Effects of Family Income and Maternal Education on the Risk of Low Birth Weight

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ABSTRACT

Background: Low birthweight (LBW) is still a problem, especially in developing countries. Family income and maternal education are factors that influence health service outcomes, including preventing low birth weight babies. The aim of this study was to analyze the influence of family income and maternal education on the risk of low birth weight babies.

Subjects and Method: Observational analytical research design with a cross sectional approach. The sampling technique is random sampling. The research was conducted in Blora Regency, Central Java with a sample size of 200 mothers with newborn babies. The dependent variable is low birth weight. The independent variables consist of exposure to cigarette smoke, maternal age, family income, pos pelayanan terpadu strata and maternal education. The study instrument used was a questionnaire. Data were analyzed using path analysis with STATA 13.

Results: Low birth weight was directly influenced by family income (OR= 0.52; 95% CI= 0.27 to 1.00; p= 0.050). Low birth weight is directly influenced by family income and maternal education. Family income was influenced by maternal education (OR= 2.35; 95% CI= 1.32 to 4.21; p = 0.004). Maternal education was affected by age (OR= 0.43; 95% CI= 0.24 to 0.77; p = 0.004).

Conclusion: Low birth weight is directly influenced by family income. Low birth weight is directly influenced by family income and maternal education. Family income was influenced by maternal education. Maternal education was affected by age.

Keywords: low birth weight, family income, pos pelayanan terpadu strata, maternal education, exposure to cigarette smoke

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BACKGROUND

Currently LBW babies are still a problem, especially in developing countries, the infant mortality rate (IMR) is the number of deaths of babies in the first 28 days of age, per 1,000 live births in a particular year. The infant mortality rate is one of the indicators for determining the health status of children in Indonesia. Every year, newborn or neonatal deaths reach 30% of all deaths of

children under five. Every day 8,000 newborn babies in the world die from causes that cannot be prevented. As many as 45% of infant deaths occur in the first 24 hours of a baby's life (WHO, 2012).

According to research conducted by Simamora, (2020). The proportion of LBW babies born to mothers whose husbands were active smokers was 7.5%, the proportion of LBW babies who had husbands who were active smokers was slightly higher than in mothers who had husbands who did not smoke, although the difference was not significant (PR= 1.11; 95% CI= 0.72 to 1.66). There was a significant relationship found between exposure to environmental cigarette smoke and low average birth weight (Miyake et al., 2013). Babies with LBW have a higher risk of death, delayed growth and development during childhood compared to babies who are not LBW (Rajashree et al., 2015).

The level of maternal education is one of the risk factors for mothers giving birth to babies with LBW, this is supported by research conducted at RSUP dr. Soeradji Tirtonegoro Klaten. Mothers with low education tend to be less able to deal with their pregnancy, namely from fulfilling nutrition to ANC checks which can result in LBW births. Education is a measure of economic status which influences health service outcomes. The higher the mother's educational level, the more mature she is in making decisions about how to prevent her baby from being born with a low weight (Salsabila et al., 2021).

According to the Blora District Health Service, the biggest causes of infant mortality in Blora District are LBW (34.7%), asphyxia (18.7%) and other causes (aspiration, acute respiratory infections, diarrhea, etc.). Efforts have been made to reduce the infant mortality rate starting with improving nutritional patterns for pregnant women,

improving the quality of delivery services and improving the quality of services for newborns. The number of births of LBW babies is still relatively high in Blora district, namely 507 cases (4.91%), of which LBW births pose the greatest risk of causing morbidity and infant death, so we need to be careful and think about the best solution to prevent this. Based on the background above, researchers consider it necessary to conduct research on the influence of determinants on the risk of low birth weight in Blora Regency, Central Java.

SUBJECTS AND METHOD

1. Study Design
The research design used in this research is an observational analytical research study using a cross-sectional approach. Multivariate analysis was carried out using path analysis techniques. Path analysis is a method for analyzing variables, both those that have a direct and indirect relationship.

2. Population and Sample
Population is a target with the same characteristics and can be clearly defined, namely a collection of subjects. The source population is subjects selected from the target population to be used as a truly specific subject sample that can be accessed, reached and used as a reference by researchers for research purposes through empirical observations (Murti, 2018). All mothers with newborn babies who are in the working area of the Community Health Center in Blora Regency, Central Java Province. The inclusion criteria in this study were mothers with newborn babies aged 0-7 days, mothers with newborn babies had complete medical record data. Meanwhile, the exclusion criteria in this study were mothers with newborn babies who experienced serious emergencies, mothers with newborn babies who experienced severe congenital abnormalities.

3. Study Variables

The independent variables are exposure to cigarette smoke in the home environment, age, family income, pos pelayanan terpadu strata, and education. The dependent variable is LBW.

4. Operational Definition of Variables

LBW: Newborns whose birth weight is <2500 grams, regardless of gestational age. Value 0 = LBW ≥ 2500 g, 1 = LBW < 2500 g.

Exposure to cigarette smoke: Exposure to smoke inhaled by someone, both active smokers and non-smokers (passive smokers). Value 0 = no / low, 1 = yes / high.

Age: The mother's age when pregnant is calculated based on the date of birth written on the questionnaire.

Family Income: Activities or activities carried out to meet their living needs. Average monthly income to support the entire family. Value 0=<IDR 2,0000,000 and value 1= ≥IDR 2,000,000.

Pos pelayanan terpadu Strata: Pos pelayanan terpadu service status levels ranging from pratama to independent. Value 0 = not independent, 1 = independent.

Mother's Education: the last formal education taken by the mother as a research subject until she received a diploma, as an effort to increase knowledge, obtained from formal and non-formal institutions. Value 0=<SHS and value 1= ≥SHS.

5. Study Instruments

Data collection related to exposure to cigarette smoke in the home environment, family income, pos pelayanan terpadu strata and education was carried out using interview techniques using questionnaires. Meanwhile, the dependent variable is LBW, an assessment instrument using a baby weight measuring tool.

6. Data Analysis

Univariate analysis was used to provide an overview of the characteristics of research respondents. Continuous data is described using the parameters frequency (n), mean, standard deviation (SD), minimum value, and maximum value. Meanwhile, categorical data is described using frequency (n) and percentage (%) parameters.

Bivariate analysis was carried out to understand the relationship between two variables. Differences in proportions between groups were tested using the chi-square test. Multivariate analysis was carried out using path analysis techniques. Path analysis is a method for analyzing variables, both those that have a direct and indirect relationship (Murti, 2019).

7. Research Ethics

Research ethics including informed consent, anonymity, and confidentiality, were handled carefully throughout the research process. A letter of approval for research ethics permission was obtained from the Research Ethics Committee of Dr Moewardi Regional General Hospital, Indonesia, No. 1,941/X/HREC/2023, on October 31, 2023.

RESULTS

1. Univariate Analysis

Univariate characteristics of the research sample explain the distribution of research subjects based on independent variables, namely exposure to cigarette smoke in the home environment, age, family income, pos pelayanan terpadu strata and education. The dependent variable is LBW.

Table 1. above shows that in the cigarette smoke exposure variable, there were 129 people exposed to cigarette smoke with a percentage of 64.0%, the mother's age variable, age ≥27 years was 104 with a percentage of 52.0%, family income ≥Rp.2,000,000 was 104 with a percentage of 52.0 %, the pos pelayanan terpadu strata variable with non-independent status was 116 with a percentage of 58.0%, the maternal education variable,

mothers with ≥ high school education were 121 with a percentage of 60.5%, the LBW variable, babies who did not experience LBW were 150 with a percentage of 75.0%, and those who did not LBW as much as 50 with a percentage of 25.0%.

Table 1. Results of descriptive analysis of research variables

Variable	Category	Frequency (n)	Percentage (%)
Exposure to cigarette smoke	Yes	129	64.5
	No	71	35.5
Age	< 27 years old	96	48.0
	≥ 27 years old	104	52.0
Family income	< Rp 2,000,000	96	48.0
	≥ Rp 2,000,000	104	52.0
Pos pelayanan terpadu strata	Independent	84	42.0
	Dependent	116	58.0
Mother's education	< SHS	79	39.5
	≥ SHS	121	60.5
LBW	BBLN ≥ 2500 gr	150	75.0
	BBLR < 2500 gr	50	25.0

Table 2. Bivariate analysis of the influence of exposure to cigarette smoke, age, family income, pos pelayanan terpadu strata and maternal education on the risk of LBW babies

Variable	LBW		NBW		Total		OR	CI 95%		P
	N	%	N	%	n	%		Lower Limit	Upper Limit	
Exposure to cigarette smoke										
No	20	10	51	25.5	71	35.5	0.77	0.4	1.49	0.440
Yes	30	15	99	49.5	129	64.5				
Age										
< 27 years old	24	12	72	36	96	48	1	0.52	1.9	1.000
≥ 27 years old	26	13	78	39	104	52				
Family Income										
< 2,000,000	30	15	66	33	96	48	0.52	0.27	1	0.050
≥ 2,000,000	84	42	20	10	104	52				
Integrated service post strata										
Non Independent	46	23	118	59	164	82	0.32	0.1	0.95	0.040
Independent	4	2	32	16	36	18				
Maternal Education										
<SHS (low)	25	12.5	54	27	79	39.5	0.51	0.26	0.98	0.040
≥SHS (high)	25	12.5	96	48	121	60.5				

2. Bivariate Analysis

Explaining the influence of the independent variables, namely exposure to cigarette smoke in the home environment, age, family income, pos pelayanan terpadu strata, and education on the dependent variable, namely LBW. The analytical test used in bivariate analysis is chi-square

with a confidence level of 95% (p<0.05). Bivariate analysis based on research results is as follows:

Table 2 shows the results that exposure to cigarette smoke has no statistically significant value (OR= 0.77; CI 95%= 0.40 to 1.49; p= 0.440) on the risk of LBW babies, age has no statistically significant value (OR= 1.00; CI 95% = 0.52 to 1.90; p= 1.000) on the risk of LBW babies, family income is statistically significant with a value (OR= 0.52; CI 95%= 0.27 to 1.00; p= 0.050) on the risk of a LBW baby, pos pelayanan terpadu strata is statistically significant with a value (OR= 0.32; CI 95%= 0.10 to 0.95; p= 0.040) on the risk of LBW babies, and maternal education is

statistically significant with the value (OR= 0.51; CI 95%= 0.26 to 0.98; p= 0.040) on the risk of babies LBW.

3. Multivariate Analysis

Multivariate analysis was carried out using simple path analysis using the Stata 13 program, with the following results:

Figure 1. Explains the relationship between the variables studied, described through model specifications which are differentiated based on endogenous and exogenous variables. The exogenous variables are maternal age, exposure to cigarette smoke and integrated service post strata, while the endogenous variables are maternal education, family income and LBW.

a. Path analysis model
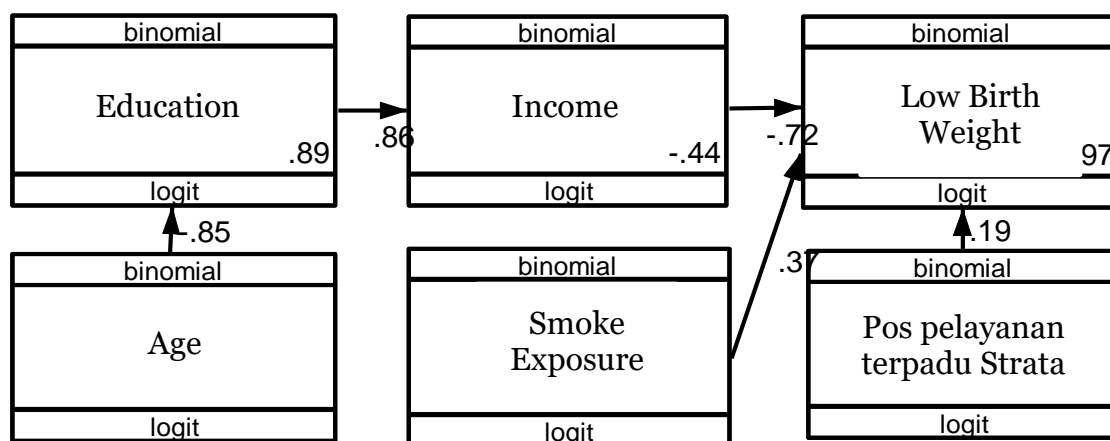
Figure 1. Path analysis results regarding factors that influence the risk of babies with low birth weight

Table 4 shows that the risk of LBW decreases with high family income, and this effect is statistically significant. Mothers from high income families have a risk of giving birth to LBW babies 0.49 times compared to those with low income (OR= 0.49; 95% CI= 0.25 to 0.95; p= 0.035). Exposure to cigarette smoke during pregnancy (OR= 1.45; 95% CI= 0.73 to 2.87; p= 0.288) or integrated service post strata (OR= 1.21;

95% CI= 0.63 to 2.32; p= 0.577) did not show a statistically significant effect.

Family income was higher for mothers with higher education and this difference was statistically significant (OR= 2.35; 95% CI= 1.32 to 4.21; p= 0.004), while for the variables of education and maternal age it showed that mothers whose average age was ≥ 27 years old were less likely to have a college education than mothers with a mean

age < 27 years, and this difference was statistically significant (OR= 0.43; 95% CI= 0.24 to 0.77; p= 0.004).

b. Parameter Estimation

Table 4. Path analysis results regarding factors that influence the risk of babies with low birth weight

Dependent Variable	Independent Variable	OR	CI 95 %		P
			Lower Limit	Upper Limit	
Direct Effects					
LBW	← Family income (≥Rp 2,000,000)	0.49	0.25	0.95	0.035
LBW	← Integrated service post strata (Mandiri)	1.21	0.63	2.32	0.577
LBW	← Exposure to cigarette smoke	1.45	0.73	2.87	0.288
Indirect Effects					
Family Income (≥Rp 2,000,000)	← Maternal Education (≥SHS)	2.35	1.32	4.21	0.004
Maternal education (≥SHS)	← Maternal Age (≥27 years)	0.43	0.24	0.77	0.004

DISCUSSION

The influence of exposure to cigarette smoke, integrated service post strata, maternal age, family income and maternal education on the risk of LBW babies.

1. The effect of exposure to cigarette smoke on the risk of LBW babies

Exposure to cigarette smoke is exposure to smoke inhaled by someone who is not a smoker (passive smoker). Cigarette smoke is more dangerous for passive smokers than active smokers. Cigarette smoke contains dangerous substances such as tar, nicotine, carbon monoxide and lead which can interfere with the growth of the fetus in the womb. Exposure to cigarette smoke is one of the factors causing LBW births, environmental factors that are exposed to cigarette smoke can cause mothers to give birth to babies with LBW (Putri et al., 2019).

Based on the results of the path analysis carried out in this study, it was stated that exposure to cigarette smoke during maternal pregnancy was not statistically significant in the risk of birth of a LBW baby, value

(OR= 1.45; 95% CI= 0.73 to 2.88; p= 0.288). This is in line with the results of research conducted by the Sidotopo Community Health Center, Semampir District, Surabaya City which analyzed the relationship between exposure to cigarette smoke and the incidence of low birth weight using analytical observational type. The results showed that exposure to cigarette smoke in the case and control groups had no relationship with the incidence of LBW (p = 0.693) (Vitara, 2023).

Supporting previous research conducted by Simamora et al., (2020), stated that exposure to cigarette smoke was not significantly related to the risk of LBW babies with a value of (PR= 1.10; 95% CI= 0.72 to 1.66) after adjusting for confounding variables, variables that The question in question, namely antenatal care services, is a confounding variable, an unmeasured variable that can influence the alleged cause and effect.

2. The influence of family income on the risk of LBW babies

Family income is the total real income of all household members which is used to meet collective and individual needs in the household. Family income influences the incidence of low birth weight (LBW) babies, based on the results of the path analysis that has been carried out, it is stated that high family income can reduce the risk of mothers giving birth to LBW babies by 0.49 times compared to low family income (OR= 0.49; CI 95 %= 0.25 to 0.95; p= 0.035).

The results of this research are in line with the results of research in the Gedung Johor Village, Medan City, where the results of the research show that there is a link between socio-economic status and the incidence of LBW where the p value is (0.005), this research recommends that every pregnant woman should still consume nutritious food even though not expensive food (Sitorus et al., 2022). Supporting research conducted in Nganjuk Regency, East Java stated that there was an indirect relationship between family income when the mother was pregnant and the incidence of LBW babies in Nganjuk Regency, East Java. Socioeconomics, especially income, influences households in obtaining food needs and health services (Nurahmawati D, 2017).

In line with research conducted in Prabumulih City, South Sumatra, it was stated that there was a relationship between family income and the risk of LBW babies at the East Prabumulih Health Center, Prabumulih City in 2019. Efforts to improve the level of health in a family must be supported by income. With a high income, it is easy for someone to buy medicine when they are sick, buy nutritious food when they are pregnant and get easy access to doctor's services when they are pregnant. The statistical test results showed that p= 0.001 (p ≤ 0.05),

meaning that there is a significant relationship between family income and the risk of LBW babies (Anggriani, 2020).

3. The influence of integrated service post strata on the risk of LBW babies

The integrated service post level is a level of health services that is considered important in efforts to improve the health status of mothers and children. The level of integrated service posts influences the services provided to the community. Independent integrated service posts or often known as plenary integrated service posts can carry out activities more than 8 times per year, with an average number of cadres of five people or more. Based on the results of the path analysis that was carried out, the integrated service post strata did not statistically significantly influence the incidence of LBW babies, value (OR= 1.21; 95% CI= 0.63 to 2.32; p= 0.577). Research that supports this research, conducted in Cilegon Regency, Banten Province, states that there is no relationship between the availability of health services and the risk of LBW babies, meaning that the presence or absence of health services in the area has no influence on the birth of LBW babies (Pertiwi et al., 2022).

An integrated service post is a forum for community participation in realizing the level of health of the people living in their environment. In order to achieve a good level of integrated service post, the support of skilled cadres is needed. The results of research conducted by Butarbutar (2022), there is an influence of integrated service post cadre training on integrated service post strata where p= 0.027. This means that even though the integrated service post strata are complete, the cadres are not active as drivers of activities at the community health center, the results are not optimal in improving health status, especially maternal

and child health.

4. The Effect of education and mother's age

Based on the results of the path analysis that has been carried out, it shows that mothers with an average age of ≥ 27 years are less likely to be highly educated than mothers with an average age of < 27 years, and this difference has a statistically significant value (OR= 0.43; 95% CI= 0.24 to 0.77; p= 0.004). This is in line with research conducted by Demelash et al., (2015) showing that maternal age < 20 years has a 3.0 times risk of giving birth to a LBW baby, while low formal education has a 6 times risk of giving birth to a LBW baby. Based on research conducted by Sholiha and Sumarmi (2015), it is stated that mothers aged ≥ 27 years (20-35 years) have lower education than mothers aged < 27 years, as evidenced by the analysis results of the p value < 0.05 (OR= 0.19; CI 95 %= 0.04 to 0.79; p= 0.002).

5. The Effect of family income and mother's education

Based on the results of the path analysis that has been carried out, it shows that family income is higher for mothers with higher education and this difference is statistically significant (OR= 2.35; 95% CI= 1.32 to 4.21; p = 0.004). This means that a mother's high family income is directly proportional to the mother's high education. The results of this research are supported by Sutarto et al., (2020), stating that there is a significant relationship between maternal family income and maternal education, meaning that a highly educated mother is in line with a high income, this is because a highly educated mother will find it easy to obtain employment and indirectly the mother's income also increases.

Previous research conducted by Angkasa et al. (2019) stated that more than half of parents are over 35 years old. Most parents had not completed nine years of education and mothers with low education were in greater proportion than fathers. Regarding nutritional knowledge, the majority of parents have good knowledge.

In line with research by Astuti et al. (2018) which states that there is a relationship between family income. Factors that can influence nutritional status are age, education, and parents' occupation. The family's ability to buy the food they want to buy also depends on the size of the family's income. If families with low incomes are able to manage nutritious food with simple and cheap ingredients, then the growth of children under five will also be good.

AUTHOR CONTRIBUTION

All authors have made significant contributions to data analysis as well as preparing the final manuscript.

CONFLICT OF INTEREST

There is no conflict of interest in this study.

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