

ORIGINAL ARTICLE

Would You Have Your Future Children Vaccinated? A Study Among Foundation Program Students in a Malaysian Public University

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ABSTRACT

Introduction: There are a growing number of parents who hesitate to vaccinate their children. Therefore, the current study was conducted to assess future parents-to-be intention to vaccinate their children, as well as to investigate contributing factors of vaccination intention and to identify sources of information on childhood vaccination. **Method:** A cross-sectional study was conducted among Foundation Program students at a public university for five months, from April to August 2019. Factors studied included sociodemographic characteristics, knowledge and attitudes toward childhood immunization, and religiosity. Data were collected using a validated self-completed questionnaire. Simple random sampling was conducted, with a total of 371 students were recruited as respondents. Multiple logistic regression was performed to determine the predictors. The significance level is set at alpha less than 5%. **Results:** Approximately 95% of respondents indicated an intention to vaccinate their future. The mean age of respondents was 19 ± 0.37 years old. A motive to vaccinate their future children was high among females (AOR: 4.20, 95% CI: 1.59, 11.08, $p: 0.004$), having sufficient knowledge about childhood vaccination (AOR: 3.92, 95% CI: 1.23, 12.45, $p: 0.021$), and having a positive attitude toward childhood vaccination (AOR: 9.56, 95% CI: 2.15, 42.46, $p: 0.003$). There was no significant association between intention to have their future children vaccinated and religiosity. The sources of information about childhood vaccination were mainly the Internet (72%), mass media (68.2%), and social media (61.7%). **Conclusion:** Readiness of foundation program students was satisfactory. However, policymakers and program planners should target improving knowledge and attitudes of young people about childhood immunization especially among young men as they will head the household. This effort may sustain the readiness of young people to vaccinate their future children. The approach should include the Internet, mass media, and social media. *Malaysian Journal of Medicine and Health Sciences* (2022) 18(6):42-49. doi:10.47836/mjmh18.6.7

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INTRODUCTION

Vaccination is the administration of killed or attenuated proteins/toxins of microorganisms to stimulate immune system protection against disease (1). To ensure that vaccination coverage is maintained throughout the world, the World Health Organization (WHO) launched the Expanded Program on Immunization (EPI) in 1974, in which 194 countries participated (2). This program significantly reduced the number of vaccine-preventable diseases and prevented more than 2 million child deaths per year (3). The EPI program is considered one of the most successful and cost-effective public health interventions (3). In Malaysia, the childhood

immunization program was introduced in the 1950s as part of the maternal and child health program (4). In 2009, the immunization program in Malaysia achieved an immunization coverage rate of more than 95% for all planned child immunization programs (5), which was higher than the target of 90% set by WHO (6).

However, since 2011, there has been a growing number of parents worldwide who are hesitant to have their children vaccinated (7). It also affected Malaysia, where vaccination coverage has been declining since 2014. The 2016 Malaysian National Health and Morbidity Survey (NHMS) showed that the overall completed immunizations among children confirmed by their health certificate decreased to 86.4% (8). As a result, there was a sudden increase in measles cases in 2015, with more than 1,000 cases compared to 200 reported cases the previous year (9). In 2017, the Malaysian Ministry of Health (MOH) addressed 110 clusters of

the measles outbreak, while in 2018, the number of the clusters increased to 133 and 6 deaths (9). While only 353 cases of pertussis were reported in 2017, the number increased to 892 in 2018 and six deaths that year (10).

WHO defined vaccine hesitancy as “delay in accepting or refusing vaccines despite availability of immunization services” (3). Studies show that the prevalence of vaccine hesitancy among Malaysian parents ranges from 11.6% to 14.5% (11,12). Factors associated with vaccine hesitancy include lack of confidence in vaccination (13), uncertainty about the effectiveness of vaccination (14), fear of harmful side effects (15), belief that the immune system may be weakened after vaccination (16), lack of information and knowledge (17), lack of awareness (18), negative attitude (19), belief in alternative medicine (20), doubt about halal status (11), and forgetfulness (21).

To measure vaccine hesitancy, WHO has developed the Vaccine Hesitancy Scale (VHS) to combine current research on the determinants of vaccination hesitancy and to standardise the calculation of attitudes toward vaccination (22). As a result, several studies have been conducted worldwide using VHS survey instruments, and prevalence varies by geographic area. A study of residents in the United Kingdom reported that more than half of respondents noted a hesitant attitude toward at least one VHS item, and 90% of responses in the “neither agree nor disagree” category (23). In addition, a survey conducted in Romania found that 30.0% of parents were hesitant with 11.7% refusing to have their child vaccinated against varicella, measles, human papillomavirus (HPV), and mumps (24). Although the use of VHS was under-reported in the Malaysian case study, the survey of Malaysian pregnant mothers on attitudes toward childhood vaccines (PACV) found that about 8.0% (86/1081) of them were vaccine-hesitant (25).

Young adults symbolise a subset of the population who will be future parents. Their current knowledge, beliefs, and attitudes about vaccination may influence their future actions. Therefore, it is critical to shaping their attitudes and behaviours early to overcome vaccine hesitancy and maintain healthy lifestyles for the future generation. Several studies have been conducted among college and university students addressing vaccination acceptability, potential barriers to vaccination, and factors related to the topic. The most commonly discussed vaccinations include seasonal influenza (26), HPV (27), hepatitis B (28), and COVID-19 vaccines (29). A study conducted among undergraduate students at California State University, Northridge (CSUN) showed that only about 43.0% were vaccinated against seasonal influenza; while the rest of the respondents indicated that vaccination leads to some illness, has side effects, and some think they are not in the risk group (26). A survey of undergraduates at the University of South

Alabama (USA) found low HPV vaccination rates. Only 53 of 297 (44.5%) students were fully vaccinated (30). Misconceptions, religious beliefs, and conspiracy beliefs regarding the human immune system are also cited as barriers to vaccination COVID -19 among university students (29).

Therefore, this study was conducted to determine whether they intend to vaccinate their children later, to identify the factors that predict the intention to vaccinate their children, and to identify the main sources of information about childhood vaccination among young adults.

MATERIALS AND METHODS

Study design and setting

An institutional cross-sectional study was conducted at UPM, a public university, from April to August 2019. This university is in Selangor, one of the most populous states in Malaysia. The students of this public university come from different parts of the country, including overseas. There are 16 faculties, 10 institutes, 19 centres, 1 school, 1 academy, and 18 residential colleges (31) with a total of 30,000 students (32). The population for this study was Foundation Programme students. The Foundation Programme is an undergraduate level programme before the admission of these students to their respective fields of study. Approximately 1000 students participated in this programme. Students who were less than 18 years old and/or married were excluded from this study. Married students who are a minority group were excluded as they might have received some information about childhood vaccination. This might produce bias when they answered the questionnaire.

Sample size and sampling technique

Two proportion formula was used in determining sample-size for testing the hypothesis (33). The sample size of 472 students was computed with the assumption of 84.3% and 93.2% expected proportion of male and female with good knowledge, attitude, and practice (KAP) towards child immunization based on previous study (12) with 20% non-response rate. Simple random sampling technique was used to select study subjects using the list of names of Foundation Program students.

Study instruments

Respondents were required to complete a self-administered questionnaire which consisted of seven sections that include sociodemographic characteristics, knowledge, attitude, religiosity, source of information on childhood immunization and intention to vaccinate.

Variables

Dependent variable: Intention to vaccinate children: the respondents stated their willingness to vaccinate their children by answering “yes”, “no”, and “not sure”. Those who answered “yes” were categorized as

having intention to vaccinate children. While those who answered “no” and “not sure” were categorized as did not have intention to vaccinate children.

Independent variables: Sociodemographic variables include gender, ethnicity, and religion. Items on knowledge and attitude on children’s vaccination were adapted from a study conducted in Malaysia (34) with Cronbach’s alpha for knowledge and attitude were 0.70 and 0.70, respectively. Items on knowledge was recorded as “yes”, “no” and “don’t know” for each question. A score of “1” was given to any correct answers and “0” for incorrect and “don’t know” answers. There was a total of 14 items. The maximum score was 14 and the minimum score was 0. The data obtained was not normally distributed, hence the cut-off point for knowledge score was based on the median scores i.e. 7. A score of more than 7 was categorized as adequate knowledge. Attitude was assessed based on 17 items with 5 points Likert scale; 1 score was given to “strongly agree” and 5 for “strongly disagree” of positive statement. Reverse scoring was used for the negative statements. The maximum score was 69 and the minimum score was 28. The cut-off point for attitude score was based on median score (19) which was 46.0 as the data was not normally distributed. A score of above 46 was categorized as having positive attitude on child immunization.

Religiosity was assessed using the Duke University Religion (DUREL) index which consists of a five-item scale accessing three major dimension or subscale of religion involvement: Organizational Religious Activity (ORA), Non-Organizational Religious Activity (NORA) and Intrinsic Religiosity (IR). The Cronbach’s alpha was between 0.78 and 0.691 (35). The ORA and NORA used 6 points Likert scale with 1 for “never”, 2 for “once a year or less”, 3 for “a few times in year”, 4 for “a few times in a month”, 5 for “once a week” and 6 for “more than once in a week”. The maximum score was six and minimum was 1. The IR consists of three statements that were assessed using 5 points Likert scale; 1 for “definitely not true”, 2 for “tends not to be true”, 3 for “unsure”, 4 for “tends to be true” and 5 for “definitely true of me” where the maximum and minimum score were 15 and 3 respectively. These three subscales were analysed separately. Reverse scoring was used for the negative statements.

Data collection

Data collection was conducted in their student residence, Thirteenth College. Respondents were selected by simple random sampling based on a list of names. A temporary booth was set up where questionnaires were distributed, completed by respondents on-site, and returned to the researcher.

Analysis

The International Business Machines Statistical

Package for the Social Science version 25.0 was used for the analyses. Normality test was performed using Kolmogorov-Smirnov test and histogram. Descriptive statistics were presented as mean and standard deviation (SD) for continuous variables and frequencies and percentages for categorical variables. Chi-square test or Fisher’s exact test were used to measure the association between categorical independent variables and intention to vaccinate children. Logistic regression was used to measure the association between religiosity and intention to vaccinate children. Significant variables from the bivariate analysis were included in the multiple logistic regression analysis. Predictors of intention to vaccinate children were determined using the “enter” approach of multiple logistic regression analysis with a 95% confidence interval (95% CI). The significance level was set at alpha less than 5.0%.

Ethical clearance

Ethical approval was obtained from the Human Research Ethics Committee, UPM (UPM/TNCPI/RMC/1.4.18.2 (JKEUPM)). Besides, the Thirteenth College principal’s approval and written informed consent from respondents were obtained before conducting the study. Participants were informed that all information would be kept private and confidential and that they could withdraw from the study at any time.

RESULTS

Of the 472-questionnaire distributed, 371 (78.6%) consented and answered the self-administered questionnaire. The mean age of respondents was 19 ± 0.37 years old. Table I shows the sociodemographic characteristics of the respondents. Of these respondents, 71.2% were female, Malay (88.1%) and Muslim (91.1%). The majority of the respondents (94.1%) have heard of child immunization.

The top three sources of information about childhood vaccination were the Internet (72%), mass media, i.e., television and newspaper (68.2%), and social media (61.7%). Table II shows the frequency and percentage distribution of respondents’ knowledge about childhood vaccination. The top three incorrect responses were “Vaccines should not be given if a child has a fever greater than 38 degrees Celsius” (87.6%), “Most vaccines can be given in combination with other vaccines” (83.8%), and “Multiple vaccines in one visit can overload a child’s immune system” (80.1%). The result shows that more than two-thirds of respondents (70.4%) have adequate knowledge about childhood vaccinations.

Table III shows the respondents’ attitudes on child immunization. For the positive statements, the majority of the respondents answered “strongly agree” and “agree” for “Children need to get all doctor-recommended vaccinations”, “Child immunization is important”, and “Immunization is more beneficial than

Table I: Sociodemographic Characteristics of the Respondents (N=371)

Socio-demographic characteristics	n	%
Gender		
Male	107	28.8
Female	264	71.2
Ethnicity		
Malay	327	88.1
Chinese	18	4.9
Indian	17	4.6
Others	9	2.4
Religion		
Muslim	338	91.1
Christian	4	1.1
Buddhist	11	3.0
Hindu	14	3.8
Others	4	1.1

harmful". For the negative statements, the majority of the respondents answered, "My children are at low risk for disease(s)". The result showed that only slightly more than half (53.4%) of the respondents have a positive attitude towards child immunization.

As for the religiosity aspect, the mean and standard deviation for organizational religious activity (ORA), non-organizational religious activity (NORA) and intrinsic religiosity (IR) were 4.20 (±1.20), 5.09 (±1.20) and 14.22 (±1.54), respectively.

Intention to vaccinate children and associated factors

Only 94.6% and 93.3% of the respondents have the intention to vaccinate and complete the vaccination

schedule of their future children. Table IV shows that the intention to vaccinate children was significantly associated with gender, knowledge, and attitude on child vaccination.

Predictors of intention to vaccinate children

Multiple logistic regression analysis was conducted to predict intention to vaccinate children based on gender, knowledge, and attitude on vaccination. These predictors fit the Hosmer and Lemeshow goodness of fit test ($\chi^2 = 7.816, df = 6, p = 0.252$). The Omnibus test showed significant results ($p < 0.001$). The model correctly classified 94.6% of intention to vaccinate children with variance between 8.0% (Cox and Snell R Square) and 24.0% (Nagelkerke R square). Table V shows the predictors of respondents' intention to vaccinate children. Females have 4 times higher odds to vaccinate their children in the future (AOR: 4.20, 95% CI: 1.59, 11.08, $p = 0.004$). Respondents with adequate knowledge on child immunization have 4 times higher odds (AOR: 3.92, 95% CI: 1.23, 12.45, $p = 0.021$) and respondents with a positive attitude on child immunization are nearly 10 times more likely to vaccinate their children in the future respectively (AOR: 9.56, 95% CI: 2.15, 42.46, $p = 0.003$).

DISCUSSION

This study was conducted to determine the intention to vaccinate future children and its predictors among Foundation Program students of UPM. The response rate was moderate. The majority of the respondents were female, Malay, and Muslim. These findings correspond to the general demographics of Foundation Program students in Malaysia. In Malaysia, the Malay ethnicity forms the largest ethnic subgroup in the Bumiputera group (68.6% of Malaysian citizens) (36), and Islam is the main religion, while the total enrolment for Matriculation and Foundation Programs in public

Table II: Descriptive Statistics of Respondent's Knowledge on Child Immunization (N=371)

Knowledge Statements	Correct		Incorrect	
	n	%	n	%
There are different types of childhood vaccines	339	91.4	32	8.6
First vaccine dose is given at birth	281	75.7	90	24.3
Vaccination is for all ages	227	61.2	144	38.8
Most diseases against which children are vaccinated occur during the first years of life	189	50.9	182	49.1
Vaccines are available for common colds, ear infection and diarrhoea without fever	120	32.3	251	67.7
Most vaccines can be given in combination with other vaccines	60	16.2	311	83.8
Scheduled vaccination prevents children from some infectious diseases and its complications	325	87.6	46	12.4
Multi-doses of the same vaccine given at intervals are important for child immunity	265	71.4	106	28.6
More than one dose of vaccine may be required for complete protection of a child	199	53.6	172	46.4
Vaccines should not be given if child is having fever of more than 38 degree Celsius.	46	12.4	325	87.6
Immunization can cause autism in children	193	52.0	178	48.0
Healthy children do not need immunization	329	88.7	42	11.3
Children get too many vaccines in the first two years of life	142	38.3	229	61.7
Getting multiple shots in one visit can overload a child's immune system	74	19.9	297	80.1

Table III: Descriptive Statistics of Respondent's Attitude on Child Immunization (N=371)

Attitude Statements	Strongly Agree		Agree		Not Sure		Disagree		Strongly Disagree	
	n	%	n	%	n	%	n	%	n	%
Immunization is more beneficial than harmful	240	64.7	103	27.8	20	5.4	3	0.8	5	1.3
Vaccines given for child immunization are safe	201	54.2	136	36.7	32	8.6	2	0.5	-	-
Compliance to immunization schedule is important	189	50.9	143	38.5	36	9.7	3	0.8	-	-
Immunization keeps your child health	197	53.1	136	36.7	33	8.9	5	1.3	-	-
Child immunization is important	250	67.4	104	28.0	16	4.3	1	0.3	-	-
It is important for children to get all doctor-recommended vaccinations	248	66.8	104	28.0	17	4.6	2	0.5	-	-
Too many vaccines could overwhelm a child's immune system*	35	9.4	76	20.5	203	54.7	45	12.1	12	3.2
Vaccines are given at too young of age*	25	6.7	88	23.7	136	36.7	100	27.0	22	5.9
It is better for children to get diseases naturally*	17	4.6	66	17.8	127	34.2	95	25.6	66	17.8
Vaccines are necessary to prevent certain diseases	185	49.9	151	40.7	28	7.5	5	1.3	2	0.5
If I vaccinate my child, he/she may have a serious side effect*	7	1.9	33	8.9	147	39.6	126	34.0	58	15.6
I have read or heard about problems with vaccines	58	15.6	128	34.5	96	25.9	66	17.8	23	6.2
My children are at low risk for disease(s)*	88	23.7	107	28.8	123	33.2	38	10.2	15	4.0
The risk for adverse effects from this vaccine is too great*	16	4.3	47	12.7	174	46.9	90	24.3	44	11.9
There has not been enough research on this vaccine*	29	7.8	66	17.8	169	45.6	77	20.8	30	8.1
I do not think vaccines are effective in preventing disease(s)*	11	3.0	33	8.9	67	18.1	162	43.7	98	26.4
I have moral/ethical concerns regarding this vaccine*	25	6.7	61	16.4	92	24.8	110	29.6	83	22.4

Note: *Reverse scoring was used.

Table IV: Factor associated with intention to vaccinate children

Factors	n	Intention		χ ²	df	P
		"Yes" n (%)	"No" & "Not Sure" n (%)			
Gender				10.001	1	0.002*
Male	107	95 (88.8)	12 (11.2)			
Female	264	256 (97.0)	8 (3.0)			
Ethnicity^a					1	0.791
Malay	327	309 (94.5)	18 (5.5)			
Non-Malay	44	42 (95.5)	2 (4.5)			
Religion				0.396	1	0.529
Muslim	338	319 (94.4)	19 (5.6)			
Non-Muslim	33	32 (97.0)	1 (3.0)			
Knowledge				20.844	1	<0.001*
Adequate	261	256 (98.1)	5 (1.9)			
Inadequate	110	95 (86.4)	15 (13.6)			
Attitude^a					1	<0.001*
Positive	198	196 (99.0)	2 (1.0)			
Negative	173	155 (89.6)	18 (10.4)			

Note: ^aFisher exact test was used. * Significant at p < 0.05.

universities are mainly females (60.2%) and Bumiputera (83.7%) (37).

The percentage of Foundation Program students intending to vaccinate their children were about 95%. No similar study has been conducted among parents-to-be. However, comparing to a study conducted among parents in China found that 83.4% of them were willing to vaccinate their children against influenza (38). In

Table V: Predictors of Respondents' Intention to Vaccinate Children

Variables	B	SE	Wald	df	Ad-justed OR	95% CI for Odds Ratio		P-value
						lower	upper	
Constant	0.928	0.372		1		-	-	
Gender								
Male					Ref			
Female	1.371	0.495	8.432	1	4.20	1.59	11.08	0.004*
Knowledge				1				
Adequate	1.887	0.590	5.351		3.92	1.23	12.45	0.021*
Inadequate					Ref			
Attitude								
Positive	2.045	0.761	8.805	1	9.56	2.15	42.46	0.003*
Negative					Ref			

Note: OR - Odds ratio. B - Beta coefficient. SE - Standard error. CI - Confidence interval. *Significant at p < 0.05.

addition, research conducted among Thai parents found that 85.0% intended to have their children vaccinated against HPV if the cost of vaccination was subsidized (39). These demonstrate that vaccination readiness in Malaysia is higher in percentage than in other countries such as China and Thailand.

The present study results show that the predicting factors for vaccination of their future children are adequate knowledge and positive attitude on child immunization and being female. Female students have four times higher odds of intending to vaccinate their children in the future compared to their male counterparts. This finding is similar to a study among undergraduate students in Makerere University College of Health Sciences, Africa,

where males students are less likely to get vaccination (PR: 0.79, 95% CI: 0.69, 0.91, $p = 0.004$) compared to female students (40). Also, Scherer et al. (2018) found a noticeable gender difference in vaccination decision making (41). Furthermore, women were found to have more trust in any influencing information on vaccination (42), while a study conducted in Malaysia showed that males have higher odds of having vaccine hesitancy (OR: 4.6, $p = 0.009$, 95% CI: 1.48-14.49) (12). Thus, the promotion of the vaccination should be enhanced among males, especially when they have a significant role as the head of household in the Asian culture and are responsible as decision-makers in family matters such as vaccination.

This study showed that adequate knowledge is a statistically significant factor for the intention to vaccinate future children. Respondents who had competent knowledge were four times more likely to vaccinate their children in the future, compared to those with less knowledge. This finding is similar to previous studies that showed a significant association between higher knowledge of childhood immunization and increased uptake of childhood immunization (34,43). Therefore, improving the knowledge on child immunization among young adults through health education is vital to boost the immunization rate in the future.

Attitude toward childhood vaccination is another statistically significant predictor of intention to vaccinate future children. Respondents with a positive attitude were nearly ten times more likely to have their children vaccinated in the future than respondents with a negative attitude. Sufficient knowledge is vital, but a positive attitude is even more important (44). This finding is consistent with other studies that have shown that positive attitudes toward childhood vaccination are significantly associated with higher vaccination rates (OR 11.61, 95% CI 6.43-20.96, $p < 0.001$) (45,46). However, with nearly half of the respondents in this study having negative attitudes toward childhood immunizations, efforts to change this negativity need to be strengthened.

Although the proportion of intention to vaccinate future children was higher among non-Malays in our study, there was no significant association between ethnicity and intention to vaccinate future children. The association between ethnicity with vaccination intention varied in previous studies. Results from the National Health and Morbidity Survey of Malaysia showed an insignificant association between ethnicity and vaccination completion (47), while another study found that parental ethnicity had no association with vaccination hesitancy (48). In contrast, a nationwide study showed that vaccination coverage was significantly lower among Malay children than among Indian minority and other Bumiputera children (8). This discrepancy may be due to different study populations

in various settings.

Regarding the relationship between religion and intention to vaccinate children in the future, the results of this study did not reveal a significant relationship. This finding is consistent with a study conducted in Ghana (49). Parents often use religion as an excuse for not vaccinating their children even though religions respect life as a fundamental value and do not oppose vaccination (50).

Among respondents in this study, the main sources of information about vaccination were the Internet, mass media (television and newspaper), and social media. Previous study have shown that health care providers remain the most trusted source of information because they are the most reliable and affordable source of information on immunisation issues (25). Therefore, health care providers need to reach these young people through newer platforms such as the Internet, mass media, and social media.

CONCLUSION

In conclusion, the percentage of students in the foundation programme who intend to have their future children vaccinated is satisfactory. However, there was still a lack of sufficient knowledge and positive attitude towards childhood vaccination. It needs to be improved before these young adults, especially the male students, become future parents. Therefore, policymakers and programme planners should promote childhood immunisation among young people to enhance future immunisation coverage. The way of health education and promotion should use the Internet, mass media, and social media.

The study population is limited to Foundation Program students at a public university. Results may not reflect Foundation Program students at other public or private universities. The cross-sectional study design only examines relationships among variables and may only represent the population during the study period.

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