

## ORIGINAL ARTICLE

# Inadequate Health Literacy on Childhood Immunization and Its Predictors among Antenatal Mothers

Nazatul Yusrina Mohamad Yusof<sup>1</sup>, Nor Afiah Mohd Zulkefli<sup>1</sup>, Suriani Ismail, Mohammad Faid Abd Rashid<sup>2</sup>

<sup>1</sup> Department of Community Health, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, 43400 Serdang, Selangor Malaysia

<sup>2</sup> Seremban Health District Office, Jalan Lee Sam, 70590 Seremban, Negeri Sembilan, Malaysia

## ABSTRACT

**Introduction:** Outbreak of vaccine preventable disease still persists despite good coverage of immunization in Malaysia. Health literacy on childhood immunization is one of essential factor for the outbreak to happen. Thus, this study determined the predictors of health literacy on childhood immunization among antenatal mother in Seremban, Negeri Sembilan. **Methodology:** A cross sectional study was conducted among 424 antenatal women using a cluster sampling approach. Antenatal women who were Malaysian and not illiterate were chosen in this study. A self-administered, validated and pretested questionnaire was used to collect data on sociodemographic, socio economic, awareness on immunization, utilization of health care services and health literacy on childhood immunization. The data was analyzed using SPSS version 22.0. Chi Square test was used in bivariate analysis and multiple logistic regression was used to determine the predictors of inadequate health literacy on childhood immunization. **Result:** Out of 362 respondents, 81.2% were inadequate health literacy. The predictors were maternal education (AOR= 2.608, 95% CI 1.477-4.604), parity (AOR= 1.067, 95% CI 1.103-3.876), residential area (AOR= 2.344, 95% CI 1.184-4.641) and utilization of government hospital (AOR= 2.344, 95% CI 1.184-4.641). **Conclusion:** Accessibility of health education with regard to immunization need to be strengthen among primigravida, low education and those staying in rural area. In addition, health education also needs to emphasize on the individual that is employed and low economic status with underutilization of government hospital. A simplified education material with interesting pictures and using visual aids help illiterate people for better understanding.

**Keywords:** Health literacy, Childhood immunization, Predictors

## Corresponding author:

Assoc. Prof. Dr. Nor Afiah Mohd Zulkefli  
Email: [norafiah@upm.edu.my](mailto:norafiah@upm.edu.my)

reduced to another 1.5 million prevented deaths if the coverage improves. (1, 2)

In Malaysia, the immunization program had been established as early as 1950s. (3) The coverage of immunization achieved above 95% for BCG, Haemophilus Influenza B (HiB), Polio and Hepatitis B vaccination, and 93.07% for Mumps and Measles and Rubella (MMR) in 2015. (4)

## INTRODUCTION

### Background

The World Health Organization (WHO) launched an Expanded program for Immunization (EPI) in 1974. (1) This program targeted high-risk people for universal access of immunization, especially children. WHO recommended that all countries should have their own immunization schedule based on suitability of their country and estimated that around 19.4 million infants did not receive their basic vaccination, especially in developing countries such as Indonesia, Nigeria and Pakistan. Globally, the coverage of basic immunizations in 2015 was 86% for DPT and Polio respectively; 85% for measles and 82% for Hepatitis B. With these achievements, immunization can prevent almost two to three million deaths every year and it could be further

Despite the establishment of immunization programs globally and nationally, various vaccine preventable diseases (VPD) outbreaks still occur. For example, Malaysia experienced a sudden rise of Measles cases, from 195 cases in 2013 to 235 and 602 cases in 2014 and 2015 respectively. Moreover, Measles complicated mortality also increased from one case in 2014 to two cases in 2015. The main reason was due to vaccination hesitancy. Most of these parents belonged in antivaccination groups that have wrong perception toward vaccination. (4) Apart of Measles, Malaysia also encountered a Diphtheria outbreak in 2016, with

27 positive cases and five deaths. The origin of the outbreak was also due to incomplete vaccination with possibility of inadequate health literacy on childhood immunization (5, 6). A recent outbreak occurred in Negeri Sembilan in 2016, thus the study was conducted in the Seremban district. (6)

Health literacy is the ability of an individual to obtain, process and understand basic health information and access to the healthcare system in order to make good decisions for themselves, their family and community. (7) Higher level of health literacy in the community provides social benefit by community empowerment in which individuals in the community, government and non-governmental agencies play their roles to promote health, for example in vaccination programs. Community empowerment will help marginalized people such as those in remote or poverty stricken areas to have the ability to access immunization and protect themselves from VPD. (8) Thus, health literacy is believed to be the strongest predictor of health outcome. (7) The associated factors related to inadequate health literacy in general are old age, low socioeconomic status, lack of utilization of healthcare services and being a minority group. (9) In addition, marital status, maternal level of education, parity, residential area, husband's education and primary language are also associated with health literacy especially regarding childhood immunization. (10–14)single (87%

Furthermore, there is limited research conducted in Malaysia to look for predictors and understand the level of health literacy on childhood immunization. Therefore, it is essential to study the predictors of health literacy on childhood immunization among antenatal women, in order to get general information of the local population and plan better health promotion that is suited to the society.

## MATERIALS AND METHODS

A cross sectional study was conducted in the health clinic under the administration of the Seremban health district office using the cluster sampling approach. Among 12 health clinics in Seremban, four were chosen by random sampling method. All antenatal women who are Malaysians were selected while illiterate participants were excluded during the one-month data collection period. The sample size was calculated using the two proportion formula by Lwanga and Lemeshow (15) for all variables. In this study, a proportion of adequate health literacy with the marital status of participants of a research done by Reisi et al. (11) was used for sample size calculation with a total of 424 respondents being considered, after taking into adjustment for comparison of two groups, design effect and 20% of non-response participants. The independent variables were sociodemographic factors (maternal age,

marital status, maternal level of education, ethnicity, parity, residential area, partner's education and primary language), socioeconomic factors (maternal employment, household income), and awareness on childhood immunization and utilization of healthcare services. The dependent variable was level of maternal health literacy on childhood immunization.

### Instrument

This study used self-administered questionnaire which included five sections that were distributed into sociodemographic, socioeconomic, awareness on immunization, utilization of healthcare services and health literacy on childhood immunization factors. The sociodemographic factor comprised of respondent's age, marital status, respondents' educational level, ethnicity, parity, residential area, partner's education level and usage of primary language for communication. The respondents and partners' education level were determined by their highest formal education achievement either primary and secondary school, matriculation, diploma, first degree, second degree, or doctorate. This level of education was grouped into two groups which were low education and high education based on the Ministry's administration. Lower education included those who have no formal education, primary education and secondary education, whereas higher education included those who have diploma, degree, masters and doctorate.

For the socioeconomic factor, it consisted of two questions which were maternal employment status and household income. This household income was grouped based on the National Health Morbidity Survey (NHMS) Maternal and Child health standard, which are <RM1000, RM 1000-1999, RM 2000-2999, RM 3000-3999, RM 4000- 4999, >RM 5000. The other section in the questionnaire was self-reported awareness on childhood immunization. Following that, section 4 consisted of the types of utilization of the health care system among respondents.

The questionnaire for health literacy on childhood immunization was adapted from a study done in India by Johri et al in 2015. It has two questions pertaining to Malaysia's immunization schedule and three questions based on immunization record in children health book corresponding to subsection A and subsection B. All five questions measured the components of reading, writing, calculation and understanding of participants related to immunization material. Correct answer merits one mark and no mark on wrong or unanswered questions. Thus, subsection A and B contribute respectively 13 (one item in question one and 12 items in question two) and five marks (one item in question three, three items in question four and one item in question five) that lead to the total score range of 0 to 18. Subsequently, three groups will be categorized into inadequate (< 60%), marginal (60-

75%) and adequate (>75%) on health literacy. (13) Finally, those respondents in inadequate and marginal groups will be consolidated into the inadequate group and those in the adequate group will remain the same. (13)

### Validated questionnaire

Back to back translation from English to Malay and Malay to English was done by three experts from English and Malay literature to look for similarity of the original copy. Next, content validity of the tool was verified by two expert specialists, which are Public Health Physician and Family Health Physician and comments were taken for improvement. Subsequently, face to face validity were tested and feedbacks were taken into consideration.

### Pretest questionnaire

Test re-test reliability test was done in this questionnaire among antenatal women in health clinics in Seremban which were not included in this study population. The interval was between 10 to 14 days from the first test to the second administration of the questionnaire. The values for test re-test reliability for Intraclass Coefficient Correlation (ICC) are between 0.7 to 0.8 which means the questionnaire is reliable to measure health literacy on childhood immunization and its associated factor.

### Data Analysis

The data was analyzed using IBM *Statistical Analysis of Social Sciences System* (SPSS) version 22.0. Descriptive statistics was performed to look for percentage, mean and median of the variables. In addition, a Chi Square test was done to look for association between two categorical data. The independent variables with  $p$  value less than 0.25 from the bivariate analysis were chosen to fit in the preliminary model in multiple logistic regressions for predictors of likelihood of inadequate health literacy on childhood immunization.

### Ethical Approval

This study has obtained approval from the Medical Research of Ethic Committee (MREC) of the Ministry of Health (MOH) and the Ethic Committee of University Putra Malaysia.

Furthermore, informed consent from the respondents were also obtained before the study was conducted. All details of the respondents were kept privately and used solely for the research purposes.

## RESULTS

A total of 430 consented eligible respondents were given a set of questionnaires to answer. Among these eligible participants, 362 antenatal women completed the questionnaires which was equivalent to 84.2% response rate.

### Descriptive Statistic

The mean age of respondents was  $29.86 \pm 5.16$  with the majority of them being married (98.3%), Malay ethnicity (83.1%) using Malay language (84.8%) as their daily conversation, had one or more children (63.8%), employed (67.1%), low maternal (70.4%) and partner's (74.9%) education level. Overall, almost half of the respondents stayed in rural areas and only 3.3% of the respondents were with household income less than RM 1000. Furthermore, the majority of participants had self-reported awareness in immunization and utilized government health clinics to seek treatment. The summary of the descriptive statistic is shown in Table 1.

### Health Literacy on Childhood Immunization

The range score for health literacy on childhood immunization was between 0 to 18 with the median score of  $11.00 \pm 9.00$ . Whilst, the median score for each section were  $8.00 \pm 7.00$  and  $4.00 \pm 3.00$  respectively as depicted in Table 2.

Table 3 summarizes the distribution of correct and incorrect responses for the questionnaire on health literacy on childhood immunization. Relatively, the overall percentage disclosed higher percentage of incorrect responses compared to correct responses. Specifically, the percentage of incorrect answers was much higher in section 5A in contrast with section 5B. Out of 362 respondents, 81.2% had inadequate health literacy while the remaining 18.8% had adequate health literacy which respectively equals to 294 and 68 antenatal women.

### Bivariate Analysis

Table 4 shows significant association between maternal education ( $X^2= 11.303$ ,  $df = 1$ ,  $p= 0.001$ ), ethnicity ( $X^2= 4.588$ ,  $df = 1$ ,  $p= 0.032$ ), parity ( $X^2= 3.961$ ,  $df = 1$ ,  $p= 0.047$ ), residential area ( $X^2= 4.781$ ,  $df = 1$ ,  $p= 0.029$ ), partner's education ( $X^2= 5.277$ ,  $df = 1$ ,  $p= 0.022$ ), household income ( $X^2= 21.198$ ,  $df = 1$ ,  $p= 0.001$ ), and utilization of government hospitals ( $X^2= 6.671$ ,  $df = 1$ ,  $p= 0.010$ ) with health literacy on childhood immunization.

### Multivariate Analysis

Multiple logistic regression was performed to determine inadequate health literacy on childhood immunization predictors. Each variable checked for multicollinearity and two factors were excluded for advance analysis. Then, the preliminary model proceeded to stepwise methods and consequently, "backward LR" disclosed the most number significance variables. As illustrated in Table 5, a multivariate model depicted that low educated mothers were three times more likely to have inadequate health literacy (AOR= 2.608, 95% CI 1.477-4.604). Whereby, nulliparity was twice likely to have probability of inadequate health literacy on childhood immunization (AOR= 2.067, 95% CI 1.103-3.876). Furthermore, the respondents who were staying in rural

**Table 1.** Sociodemographic, socioeconomic, awareness and health care services characteristics of the respondents (N=362)

<b>Characteristics</b>	<b>Mean ± SD</b>	<b>Median ± IQR</b>	<b>n (%)</b>
<b>Age (Years)</b>	29.86 ± 5.16		
<b>Marital Status</b>			
Married			356 (98.3)
Single			6 (1.7)
<b>Ethnicity</b>			
Malay			301 (83.1)
Chinese			15 (4.1)
Indian			41 (11.3)
Others			5 (1.4)
<b>Parity</b>		1.00 ± 2.00	
< 1			131 (36.2)
≥ 1			231 (63.8)
<b>Maternal Education</b>			
Lower education			255 (70.4)
High education			107 (29.6)
<b>Residential Area</b>			
Rural			179 (49.4)
Urban			183 (50.6)
<b>Partner Education<sup>a</sup></b>			
Lower Education			271 (74.9)
High Education			85 (23.5)
<b>Primary Language</b>			
Non-Malay			55 (15.2)
Malay			307 (84.8)
<b>Maternal Employment Status</b>			
Unemployed			119 (32.9)
Employed			243 (67.1)
<b>Household Income</b>		3500 ± 3000	
< RM 1000			12 (3.3)
RM 1000 – RM1999			60 (16.6)
RM 2000 – RM2999			59 (16.3)
RM 3000 – RM3999			61 (16.9)
RM 4000 – RM4999			54 (14.9)
> RM 5000			116 (32.0)
<b>Awareness on immunization</b>			
No			34 (9.4)
Yes			328 (90.6)
<b>Government Clinic</b>			
No			40 (11.0)
Yes			322 (89.0)
<b>Private Clinic</b>			
No			261 (72.1)
Yes			101 (27.9)
<b>Government Hospital</b>			
No			310 (85.6)
Yes			52 (14.4)
<b>Private Hospital</b>			
No			334 (92.3)
Yes			28 (7.7)

<sup>a</sup>Partner's education are missing 6 respondents.

**Table 2.** Health Literacy on Childhood Immunization Score of respondents (N= 362)

Variables	Median ± IQR
Health Literacy Total Score (0-18)	11.00 ± 9.00
Health Literacy Score for Questionnaire Section 5A (0-13)	8.00 ± 7.00
Health Literacy Score for Questionnaire Section 5B (0-5)	4.00 ± 3.00

**Table 3.** Distribution of correct and incorrect responses toward Health Literacy Questionnaires

Variables	Questionnaires on Health Literacy on Childhood Immunization	Correct n (%)	Incorrect n (%)
HL5A1	How many vaccine preventable diseases in this immunization schedule? (one item)	72 (19.9)	290 (80.1)
HL5A2	List all the vaccine preventable diseases in this immunization schedule? (12 items)	22 (6.1)	340 (93.9)
HL5B1	When was the baby born? (one item)	275 (76.0)	87 (24.0)
HL5B2	What type of vaccine that had been given to the baby? (three items)	178 (49.2)	184 (50.8)
HL5B3	When is his next appointment for vaccination? (one items)	158 (43.6)	204 (56.4)

areas also were twice likely to have inadequate health literacy as compared to those staying in urban areas (AOR= 1.868, 95% CI 1.061-3.290). Moreover, non-utilizing government hospital respondents were two times more likely to have inadequate health literacy (AOR= 2.344, 95% CI 1.184-4.641).

The logistic regression was statistically significant ( $X^2=26.889$   $df=4$ ,  $p<0.001$ ) and fit the sample as shown by Hosmer and Lemeshow on goodness of fit test ( $p=0.064$ ). However, the predictors only accounted for 11.5% of the variance in health literacy on childhood immunization (Nagelkerke R squared = 0.115) and correctly classified about 80.9% of the respondents.

## DISCUSSION

In this study, the majority of respondents in the Seremban district have inadequate health literacy (81.2%) on childhood immunization. It is demonstrated as a comparable outcome with a study done in India by Johri et al in 2015 where 66.6% of their respondents had poor health literacy (13). The difference between percentage were most likely due to different settings of the participants which in this study, were antenatal women while in the other investigation ha respondents who were mother with children between the age of 12 to 23 months. Antenatal women who were primigravida and had no children yet had no experience or awareness regarding immunization as compared with mothers with

a child who had recently received vaccination (16) delivery and postnatal services were identified. In each of the selected health facility structured questionnaires were administered to mothers with children aged six weeks to nine months attending well baby clinics. Frequencies, Chi square and multivariate logistic regression were determined using the SPSS software (version 20).

### Predictors of likelihood of inadequate health Literacy

Low maternal education level was one of the predictors of the inadequate health literacy level in this study. Mothers with lower education were three times more likely to have inadequate health literacy than mothers with higher education. Similarly, a previous study done in Taiwan among 347 participants revealed that mothers' education level was significantly associated with the level of health literacy ( $p<0.001$ ). It stated that education empowered women in deciding for their health as well as their children health. (12,17) and examine associations with health behaviours and self-rated health. Design: Psychometric testing using a British version of the Test of Functional Health Literacy in Adults (TOFHLA Without education, respondents were not able to obtain, process and understand basic health information and health care services in order to make a decision. (18) Besides that, the majority of respondents with low education level had lack health seeking behavior as they did not understand health information and they were usually under served in health care services (12, 17)and examine associations

**Table 4.** Association between sociodemographic and socioeconomic characteristics of antenatal women and level of health literacy on childhood immunization (N=362)

Variables	Poor Health Literacy n = 294 (%)	Good Health Literacy n = 68 (%)	Test Statistics		
			$\chi^2$	df	P-value
<b>Age group</b>					
< 30 Years	163 (84.0)	31 (16.0)	1.778	1	0.182
≥ 30 Years	131 (78.0)	37 (22.0)			
<b>Marital status</b>					
Single	6 (100.0)	0 (00.0)	NA	1	0.599 <sup>a</sup>
Married	288 (80.9)	68 (19.1)			
<b>Maternal Education</b>					
Lower Education <sup>b</sup>	219 (85.9)	36 (14.1)	11.303	1	0.001*
Higher Education <sup>c</sup>	75 (70.1)	32 (29.9)			
<b>Ethnicity</b>					
Non-Malay	56 (91.8)	5 (8.2)	4.588	1	0.032*
Malay	238 (79.1)	63 (20.9)			
<b>Parity</b>					
< 1	114 (87.0)	17 (13.0)	3.961	1	0.047*
≥ 1	180 (77.9)	51 (22.1)			
<b>Residential Area</b>					
Rural	154 (86.0)	25 (14.0)	4.781	1	0.029*
Urban	140 (76.5)	43 (23.5)			
<b>Partner's Education<sup>e</sup></b>					
Lower Education	227 (83.8)	44 (16.2)	5.277	1	0.022*
Higher Education	61 (71.8)	24 (28.2)			
<b>Primary Language</b>					
Non-Malay	50 (90.9)	5 (9.1)	3.280	1	0.070
Malay	244 (79.5)	63 (20.5)			
<b>Maternal Employment</b>					
Unemployed	104 (87.4)	15 (12.6)	3.854	1	0.050
Employed	190 (78.2)	53 (21.8)			
<b>Household Income</b>					
< RM 1000	12 (100.0)	0 (0.0)	21.198	5	0.001*
RM 1000 – RM1999	56 (93.3)	4 (6.7)			
RM 2000 – RM2999	51 (86.4)	8 (13.6)			
RM 3000 – RM3999	50 (82.0)	11 (18.0)			
RM 4000 – RM4999	45 (83.3)	9 (16.7)			
> RM 5000	80 (69.0)	36 (31.0)			
<b>Awareness on immunization</b>					
No	32 (94.1)	2 (5.9)	3.214	1	0.073
Yes	262 (79.9)	66 (20.1)			
<b>Government Clinic</b>					
No	31 (77.5)	9 (22.5)	0.179	1	0.672
Yes	263 (81.7)	59 (18.3)			
<b>Private Clinic</b>					
No	216 (82.8)	45 (17.2)	1.120	1	0.290
Yes	78 (77.2)	23 (22.8)			
<b>Government Hospital</b>					
No	259 (83.5)	51 (16.5)	6.671	1	0.010*
Yes	35 (67.3)	17 (32.7)			
<b>Private Hospital</b>					
No	272 (81.4)	62 (18.6)	0.015	1	0.904
Yes	22 (78.6)	6 (21.4)			

<sup>a</sup>Fisher's Exact Test

<sup>e</sup>Partner's education are missing 6 respondents.

\* Significant at P < 0.05



**Table 5.** Predictor of Inadequate Health Literacy on Childhood Immunization

Variable	$\beta$	SE	Wald	P - value	Adjusted Odds Ratio	(95% CI)	
						Upper	Lower
<b>Maternal Education</b>							
Lower Education	0.959	0.290	10.928	0.001*	2.608	1.477	4.604
Higher Education					1		
<b>Parity</b>							
< 1	0.726	0.321	5.129	0.024*	2.067	1.103	3.876
$\geq 1$					1		
<b>Residential Area</b>							
Rural	0.625	0.289	4.688	0.030*	1.868	1.061	3.290
Urban					1		
<b>Government Hospital</b>							
No	0.852	0.348	5.975	0.015*	2.344	1.184	4.641
Yes					1		
<b>Constant</b>	-2.791	0.368	57.465	<0.001	0.061		

\* Significant at  $P < 0.05$

with health behaviours and self-rated health. Design: Psychometric testing using a British version of the Test of Functional Health Literacy in Adults (TOFHLA).

As for number of children, this research signifies that the nulliparous women were more likely to have inadequate health literacy on childhood immunization. Lack of health seeking behavior and experience in using preventive care might be the result of lack of previous learning experience. The reflection of learning experience may bring an awareness about the importance of immunization and will commit a greater decision later on. (19) Being a primigravida, they most likely tend to seek health information for the benefit of themselves and their pregnancies. They also have less contact with health care providers to get information (16, 20) delivery and postnatal services were identified. In each of the selected health facility structured questionnaires were administered to mothers with children aged six weeks to nine months attending well baby clinics. Frequencies, Chi square and multivariate logistic regression were determined using the SPSS software (version 20). This outcome is parallel with a study done by Ciceklioglu et al in Western Urban, Turkey, where mothers with no previous live birth were five times more likely to have poor health literacy in contrast with those who had at least one previous live birth (AOR= 5.100, 95% CI 1.700-14.900) (20) blood pressure and foetal heart-beat measurements, advice about healthy lifestyles, laboratory examinations, and tetanus immunization. RESULTS: Rates of the women who visited public primary health care settings, private care sources, and public hospitals at least once were 76.0, 57.1, and 54.6%, respectively. As to prenatal care, 64.9% of the participants received an adequate amount and 25.9% an adequate content. Parity ( $P = 0.00$ ).

On the other hand, the other predictor of inadequate health literacy was residential area. Respondents who

stayed in the rural areas were twice likely to have inadequate health literacy as opposed to those who stayed in urban areas. The majority of people who lived in rural areas had difficulties in accessing health care services as most of them had low education. (7) In Malaysia, public health care system uses a two-tier system whereby the end point of the services is the community clinic. This community clinic can approximately cover a five-kilometer radius of the rural area. The accessibility of the health care system can be a problem if public transport is not made available (21). This significant predictor was similar with a study done in Serbia among adult participants and it disclosed that people who stayed in urban areas were five times more likely to have good health literacy (AOR= 4.510, 95% CI 1.950-10.400) (22) health literacy has become a vibrant area of research. Our objective was to evaluate health literacy and its association with socio-demographic variables, self-perception of health and the presence of chronic conditions in primary health-care patients. METHODS: A cross-sectional study among 120 patients was conducted in two primary health-care centers. The test of functional health literacy in adults, a 50-item reading comprehension and 17-item numerical ability test (score, 0-100). Another evidence from a previous study also found that mothers who lived in rural areas in India were twice more likely to have poor health literacy compared with those in urban areas (AOR=1.57, 95%CI 1.110- 2.200) (13).

A difference in socioeconomic factors such as employment status and household income determined the types of utilization of healthcare services. Accessibility to health care services that run during office hours made working respondents unable to utilize government health clinic. On top of that, the utilization of private sector health care system also made people less willing to go to private clinics or private hospitals

to seek treatment (7,23)writing, basic mathematical calculations, and speech and speech comprehension\ nskills (Kirsch, 2001a. Therefore, one way to access the health care system was to go to government hospitals that provided 24 hours services and subsidized by the government (24). A significant evidence of this study was comparable with reserach conducted by Pati et al in U.S. among 293 respondents, that used hospital-affiliated sites, where 79% of respondents had good health literacy and completed their immunization. (10) single (87%

### Limitation

Some limitations in this study warrant a discussion. A causal relationship between contributing factors and health literacy on childhood immunization was unable to be determined as cross-sectional study designed had been used and it measured concurrently. Most importantly, the result may not be representative of the whole population since it only covers antenatal women who followed up in the Seremban district health clinics. In addition, as it is a self-administered questionnaire, a selection bias may have occurred considering that the respondents were those proficient merely in English and Malay languages. Hence, the translation of questionnaires should be considered into other languages too.

As a recommendation, health education and health promotion in relation with immunization schedule and information need to be focusing more on antenatal women who were primigravida and had low education status. The education material needs to be simplified into short and concise messages, using layman words and include interesting pictures for better understanding, for those with limited health literacy (25). Using visual aids such as video also will help illiterate people to better understand health information (25). Besides that, health awareness programs for immunization can be held in the community especially in rural areas, in collaboration with "Panel Penasihat Klinik Kesihatan" and local organizations such as "KEMAS" for better health outcome. Furthermore, the healthcare provider also could organize a parenting course to all newly pregnant mothers by involving their partners to increase awareness on childhood immunization.

In overcoming a study constraint, a qualitative research is recommended for future research to explore the possible causes and factors related to health literacy on childhood immunization as it is still new in Malaysia. A cohort study design also can be performed to look for temporal relationship between the cause and effect of health literacy. A translation of questionnaires into other languages such as Chinese and Indian language will be more favorable to motivate other ethnic groups to participate in forthcoming researches.

### CONCLUSION

As a conclusion, majority of the respondents among antenatal women in Seremban Health District have inadequate health literacy (81.2%) on childhood immunization. The predictors of inadequate health literacy are those with low maternal education level, stayed in rural area, nulliparity and no utilization of government hospital.

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