was tested using Cronbach's alpha coefficient in a limited trial before the main data collection. Data collection was conducted through a structured survey carried out at Posyandu and home visits, involving health cadres as facilitators to help reach respondents in low-education areas. Each respondent was given an explanation of the research objectives and asked for written consent before completing the questionnaire, in accordance with public health research ethics principles.

The collected data were analyzed univariately to describe the frequency distribution of respondent characteristics and children's basic immunization status, and bivariately using the chi-square test to examine the relationship between the role of cadres and basic immunization status. Furthermore, multivariate analysis was performed using binary logistic regression to measure the effect of the role of cadres on the completeness of basic immunization after controlling for confounding variables such as maternal education and socioeconomic status, as recommended by Neuman (2014) in the analysis of social survey data and used in the study of immunization determinants by Tesema et al. (2020) and Hajizadeh (2018). The level of statistical significance used was 0.05 with a 95 percent confidence interval as the basis for drawing conclusions.

RESULT AND DISCUSSION

Respondent Characteristics

A total of 210 mothers with children aged 12–24 months participated in this study. The majority of respondents had a basic education level (elementary school/equivalent) at 57.1 percent, secondary education (junior high school/high school) at 34.3 percent, and higher education at 8.6 percent. The average age of the mothers was 28.4 years (SD = 4.9). A total of 64.8 percent of

respondents were not working (housewives), while 35.2 percent worked in the informal sector.

Child Basic Immunization Status

Of the total respondents, 132 children (62.9%) received complete basic immunizations, while 78 children (37.1%) did not receive complete basic immunizations. The types of immunizations most commonly missed in the incomplete group were measles (71.8%) and DPT (46.2%).

Health Worker Role Score

The health worker role score was calculated based on five indicators with a score range of 1–4 (the higher the score, the better the role of the health worker). The average health worker role score was 3.11 (SD = 0.48). The average dimension scores were as follows:

Table 1. Descriptive Statistics of Health Cadres' Role Scores by Dimension

Dimension of Cadre Role	Mean	SD
Immunization education	3.07	0.62
Interpersonal communication with mothers	3.15	0.57
Reminder for Posyandu schedule	3.22	0.54
Assistance during immunization visit	3.02	0.66
Monitoring child immunization	3.08	0.60

This value indicates that the role of health cadres is relatively good but still not optimal and varies across dimensions.

Bivariate Analysis

The chi-square test results show that the role of health cadres has a significant relationship with the completeness of basic immunization in children (χ^2 = 17.84; p = 0.000). The proportion of basic immunization completeness in respondents in the "high cadre role" category was 77.5 percent, much higher than in the "low cadre role" group, which was 45.1 percent.

Multivariate Analysis

Binary logistic regression was performed to measure the effect of the role of health cadres on the completeness of basic immunization after controlling for maternal education and socioeconomic status.

The results of the logistic regression analysis are shown below:

Table 1. Binary Logistic Regression Analysis of the Role of Health Cadres in Complete Basic Immunization

Variable	β coefficient	Odds Ratio (OR)	p-value	95% CI
Health cadre role	1.126	3.08	0.001	1.62 – 5.87
Mother's education level	0.714	2.04	0.018	1.13 – 3.70

Socioeconomic status	0.532	1.70	0.047	1.01 – 2.85

The internal table of regression analysis results is not separated into subsections because it is not a discussion table. The results of the logistic regression analysis show that all independent variables in the model have a p-value below 0.05, so they can be said to have a significant effect on the completeness of basic immunization. The variable of the role of health cadres has the smallest p-value, namely 0.001, which indicates a very strong level of significance. This value shows that the possibility of this relationship occurring only by chance or research error is very small, namely only 0.1%. Thus, the role of health cadres is confirmed to make a real contribution to increasing the chances of toddlers receiving complete basic immunization.

Furthermore, the mother's education level had a p-value of 0.018, which was also below the significance threshold of 0.05. This value confirms that the mother's education level has a significant effect on the completeness of basic immunization. This shows that the higher the mother's education, the greater the likelihood that they will have the knowledge, awareness, and access to health information that encourages the completion of their child's immunization schedule. Statistically, the likelihood of this influence is valid and not coincidental.

Socioeconomic status has a p-value of 0.047. Although this value is still below the significance threshold, its level of significance is the lowest compared to the other two variables. This means that socioeconomic status still has a significant effect on the completeness of basic immunization, but its influence is not as strong as the role of health cadres or the mother's level of education. In other words, access to economic resources remains an important factor in determining the completeness of basic immunization, although it is not the dominant factor.

The tested logistic regression model shows that the role of health cadres is the variable with the strongest influence in determining the completeness of basic immunization in children. The results of the analysis show that children whose mothers interact intensively with health cadres are 3.08 times more likely to receive complete basic immunization than children with low levels of cadre involvement, after controlling for the variables of maternal education and socioeconomic status. These findings indicate that health cadres play a strategic role in facilitating access to information, providing assistance, and motivating families to complete the immunization schedule on time.

In addition, the mother's level of education was also found to have a significant effect and function as an important covariate in the model. Higher education enables mothers to understand the benefits of immunization and the risks of vaccine-preventable diseases, thereby encouraging higher compliance in completing basic immunizations for children. Thus, increasing the knowledge and health literacy capacity of the community, especially mothers, is a crucial aspect in efforts to increase immunization coverage. Meanwhile,

socioeconomic status also showed a significant influence, although with a lower effect strength compared to the role of health cadres. This condition illustrates that families with better socioeconomic status tend to have greater access to health facilities, transportation, and environmental support, making them more capable of ensuring the completion of their children's immunizations. However, it was found that direct intervention through health cadres still had a greater impact, even on groups with various socioeconomic backgrounds. These findings emphasize the importance of a community-based approach through the empowerment of health cadres as a key strategy to increase basic immunization coverage evenly across communities.

Model Strength

Nagelkerke $R^2 = 0.312$, meaning that the regression model explains **31.2 percent of the variability in basic immunization completeness**, while the rest is influenced by other factors not examined (e.g., trust in vaccines, health myths, access to immunization facilities).

Analysis of Variations in the Role of Cadres and Implications for Basic Immunization Promotion

Variations in the dimensions of the role of health cadres in this study show interesting patterns that have direct implications for the effectiveness of basic immunization promotion. The dimension with the highest contribution to immunization coverage was reminding Posyandu schedules, while the lowest dimension was accompanying immunization visits. This difference cannot be understood merely as a technical variation in the work of cadres, but rather reflects the dynamics of capacity, resources, and social barriers faced by cadres in carrying out their roles in low-education areas. The high reminder schedule score indicates that most cadres are able to maintain regular interaction with mothers of young children through immunization schedule notifications. This routine communication acts as a health behavior nudge that reminds families of their child immunization obligations and helps structure health compliance behavior in the context of a community with limited literacy. These findings are in line with a study by Pawenrusi and Hatta (2020), which identified that administrative activities and schedule reminders are the most consistently implemented components of the immunization program by cadres.

However, the role of schedule reminders does not necessarily result in profound behavioral changes without the support of interpersonal communication and quality education. High scores on the interpersonal communication dimension confirm that cadres are able to build emotional closeness with families, which is an important factor in reducing doubts about immunization. This is consistent with the findings of Sari and Hanifah (2018), which show that increasing the educational capacity of cadres improves their understanding in conveying booster immunization information more persuasively. In addition, the social attachment of cadres to mothers of toddlers enables cadres to overcome vaccination resistance that arises due to fear, myths,

or misinformation. Research by Winandar et al. (2023) confirms that cadres' active behavior in interpersonal communication contributes to family participation in child health services, reinforcing the view that social trust is an important mediator for the acceptance of basic immunization.

On the other hand, the lowest immunization visit assistance scores indicate logistical and structural barriers. Accompaniment requires cadres to take the time to accompany mothers to health facilities, which may not always be possible given that some cadres also have other domestic and social responsibilities. This obstacle is in line with the findings of Oyo-Ita et al. (2023), which show that community health worker-based interventions will be more effective if these workers receive technical and structural support that enables them to perform their supervisory and accompaniment functions optimally.

Accompanying immunization visits actually has great potential in helping families who are anxious to come to the service, especially in low-educated communities that are prone to health misconceptions. Thus, the low score on this dimension does not indicate low relevance, but rather indicates the need for program support so that cadres can perform this role more optimally. Moderate supervision and monitoring of immunization status also reinforce this interpretation. Monitoring requires recording and follow-up, not just notification. Research by Surury et al. (2021) shows that incomplete immunization often occurs because there is no follow-up after a child misses a dose of immunization. In this context, cadres can play a critical role as reminders after a child misses an immunization visit, not just as contacts before the schedule. The findings of Huang et al. (2018) support this, showing that community health workers will have a significant impact if they are involved in education, health monitoring, and intensive follow-up with families.

Overall, the analysis of this study confirms that the role of cadres is not homogeneous and that their impact on basic immunization is influenced by the quality of the interaction between cadres and families. Administrative interactions such as scheduling notifications have broad coverage but their impact on vaccination behavior is not always strong. Conversely, emotional and personal interactions such as interpersonal communication and mentoring build health trust within families and have a profound influence on immunization decisions. Thus, strategies to enhance the role of cadres should be directed at strengthening the quality of interpersonal interactions and the educational empowerment of cadres, rather than simply increasing the frequency of contact. These findings have important policy implications: the empowerment of cadres in immunization programs should focus on improving persuasive communication skills, developing culturally relevant educational materials, and providing logistical support that enables cadres to provide consistent immunization counseling.

Structural Implications of Strengthening the Role of Health Workers in Increasing Basic Immunization Coverage in Low-Education Areas

The findings of this study show that the role of health workers is a significant determinant of the completeness of basic immunization for children, but its effectiveness is highly dependent on the structural support of the public health system. High cadre role scores in the dimensions of schedule reminders and interpersonal communication indicate that cadres have performed their social and informational functions optimally, but low scores in the dimension of visit assistance indicate logistical and structural barriers that limit the contribution of cadres to more intensive immunization promotion. This shows that the achievement of basic immunization is not only determined by the individual capacity of cadres, but also by institutional support mechanisms that enable cadres to carry out their roles sustainably. Research by Oyo-Ita et al. (2023) also concluded that community health worker-based interventions require training, supervision, and technical assistance to increase immunization coverage in low-income countries. These findings demonstrate the relevance of strengthening cadre institutions as a strategy for improving basic immunization in low-education areas.

Immunization program approaches that focus on information delivery have proven insufficient to overcome psychosocial barriers to vaccine acceptance in low-education communities. Although schedule reminders have a broad contribution in encouraging attendance at Posyandu, the final decision regarding immunization is greatly influenced by trust and risk perceptions that originate from interpersonal communication and health education. Research by Oku et al. (2016) confirms that communication strategies must be socially and culturally adapted in order to increase vaccine acceptance in low-educated communities. In line with these findings, Sari and Hanifah (2018) show that cadre education capacity can be improved through media training and targeted health communication methods. Thus, deepening cadre competence in the dimensions of education and communication will increase their persuasiveness in addressing vaccine hesitancy and misinformation. Investing in human resource capacity is a key strategy for expanding the effectiveness of cadres' role in promoting immunization.

This study also indicates that the lowest role of cadres—accompanying visits to health facilities—actually has the greatest potential in helping families facing logistical, psychological, or economic barriers. In low-educated communities, doubts about immunization are often reinforced by anxiety and mobility difficulties. Oyo-Ita et al. (2023) emphasize that structural support in the form of transportation, incentives, and strengthening of referral systems has been shown to increase the involvement of community health workers in immunization promotion. This points to the need for more systematic policies to enable cadres to act not only as information disseminators but also as immunization service companions.

Community-based interventions that combine education, mentoring, and home visits have the potential to produce greater impact than single informative strategies, especially in low-education areas. Theoretically, the contribution of this study lies in confirming that the intensity of cadres' roles does not always reflect the quality of public health interactions. The frequency of cadre involvement does not guarantee behavioral change if it is not accompanied by interpersonal communication approaches and emotional support that encourage families to make health decisions based on trust, not just information. This study also reinforces the concept that in the context of communities with educational barriers, health promotion must be oriented towards social relations and strengthening trust, not just knowledge transfer. Thus, the results of this study broaden the understanding of the mechanisms of community-based immunization promotion through the role of cadres as health agents as well as social agents who influence family decisions.

CONCLUSION

This study shows that the role of health cadres has a significant influence on the completeness of basic immunization for children in low-education areas. Statistical analysis shows that children in families who interact intensively with cadres are more likely to receive complete basic immunization than families who do not receive cadre support. The dimensions of schedule reminders and interpersonal communication are the strongest components of the cadre's role in influencing family immunization decisions, while accompanying visits to health facilities is the dimension with the lowest contribution due to structural and logistical barriers. Thus, the achievement of basic immunization cannot be viewed solely as a function of the formal health system, but involves community-based social agents who have emotional and cultural closeness to the community.

Based on these findings, strategies to increase immunization coverage require structural interventions to comprehensively strengthen the role of health cadres.

Persuasive communication and health education training needs to be expanded to improve the effectiveness of cadres in addressing vaccine hesitancy and misinformation, especially among low-educated communities. Logistical support in the form of transportation, assistance incentives, and a child immunization follow-up system needs to be prepared so that cadres can optimally carry out their assistance and monitoring functions. The integration of cadres into the community-based immunization monitoring system and collaboration with formal health workers at the Puskesmas level will ensure the continuity of the cadres' role in the immunization program. Efforts to strengthen the role of health cadres structurally are expected to contribute to a sustainable increase in basic immunization coverage and narrow the health access gap in low-education areas.

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