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Effects of Hepatitis B Immunization Completeness on Hepatitis B Incidence among Children in Indonesia

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ABSTRACT

Indonesia is a country that is endemic for Hepatitis B, with a prevalence of 7% to 10%. At least 3.9% of pregnant women in Indonesia are living with Hepatitis B, with a risk of maternal transmission of approximately 45%. The low coverage of hepatitis B immunization in infants aged 0–7 days can have an impact on increasing the prevalence of the hepatitis B virus. This study aims to determine the effect of immunization on the incidence of Hepatitis B among children in Indonesia. A cross-sectional study was conducted using the 2018 Basic Health Research (Riskesdas) data. The sample in this study was 7,434 children aged 6–12 months, excluding missing data. This study used univariate analysis to describe the general characteristics of the sample and bivariate analysis (*Chi-square test*) to examine the factors associated with hepatitis B with a 95% confidence interval. The results showed that there was no relationship between the complete administration of Hepatitis B immunization and the incidence of Hepatitis B in children (*p-value* = 0.351). The limitations of the Riskesdas data were that there was missing information about the immunization status of children, thus affecting the results of statistical tests related to the effect of HB immunization on the incidence of hepatitis B in children. Complete hepatitis B immunization coverage needs to be increased by taking into account various factors such as family support, family history of hepatitis B, age, level of education, knowledge, number of children, and the role of health professionals.

Keywords: Hepatitis B, immunization, children

Introduction

Indonesia is included in the moderate and high endemicity groups of Hepatitis B, with a population prevalence of 7%–10%. At least 3.9% of pregnant women in Indonesia are living with Hepatitis B, with a risk of maternal transmission of approximately 45%. Currently, it is estimated that there are more than 11 million people with Hepatitis B in Indonesia. In countries with a low prevalence of hepatitis B, most people with hepatitis are aged 20–40 years, whereas in countries with a high prevalence of hepatitis, most people with hepatitis are children (Safitri et al., 2023).

The HB vaccine is a recombinant virus vaccine that has been inactivated and is non-infectious. This immunization aims to give immunity against hepatitis B. HB-0 immunization given to babies before contact or after contact can protect babies from hepatitis B infection. Not providing immunizations for children can result in serious illness, death, disability, and even death. source of disease transmission (Kartika et al., 2022). If the Hepatitis B virus attacks the baby, it will have an impact on liver damage in the baby and can even cause liver cancer. Therefore, giving HB0 immunization to infants will provide protection against exposure to the Hepatitis B virus (Safitri et al., 2023).

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The low coverage of hepatitis B immunization in infants aged 0–7 days can have an impact on increasing the prevalence of the hepatitis B virus and the degree of immunity to the virus in infants. Giving hepatitis B immunization to infants aged 0–7 days is more immune-responsive and forms a protective anti-HBs of 100%, while giving hepatitis B immunization to infants aged more than 7 days forms a protective anti-HBs of 90% (Ayuningsih, 2022). The first hepatitis B immunization is given to infants aged <12 hours and is carried out after the injection of vitamin K. This is considered to prevent bleeding in infants due to vitamin K deficiency. The distance between doses 1 and 2 is at least 4 weeks. The selection of DPT-HB-Hib immunization according to the schedule will provide three doses of hepatitis B vaccine in a row after hepatitis B vaccination at birth (Nur, 2022).

The national program for the prevention and control of the Hepatitis B virus is currently focused on preventing mother-to-child transmission (PPIA) because 95% of Hepatitis B transmission is vertical, namely from mothers who are positive for Hepatitis B to their babies. Approximately 90% of infants infected with HBsAg-reactive mothers will develop chronic hepatitis B (Infodatin, 2017). Therefore, it is very important to examine the effect of immunization on the incidence of hepatitis B in children.

Material and Methods

Research design

The cross-sectional study design was used to determine the effect of the completeness of hepatitis B immunization on the incidence of hepatitis B among children in Indonesia.

Population and sample

The Basic Health Survey 2018 (Riskesdas 2018) data was collected by the Research and Development Agency of the Ministry of Health of the Republic of Indonesia in 2018. The population is all households, representing 34 provinces spread across 514 districts and cities throughout Indonesia. The sample in this study was children aged 6–12 months, based on the 2018 Riskesdas data of 10,240 children. However, because there were 2,859 (27.8%) missing data about status immunization, only 7,394 children were included in the sample analysis in this study. The sample selection comes from census block data determined by the district or city Central Bureau of Statistics based on area mapping in the field. Each census block consists of 10 households, which are the samples of the study.

Data collection and analysis

The 2018 Riskesdas data collection is carried out by local enumerators with technical supervision by the regency or city technical responsible (Called PJT) and administrative supervision by the regency or city operations responsible (called PJO). Methods of data collection include interviews with respondents by data collection officers. Interviews were conducted face-to-face and asked questions directly to respondents using a structured questionnaire equipped with a manual for filling out the questionnaire and a book containing display pictures. Questionnaires for interviews have been tried out beforehand to find problems in terms of difficulty, understanding of language and health terms, and the flow of questions. Data analysis was performed using statistical tests ranging from univariate, bivariate, and multivariate. The bivariate test used the *Chi-square test* to determine the effect of HB-0, HB-1, HB-2, and HB-3 and the completeness of HB immunization on the incidence of hepatitis B in children by presenting the prevalence ratio (PR) value and *p-value*. As well as a logistic regression test to determine the relationship and magnitude of all independent variables to the dependent variable by presenting the adjusted PR and *p-values*.

Results and Discussion

Table 1. Characteristic frequency distribution, diagnosis of hepatitis B, administration of HB immunization, and completeness of HB immunization in children

Child Characteristics	Frequency (N=7,434)	Persentase (%)
Sex		
Male	3,746	50.4
Female	3,688	49.6
Age		
6 months	1,060	14.3
7 months	1,073	14.4
8 months	1,053	14.2
9 months	1,040	14.1
10 months	1,061	14.3
11 months	1,053	14.2
10 months	1,094	14.7
Hepatitis B diagnosis		
Yes	40	0.5
No	7,394	99.5
Giving HB-0 Immunization		
No	756	10.5
Yes	6,678	89.8
Giving HB-1 Immunization		
No	272	3.7
Yes	7,162	96.3
Giving HB-2 Immunization		
No	562	7.6
Yes	6,872	92.4
Giving HB-3 Immunization		
No	1,266	15.1
Yes	6,308	84.9
HB Immunization status		
Completed	1,680	22.6
Uncompleted	5,754	77.4

Based on Table 1 above, it was known that out of 7,434 children, 3,746 (50.4%) were male and 3,688 (49.6%) female, with the proportion of the age of the majority of children being the same, around 14% from ages 6 to 12 months. The frequency of occurrence of hepatitis B in children aged 6–12 months is 0.5% (40 children). Based on the Maternal Child Health (MCH) handbook and the respondent's statement, there were 6,678 children (89.8%) who received the HB-0 dose immunization, 7,162 children (96.3%) who received the HB-1 dose immunization, and 6,872 HB-2 dose immunizations. children (92.4%) and 6,308 children (84.9%) received HB-3 dose immunization. As for those who received HB complete immunization doses based on the MCH handbook and respondent's statements, there were 5,754 children (77.4%).

Table 2. Bivariate Analysis of the Effect of Administration and Completeness of Hepatitis B Immunization on the Incidence of Hepatitis B in Children

Variable	Hepatitis B				Prevalence Ratio (95% CI)	*p-value*
	Yes		No			
	n	%	n	%		
Giving HB-0 Immunization						
No	5	0.7	751	99.3	1.26 (0.49-3.21)	0.597
Yes	35	0.5	6643	99.5		
Giving HB-1 Immunization						
No	3	1.1	269	98.9	2.13 (0.66-6.88)	0.179
Yes	37	0.5	7125	99.5		
Giving HB-2 Immunization						
No	4	0.7	558	99.3	1.35 (0.48-3.80)	0.541
Yes	36	0.5	6836	99.5		
Giving HB-3 Immunization						
No	10	0.9	1116	99.1	1.86 (0.91-3.80)	0.128
Yes	30	0.5	6278	99.5		
HB Immunization status						
Completed	12	0.7	1668	99.3	1.46 (0.74-2.88)	0.351
Uncompleted	28	0.5	5726	99.5		

Based on table 2 above, it shows that in children who were not immunized with HB-0, as many as 5 children (0.7%) had hepatitis B; in children who were not immunized with HB-1, as many as 3 children (1.1%) had hepatitis B; in children who were not immunized with HB-1 2, 4 children (0.7%) had hepatitis B; and 10 children (0.9%) did not receive HB-3 immunization. As for children who did not receive complete HB immunization, 12 children (0.7%) had hepatitis. Based on bivariate analysis with the chi-square test, there was no relationship between HB-0 immunization (*p-value* = 0.597), HB-1 immunization (*p-value* = 0.179), HB-2 immunization (*p-value* = 0.541), HB-3 immunization (*p-value* = 0.128), and the completeness of HB immunization (*p-value* = 0.351) based on the MCH handbook and the respondent's statements about the incidence of hepatitis B in children.

Several possible things caused the results of the statistical analysis to show that there was no relationship between immunization and the incidence of hepatitis B in children. This might be influenced by missing data in the immunization data of 27.8% for 2,859 children, thus affecting the number of samples to be analyzed because they were not included in the data analysis. This data cannot be used to determine whether they received complete immunization or not. Among the missing data, there were 13 children (0.45%) who had hepatitis B who were not analyzed, thus affecting the results of the statistical analysis. Another thing is the low percentage of hepatitis B incidence in children, which is only 0.5% in the study population. In addition to giving HB immunization, hepatitis B immunoglobulin (HBIg) also affects the incidence of hepatitis B in children. Research conducted by Diajeng in 2023 explains that newborns to HBsAg reactive mothers who receive HBIg and are registered at the Lamongan District Health Office are mostly babies who receive vaccines from government programs, while babies who receive vaccines privately tend not to be reported to the Health Office. Lamongan Regency. The HBIg given can help the body to make antibodies or immunity directly without having to produce active substances for its immunity. A few hours after being given HBIg, the body can produce anti-HBs antibodies. HBIg has a protective effectiveness of 85-95% within 3-6 months (Kirana, 2023).

Therefore, it is necessary to make efforts to increase HB's complete immunization coverage. Several steps to increase immunization coverage are to provide correct information about immunization, mobilize all available resources to disseminate the benefits of immunization, ensure immunization services are easily accessible to all people, and improve quality immunization services with high and equitable coverage. In addition, it is necessary to carry out a more detailed study and evaluation of the immunization program to find out whether the target setting is not in accordance with the facts in the field if compared with the recording and reporting system from the community health center, the private or independent practice of health workers, and private clinics. Complete hepatitis B immunization is greatly influenced by various factors, such as family support, family history, age, level of education, knowledge, number of children, and the role of health workers.

Family support

Family support is very important for mothers to bring their babies up to date on immunizations. The mother's motivation greatly influences the immunization of her baby because the better the family support, the stronger the mother's motivation to bring her baby for immunization (Kartika et al., 2022). Support from the family, such as husbands, parents, in-laws, and siblings, in addition to facilities, is also needed as support for immunization (Adiwiharyanto et al., 2022).

This is also supported by Friedman's theory (2017) that mothers need someone who can provide support in caring for their children, including in terms of administering immunizations. Husband's support is the most meaningful support for mothers because husbands are the nuclear family and the person closest to mothers, so husband's support is something that really needs to be done at this time. If the family's attitude towards immunization is less responsive and ignores the implementation of immunization activities, then the baby's mother does not do it because there is no support from the family (Safitri et al., 2023).

Family history

According to the WHO, Hepatitis B virus transmission can occur from mother to child in the womb and through parenteral (blood-to-blood) transmission during birth (perinatal). Geeta and Riyaz (2013) stated that this transmission route creates HBsAg-positive children who are highly infectious and become the focus of further horizontal transmission, but the act of breastfeeding by HBsAg-positive mothers does not increase the risk of transmission to the baby and therefore is not contraindicated as long as the baby is immunized (Patton & Tran, 2014). This is in accordance with the theory that transmission that occurs during the perinatal period is transmitted from mother to newborn child. If a mother is positive for HBsAg, 90% of the babies born will be infected (Budiati et al., 2022).

Level of knowledge

Rusmiati (2010) stated that mothers with higher education have 2.88 times more chances than mothers with low education to give HB-0 immunization to their babies. Obstacles to implementing the immunization program are the existence of myths and/or local cultural customs that apply in the community and people's fear of the side effects that arise. This is usually indicated by a negative statement in the form of refusal of administration or adherence to immunization (Ayuningsih, 2022). Mothers with higher levels of education find it easier to understand the immunization messages conveyed by health workers, both through counseling and the mass media, so they are expected to be able to apply the information they receive, namely giving complete immunization to their children (Adiwiharyanto et al., 2022). Thus, the higher the level of education, the better the ability to carry out the roles and functions of the family, especially in carrying out immunization activities (Safitri et al., 2023).

Knowledge

Educational efforts regarding the importance of immunization need to be carried out to increase mother's knowledge. Research conducted by the previous study showed a significant effect of using leaflets and booklets on increasing mothers' knowledge about the completeness of basic immunization for 9-month-old babies (Rahmawati, 2022). If a mother has good knowledge about something, then thoughts will arise about the positive side. This knowledge influences a person's behavior in accordance with her thoughts; if she thinks positively, then she will behave positively. If a mother knows the benefits of HB-0 immunization for her baby, she will immunize her baby (Safitri et al., 2023). The higher the level of the mother's knowledge about the implementation of complete basic immunization, the higher the compliance to carry out complete basic immunization (Adiwiharyanto et al., 2022).

Number of children

The mother's experience caring for her first child becomes a provision for caring for her second, third, and so on. Thus, for mothers who have more than one child, it is hoped that their child's immunization will be more complete (Adiwiharyanto et al., 2022). Previous research states that the characteristics of pregnant women based on parity are not related to the incidence of reactive HBsAg (Andriana & Setya Yuningsih, 2023).

The role of health workers

Research conducted by Maiyanisa in 2023 states that there is a significant relationship between the role of cadres and the completeness of basic immunization for toddlers in the working area of the Kuala Lahang Health Center (Aliviani Putri & Maiyanisa, 2023). Lack of socialization from health workers causes low understanding and adherence among mothers to the immunization program. Based on these data, it can be concluded that promotional and preventive efforts have not run optimally (Lihi & Dusra, 2023). In addition to cadres, midwives also have an important role in Hepatitis B immunization in children. Approximately 64.7% of mothers stated that midwives did not explain to them that all newborns must be given hepatitis B immunization, 59.2% of mothers stated that they did not receive an explanation from midwives about the benefits of hepatitis B immunization for infants, and 59.8% of mothers stated that they do not know that giving the first hepatitis B immunization to babies cannot be later than seven days after the baby is born. Therefore, they think this hepatitis B immunization can be given when the baby is more than 1 month old (Manurung, 2023).

Conclusion

Based on the results of the study, it can be concluded that there is no significant relationship (*p-value* >0.05) between the administration of HB-0 immunization, the administration of HB-1 immunization, the administration of HB-2 immunization, the administration of HB-3 immunization, and the completeness of HB immunization on incidents of Hepatitis B in children. The coverage of complete hepatitis B immunization (77.4%) given to children is still low, so HB immunization needs to be increased by taking into account various factors such as family support, family history, age, level of education, knowledge, number of children, and the role of health workers.

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