

FACTORS AFFECTING THE PREVENTION OF COVID-19 TRANSMISSION IN SCHOOL-AGE CHILDREN

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ABSTRACT

The COVID-19 pandemic has had a physical and psychological impact on school-age children. Parents also have the challenge of shaping the behavior of school-age children regarding the prevention of COVID-19 transmission. This study aims to analyze the factors that influence the behavior of school-age children in preventing the transmission of COVID-19. This is a cross-sectional study with a random sampling technique and distributed a questionnaire survey to parents who have school-age children that are 6-12 years old, and the total was 474 people. The questionnaire assesses school-age children's behavior by applying the Health Belief Model theory. Multiple logistic regression tests found that parental age, parental education level, parental knowledge, and residence had a significant influence on the prevention of COVID-19 transmission in school-age children (P -value < 0.05). Four variables having a chance in good prevention of COVID-19 transmission at school-age children, there were elderly parents had a 5.6-time (95% CI OR 2.8-11.5), parents with higher education had 2.9 times (95% CI OR 1.9:4.3), parents with good knowledge had 2.6-time (95% CI OR 1.7-4.1), urban areas also had 1.86-time (95% CI OR 1.18-2.95). Parental age, parental level education, parental knowledge, and residence have a significant influence on the prevention of COVID-19 transmission behavior in school-age children.

Keywords: COVID-19; Health Belief Model theory; parents, school-age children



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INTRODUCTION

The Coronavirus (COVID)-19 has infected humans of all ages, including the age group of children. In Indonesia, the Ministry of Health on December 19, 2021, recorded that 2% of COVID-19 cases were in the 0-5-year age group, while 10.2% were in the 6-18-year age group. The group of positive cases in school-age children increased the percentage of overall positive cases due to face-to-face learning. Central Java, one of the provinces with the largest population in Indonesia, is one of the 10 regions with the highest cases of COVID-19 in school-age children (Ministry of Health, 2021).

The pandemic has had both physical and psychological impacts on school-age children. This arises from restrictions on daily activities, such as strict health protocols during learning at school, as well as restrictions on playing in public areas and socializing with friends (Bai et al., 2020). In

addition, information from social media also caused feelings of fear of being infected with COVID-19 and transmitting it to other family members (Narzisi, 2020; Szabo et al., 2020). One study stated that the COVID-19 pandemic situation caused sleep disorders and post-traumatic stress disorder (PTSD) in school-age children with an incidence rate of around 7% (Altena et al., 2020). Another study found that children had an increased frequency of anger by 67.2%, has worsened daily routine activities by 56%, and had trouble maintaining concentration by 53.9% (Zhang et al., 2020).

Parents need to exercise their role as caretakers to minimize the physical and psychological impact of the COVID-19 pandemic on their school-age children (Weaver & Wiener, 2020). This is in addition to preventing the transmission of the disease (Chen et al., 2020; Goldschmidt, 2020). However, the pandemic did not only affect the psychology of parents

through emotional disorders, depression, anxiety, and hypochondriasis (Bai et al., 2020) but also through socio-economic impacts, such as a decrease in family income which affects the fulfillment of nutritional needs and hygiene practice facilities, such as the purchase of masks and hand soap (Zhong et al., 2020).

Children's behavior during the COVID-19 pandemic is related to their parents' physical, emotional, and cognitive reactions (Bai et al., 2020; Cao et al., 2020; Liu et al., 2021; Paterson et al., 2021). Lack of parental knowledge has also been found to be related to negative attitudes and practices in preventing the transmission of this disease (Paulsen et al., 2021; Yıldırım & Güler, 2020; Zhong et al., 2020). Past studies have focused on the impact of the COVID-19 pandemic on the behavior of school-age children psychologically, but these studies have not been conducted holistically, including investigating the impact on children's physical, cognitive, social, and spiritual well-being.

This study aims to analyze the factors that influence the behavior of preventing the transmission of COVID-19 in school-age children. This study placed a greater focus on the impact of the COVID-19 pandemic on the psychology of school-age children. The researchers applied the Health Belief Model theory (Rosenstock, 1974) by analyzing the variables, i.e., perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and cues to action.

METHOD

Study design

This is a quantitative study that applied a cross-sectional approach to analyze the factors that affect the prevention of COVID-19 transmission in school-age children.

Sample

The random sampling technique was used with the inclusion criteria being parents of 6-12 years old children who have never been confirmed positive for COVID-19 by using the polymerase chain reaction (PCR) method and parents that are able to write and read. The exclusion criteria were parents that refused to participate in this study, parents of children with developmental disorders, such as autism spectrum disorder (ASD) and Down syndrome, and parents of children with immunocompromises, such as cancer. The total samples were 474 parents, thus, exceeding the minimum sample size for regression analysis, which is 10 times the independent variables (there are 9 independent variables in this study) (Pagano, 2018).

Instrument

The questionnaire used contains basic information, such as the characteristics of the parents and their children. The characteristics of the parents include age, occupation, education, socioeconomic conditions, demographics, and knowledge. The characteristics of the children include age and gender.

The theory of Health Belief Model by Rosenstock (1974) questionnaire developed by Kamal et al. (2017) on the behavior of school children in preventing COVID-19 transmission was used. This questionnaire assesses the behavior of school-age children in preventing COVID-19 transmission with 20 questions that consider perceived susceptibility, perceived severity, perceived barriers, perceived benefits, and cues to action. The questionnaire had undergone validity and reliability tests with 40 parents as samples and the results of the Cronbach's alpha showed that

parental knowledge was 0.740 and behavior of school-age children was 0.738.

Each favorable statement on the questionnaire regarding behavior is measured by a Likert scale which consists of strongly agree (4), agree (3), disagree (2), and strongly disagree (1). Each unfavorable statement on the perceived barrier item consists of 1 for strongly agree, 2 for agree, 3 for disagree, and 4 for strongly disagree. The total score on behavior was calculated by the total score divided by the maximum score multiplied by 100%. The total score was then categorized as good if it had a percentage of > 75% and as bad if it had a score of ≤ 75%.

The questionnaire on parental knowledge consists of 10 questions with 7 questions on cognitive knowledge, 1 question on attitude, and 2 questions on practice. Each question was given a score of 1 if it is true and 0 if it is false. The total score was then categorized as good if it had a percentage of > 75% and as bad if it had a score of ≤ 75%.

Data collection

This study was conducted with an online survey via Google Forms between May and July 2021 through a group of health workers or a group of parents in Central Java and Special Region (D.I.) of Yogyakarta, Indonesia. The Google Forms contained the informed consent form and questionnaire.

Statistical analysis

The variables were categorized into two (binary). The dependent variable: the behavior of school-age children was categorized into two, namely, good (total score > 75%) and bad (total score ≤ 75%). The independent variable in the form of parental age was categorized according to Havighurst's Developmental theory, namely, early adulthood (19-30 years) and late adulthood (31-60 years). The educational variable was categorized into basic education (elementary school or SD, junior high school or SMP, and senior high school or SMA) and higher education (diploma, bachelor, and postgraduate) according to Government Regulation Number 17 of 2010 on Management and Implementation of Education. Parents' occupation status was categorized into employed and unemployed. The respondents' residence was categorized into urban and rural areas. Income during the pandemic was categorized into two categories; affected and not affected.

The source of information on COVID-19 was categorized into two: health workers and social media. Parental knowledge was categorized into good (total score > 75%) and bad (total score ≤ 75%). The children's ages were categorized based on Piaget's theory of Cognitive Development, namely, concrete operational stages (6-10 years) and formal (11-12 years). Gender was categorized into male and female.

A univariate analysis was used to describe the parents' and children's characteristics and prevention of COVID-19 transmission. A bivariate analysis or the Chi-square test was used to determine the factors affecting the prevention of COVID-19 transmission in school-age children. The multiple logistic regression using the enter method was also used to determine the most dominant factors that influence the behavior of school-age children.

Ethical Consideration

This research has passed the ethical review of the ethics test at the Ethics Committee of Dr Moewardi Public Hospital (RSUD Dr Moewardi) Number: 427/IV/HREC/2021.

RESULTS

Univariate analysis

Table 1 exhibits that most parents were aged 31-60 years at 87.6%. Parents' education has almost the same percentage as 43.7% had basic education level and 46.3% had higher education. The majority of parents work at 78.5% and have had their income affected by the COVID-19 pandemic at 73.2%. Family demographics were almost the same between

those living in rural areas and urban areas at 52.3% and 47.7%, respectively. For the characteristics of school-age children, a majority of them were in the 6-11-year age group at 73.6%. The respondents were also almost equal as 48.7% were girls and 51.3% were boys. For the parental knowledge variable, a majority of the parents tested were in the excellent category at 70%. The majority of parents also obtained information about COVID-19 from social media at 63.3%.

Table 1. Characteristics of respondents based on parental identity, children's identity, and information in COVID-19 pandemic (n = 474)

Variable	Total f (%)
1. Parents' characteristics	
a. Parents' age	
- 19-30 years old (early adulthood)	59 (12.4)
- 31-60 years old (old age)	415 (87.6)
b. Parents' education	
- Basic education (elementary – high school)	207 (43.7)
- Higher education (diploma, graduate, post-graduate, and doctoral degree)	267 (56.3)
c. Occupation	
- Unemployment	102 (21.5)
- Employment	372 (78.5)
d. Income during pandemic	
- Affected	347 (73.2)
- Not affected	127 (26.8)
Total	474 (100)
e. Residence	
- Rural	248 (52.3)
- Urban	226 (47.7)
2. Children characteristics	
a. Age	
- 6-10 years old (cognitive concrete operational development)	349 (73.6)
- 11-12 years old (cognitive formal development)	125 (26.4)
b. Gender	
- Female	231 (48.7)
- Male	243 (51.3)
3. COVID-19 information characteristics	
a. Parents' knowledge of COVID-19 for children	
- Poor	142 (30)
- Excellent	332 (70)
b. References of COVID-19 for children	
- Social media	300 (63.3)
- Health workers	174 (36.7)

Bivariate analysis

Table 2 exhibits the results from the Chi-square bivariate test analysis and shows that age, education, and parental knowledge significantly affect the behavior of school-age children in preventing COVID-19 transmission. Parents in the advanced adult age category are 9.2 times more likely to have school-age children with COVID-19 excellent transmission prevention behavior compared to parents in the early adult age category (95% CI OR 4.7:17.9). Further analysis found that parents' age had a significant influence on the behavior of school-age children in preventing the transmission of COVID-19 (p -value = 0.001).

Moreover, parents with higher education are 2.9 times more likely to have school-age children with excellent COVID-19 transmission prevention behavior than parents with primary education (95% CI OR 1.9:4, 3). Further analysis found that

parental education significantly affects children's behavior in preventing COVID-19 transmission (p -value = 0.001).

It was also found that parents with good knowledge about COVID-19 are 3.4 times more likely to have school-age children with excellent COVID-19 transmission prevention behavior than parents with less knowledge (95% CI OR 2.3:5.2). Further analysis showed that knowledge had a significant effect on the behavior of school-age children in preventing the transmission of COVID-19 (p -value = 0.001).

Parents with urban demographics are also 2.2 times more likely to have school-age children with excellent COVID-19 transmission prevention behavior than parents with rural demographics (95% CI OR 1.5:3.3). The analysis results showed that the parents' demographics significantly influenced the behavior of school-age children in preventing the transmission of COVID-19 (p -value = 0.001).

Table 2. Factors affecting the prevention of COVID-19 transmission in school-age children based on bivariate analysis (n = 474)

Variable	School-age children		Total f (%)	df	X ²	p-value	OR (95% CI)
	Poor f (%)	Excellent f (%)					
Parent identity							
1. Parents' age							
a. 19-30 years old (early adulthood)	47 (79.7)	12 (50)	59 (100)	1	53.4	0.001*	9.2 (4.7-17.9)
b. 31-60 years old (old age)	124 (29.9)	291 (70.1)	415 (100)				
2. Parents' education							
a. Basic education (elementary – high school)	103 (49.8)	104 (50.2)	207 (100)	1	28.8	0.001*	2.9 (1.9-4.3)
b. Higher education (diploma, graduate, post-graduate, and doctoral degree)	68 (25.5)	199 (74.5)	267 (100)				
3. Occupation							
a. Unemployment	41 (40.2)	61 (59.8)	102 (100)	1	0.7	0.39	1.3 (0.9-2.1)
b. Employment	130 (34.9)	242 (65.1)	372 (100)				
4. Income during pandemics							
a. Affected	133 (38.3)	214 (61.7)	347 (100)	1	2.5	0.11	1.5 (0.9-2.3)
b. Not affected	38 (29.9)	89 (70.1)	127 (100)				
5. Residence							
a. Rural	111 (44.8)	137 (55.2)	248 (100)	1	16.2	0.001*	2.2 (1.5-3.3)
b. Urban	60 (26.5)	166 (73.5)	226 (100)				
Children Identity							
1. Children age							
a. 6-10 year (cognitive concrete operational development)	131 (37.5)	218 (62.5)	349 (100)	1	0.9	0.32	1.3 (0.8-1.9)
b. 11-12 year (cognitive formal development)	40 (32)	85 (68)	125 (100)				
2. Gender							
a. Female	80 (34.6)	151 (65.4)	231 (100)	1	0.3	0.59	0.88 (0.61-1.29)
b. Male	91 (37.4)	152 (62.6)	243 (100)				
COVID-19 information characteristics							
1. Knowledge about COVID-19							
a. Poor	80 (56.3)	62 (43.7)	142 (100)	1	34.8	0.001*	3.4 (2.3-5.2)
b. Excellent	91 (27.4)	241 (72.6)	332 (100)				
2. COVID-19 references							
a. Social media	113 (37.7)	187 (62.3)	300 (100)	1	0.72	0.39	1.21 (0.82-1.79)
b. Health workers	58 (33.3)	116 (66.7)	174 (100)				

Note: Chi-square test results. *statistically significant with $p = 0.05$

Multivariate analysis

Table 3 exhibits the multiple logistic regression analysis and further describes the effect of knowledge on COVID-19 transmission prevention behavior. Parents in the advanced adult category have 5.6-time chance of having school-age children with excellent COVID-19 transmission prevention behavior compared to parents in the early adult category after controlling for the variables of parental education, parental knowledge, and demographics (95% CI OR 2.8:11.5). Parental age has been found to have a significant influence on the behavior of school-age children in preventing the transmission of COVID-19 (p -value = 0.001). Thus, the variable of parental age has the most important impact on the behavior of avoiding the transmission of COVID-19 in school-age children with an OR = 5.6.

Parents with higher education are 2.9 times more likely to have school-age children with excellent COVID-19 transmission prevention behavior compared to parents with

primary education after controlling for variables of parental age, parental knowledge, and demographics (95% CI OR 1.9:4.3), and also the parental education level has significant effect on the behavior of school-age children in preventing the transmission of COVID-19 (p -value = 0.001).

Parents with good knowledge are 2.6 times more likely to have school-age children with excellent COVID-19 prevention behavior compared to parents with less knowledge after controlling for the variables of parental age, education, and demographics (95% CI OR 1.7:4.1). Therefore, parental knowledge has a significant influence on the behavior of school-age children in preventing the transmission of COVID-19 (p -value = 0.001).

Parents living in urban areas are also 1.9 times more likely to have school-age children with excellent COVID-19 transmission prevention behavior compared to parents living in rural areas after controlling for the variables of parental

age, parental education, and parental knowledge. Thus, the parents' demographic significantly influences the behavior of school-age children in preventing the transmission of COVID-19 (p -value = 0.008).

Logistics regression model equation

The Z behavior of children of good school age = $-2.077 + 1.729$ elderly parents + 0.376 high parental educations + 0.965 good knowledge + 0.622 residences in the city.

Table 3. Final model of the effect of parental characteristics, children, and COVID-19 information on school-age children's behavior in avoiding COVID-19 transmission (n = 474)

Variable	B	S.E	Wald	p-value	OR	95% CI OR
Parents' age	1729	0364	22573	0001	5636	2762-11502
Parents' education	0376	0238	2504	0114	1456	0914-2320
Knowledge	0965	0229	17686	0001	2625	1674-4115
Demographics	0622	0234	7053	0008	1862	1177-2946
Constanta	-2077	0366	32265	0001	0125	

DISCUSSION

This study analyzed factors that affect the prevention of COVID-19 transmission in school-age children based on the Health Belief Model theory by Rosenstock (1974). This study's results indicate that parents' age affects the behavior of preventing the transmission of COVID-19 in school-age children. However, different results showed that age has no effect on behavior formation during the COVID-19 pandemic, but gender affects psychological impact. The study stated that women are more likely to experience psychological behavioral disorders (Yıldırım & Güler, 2020).

This study found that parental demographics affect the behavior of preventing the transmission of COVID-19 in school-age children. Urban areas have a better economy and facilities than rural areas, therefore people living in urban areas are better at providing equipment and adequate information to prevent the transmission of COVID-19 (Cao et al., 2020). The results of different studies also showed that the high transmission of COVID-19 is associated with mobility and the use of public transportation in urban areas (Costa, 2020). School-age children require adherence to health protocols during activities (Paterson et al., 2021; Paulsen et al., 2021; Zhong et al., 2020).

The parent's level of education has a significant effect on the behavior of preventing the transmission of COVID-19. The level of education will affect the parents' knowledge. A study conducted in Hubei, China, stated that 90% of parents correctly filled out a questionnaire about the knowledge and prevention of COVID-19 transmission; 97.1% said they believed that they would win the war against the COVID-19 pandemic, and 98% said they used a mask when leaving the house. Thus, the respondents' characteristics such as education level influence the knowledge and practice of preventing the transmission of COVID-19 (Zhong et al., 2020).

The results showed that comprehensive parental knowledge affected the behavior of school-age children in preventing the transmission of COVID-19. Previous literature has also found that good parental knowledge will improve school-age children's physical, emotional, social, intellectual, and spiritual well-being (Dalton et al., 2020). Furthermore, parents could apply COVID-19 transmission prevention behaviors such as keeping their children sleeping 9-11 hours to maintain emotional stability and optimizing growth hormones at night (P. Chen et al., 2020; Király et al., 2020). Parents could also assist their children when accessing information on social media to meet their socializing needs, as well as to

The logistic regression model can be used as a basis for calculating the probability of COVID-19 prevention behavior in school-age children and lead to mapping risk groups or groups with a small probability.

channel their skills and maintain their children's emotions (Dong et al., 2020; Goldschmidt, 2020; Jiao et al., 2020).

The characteristics of the child also influence parental knowledge. Erikson's theory of psychosocial development (1963) states that school-age children are in the industrial versus inferiority stage. Children learn about rules such as wearing masks and keeping a distance when playing with friends. Piaget's theory of development (1969) adds that school-age children are at the concrete operation stage; namely, children learn based on logic and causal relationships in problem-solving (Murray et al., 2017). Obstacles experienced by parents in shaping the behavior of their school-age children are difficulties in explaining the importance of implementing health protocols and children experiencing boredom. Lack of time for parents to accompany their children, an undisciplined environment in implementing health protocols, and culture in the community are also other obstacles. UNICEF (2020) recommends having an open dialogue following the child's growth and development (Roy et al., 2020). The role of parents as role models is to explain to their children about the COVID-19 pandemic in easy-to-understand language and provide examples of hygienic behavior (Buheji et al., 2020).

The study found that a child's welfare is formed by 3 key components: good communication between children and parents, family beliefs or belief systems, and organization against the psychosocial impact of the COVID-19 pandemic (Jiao et al., 2020). Increasing parental knowledge in shaping children's COVID-19 transmission prevention behavior was conducted through the concept of "social learning". Social learning is the provision of aggressive family-based health information and education to optimize the role of the family. Communication strategies with cultural and religious approaches are also needed to increase beliefs about the risk of contracting the disease to form good preventive behavior (Adesina et al., 2021; Alagili & Bamashmous, 2021; Lee & You, 2020; Li et al., 2020; Prime et al., 2020).

This study proved that parental characteristics have a significant effect on the behavior of school-age children, especially on perceived susceptibility, severity, benefits, and cues to action. Other research shows that research respondents have a higher perceived severity of the impact of COVID-19 infection than their perceived susceptibility to COVID-19 infection. The practice of preventive measures is related to beliefs about the risk of COVID-19 disease. Faith in the risk of illness will increase confidence in protective behavior and affect adaptive behavior (Lee & You, 2020).

Moreover, perceptions of the belief in the severity of signs and symptoms and viewing COVID-19 as a severe disease will cause parents to adopt COVID-19 transmission prevention behaviors in their school-age children (Costa, 2020).

The limitation of this study is that the research was conducted through online surveys, therefore we were unable to reach parents who do not have access to the internet and smartphone networks. Further research can be conducted using face-to-face interviews and observation for data collection. Future research can also be conducted to examine the most effective interventions to optimize the role of parents in shaping the behavior of school-age children in preventing the transmission of COVID-19.

CONCLUSION AND RECOMMENDATION

Parental characteristics, such as age, education, knowledge, and demographics have a significant effect on preventing the transmission of COVID-19 in school-age children. Nurses could optimize these parents' ability to increase the positive behavior of school-age children by preventing the transmission of COVID-19 through the provision of family-based information and education by considering demographic factors, education, and the parents' age.

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