Contextual Effect of the Integrated Health Post on DPT3 Immunization Uptake among Infants in Wonogiri, Central Java

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ABSTRACT

Background: DPT3 immunization coverage is considered as one indicator of the success of immunization programs in various countries. Indonesia is one of the countries that adopted Expand Program in Immunization (EPI) in 1977 which later introduced DPT as part of routine basic immunization services for infants, although there are still infants who do not get complete DPT immunization at this time. The purpose of this study was to analyze contextual effect of the integrated health post on DPT3 immunization uptake among infants in Wonogiri, Central Java.
Subjects and Method: This was an analytical observational study with a cross sectional design. It was conducted in Wonogiri community health center II, East Java, from October to December 2018. A sample of 200 infants was selected from 25 integrated health posts with simple random sampling. The dependent variable was the use of DPT3 immunization. The independent variables were maternal education, family income, religion and beliefs, family support, information exposure, attitude, subjective norm, perceived behavior control, and intention. The data were collected by questionnaire and analyzed by a multilevel logistic regression.
Results: The use of DPT3 immunization was influenced by maternal education (b = 2.01; 95% CI= 0.26 to 3.76; p= 0.025), family income (b= 2.56; 95% CI= 0.45 to 4.67; p= 0.017), religion and beliefs (b= 4.37; 95% CI= 1.78 to 6.96; p= 0.001), family support (b= 1.92; 95% CI= - 0.07 to 3.90; p= 0.058), exposure to information (b= 1.82; 95% CI= 0.11 to 3.54; p= 0.037), attitude (b= 1.59; 95% CI= - 0.29 to 3.47; p= 0.097), subjective norm (b= 1.66; 95% CI= - 0.17 to 3.49; p= 0.074), perceived behavior control (b= 2.50; 95 % CI= 0.57 to 4.43; p= 0.011), and intention (b= 2.93; 95% CI= 0.68 to 5.19; p= 0.011). Integrated health post had strong contextual effect on the use of DPT3 immunization with ICC= 53%.
Conclusion: The use of DPT3 immunization is influenced by maternal education, family income, religion and beliefs, family support, exposure to information, attitude, subjective norm, perceived behavior control, and intention. Integrated health post has strong contextual effect on the use of DPT3 immunization.

Keywords: DPT3 immunization, factors, Theory of Planned Behavior, posyandu, information exposure

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BACKGROUND

Immunization is a disease prevention measure that is very cost effective and is one of the main interventions to achieve Sustainable Development Goals (SDGs), specifically the goal of reducing infant mortality to at least 12/ 1,000 live births and deaths of children under 5 years of age at least 25/ 1,000 live births in 2030 in all countries (United Nations, 2017). DPT immunization is one of the basic immunizations that must be given to infants through the injection of a DPT-HB-Hib combination vaccine (diphtheria, pertussis,

tetanus, hepatitis B and Haemophilus influenzae type b). DPT immunization is given to infants aged 2, 3 and 4 months (Indonesian Ministry of Health, 2017). Complete DPT immunization coverage is considered as one indicator of the success of immunization programs in various countries that reflects access to basic health services (Rammohan et al., 2015).

Indonesia is one of the countries that adopted Expanded Program in Immunization in 1977 which later introduced DPT as part of routine basic immunization services for infants, although in 2017 there were still babies who did not get DPT immunization. DPT1 immunization coverage in Indonesia in 2017 was 90.7% while DPT3 immunization coverage only reached 88.3%. The average DPT immunization dropout rate in 2017 was 17.7%, much greater than the figures in 2015 and 2016 (2.0% and 2.6%). The assumption of the dropout rate is the increasing number of infants who do not complete 3 DPT immunization doses or infants get DPT1 immunization but do not receive DPT3 immunization (Indonesian Ministry of Health, 2018).

The drop in DPT immunization rates for infants in Wonogiri from 2011 to 2017 has increased. One of the factors in the high dropout rate is the lack of empowerment of *posyandu* in serving immunizations and immunization is not optimal in areas with low immunization coverage (Wonogiri District Health Office, 2016). *Posyandu* as a form of health efforts with health resources has a role for immunization coverage in its area because one of its main service activeties is immunization (Ministry of Health, Republic of Indonesia, 2012).

Many studies explain the predictors of immunization coverage and use of DPT immunization in infants that focuses on household levels including education, maternal employment, religion, family support, health personnel support and information exposure (Libunelo et al., 2018; Mayasari et al., 2017; McKee et al., 2016; Yenit et al., 2018; Ridwan et al., 2015; Putri et al., 2017; Hidayah et al., 2018; Jung et al., 2015). In addition to predictors originating from household levels, health service factors at the above levels are also important to be identified as contextual factors for DPT3 immunization coverage (Rammohan et al., 2015).

A better understanding of the predictors of DPT immunization coverage is used in designing interventions that are effective in increasing immunization coverage. In this study, factors related to parents' intention to immunize infants were informed through Theory of Planned Behavior (TPB). Intention is determined by a positive attitude towards certain behaviors, the approval of the person who influences the individual and control of perceived behavior. TPB has been used to predict various health behaviors, including the intention to immunize (He et al., 2015; Catalano et al., 2016).

Factor analysis of DPT3 immunization use is needed as a follow-up effort in knowing the important factors for using DPT3 immunization. It is expected that using a multilevel approach can be known the influence of various levels and levels that have a higher influence on the use of DPT3 immunization in infants. Therefore, researchers are interested in conducting research on the factors of DPT3 use in infants in Wonogiri.

SUBJECTS AND METHOD

1. Study Design

This was an analytic observational study with a cross sectional design. The study was conducted in the Wonogiri Health Center II, from October to December 2018.

2. Population and Samples

The target population of this study was infants aged 5-12 months. The source population of this study was infants aged 5-12 months in Wonogiri Health Center II. A sample of 200 infants from 25 integrated health posts (posyandu) was selected by simple random sampling. A total of 25 posyandus was selected by stratified random sampling.

3. Study Variables

The dependent variable was DPT3 immunization. The independent variables were maternal education, family income, religion and belief, family support, information exposure, attitude, subjective norm, perceived behavior control, and intention.

4. Operational Definition of Variables

The use of DPT3 immunization was defined as the complete status of DPT immunization in infants including receipt of DPT-HB-Hib 1 vaccine, DPT-HB-Hib 2 and DPT-HB-Hib 3 which can be proved in the table of immunization records of children in maternal and child health books. The measurement scale was categorical, coded 0 for incomplete and 1 for complete.

Maternal education was defined as the highest formal education attained by mother. The measurement scale was categorical, coded 0 for <Senior high school and 1 for ≥Senior high school.

Family income was defined as the amount of fixed income in the form of monthly salary and additional income from the head of the family, mother and other family members and expressed in rupiah per month by taking into account the Wonogiri minimum regional wage (Rp 1,524,000). The measurement scale was continous, but transformed into dichotomous, coded 0 for <Rp 1,524,000 and 1 for ≥Rp 1,524,000.

Religion and belief were components of the socio-demographic integral that influence perceived susceptibility and severity of an infection and were related to maternal perception of immunization. The measurement scale was continuous, but it was transformed into dichotomous, coded 0 for not supporting (score <4) and 1 for supportive (score ≥ 4).

Family support was defined as a form of assistance in the form of attitudes, actions, and acceptance of family members toward infant immunization including emotional, infomational, instrumental, and appraisal support. The measurement scale was continous, but it was transformed into dichotomous, coded 0 for weak (score <6) and 1 for strong (score ≥ 6).

Information exposure was defined as the mother exposure to information from health care providers, print media, electronic media and the internet about DPT immunization. The measurement scale was continous, but it was transformed into dichotomous, coded 0 for low (score <4) and 1 for high (score ≥ 4).

Attitude was defined as the tendency of mothers to respond, assess or express both in the form of beliefs or feelings towards the behavior of giving DPT immunization to infants. The measurement scale was continous, but it was transformed into dichotomous, coded 0 for negative (score <7) and 1 for positive (score ≥ 7).

Subjective norm was defined as perceptions or opinions of mothers about rules or standards that exist in the social environment, especially those who are considered important or influential if the mother provides DPT immunization to the baby. The measurement scale was continous, but it was transformed into dichotomous, coded 0 for not supporting (score <6) and 1 for supportive (score ≥ 6).

Perceived behavior control was defined as maternal perception of the ease or difficulty of giving DPT immunization to

infants, whether or not they are able to control their ability to perform behavior and perceptions of external factors that can shape and influence it. The measurement scale was continous, but it was transformed into dichotomous, coded 0 for weak (score <7) and 1 for strong (score ≥ 7).

Intention was defined as the condition of the maternal mental readiness as well as the plan or conscious decision making to provide DPT immunization to the baby. The measurement scale was continous, but it was transformed into dichotomous, coded 0 for weak (score <6) and 1 for strong (score ≥ 6).

5. Study Instrument

The study instrument used for data collection was a questionnaire. Validity test was done with content and face validities. Reliability tests in this study were carried out in 20 infants by calculating total item correlations (>0.20) and Cronbach's alpha (≥0.70).

6. Data Analysis

Univariate analysis was described in frequency and percentage. Bivariate analysis was performed by Chi square. Multivariate analysis was conducted by a multilevel logistic regression run on Stata 13.

7. Research Ethics

Research ethics included on informed consent, anonymity, confidentiality, and ethical research. Research ethics was obtained from Research ethics committee Universitas Sebelas Maret, Surakarta, Central Java, with number 351/UN27.6/KEPK/2018.

RESULTS

1. Univariate Analysis

Table 1 showed sample characteristics. Table 1 showed that most of mothers are highly educated (60%) and had high family income (59.5%). The majority of mothers had religious belief that support immunization (66%), strong family support (63.5%), high information exposure toward DPT immunization (51.5%), positive attitude (50%), supportive subjective norm (66%), strong perceived behavior control (69.5%), and strong intention (65.5%).

Table 1. Sample Characteristics

Characteristics	N	%
Maternal education		
Low	80	40%
High	120	60%
Family Income		
Low	81	40.5%
High	119	59.5%
Religion and Beliefe		
Not supporting	92	46%
Supporting	108	54%
Family Support		
Weak	95	47.5%
Strong	105	52.5%
Information Exposure		
A little	97	48.5%
Much	103	51.5%
Behavior		
Negative	100	50%
Positive	100	50%
Subjective Norm		
Not supporting	68	34%
Supporting	132	66%
Perceived Behavior Control		
Weak	61	30.5%
Strong	139	69.5%
Intention		
Weak	69	34.5%
Strong	131	65.5%

2. Bivariate Analysis

Table 2 showed the results of bivariate analysis. Table 2 showed that the use of DPT immunization increased with high maternal education (OR=5.12; CI 95%= 2.42 to 10.84; p<0.001), high family income (OR=1.96; CI 95%= 0.98 to 3.92; p=0.054), good religion and belief (OR=

17.49; CI 95%= 5.92 to 51.61; p<0.001), strong family support (OR= 3.94; CI 95%= 1.85 to 8.43; p<0.001), high information exposure (OR=2.81; CI 95%= 1.36 to 5.82; p= 0.004), positive attitude (OR= 3.47; CI 95%= 1.62 to 7.40; p<0.001), subjective norm (OR= 4.22; CI 95%= 2.06 to 8.65; p<0.001), perceived behavior control (OR= 4.66; CI 95%= 2.26 to 9.58; p<0.001), and strong intention (OR=5.12; CI 95%= 2.42 to 10.84; p<0.001).

Independent Variable	DPT immunization		OR	CI (95%)		p
	Incomplete	Complete		Lower limit	Upper limit	
Maternal Education						
Low	29 (36.3%)	51 (63.8%)	5.12	2.42	10.84	<0.001
High	12 (10.0%)	108 (90.0%)				
Family income						
Low	22 (27.2%)	59 (72.8%)	1.96	0.98	3.92	0.054
High	19 (16.0%)	100 (84.0%)				
Religion and belief						
Not supporting	37 (40.2%)	55 (59.8%)	17.49	5.92	51.61	<0.001
Supporting	4 (3.7%)	104 (96.3%)				
Family support						
Weak	30 (31.6%)	65 (68.4%)				
Strong	11 (10.5%)	94 (89.5%)	3.94	1.85	8.43	<0.001
Information exposure						
Low	28 (28.9%)	69 (71.1%)	2.81	1.36	5.82	0.004
High	13 (12.6%)	90 (87.4%)				
Attitude						
Negative	30 (30.0%)	70 (70.0%)	3.47	1.62	7.40	<0.001
Positive	11 (11.0%)	89 (89.0%)				
Subjective norm						
Not supporting	25 (36.8%)	43 (63.2%)	4.22	2.06	8.65	<0.001
Supporting	16 (12.1%)	116 (87.9%)				
Perceived behavior control						
Weak	24 (39.3%)	37 (60.7%)	4.66	2.26	9.58	<0.001
Strong	17 (12.2%)	122 (87.8%)				
Intention						
Weak	31 (44.9%)	38 (55.1%)	9.87	4.43	21.98	<0.001
Strong	10 (7.6%)	121 (92.4%)				

3. Multivariate Analysis

Table 3 showed the results of multilevel logistic regression on the use of DPT3 immunization. DPT3 immunization use was affected by maternal education, family income, religion and belief, family support, information exposure, attitude, subjective norm, perceived behavior control, and intention.

There was an effect of maternal education on the use of DPT3 immunization. Mothers with high level of education were more likely to use DPT immunization for their babies compared to mothers with low education (b=2.01; CI 95%= 0.26 to 3.76; p= 0.025).

There was an effect of family income on the use of DPT3 immunization. Mothers

with high high family income were more likely to use DPT immunization for their babies compared to mothers with low family income (b=2.56; CI 95%= 0.45 to 4.67; p=0.017).

There was an effect of religion and belief on the use of DPT3 immunization. Mothers who have religion and belief that support the immunization were more likely to use DPT immunization for their babies compared to mothers who have religion and belief that did not support the immunization (b=4.37; CI 95%= 1.78 to 6.96; p=0.001).

Table 3. Multilevel linear regression on the use of DPT3 immunization

Independent Variables	b	CI (95%)		p
		Lower limit	Upper limit	
Fixed Effect				
Maternal Education	2.01	0.25	3.76	0.025
Family Income	2.56	0.45	4.67	0.017
Religion and Belief	4.37	1.78	6.96	0.001
Family Support	1.92	-0.07	3.90	0.058
Information Exposure	1.82	0.11	3.54	0.037
Attitude	1.59	-0.29	3.47	0.097
Subjective Norm	1.66	-0.16	3.49	0.074
Perceived Behavioral Control	2.50	0.57	4.43	0.011
Intention	2.93	0.68	5.19	0.011
Random Effect				
Health Center				
Var (constants)	3.73	0.69	20.23	
Log likelihood = -36.74				
LR test vs. logistic regression	p=0.005			
chibar2 (01) = 6.71				
ICC = 53.11%				

There was an effect of family support on the use of DPT3 immunization. Mothers with strong family support were more likely to use DPT immunization for their babies compared to mothers with weak family support (b=1.92; CI 95%=-0.07 to 3.90; p=0.058).

There was an effect of information exposure on the use of DPT3 immunization. Mothers who have a lot of information exposure of were more likely to use DPT immunization for their babies compared to mothers with lack of information exposure (b=1.82; CI 95%=0.11 to 3.54; p=0.037).

There was an effect of attitude on the use of DPT3 immunization. Mothers who have positive attitudes of were more likely to use DPT immunization for their babies compared to mothers with negative attitude (b=1.59; CI 95%= -0.29 to 3.47; p=0.097).

There was an effect of subjective norm on the use of DPT3 immunization. Mothers who have supportive subjective norm were more likely to use DPT immunization for their babies compared to mothers who did not have supportive subjective norm (b=1.66; CI 95%= -0.17 to 3.49; p= 0.074).

There was an effect of perceived behavioral control on the use of DPT3 immunization. Mothers who have strong perceived behavioral control were more likely to use DPT immunization for their babies compared to mothers with weak perceived behavioral control (b=2.50; CI 95%= 0.57 to 4.43; p=0.011).

There was an effect of intention on the use of DPT3 immunization. Mothers who have strong intention were more likely to use DPT immunization for their babies compared to mothers with weak intention (b=2.93; CI 95%= 0.68 to 5.18; p= 0.011).

The result of ICC was 53.11%, it was showed that the health centers in each strata had a contextual influence on the variation in use of DPT3 immunization by 53.11%. This number was greater than the 8-10% role of thumb, therefore, the contextual effect of health center shown by multilevel analysis was very important to note. Likehood ratio = 0.005 showed that there were differences and statistically significant between models without taking into account the contextual effects. Health center with *mandiri* strata increased the likelihood of using DPT immunization rather than posyandu with *purnama* and *madya* strata.

DISCUSSION

1. The effect of maternal education on the use of DPT3 immunization

There was an effect of maternal education on the use of DPT3 immunization. Mothers with high level of education were more likely to use DPT immunization for their babies compared to mothers with low education (b=2.01; CI 95%= 0.26 to 3.76; p= 0.025). The result of this study was in line with some previous studies which stated that there was an effect of maternal education on immunization coverage (Forshaw *et al.*, 2017; Balogun *et al.*, 2017).

The influence of maternal education on immunization can be associated through two important pathways, namely human capital and cultural capital. Human capital explained that education lead to more accurate knowledge about health while cultural capital explained that education enhanced social status and interpersersonal styles that were more confident so as to facilitate interaction with the health care system (Vikram *et* al., 2012).

2. The effect of family income on the use of DPT3 immunization

There was an effect of family income on the use of DPT3 immunization. Mothers with high high family income were more likely to use DPT immunization for their babies compared to mothers with low family income (b=2.56; CI95%= 0.45 to 4.67; p= 0.017). The result of this study was in line with a study done by Legesse and Dechasa (2015) which stated that there was a relationship between family income and the coverage of DPT immunization.

Family income was a socio-economic factor that influenced parents' knowledge and practices regarding immunization and the ability to complete immunizations on schedule. Low family income lead to behaviors where prevention activities were not considered as family priorities (Al-lela *et* al., 2014; De Oliveira *et al.*, 2014).

3. The effect of religion and belief on the use of DPT3 immunization

There was an effect of religion and belief on the use of DPT3 immunization. Mothers who have religion and belief that support the immunization were more likely to use DPT immunization for their babies compared to mothers who have religion and belief that did not support the immunization (b=4.37; CI 95%= 1.78 to 6.96; p= 0.001). Religion that influenced immunezation decisions can be explained through the central construct of the Theory of Reasoned Action, namely subjective beliefs and norms. Religious practices and teachings can influence beliefs about acceptance of certain health behaviors including the use of DPT immunization (Shelton et al, 2013).

4. The effect of family support on the use of DPT3 immunization

There was an effect of family support on the use of DPT3 immunization. Mothers with strong family support were more likely to use DPT immunization for their babies compared to mothers with weak family support (b=1.92; CI 95%=-0.07 to 3.90; p= 0.058). The result of this study was in line with a study by Mokodompit *et al.* (2015) which stated that there was a relationship between family support and complete immunization status.

Family support was an important factor in healthy behavior. Families who believe in the benefits of immunization for babies would encourage family members to use health services optimally. The support was in the form of providing information to mothers about immunization, accompanying mothers to immunize their babies and helping mothers to care for their babies after immunization (Senewe, 2017).

5. The effect of information exposure on the use of DPT3 immunization

There was an effect of information exposure on the use of DPT3 immunization. Mothers who have a lot of information exposure of were more likely to use DPT immunization for their babies compared to mothers with lack of information exposure (b=1.82; CI 95%=0.11 to 3.54; p=0.037). The result of this study was in line the previous study which stated that there was a relationship between information exposure and the use of immunization (Adedire *et al.*, 2016; Ajizah *et al.*, 2018; Acharya *et al.*, 2018).

Exposure to information can produce positive changes and prevent negative changes in health behavior in large populations. Success was likely to increase in episodic programs or once in a while such as immunization when compared to sustainable programs. The availability of major products and access to services was an important key in convincing individuals to follow up on messages in the information media (Wakefield *et al.*, 2014).

6. The effect of attitude on the use of DPT3 immunization

There was an effect of attitude on the use of DPT3 immunization. Mothers who have positive attitudes of were more likely to use DPT immunization for their babies compared to mothers with negative attitudes (b= 1.59; CI 95%= -0.29 to 3.47; p=0.097). Previous study showed that the parental attitude was a strong predictor of parents' intention to give vaccinations to their children (VanWormer *et al.*, 2017).

Mothers with a positive attitude generally understand that immunization was not something to worry about related to side effects that were only temporary but can protect their babies from disease. Mothers with negative attitudes toward immunization have an understanding that immunization was less profitable and made the babies sick. Negative maternal attitudes can also be influenced by unpleasant experiences when bringing their babies to health facilities (Putri *et al.*, 2017).

7. The effect of subjective norm on the use of DPT3 Immunization

There was an effect of subjective norm on the use of DPT3 immunization. Mothers who have supportive subjective norm were more likely to use DPT immunization for their babies compared to mothers who did not have supportive subjective norm (b= 1.66; CI 95%= -0.17 to 3.49; p= 0.074). Smith *et al.* (2017) provided diverse evidence for the relationship of social influence to vaccination including subjecttive norms, but there were studies which showed that there was no relationship between social influence and vaccination.

Subjective norms were mainly related to someone's perception of the important expectations of others to behave in a certain

way. Subjective norms influenced behavior through motivation to adhere to normative beliefs and expectations, norms have a direct effect on the intention to behave through compliance or social pressure (Britt *et al*., 2014).

8. The effect of perceived behavior control on the use of DPT3 immunization

There was an effect of perceived behavioral control on the use of DPT3 immunization. Mothers who have strong perceived behavior control were more likely to use DPT immunization for their babies compared to mothers with weak perceived behavioral control (b=2.50; CI 95%= 0.57 to 4.43; p= 0.011). The result of this study was in line with a study done by Dubé *et al.* (2017) which stated that strong perceived behavior control was related to parental intention to give vaccination to their children.

Perceived behavioral control in the framework of Planned Behavior Theory was used to calculate intentions directly as well as being able to be a moderator of subjective norms of intention to vaccinate, or in the other words was the interaction between subjective norms and perceived behavior control has a strong influence on the intention to vaccinate (Britt *et al*., 2014).

9. The effect of intention on the use of DPT3 immunization

There was an effect of intention on the use of DPT3 immunization. Mothers who have strong intention were more likely to use DPT immunization for their babies compared to mothers with weak intention (b= 2.93; CI 95%= 0.68 to 5.18; p= 0.011). The result of this study was in line with a study done by Conner et al. (2016) which stated that intention was a predictor of healthy behavior. Ababu et al. (2017) explained that parents with strong intention were 6.49 times ore likely to use DPT3 immunization for their babies compared to mothers with weak intention (OR=6.49; CI 95%= 4.83 to 8.71; p<0.001).

Dubé *et al.* (2017) use the Planned Behavior Theory model to show intention constructs in the practice of immunization. Parents who did not consider immunization as an important way to protect the health of children and considered diseases that can be prevented by immunization tend to be harmless would have a weak intention to immunization and tend to not immunize their children.

10. The effect of health center on the use of DPT3 immunization

The ICC results of 53.11% showed that the health center in each strata had a contextual influence on the variation in use of DPT3 immunization by 53.11%. Ministry of Health RI (2012) explained that health center activities consisted of main activities and development activities or choices. The main activities included maternal and child health problems, family planning, immunezation, nutrition and prevention and control of diarrhea. Development activities were in addition to new activities beside five main activities such as *Bina Keluarga Balita* (BKB) and other village community development programs. With the health center routine activities, health personnels and health cadres can share information about DPT immunization to the community, especially to the mothers.

Wonogiri II health center (2018) stated that there were 3 strata of Posyandu in the working area of the health center, namely madya, purnama and mandiri strata. The distribution of the strata was conducted based on the Health Center Independence Review which included the organization and level of achievement of the program and other indicators. Although the determination of the health center strata has almost the same assessment

criteria in each strata, there were some differences in additional program indicators and healthy fund coverage. Additional program related to immunization was immunization counseling activities with health personnels or community leaders while healthy funds were used in funding these additional programs.

This study concluded that maternal education, family income, religion and beliefs, family support, information exposure, attitudes, subjective norms, perceived behavioral control and intentions affected the use of DPT3 immunization among infants in Wonogiri District.

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