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Parent's Knowledge and Attitude as Key Determinants of Completeness Childhood Immunization in Central Java, Indonesia

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Abstract

Incomplete basic immunization in children aged 11-23 months has the potential to increase contracting dangerous diseases risk due to suboptimal immunity. Parents play an important role in ensuring the success of children's immunization. This study's purpose was to analyze the completeness of CBI based on parents' knowledge, attitude, perception, and satisfaction in immunizing their children. It's a quantitative analytic study with a cross-sectional approach. The population was all children with a sample of 685 children taken by purposive sampling technique from 31 districts in Central Java province. Data were collected through interviews and analyzed univariate with frequency distribution, bivariate with Chi-Square test, and multivariate with multiple logistic regression. A total of 38.7% of children were not fully immunized, especially in booster immunization (73.4%), IPV (25.7%), and MR (15.9%). Partially, it was proven that parent's knowledge, attitude, perception, and satisfaction were related to the completeness of basic immunization. Simultaneously knowledge and attitude together affect the completeness of basic immunization in children with an overall effect of 42%. Parents' knowledge and attitudes are key factors for the completeness of basic childhood immunization. Need to improve literacy and strengthen positive attitudes through structured IEC using a personal approach, as well as involving key figures in the community in their support for the immunization program. Utilizing communication technology and social media is an alternative that should be considered.

Introduction

Immunization has proven to be very effective in preventing the transmission of dangerous diseases and its measurable impact on reducing morbidity and mortality of children (Chan, 2014; Efendi *et al*., 2020; Kanchan *et al*., 2018). In addition to providing personal protection from the risk of contracting disease and death, immunization has also been shown to protect the community level or herd immunity However, optimal protection from immunization will only be obtained when children are fully immunized. This is related to the body's immune system and the power generated by each type of antigen given. Several studies have shown that children who are not fully immunized are at risk of poor health status and growth development, including the risk of malnutrition (Ma'alin *et al*., 2016). When routine childhood immunizations are not completed, children become individually and collectively vulnerable, putting them at higher

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risk of vaccine-preventable diseases (WHO, 2022).

Although immunization has been routinely implemented since 1980 in Indonesia and other Southeast Asian countries, cases of immunization-preventable diseases still occur frequently today. In 2019, Philippines reported an outbreak of polio serotypes 1 and 2, followed by Malaysia in 2020 (Snider *et al*., 2022), and spreading throughout Asia (Kemenkes RI, 2020). A total of 16 countries reported an incidence of polio type 2 in 2022 including Indonesia, although in 2014 Indonesia received a polio-free certificate from WHO (Harizon *et al*., 2020; Kemenkes RI, 2020). Measles cases in Malaysia increased significantly from 125 cases (2013) to 1467 cases (2018), including 4 cases of diphtheria and 19 cases of pertussis (Wong *et al*., 2020). The high number of cases of diseases that can be prevented by immunization proves that there are obstacles and problems in immunization program implementation so far.

Referring to the Minister of Health Regulation No. 12 of 2017 concerning the Implementation of Immunization, every child up to 24 months old was entitled to completing basic immunization, namely: HB-0 (1 time); BCG (1 time); Polio drops/OPV (4 times); Polio injection/IPV (1 time); DPT/HB/HiB (3 times); Measles Rubella/MR (1 time); and booster immunization, namely DPT/HB/HiB and MR. Every child gets Complete Basic Immunization (CBI) status when they have received all types of immunization according to the type, frequency, and volume. Based on data from Indonesian Health Profile 2020, there is a downward trend in CBI coverage from 90.6% (2018) to 93.7% (2019) and 83.3% (2020). The Health Basic Research data in 2018 even showed CBI coverage of only 57.9%. The immunization dropout rate with an indicator comparing DPT/HB/HiB-1 coverage with Measles-Rubella (MR) coverage also shows an increasing trend from 2.5% (2018) to 3.1% (2019) and 4.2% (2020). The national coverage of basic immunization in 2021 slightly increased to 84.2% but has not yet reached the strategic plan target of 93.6%. Provincial CBI coverage also varies in the range of 42.7% - 100% with Aceh province having the lowest coverage and the highest in South Sulawesi province. The dropout rate vaccine (DO) of 6.9% also still does not meet the target of <5%. Based on data National Socioeconomic Survey 2020, it is known that only 30.8% of children aged 12-23 months in Sumatra have complete immunization status, and 10.3% of children did not receive basic immunization at all (Setiawan & Wijayanto, 2022).

Low coverage of basic immunization contributes to the increasing number of cases of immunization-preventable diseases in Indonesia. Based on data from the Indonesian Health Profile in 2021, 11 cases of Tetanus Neonatorum (TN) were found with 9 deaths (CFR 82%). A total of 9 children out of 11 TN patients (82%) were not immunized. Although the number of suspected measles cases in 2021 decreased to 2931 cases (compared to 3434 cases in 2020), the distribution map of the area is widening. Only 3 of 34 provinces had suspected measles cases. A total of 259 diphtheria cases were found in 2020 and slightly decreased to 235 cases in 2021, but the case fatality rate (CFR) increased from 5.02% (13 deaths in 2020) to 11% (25 deaths in 2021). A high CFR rate indicates a greater risk of death for the patient. As the third most populous province in Indonesia, Central Java province has also experienced a decrease in CBI coverage. Through data from the Central Java Health Profile in 2021, it could be seen that there has been a downward trend in the last 3 (three) years, namely 98.5% (in 2019), 94.3% (in 2020) and 86.7% (in 2021). The risk of immunization-preventable disease outbreaks is also quite large and spread in various regions in Central Java province. In 2020, 113 cases of paralysis were found, and this increased to 196 cases in 2021. Diphtheria cases also increased to 11 cases (in 2021) although it had decreased to only 1 case (2020) from 9 cases (2019). Although the total number of measles cases has decreased from 1389 cases (2019) to 683 cases (2020) and 507 (2021), the area of distribution has increased in 22 districts/cities (62.9% of all districts/cities in Central Java province).

The main obstacle to immunization programs relates to low utilization which directly contributes to low coverage. Low immunization utilization is mainly due to access barriers related to limited resources and inadequate infrastructure (Bangura *et al*.,

2020), socioeconomic factor barriers (Herliana & Douiri, 2017) related to living conditions, maternal education, maternal employment status, place of delivery, and inequality in the distribution of health facilities (Setiawan & Wijayanto, 2022), and behavioral barriers related to negative perceptions, doubts, and rejection of vaccines (Smith *et al*., 2017). Parents' hesitation to immunize their children is mainly related to concerns about vaccine safety and side effects, poor personal experiences in the past, false beliefs and faith in vaccines, and distrust of the government, health system, and healthcare providers, especially in religious fanatics and ethnic minority communities (Mursinah *et al*., 2020). Access difficulties are mainly the reason for low socioeconomic groups to delay or cancel immunization. Low accessibility not only leads to low coverage but also creates large pockets of unimmunized vulnerable groups at risk of contracting or transmitting diseases (Mallory *et al*., 2018). Studies in India have shown that maternal education and wealth index are confounding factors that affect immunization completeness (Kanchan *et al*., 2018). In Asian countries, especially in Southeast Asia, social elements, culture, traditions, norms, and religion strongly influence health service-seeking behavior including immunization services (Arnault & Woo, 2018).

Parents play a very important role in fulfilling the coverage and completeness of basic immunization in their children. Parents' attitudes and beliefs towards vaccination are important to understand to shape vaccine acceptance and intervention demand (Balgovind & Mohammadnezhad, 2022; Wallace *et al*., 2019). Parental knowledge of immunization is related to the level of literacy and the ability to obtain and understand various health information that ultimately affects every health decision made (Aharon *et al*., 2017). Fear of side effects, concern about multiple injections of immunization, and parents' doubts about vaccine safety are often caused by misinformation and misunderstandings that parents receive about immunization (Crescitelli *et al*., 2020; Joshi *et al*., 2018; Syiroj *et al*., 2019). The satisfaction of immunization services received also influences mothers' decisions to immunize or not immunize their children (Debela *et al*., 2022). Dissatisfaction with the immunization received is related to reluctance, delay, and inaccuracy of immunization time on schedule (Beavis *et al*., 2022; Uwaibi & Omozuwa, 2021). Preliminary studies conducted by the author on several parents showed low literacy related to immunization programs, in addition to wrong attitudes and perceptions about immunization. The purpose of the study was to analyze the completeness of basic immunization of children aged <24 months based on parents' knowledge, attitudes, perceptions, and satisfaction with child immunization.

Method

This is a quantitative analytic study with a cross-sectional approach. Conducted in Central Java province and spread across 31 of the 35 districts/cities in Central Java province. The population was all children aged 11-23 months. Samples were determined using a purposive sampling technique based on the public health center (PHC) that had the lowest CBI coverage from each district. In each PHC, 1 (one) village with the lowest immunization coverage was taken. Each village sampled at least 20 children per village randomly, resulting in a total sample of 685 children. Respondents were parents or caregivers who lived with their children and gave informed consent.

The independent variables of the study include knowledge, attitude, perception, and satisfaction of parents towards immunization, while the dependent variable is the completeness of basic immunization in children. Basic immunization is declared complete when the child has received all types of mandatory immunizations that are part of the government program (including booster immunization), namely HB-0, BCG, oral Polio (OPV) 4x, DPT/HB/HiB (3x), injectable Polio (IPV), Measles Rubella (MR) and booster immunization (2x). Data collection using an interview method using a questionnaire that had been tested for validity and reliability. Observations were also made to collect data on the completeness of immunization status through the Maternal and Child Health Book that each child has had since birth. The research

enumerators were students participating in Universitas Diponegoro Thematic Work Practice on immunization who had been given adequate explanations regarding filling out questionnaires, observation sheets, and field data collection using accidental techniques. The data collected were analyzed univariately with frequency distribution, bivariate using the Chi-Square test because the data form is categorical, and multivariate analyzed using multiple logistic regression tests to see the influence of all variables simultaneously and identify the variable that has the most dominant influence on the completeness of basic immunization. This study has also met ethical standards through a certificate of Ethical Review Pass Number 361/EA/KEPK-FKM/2022 from the Health Research Ethics Commission, Faculty of Public Health, Universitas Diponegoro.

Result and Discussion

Table 1 shows that only 61.3% of children had complete status for basic immunization. The immunizations with the lowest utilization were booster immunizations, namely DPT/HB/HiB_4 (26.6%) and Measles-Rubella_2 (44.1%). Of all types of immunization antigens, IPV coverage was lowest (74.3%), followed by MR (84.1%) and OPV_4 (87.3%). All vaccine types had coverage below the national target (<95%), including BCG which only reached 94.5%.

Table 1. The Immunization Coverage based on Antigen Type

Antigen type	Not N (%)	Yes N (%)
HB-0	70 (10.2%)	615 (89.8%)
BCG	38 (5.5%)	647 (94.5%)
DPT/HB/HiB_3	80 (11.7%)	605 (88.3%)
Polio (OPV)_4	87 (12.7%)	598 (87.3%)
Polio (IPV)	176 (25.7%)	509 (74.3%)
Measles-Rubella	109 (15.9%)	576 (84.1%)
DPT/HB/HiB_4 (*booster*)	503 (73.4%)	182 (26.6%)
MR (*booster*)	383 (55.9%)	302 (44.1%)
CBI status	265 (38.7%)	420 (61.3%)

Table 2 shows the proportion of parents who have low knowledge about immunization is 54.2%, poor attitude (47.1%), poor perception (46.7%), and low satisfaction with immunization (40%). Results of univariate analysis showed that poor maternal knowledge was related to the understanding that booster immunization does not need to be given if the basic immunization status is complete (54.5%), they do not know about immunization program (42.8%), complete immunization if each child is immunized once for each type of antigen (42.6%), the cause of measles and tuberculosis (30.5%) and the obligation of every newborn to get HB-0 vaccine (24.7%). Poor maternal attitudes were mainly related to the understanding that immunization can be given late (51.8%), MR immunization is sufficient only once and does not need to be repeated (42.4%), and giving vitamins and herbs can prevent disease transmission (25.9%). A total of 35.8% of parents agreed that booster immunization does not need to be given (35.8%) and does not affect the health status of children (36.7%).

As many as 36.2% of parents participated in immunization because they only followed government recommendations. Parents' perceptions regarding post-immunization adverse events are still not good (57.5%) and perceptions related to multiple injections are also not good (47.7%). Parents' dissatisfaction was related to unclear information provided by health workers about the benefits, risks, and side effects of immunization (25%), the inconvenience of clinic facilities and services that did not meet the needs of children (37.8%), long waiting times for immunization (34.1%) and the ability of staff to calm children when crying during immunization (31.3%).

Table 2 also shows that among the group of parents who have fully immunized their children, the proportion of those with high knowledge is higher (68.8%) than those with low knowledge (55%), those with good attitudes is also higher (67.8%), those with good perceptions is also higher (65.2%) and those with high satisfaction is also higher (65%). Statistically proven there is a partial relationship between knowledge, attitude, perception, and satisfaction with the completeness of basic immunization with p-value<0.05. Based on the results of multivariate analysis (see Table 3) it is evident that knowledge and attitude together affect the completeness of immunization with

Table 2. Relationship Analysis Between Independent Variables and Completeness of Child Immunization

Variables	Completeness of Immunization		Total N (%)	Sig.
	Not Complete N (%)	Complete N (%)		
Knowledge				
Low	167 (45.0%)	204 (55.0%)	371 (100%)	0.000*
High	98 (31.2%)	216 (68.8%)	314 (100%)	
Attitude				
Poor	148 (46.0%)	174 (54.0%)	322 (100%)	0.000*
Good	117 (32.2%)	246 (67.8%)	363 (100%)	
Perception				
Poor	138 (43.1%)	182 (56.9%)	320 (100%)	0.031*
Good	127 (34.8%)	238 (65.2%)	365 (100%)	
Satisfaction				
Low	121 (44.2%)	153 (55.8%)	274 (100%)	0.020*
High	144 (35.0%)	267 (65.0%)	411 (100%)	

*Significant at p-value<0,05

an overall effect of 42% of the resulting R^2 value. Knowledge and attitude have a dominant influence with Exp(B) values of 1.596 and 1.580. The chance of an increase in the completeness of basic immunization is 1.596 times greater if parental knowledge is improved and 1.580 times greater if parental attitudes are improved.

The results showed that Hepatitis immunization coverage (HB-0) and Bacillus Calmette-Guerin (BCG) had the highest coverage among other antigen types. Programmatically, both vaccines are given when newborns are birth (for HB-0 vaccine) at health facilities and when they are one month old (BCG vaccine). Coverage of two types of booster immunization (DPT/HB/HiB-4 and MR-2) was the lowest among other immunization types, at 26.6% and 44.1%. These figures are still far from the national target of 95%. Repeated immunization (booster) is given to children aged 18 months, with a gap of about 9 months after the child received the first MR vaccine at the age of 9 months. It is suspected that the long waiting time for repeating vaccines causes parents to forget the immunization schedule, especially when they do not have a record of their child's immunization. Forgetfulness is also often the reason for delays in immunizing children. Studies in Malaysia show that in addition to the reasons for forgetting and no time, doubts about the halal-ness of vaccines are also a contributing factor to reluctance and refusal of immunization (N. A. Ahmad *et al*., 2017). The same condition also occurred in Indonesia (Syiroj *et al*., 2019). A study in Uganda showed that 44% of parents answered that they did not know, were not interested, felt lazy and reluctant as reasons for not fully immunizing their children and another 44% answered because they were afraid of side effects (Vonasek *et al*., 2016).

Immunization is complete when a child receives all types of vaccines with a predetermined frequency. Low immunization coverage is caused by internal and external factors. The data from Health Basic Research 2018 shows that basic immunization coverage is only 57.9%, incomplete immunization is 32.9% and no immunization is 9.2%. Reasons for not immunizing children include fear of

Table 3. Result of Multivariate Analysis

Variables	B	SE	Wald	df	Sig.	Exp(B)	95% CI for Exp(B)	
							Lower	Upper
Knowledge	0.467	0.167	7.850	1	0.005*	1.596	1.151	2.213
Attitude	0.458	0.165	7.702	1	0.006*	1.580	1.144	2.183
Constant	0.019	0.123	0.025	1	0.876	1.019	-	-

* Significant at p-value<0,05

side effects (28.8%), family refusal (26.3%), far immunization post (21.9%), busy parents (16.3%), sick child (6.8%) and not knowing the place of service (6.7%). This result shows that the largest proportion of children not immunized or immunized but incomplete is more due to family factors that tend to be afraid, do not trust vaccines, and, also do not want to be bothered. The low level of support from parents, families, and communities indicates that there are obstacles related to their perceptions and attitudes toward immunization. Immunization barriers include three interrelated themes: barriers related to beliefs, vaccine safety concerns, and issues of trust and misinformation received (Syiroj *et al*., 2019). On the other hand, poor staff attitudes, long waiting times, and unpleasant immunization service procedures are also factors that prevent parents from attending the follow-up immunization schedule, including uncomfortable clinic environment conditions (Balgovind & Mohammadnezhad, 2022; Oku *et al*., 2017). Lack of knowledge of vaccine indications and contraindications and lack of counseling skills, as well as the tendency of harsh or even hostile attitudes towards mothers, are also barriers that affect parents' knowledge, attitudes, and perceptions of immunization services (Bangura *et al*., 2020).

When children are not fully immunized, they are at risk of health problems and malnutrition. The emergence of cases of immunization-preventable diseases indicates obstacles in the implementation of immunization programs. Through mathematical analysis, studies in the USA have shown that unvaccinated children are 4-5 times worse off for measles, 2 times worse off for chickenpox, and 5-8 times worse off for rubella (Fefferman & Naumova, 2015). In addition to the risk of contracting dangerous diseases, there is also a risk of poor growth and nutritional status. A study in Ethiopia found that unimmunized children were 2.5 times more likely to be underweight, and the prevalence of stunting was 3.8 times greater in households with large family sizes (Ma'alin *et al*., 2016). Studies in Pakistan also prove that immunization completeness is significantly associated with malnutrition and underweight in children (D. Ahmad *et al*., 2020). A study in Indonesia showed that immunization completeness is a protective factor for not stunting in children under five (<5 years), in addition to LBW, the number of children <3 people and parenting. The prevalence of stunting in children with incomplete immunization was 41.1% higher than in children with complete immunization (32.5%) and the risk was 7 times (Simbolon *et al*., 2019). Studies in Timor Leste also show that the risk of stunting is associated with the completeness of immunization and the history of infectious diseases that children have (Pacheco *et al*., 2017).

Immunization completeness is often associated with delays in service utilization, which can be caused by access and affordability issues, children who are sick during the immunization schedule, and parents' ignorance of the immunization schedule. The absence of home visits, misinformation and misunderstanding, and dissatisfaction are the determining factors for incomplete immunization (Mebrat *et al*., 2021). A study in Temanggung, Central Java province proves that maternal knowledge and perceptions correlate with the completeness of basic immunization (Sriatmi *et al*., 2021). Knowledge, social influence, information, and trust in health workers are associated with vaccination compliance (Smith *et al*., 2017). Completing children's immunization status is done by complying with a predetermined service schedule because the schedule is made according to the age of children and the type of vaccine that must be received. Immunization schedule adherence is related to the timeliness, potent status, and immunity of vaccine given type. The immunization schedule has also been adjusted to the child's level of vulnerability. On the other hand, policy factors also contribute to parents' compliance with vaccinating their children. Studies in the USA show that increasing immunization adverse events that have occurred in recent years are consistently associated with parental refusal of recommended immunizations for children. Empirical studies show an association between the level of non-vaccination behavior and permissive vaccine exemption policies. Exemptions due to religion and belief, as well as vaccinations for school entry prerequisites,

are not constitutionally required. These results suggest that legal reforms and strict regulatory arrangements can encourage higher immunization rates (Weithorn & Reiss, 2018).

The results prove that low parental knowledge, less supportive attitudes, and negative perceptions about immunization are positively correlated with the completeness of basic immunization. These results are in line with a systematic review study that lack of knowledge, distance and access points, lack of partner support and negative attitudes, and distrust of vaccines and immunization programs are barriers to immunization practices (Bangura *et al*., 2020). Parents' knowledge, attitude, and behavior will determine immunization decisions, while decision-making about immunization is a very complex process (Balgovind & Mohammadnezhad, 2022). Better of knowledge, attitude, and perception of parents, the lower the risk of immunization refusal. Through multivariate tests, it is also proven that knowledge and attitudes affect the completeness of immunization. Understanding parents' knowledge and attitudes about immunization is key to a successful immunization program. Theoretically, it is understood that knowledge is the result of curiosity through the sensory process towards certain objects, as well as being an important domain for the formation of behavior. Attitude is a person's closed reaction or response to a stimulus or object that involves opinion and emotional factors. This response is formed based on the experience of cognition, reaction, affection, desire, and past behavior that wants to be raised. Attitudes can be positive (in favor) or negative (against).

Refusal of vaccines and immunization is often caused by erroneous knowledge, attitudes, and perceptions about immunization in the community. Refusal generally begins with doubts and distrust of vaccines, especially regarding the safety and effectiveness of vaccines in protecting children (Syiroj *et al*., 2019). Dube *et al.* explained that vaccine hesitancy or refusal is complex and varies for different types of vaccines, across time and context. The main determinants of a person's acceptance or rejection of immunization are related to perceived risk of disease, concerns about vaccine safety, perceived need, usefulness of the vaccine, experience with health services, emotions, mindset, sources of information, and different levels of social norms (Dubé *et al*., 2021). There is a strong association between vaccination and perceived susceptibility to disease, while a weak association exists between vaccination and perceived severity of disease.

Knowledge about vaccines, social influence, and trust in health workers also contribute to vaccination behavior (Smith *et al*., 2017). A total of 51.1% of respondents had a child card based on a study in Southern Nigeria. Of these, only 76.3% had complete immunization status. Maternal education is a significant factor associated with immunization timeliness (Nalley & Maduka, 2019). The low knowledge and socioeconomic resources are the main barriers to incomplete basic immunization for children in Indonesia too (Siramaneerat & Agushybana, 2021). These results are in line with a Kenyan study which showed that highly educated mothers were 54% more likely to be fully immunized than those with low education, and children born in health facilities were 41% more likely. Children in wealthy households were 43-57 times more likely to be fully immunized than those born into poor families. Also, children born in the order ≤ 6 had a 37% lower chance of being fully immunized (Allan *et al*., 2021). Barriers that arise from parents and communities include lack of knowledge about immunization, difficult distance to access points, financial difficulties, low partner support, and mistrust of vaccines and immunization programs. Meanwhile, barriers at the health system level are related to dimensions of health service providers (supply side), including limited human resources, inadequate infrastructure in maintaining the cold chain, and inadequate management of the vaccine supply (Bangura *et al*., 2020).

It must be recognized that internationally, the phenomenon of parental hesitance is increasing and presents a growing challenge to health professionals (Crescitelli *et al*., 2020). Differences in people's levels of trust in governments and countries also impact vaccination acceptance rates (Handy *et al*., 2017). Navin *et al.* explained that the reasons for vaccine refusal can vary according to

different motivations. Parents who refuse vaccines, because they do not care about immunization-preventable diseases, are more likely to immunize their children if they realize that immunization-preventable diseases are serious diseases with fragile herd immunity. Parents who refuse vaccines because they are not concerned about vaccine-preventable diseases may become more likely to vaccinate if they realize vaccine-preventable diseases are serious, herd immunity is fragile, and international travel makes everyone vulnerable and the interactions between people that occur make them even more vulnerable. Similarly, parents who refuse for vaccine safety reasons should be provided with evidence that the risk of vaccine complications is very low and the ingredients from which vaccines are made are very safe and natural (Navin *et al*., 2019).

Psychologically, the relationship between parents or families with vaccines and immunization gives rise to varied cognitive associations. The Howell *et al*. study proves that a person's cognitive associations correlate with intention, beliefs, and refusal of vaccines and immunization. Cognitive associations about vaccine identity, especially those related to understanding that vaccines protect or vaccines harm, can be a psychological building block that bridges parents' immunization beliefs and behaviors (Howell *et al*., 2022). The better the cognitive associations formed about vaccines and immunization, the higher the chance of utilizing immunization services. There is a relationship between maternal knowledge and perceptions of the completeness of child immunization (Mebrat *et al*., 2021; Navin *et al*., 2019; Sriatmi *et al*., 2021). Smith *et al*'s study proves a strong relationship between the perception that vaccines do not cause side effects, positive attitudes, and recommendations for perceived difficulties in using immunizations, including perceived vulnerability and severity of illness (Smith *et al*., 2017).

Building positive interactions and communication between health workers, parents, and communities regarding immunization is a strategic step in improving attitudes and perceptions while minimizing the rejection that occurs (Aharon *et al*., 2017). Health workers have been considered a trusted source of information about vaccines and immunizations (Balgovind & Mohammadnezhad, 2022). Effective communication with parents is essential for overcoming immunization barriers, overcome hesitancy and increasing immunization coverage (Oku *et al*., 2017). Hesitation and refusal of immunization are mainly caused by misinformation, negative experiences, and the strong influence of anti-vaccine groups through massive mass media (N. A. Ahmad *et al*., 2017; Crescitelli *et al*., 2020; Dubé *et al*., 2021). Increased misinformation through media and anti-vaccine advocacy is an important contributor to hesitance levels in the United States and other developed countries with strong immunization programs (Handy *et al*., 2017; Olson *et al*., 2020). The negative influence of the anti-vaccine movement is often cited as a cause of increased vaccine resistance in society (Dubé *et al*., 2021). Vaccine acceptance is a critical component of sustainable immunization programs, so increased vaccine hesitancy automatically affects their success. The 2017 measles outbreak in Italy is evidence of how vaccine hesitancy and refusal as a result of advances in global internet access has played an important role, as well as evidence of how the anti-vaccine movement has grown (Siani, 2019).

Good communication about vaccination is not only related to the message conveyed, but is also influenced by the environment and attitudes of the sender and receiver of the message themselves. Policymakers and health program managers need to understand these factors so they can implement communication approaches effectively (Oku *et al*., 2017), including health workers as the main source of information (Beavis *et al*., 2022; Debela *et al*., 2022; Sriatmi *et al*., 2021). In addition to staff attitudes, uncomfortable clinic environments and long waiting times are barriers to receiving information (Oku *et al*., 2017). Studies conducted in Botswana, the Dominican Republic, and Greece showed a high dependence on healthcare providers for information and communication about vaccines (Handy *et al*., 2017). Health workers are required to be able to provide information to parents or other caregivers and support them in deciding to

vaccinate their children (Oku *et al*., 2017). On the other hand, trust in the government and healthcare system affects vaccine acceptance differently in each country. This points to the need for countries to have specific data on vaccine acceptance by their populations, and to understand which drivers can be leveraged to improve immunization programs successfully (Handy *et al*., 2017). Effective communication is needed to increase coverage and reduce resistance to the use of existing or new vaccines (Oku *et al*., 2017). Positive communication and interaction also need to be built with key figures in society such as religious leaders, community leaders, and regional officials in supporting immunization programs to be the right choice of action (Syiroj *et al*., 2019). They are generally behavioral role models for their followers and surrounding communities.

Building and strengthening immunization literacy for the community also needs to be done. Vaccine literacy is defined not only as knowledge about vaccines but also the ability to use critical and evaluation skills to seek appropriate information, especially information available in media that tends to increase, especially on the internet and social media (Olson *et al*., 2020). Today the internet and social media are increasingly used to communicate, learn, also to make and reinforce decisions about vaccination. Many studies show that vaccine refusal or delay is more common among people who report the internet as their main source of information about vaccines (Dubé *et al*., 2021). Parents generally also find it difficult to know which sources of information are valid and reliable. They are also confused about where finding information that they think is balanced and impartial. Vaccine literacy is an important factor in reducing the negative effects of exposure to misleading information about vaccination (Olson *et al*., 2020), although it must sometimes be acknowledged that those with high health literacy are less likely to adhere to immunization, especially regarding the perceived reliability of information sources (Aharon *et al*., 2017). Vaccine controversies, mostly spread in traditional media (newspapers, magazines, radio, television) as well as social media, have a tremendous impact on immunization coverage. In the face of current vaccine hesitancy, the internet and social media play a key role (Dubé *et al*., 2021). Studies have shown that increased information about vaccines is associated with coverage, but how these various sources of information affect immunization programs needs further research (Smith *et al*., 2017).

Satisfaction with the information and explanations received about vaccine safety and the risk of adverse effects is also lacking (Beavis *et al*., 2022; Crescitelli *et al*., 2020) Some parents also expressed distrust of the information about vaccines and adverse effects provided by health workers, believing it to be subjective and manipulated. Explanations were also only provided on how to minimize and report vaccine side effects but did not promote and support "open" debate or discussion on vaccine safety (Crescitelli *et al*., 2020). While providers (including health workers) and medical literature are the main sources of information about vaccines, complaints about lack of communication and explanations remain (Handy *et al*., 2017). Parents want vaccine information that is tailored to them and their child's needs (Crescitelli *et al*., 2020). Therefore, all future interventions should ensure that the needs of the target group are well studied and understood, including understanding specific vaccine issues in the community, historical experiences, religious or political affiliations, socioeconomic status, demographic background, and trusted messengers. Vaccine messages, information, and stimuli must be able to evoke different values while appealing to society's values to change their behavior about vaccines and immunization (Olson *et al*., 2020). This can also motivate parents who were previously hesitant or refused vaccines to accept and vaccinate their children (Crescitelli *et al*., 2020).

Conclusion

Complete basic immunization coverage was only 61.3%. All coverage for each antigen type has not reached the minimum target of 95%. Coverage of both repeated immunization (booster) DPT/HB/HiB and MR is the lowest, followed by IPV immunization. Many parents have low knowledge, unfavorable attitudes and perceptions, and also dissatisfaction with

services received.

Parents' knowledge and attitudes are key factors for the completeness of basic childhood immunization. Increasing literacy and strengthening positive attitudes must continue to be pursued through structured IEC with a personal approach, as well as involving society leaders in supporting immunization programs. Improvement of immunization education materials needs to be done using of simple science language, the right choice of words, interesting topics as needed, and using visual aids according to the target audience. Utilization of communication technology and social media is one alternative that should be considered.

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