FACTORS AFFECTING MATERNAL COMPLIANCE IN GIVING MULTIPLE IMMUNIZATION INJECTIONS TO TODDLERS AT MEDOKAN AYU HEALTH CENTER IN SURABAYA

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ABSTRACT

Maternal compliance as determining factor in increasing the coverage of double immunization injections for children <2-years-old at the Medokan Ayu Health Center in Surabaya. Based on local monitoring data, the average immunized child is still below the target of 90% which is certainly at high risk of exposure to hepatitis-B, tuberculosis, whooping cough, and diphtheria in children. This study aimed to analyze the factors that affect maternal compliance in administering double immunization injections to children <2-years-old at the Medokan Ayu Surabaya Health Center. This was observational research with *a cross-sectional* study design. Data was collected using questionnaires distributed directly to respondents. The population in this study was mothers who have children <2-years-old at the Medokan Ayu Health Center in Surabaya. Sample selected using *the Multistage Random Sampling technique*. There was no influence between demographic factors on maternal compliance in administering double immunization injections to children <2-years-old at the Medokan Ayu Health Center in Surabaya (p=0.855). There were effects of perceived vulnerability, perceived severity, perceived benefits, perceived obstacles, belief in success (self-efficacy), and signals to action on maternal compliance in administering double immunization injections to children <2-years-old at the Medokan Ayu Surabaya Health Center (p< 0.05). Mothers who have perceived obstacles, as well as disbelief in the success of double immunization injections tend to disobey in providing immunization injections to their children. The latest program from the Health Center which is home immunization visits is a to increase the coverage of double immunization injections for children <2-years-old.

Keywords: Vaccination, Immunization, Compliance, Child, Public Health.

ABSTRAK

Kepatuhan ibu sebagai faktor penentu dalam peningkatan cakupan imunisasi suntikan ganda pada anak <2 tahun di Puskesmas Medokan Ayu Surabaya. Data pemantauan menunjukkan bahwa cakupan imunisasi ganda di Puskesmas Medokan Ayu Surabaya belum mencapai target 90%, dengan capaian DPT/HB/Hib1 sebesar 85,4%, IPV2 hanya 44,2%, PCV2 sebesar 89,3%, DPT/HB/Hib lanjutan 85,6%, dan MR lanjutan 87,1%. Hal ini tentunya berisiko tinggi terpapar penyakit hepatitis-B, tuberkulosis, batuk rejan, dan difteri. Penelitian ini memiliki tujaun untuk menganalisis faktor yang dapat memeengaruhi kepatuhan ibu dalam pemberian imunisasi suntikan ganda pada anak <2 tahun di Puskesmas Medokan Ayu Surabaya. Penelitian ini menggunakan desain observasional dengan pendekatan cross-sectional. Data dikumpulkan melalui kuesioner yang dibagikan langsung kepada responden. Populasi dalam penelitian ini adalah ibu yang memiliki anak <2 tahun di Puskesmas Medokan Ayu Surabaya. Sampel dipilih dengan menggunakan teknik Multistage Random Sampling. *Tidak terdapat pengaruh faktor demografi terhadap kepatuhan ibu dalam memberikan suntikan imunisasi ganda pada anak <2 tahun di Puskesmas Medokan Ayu Surabaya (p=0,855). Terdapat*

*pengaruh persepsi kerentanan, persepsi keparahan, persepsi manfaat, persepsi hambatan, keyakinan akan keberhasilan (*self-efficacy*), dan sinyal untuk bertindak terhadap kepatuhan ibu dalam memberikan suntikan imunisasi ganda pada anak <2 tahun di Puskesmas Medokan Ayu Surabaya (p< 0,05). Oleh karena itu, Ibu yang mempunyai persepsi hambatan, serta tidak yakin terhadap keberhasilan suntikan imunisasi ganda cenderung tidak patuh dalam memberikan suntikan imunisasi pada anaknya. Program terkini dari Puskesmas yaitu kunjungan imunisasi di rumah merupakan salah satu upaya untuk meningkatkan cakupan suntikan imunisasi ganda pada anak <2 tahun.*

***Kata kunci**: Vaksinasi, Imunisasi Ganda, Kepatuhan, Anak, Ibu Baduta, Kesehatan Masyarakat*

INTRODUCTION

According to the National Medium-Term Development Plan for 2020-2024, the complete basic immunization coverage rate was 93.6% in 2021 for infants aged 0-11 months and 15 districts/cities have achieved an IDL of 80% for children aged 0-11 months (1). According to Regulation of the Minister of Health of the Republic of Indonesia Number 12 of 2017 concerning immunization, all children in Indonesia are required to receive complete basic immunization until the age of 1 year by administering 1 dose of BCG (*Bacillus Calm ette Guerin*), 3 doses of DPT (Diphtheria, Pertussis, Tetanus), 3 doses of Hb (Hepatitis-B) and Hib (*Haemophilus influenza type B*), 4 doses of Polio, and 1 dose of measles. (2). The low coverage of complete basic immunization with a double injection program is the main problem in the study.

A substantial decline has been observed in the coverage of complete basic immunization since the onset of the pandemic caused by the novel corona virus, also known as SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2), dropping from 84.2% in 2020 to 79.6% in 2021 (3). The Covid-19 pandemic has had an impact on supply chain disruptions, activity restriction rules, and a reduction in health workers, thus hindering complete basic immunization services (4). The Covid-19 pandemic also has an impact on parents' non-compliance in giving double immunization injections to babies and affects the baby's immunity and susceptibility to a disease (5). Mother's non-compliance to immunize her child affects the incompleteness of immunizations that the child must receive so that there is a higher risk of various diseases such as hepatitis, tuberculosis, whooping cough, diphtheria, then the possibility that other family members will be easily exposed to the disease, there is a decrease in quality of life such as polio can cause permanent disability and even death (6).

Globally, the immunization rate for 3 doses of DPT-3 vaccine dropped from 86% in 2019 to 83% in 2020, which means that about 22.3 million children did not get immunization, and for the first dose of measles, from 86% to 84%, which means about 22.3 million children missed immunizations (7). The Ministry of Health of the Republic of Indonesia stated that around 5% or 240,000 children in Indonesia have not received additional protection from complete basic immunization (8). Immunization coverage in East Java for children who received measles (70.8%) and BCG (89.44%) immunizations once, DPT immunization (85.6%), Polio (89.38%), and Hepatitis (87.17%) three times, Complete immunization: one BCG and Measles and three DPT, Polio and Hepatitis B.

Based on the initial survey data of the research at the Medokan Ayu Health Center in Surabaya on February 23, 2024, the Local Area Monitoring data from January 2023 to December 2024 revealed the coverage of complete basic immunization through a double immunization injection program for

children under the age of two: the DPT/HB/Hib1 vaccine with coverage (85.4%) of 108 children aged <2 years, IPV2 (44.2%) from 358 children aged <2 years, PCV2 (89.3%) from 723 children aged <2 years, DPT/HB/Hib Advanced (85.6%) from 715 children aged <2 years, and Advanced MR (87.1%) from 727 children aged <2 years. The data shows that almost all basic immunizations complete with the double immunization injection program at the Medokan Ayu Surabaya Health Center have not reached the target or are still below 90%.

Multiple Immunization or *Multiple Injection* is a solution to reduce the number of injections because the administration of more than one type in one visit is safe, effective and does not increase the risk of AEFIs (Post-Immunization Adverse Events) (9). The success of immunization coverage is greatly supported by the mother's compliance in providing double immunization injections for her child (10).

Factors that affect parental compliance in providing complete basic immunizations based on the *Health Belief Model* (HBM) theory are the existence of 7 main elements in health services, namely demographic factors (age, occupation, education level, economic level), perceived vulnerability, perceived severity, perceived benefits, self-efficacy, perceived obstacles, and cues to action (11). However, despite the theoretical comprehensiveness of HBM, gaps remain in its practical application particularly in how certain components may hinder maternal compliance with dual immunization injections for toddlers. For instance, many mothers still believe their child is not susceptible to vaccine preventable diseases, indicating a weakness in perceived vulnerability. Perceived severity is also often minimized due to a lack of visible cases or low awareness, reducing the urgency to act. Although perceived benefits are acknowledged, they are sometimes outweighed by perceived barriers, such as fear of adverse reactions or logistical difficulties in accessing healthcare facilities. Moreover, limited cues to action such as inconsistent health worker outreach and low maternal self-efficacy further contribute to the problem.

The Health Belief Model (HBM) explains maternal compliance with multiple immunization injections for toddlers by highlighting how a mother's perception of the severity of diseases, the benefits of immunization, and the risks of not vaccinating influence her decision-making. Factors like perceived barriers, cues to action, and self-efficacy also play key roles in shaping compliance (12). The HBM concept was used in the study to find out the reasons for individuals to engage or not to engage in healthy behavior . If the influencing factors are known, then efforts to improve the achievement of immunization targets with double immunization injections can be prioritized. Based on this background, the objective of the article is to analyze the factors influencing maternal compliance in administering double immunization injections to children under two years old at the Medokan Ayu Surabaya Health Center, using the Health Belief Model (HBM) framework to identify key determinants affecting immunization behavior and improve immunization coverage.

METHODS

This study was conducted at the Medokan Ayu Surabaya Health Center using an observational research design with a cross-sectional approach, meaning data were collected at one time on one group of respondents. Sample determination was carried out using a multistage random sampling technique from a total population of 810 people spread across three villages. Through the screening process, 112 respondents from one of the villages were identified as research samples.

Inclusion criteria in this study include mothers who are willing to sign informed consent, have a KMS (*Kartu Menuju* Sehat) as evidence of recording child growth and development (age, weight,

and gender), and are present when the child receives multiple immunizations. The exclusion criteria were mothers who could not be represented by others in filling out the questionnaire.

This study used the Health Belief Model (HBM) framework to analyze factors influencing maternal adherence to double immunization in children under two years of age. Six independent variables were measured based on the components of the HBM. These included perceived vulnerability, which was assessed using five statement items on a five-point Likert scale; perceived severity, measured with three statement items; perceived benefits, assessed using four statement items; perceived barriers, also using four statement items; cues to action, measured with three statement items; and self-efficacy, which was evaluated through three statement items.

The development of these items was informed by a comprehensive literature review and insights from subject matter experts. The data collection instrument employed a Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Prior to its implementation in data collection, the instrument underwent rigorous validity and reliability assessments.

The dependent variable in this study was maternal compliance with multiple immunizations, which was measured using a questionnaire consisting of four statement items. These items included the belief that adherence to the immunization schedule is imperative; the importance of ensuring the completeness of the types of immunizations administered; instances of absence due to personal reasons; and the observation of maternal initiative in seeking information or requesting immunization schedules.

This compliance measurement employs a 5 point Likert scale. The evaluation of compliance was not limited to a binary classification as either compliant or non-compliant; rather, it was assessed through the quantitative analysis of four distinct indicators. This approach enabled a more profound and nuanced examination of the relationship between each HBM component and the level of compliance.

Data Collection Methods

The type of data was a primary data and collected using questionnaires and interviews. The study employs a classification system to categorize economic level as low (income <1 million rupiah/month), medium (2-3 million rupiah/month), and high (3.5-5 million rupiah/month). A similar categorization system is used to classify education level as low (no school), medium (high school), and high (college).

The data underwent a thorough examination that entailed the application of univariate analysis, bivariate analysis, and multivariate analysis. Compliance was assessed by examining the records in the Maternal and Child Health book brought during visits to the Puskesmas. Positive statements were scored on a Likert scale from 1 to 4, while negative statements were reverse scored.The results were categorized based on the mean to determine compliance or non-compliance. The study identified several indicators of compliance, including perceived susceptibility, severity, benefits, barriers, self-efficacy, and cues to action.Independent variables such as age, occupation, education level, economic level, perceived threat of disease, and barriers to immunization were considered.The dependent variable was the maternal compliance in providing multiple immunization injections to children under two years of age.

Data Analysis

This study employed a logistic regression analysis to examine the factors that influence maternal compliance in administering multiple immunization injections to children under two years of age at the Medokan Ayu Surabaya Health Center. The data underwent a thorough examination that entailed the application of

univariate analysis, bivariate analysis, and multivariate analysis.

Ethical Clearance

This research has obtained ethical feasibility on April 21, 2024 from the research ethics commission of the Faculty of Public Health, Airlangga University Surabaya number: 111/EA/KEPK/2024. The validity test in this study was carried out at the Kedungdoro Health Center in Surabaya on April 13 with a total of 30 respondents with a significant level of 5%.

RESULTS

Univariate Analysis

Table 1 shows the distribution of the most respondents in the age category of 21 – 30 years old by 67.0%. The average respondent has a job as a housewife at 83.0%. The average economic level of respondents in the medium category (54.5%) and the average level of education is the highest in the low category (43.8%).

Table 1. Frequency Distribution of Respondent Characteristics

Characteristics	Frequency	(%)
Age		
21-30 y.o	75	67.0
31-40 y.o	37	33.0
Occupation		
Teacher	4	3.6
Housewife	93	83.0
Civil Servant	3	2.7
Private Sector	12	10.7
Economy Level		
Low	28	25.0
Middle	61	54.5
High	23	20.5
Education Level		
Low	49	43.8
Middle	39	34.8
High	24	21.4

Table 2. shows the frequency distribution of respondents with the most perceived vulnerability is in the ‘vulnerable’ category (55.4%). The frequency distribution of respondents with the most perceived severity in the 'severe' category (75.0%), the most perceived benefits were in the 'there is a perceived benefit' category (50.9%), the most perceived obstacles in the 'there is perceived obstacles' category (69.6%), the self-efficacy was the most in the 'Execution' category (84.8%), the signals to action mostly grouped in the 'feeling capable' category (55.4%) and the frequency distribution of the respondents with the most compliance was in the 'compliant' category (70.0%).

Table 2. Frequency Distribution of Mother's Perception Factors

Result	Frequency	(%)
Vulnerability		
Not Vulnerable	50	44.6
Vulnerable	62	55.4
Perceived severity		
Not severe	28	25.0
Severe	84	75.0
Perceived Benefit		
There isn’t any	55	49.1
There is	57	50.9
Perceived obstacles		
There isn’t any	78	30.4
There is	34	69.6
Self-Efficacy		
No Execution	17	15.2
Execution	95	84.8
Signals to Action		
Feeling Incapable	50	44.6
Feeling Capable	62	55.4
Compliance		
Non-Compliance	33	29.5
Obedient	79	70.5
Total	**112**	**100**

Bivariable Selection Results

Table 3. Bivariable Selection Results Affect Mother's Compliance

Variable	p value	Description
Demography	0,855	Not a Model Candidate
Vulnerability	<0,001	Model Candidate
Perceived Severity	<0,001	Model Candidate

Variable	p value	Description
Perceived Benefit	<0,001	Model Candidate
Perceived Obstacle	<0,001	Model Candidate
Self-Efficacy	0.004	Model Candidate
Signals to action	<0,001	Model Candidate

Table 3 shows that of the 7 independent variables, one variable was not eligible for inclusion in multivariable modeling due to a p-value > 0.25, namely the Demographic variable. The statistical analysis used for this variable selection process was bivariate logistic regression, which aims to assess the association of each independent variable with maternal compliance in administering double immunization injections to children under 2 years of age. A p-value of 0.855 was obtained for the demographic variable, which is greater than 0.05, indicating that there is no statistically significant influence between demographic factors and maternal compliance. Therefore, this variable was excluded from the multivariable analysis. Meanwhile, in the variables of perceived vulnerability, perceived severity, perceived benefits, perceived obstacles, self-confidence, and signals to act, results were obtained with a *p-value* of < 0.05, indicating a statistically significant influence on maternal compliance. These variables were thus eligible for inclusion in the subsequent multivariable logistic regression modeling conducted at the Medokan Ayu Surabaya Health Center.

Multivariable Modeling Results

The most influential factor on mothers' compliance in administering double immunization injections was self-confidence with the largest PR (Prevalence Ratio) of 54.05 (95% CI 5.74 – 508.57), it was stated in Table 4 below.

Table 4. Results of Multivariable Modelling of Factors Affecting Mother's Compliance in Dual Immunization Injection

Variable	p value	OR	95 % CI	
			Lower	Upper
Vulnerability				
Vulnerable	0,004	166,75	2,79	204,08
Not vulnerable (Ref)				
Perceived Severity				
Severe	0,002	78	3,99	420,17
Not severe (Ref)				
Perceived Benefits				
There is	0,024	46,8	1,32	56,60
There isn’t any (Ref)				
Perceived Obstacles				
There is	0,013	31,73	1,57	49,46
There isn’t any (Ref)				
Self-Efficacy				
Execution	<0,001	288	5,74	508,57
No Execution (Ref)				
Signals to action				
Feeling capable	0,044	166,75	1,05	53,32
Feeling incapable (Ref)				

DISCUSSION

This study examined demographic variables including age, occupation, education level, and economic level in the context of maternal compliance with double immunization injections at the Medokan Ayu Health Center. The age of mothers, especially those aged 21-30 years, has a significant effect on adherence to immunization (13).

Maternal education is also considered important, but this study showed no significant effect between education level and maternal compliance, although other studies (13) showed a significant relationship between maternal education and the implementation of immunization for children.

Mother's occupation didn't affect adherence to immunization, according to research (13). The mother's economic level also did not have a significant effect, although there are differences in findings with the study conducted A study conducted at *Klinik Pratama Sunggal* in 2023 (13). This difference in results may be caused by differences in economic perception as a demand factor in health services (2). This study suggested the importance of knowledge and education for mothers to improve immunization compliance, with a focus on socialization and the provision of supporting facilities in health centers.

The perceived perception of vulnerability, which is the belief about the likelihood of a person getting sick, affects health behavior. In the theory of *the Health Belief Model*, this perception influences individuals to take precautions (14). The perception of vulnerability is closely related to the status of child immunization in Makassar (15). Pursuant to the research conducted in 2020 in Meteseh Village, it has been (16) also stated that a good perception of vulnerability encourages immunization, while a low perception can lead to doubt. Research at the Medokan Ayu Health Center in Surabaya showed that 62% of respondents with a good perception of vulnerability were more likely to be compliant in giving double immunization injections to children under 2 years old, driven by concerns about diseases such as DPT, measles, polio, and hepatitis-B. These findings confirm that perceived vulnerability is an important factor in maternal compliance with immunization.

The perceived severity is related to the individual's belief in the seriousness of the disease, which motivates them to take preventive measures, such as double immunization injections in children (17). A study conducted in 2023 in the Simpang Tiga sub-district yielded notable findings, stated that the higher the perception of severity, the more likely it is that parents will give immunization (18). But another study that conducted in 2019 at Tompo Balang Village found that there was no effect between the perception of severity and maternal acceptance of immunization in toddlers in Gowa (19), in contrast to the results of the study at the Medokan Ayu Health Center which showed an influence of the perception of severity on immunization compliance. In the Health *Belief Model theory*, the perception of severity plays an important role in encouraging healthy behavior, because it can be formed from medical information and individual beliefs (20).

The perceived benefit is the individual's belief that health measures will provide benefits, especially if they feel vulnerable to certain diseases (21). Research conducted in 2021 at Kaliwungu health center (22) showed that mothers who saw immunization as beneficial were 1.83 times more likely to immunize their children than mothers who did not see the benefits. However, research in Tompo Balang Village showed that mothers who initially feel that immunization is beneficial, after doing so, do not always feel the expected benefits, especially if they believe the vaccine is made from haram or ineffective ingredients. This suggests that low benefit perception may hinder preventive measures such as immunization (20). Therefore, it is important to involve mothers in immunizing so that they can feel the benefits and increase compliance with double immunization injections.

Perceived barriers refer to an individual's assessment of various obstacles to making behavior changes, such as distractions, costs, dangers, and discomfort (23). Research that conducted in 2022 at Naga Kesiangan Health Center (24) showed that there was a relationship

between the perception of maternal barriers and compliance in providing basic immunization to toddlers, where mothers who have a perception of low barriers are more compliant in providing immunizations. A previous study at Tompo Balang Village in 2019 found that 87.5% of mothers who had a perception of low resistance still gave immunization, while 87.9% of mothers who had a perception of high resistance did not give immunization (19). The main obstacle faced by mothers in administering immunizations is concerns related to the 'halalness' of vaccines, which are considered contrary to religious teachings. This shows the importance of education from health workers to overcome negative perceptions that can be an obstacle in the administration of immunization (19).

The concept of self-efficacy, also referred to as belief in success, refers to an individual's conviction in their capacity to achieve success in a particular action, including the process of immunizing children (25). A study conducted at the Medokan Ayu Health Center in Surabaya revealed a substantial correlation between maternal confidence in success and adherence to the administration of double immunization injections to children under two years of age. This finding aligns with the observations made at the Tanjung Morawa Health Center (2,13). This belief is influenced by the consistency of mothers in carrying out immunizations, support from those closest to them, and the belief that double immunization is able to protect children from diseases.

However this study posits that the presence of wide confidence intervals (CIs) on perceived vulnerability, severity, and self efficacy can be attributed to a number of factors, including limited sample size, respondent variability, biases in questionnaire completion, and limitations in controlling for external variables.

However, research conducted in 2018(26) in Lebbotengae Village found that although mothers were confident in the basic immunization program, they remained non-compliant due to low knowledge and lack of support from families. This shows that mothers' confidence in the success of immunization is greatly influenced by external factors such as knowledge and family support. Low family support can weaken maternal confidence, thereby reducing adherence to basic immunization programs.

An action trigger is a factor that influences a person to take an action, such as information from the media, advice from others, or personal experiences (27) . Study at Tompo Balang Village in 2019 (19) showed that mothers with low acting signals were actually more likely to immunize their children than mothers with high acting signals. Support from the family, especially the husband, plays an important role in the mother's decision to immunize (22). On the other hand, research (28) showed that mothers who lack family support remain compliant with immunization because of their independence. Moreover other studies (16) also found that support from health workers and the government, as well as information from the media, encouraged maternal compliance in immunization.

Some of the limitations in the study include: Demographic Factors still focus on age, occupation, economic level and education level, have not been researched related to family support factors, culture, social pressure and others, then there were limitations in the time and place of the research, because data collection was done at the same time as double immunization injection activities. Therefore, there is a possibility of making respondents less focused and thorough in answering every question from the questionnaire distributed. The double immunization injection variable is an advantage in the study from the latest double immunization injection program in an effort to increase complete basic immunization coverage in Indonesia which is still rarely studied. The study used the *Health Belief Model* theory to explore what factors affect maternal behavior in

adherence to double immunization injections in children.

Mother's compliance is important in efforts to increase the coverage of double immunization injections. Mothers who do not experience the perceived vulnerability, perceived benefits, and perceived severity may neglect their children's health conditions. Addressing this issue requires the involvement of both the government and primary health care services to enhance the coverage of double immunization injections.

CONCLUSIONS AND SUGGESTIONS

Conclusion

Mothers who have perceived obstacles, as well as uncertainty about the success of double immunization injections are triggers to not be participated in providing immunization injections to their children, so that the latest program from the Health Center such as home immunization visits is a solution in an effort to increase the coverage of double immunization injections for children <2 years old in the working area of the Medokan Ayu Health Center in Surabaya. All efforts made by the Health Center, the Government, Cadres, and all Health Workers are beneficial to achieve an increase in double immunization injection coverage and of course solve the national problem related to the low coverage of double immunization injections which is still below the 90% target.

Suggestion

Support from family and the environment as well as health workers by increasing knowledge of double injection immunization may encourage mothers to comply with double injection immunization for children.

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AUTHOR CONTRIBUTIONS

KS: Methodology, Conceptualization, Writing and review draft. DH: Methodology, Conceptualization, Writing, review, and editing draft. MM: Methodology, Project Administration, Writing, review, and editing draft.

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