What Factors Affect the Dropout Rate of DPT/HB/HiB Immunization?

Putri Asmita Wigati[1*], *Raysha Rizka* Adzana[1] and *Ayun* Sriatmi[1]

[1]Faculty of Public Health, Universitas Diponegoro, Semarang, Central Java, Indonesia

Abstract. DPT/HB/HiB immunization is administered to children under two years old on four occasions, following established regulations. Every child must complete DPT/HB/HiB to achieve optimal immunity. Kuningan Regency has a DPT/HB/HiB immunization dropout rate of 9.5%, while a rate below 5% is considered good. This study aims to determine the factors influencing the dropout rate of DPT/HB/HiB immunization among children under two years old in Kuningan Regency. This study employed cross-sectional study using quantitative methods. The population involved children under two years old, with a total sample of 162 respondents. Data were analyzed using Chi Square test and multivariate logistic regression, with a questionnaire as the research instrument. The findings of this study indicate that mothers' knowledge of immunization (p=0.024), mothers' perception of immunization (p-0.007), immunization history (p=0.000), and health workers support (p=0.006) influence the DPT/HB/HiB immunization dropout status. The dropout rate of DPT/HB/HiB among children aged two years was 14.2%. Overall, the DPT/HB/HiB immunization dropout status was influenced by 44.6 percent of the variables, including mother's knowledge and perception, immunization history, and health worker support. Immunization history had the greatest influence on the risk of DPT/HB/HiB immunization dropout, with Exp(B)=14.901. Health workers should be proactive and seek effective ways to ensure that all mothers and infants complete the DPT/HB/HiB immunization, supported by continuous education on immunization.

1 Introduction

Immunization is one of the key disease prevention efforts to optimize children's health. The World Health Organization (WHO) has stated that all countries should achieve 90% coverage of all vaccines by 2020. Globally, in 2020, there remained 19.4 million children who had not received vaccination. Among these children, 60% were from 10 countries, including Indonesia. According to the 2018 Indonesian Basic Health Research Survey, the proportion of children aged 12–23 months with complete immunization was only 57.9%. It was also reported that 7 out of 33 provinces had vaccination coverage below 40%, which is far from the national target of 92% [1].

DPT/HB/Hib immunization is a combination vaccine that protects against several diseases simultaneously: diphtheria, tetanus, pertussis (whooping cough), hepatitis B, and Haemophilus influenzae type b (Hib) infection. This vaccine is generally administered as part

* Corresponding Putriasmita@lecturer.undip.ac.id

of the routine immunization program for infants and children [2]. It has been proven effective in reducing the incidence of diseases caused by these pathogens. For instance, a study in Salvador, Brazil, showed a 69% reduction in Hib meningitis cases after the introduction of immunization [3]. Furthermore, the use of hexavalent vaccines (including DPT-HB/HiB) in Europe has successfully maintained the long-term positive effects of Hib vaccination. Therefore, DPT-HB/HiB immunization is an important component of childhood immunization programs in many countries to protect children from vaccine-preventable diseases [4].

Research has shown that the use of the hexavalent DTPa-HBV-IPV/Hib vaccine has successfully reduced the incidence of invasive Hib disease in Europe [4]. The efficacy of the DTPa/HB/Hib combination vaccine is 97.5% among children who receive at least one dose and increases to 98.8% among those who receive the full 3-dose schedule [5]. The use of this combination vaccine also simplifies immunization programs by reducing the number of required injections [5].

Based on the Indonesian Health Profile, there was a decline in DPT/HB/HiB 1 and DPT/HB/HiB 4 immunization coverage in 2022, recorded at 102.8% and 91.4%, respectively, while in 2023, coverage decreased to 89.8% and 76.5%, respectively. In West Java Province, DPT/HB/HiB 1 and DPT/HB/HiB 4 immunization coverage also declined from 109.5% and 101.7% in 2022 to 92.6% and 86.5% in 2023.

In 2023, Kuningan Regency, West Java Province, experienced an outbreak (KLB) with two confirmed diphtheria cases and 11 confirmed pertussis cases, ranking second in hepatitis cases, third in pertussis cases, and fifth in diphtheria cases in the province. This is reflected in the DPT/HB/HiB immunization coverage from dose 1 to dose 4 in 2023, which declined by 9.5%. This indicates a dropout rate in DPT/HB/HiB immunizations in Kuningan Regency, West Java Province.

Dropout of DPT/HB/HiB immunization refers to a condition in which an infant does not receive the complete DPT/HB/HiB immunization according to the prescribed schedule, as recorded in the Maternal and Child Health (KIA) book. The impact of incomplete immunization includes suboptimal and non-specific immune responses to diseases preventable by vaccination [6]. The immunization dropout rate is considered acceptable if it is below 5%. Data on the DPT/HB/HiB immunization dropout rate per Community Health Center in Kuningan Regency in 2023 showed a rate of 9.5%, exceeding the 5% standard. Of the 37 Community Health Centers in Kuningan Regency, 23 had high dropout rates. The five health centers with the highest dropout rates were Garawangi (44.24%), Kalimanggis (42.2%), Kuningan (31.24%), Mandirancan (30.06%), and Ciwaru (25%). Meanwhile, the health centers with the lowest DPT/HB/HiB immunization dropout rates were Subang (-36.32%), Manggari (-22.65%), and Lamepayung (-22.09%).

A preliminary study conducted through interviews with 15 mothers of children under 2 years old showed that seven mothers did not complete DPT/HB/HiB immunizations due to concerns about its side effects. This shows that some mothers lack understanding of the importance and benefits of immunization. The dropout of DPT/HB/HiB immunization is related to the limited utilization of available immunization services due to knowledge-related factors. According to Andersen's theory on health services utilization, three factors influence the behavior of utilizing health services: predisposing factors, enabling factors, and needs. Through Andersen's theory, the factors influencing the dropout status of DPT/HB/HiB immunization in Kuningan Regency will be interpreted [7].

Based on the data description and preliminary study results, the researcher is interested in conducting further research on the factors influencing the dropout status of DPT/HB/HiB immunization in toddlers in Kuningan Regency, including the factors with the greatest influence.

2 Methods

This study was a survey study using a cross-sectional quantitative research method. It aims to analyze the factors affecting DPT/HB/HIB immunization dropout rates. This research was conducted in January-February 2025 in Kuningan Regency, West Java Province. The target population comprised all mothers with children under two years old in Kuningan Regency, West Java Province (15, 703 children).

Sample determination was conducted in the following stages: selecting the research location, identifying the accessible population at the chosen location, determining the total sample size from the population, selecting samples from the chosen research location, and conducting the sampling process.

The research locations were determined using the purposive sampling method, which selects specific locations based on high and low DPT/HB/HiB immunization dropout rates and their proximity to urban areas. The reachable population from the four selected locations totaled 3,104 children. The total sample size was calculated using Slovin's formula, resulting in 162 children. Samples from the four locations were obtained using proportional sampling techniques. The number of samples from each location is presented below.

Table 1. Research Samples

Health Center	Accessible Population	Sample
Kuningan	688	34
Ciawigebang	816	40
Pancalang	323	16
Jalaksana	683	33
Cidahu	594	29

The selected sample was determined using an incidental sampling technique based on the following inclusion criteria: mothers who were permanently domiciled in the selected Community Health Center area, had a KIA book, and had children over 19 months of age. The research variables were mothers' knowledge of immunization, mothers' perception of immunization, immunization history, and health worker supports.

The research instrument was a questionnaire consisting of items on respondent characteristics and dependent and independent variables. The independent variables were measured using 15 questions with four answer choices and scores as follows: "Strongly Disagree=1", "Disagree=2", "Agree=3", and "Strongly Agree=4". The total score was categorized based on the median value. The mother's knowledge variable as an independent variable was measured using 10 questions with 2 answer choices, scored as: "correct=1," "wrong =0." The DPT/HB/HiB immunization dropout status was measured by checking the child's immunization records in the KIA book. Dropout status was defined as a child not receiving all four doses of the DPT/HB/HiB immunization.

The questionnaire was administered to 30 respondents at the Sindangagung Health Center, and its validity was evaluated using Pearson Correlation Product Moment. Twenty-five questions had correlation values above the r-tables = 0,361, indicating they were valid. The reliability of this questionnaire was checked using Cronbach's alpha test, which yielded an alpha value >0.06, indicating that the instrument was reliable.

This research utilized chi-square test analysis to examine the relationship between independent variables, including mother's knowledge, trust, perception, attitudes, anxiety about side effects, history of side effects from DPT/HB/HiB immunization, family support, support from health cadres, support from health workers, accessibility of health services, vaccine availability, and history of child illness, and the dependent variable, DPT/HB/HiB

immunization dropout status. A multivariate analysis was then conducted using logistic regression to determine the factors affecting the DPT/HB/HIB immunization dropout rate. Data were collected through observation of KIA books and interviews using a questionnaire. This study received an ethical clearance letter from the Faculty of Public Health, Diponegoro University (Number: 440/EA/KEPK-FKM/2024).

3 Results And Discussion

Respondents Characteristics Result: Most respondents were in the older adult age category (51.2%). Most respondents had a high school education level or equivalent (37%). A total of 144 (88.9%) of the 162 respondents were housewives. The largest proportion of families (61.7%) had an income below the district minimum wage (UMK) of Kuningan Regency (IDR 2,209,519).

Table 2. Respondent Characteristic

Characteristic	Amount (n)	Percentage (%)
Mother's Age		
18 – 30 Years	79	48.8
≥ 31 Years	83	51.2
Mother's Education		
Elementary School	34	21.0
Junior High School	50	30.9
Senior High School	60	37.0
Undergraduate Degree	18	11.0
Mother's Employment Status		
Doesn't Work	144	88.9
Work	18	11.1
Family Income		
< UMK	100	61.7
≥ UMK	62	38.3

Table 3. Chi-Square Test Result

Dependent Variables	*Drop Out* DPT/HB/HIB Immunization status				Total		P value
	Drop out		Non Drop Out				
	n	%	n	%	n	%	
Mother's Knowledge							
Low	13	25.5	38	74.5	51	100.0	
High	10	9.0	101	91.0	111	100.0	0.11
Total	23	14.2	139	85.8	162	100.0	
Mother's Trust							
Low	17	30.9	38	69.1	55	100.0	
High	6	5.6	101	94.4	107	100.0	0.001*
Total	23	14.2	139	85.8	162	100.0	
Mother's Perception							
Low	15	23.4	49	76.6	64	100.0	
High	8	8.2	90	91.8	98	100.0	0.013*
Total	23	14.2	139	85.8	162	100.0	
Mother's Attitude							
Low	12	34.3	23	65.7	35	100.0	

Dependent Variables	*Drop Out* DPT/HB/HIB Immunization status				Total		P value
	Drop out		Non Drop Out				
	n	%	n	%	n	%	
High	11	8.7	116	91.3	127	100.0	0.001*
Total	23	14.2	139	85.8	162	100.0	
Maternal Anxiety About Side Effect							
Low	5	25.0	15	75.0	20	100.0	
High	18	12.7	124	87.3	142	100.0	0.168
Total	23	14.2	139	85.8	162	100.0	
History of side effects of immunization							
Low	15	41.7	21	58.3	36	100.0	
High	8	6.3	118	93.7	126	100.0	0.001*
Total	23	14.2	139	85.8	162	100.0	
Family Support							
Low	11	14.3	66	66.1	77	100.0	
High	12	14.1	73	72.9	85	100.0	1.000
Total	23	14.2	139	85.8	162	100.0	
Health Cadre Support							
Low	14	18.7	61	81.3	75	100.0	
High	9	10.3	78	89.7	87	100.0	0.198
Total	23	14.2	139	85.8	162	100.0	
Health Worker Support							
Low	16	23.2	53	76.8	69	100.0	
High	7	7.5	86	92.5	93	100.0	0.009*
Total	23	14.2	139	85.8	162	100.0	
Health Service Accessibility							
Low	6	13.0	40	39.5	46	100.0	
High	17	14.7	99	99.5	116	100.0	0.988
Total	23	14.2	139	85.8	162	100.0	
Vaccine Availability							
Low	14	21.5	51	78.5	65	100.0	
High	9	9.3	88	90.7	97	100.0	0.050
Total	23	14.2	139	85.8	162	100.0	
Child's Diseases History							
Low	8	26.7	22	73.3	30	100.0	
High	15	11.4	117	88.6	132	100.0	0.042*
Total	23	14.2	139	85.8	162	100.0	

*There is a relationship

Table 3 shows that there is a relationship between mother's trust (p=0.001), mother's perception of immunization (p=0.013), mother's attitude (p=0.001), history of side effect immunization of DPT/HB/HIB (p=0.001), health worker support (p=0.009) and child's disease history (p=0.042) with DPT/HB/HIB Immunization dropout status.

Based on Chi-square analysis revealed a significance value of 0.001, indicating a significant relationship between mother's trust and DPT/HB/HiB immunization dropout status. Based on calculations using median values, the majority of mothers had high confidence in DPT/HB/HiB immunization (66%). This aligns with the previous study, which stated that mothers' beliefs influence the provision of immunizations to their children. One factor that can affect a mother's confidence is a negative experience, either from administering immunizations to their children or from observing the experiences of other family members. Therefore, trust is considered a predisposing factor in a mother's decision to provide immunizations to her child [8].

Based on Chi-square analysis showed a significance value of 0.001, indicating a significant relationship between mother's attitude and DPT/HB/HiB immunization dropout status. Based on calculations using median values, the majority of mothers had a positive attitude towards DPT/HB/HiB immunization (78.4%). This aligns with the previous study that reported a significant influence of maternal attitudes on maternal behavior in fulfilling immunizations. Mothers with a positive attitude towards immunization tend to have good behavior in fulfilling their children's immunizations. Several factors that can influence a mother's attitude include her perspective and background [9]. According to respondent interviews, some mothers did not agree to provide complete DPT/HB/HiB immunization according to the schedule or to continue immunizations even when busy. Mothers who do not complete their children's immunization often believe that further immunization is unnecessary because basic immunization has already been given.

Based on Chi- square analysis revealed a significance value of 0.013, indicating a significant relationship between the mother's perception of DPT/HB/HiB immunization and immunization drop out status. Based on median calculations, the majority of respondents were categorized as having a positive perception (60.5%). However, bivariate analysis showed that among the 64 respondents with unfavorable perceptions, 23.4% had children who dropped out of DPT/HB/HiB immunization schedules. This aligns with the previous study which found that respondents with positive perceptions of immunization participated more actively in posyandu activities, enabling mothers to gain more information about immunization and increasing their motivation to immunize their children [10].

Based on Chi-square analysis revealed a significance value of 0.001, indicating a significant relationship between the history of DPT/HB/HiB immunization side effects and immunization drop out status. Statistical analysis showed that among 36 respondents who perceived the side effects as severe, 41.7% had children with incomplete immunization. These findings align with study, who stated that mothers whose children experienced side effects were 3,237 times more likely to have incomplete immunizations than mothers whose children did not experience side effects [11].

Law Number 17 on Health defines a health worker as an individual committed to the healthcare sector. Health workers should have a professional attitude, knowledge, and skills to conduct health services. Chi-square analysis revealed a significance value of 0.009, indicating a significant relationship between support from health workers and DPT/HB/HiB immunization dropout status. Based on median calculations, the majority of health cadres provided support (57.4%). However, statistical analysis showed that among the 69 respondents who perceived a lack of support from health workers, 23.2% had children who dropped out of immunization. This finding aligns with the previous study, which reported that the effective role of healthcare workers is associated with higher maternal motivation in administering PCV immunization. Health workers contribute to promoting healthier community behaviors. They should be capable of raising public awareness, particularly among mothers with infants, about the importance of childhood immunization through communication, education, and information [12].

Based on Chi-square analysis revealed a significance value of 0.042, indicating a significant relationship between a child's illness history and the DPT/HB/HiB immunization dropout status. Based on median calculations, the majority of respondents were categorized as healthy (81.5%). However, several respondents experienced delays in providing DPT/HB/HiB immunization because the child was ill. These findings align with the previous study, which stated that children's health conditions are a key factor inhibiting immunization [13].

Table 3 illustrates that the independent variables with a p-value < 0.25 comprise 10 variables: mother's knowledge, trust, perception, attitude, maternal anxiety about side effect, history of DPT/HB/HIB side effect, health cadre's support, health worker support,

DPT/HB/HIB vaccine availability, and child's diseases history. Next, it was entered into multivariate data analyzed using logistic regression, resulting in information as presented in Table 4.

Table 4. The Factors Affect Drop Out Status of DPT/HB/HIB Immunization

Variable	Sign.	Exp(B)
Mother's Knowledge of Immunization	0,024	3.599
Mother's Perception of Immunization	0,007	5.503
History of Side Effect of DPT/HB/HiB Immunization	0,000	14.801
Support of Health Worker	0.006	5.607

Table 4 shows that mothers' knowledge of immunization (p=0.024), mothers' perception of immunization (p=0.007), immunization history (p=0.000), and health workers support (p=0.006) collectively influence DPT/HB/HiB immunization dropout status. The history of immunization side effects had the most influence on dropout risk (Exp(B)=14.901). Overall, 44.6% of the variation in DPT/HB/HiB immunization dropout status was explained by mother's knowledge, mother's perception, history of side effects of immunization, and health worker support.

Health workers play a crucial role in improving health and guiding communities toward healthier lifestyles. They are also responsible for increasing public understanding, especially among mothers and children, of the importance of immunization through communication, outreach, and information delivery [12].

The four variables, mother's knowledge of immunization, mother's perception of immunization, history of side effects of immunization, and support of health workers, collectively influenced DPT/HB/HiB immunizations dropout status. These four variables are interrelated and form a complex relationship. Maternal trust is a crucial factor in the decision to vaccinate children and can arise from a mother's good knowledge of immunization [14]. It is important for parents, especially mothers, to understand immunization and the potential side effects of DPT/HB/HiB vaccination. This information can be obtained through counseling sessions provided by healthcare professionals [15].

Health workers play a crucial role in conveying information and enhancing mothers' understanding of the importance of immunization. This support not only increases knowledge but also fosters positive perceptions among mothers, which can ultimately reduce the risk of immunization interruptions [15].

4 Conclusion

Variables related to DPT/HB/HiB immunization dropout status include mother's trust, mother's perception of immunization, mother's attitude, history of immunization side effects of DPT/HB/HIB, health worker support, and child's disease history. This study also showed that the dropout status among children under two years in Kuningan Regency were influenced by maternal knowledge, maternal perceptions of immunization, history of immunization side effects, and health worker support. Among these four factors, the history of DPT/HB/HiB immunization side effects had the greatest influence on dropout status. Overall, these four variables explained 44.6% of the variation in dropout status. Therefore, health workers need to be more proactive in providing education and support to mothers to achieve complete immunization coverage.

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