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Original Article

Parental knowledge, attitude, and behavioral factors in immunization response following a diphtheria outbreak in children in 2018-2019

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Abstract

Background A diphtheria outbreak was declared at the end of 2017. The outbreak response immunization (ORI) was a key Indonesian government strategy to control diphtheria in three outbreak areas. This strategy was implemented starting December 11, 2018. Parents' positive knowledge, attitude, and behavior regarding diphtheria and the diphtheria ORI may influence the coverage of diphtheria ORI in Indonesia.

Objective To assess for relationships between parental knowledge, attitude, and behavior to coverage of diphtheria ORI in children.

Methods This cross-sectional study was conducted at Kapuk Muara Public Elementary School 03, North Jakarta from November 2018 to August 2019. The respondents were parents of the schoolchildren. Parents filled questionnaires about their knowledge, attitude, and behavior with regards to diphtheria ORI coverage in children.

Results The coverage of diphtheria ORI in children was 61.8%. From 110 respondents, 40.9% of parents had at least sufficient knowledge, 73.8% had good attitude, and 55.5% had good behavior regarding diphtheria and diphtheria ORI. Parental knowledge had no significant association to coverage of diphtheria ORI in their children. However, there were significant relationships between parental attitude and behavior to coverage of diphtheria ORI in their children.

Conclusion The coverage of diphtheria ORI needs improvement. Most parents have sufficient level of knowledge, good attitude, and good behavior towards diphtheria and diphtheria ORI. There is no association between parental knowledge about diphtheria and diphtheria ORI to coverage of diphtheria ORI, but there are significant association of parental attitude and behavior toward diphtheria ORI coverage. **[Paediatr Indones. 2020;60:142-8; doi: http://dx.doi.org/10.14238/pi60.3.2020.142-8]**.

Keywords: *ORI diphtheria; parent's knowledge; attitude, behavior*

Diphtheria is caused by Corynebacterium diphtheriae.[1] The bacteria produce endotoxins that cause tissue necrosis, airway obstruction, and myocarditis.[2-5] The Indonesian Ministry of Health recorded 591 cases of diphtheria in 20 provinces in Indonesia by the 48th week of 2017 and declared diphtheria to be an outbreak.[6] *The Diphtheria Outbreak Response Immunization* (ORI) was one government strategy to control the outbreak through additional immunizations in affected regions.[2,7]

The World Health Organization (WHO) stated that lack of complete immunization coverage over a long period of time is one of the causes of diphtheria outbreaks.[7] The government has promulgated a mandatory complete basic immunization program since 1974 [*Expanding Program on Immunization*/EPI]. Immunization coverage reached 80% up until 1990.[8] Diphtheria immunization is one of the mandatory vaccinations that every baby or child in Indonesia should receive.[9]

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The knowledge and behavior of parents about immunization are major factors in children's completion of immunizations. A study in Iraq reported a positive correlation between immunization coverage and parental knowledge and behavior of immunizations.[10] In addition, a study in Malaysia showed that interventions to provide information about immunizations increased parental knowledge on the topic.[11]

The Indonesian Ministry of Health implemented the diphtheria ORI since December 11, 2018, in three outbreak areas (Jakarta, Banten, and West Java provinces). Knowledge, attitude, and behavior of parents may have an affect on the coverage of diphtheria ORI in Indonesia. Until January 11, 2018, the average coverage of diphtheria ORI was 68.36% of the total target of 7.9 million persons. In early January 2018, no additional areas reported diphtheria outbreaks.[6,7,12-14] As such, we aimed to assess the coverage of the diphtheria ORI in one primary school, and analyze for associations to parental knowledge, attitude, and behavior on immunizations.

Methods

Subjects' characteristic in this study were divided into 3 categories based on their socioeconomic level, categorized as middle-lower if subjects' average monthly income was below 2,600,000 IDR, intermediate 2,600,000-6,000,000 IDR, and middle-upper if above 6,000,000 IDR.[15-16] Subjects' knowledge was classified into 3 categories; good, sufficient, poor. Subjects' knowledge was categorized as good if the final score in the questionnaire was above 75%, sufficient 56-75%, and poor if below 56%.[17] Subjects' attitude was classified into 2 categories (good and poor) based on the median value of the total points in the questionnaire. It was categorized as good if the final score was more than 9 points and categorized as poor if less than 9 points. Meanwhile, the subjects' behavior was classified into 2 categories (good and poor) based on the median value of the total points. Categorized as good if the final score was more than 7 points and poor if less than 7.[18] Diphtheria ORI coverage was categorized as complete if children received additional diphtheria immunization. Additional diphtheria immunization in this study meant outbreak-related additional doses in children who had complete childhood basic immunization; were classified as complete if they received 3 additional doses in accordance with the diphtheria ORI provision and "incomplete" if they only received 1 or 2 additional doses.[19]

This cross-sectional study was conducted from November 2018 to August 2019 at Public Elementary School 03, Kapuk Muara, North Jakarta. Subjects were parents of the students. Subjects were chosen by simple random sampling. Inclusion criteria were parents (aged 17-55 years) who had children aged 1-19 years and knew about diphtheria immunization as a response to the outbreak in Indonesia. Exclusion criteria were parents who refused to participate, could not communicate properly (had mental disability, or hearing and speech impairment), or did not know about diphtheria immunization or the diphtheria ORI. Parents who removed themselves when the study was in progress were considered to have dropped out.

The minimum required sample size was estimated to be 96, with an additional 15% added to anticipate dropping out. The sample size was, therefore, 110 subjects. This study was approved by the Research Ethics Committee of Universitas Katolik Indonesia Atma Jaya, School of Medicine and Health Sciences. Data were collected from questionnaires filled directly by the subjects with supervision from the researcher. The questionnaires used in this study consisted of questions about parental knowledge (12 questions), attitude (7 questions) towards diphtheria and diphtheria ORI, and behavior (4 questions) towards diphtheria ORI. In questions about knowledge, if the subjects answered correctly then a score of 1 was given and 0 if the answer was wrong. In questions about attitude, if the subjects answered accordingly then a score of 2 was given, 1 if the answer was wrong, and 0 if the subjects answered "do not know". In questions about behavior, if the subjects answered yes or correct then a score of 2 was given, 1 for a no or incorrect answer, and 0 for a "do not know" answer (**Appendix**). The questionnaire was created by the researchers and has been validated to a population that was similar to the target population. Data were analyzed with *SPSS version 23* software, using a non-parametric comparative test with a 95% confidence level. Bivariate data were analyzed using Chi-square test for results with P values < 0.05. A P value of < 0.05 was considered to be statistically significant.

Results

Characteristics of study subjects are shown in **Table 1**. Most study subjects were female (98.2%). Subjects were mostly in late adulthood or 36-45 years old (46.4%) and mostly senior high school graduates (37.3%). The most common socioeconomic level was middle-lower level (66.4%), with only a small proportion in the middle-upper level (4.5%).

Table 1. Study subjects' characteristics

Demographic characteristics	(N=110)
Gender, n (%)	
Male	2 (1.8)
Female	108 (98.2)
Age by group, n (%)	
Late teens (17-25 years)	0 (0)
Early adulthood (26-35 years)	47 (42.7)
Late adulthood (36-45 years)	51 (46.4)
Early elderly (46-55 years)	12 (10.9)
Highest education level attained	
Elementary	38 (34.5)
Junior high	30 (27.3)
Senior high	41 (37.3)
College	1 (0.9)
Socioeconomic Level	
Middle-lower	73 (66.4)
Intermediate	32 (29.1)
Middle-upper	5 (4.5)

Fifty-five (40.9%) subjects had sufficient knowledge and 41 (37.3) had poor knowledge. There were only 24 (21.8%) subjects with good knowledge about diphtheria and diphtheria ORI. Sixty-one (80.9%) subjects had good attitude and 49 (44.5%) had poor attitude. Most study subjects had good behaviour (80.9%), and only 21 (19.1%) had poor behaviour (**Table 2**).

Table 2. Parental knowledge, attitude, and behavior about diphtheria and diphtheria ORI

Variables	(N=110)
Parental knowledge, n (%)	
Good	24 (21.8)
Sufficient	45 (40.9)
Poor	41 (37.3)
Parental attitude, n (%)	
Good	61 (80.9)
Poor	49 (44.5)
Parental behaviour, n (%)	
Good	89 (80.9)
Poor	21 (19.1)

Table 3. Diphtheria ORI coverage

Variables	(N=110)
Diphtheria ORI coverage, n (%)	
Complete (3 doses)	68 (61.8)
Incomplete	
1 dose	26 (23.6)
2 doses	16 (14.5)

Sixty-eight (61.8%) subjects allowed for the administration of the complete (3 doses) additional diphtheria immunizations to their children. Twenty-six (23.6%) subjects allowed for only one dose to their children, and 16 (14.5%) allowed for two doses of additional diphtheria immunizations (**Table 3**).

Bivariate analysis of relationships between parental knowledge, attitude, and behavior about diphtheria and ORI diphtheria to coverage of diphtheria ORI are shown in **Table 4**. Chi-square test

Table 4. Bivariate analysis of parental knowledge, attitude, and behavior about diphtheria and diphtheria ORI to diphtheria ORI coverage

Variables	Diphtheria ORI coverage			P value
	Complete (3 doses) n=68	Incomplete n=42	Total N=110	
Knowledge, n(%)				0.075
Good	18 (75)	6 (25)	24	
Sufficient	30 (66.7)	15 (33.3)	45	
Poor	20 (48.8)	21 (51.2)	41	
Attitude				0.004
Good	45 (73.8)	16 (26.2)	61	
Poor	23 (47)	26 (53)	49	
Behavior				0.047
Good	59 (66.3)	30 (33.7)	89	
Poor	9 (42.9)	12 (57.1)	21	

revealed no significant association between parental knowledge about diphtheria and diphtheria ORI to diphtheria ORI coverage (P=0.075).

Of the subjects with good attitude (61/110; 55.5%), the majority (45/61; 73.8%) gave all 3 doses. Of those with poor attitude (49/110; 44.5%), the majority (26/49; 53%) gave fewer than 3 doses. Chi-square test revealed that good parental attitude about diphtheria and diphtheria ORI had a significant association with complete diphtheria ORI coverage (P=0.004).

More than half the number of subjects who had good behavior gave their children the complete 3 doses of additional diphtheria immunization (59/89; 66.3%). However, quite a few subjects with good behavior did not complete the additional diphtheria immunization (30/89; 33.7%). More subjects with poor behavior did not complete the immunizations (12/21; 57.1%) than those who did complete the 3 doses (9/21; 42.9%). Chi-square test revealed a significant association between good parental behavior about diphtheria ORI and complete ORI diphtheria coverage.

Discussion

Diphtheria ORI coverage in Public Elementary School 03, North Jakarta was 61.8%. This result was far below the Ministry of Health target of 95%. Another study conducted at Mijen Health Center, Semarang, Central Java, also reported low diphtheria ORI coverage, although even low national coverage appeared to reduce transmission and death due to diphtheria.[20] Diphtheria ORI were given in 3 rounds; the number of subjects whose children participated in each round consistently declined. Consistent participation may be influenced by community psychosocial concerns with regards to obedience.[21] The quick and sudden implementation of diphtheria ORI also contributed to the decrease in the number of subjects per round.

The third exclusion criteria was parents that did not know about diphtheria immunization or the diphtheria ORI. We did not find it bias because the inclusion criteria was parents who knew about diphtheria and diphtheria ORI but had poor knowledge about it. We found no association between parental knowledge about diphtheria and diphtheria ORI to coverage of diphtheria ORI. In contrast, a previous study reported a significant strong positive correlation between the two.[22] Another study also had similar results, but the correlation between the two variables was low.[23] Several predisposing factors may have influenced the results, including subjects' formal education level, family socio-economic status, sources of information, and others.[24] A factor that also affected the results is subjects' non-compliance to additional immunization, which was a mandatory for students of 03 Public Elementary School. At the beginning of the study 110 students received the first dose of additional ORI immunization, but only 68 students completed the 3 additional doses as some of the parents complaint with the side effect of the additional immunization.

Parental attitude about diphtheria and diphtheria ORI had a significant association with the coverage of diphtheria ORI in children, similar to a study conducted by Dini *et al*.[20] In addition, parental behavior towards diphtheria ORI had a significant association with the coverage of diphtheria ORI, similar to results by Halimantus *et al*. who found a significant but weak correlation.[25]

In conclusion, the coverage of diphtheria ORI at Public Elementary School 03 needs improvement because the coverage was only 68%, meaning that it has not reached the total target of 7.9 million persons. There is no association between parental knowledge about diphtheria and diphtheria ORI to coverage of diphtheria ORI. Meanwhile, parental attitude about diphtheria and diphtheria ORI have a significant association with the coverage of diphtheria ORI in children and parental behavior towards diphtheria ORI also have a significant association with the coverage of diphtheria ORI.

The strength of this study was that it showed the shortcomings of the diphtheria ORI program, which was still far below the target even though this program had been required by the government and given free of charge. Moreover, there were only few studies conducted on this topic. The lack of this study was that it did not learn more about the causes of the reduction in number of respondents on the second and third dose of ORI diphtheria immunization.

Conflict of Interest

None declared.

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Appendix. Questionnaires

I. Characteristics

1. Name and gender	(M/F)	Code
2. Age	years-old (According to the last birthday)	
3. Highest education level attained	Elementary Junior high Senior high College	1 2 3 4
4. Family's average income	Middle-lower (< 2,6 millionIDR) Intermediate (2,6-6 millionIDR) Middle-upper (> 6 millionIDR)	1 2 3

II. Knowledge about diphtheria and diphtheria ORI

No.	Questions	Yes	No
1	Have you ever heard diphtheria?		
2	Is diphtheria a contagious disease?		
3	Is diphtheria transmitted through the respiratory tract?		
4	Do you know the characteristic of diphtheria?		
5	Do you know how to prevent diphtheria in the environment?		
6	Do you know about diphtheria outbreak in Indonesia?		
7	Do you know the cause of diphtheria outbreak in Indonesia?		
8	Do you know about diphtheria Outbreak Response Immunization/ ORI (mandatory diphtheria immunization programme for children aged 1-19) that conducted by the government?		
9	Do you know that the diphtheria ORI conducted by the government is free of charge?		
10	Do you know when your child should be given the required additional diphtheria immunization?		
11	Do you know the side effects of diphtheria immunization?		
12	Do you know about the post-immunization events (adverse events following immunization)?		

III. Attitude about diphtheria and diphtheria ORI

No.	Questions	Answers	Score
1	In your opinion, is diphtheria dangerous?	Agree Not fully agree Disagree Do not know	1 2 3 98
2	What is the reason you consider diphtheria as a dangerous disease?	Causing death Causing other diseases Interfere children's activity Do not know	1 2 3 98
3	In your opinion, is diphtheria ORI programme important and required?	Agree Not fully agree Disagree Do not know	1 2 3 98
4	In your opinion, who is in charge of providing information about diphtheria ORI?	Both parents Husband/ wife Government Health facilities/ services Do not know	1 2 3 4 98
5	What information about diphtheria immunization that you should know as a parent?	The types of The benefits The side effects and how to handle it Time of administration The amount of dose Place to get immunization Do not know	1 2 3 4 5 6 98
6	Do you still bring your child to be given further doses of diphtheria immunization?	Yes No Do not know	1 2 98
7	What is the reason that make you still bring your child to continue to be given further doses of diphtheria immunization after knowing the side effects?	Required by the government Concerned with the children's health The side effects do not cause any worries Do not know	1 2 3 98

IV.Behavior towards diphtheria ORI

No.	Questions	Answers	Score
1	Have you ever participated in counseling about diphtheria ORI?	Yes No	1 2
2	What is the reason you are taking your child for additional diphtheria immunization?	Self awareness Run the government's programme Following the surrounding community Following the family Following the community leaders (tokoh masyarakat) Others _____	1 2 3 4 5 96
3	Have you ever invited people closest to you or the surrounding community to provide additional diphtheria immunization to their child?	Yes No	1 2
4	Does the person closest to you support you to give your child diphtheria immunization?	Yes No Do not know	1 2 98

V. Diphtheria ORI Coverage

No.	Questions	Answers	Score
1	Has your child been given additional diphtheria immunization?	1 dose 2 doses Complete (3 doses)	1 2 3