SOCIAL DETERMINANT OF COVID-19 RISKS AMONG CHILDREN IN JAKARTA, INDONESIA

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Abstract

Pandemics have historically disproportionately impacted the poor and disadvantaged. Poverty, the external environment, and race or ethnicity can all significantly impact COVID-19 consequences. Those barriers, called social determinants of health (SDOH), are significant for many people's health. This study aimed to investigate the social determinant of COVID-19 risk among children in Jakarta, Indonesia. We recruited parents whose children were between 6 and 12 and were admitted to a general public hospital in Jakarta, Indonesia. Logistic regression was used to examine the relationship between socioeconomic status and COVID-19 risk. This analysis includes 200 parents of children aged 6 to 12 years old (60%) retrospectively recruited. About half of the parents had undertaken primary education level. No significant correlation was found between parent education level, occupation, and monthly income with COVID-19 risk among children. The number of house occupants more than two was positively associated with a higher risk of COVID-19 in children. In conclusion, poor housing conditions increase the probability of COVID-19infection in Indonesian children. This implies that parental reinforcement of anti-household transmission strategies is necessary.

Keywords: *a social determinant of health, COVID-19, children*

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INTRODUCTION

Jakarta, the capital city of Indonesia, is a very fragmented city. There are areas of wealth and poverty (Firman, 2009). This context provides a window into how social factors contribute to the spread of the COVID-19 pandemic in an economically vulnerable society with high levels of income inequality. Mena and colleagues investigated the incidence and mortality associated with COVID-19 to understand spatial variations in disease burden better. A lack of access to healthcare was the factor that contributed to higher rates of infection fatalities in lower-income municipalities (Marmot, 2002). Testing delays and capacity differences revealed a disparity in the quality of health care delivery. COVID-19 underreporting and deaths are well-explained by these metrics, which show that the disparities unfairly target younger people. Poverty, the external environment, and race or ethnicity can all significantly impact COVID-19 consequences (Abrams and Szefler, 2020). Those barriers, called social determinants of health (SDOH), are significant for many people's health (Fitzpatrick *et al*., 2015).

Monitors of pandemic and response outcomes should consider individual and community socioeconomic factors. Socioeconomic status is complex and should encompass more than income; secondly, socioeconomic characteristics are consistently associated with various outcomes, including disease incidence, mortality, and healthcare utilization. Individual (Marmot, 2002; Frank and Haw, 2011; Fitzpatrick *et al*., 2015) and community level associations with health outcomes have been observed (Billings, Anderson and Newman, 1996; Cookson *et al*., 2017). Considering the effects of material and social hardship that disadvantage poor people in general, it is not hard to imagine that the COVID-19 disease outbreak is also a result of these factors. Groups who are marginalized are particularly vulnerable. They may be more susceptible to infection due to crowded housing conditions and a relative lack of resources for self-isolation and physical separation (Malmusi *et al*., 2022).

People with poor social determinants have a much harder time physically distancing themselves from COVID-19 transmission sites. School closures exacerbate food insecurity for low-income children enrolled in school programs. Homeless people or families are more susceptible to infection. The physical and mental health of these children is at risk due to malnutrition, which lowers the immune response, which can increase the risk of transmitting infectious diseases (Allotey *et al*., 2020). The ability to physically distance oneself has been characterized as a privilege that is simply not available in some communities (Breslin *et al*., 2020). Chronic respiratory problems make the link between social inequalities and COVID-19 even stronger (Elmore *et al*., 2020). In order to determine the impact on people with negative social determinants, more research is needed.

Pandemics have historically disproportionately impacted the poor and disadvantaged. Infectious diseases such as tuberculosis can be mitigated by improving housing conditions, reducing overcrowding, and providing better nutrition. After this initial wave of COVID-19 outbreaks, it is expected that there will be recurrences. argue that new approaches to management are required (Pollán *et al*., 2020). Studies are needed to determine the impact on people with negative environmental and behavioral factors, such as mental health issues and substance abuse, associated with the study. The social determinants of health must be

considered when developing pandemic research priorities, setting public health objectives, and implementing policies (Emeruwa *et al.*, 2020). Adverse determinant interventions, such as reducing smoke exposure, can significantly reduce future pandemic risk. Furthermore, the consequences of COVID-19 have shed light on the widespread inequalities in our society, providing an opportunity to address those inequalities in the coming months and years (Elmore *et al.*, 2020). This study aimed to investigate the social determinant of COVID-19 risk among children in Jakarta, Indonesia.

METHODS

Study Design

We recruited parents whose children were between 6 and 12 and were admitted to a general public hospital in Jakarta, Indonesia. Patients from the city of Jakarta are the primary focus of this hospital (about 10,56 million people). Furthermore, during the first wave of the pandemic, this hospital was the site of most children's hospitalizations (40 percent).

Procedure

The study was approved by the ethics committees of the affiliated university (E107/ETK/IV/2020) and the hospital where it was conducted. Each participant gave informed consent. There were two ways for parents with children under the age of 12 to get involved: (1) Children admitted for delivery between April 15, 2020, and August 15, 2020, were contacted by phone and invited to participate in a retrospective sub-cohort. (2) At admission, the prospective sub-cohort of children under the age of 12 who will be admitted for delivery on or after August 26, 2020, were invited. A PCR test was performed on all of them the day they arrived at the hospital.

Measures

Interviewing the parent yielded information on the family's socioeconomic status, which was then used to categorize the children as having completed elementary, secondary, vocational, or university-level training. Surface in square meters, number of restrooms, number of rooms, number of people in the household, and availability of air conditioning were all self-reported. The occupational statuses were classified as inactive/unemployed, employed, and self-employed.

At the time of admission to the hospital and at the time of recruitment, all children were tested for a COVID-19 current infection via PCR. At the time of recruitment, PCR-positive children were considered positive for COVID-19 in this study.

Statistical Analysis

A numeric value or a percentage denotes variables. Logistic regression was used to examine the relationship between socioeconomic status and COVID-19 risk. The results are presented as odds ratios. We used cubic splines to incorporate them into logistic regression models to evaluate housing factors as continuous data without assuming a linear correlation with COVID-19 infection. Due to the post hoc nature of the analysis, odds ratios and 95% confidence intervals were calculated. The IBM SPSS version 23 was used to conduct all of the analyses.

Table 1 Socio-economic characteristics (n=200)

Variable	n (%)
Parent characteristics	
Educational level	

Variable	n (%)
Primary school	86 (43)
Secondary school	67 (33.5)
Tertiary school	47 (23.5)
Occupation	
Unemployed	132 (66)
Employed	68 (34)
Monthly income	
Below minimum basic salary	156 (78)
Above minimum basic salary	44 (22)
Children characteristics	
Age, Mean ± SD	10.43±3.87
Gender	
Male	120 (60)
Female	80 (40)
Having comorbidity	
Yes	56 (28)
No	144 (72)
House are	
<24 m^2	153 (76.5)
25-49 m^2	12 (6)
≥50 m^2	35 (17.5)
Number of toilets	
1	168 (82)
2	27 (13.5)
≥3	5 (2.5)
Number of rooms in the house	
1 or 2	161 (80.5)
3	36 (18)
≥4	3 (1.5)
Number of occupants of the house	
2	56 (28)
3	74 (37)
≥4	70 (35)
Availability of air conditioning	
No	178 (89)
Yes	22 (11)

RESULTS

This analysis includes 200 parents of children aged 6 to 12 years old (60%) retrospectively recruited. About half of the parents had undertaken primary education

level. Regarding occupation status, 66% of parents were unemployed, and 78% had a monthly income below the minimum basic salary. About 76.5% of them had house surfaces less than 24-meter square, 80% with only one restroom, and 80% had 1 or 2 rooms. About 72% lived more than two cohabiting and 80% without air conditioning (Table I).

Table II shows the association between social-economic characteristics and the risk of COVID-19 among children. In multivariate analysis, no significant correlation was found between parent education level, occupation, and monthly income with COVID-19 risk among children.

Table III shows the association between housing and the risk of COVID-19 in children. In multivariate analysis, the housing surface was positively associated with a higher risk of COVID-19 infection (OR = 2.00, 95% CI (1.87–5.45) for surface with less than 24-meter square). The number of restrooms was also significantly associated with the risk of COVID-19 (OR= 1.61, 95% CI= (1.87–5.45) for only one room). The number of rooms one or two was associated with risk of COVID-19 with OR 2.34, 95% CI=1.34-6.09. The number of house occupants more than two was significantly associated with a higher risk of COVID-19 among children (OR=2.82, 95%CI=1.23-7.82).

DISCUSSION

There is a link between the prevalence of COVID-19 in children and a higher number of rooms, a higher population, and a lower surface area per person. Coronavirus positivity was not associated with the parent's educational level or employment status. About COVID-19 transmission, it is possible that children between the ages of 6 and 12 have been particularly exposed to the virus in their homes rather than at school, based on the increased risk associated with housing characteristics. Children who tested positive for COVID-19 also had higher numbers of rooms, occupants, and floor area per person than those who tested negative, as well as lower levels of heating.

Table 2 Association between social-economic characteristics and risk of COVID-19 among children.

Variable	Univariate analysis OR (95% CI)	Multivariate analysis OR (95% CI)
Educational level		
Primary school	2.34 (1.02–6.18) *	0.72 (0.22–1.31)
Secondary school	0.68 (0.41–3.47)	1.18 (0.31–4.46)
Vocational training	0.31 (0.15–1.39)	0.96 (0.45–2.03)
University	1 (ref.)	1 (ref.)
Occupation		
Unemployed/inactive	0.87 (0.36–1.37)	1.17 (0.59–2.28)
Working	1 (ref.)	1 (ref.)
Monthly income		
Below minimum basic salary	1.42 (0.76–2.39)	1.05 (0.97–2.36)
Above minimum basic salary	1 (ref.)	1 (ref.)

However, parental education and employment status did not correlate with

coronavirus positivity. Children between the ages of 6 and 12 are more likely to get COVID-19 if they live in a home with many people. Indonesia has been one of the hardest hits by the COVID-19 pandemic. A study in Spain looked at the prevalence of antibodies against COVID-19 and found no difference in income level in its first wave (Emeruwa *et al.*, 2020). Regarding family income and housing conditions, these findings agree with ours, indicating a higher risk of infection in people who live in poorer conditions. It has also been found that pregnant women who live in areas with a high population density and a high number of residents per room are more likely to become infected with COVID-19 (Emeruwa *et al.*, 2020).

More than half of the people who live in the same house as an affected individual would have COVID-19 detectable at any given time (Shen *et al.*, 2020; Sun *et al.*, 2021). People who live in cramped quarters may find it challenging to maintain their own space, increasing the amount of time they spend interacting with others (Rolfes *et al.*, 2021). In this way, it is essential to note that out of all the different types of contacts, only those in the household show an intergenerational pattern (Sun *et al.*, 2021), which could have led to a more extensive spread of the disease. People should remember that lockdowns, stay-at-home advice, and non-essential work could have kept many people from getting COVID-19 in the workplace, but it has not done anything about transmission at home and could have even made it worse (Sun *et al.*, 2021).

Our findings may impact public health. Protecting against COVID-19 transmission in the home is not easy. Prevention efforts in the house, such as protective equipment or operational procedures, could have been more widespread. Children could have taken online classes to avoid getting COVID-19, and they could have done this to protect themselves. Public health officials have not encouraged people to take steps that could have been especially useful if their kids took online lessons, but their parents worked. Household interactions of COVID-19 cases have been quarantined (UK, 2021; Zhang, 2021), but imposing them may be challenging due to lack of resources or house space.

Table 3 Association between the housing and risk of COVID-19 in children

Variable	Univariate analysis OR (95% CI)	Multivariate analysis OR (95% CI)
House are		
<24 m^2	1.88 (1.05–6.32) *	2.00 (1.87–5.45) *
25-49 m^2	1.76 (1.13–4.89) *	1.41 1.50–5.32) *
≥50 m^2	1 (ref.)	1 (ref.)
number of toilets		
1	1.86 (1.37–5.42) *	1.61 (1.21–6.73) *
2	1.53 (0.74–3.18) *	1.60 (0.76–4.35) *
≥3	1 (ref.)	1 (ref.)
number of rooms in the house		
1 or 2	2.08 (1.45–7.29) *	2.34 (1.34–6.09) *
3	1.45 (1.11–3.79) *	1.27 (1.09–5.34) *

Variable	Univariate analysis OR (95% CI)	Multivariate analysis OR (95% CI)
≥4	1 (ref.)	1 (ref.)
number of occupants of the house		
2	2.82 (1.23–7.82) *	2.13 (1.42–7.53) *
3	1.89 (1.04–5.76) *	1.18 (1.02–4.92) *
≥4	1 (ref.)	1 (ref.)
Availability of air conditioning		
No	0.38 (0.11–1.09)	0.42 (0.19–1.16)
Yes	1 (ref.)	1 (ref.)

Our research has some limitations. To begin, our findings included both present and previous COVID-19 infections. In this regard, our findings could perhaps be viewed as total overall over the study duration; thus, we prevented any timeframe evaluations. Second, socio-economic status was self-reported, introducing some recall bias. Because this data was collected prior to testing for COVID-19 infection, we suppose that any bias, if it exists, will be non-differential, resulting in odds ratio estimates biased towards the null. Thus, our findings on social, economic factors linked to increased risk of COVID-19 infection are reliable. Finally, our house score was made up on the spot, even though bootstrapping validated it internally. This points tally needs to be checked out by other groups. However, our study has some advantages, such as our hospital focused on children's care during the top trending months of the disease outbreak, which makes our study population-based. Weather conditions may impact both COVID-19 circulation and a child's time spent at home, as well as on the mother's compliance with specific suggestions, such as standard airflow. More research is necessary to confirm whether the connection we discovered between housing and infection risk was consistent across multiple waves of the disease outbreak, which happened during various climate seasons.

CONCLUSIONS

In conclusion, poor housing conditions increase the probability of COVID-19infection in Indonesian children. This implies that parental reinforcement of anti-household transmission strategies is necessary. The instructions for household quarantine might contain particular recommendations if a child is in the family, which would be helpful in this situation.

CONFLICT OF INTEREST

All author declares no conflict of interest.

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