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CHILD MORBIDITY IN EASTERN INDONESIA: DOES EDUCATION AND SMOKING BEHAVIOR OF PARENTS INFLUENCE IT?

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ABSTRACT

Child health is important, as it contributes to the child's future. Indonesia was ranked second after India as a country with the highest tuberculosis (TB) cases. Well-educated parents must care for their children and maintain their health. At the same time, provinces in Eastern Indonesia have the lowest percentage of non-smoking areas (KTR) implementation. In this study, we analyzed the level of morbidity that focuses on respiratory disease, namely coughing and breathlessness in children. In addition, this study also analyzed the education and parents' smoking behavior focused in Eastern Indonesia. The study analyzes child morbidity according to several affecting factors. Data used were cross-section data collected from secondary data from Indonesia Family Life Survey East (IFLS-East) in 2012. By applying the logistic regression analysis by logit and probit analysis, we figured out that parents' education, children's age, health service availability, and domicile area significantly influenced child morbidity. Fathers' education played a crucial role, as the higher their education, the lower their children's morbidity. Besides, we also found out that parents' smoking habits, child immunization status, sex, and health insurance ownership did not significantly influence child morbidity. Fulfillment of educational aspects is required to the maximum until reaching adulthood, especially for unmarried individuals. Apart from that, parents of smokers and non-smokers need to be educated effectively on the dangers of smoking in order to create a healthy environment and the importance of tobacco or cigarette control policies in the Eastern part of Indonesia.

Keywords: child morbidity, education, parents' smoking behavior, eastern indonesia

Introduction

Indonesia was ranked second after India, with the highest number of tuberculosis (TB) cases.[1] Based on the data from *Profil Kesehatan Indonesia* by the Ministry of Health, Indonesia reportedly had 330,729 TB cases in 2015, which increased to 351,893 in 2016.[1] It implicitly indicates that many people do not realize or even recognize the danger of tuberculosis and its treatment. We assumed they might not get any related education or did not implement the recommended behavior. Education level may reflect individual health knowledge, and individual behavior or habit may determine their health.

Parents with higher education will undoubtedly have better methods of taking care of their children and maintaining their health. Children still depend on their parents and are vulnerable to their surroundings, so all activities conducted by the parents may determine their health. Besides, children's health is essential because it can be an investment for their future. KPPPA (*Kementerian Pemberdayaan Perempuan dan Perlindungan Anak*, Ministry of Woman Empowerment and Child Protection) and BPS (*Badan Pusat Statistik*, Central Bureau of Statistics) argued that in 2017, the percentage of ill children (morbidity) was 15.86%. The morbidity consisted of cough and shortness of breath, but it may be alarming, as the symptoms last long and may deteriorate, causing tuberculosis.

We have acknowledged that one of the tuberculosis causes is cigarette smoke. Some empirical research examined the effects and risks of cigarette smoke on children's health.[2–9] The impacts and risks suggest that we make a non-smoking area policy. The smoking-banning policy issued by the government that could increase the rate of healthy baby birth. The policy indicated that the government began to be concerned about smoking impacts, encouraging them to implement non-smoking environments. In the Eastern part of Indonesia, there are few non-smoking public rooms.

Some research showed that various aspects that potentially affect children's health either directly or indirectly. Early children's health shall acquire attention and support from all parties. For example, air pollution in the room had the most significant impact on children's health.[4] The children whose mothers smoked could suffer from respiratory problems higher than children whose mothers did not.[2] Moreover, in Portugal, children with smoking mothers with low-level education had a higher risk of cigarette smoke exposure.[2]

Furthermore, parents' socio-economic status and behaviors also greatly influence children's health. Parents' behaviors during their children's prenatal period and childhood.[10] They figured out that poor and less educated parents with bad health in the US negatively impacted all aspects of their children's health. Meanwhile, children born to highly educated mothers tended to maintain good health. Household characteristics, insurance ownership, and distance from smokers also affected children's health status. The highly educated women managed to postpone their

marriage, restrict their fertility, improve early children's health investment, and deliver children with good nutrition.

Educated women also preferred to give immunization services to their children, avoiding any potential disease.[2,11] 89% of children in Sierra Leone had been provided BCG immunization to prevent tuberculosis. It decreased the infant mortality rate during their survey period. Respiratory infection and diarrhea have caused child mortality.[12] In addition, parents' education and economic status were also risk factors for child morbidity. The interaction between parents' education and financial status and the risks of diarrhea and respiratory diseases in children.[13,14] It shows that mothers' high education gave effect to the improved protection for children born in wealthy families.[14] Moreover, improved economic status might cut the health risks of children with more educated women. Children in a higher economic quartile had less potential to suffer from diarrhea and respiratory diseases.

The correlation between parents' education, children's health results (body height and weight), and immunization status.[2,3,6] It found that fathers' education was positively related to immunization decisions, while mothers' education was reportedly more related to long-term health results, such as body height and weight. In Bangladesh, fathers' education was more considered a determinant factor of childhood stunting than mothers'.[13] Compared to research focusing on mothers, there is less research on fathers' education to determine health, as fathers play unclear roles in raising their children. However, fathers' education might be more than that because, in developing countries, they are often more educated than mothers.[14] For instance, in Pakistan, fathers got three years higher education than mothers. Meanwhile, mothers' exposure to media and health knowledge were the main channel affecting their children's body height. At the same time, empowerment in their households influenced their children's body weight.[15]

Cigarette smoke exposure at home or in cars affects children's health issues in many countries. The findings conveyed that 32.3% of children who did not suffer from asthma and 32.4% of children who suffered from asthma had been exposed to cigarette smoke at home since at least one family member smoked. Additionally, 18.6% of children who did not suffer from asthma and 17.9% who suffered from asthma were exposed to cigarette smoke in cars. The prevalence of stunting, underweight, and wasting was significantly higher in children whose parents consumed tobacco than children whose parents did not.[2–4,8,11]

Respiratory diseases, such as URI (Upper Respiratory Tract Infection), may cause fatality to children's health. Some risky factors potentially affect URI prevalence in children.[15] The risk factors were breast milk provision, household size, fuel use, and parents' education and smoking behavior. They declared that bad immunization status significantly influenced URI prevalence and that 50% of inadequately immunized subjects suffered from chronic URI. Chronic URI caused

pneumonia that was also affected by malnutrition, inadequate breast milk provision, large family size, and parents' low education.

Furthermore, the influence of parent's education and the number of family members on URI in children under five years old in Ahmedabad.[16] They defined that URI prevalence was lower in urban areas (17.2%) than in rural areas (26.8%), as there were few essential health services and low socio-economic status in the second areas. Meanwhile, The effects of parents' education on children's health described that in developing countries, mothers' education had more impact on children's nutrition than fathers'.[17] In addition, parents' low education and 'rough' work influenced stunting prevalence of children.[4] In India, significant determining factors of stunting were children's age, fathers' education, occupation factor, income, vitamin A provision, and anemia. Moreover, Illiterate mothers were more prone to give birth to stunted children than literate mothers.[18] The parents' formal education was an essential factor influencing stunting in Guatemala's rural areas.[13]

There is much evidence of the effects of education and smoke on health. Therefore, we require a government policy that restricts the number of smoking rooms. The restriction or smoking ban may become an alternative to prevent children's health issues. The procedure stipulated by the government, particularly the effects of the smoking ban on women's pregnancies working at bars or restaurants.[19] The procedure improved the rate of healthy baby birth, minimized the possibility of premature birth, and even decreased the rate of infant mortality. It emphasizes that parents must not smoke near their children and that a 100% non-smoking environment shall be established. Additionally, it encourages men and women who become parents to be concerned about their education and behaviors, enabling them to raise and take care of their children well. Finally, the research highlights the importance of tobacco or cigarette-controlling policies to improve children's and parents' health.

According to the provincial government, in 2017, the small percentages of regencies/cities that had implemented the non-smoking areas (*KTR, Kawasan Tanpa Rokok*) in 50% of schools belonged to provinces in Eastern Indonesia, namely East Nusa Tenggara (9%), Papua (10%), and Southeast Sulawesi (11%).[1] Consequently, the child morbidity rate caused by cigarette smoke was high. The phenomenon becomes the background of our research that analyzes factors influencing child morbidity in Eastern Indonesia.

Our research is different from other conducted research in terms of the research method. In this research, we analyzed the morbidity rate by existing components in secondary data: cough and shortness of breath that children had suffered for the last month. Additionally, we observed parents' education and smoking behavior in Eastern Indonesia.

Methods

Research data were collected from the Indonesia Family Life Survey in East (IFLS-East) as the secondary data. IFLS-East was a national survey providing a vast individual, household, and community-based dataset. It represented 80% of the population in eastern Indonesia. Seven provinces included in IFLS-East were East Nusa Tenggara, East Kalimantan, Southeast Sulawesi, Maluku, North Maluku, Papua, and West Papua. The research used a dependent variable, such as child morbidity rate acquired from the data of respiratory tract diseases, such as cough and shortness of breath that children had experienced in the last month. Furthermore, independent variables employed in this research were parents' smoking habit,[16] parents' education,[2,13–16,18,20] children's age (0-5 years old), children's sex, area,[16] immunization provision for children,[17] health service availability,[16] and health insurance ownership.[21] The operational definition of the used variables is presented in Table 1.

Table 1. The Operational Definition of Research Variables

Variables	Code	Questions of variable
Morbidity	MAA01	Did your child ever experience […] in the last 4 weeks?
Age of Child	COV3B5	How old is [name of child]??
Parent's Smoker	KM01A	Have you ever chewed tobacco, smoked a pipe, smoked self-rolled cigarettes, or smoked cigarettes/cigars? Do you still have the habit, or have you totally quit?
Parent's years of schooling	AR16, AR17	Highest Level of Schooling Attended by Parent? Highest grade ever completed by Parent?
Gender of child	COV3B5	Sex of child (male/ female)
Giving immune	RJA30A	Please let us know, whether [child] has already received the immunizations of TBC or BCG?
Facilitated of health care	J19	In this village, is there a Health Care (Pos Kesehatan Desa/Poskesdes)?
Health insurance ownership	KR26	Does this household have a Health Card or JAMKESMAS card?
Domicile	SA2	Urban/rural

Note: *Indonesian Family Life Survey (*IFLS) *East Data retrieved by* RAND website

This study used cross-sectional data because the IFLS-East only had one survey period. In this study, ethical clearance was not proposed by the author because IFLS-East data was open source data that could be accessed by everyone on the website of RAND. The data analysis method used in this study is logistic regression analysis by logit and probit models. The logistic regression model is an approach to making predictive models with the dependent variable dichotomous scale, a nominal scale with two categories.[22] The model can be written as follows:

$$P_i = \frac{1}{1+e^{-Z_i}} = \frac{e^{z}}{1+e^{z}} \quad \text{.....(1)}$$

where $Z_i = \beta_1 + \beta_2 X_i$, Thus, the equation for this research model is as follows :

$$Morbid_i = \beta_0 + \beta_1 A_i + \beta_2 P_i + \beta_3 E_i + u_i \quad \text{..... (2)}$$

Where:

$Morbid_i$:Child Morbidity

A_i : Variable characteristics of children (age and gender)

P_i : Variable characteristics of parents (smoking behavior, father's years of schooling, mother's years of schooling)

E_i : Control variables (immunization, domicile, health insurance ownership, Health care facilities)

u_i : *error term*

Results

To measure child morbidity, the analysis unit employed was characteristics of children aged 0-5 years old in eastern Indonesia. We considered the analysis unit, as children aged less than six years old were more relatively prone to diseases, and the symptoms might develop in the long term. Then, the child morbidity rate was measured through indicators showing children's vulnerability to disease and focusing on their respiratory tract (asthma, shortness of breath, lungs, and others) based on the available self-reported data. It was estimated by the dummy variable value scored 1 and 0 when children were 'vulnerable to disease/had highly increased morbidity' and when they were 'not vulnerable to disease/had decreased morbidity, respectively.

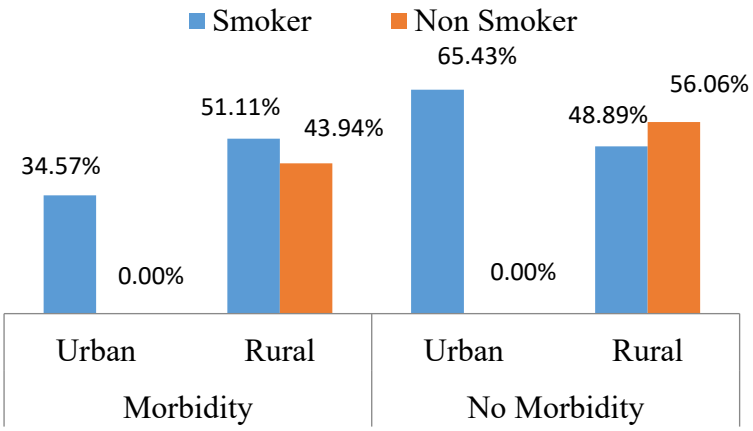

Figure 1. Percentage of parental smoking status by area and child morbidity in Eastern Indonesia

Source: Data IFLS-East processed by author, 2022

According to Figure 1, all parents living in urban areas smoked. However, 51.11% of smoking parents had children suffering from morbidity, and 56.06% of children suffered from morbidity in rural areas. It should have resulted differently when the percentage of children that did not suffer from morbidity was high in smoking parents.

Table 2 shows a statistical description of the sample, namely children aged 0-5 years old suffering or not suffering from morbidity and intervened by several other variables. In accordance

with the description data, 94.58% or 1,152 parents smoked, while the percentage of parents that did not smoke was low in eastern Indonesia. Additionally, the percentage difference between children experiencing morbidity and those that did not was also low, as was the percentage difference between male and female children experiencing morbidity. Besides, we could also observe that almost 86.70% or 1,056 of 1,218 respondents lived in rural areas. There were 535 children suffering from morbidity who lived in rural areas. In contrast, there were fewer children suffering from morbidity who lived in urban areas.

Health service availability, such as polyclinics and village health posts in eastern Indonesia, was 66.26% in percentage, or there were 807 villages with no health service available. There were only 411 villages facilitated by health services. A percentage of 70.39% depicting no-health-service-availability conditions made children suffer from morbidity. Moreover, of the availability of health facilities, children that did not suffer from morbidity were 236 out of 1,218 in number or 37.64% in percentage. Generally, the use of health services was supported by health insurance that was given by either the government or certain parties in eastern Indonesia. The difference between those that owned health insurance and those that did not was relatively small, was eight in number (605 people owned health insurance, whereas 613 people did not). Furthermore, the difference between child morbidity suffered by respondents who owned health insurance and that suffered by respondents who did not was small as well.

Table 2.Tabulation of Respondents' Statistical Descriptions

Variables	No Morbidity	Morbidity	Total
Parents' smoking status			
Smoker	94.10	95.09	94.58
Non Smoker	5.90	4.91	5.42
Gender of child			
Male	50.08	52.96	51.48
Female	49.92	47.04	48.52
Domicile			
Urban	16.91	9.48	13.30
Rural	83.09	90.52	86.70
Immunization Status			
Immunization	79.11	79.70	79.39
No Immunization	20.89	20.30	20.61
Availability of health services			
Exist	37.64	29.61	33.74
No exist	62.36	70.39	66.26
Health insurance ownership			
Have insurance	49.44	51.27	50.33
Don't have insurance	50.56	48.73	49.67
Total of samples	627	591	1.218

Note: Measure the value of morbidity in the percentage (%)
Source: data IFLS-East processed by authors (2022)

Moreover, the length of parents education was 7-8 years (fathers) and 6-7 years (mothers). Table 3 claims that the size proposes that most parents only graduated from junior high schools and that the highest education was a bachelor's. The later education was completed in 16-18 years, and

there were approximately 43 fathers and 31 mothers of 1,218 parents completing their bachelor's degree. Then, children's age analyzed in the model as an analysis unit ranged from 0-5 years old, with the most common age ranging from 2-2.5 years old.

Table 3. Description Data of Parent Education Statistics on Child Morbidity in Eastern Indonesia

Variables	Mean	Dev. standard	Max
Father education	7.61	3.984	18
Mother education	6.97	3.988	16
Age of children	2.47	1.743	5

Source: Data IFLS-East processed by author, 2022

The comparison estimation model was divided into Ordinary Least Square (OLS), Logit, and Probit and presented in Table 4. The three estimation models proved a consistent correlation and significance among OLS, Logit, and Probit. However, the OLS estimation was not used here since it contained biased estimators, such as probability value that might be more than one (>1), or less than that (<0), and partial effects that might be similar, so they were considered to have the linear function property. To solve it, we used non-linear models such as Probit and Logit, to represent the analysis on limited dependent variables.

Table 4. Comparison Estimation Model OLS, Logit, and Probit

	Child Morbidity		
	OLS	Logit	Probit
Parents' Smoking Status	0.0844	0.345	0.213
	(0.0640)	(0.264)	(0.164)
Years of Parent's Schooling			
Father education	**-0.00695***	**-0.0288***	**-0.0176***
	(0.00392)	(0.0163)	(0.0101)
Mother education	**0.0133*****	**0.0551*****	**0.0341*****
	(0.00413)	(0.0173)	(0.0107)
Age of children	**-0.0254*****	**-0.106*****	**-0.0655*****
(Children's age 0-5 years old)	(0.00824)	(0.0344)	(0.0213)
Gender of children	0.0304	0.128	0.0815
	(0.0285)	(0.119)	(0.0736)
Domicile	**-0.225*****	**-0.947*****	**-0.584*****
	(0.0450)	(0.194)	(0.118)
Immunization of child	0.0488	0.202	0.125
	(0.0363)	(0.151)	(0.0934)
Availability of health services	**-0.110*****	**-0.456*****	**-0.283*****
(poliklinik/poskesdes/etc)	(0.0303)	(0.127)	(0.0785)
Health Insurance Ownership	-0.00546	-0.0211	-0.0147
(bpjs, askes, jkn, etc)	(0.0290)	(0.120)	(0.0750)
_cons	0.444***	-0.228	-0.142
	(0.0792)	(0.328)	(0.203)
N	1218	1218	1218
R^2	0.041		

Note : () *standard errors*, $^{*}p< 0.1$, $^{**}p< 0.05$, $^{***}p< 0.01$, Data IFLS-East processed by author, 2022

Table 4, reveals that there was a positive correlation between parents' status and child morbidity, suggesting that when the parents were smokers and currently smoking, child morbidity increased. Furthermore, the correlation between fathers' education and child morbidity and

mothers' education and child morbidity was different. The higher the fathers' education, the more decreased the child morbidity, as seen in the negative variable coefficient symbol (-); while the higher the mother education, the more increased the child morbidity. It was in accordance with the research stating that fathers' education affected their children's health; whereas mothers' education affected their children's long-term health; such as body height and weight.[15,16]

On the other hand, children's age indicated a negative correlation, arguing that the older the children, the more decreased the children's morbidity possibility. It might occur because when children grow older, their immune system should be more developed. However, it would never happen if parents did not maintain their children's growth well. Table 4 also clarifies that respondents domicile area influenced their morbidity (a negative correlation). Children living in rural areas were more prone to suffer from morbidity than those living in urban areas. Additionally, when respondents lived in an area facilitated by health services, such as health care, integrated service, or village health care, their proneness to morbidity decreased.

The change level of dependent and independent variables was estimated based on the marginal effects resulting by Probit and Logit. Then, the estimation result was divided into four. Each analysis test had estimation with controlled variables and without controlled variables. Table 4 confirms that parents' smoking status did not significantly affect child morbidity despite their positive correlation. In conclusion, after we analyzed parents who smoke and those who do not, their children had an equal morbidity rate. However, the data structure used in eastern Indonesia conveyed that all studied parents were smokers, as defined by Figure 2. Additionally, the previous statistical description of data explained that the percentage of children experiencing increased and decreased morbidity because of smoking parents was similar: 94.10% for children that did not experience morbidity and 95.09% that did.

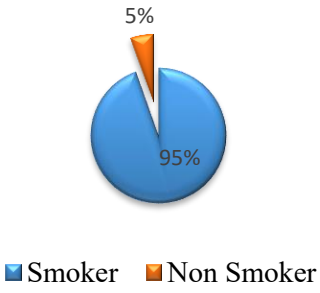

Figure 2. Percentage of 1218 Parent's Smoking Status in Eastern Indonesia

Source : Data IFLS-East processed by author, 2022

In Table 5, the length of parents' education significantly affected morbidity. Fathers' education significantly but negatively affected child morbidity. When they add 1 year of, their children's morbidity probability will be decreased by 0.0068 *ceteris paribus*. Nevertheless,

mothers' education significantly and positively affected the morbidity, depicting that when they add one year to their education, their children's morbidity probability will be increased by 0.013 *ceterisparibus*.

Besides, controlled variables (children's age, domicile area, and health service availability) contained by the models influenced child morbidity. When they child grow 1-year older, their morbidity probability will be decreased by 0.025 *ceteris paribus*. Similarly, when the children live in an area facilitated by health services; such as integrated service, polyclinic, village health care, and others, their morbidity probability will be decreased by 0.109. Moreover, the area variable indicated that children living in a rural area had 0.027 times the potential to suffer from morbidity than those living in an urban area.

Table 5. Marginal Effects of Logit and Probit Analysis

Variables	Morbidity Without Control (Logit)	Morbidity With Control (Logit)	Morbidity Without Control (Probit)	Morbidity With Control (Probit)
Parents' Smoking Status	0.0390 (0.0636)	0.0820 (0.0632)	0.0390 (0.0637)	0.0826 (0.0631)
Years of Schooling (Father)	-0.00590 (0.00391)	**-0.00680*** (0.00389)	-0.00590 (0.00392)	**-0.00689*** (0.00389)
Years of Schooling (Mother)	**0.00735*** (0.00389)	**0.0131***** (0.00408)	**0.00735*** (0.00389)	**0.0132***** (0.00407)
Age of Child	-	**-0.0253***** (0.00814)	-	**-0.0254***** (0.00812)
Gender of Child	-	0.0315 (0.0283)	-	0.0306 (0.0284)
Domicile	-	**-0.225***** (0.0442)	-	**-0.227***** (0.0447)
Immunization of child	-	0.0481 (0.0360)	-	0.0483 (0.0360)
Availability of health services	-	**-0.109***** (0.0298)	-	**-0.109***** (0.0297)
Health Insurance Ownership	-	-0.00568 (0.0289)	-	-0.00505 (0.0289)
N	1218	1218	1218	1218
R^2				

Note : () *standard errors*, $^{*}p< 0.1$, $^{**}p< 0.05$, $^{***}p< 0.01$, (-) is variable control that are considered constant or error term in logit and probit regression by model 1
Source : Data IFLS-East processed by author, 2022

Discussion

Based on the results of the study, it was found that parents education is one of the important factors influencing child morbidity. The results show that the father's role is an important factor in

maintaining children's health, especially in Eastern Indonesia. This is because, in general, men have higher education than mothers, so they can get better jobs. A good job will affect the fulfillment of nutrition and the economic status of families through the wages they get for work so that they can raise children with consumption and healthy living habits. This is also supported by previous studies on Parents education.[13,15]

In addition, our results also found a significant and positive effect of the mother's education on child morbidity (based on Table 5), which means that the higher the mother's education, the higher the child's morbidity. It is suspected that the higher the education level of a mother, the probability of becoming a working mother than being a housewife. This causes a lack of attention to children's health because the quality of interaction between mother and child is reduced. Mothers work from morning to evening, so mothers do not have much time to pay attention to food and the nutritional needs of their children. Working mothers tend to have an influence on household life, so mothers do not have much time to get information.[21] Mother's work also affects children's development because the presence of mothers in daily life for children is less than mother who do not work, so the opportunity for mothers to provide motivation and stimulation to children in carrying out sensory and motor development tasks is limited.[23–25]

In our study, there was no correlation between parental smoking status and child morbidity. However, this study implicitly emphasizes the importance of parental education in order to get good child health literacy and can apply it to children to prevent high child morbidity rates. Besides that, it is also necessary to educate parents not to smoke near children and to create a smoke-free environment. Smoking control policies in the community will improve the welfare and health of children and parents. In terms of the child's immune system, the older the child, the better the probability of health, but this also needs to be supported by the role of parents in maintaining good child development. This is in line with the results of research, which found that the age of the child affects the morbidity.[7] In addition, the results of the study also show that domicile has a negative and significant effect on child morbidity. Children living in rural areas tend to be more susceptible to high morbidity than children living in urban areas. We indicate that there is a correlation between the availability and quality of health facilities. Our findings show that there is a negative effect between the availability of health facilities and child morbidity, which means that a minimal number of health services will increase child morbidity. This supports the link between domicile and health service availability.[21] The availability of health services in rural areas tends to be less than in urban areas, so in addition to minimal access to health services, it also affects health literacy for parents about children's health.

Conclusion

The effects of parents' education and socio-economic status on child health problems have been proven by many researchers. However, parents' behaviours and smoking habits were also an

important concern. The research findings were in accordance with the findings of some previous research. Fathers' education was a crucial factor in child health problems. In developing countries, fathers were usually more educated than mothers. Fathers with higher education were able to find a better job, increasing the economic status of their family and hence enabling them to raise their children well. The research findings implicitly emphasized the importance of education. Education shall be well acquired until adulthood, especially before the students' marriage. Besides, parents must not smoke near their children, and we strongly require a 100% non-smoking environment. In addition to that, the findings also highlight the importance of tobacco or cigarette-controlling policies to improve both children's and parents' health.

There are several grounding reasons, which might be that, in eastern Indonesia, the smoking habit was considerably high, impeding the effort to examine the variation between children experiencing morbidity due to smoking or due to another cause. In addition to that, we could not investigate the impacts of cigarettes at once; while our time to perform this research was limited, and child morbidity (cough and shortness of breath) was only possibly measured in the last month. For the measurement, we proposed questions to the children's parents or guardians. Therefore, the research findings were accompanied by research limitations, particularly the limitation of child morbidity measurement that was relatively subjective, causing the possibility of error measurement.

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Conflict of Interest

The authors declare that they have no conflict of interest

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