International Research Journal of Pharmacy and Medical Sciences
ISSN (Online): 2581-3277

The Effect of Educational Intervention on Parental Knowledge Regarding Immunization

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Abstract*— *Introduction: *Vaccination has been proven to control and eradicate infectious disease. However, immunization status among children can be affected by parental knowledge. Hence, we aimed to evaluate the impact of educational intervention as well as predictors of baseline knowledge regarding immunization among parents.* ***Methodology:*** *This was a pre-post intervention study conducted from January to August 2017. The inclusion criteria were all parents with children aged 12 years old and below receiving treatment in Raja Perempuan Zainab II Hospital, Kelantan, Malaysia. Subjects were recruited at outpatient pharmacy counter when they came to refill their prescriptions. Later, they were invited to watch an educational animated movie which was adapted from previous literature. They were required to complete a self-administered questionnaire before and after the intervention.* ***Results:*** *A total of 67 parents were recruited in this study. Most of them were Malay (86.6%, n=58) mothers (52.2%, n=35) with mean(SD) age of 36.21(6.66) years old. The number of parents who answered correctly were increased for all 10 items following educational intervention with 9 of them were significant ($p<0.05$). There was a significant improvement of mean(SD) knowledge scores when compared between pre- and post-test [5.84(2.26) vs 8.48(1.50), 95% CI (-3.22, -2.06), $p<0.001$]. Four (4) variables were significant as predictors of baseline knowledge scores; gender, number of pre-school children, education level and exposure to information scores ($p<0.05$).* ***Conclusion:*** *Educational intervention was effective in increasing parental knowledge. Further studies are warranted to identify other predictors of parental knowledge regarding immunization.*

***Keywords*—** *Educational intervention; immunization; parental knowledge; vaccination.*

I. INTRODUCTION

Vaccination has greatly reduced the burden of infectious disease. It is a human right for every individual to have the opportunity to live a healthier and fuller life by getting immunized. It provides disease control benefits, mitigation of disease severity, herd protection of unvaccinated population and prevention of related diseases. Its benefits extend far beyond that as it also enables multifaceted harvest for the society [1].

Realizing the potential of vaccine and its positive impact, Global Immunization Vision and Strategy was launched in 2005. Following the success of this strategic framework, Global Vaccine Action Plan was endorsed in 2012 to promote impartial access to vaccine. Its primary target is to achieve vaccination coverage of at least 90% nationally and at least 80% in every district by 2020. World Health Organization also declared the last week of April each year as World Immunization Week. This is a global health campaign designed to raise awareness and demand for immunization as well as to improve vaccination delivery services [2].

The world observes a tremendous difference in terms of vaccination coverage rates after the implementation of these strategies. In Malaysia, immunization program was introduced in the early 1950s with public health facilities providing vaccines free of charge. According to the Department of Public Health in 2013, Malaysia has high childhood immunization coverage rates of mostly above 95%; BCG (98.26%), DTP-HIB 3rd dose (97.97%), Polio 3rd dose (97.97%), MMR (94.37%), Hepatitis B 3rd dose (97.97%) and HPV 3rd dose (83.02%) [3]. Having said that, we witnessed a small but concerning drop in the immunization uptake each year [4], [5].

Literature has shown that immunization status among children can be affected by parental knowledge regarding immunization [6]–[9]. A cross-sectional study conducted among 396 parents in Sungai Petani, Kedah, Malaysia reported that many still displayed lack of knowledge and practice regarding vaccination [10]. This indicated that an educational intervention is required to improve public receptivity towards childhood immunization [10] as well as to eliminate parental barriers as the main factor that affect childhood vaccination [6], [11].

Another growing matter is the emergence of a new heterogeneous group of parental vaccine hesitancy within the community. It is a subject of great distress whereby one of the key determinants is individual and group influences which include knowledge and awareness. Lack of knowledge causes parents to have doubts about vaccination which leads to negative attitude and reluctance towards immunization completeness [6], [12]. This issue points out to the need for educational programme which specifically addresses parents [13]. Hence, we aimed to evaluate the effect of educational intervention as well as the predictors of baseline knowledge regarding immunization among parents.

II. METHODOLOGY

A. Design and Study Population

This was a pre-post intervention study conducted from January to August 2017. The inclusion criteria were all parents with children aged 12 years old and below receiving treatment

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in Raja Perempuan Zainab II Hospital (HRPZ II), Kelantan, Malaysia.

B. Intervention

The intervention was delivered through a 4:17 minutes educational animated movie adapted from Awadh et al. (2014) [12]. The content of the intervention consisted of the importance of completing vaccination, type of diseases that could be prevented from immunization programme, type of vaccines available, myths and facts about vaccination as well as possible side effects of vaccination. Content validity was assessed based on expert opinion which involved a paediatric consultant, pharmacists and nurses handling the vaccination clinic. A pilot study was then carried out on 30 subjects to ensure face validity.

C. Data Collection

Subjects were recruited at outpatient pharmacy counter in HRPZ II when they came to refill their prescriptions. Later, they were invited to watch the educational intervention on immunization in the counselling room. Eligible subjects were required to answer self-administered questionnaire before and after the intervention. The validated questionnaire was adopted from Awadh et al. (2014) which comprised 3 parts; demographic data, knowledge regarding immunization (10 items) and exposure to information on immunization (10 items). The total score ranged from 0 to 10 whereby higher score indicated better knowledge and exposure to information. Permission to use the research tools was obtained from the corresponding author [12]. A minimum sample size of 64 subjects was calculated based on the ability to detect a medium effect size or larger clinical effect (Cohen's $d = 0.5$) and tested at a conventional power of 0.8 and alpha of 0.05 (two-tailed testing) [14].

D. Statistical Analysis

Data was analysed using Statistical Package for Social Sciences (SPSS) version 20.0. Descriptive data was expressed as mean(SD) while categorical data was presented as frequency and percentage. Paired t-test was applied to compare the differences in knowledge scores among parents before and after the educational intervention. Multiple linear regression (backward) was used to determine the predictors of baseline knowledge regarding immunization. A *p*-value of less than 0.05 was considered as statistically significant.

E. Ethical Approval

This research was submitted to National Medical Research Registry (NMRR) for ethical approval and was granted with NMRR ID number of NMRR-16-2540-33540. Permission to conduct the study at the site was obtained from the Director of HRPZ II. Participants were adequately informed regarding the study and voluntarily consented prior to data collection.

III. Results

A. Demographic Characteristics

A total of 67 parents were recruited in our study. Most of them were Malay (86.6%, n=58) mothers (52.2%, n=35) with mean(SD) age of 36.21(6.66) years old. Many had 0 to 2 children (77.6%, n=52), lived in rural area (56.7%, n=38) and employed (76.1%, n=51) (Table 1).

TABLE 1. Demographic characteristics of subjects (n=67).

Demographic characteristics	n	%
Gender		
Male	32	47.8
Female	35	52.2
No. of pre-school children		
0 to 2	52	77.6
3 to 4	15	22.4
Ethnicity		
Malay	58	86.6
Chinese	9	13.4
Place of living		
Rural	38	56.7
Urban	29	43.3
Employment status		
Employed	51	76.1
Unemployed	16	25.9
Education level		
Primary	13	19.4
Secondary	39	58.2
Tertiary	15	22.4
Family income (RM)		
≤1,000	9	13.4
1,001-2,000	19	28.4
2,001-3,000	20	29.9
>RM3,001	19	28.4

B. Knowledge Regarding Immunization

The number of parents who answered correctly were increased for all 10 items following educational intervention with 9 of them were significant ($p<0.05$). Even though question number 9 (If the child receives extra immunization, it is more effective and safer) was not statistically significant, there was an incremental of 13.5% of correct response after intervention ($p=0.188$) (Table 2).

TABLE 2. Comparison of parental knowledge regarding immunization at pre- and post- intervention (n=67).

Items	Correct Response (Pre) n (%)	Correct Response (Post) n (%)	*p*-value
Healthy children do not need immunization	42 (62.7)	53 (79.1)	0.019
There are different types of vaccines	45 (67.2)	64 (95.5)	<0.001
Active immunization is a killed or weakened form of a disease-causing agent	39 (58.2)	62 (92.5)	<0.001
Vaccination is for all ages	33 (49.3)	60 (89.6)	<0.001
Children get too many vaccines in the first two years of life	39 (58.2)	56 (83.6)	0.002
The immunization of the children should started at birth	50 (74.6)	60 (89.6)	0.013
In some health situations, vaccine should not be given	43 (64.2)	56 (83.6)	0.021
Vaccines can be given in combination	30 (44.8)	53 (79.1)	<0.001
If the child receives extra immunization, it is more effective and safer	34 (50.7)	43 (64.2)	0.188
More than one dose of vaccine may be required for complete protection	36 (53.7)	61 (91.0)	<0.001

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We also noted that there was a significant improvement of mean(SD) knowledge scores when compared between pre- and post-intervention using paired t-test [5.84(2.26) versus 8.48(1.50), 95% CI (-3.22, -2.06), $p<0.001$] (Table 3).

TABLE 3. Knowledge scores measured at pre- and post- intervention.

Scale	Mean(SD)	Minimum	Maximum	*p*-value
Knowledge				
Pre	5.84(2.26)	0	10	<0.001
Post	8.48(1.50)	3	10	

C. Exposure to Information on Immunization

Mean(SD) exposure to information scores was 4.79(2.72). Slightly more than half of the subjects believed that they were adequately informed (n=39, 58.2%) and felt that they had enough access to information on vaccination (n=30, 55.2%). Most of them learnt about vaccination in the print media (n=52, 77.6%) and usually gained some knowledge from the hospital (n=37, 55.2%) (Table 4).

TABLE 4. The proportion of exposure to information regarding immunization based on each item (n=67).

Items	n	%
Do you think that you are adequately informed about vaccination?		
Yes	39	58.2
No	28	41.8
Do you read about vaccination in the print media?		
Yes	52	77.6
No	15	22.4
Do you watch any television programme about vaccination?		
Yes	19	28.4
No	48	71.6
Do you listen about vaccination over the radio?		
Yes	20	29.9
No	47	70.1
Do you read about vaccination on the internet?		
Yes	20	29.9
No	47	70.1
Do you obtain information about vaccination from antenatal clinic?		
Yes	30	44.8
No	37	55.2
Do you obtain information about vaccination from the hospital?		
Yes	37	55.2
No	30	44.8
Do you think that you have enough access to information on vaccination?		
Yes	30	55.2
No	37	44.8
Do you know the immunization schedule for your child?		
Yes	44	65.7
No	23	34.3
Is it important to follow the immunization schedule?		
Yes	56	83.6
No	11	16.4

D. Predictors of Baseline Knowledge Regarding Immunization

Multiple linear regression (backward) was utilized to determine the predictors of baseline knowledge regarding immunization. Four (4) variables were significant in a final model that explained 48.5% of the variance for baseline knowledge scores; gender, number of pre-school children, education level and exposure to information scores ($p<0.05$). Higher knowledge scores were seen in mothers (b=1.303, $p=0.014$) as well as subjects with tertiary education level (b=2.694, $p<0.001$) and better exposure to information scores (b=0.216, $p=0.017$). However, number of pre-school children was inversely associated (b=-1.154, $p=0.039$) with knowledge scores (Table 5).

IV. Discussion

The descriptive statistics for demographic characteristics revealed that our study population had much in common with the previous work by Awadh et al. (2014). The only difference was that our subjects mainly lived in rural area. Majority of the participants were mothers which was consistent with existing literature [9], [13], [15]. The possible reason is that women are more involved in engagement activities with their children. Often they are believed to be in charge of caregiving [14] suggesting that they are usually responsible for the child's immunizations [13].

It was observed that our respondents had average baseline knowledge regarding immunization. The mean(SD) knowledge score was lower than Awadh et al. (2014) which was 6.84(1.52) [12]. Meanwhile, higher knowledge scores were described elsewhere outside of Malaysia [16], [17]. This could be due to the fact that our subjects were mostly less educated [9], [10], [13], [15] and lived in rural areas when compared to other studies [10], [13], [15]. Another explanation was that our respondents had poor exposure to information on immunization. Many only read about vaccination from the print media and obtained the information from the hospital. They mostly did not watch or listen to any television or radio talk on vaccination and did not read articles about the topic online.

Previous evidences showed that educational intervention could successfully improve parental knowledge [8], [13], [18]. Similarly, Awadh et al. (2014) perceived that more subjects answered the questions correctly after attending the educational seminar [12]. Our findings were also in agreement with Azreena et al. (2018) who noted that majority of respondents who took part in educational talk had adequate knowledge [8]. Others had reported that implementing educational intervention could increase immunization rate as well as promote vaccination completeness and timeliness [6], [7]. Providing an educational video during waiting time in the hospital may improve the convenience of healthcare whilst provide necessary information needed by patients and caregivers [19].

We found that the predictors of baseline knowledge regarding immunization were gender, number of pre-school children, education level and exposure to information scores. Mothers were anticipated to get better knowledge scores which concurred with Azreena et al. (2018). They discerned that mothers were about twice more likely to have adequate knowledge than fathers [9]. Aziz et al. (2018) concluded that higher knowledge level was associated with female gender [10]. Often children are accompanied by their mothers during their visits to the clinics which suggested that they may

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receive more information regarding childhood immunization from healthcare providers [20]. However, there were contradicting results such as the one in Iraq whereby fathers were observed to have better knowledge [16] as well as Awadh et al. (2014) who found that there was no association between gender and knowledge [13].

TABLE 5. Predictors of baseline knowledge regarding immunization.

Predictors	SLR[a]		MLR[b]		
	***b* (95% CI)**	***p*-value**	**Adjusted *b* (95% CI)**	***t* statistics**	***p*-value**
Gender					
Male[c]					
Female	1.241 (0.172, 2.310)	0.024	1.303 (0.278, 2.329)	2.541	0.014
Age (years)	-0.044 (-0.128, 0.039)	0.292	-	-	-
No. of pre-school children					
0 to 2[c]					
3 to 4	-0.905 (-2.219, 0.409)	0.174	-1.154 (-2.246, -0.063)	-0.2035	0.039
Ethnicity					
Malay[c]					
Chinese	1.473 (-0.115, 3.061)	0.069	-	-	-
Place of living					
Rural[c]					
Urban	1.201 (0.120, 2.283)	0.030	-	-	-
Employment status					
Employed[c]					
Unemployed	0.134 (-1.169, 1.437)	0.838	-	-	-
Education level					
Primary[c]					
Secondary	-1.264 (-2.346, -0.181)	0.023			
Tertiary	2.788 (1.648, 3.929)	<0.001	2.694 (1.587, 3.802)	4.483	<0.001
Family income (RM)					
≤1,000[c]					
1,001-2,000	-0.138 (-1.371, 1.094)	0.824	-	-	-
2,001-3,000	-0.550 (-1.757, 0.657)	0.366	-	-	-
3,000	1.111 (-0.091, 2.313)	0.069	-	-	-
Exposure to information scores	0.408 (0.228, 0.588)	<0.001	0.216 (0.041, 0.392)	2.464	0.017

[a]Simple linear regression, [b]Multiple linear regression (backward), [c]Reference group
R^2 = 0.485. The model reasonably fits well. Model assumptions are met. There are no interaction and multicollinearity problem

Our study showed that the number of pre-school children was inversely associated with knowledge scores. This was supported by Al-lela et al. (2014) who suggested that parents had less time to receive healthcare information when they had many pre-school children [20]. However, other evidences demonstrated no significant association between childhood immunization knowledge among parents and number of children or family size [9], [13], [21].

Many researches agreed that education level was one of the predictors of parental knowledge regarding immunization. Parents with tertiary education background are more likely to acquire higher knowledge scores than those with lower educational level. This was also proven by Azreena et al. (2018) who found that non-graduates were associated with inadequate knowledge [9]. Al-lela et al. (2014), Awadh et al. (2015) and Braczkowska et al. (2018) concluded that there was a significant relationship between education level and knowledge. This may be due to parents with higher education background have more access to health information [18] and hence, are more intuitive [21].

The multivariable analysis also showed that parents with higher exposure to information scores tended to have better knowledge regarding immunization. Again, this finding was inclined with Azreena et al. (2018) who noted that parents who attended educational talk had higher percentage of adequate knowledge [9]. Vezzosi et al. (2017) also suggested that repeated exposure to information from healthcare providers might as well help to improve the vaccination rates [18].

Our study however, had some limitations that we needed to address. We only recruited subjects from a single center using non-probability sampling. Therefore, the results might not reflect the knowledge of all Malaysian parents. Also, participants were evaluated immediately after the educational intervention was given and thus, its actual effectiveness could not be established. Other than that, the small sample size limited us from generalizing the findings for predictors of knowledge regarding immunization to the entire Malaysian population. Notwithstanding these limitations, we believe that the outcomes of this research are still worth noting.

V. Conclusion

Educational intervention is effective in increasing parental knowledge regarding immunization in our setting. The implementation of this educational animated movie can provide good exposure to parents with many pre-school children and lower education background. Further researches are warranted to determine other predictors of knowledge as well as its relation with attitudes and practices regarding immunization among parents.

Acknowledgment

The authors would like to thank the Director General of Health Malaysia for his permission to publish this paper. No

external organization was involved in this research project as it was self-funded by the authors.

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