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Factor Influencing Vaccine Rejection of Complete Basic Immunization in Indonesia

Agustina Setyaningsih[1]*, Kemal N Siregar[2]

[1]Faculty of Public Health, University of Indonesia, Depok, West Java, Indonesia; [2]Department of Biostatistics and Population Studies, Faculty of Public Health, Universitas of Indonesia, Depok, Indonesia

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***Correspondence:** Agustina Setyaningsih, PhD Candidate, Faculty of Public Health, University of Indonesia, Depok, West Java, Indonesia. E-mail: tinaloren30@gmail.com
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Abstract

AIM: This study aims to identify psychological factors against vaccine rejection in Indonesia. The study also provides a review of the group of different factors on psychological factors in social media.

METHODS: This study uses secondary data sourced from Facebook, Twitter, YouTube and Instagram about vaccines rejection from 2018 to 2019. That text is labeled based on seven psychological factors that influence vaccine rejection. The factor analysis method is used to determine the relationship between vaccine rejection and psychological factors.

RESULTS: Dimension 1 focused on individual and group influences, where the correlation value between factors such as vaccine misinformation, health worker trust, perception of side effect is 0.906 (>0.5). Dimension 2 used different factors such as trust in the goverment, negative opinion about vaccine efficacy, and social influence as contextual/environmental influencers,with a correlation value of 0.866 (>0.5). Meanwhile, Dimension 3 with general perception is a factor in vaccine and vaccination specific problems with a correlation value of 0.940 (>0.5).

CONCLUSION: Psychological factors are mainly associated with vaccine rejection. Stakeholders need to observe these factors in identifying conditions for childhood vaccines rejection posted on social media in Indonesia.

Introduction

Vaccination is one of the most effective ways to protect children from infectious such as diphtheria, tetanus, pertussis, polio, measles and influenza. Regular vaccines injection in the child period has proved to boost the level of immunity individually and achieve herd immunity communally by reducing the burden of vaccine-preventable diseases [1]. However, outbreak events in various countries still exist, showing that not all vaccination campaigns achieve immunization coverage [3]. Based on World Health Organization (WHO) data from 2017 to 2019, significant outbreaks of measles have been reported in the United States (1.656 cases), China (38.783 cases), India (208.401 cases), and Congo (226.495 cases). The hypothesis is in line with those countries' low complete basic immunization (IDL) coverage below 80% at the time [4]. This condition is compounded by the Covid-19 pandemic, which impacts the implementation of immunization programs [2].

Indonesia's basic immunization coverage from 2013 to 2018 was still low and did not reach global immunization coverage goals, and even declined [5]. Several vaccination rates were reported to be decreased, such as Bacillus Calmette–Guérin (BCG) from 87.6% to 86.9%; Diphtheria, Tetanus, and Pertussis- Hepatitis B (DTP-HB3, DTP-HB, HB3 from 75.6% to 61.3%; Polio-4/IPV from 77.7% to 67.6%; Measles from 82. 1% to 77.3% [5]. The decrease also indicates the phenomenon of the decline in immunization coverage in basic immunization coverage from 59.2% to 57.9%, and almost all regions in Indonesia are still found to have under the vaccination coverage rate below the herd immunity threshold [5].

Some factors cause the low coverage of complete basic immunization and psychological factors that are significant why a person can practice healthy living behaviors, including immunization [6 - 7] Psychological factors have three parts, namely thoughts and feelings, social processes and direct affective behavior. Related to vaccine behavior, one of them is vaccine rejection, which impacts low complete basic immunization coverage, as happened in the United States (6-25%) where parents have refused one or more vaccines for their children [8]. Vaccine rejection occurs in cases of measles and pertussis, and the magnitude of vaccine refusal in every country depends on access to vaccination [9].

Parents rejection of vaccinations and anti-vaccine groups are the possible sources of vaccine refusal and hesitation. They influence political policies, social networks and individuals through their messages and activities in conventional and social media [7].

The growth of social media impacts the anti-vaccine movements in spreading negative sentiments regarding vaccines and vaccination topics through misinformation about vaccine safety and side effects, religious and personal ideologies, and lack of trust in authorities [10].

The risk of vaccine rejection in infants and children has led to high transmission of infectious disease viruses and repeated epidemics [11]. For children under five who do not receive basic childhood vaccines, such as pertussis vaccine, the cases caused an increase in the cost of medical care for infants under one year of age, even leading to a cause of death [12].

Researchers hope that this research is useful and can be used as policy recommendations, especially for stakeholders involved by increasing interventions to increase immunization coverage rates.

Methods

This study uses secondary data collection by observing textual data sourced from social media, including Facebook, Twitter, Instagram and YouTube. This study also used factor analysis to measure the relationship between variables including vaccine misinformation, trust in government, negative opinion about vaccine efficacy, trust in health workers, social influence, general behavior, perception of side effects, and to create the main dimensions or group. From the variables of this study, all data were analyzed using data processing software.

The next step focuses on the value of Kaiser-Meyer-Olkin Measure of Sampling Adequacy and Bartlett's Test of Sphericity used to assess the suitability of the data for factor analysis [13]. The first exploratory factor analysis (EFA) was performed without rotation, using maximum likelihood extraction and eigenvalues > 1. In addition, this study performed EFA using ProMax rotation and applied a three-factor solution to the structural test.

Ethical Approval

Ethical approval for this study was obtained from the research and community engagement ethical committee of public health faculty, University of Indonesia (Ket-631/UN2.F10.D11/PPM.00.02/2020).

Results

Assumption Test (Normality)

Normality test for satistical analysis uses the One-Sample Kolmogorov Smirnov. Table 1 shows the result of the normality test.

Table 1: Normality Test

Kolmogorov-Smirnov Test		
Variable	Sig Value	Description
Vaccine misinformation	0.674c	Normal Distribution
Trust in the government	0.129c	Normal Distribution
Negative opinions about vaccine efficacy	0.498c	Normal Distribution
Trust in health workers	0.177c	Normal Distribution
Social influence	0.454c	Normal Distribution
General behavior	0.416c	Normal Distribution
Perception of vaccine side effects	0.399c	Normal Distribution

Based on the statistical software output above, the Asymp value can be seen. The Sig. value (2-tailed) for each variable is greater than 0.05, and it can be concluded that all variables are normally distributed. Table 2 presents the results of KMO and Bartlett 's Test.

Table 2: KMO and Bartlett 's Test

KMO and Bartlett's Test	
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	0.534
Bartlett's Test of Sphericity	48.776
Df	21
Sig.	0.001

From the test results, the Kaiser-Meyer-Olkin Measure of Sampling Adequacy value is 0.534, which is greater than 0.50, and the significance value of Bartlett's Test of Sphericity is 0.001. The result fulfilled the assumption of correlation so that the variables can be predicted and analyzed. Furthermore, a correlation test was conducted to see the value of Anti-Image Correlation between variables greater than 0.50. The results of this test are shown in Table 3.

Table 3: Anti-Image Correlation Value

Variable	Anti-Image Correlation
Vaccine misinformation	0,546
Trust in the government	0,543
Negative opinions about vaccine efficacy	0,500
Trust in health workers	0,950
Social influence	0,913
General behavior	0,959
Perception of vaccine side effects	0,891

Based on the results of SPSS above, it can be seen that the value of the Anti-Image Correlation of each variable is above 0.50, so it can be said that there is a strong correlation between the variables studied.

Table 4: Communalities Values

Communalities	Initial	Extraction
Vaccine misinformation	1.000	0.413
Trust in the government	1.000	0.474
Negative opinions about vaccine efficacy	1.000	0.548
Trust in health workers	1.000	0.349
Social influence	1.000	0.574
General behavior	1.000	0.804
Perception of vaccine side effects	1.000	0.614

Furthermore, from the results of statistical tests, the extraction value for all variables is greater than 0.50. Thus it can be said that all variables are acceptable to be used to explain these factors. After interpreting the value of communality, it takes a step

Table 5: Total Variance Explained Value

Total Variance Explained						
Dimen	Initial Eigenvalues			Extraction Sums of Squared Loadings		
sion	Total	% of Va riance	Cumulative %	Total	% of Variance	Cumulative %
1.	1.475	21.065	21.065	1.475	21.065	21.065
2.	1.219	17.416	38.480	1.219	17.416	38.480
3.	1.082	15.460	53.940	1.082	15.460	53.940
4.	0.960	13.715	67.655			
5.	0.840	11.994	79.649			
6.	0.749	10.693	90.342			
7.	0.676	9.658	100.000			

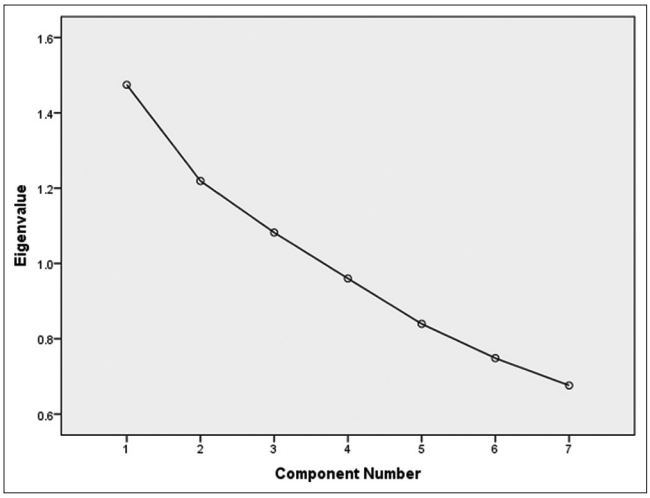

Figure 1: Screen Plot of Eigenvalues

process to calculate the total variance explained to show the value of each variable to be analyzed. Table 5 reports the total variance for the explained values.

Based on the table above, two kinds of analysis can explain the variance: Initial Eigenvalues and Extraction Sums of Squared Loadings. The initial eigenvalues show that all the factors formed are as many as seven factors. If the values of all variables are added up 1.475 + 1.219 + 1.082 + 0.960 + 0.840 + 0.749 + 0.676, then the result is 7. The Extraction Sums of Squared Loadings shows the number of variations or many factors that can be formed, namely as many as three factors, namely 1,475, 1,219, and 1,082.

In the total output variance described, three factors have eigenvalues of more than 1, namely 1,475, 1,219, and 1,082. Factor 1 of 1.475 explains the variation 21.065%. Factor 2 of 1,219 explains 17.416% variation. Factor 3 of 1.082 explains the variation of 15.460%. If factors 1, 2, and 3 are added together cumulatively, these three factors explain 53.940% of the variations.

Figure 1 depicts the screen plot for determine the number of factors to retain in an exploratory factor analysis (FA) or principal Dimensions to keep in a principal Dimension analysis (PCA). From the figure, it can be seen that there are only three factors whose values are above 1.

The Dimension Matrix stage aims to explain the correlation value or relationship between each variable and the factors that will be created. The results of the test using the Dimension matrix are shown in Table 6.

Table 6: Dimension Matrix

Rotated Dimension Matrix			
	Dimension		
	1	2	3
Vaccine misinformation	0.55	-0.316	-,033
Trust in the government	0.257	0.631	-0.104
Negative opinions about vaccine efficacy	0,007	0.653	0.349
Trust in health workers	-0.485	0.335	0,049
Social influence	-0.619	-0.286	-0.331
General behavior	0.153	0.313	0.826
Perception of vaccine side effects	0.675	0.064	-0.393

Based on the results of the statistical software above, it can be explained that the vaccine misinformation variable has a correlation of 0.558 with factor 1, while the correlation with factor 2 is -0.316, and the correlation with factor 3 is -0.033. The variable trust in the government has a correlation of 0.257 with factor 1, the correlation with factor 2 is 0.631, and the correlation with factor 3 is -0.104. The variable Negative Opinion Vaccine Efficacy correlates 0.007, a correlation with factor 2 is 0.653, and a correlation with a factor of 3 is 0.349. The variable Trust in Healthcare workers correlates -0.485, a correlation with factor 2 is 0.335, and a correlation with factor 3 is 0.049. The Social Influence variable correlates -0.619, the correlation with factor 2 is -0.286, and factor 3 is -0.331. The General Behavior variable correlates 0.153, a correlation with factor 2 is -0.313, and a correlation with factor 3 is 0.826. The side effect perception variable correlates 0.675, a correlation with factor 2 is 0.064, and factor 3 is -0.393.

The relationship between each variable and the factor has been found, and the next step is at the Dimension matrix, which is rotated to determine which variables meet the categories by looking at the largest correlation value between variables and factors or Dimensions. Table 7 presents the result of the rotated Dimension matrix.

Table 7: Dimension Transformation Matrix

Rotated Dimension Matrix			
	Dimension		
	1	2	3
Vaccine misinformation	0.630	-0.050	0.115
Trust in the government	0.019	0.624	-0.290
Negative opinions about vaccine efficacy	-0.307	0.664	0.110
Trust in health workers	-0.574	0.101	-0.101
Social influence	-0.387	-0.597	-0.260
General behavior	0.089	0.021	0.892
Perception of vaccine side effects	0.667	0.229	-0.342

Based on the table, in Dimension 1, the correlation value is 0.906, greater than 0.5. In Dimension 2, which has a correlation value of 0.866 greater than 0.5 and in Dimension 3, it has a correlation value of 0.940 greater than 0.5. From these results, it can be concluded that the Dimensions formed are feasible to summarize the variables in the study.

Discussion

One of the causes behind the decline in vaccinations in Indonesia is the presence of groups that reject immunization [13-14]. Some groups may use health related website act as peer-to-peer information channels that provied experiental information including factors like health service, affecting behavior [15]. One study conducted in Indonesia found several reasons for parents not to immunize their children were categorized into three interelated themes: belief barriers, safety concerns, trust and minsinformation issues [16]. This research also inline with study of community assesment

of measles immunizaton in the Sleman Regency (Yogyakarta Special Region), the internet media were often used by citizens to search for health information, including measles immunization [17].

Relationship "Between Factors-Predictor Factors", based on the analysis results using statistical software, it was found that in the factor analysis test, only three dimensions were formed from the seven main factors. It had been rotated into dimension 1, consisting of the combination of vaccine misinformation, trust in health workers, and perception of side effects.

Dimension 1 is called individual or group influences. Dimension 2 as contextual/enviromental influence is created from 3 factors such as trust in the government, negative opinions about vaccine efficacy, and social influence. And the last dimension 3 is a factor in vaccine and vaccination specific problems that is created from 1 factor as a general perception. The three dimensions refer to the results of the Strategic Advisory Group of Experts on Immunization (SAGE) Working Grorup Study concluded that vaccine rejection behaviour was influenced by three main factors, namely [1]. Contextual influences such as communication and media environment, influential leaders, historical reasons, religion, culture, political reasons, lobbying (approach) by anti-vaccine groups, geographical barriers and the pharmaceutical industry [2]. Individual and group influences arising from personal vaccine perception factors such as knowledge, health system and social/peer environment, and [3] vaccine-/ vaccination-specific issues [18].

In this individual or group influence factor, all three are integrated into dimension 1 related to the technical administration of the vaccine and the quality of the vaccine itself. The factor is in line with the research of [19], where the influence arises due to socio-cultural factors, the environment, institutions, health services and economic and political factors. Vaccine misinformation from social media can create negative sentiment through the news created and provides a platform from which the media is published and can be used as lobbying advice to influence others. Social media also allows users to speak their opinions and experiences and facilitates social networking groups to support or reject vaccines. Meanwhile, the role of professional health workers is a role model for patients. Based on research from [19], it concluded that vaccine hesitancy is individual behavior but can have a broad social impact because (SAGE) recommends the need for health workers and all parties involved in the immunization program to be exposed to this behavior and must also be able to identify and assess the determinants that cause the behavior.

Perceptions of risks and benefits (perceived, heuristics) are influenced by risks posed by the disease that can be affected by the impact on the vaccination program. Approach to the Health Believe Model (HBM), perceptions will be able to influence decision making in the approach technique in two ways, namely understanding the risks and risks posed by diseases that can be prevented by immunization (PD3I) will encourage the acceptance of temporary vaccines, on the other hand, understanding will the risks or side effects posed by vaccines can result in vaccine death [18].

Furthermore, in a study conducted in the Netherlands, it was found that higher levels of intention to receive vaccination during the H1N1 pandemic were associated with greater trust in the government, fear/ concern, and perceived susceptibility to the disease. In contrast, in the Democratic Republic of the Congo, religious beliefs, deeply rooted traditions, and strong distrust of government health services have undermined some polio eradication efforts [20]. In certain areas of Nigeria, reasons for refusing vaccines by mothers and/ or fathers were also found, including rumors about vaccine safety, public suspicions about the motives behind immunization promotion and pre-existing political, religious and ethnic tensions [20]. To reach more children with life-saving vaccines, communication about vaccines needs to consider the specific social, cultural and political context of each country [20].

Second, dimension 2 is a combination of trust in the government, negative opinion of vaccine efficacy, and social influence called contextual/environmental influences. In this dimension, the three factors become integrated into contextual/environmental influence factors related to regulations and external influences, in this case, the government and the social environment related to various unfounded negative opinions that can affect the community. Also, it includes the family's decision to let their children get vaccination services, negative opinions that continue to be campaigned by irresponsible people both in the natural social environment and social media environment. These conditions can affect to understanding and willpower of the community to access vaccination services for their family members. This dimension is in line with the presentation of the WHO study for crisis communication and mitigation in the cases related to the vaccination process, describing the conditions that occur in the Israeli state government; an example of successful listening during a crisis is the Israeli Ministry of Health communication campaign in 2013 [21].

The country established environmental surveillance for poliovirus following the poliomyelitis (polio) outbreak in 1988 through the system in public health authorities were warned about the introduction and covert spread of wild poliovirus type 1 in 2013 [22]. High population immunity, with high vaccination coverage and no cases of paralytic polio, were detected. A key element contributing to this success is the sophisticated communication monitoring system used to monitor public opinion and respond to public concerns. For example, authorities monitor social media and are aware of plans for anti-vaccination protests. They could mobilize polio victims who were

paralyzed when immunization was not widely available to overcome the crowds at these demonstrations [23]. It can be said that trust in the government and policymakers can affect trust in the vaccination program launched by the Government. Vaccination is a regulation and is mandated by the government. In general, there is a positive relationship between trust in government and vaccine acceptance, including trust in technical and organizational capabilities [24].

Negative opinions are based on knowledge and awareness to refuse vaccines. The refusal of vaccination is caused by individuals not having accurate knowledge about vaccines or lack vigilance due to not receiving enough information or more negative opinions. Insufficient accurate knowledge can lead to vaccine doubt and rejection [18].

Meanwhile, immunization as a social influence which is social capital in the community, is a friendship, mutual cooperation and recitation [25]. According to research, predisposing factors were identified, including citizen knowledge, health awareness and beliefs, and perceived health needs.26 Dimension 3 is created from general behavior or the specific factor regarding vaccine and vaccination issues. Attitudes towards vaccination have a strong impact on vaccination decisions. Assertiveness can override rational thinking and the decision process. They can arise from a particular identity (religious, anthropological or otherwise [27], distrust of authority, or other factors. The groups, in this case, can be defined by where people live but can also be determined by ages, genders, socioeconomic status, educations, professions, and religions or beliefs [28]. Thus, a group can be an ethnic group, a specific city neighbourhood, or an online anti-vaccination group. Past vaccination decisions are one of the best predictors of future vaccination behavior. Becoming a habit: a routine behavior that is not questioned but happens because it has happened before [29]. It is therefore suggested that the first vaccination is essential [21].

General behavior related to the risks and benefits of receiving vaccines may encourage individuals to refuse the vaccine, even though the vaccine's safety has been scientifically proven. For example, the history of the suspension of rotavirus vaccine use was due to cases of Guillain-Barre Syndrome after receiving flu vaccine in 1976 or narcolepsy after H1N1 vaccin [30]. The epidemiological perspective of risk is based on a rational approach, where risk is objective or measurable. A rational approach to risk implies that decision making in the face of risk can be improved by ensuring that emotional, cognitive, and social distortions influence people's judgments [30]. The perception of risk is based more on past experiences than the perception of the expert based on scientific data [31].

Psychological factors are the significant factors affecting vaccination acceptance. This study is also closely related to how the influence of a person's choice or decisions are taken for the selection of vaccination services to be accessed affected by psychological readiness to receive them or letting family members receive vaccination services. It is related to the positive impact or other symptoms that arise after the immunization, which some consider having a negative impact of vaccination. It is also closely related to the fear of vaccine safety, an unwanted situation or event that is right or wrong related to vaccination and creates feelings of insecurity and distrust of vaccines and health authorities [21].

Lessons learned from the WHO European Region show that vaccine doubts and fears about vaccine safety are linked – for two reasons. With high levels of vaccine skepticism, labels are more easily influenced by misperceptions about vaccines hatred of vaccine safety in many countries has increased skepticism about vaccines, as demonstrated by the trust and confidence in vaccines and health authorities. It means that overcoming vaccine doubt is essential to improve vaccination and ensure resistance to vaccine safety [21].

These conditions also imply that an effective response to safety fears can help prevent an escalation of vaccine indecision in the population. False studies on safety raise doubts, such as research from Andrew Wakefield on the link between the measles, mumps and rubella (MMR) vaccine and autism in 1998, MMR vaccination rates falling in some countries and remaining below previous levels for several years, and a resurgence measles outbreaks were increased [32].

Even though this study was subsequently found to be seriously flawed, the authors pleaded guilty to serious professional misconduct and that many subsequent studies found no link between the MMR vaccine and autism. Several member states in the European Region reported that this paper is still being used to support the arguments. MMR vaccination and the link between MMR and autism is still a widespread misperception that fuels vaccine hesitancy among parents. Trust is a sensitive item: hard to come by and easy to lose. Research shows that the MMR vaccine is not associated with an increased risk of autism among children, despite strong evidence of safety, but some people are still hesitant to refuse the MMR vaccine [32].

Psychology also appears to be decisive in the attitudes of factors towards general vaccination, particularly towards Covid-19 vaccination [32-35]. Psychological factors that can drive individual attitudes towards child vaccination and Covid-19 are invaluable in designing strategies that can assist in fighting doubt and vaccines and evaluating appropriate forms of intervention in overcoming doubt and vaccines [36].

Conclusion

Secondary data on social media can measure the rejection of basic vaccines for children aged 12-23 months in Indonesia. Research shows that the influencing factors include vaccine misinformation, trust in the government, negative opinion on vaccine efficacy, trust in health workers, social influence, general behavior, perception of side effects that are related to vaccine rejection, that all can be formed become three dimensions so that they can be analyzed further.

These findings can assist stakeholders in identifying psychological factors that can be monitored on social media and affect vaccine rejection to formulate effective communication strategies to reduce complete basic childhood vaccine rejection. Vaccine refusal must continue to be monitored and studied from psychological factors and other factors to be treated immediately to reduce widespread effects.

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