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Putri Bungsu Machmud
Universitas Indonesia, Depok, putri.bungsu10@ui.ac.id

Dwi Gayatri
Universitas Indonesia, Depok, dwi.gayatri@ui.ac.id

Erni Astutik
Universitas Airlangga, Surabaya, erni.astutik@fkm.unair.ac.id

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Complete Dose of Hepatitis B Vaccination Among Children in Indonesia and Factors Associated: A Community-Based Study

Putri Bungsu Machmud[1*], Dwi Gayatri[1], Erni Astutik[2]

[1]Department of Epidemiology, Faculty of Public Health, Universitas Indonesia, Depok, Indonesia
[2]Department of Epidemiology, Faculty of Public Health, Universitas Airlangga, Surabaya, Indonesia

Abstract

Hepatitis B vaccination is widely recognized as the most effective way to prevent hepatitis B infection, yet the rate of complete vaccination among Indonesian children remains low. This study aimed to evaluate the extent of hepatitis B vaccination coverage among children and identify potential associated factors in Indonesia. A community-based cross-sectional study was conducted. The study involved 7,860 Indonesian mothers of children aged 12-59 months, providing data on their children's hepatitis B vaccination status and other relevant factors from the 2017 Indonesian Demographic Health Survey. Overall, the rate of complete hepatitis B vaccination among children was relatively high (89.8%). Several factors were found to be associated with complete hepatitis B vaccination among children: living in Java, the Lesser Sunda Islands, Kalimantan, and Sulawesi compared to Sumatra; having an older mother; having parents with secondary or higher education compared to no education; having an employed mother; belonging to middle or high economic status compared to low economic status; having mothers using media irregularly or regularly, as opposed to never using media; having health insurance; and having a larger family size. These findings highlight the need for further interventions to optimize childhood hepatic vaccination coverage, which health policymakers should support.

Keywords: children, complete dose, hepatitis B, immunization, vaccination

Introduction

Hepatitis is a pathological condition characterized by inflammation of the liver resulting from a viral infection.[1] Roughly 900,000 deaths occur annually worldwide due to hepatitis B virus infection.[2] In addition, 95% of infected infants and early childhood might result in chronic hepatitis B.[1] Indonesia is categorized as a region with a moderate to high prevalence of hepatitis B virus.[3] It was recognized for having the second-highest number of infections in the Asia Pacific region, following India, which contributed to 74% of global deaths from liver cancer.[3-5] Moreover, based on the Indonesian National Health Survey (INHS) conducted in 2013, the prevalence of HBsAg was recorded at 7.1 %.[6] Muljono *et al.* reported several factors related to the high prevalence of hepatitis B in Indonesia, such as inadequate disease surveillance systems, geographical barriers, and limited testing facilities for hepatitis B detection.[7]

The hepatitis B vaccine is the key component in hepatitis B prevention, and in Indonesia, the hepatitis B vaccination program for children has been in place since 1997. The Indonesian hepatitis B vaccination program includes an initial dose given within seven days after birth, followed by three doses of combination vaccines covering diphtheria, tetanus, and pertussis (DTP) administered during the second, third, and fourth months.[8] However, the hepatitis B vaccination coverage was low and remained lower in the second and further doses. According to the 2018 INHS, the proportion of hepatitis B birth dose reached 83.1%, but then it decreased to 65.4% (second dose), 63.9% (third dose), and 61.3% (fourth dose).[9] Similarly, the 2017 Indonesian Demographic Health Survey (IDHS) reported that the hepatitis B vaccination trend stays low from the birth dose (85.1%) to further doses (87.6%, 81.3%, and 74.5% for first, second, and third dose, respectively).[10] Interestingly, this percentage is lower than that of DTP vaccination, although given simultaneously.

There are several influential factors in complete hepatitis B vaccination among children. A study by Kyuregyan *et al.* in 2018 showed that the principal reason for the absence of a hepatitis B birth dose in the Russian Federation was parental refusal.[11] A study on homeless children in Paris found that children in contact with the healthcare system at least once in the previous year had higher coverage of vaccination.[12] Wilson *et al.* claimed that children missing the hepatitis B birth

Correspondence: Putri Bungsu Machmud, Department of Epidemiology, Faculty of Public Health, Universitas Indonesia, Depok, Indonesia.*
Email: putri.bungsu10@ui.ac.id, Phone: +62 78849031

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dose vaccine were at risk for under-immunization by 18 and 24 months.[13] However, few studies have specifically assessed hepatitis B vaccination coverage. It is debatable whether the determinants are comparable to those influencing routine vaccination coverage among children. The findings of this investigation are expected to enhance the body of evidence regarding the factors predicting hepatitis B vaccination completeness in children and thus serve as reference material for policymakers. Therefore, this study aimed to analyze hepatitis B vaccination completeness in children using a large-updated dataset from the 2017 IDHS.

Method

This cross-sectional study analyzed secondary data from the 2017 IDHS, provided by Statistics Indonesia in collaboration with the National Population and Family Planning Board, the Indonesian Ministry of Health, and the Inner City Fund (ICF) implementing the Demographic and Health Survey (DHS) program.[11] After being registered and sending the concept idea of this study through the website, the DHS issued an access permit to utilize the dataset. Since the data had no individual identifiers, the confidentiality of participants was ensured. This study was a continuation of a previous study,[14] and the abstract of this paper was presented at the 2021 Asia Pacific International Conference.[15]

The study population was 86,265 mothers participating in the 2017 IDHS. The samples in this study were mothers who fit the inclusion and exclusion criteria. The study included 7,867 mothers who met the inclusion criteria: mothers having children aged 1-3 years at the time of the survey in 2016 and having comprehensive data on their hepatitis B vaccination status, as well as other independent variables. Mothers who did not know their child's immunization status were excluded from the study.

After receiving authorization from the DHS program, the data from the source was retrieved or extracted, and data cleansing was then taken to verify its usability. This encompasses the tasks of verifying the presence of any absent values, eliminating any duplicate entries, rectifying errors, and establishing uniformity in formats. Subsequently, consecutive sampling was employed to select a sample, wherein all eligible mothers who met the predetermined criteria for inclusion and exclusion were included in the subsequent analytic phase.

The outcome variable was considered a binary outcome consisting of incomplete vaccination (the child did not receive any hepatitis B vaccine or did receive less than three doses of hepatitis B vaccines) and complete vaccination (the child received three or more hepatitis B vaccines). The independent variables were sociodemographic characteristics, including geographic region[16] (Sumatra vs. Java, Lesser Sunda Island, Kalimantan, Sulawesi, Maluku Island, Papua and West Papua), residency (urban vs. rural), child's age (1 year vs. 2 and 3 years), child's sex (male vs. female), economic status corresponding to five weighted welfare levels, where lower and lower-middle rated as low income, middle as middle income, and upper-middle and upper rated as high income (low vs. middle and high), health insurance (no vs. yes), and the number of children in the household (>2 children vs. ≤2 child/children). Besides, this study also involved parental factors: age of mother and father (15 to 19 years vs. 20 to 24, 25 to 29, 30 to 34, 35 to 39, and ≥40 years), educational level of mother and father (no education vs. primary, secondary, and higher education), occupational status of mother and father based on monthly salary (unemployed vs. employed), parent's marital status (married vs. living with partner), and mother's media use (never used vs. irregularly and regularly).

In this study, the mother's media use was assessed through two combined variables: type of media use (newspaper/magazine, radio, television, and internet) and frequency of media use in the last year before the survey. Children with mothers using any media at least once a week or almost every day were given a score of two. A score of one and zero was given if a mother used media less than once a week and never used at all, respectively. Accordingly, each mother received a media usage score between 0 and 8, categorized into three groups: no use (score 0), irregular use (score 1), and regular use (score ≥2).

Analyses were done using STATA version 16 (Licensed to Putri Bungsu, Martin Luther University of Halle Wittenberg). The distribution of children's hepatitis B vaccination status, following sociodemographic and parental factors, was cross-tabulated using the Chi-square test. The crude odds ratio resulted from univariate analysis, which evaluated how each independent variable was related to the probability of incomplete hepatitis B vaccination in children. Furthermore, a multi-step logistic regression analysis was applied to evaluate the adjusted association between independent variables and the hepatitis B vaccination status of children. All independent variables with a p-value of ≤0.25 in the univariate analysis were included in the multivariate analysis. The association between the selected independent variables and the completeness of hepatitis B vaccination was analyzed using a multivariate binary logistic regression.

Results

This study included a total of 7,860 mothers with children older than one year (Figure 1). About 10% of children were never vaccinated or vaccinated with less than three doses of hepatitis B. The children's sex was equal between the male and female aged 1-3 years (mean, aged 1.69 years). Over half of the children lived in Sumatra and Java (26.3% and 29.5%, respectively). In addition, the majority of the parents were secondary school graduates. About 80% of fathers were employed, while more than 50% of mothers were unemployed. In terms of economic resources, almost 50% of children lived under a low economic status. Moreover, more than 60% of children were not covered by health insurance. Lastly, most mothers reported using media regularly in the last year of the survey (Table 1).

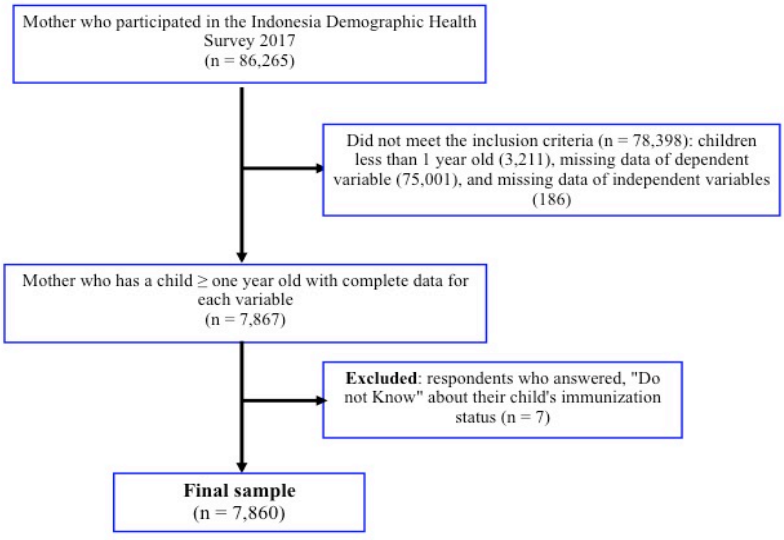

Figure 1. Flow Chart of Participant Selection for the Study

Before adjustment, the study found that geographic region, place of residency, age of mother, parent's education, father's occupational status, economic status, the number of children, health insurance ownership, and mother's media use were associated with complete hepatitis vaccination independently. In contrast, there was no association between the father's age, mother's occupational status, child's age, and sex of children with complete hepatitis B vaccination (Table 2).

Out of 15 factors, place of residency, father's age and occupation, child's age and sex, and marital status were not included in the final model. Table 2 and Figure 2 also summarize the multivariable logistic regression results between the remaining factors and the likelihood of completing hepatitis B vaccination. In terms of geographic region, the likelihood of completing vaccination dose of hepatitis B was highest among mothers with children living in the Lesser Sunda Island. Mothers living in this region were four (AOR= 4.14, 95%CI 2.96–5.77) times more likely to vaccinate their children completely compared to those living in the Sumatra region. Moreover, mothers living in Java and Kalimantan had almost three (AOR= 2.62, 95%CI 2.10–3.27 and AOR= 2.91, 95%CI 2.10–4.04, respectively) times higher odds of completing their children's hepatitis B vaccination than those living in Sumatra. Besides, the odds of being completely vaccinated among children were double higher among mothers with children living in Sulawesi (AOR = 2.13, 95%CI 1.68-2.70) than those living in Sumatra.

Table 1. Demographic Characteristic

Variable	Hepatitis B Vaccination Status (%)		Total	
	Incomplete	Complete	Frequency	Percentage
Geographic region				
Sumatra	4.0	22.3	2,068	26.3
Java	1.7	27.8	2,317	29.5
Lesser Sunda Island	0.6	9.2	774	9.8
Kalimantan	0.6	8.6	722	9.2
Sulawesi	1.4	13.7	1,190	15.1
Maluku Island	1.1	5.9	547	7.0
Papua and West Papua	0.8	2.3	242	3.1
Place of residency				
Rural	3.6	46.0	3,899	49.6
Urban	6.6	43.8	3,961	50.4
Age of father (years)				
15–19	0.1	0.3	33	0.4
20–24	0.6	5.8	502	6.4
25–29	1.9	18.0	1,563	19.9
30–34	2.7	24.2	2,113	26.9
35–39	2.3	20.6	1,802	22.9
≥40	2.7	20.8	1,847	23.5
Age of mother (years)				
15–19	0.3	1.8	166	2.1
20–24	1.7	14.7	1,289	16.4
25–29	2.7	23.2	2,032	25.9
30–34	2.3	24.8	2,132	27.1
35–39	2.2	17.4	1,541	19.6
≥40	1.1	7.8	700	8.9
Father's education				
No education	0.4	1.1	118	1.5
Primary	4.0	21.7	2,021	25.7
Secondary	4.9	52.5	4,509	57.4
Higher	1.0	14.4	1,212	15.4
Mother's education				
No education	0.4	0.9	103	1.3
Primary	4.0	19.6	1,858	23.6
Secondary	4.5	51.6	4,406	56.1
Higher	1.3	17.7	1,493	19.0
Father's occupational status				
Unemployed	0.7	8.8	743	9.5
Employed	9.5	81.0	7,117	90.5
Mother's occupational status				
Unemployed	6.1	52.9	4,636	59.0
Employed	4.1	36.9	3,224	41.0
Marital status				
Married	10.0	88.2	7,718	98.2
Living with a partner	0.2	1.6	142	1.8
Economic status				
Low	6.8	40.1	3,687	46.9
Middle	1.3	17.0	1,437	18.3
High	2.1	32.7	2,736	34.8
Child's age (year)				
1	4.7	39.8	3,498	44.5
2	4.2	38.3	3,339	42.5
3	1.3	11.7	1,023	13.0
Child's sex				
Male	5.1	46.2	4,033	51.3
Female	5.1	43.6	3,827	48.7
Number of children				
>2 children	5.2	30.8	2,829	36.0
≤2 children	5.1	58.9	5,031	64.0
Cover by health insurance				
No	4.5	32.1	2,874	36.6
Yes	5.8	57.6	4,986	63.4
Mother's media use				
Never	1.1	2.9	312	4.0
Irregularly	0.8	4.3	397	5.1
Regularly	8.3	82.7	7,151	91.0

Table 2. Logistic Regression Model of Hepatitis B Vaccination Status Among Children in Indonesia

Variable	Crude Odds Ratio (COR)		Adjusted Odds Ratio (AOR)	
	COR (95%CI)	p-value	AOR (95%CI)	p-value
Geographic region				
Sumatra	1	1	1	1
Java	2.85 (2.31 – 3.52)	**<0.001**	2.62 (2.10 – 3.27)	**<0.001**
Lesser Sunda Island	2.69 (1.96 – 3.69)	**<0.001**	4.14 (2.96 – 5.77)	**<0.001**
Kalimantan	2.55 (1.85 – 3.51)	**<0.001**	2.91 (2.10 – 4.04)	**<0.001**
Sulawesi	1.69 (1.35 – 2.13)	**<0.001**	2.13 (1.68 – 2.70)	**<0.001**
Maluku Island	0.91 (0.71 – 1.18)	0.495	1.23 (0.94 – 1.62)	0.132
Papua and West Papua	0.55 (0.40 – 0.76)	**<0.001**	0.80 (0.56 – 1.13)	0.201
Place of residency				
Urban	1	1	1	1
Rural	0.52 (0.45 – 0.61)	**<0.001**	0.91 (0.77 – 1.09)	0.320
Age of father (years)				
15–19	1	1	1	1
20–24	1.69 (0.62 – 4.58)	0.303	1.55 (0.54 – 4.45)	0.419
25–29	1.73 (0.66 – 4.58)	0.265	1.46 (0.51 – 4.13)	0.478
30–34	1.60 (0.61 – 4.19)	0.338	1.26 (0.44 – 3.59)	0.667
35–39	1.57 (0.60 – 4.12)	0.359	1.28 (0.45 – 3.70)	0.643
≥40	1.40 (0.54 – 3.66)	0.494	1.42 (0.49 – 4.13)	0.524
Age of mother (years)				
15–19	1	1	1	1
20–24	1.38 (0.86 – 2.21)	**0.189**	1.18 (0.72 – 1.94)	0.513
25–29	1.42 (0.89 – 2.25)	**0.139**	1.32 (0.81 – 2.15)	0.268
30–34	1.72 (1.08 – 2.75)	**0.022**	1.97 (1.19 – 3.27)	**0.008**
35–39	1.29 (0.81 – 2.06)	0.288	1.86 (1.11 – 3.13)	**0.019**
≥40	1.15 (0.70 – 1.88)	0.584	1.81 (1.05 – 3.14)	**0.034**
Father's education				
No education	1	1	1	1
Primary	1.94 (1.26 – 2.97)	**0.002**	1.34 (0.82 - 2.20)	0.247
Secondary	3.85 (2.52 – 5.88)	**<0.001**	2.02 (1.22 – 3.33)	**0.006**
Higher	5.25 (3.28 – 8.41)	**<0.001**	2.09 (1.18 – 3.71)	**0.011**
Mother's education				
No education	1	1	1	1
Primary	2.40 (1.56 – 3.68)	**<0.001**	1.37 (0.83 – 2.26)	0.225
Secondary	5.75 (3.76 – 8.79)	**<0.001**	2.48 (1.48 – 4.16)	**0.001**
Higher	6.51 (4.13 – 10.28)	**<0.001**	1.97 (1.11 – 3.51)	**0.020**
Father's occupational status				
Unemployed	1	1	1	1
Employed	0.71 (0.54 – 0.94)	**0.016**	0.98 (0.72 – 1.34)	0.910
Mother's occupational status				
Unemployed	1	1	1	1
Employed	1.05 (0.9 – 1.21)	0.556	1.20 (1.02 – 1.41)	**0.025**
Marital status				
Married	1	1	1	1
Living with partner	0.78 (0.47 – 1.29)	**<0.001**	1.01 (0.57 – 1.79)	0.97
Economic status				
Low	1	1	1	1
Middle	2.19 (1.76 – 2.73)	**<0.001**	1.55 (1.23 – 1.97)	**<0.001**
High	2.72 (2.26 – 3.26)	**<0.001**	1.54 (1.23 – 1.93)	**<0.001**
Child's age (years)				
1	1	1	1	1
2	1.06 (0.91 – 1.24)	0.481	1.08 (0.92 – 1.27)	0.356
3	1.06 (0.84 – 1.34)	0.612	1.12 (0.88 – 1.42)	0.372
Child's sex				
Male	1	1	1	1
Female	0.95 (0.82 – 1.10)	0.525	0.92 (0.79 – 1.07)	0.289
Number of children				
>2 children	1	1	1	1
≤2 children	1.94 (1.68 – 2.25)	**<0.001**	1.90 (1.56 – 2.31)	**<0.001**
Cover by health insurance				
No	1	1	1	1
Yes	1.40 (1.21 – 1.62)	**<0.001**	1.34 (1.14 – 1.57)	**<0.001**
Mother's media use				
Never	1	1	1	1
Irregularly	2.08 (1.45 – 3.00)	**<0.001**	1.52 (1.03 – 2.25)	**0.036**
Regularly	3.91 (3.02 – 5.07)	**<0.001**	1.80 (1.32 – 2.44)	**<0.001**

Regarding parent's parent-associated factors, children whose mothers were aged 30-34 years, 35-39 years, and ≥40 years had almost two-fold (AOR= 1.81, 95%CI 1.05–3.14, AOR= 1.86, 95%CI 1.11–3.17, and AOR= 1.97, 95%CI 1.19–3.27, respectively) higher odds of completing hepatitis B vaccination compared to children whose mothers aged 15–19 years. Mothers with secondary and higher education showed two-fold (AOR = 2.48, 95%CI 1.48–4.16) and almost two (AOR= 1.97, 95%CI 1.11–3.51), respectively, completing their children's vaccination of hepatitis B compared to those uneducated. Similarly, children whose fathers had secondary and higher education had double odds (AOR= 2.02, 95%CI 1.22–3.33 and AOR= 2.09, 95%CI 1.18–3.71, respectively) of having complete hepatitis B vaccination compared to uneducated fathers. Children with employed mothers had higher odds of being completely hepatitis B vaccinated (AOR = 1.20, 95%CI 1.02–1.41) than those with unemployed mothers. In addition, children whose mothers had irregular or regular media usage displayed increased odds (AOR= 1.52, 95%CI 1.03–2.25 and AOR= 1.80, 95%CI 1.32–2.44, respectively) of being complete-dose of hepatitis B vaccination compared those mothers who never used media.

Furthermore, in terms of enabling resources, the odds of completing hepatitis B vaccination were higher among mothers with children living in middle and high economic status compared to those with low economic status (AOR = 1.55, 95%CI 1.23–1.97; and AOR = 1.54, 95%CI 1.23–1.93, respectively). Furthermore, children born to mothers with health insurance had higher odds of completing hepatitis B vaccination compared to those born to mothers lacking health insurance (AOR = 1.34, 95%CI 1.14–1.57). Lastly, children whose mothers had two children or fewer had almost double the odds of having complete hepatitis B vaccination compared to mothers having more than two children (AOR = 1.90, 95%CI 1.56–2.31) (Table 2, Figure 2).

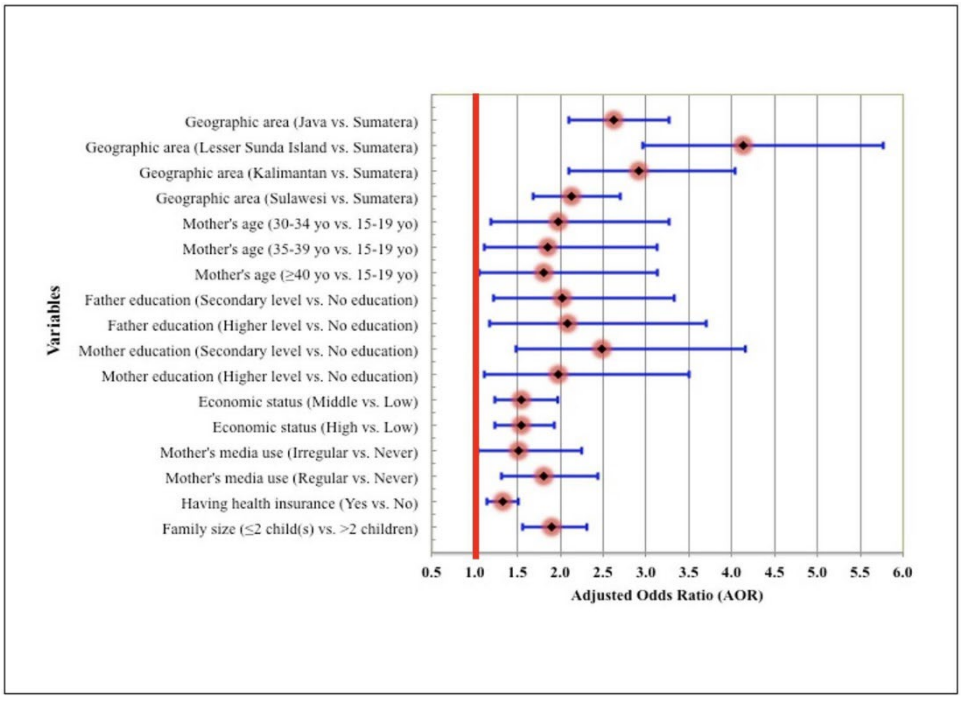

Figure 2. Final Model of Multivariable Analysis

Discussion

This study found that several factors, such as geographic region, father's education, mother's education, mother's age, mother's occupational status, economic status, health insurance ownership, the number of children in the household, and mother's media use were associated with complete hepatitis B vaccination among Indonesian children. This finding aligns with previous studies,[12,17-21] except for residence, child's age, child's sex, and marital status, which were not in line with previous studies.[12,17,22-24] For example, Cao *et al.* found that children living in rural areas in China were more likely to be vaccinated fully for hepatitis B than those living in urban areas.[25] In contrast, a study from Vietnam found that the prevalence of receiving full vaccination, including hepatitis B zero dose, was higher in urban compared to rural areas.[23] Anh *et al.* explained that this finding might be attributed to the fact that urban areas in Vietnam had greater access to and higher quality of vaccination services, owing to concentrated efforts by organizations and individuals involved in

vaccination services.[23]

Certain factors strongly linked to the hepatitis B vaccination status among children were not able to be evaluated in this study, such as factors related to the accessibility of health facilities. Studies from France,[12] India,[17] Tanzania,[18] and East Africa[20] showed the association between an antenatal and postnatal visit of a mother and complete immunization among children, including hepatitis B vaccination. Similarly, Cao *et al.* found that mothers giving birth at home were four times more likely to immunize their children incompletely. Besides, this study also showed that the odds of children being incompletely vaccinated were almost two times higher among the mothers living far from a health provider, which takes >40 minutes of travel time to the health provider, compared to those living nearby (<20 minutes travel time).[25] Furthermore, previous studies also revealed other factors that are associated with children's hepatitis B vaccination, such as birth order, birth interval, religion, ethnicity, and parents' safety concerns related to vaccination.[14,19,21,22,24,25] For instance, a study from India reported that Muslim and Christian mothers were 17% and 10%, respectively, less likely to vaccinate their children compared to Hindu mothers.[17]

This study found an association between geographic region and complete hepatitis B vaccination among children. In this study, the region was one factor affecting the completeness of hepatitis B vaccination in children. Khan *et al.* reported a similar result, in which there was a considerable disparity in the coverage of hepatitis B vaccine across the district of India.[17] A multilevel study also found that several countries in East Africa had a different opportunity from the primary vaccination of childhood among children aged 12-23 months.[20] Again, this finding reflected the necessity of equality of health provider accessibility, such as maternal health care, which could increase the possibility of hepatitis B vaccination.

Education is among the indirect factors significantly influencing childhood vaccination coverage. This finding is reasonable, given that education has a close association with knowledge and perception regarding the benefit of vaccination; parents with higher education levels tend to have a high awareness of their child's health.[17-21,23,27,28] Education also links with health literacy. Johri *et al.* showed that a mother's literacy was associated with a greater understanding of health aspects, including disease mechanisms, the importance of accessing health services, motivation to care for their child's health, and improved negotiation capacity for the health system.[29]

Related to literacy and knowledge, the mother's media use was also associated with complete hepatitis B vaccination. Previous studies showed similar results, in which children with mothers exposed to media were most likely to have a complete basic vaccination.[19,29] This is expected, given that the media is one of information access related to a child's vaccination, which could increase the mother's knowledge and act as an information tool for vaccination schedule-reminder.[25,31]

Previous studies have shown that older mothers are associated with complete hepatitis B vaccination among children.[18-21,23] For instance, Nadella *et al.* showed that children with younger mothers had higher odds of being unvaccinated or late vaccination of DTP.[18] One possible reason is that older mothers may have more experience in caring for their children, including maternal healthcare services, which often serve as the gateway for childhood vaccinations, including hepatitis B vaccination.[20]

Regarding the ability to afford vaccination services, economic status was the crucial factor influencing the complete hepatitis B vaccination among children. This was also accordant with other studies, showing that children whose families have a middle or high economic status were more likely to be completely vaccinated compared to children from families with a low economic status.[12,17-21,23] This finding reflected that even though primary hepatitis B vaccination for children is free in Indonesia; economic status still plays an important role, potentially influencing the complete vaccination. Accordingly, health insurance was also essential for vaccination status among children.[22]

This study also investigated the number of children associated with hepatitis B vaccination status among children. Similarly, a study by Awasthi *et al.* illustrated that an increase in the number of family members was related to a decreasing quality of care in the family in India.[22,30,32] This finding might be due to limited financial and time resources reducing the opportunity for each family member to access health services.

Furthermore, in this study, children with employed mothers were likely to complete hepatitis B vaccination. This is unexpected given that working time and vaccination schedule were common issues for working mothers. In 2011, Ueda *et al.* reported that working mothers were much less likely to follow recommended vaccine schedules for their children in Japan.[20] Similarly, a qualitative study from Indonesia also found that the major reason for their children's partial immunization status was unmatched mothers' scheduled activities with regular time of immunization services.[33]

However, a study by Chen *et al.* claimed no correlation between working mothers and vaccination coverage among children aged 19-35 months in California.[22] This discrepancy in current literature points out the need for further examination of this association.

This study represents the initial attempt to identify factors correlated with hepatitis B vaccination coverage, specifically in Indonesia, utilizing the latest dataset from the 2017 IDHS dataset. In addition, all potential confounding variables included in this study were controlled from a large representative population study, impacting the validity of the results. However, this study had several limitations. First, since this study relied on secondary data, there was a possibility of residual confounding due to the limited description of certain characteristics in the available data. For instance, less information on the mother's free time for vaccination, even if she is unemployed, creates a missed opportunity situation.

Another limitation is that this study was unable to incorporate variables specifically identifying children under the care of caregivers due to the working mother factor. It was hypothesized that there might be variation in vaccination rates among children under the care of mothers compared to those under the care of caregivers. Hence, data on the missed chances related to the mother's occupational variable was investigated. However, secondary analysis of DHS data remains an important contribution to public health knowledge.

Conclusion

The completeness of hepatitis B vaccination among children in Indonesia is influenced by several factors: accessibility to services, accessibility to information, and economic capability. Therefore, this study highlights the need to expand the coverage of vaccination services to areas far from health facilities as a crucial intervention in boosting childhood vaccination coverage, as this also has an impact on reducing the transportation burden for mothers when taking their children to health services. In addition, information dissemination is tailored to the characteristics of each region so that information on the benefits of vaccination can be well received by the community.

Abbreviations

INHS: the Indonesian National Health Survey; DTP: Diphtheria-Tetanus-Pertussis; IDHS: the Indonesian Demographic Health Survey; DHS: the Demographic and Health Surveys; AOR: adjusted odds ratio; COR: crude odds ratio; CI: confidence interval.

Ethics Approval and Consent to Participate

Ethical approval was obtained from the Research Ethics Committee of the Faculty of Public Health, Universitas Indonesia (Ethical approval number: Ket-73/UN2.F10.D11/PPM.00.02/2024).

Competing Interest

The authors have no conflict of interest associated with the material presented in this paper.

Availability of Data and Materials

The dataset generated and/or analyzed during the current study is not publicly available because it constitutes an excerpt of research in progress but is available from the first author upon reasonable request.

Authors' Contribution

Conceptualization: PBM, DG, EA; Data Curation: PBM; Formal Analysis: PBM; Methodology: PBM, DG, EA; Writing – original draft: PBM; Writing – review & editing: PBM, DG, EA.

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