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ORIGINAL ARTICLE

Factors influencing infant basic immunization uptake at Bestari Community Health Center, Medan

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ABSTRACT

Background: Immunization is one of the most effective public health interventions for preventing infectious diseases and reducing mortality rates. However, complete basic immunization coverage in Indonesia, particularly in North Sumatra, remains suboptimal. This study aimed to analyze the relationship between maternal characteristics (age, education, employment, knowledge, and attitudes) and the provision of complete basic immunization for infants at the Bestari Community Health Center in Medan.
Methods: The research employed an analytical survey with a cross-sectional approach involving 60 mothers visiting integrated health posts in November 2022. Data were collected via questionnaires and analyzed using the chi-square test.
Results: Results indicated significant associations between maternal age (p = 0.002), education level (p = 0.003), employment status (p = 0.000), knowledge (p = 0.000), and attitudes (p = 0.000) with infant immunization completeness.
Conclusion: The study concludes that sociodemographic factors and maternal understanding play crucial roles in immunization coverage.

Keywords: immunization, maternal characteristics, infants

Introduction

Immunization is one of the most effective public health interventions for preventing the spread of infectious diseases and reducing mortality rates. Immunization has the potential to save an estimated 1 to 2 million lives each year.[1] Infants represent a high-risk population for infectious diseases due to several factors, including their immature immune systems, specific health conditions, and environmental exposures.[2,3] A comprehensive primary immunization program for infants includes administering vaccines for a range of diseases, such as polio, measles, hepatitis B, diphtheria, pertussis, and tetanus. Achieving high immunization coverage is crucial for establishing herd immunity and safeguarding the population against disease outbreaks.[4,5]

The 2020 Health Profile of Indonesia indicates a notable decline in the coverage of basic complete immunization among infants in North Sumatra. In 2018 and 2019, the immunization coverage was recorded at 60.6%. However, in 2020, it plummeted by 27.3%, reflecting a significant drop.[6] According to data from the North Sumatra Province Central Statistics Agency in 2022, immunization coverage varies across different vaccine types. Generally, Medan's immunization rates align closely with the North Sumatra provincial

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average, although notable differences exist. For the BCG vaccination, 72.76% of toddlers in Medan received the vaccine, slightly below the provincial average of 79.17%. In contrast, the coverage for the DPT-HB3/DPT-HB/Hib3 vaccine in Medan was 82.31%, marginally exceeding the provincial average of 78.73%. The measles immunization rate in Medan reached 85.26%, slightly higher than the North Sumatra average of 84.6%. Similarly, Medan showed relatively high coverage for Polio 4 immunization at 85.12%, surpassing the provincial average of 81.13%. However, coverage for Hepatitis B (1-7 days) vaccination in Medan remains low at 18.47%, falling short of the North Sumatra average of 20.46%. Several regencies and cities exhibited higher immunization coverage than Medan for specific vaccine types. For example, Karo Regency demonstrated higher coverage for BCG immunization, while Serdang Bedagai Regency showed superior coverage for DPT-HB3/DPT-HB/Hib3 and Polio 4 vaccinations.[7]

Despite the proven efficacy of immunization, achieving comprehensive basic immunization coverage remains suboptimal in many regions of Indonesia. Maternal decisions regarding infant immunization are influenced by various factors, including maternal education, understanding of immunization principles, socioeconomic status, and access to healthcare facilities. Socioeconomic factors significantly influence access to healthcare services and resources, particularly regarding childhood vaccinations. Mothers from lower-income backgrounds often face barriers such as transportation difficulties and financial constraints, which hinder their ability to vaccinate their children.[8,9] These financial limitations can also restrict access to immunization information, complicating informed decision-making.[10] Conversely, higher maternal education levels correlate with increased knowledge of vaccination benefits and schedules. Studies indicate that mothers with a strong understanding of immunization principles are more likely to ensure their children receive timely vaccinations.[11] However, knowledge gaps stemming from misinformation or a lack of understanding about the importance of immunization can lead to vaccine hesitancy or refusal.[8,12]

The accessibility of healthcare facilities is another critical factor. Mothers residing in areas with limited healthcare services often encounter logistical challenges in adhering to vaccination schedules.[13] The presence of supportive healthcare workers who provide reliable information is crucial in encouraging immunization uptake.[14,15] Furthermore, emotional and practical support from family members significantly impacts maternal vaccination decisions. Supportive family environments can bolster mothers' confidence and motivation to vaccinate their children[16,17], whereas a lack of support may increase hesitancy. Finally, cultural norms and personal health beliefs play a substantial role. Mothers with positive perceptions of vaccine safety and efficacy are more likely to adhere to recommended schedules, while those harboring negative perceptions due to fears or misconceptions may resist vaccinating their children.[8,10,12]

A preliminary survey conducted at the Bestari Community Health Center, which encompasses three sub-districts (Petisah Tengah, Sekip, and Sei Putih Timur I), gathered data on the number of infants who received basic immunizations in 2022. The immunization visit data from January to December 2022 revealed the following coverage rates: Hepatitis B (90%), BCG (89.2%), Polio 1 (85%), DPT/HB-Hib 1 (82.5%), Polio 2 (90.4%), DPT/HB-Hib 2 (90%), Polio 3 (80%), DPT/HB-Hib 3 (87%), Polio 4 (90.2%), IPV (80.9%), Measles-Rubella (MR) (85%), and total Measles coverage (82%). These figures indicate that some children have not received complete basic immunizations at the integrated health posts (posyandu) of the Bestari Community Health Center. Additionally, a preliminary survey assessed mothers' knowledge of immunization through questionnaires administered at the integrated health posts in Medan Petisah. The results highlighted significant gaps in mothers' understanding of immunization and their lack of active participation in the integrated health post programs at the Bestari Community Health Center in Medan.

Data from both surveys reveal a discrepancy between expected immunization coverage and actual outcomes. Consequently, this study aims to analyze maternal characteristics and their relationship with the provision of complete basic immunizations for infants at the Bestari Community Health Center, Medan City. The findings are anticipated to provide valuable insights for immunization program managers at both the Bestari Community Health Center and the Medan City Health Office, aiding their efforts to enhance complete basic immunization coverage for infants. Furthermore, this study may serve as a foundation for future research on factors influencing mothers' behaviors regarding child immunization.

Method

This study employed an analytical survey method with a cross-sectional approach to examine the relationship between independent and dependent variables. Conducted at the Bestari Petisah Health Center in Medan during May 2023, the study's population consisted of all mothers who visited the integrated health

post in November 2022, totaling 60 visits. The sample was derived using total sampling, encompassing the entire population of 60 individuals.

Primary data were gathered through questionnaires administered to respondents. These questionnaires included questions designed by the researcher to test the research hypothesis. Maternal education levels were measured and categorized into three tiers: low (elementary to junior high school), middle (senior high school), and high (diploma to master's degree). Maternal age was calculated from birth until the time of the study and grouped into three categories: <20 years, 20-30 years, and >30 years. Maternal employment status was classified as either employed (engaged in primary work outside the home for 6-8 hours per day) or unemployed. Maternal knowledge about immunization, including its definition, purpose, benefits, and types, was assessed. Responses were divided into two categories: good (6-10 correct answers) and poor (1-5 correct answers). Additionally, maternal attitudes toward immunization were evaluated and categorized into two groups: positive (6-10 correct answers) and negative (1-5 correct answers).

The dependent variable in this study was the completion of basic immunization in infants. Completion of basic immunization refers to a series of vaccines administered to infants according to the schedule established by local health authorities, aimed at protecting against diseases such as hepatitis B, diphtheria, pertussis, tetanus, polio, Haemophilus influenzae type B (Hib), and pneumonia. The response categories for this variable were: complete (infant received all vaccinations required for basic immunization) and incomplete (infant did not receive all vaccinations required for basic immunization).

Data analysis utilized both univariate and bivariate analysis. Univariate analysis focused on the characteristics of respondents, such as education level, knowledge, age, occupation, and attitudes. In contrast, bivariate analysis explored the relationships between independent and dependent variables. The statistical test applied in this study was the chi-square test, a statistical technique used to evaluate hypotheses regarding the relationship between two categorical variables.

Results

Table 1 presents the demographic profile of the respondents and related factors based on a sample size of 60 individuals. The data is categorized into several characteristics: age, education, occupation, knowledge, attitude, and infant basic immunization uptake. Among the respondents, the largest group (50%) falls within the 20-30 year age range, comprising 30 individuals. The younger group, those under 20 years old, constitutes 20% of the respondents (12 individuals), while the older group, over 30 years old, accounts for 30% (18 individuals).

Table 1. Demographic profile of respondents and related factors (n=60)

Characteristics	n	%
Age		
<20 years	12	20.0
20-30 years	30	50.0
>30 years	18	30.0
Education		
Elementary - Junior High School	16	26.7
Senior High School	28	46.7
Diploma - Master's Degree	16	26.7
Occupation		
Unemployed	26	43.3
Employed	34	56.7
Knowledge		
Poor	35	58.3
Good	25	41.7
Attitude		
Negative	34	56.7
Positive	26	43.3
Infant basic immunization uptake		
Incomplete	28	46.7
Complete	32	53.3

In terms of education, the largest segment of respondents (46.7%, or 28 individuals) has completed Senior High School. Respondents with an educational background ranging from Elementary to Junior High School and those with a Diploma to Master's Degree each represent 26.7% of the sample (16 individuals

each). Regarding occupation, the majority of respondents (56.7%, or 34 individuals) are employed, while the remaining 43.3% (26 individuals) are unemployed.

When examining knowledge levels, a larger portion of respondents (58.3%, or 35 individuals) demonstrates poor knowledge regarding infant immunization, compared to 41.7% (25 individuals) who exhibit good knowledge. The data reveals that 56.7% of respondents (34 individuals) hold a negative attitude towards infant immunization, whereas 43.3% (26 individuals) have a positive attitude. Finally, concerning infant basic immunization uptake, a slightly larger proportion of respondents (53.3%, or 32 individuals) reported that their infants received complete immunization compared to those who reported incomplete immunization (46.7%, or 28 individuals).

Table 2 presents data on factors associated with the basic immunization status of infants, comparing those who received complete immunizations with those who did not. A significant relationship was identified between maternal age and infant immunization status ($p = 0.002$). The majority of mothers whose infants did not receive complete immunizations were either under 20 years of age (18.9%) or between 20 and 30 years old (20%). In contrast, a higher proportion of mothers whose infants received complete immunizations were in the 20-30 age group (30%) or above 30 years of age (21.7%). Notably, only a small percentage of mothers under 20 had infants who received complete immunizations (1.7%).

Maternal education level also demonstrated a significant relationship with infant immunization status ($p = 0.003$). The largest proportion of infants who were not fully immunized came from mothers with primary to junior high school education levels (21.7%). Conversely, the largest proportion of fully immunized infants were from mothers with senior high school education (28.3%) and those holding diploma to master's degrees (20%). A minimal number of infants from low-educated mothers received complete immunizations (5%).

Maternal employment status showed a highly significant relationship with infant immunization status ($p < 0.0001$). The majority of infants who were not fully immunized had unemployed mothers (40%), while the proportion of immunized infants was significantly higher among working mothers (43.3%). Only a small percentage of infants from working mothers did not receive complete immunizations (13.3%).

Maternal knowledge about immunization was also significantly related to infant immunization status ($p < 0.0001$). A substantial number of infants who were not fully immunized came from mothers with poor knowledge levels (40%). Conversely, most fully immunized infants were from mothers with good knowledge about immunization (40%), while only a small percentage of infants from knowledgeable mothers did not receive complete immunizations (6.7%).

Table 2. Factors associated with infant immunization status

Predictors	Infant basic immunization uptake				p
	Incomplete		Complete		
	n	%	n	%	
Age					
<20 years	11	18.9	1	1.7	0.002
20-30 years	12	20.0	18	30.0	
>30 years	5	8.3	13	21.7	
Education					
Elementary - Junior High School	13	21.7	3	5.0	0.003
Senior High School	11	18.3	17	28.3	
Diploma - Master's Degree	4	6.7	12	20.0	
Occupation					
Employed	8	13.3	26	43.3	0.000
Unemployed	24	40.0	2	3.3	
Knowledge					
Poor	11	18.9	24	40.0	0.000
Good	21	35.0	4	6.7	
Attitude					
Negative	24	40.0	10	16.7	0.000
Positive	4	6.7	22	36.7	

Additionally, maternal attitudes toward immunization showed a highly significant relationship with infant immunization status ($p < 0.0001$). The majority of infants who were not fully immunized came from mothers with negative attitudes toward vaccination (40%). In contrast, most fully immunized infants had mothers with positive attitudes toward immunization (36.7%), and few infants from these mothers did not receive complete vaccinations (6.7%). In summary, the analysis indicates that maternal age, education, employment status, knowledge, and attitudes are critical factors associated with the basic immunization

status of infants. Infants of older, more educated, working mothers who possess good knowledge about vaccinations and maintain positive attitudes toward them are more likely to receive complete basic immunizations.

Discussion

The findings indicate that over half of the sample received complete immunization, while 46.7% did not. Despite the majority being immunized, the significant proportion of infants with incomplete immunization necessitates attention and further intervention. Data analysis reveals that maternal age, education level, employment status, knowledge, and attitudes are critical factors affecting the completeness of infant immunization.

Older maternal age is significantly linked to improved infant immunization status, influenced by several factors. lder mothers generally possess greater knowledge regarding child health, particularly the importance of vaccinations and their schedules. Additionally, they often have enhanced access to health services due to increased economic stability and broader social networks, which facilitate timely vaccinations. Data from the National Immunization Survey (NIS) supports this association, revealing that vaccination coverage among children aged 19-35 months rises with maternal age. Specifically, coverage increases from 64% for mothers aged 17 to 79% for those aged 25 and older, with an approximate annual increase of 1.8% between ages 17 and 26, after which the increase plateaus.[18] Even when controlling for household wealth, children of older mothers were found to be 3.4% more likely to be fully immunized.[19] Furthermore, first-born children tend to be less likely to be fully vaccinated. Older mothers typically exert greater influence in family health decisions, which may enhance adherence to immunization schedules. Research indicates that adult daughters, particularly those aged 30 and older, significantly impact their mothers' healthcare navigation and health decisions.[20] This underscores the importance of intergenerational relationships in promoting health behaviors within families.

Maternal education is significantly associated with immunization status. Mothers with higher education levels (high school and above) are more likely to have fully immunized infants. Higher education often correlates with increased health literacy, equipping mothers to better understand the benefits of vaccination, the recommended immunization schedules, and how to access healthcare services. Furthermore, education empowers women to make informed decisions regarding their children's health. Educated mothers are more likely to seek information, question healthcare providers, and advocate for their children's well-being. Research from Saudi Arabia has revealed a positive association between educated mothers and increased vaccination uptake among their children.[21] A systematic review and meta-analysis highlighted a strong correlation between maternal education and childhood vaccination rates. The findings indicate that mothers with primary education have 1.87 times higher odds of completing vaccinations compared to those with no education, while those with secondary education or higher have 3.47 times higher odds. This study emphasizes the importance of investing in maternal education to improve vaccination rates and reduce vaccine-preventable diseases [11]. Educated mothers also tend to have better access to information about health and immunization. They are more likely to read health-related materials, utilize the internet for research on health topics, and engage in discussions about health with others.[22]

Employment status demonstrated a significant relationship with infant immunization rates. Working mothers were more likely to have fully immunized infants compared to their non-working counterparts. This trend may be attributed to the greater financial resources available to working mothers, enabling them to afford healthcare services, including vaccinations. According to the KFF Women's Health Survey, working mothers with higher incomes are less likely to experience pay loss when caring for sick children than those with lower incomes. This disparity indicates that financially secure working mothers can more readily access healthcare services without the added burden of lost wages.[23] Furthermore, research highlights that women with health insurance encounter fewer barriers when seeking medical care. This finding underscores the importance of employer-sponsored health insurance for working mothers, as it alleviates financial constraints and enhances their ability to obtain necessary medical services.[24] Additionally, working mothers may have increased exposure to health information and resources through their workplaces or professional networks.

Mothers' knowledge about immunization plays a crucial role in determining their children's vaccination status. Research indicates that mothers who possess a strong understanding of immunization are significantly more likely to ensure that their infants receive complete vaccinations. These knowledgeable mothers recognize the critical importance of vaccines in safeguarding their children against serious diseases

and are aware that vaccines are both safe and effective. A cross-sectional study conducted with 703 Cypriot mothers found that most participants held positive perceptions regarding childhood vaccinations, reflected in a high immunization rate of 97%.[25] Similarly, research focusing on primigravida mothers in Malaysia highlights how their knowledge influences their commitment to adhering to vaccination schedules. The findings suggest that mothers with greater knowledge about immunization are more likely to follow through with vaccination commitments. This underscores the necessity for healthcare providers to deliver accurate information, counteracting misconceptions that may arise from social media.[26] Furthermore, knowledgeable mothers are better equipped to navigate barriers to immunization, such as misinformation, fears regarding side effects, or logistical challenges. With the right information, these mothers can make informed decisions about their children's health and prioritize vaccination effectively.

Maternal attitudes towards immunization significantly influence vaccination rates among children. Mothers with positive beliefs about vaccines are more likely to ensure their children are fully immunized. When mothers trust healthcare providers and receive clear, accurate information about vaccines, they are more inclined to follow vaccination recommendations. A study conducted in Pakistan examined the impact of maternal education on vaccination rates for children under five. While some research indicates a positive correlation between maternal education and immunization rates, other studies present mixed findings. This suggests that maternal attitudes may play a crucial role alongside educational factors.[27] Furthermore, another study highlighted that a substantial majority of mothers recognize the importance of vaccinations for their children's health, indicating a strong connection between positive maternal attitudes and the likelihood of vaccinating their children.[28] Addressing the factors that contribute to negative maternal attitudes towards immunization is essential for improving vaccination rates and protecting children from preventable diseases. Public health initiatives should focus on educating mothers about the benefits and safety of vaccines, fostering trust in healthcare providers, and addressing cultural and religious concerns.

This study has limitations. The cross-sectional design prevents establishing causality. The small, localized sample (n=60) from one community health center in Medan limits generalizability. Self-reported questionnaire data may be subject to social desirability bias. The study only examined a few maternal characteristics, overlooking other potential factors like access to care, family support, cultural beliefs, and information exposure. Future research should use longitudinal designs, larger samples, qualitative methods, and consider a broader range of factors to provide a more comprehensive understanding.

Conclusion

In conclusion, this study identifies several critical factors that influence infant immunization status, including maternal age, education, employment, knowledge, and attitudes. Mothers who are older, more educated, and employed, and who possess strong knowledge and positive attitudes toward immunization, are more likely to ensure that their infants receive complete vaccinations. These findings highlight the need to address socioeconomic and educational disparities to enhance immunization rates. Public health interventions should prioritize improving maternal health literacy, providing accessible healthcare services, and fostering positive attitudes toward vaccination. By targeting these factors, healthcare systems can decrease the number of infants with incomplete immunizations and enhance overall child health outcomes. Ultimately, empowering mothers through education, employment opportunities, and accurate health information is essential for achieving higher vaccination coverage and preventing vaccine-preventable diseases.

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