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WORD COUNT 5436

TIME SUBMITTED 04-MAR-2025 02:09PM

PAPER ID 114962772

p-ISSN 2086-6380, e-ISSN 2548-7949

Jurnal Ilmu Kesehatan Masyarakat (JIKM)

HISTORY OF LOW BIRTH WEIGHT AND CIGARETTE SMOKE EXPOSURE ON THE INCIDENCE OF STUNTING IN TODDLERS AGED 24-59 MONTHS

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ARTICLE INFO

Article History:

Received : July 16, 2024
Accepted : January 13, 2025
Published: March 4, 2025

DOI:

https://doi.org/10.26553/jikm.2024.16.1.32-45

Available online at

http://ejournal.fkm.unsri.ac.id/index.php/jikm

ABSTRACT

Stunting is chronic malnutrition in children under the age of five, especially during the first 1000 days of life, which, if not properly addressed, can increase morbidity and mortality rates. The prevalence of stunting in Jember Regency in 2022 was higher than in East Java (34.9%). So far, several studies on risk factors for stunting have only focused on nutritional issues, but other more complex issues, such as exposure to cigarette smoke, have rarely been studied. The aim of this study was to determine the relationship between a history of Low Birth Weight (LBW) and stunting, and exposure to cigarette smoke and stunting. Cigarette smoke exposure factors included the number of smoking family members, their smoking status, smoking duration, smoking locations, cigarette types, and the number of smoking consumed. This study used a case-control design and was conducted in 3 stunting loci with a sample size of 134, comprising 67 stunting and 67 non-stunting children, matched for sex, age, and area of residence. The sampling technique used was proportional random sampling. Data, were collected using a modified Secondhand Smoke Exposure Scale (SHES) questionnaire, and bivariate analysis with chi-squared and multivariate analysis with logistic regression. The results showed no association between a history of LBW and stunting. However, there was a most significant association between exposure to cigarette smoke and stunting in terms of smoking location and number of cigarettes consumed. It is recommended that health centers address this issue by providing education on the dangers of smoking in the home.

Keywords: Cigarette Smoke Exposure, Low Birth Weight, Stunting

Introduction

Stunting represents a significant global health concern that requires immediate attention. It is a form of chronic malnutrition that is particularly prevalent during the first thousand days of life. The high incidence of stunting in children under five results in an increase in morbidity and mortality rates. The World Health Organization (WHO) describes stunting as a nutritional status based on Height-for-Age Z-score (HAZ), characterized by measurements falling below the threshold (Z-Score) of <-2 Standard Deviations (SD) to -3 SD (short/stunted) and <-3 SD (severely stunted). In 2022, the global prevalence of stunting among children under five was 22%, with the World Health Organization (WHO) establishing a standard for stunting prevalence of below 20%.[1] The 2022 Indonesian Nutritional Status Survey (*Survei Status Gizi Indonesia* or SSGI) revealed a decline in the prevalence of stunting in Indonesia, from 24.4% to 21.6%.[2] Similarly, a reduction was observed in East Java, from 23.5% to 19.2%. However, the prevalence of stunting in Jember Regency in 2022 was higher than in East Java (34.9%). Meanwhile, the prevalence of stunting as indicated by weight-for-age and length-for-age measurements is high taken from January to August 2023 in the Sumberjambe Health Center area, was 13.61%, placing it fourth in the ranking of stunting prevalence. The Sumberjambe Health Center encompasses three villages, designated as loci, namely Sumberpakem, Sumberjambe and Jambearum.[13]

The nutritional status of stunting is a consequence of chronic undernutrition and recurrent infections.[3] Stunting results in delayed linear growth, impaired motor development, disrupted body metabolism, and cognitive development, which has a detrimental impact on learning quality and productivity in adulthood.[4] Furthermore, indirect factors contributing to stunting include a history of Low Birth Weight (LBW), a history of preterm birth, access to healthcare services, sanitation, family income, and exposure to cigarette smoke.[5-12] Children with a history of LBW are six times more likely to experience stunting than those with a normal birth weight.[11] Children with Low Birth Weight (LBW) are at risk of growth failure due to difficulties in achieving the expected growth trajectory during the first two years of life.[5] Research on the causes of stunting is usually only associated with nutritional factors, while there are other factors, such as exposure to cigarette smoke. Other factors, such as exposure to cigarette smoke, are still limited. More comprehensive research on the causes of stunting is needed to provide the right information to the community in determining health efforts to prevent stunting.

Smoking is one of the health problems faced in Indonesia. In the Healthy Indonesia Program with a Family Approach program, the achievement of these indicators are still low at 44.74%. Indicators is still low at 44.74%, meaning that only about 44.74% of family members do not smoke. This shows that there are still many family members in Indonesia who smoke, which in turn directly increases exposure to cigarette smoke to mothers and children. A study indicated that children from households where smoking occurs are 3.2 times more likely to experience stunting

than those from non-smoking households. The presence of smoking habits within the family unit has been identified as a contributing factor to the development of undernutrition and increased susceptibility to illness in children.[12] This occurs when an individual is exposed to cigarette smoke for a period exceeding three hours per day, which results in an increased susceptibility to respiratory infections and a notable elevation in blood nicotine levels, reaching a range of 30-40%. Such conditions impede the absorption of vitamin C, minerals, and calcium, which are vital for children's growth.[7]

The practice of smoking is pervasive in the Integrated Health Post (*Pos Pelayanan Terpadu* or Posyandu) in Sumberjambe area, with 70% of families engaging in this habit.[13] The data indicates that 9,259 family members smoke, with 83% of these individuals acting as the heads of their respective households and 97% of whom are male. The average number of cigarettes smoked per day by smokers in Indonesia is 11, according to data from the Central Statistics Agency.[14] In 2022, expenditure on tobacco products in Jember Regency was the third highest in the food category, after ready-to-eat foods and cereals, at 5.84%, with an average expenditure of IDR 61,040 per month. [14]

In view of the high prevalence of stunting and the considerable number of smoking families in the Sumberjambe area Health Center, which includes the Posyandu Sumberjambe, Sumberpakem, and Jambearum, as well as the LBW history that represents a risk factor for stunting, this study aims to examine the relationship between LBW history and exposure to cigarette smoke with the incidence of stunting in children aged 24-59 months.

Methods

This study is an observational study with a case-control design, where the case group is compared with the control group. The research was conducted in the working area of the Sumberjambe Health Center, which includes the Posyandu Sumberjambe, Sumberpakem, and Jambearum. The independent variables measured in this study were LBW history and cigarette smoke exposure. The dependent variable in this study is the incidence of stunting in toddlers aged 24-59 months. The population of study consists of children aged 24-59 months who participated in height measurement activities in October 2023 at every posyandu in the Sumberjambe Village, Sumberpakem Village, and Jambearum Village consisted of 618 children. The population was divided into 2 population groups, namely the case population group and the control population group. The case population in this study is toddlers who are stunted, while the control population is toddlers who are not stunted. The case group, comprising children with stunted growth (nutritional status <-2 SD to -3 SD (short/stunted) and <-3 SD (severely stunted)), amount to 144 children, and the control group, comprising children with normal nutritional status (≥-2 SD), amount to 474 children. The sample size for case control studies is aimed at finding the minimum sample for each

case group and control group, resulting in a research sample consisting of 67 children in the case group and 67 children in the control group, selected using proportional random sampling. The selection of samples in the case group in the locations is adjusted based on the number of stunted toddlers in every Posyandu and who are willing to be interviewed and have no history of congenital diseases (such as heart abnormalities or physical deformities), followed by matching the same number for the control group. The matching criteria applied in this study were gender, age and residential area. Data were collected via interviews concerning the history of Low Birth Weight (LBW) and exposure to cigarette smoke, using the Secondhand Smoke Exposure Scale (SHES) questionnaire. The questionnaire was modified and underwent subsequent validation and reliability testing with a sample of 30 subjects in Plerean Village, Sumberjambe, Jember Regency, resulting in a Cronbach α coefficient of 0.746.[15,16] The questionnaire included a series of questions related to the number of family members who smoke, the smoking status of family members, the locations where smoking occurs, the history of smoking, the types of cigarettes consumed, the number of cigarettes consumed per day and the duration of smoking per day.

The data were analysed using univariate, bivariate and multivariate techniques. Univariate analysis was used to analyze respondent characteristics, family characteristics, and characteristics of exposure to cigarette smoke, which were expressed in frequency distributions. Bivariate analysis employed the chi-square test, which resulted in p-values, OR values, and confidence intervals (CI). Bivariate analysis was used to assess the relationships between LBW history and stunting, and between exposure to cigarette smoke and stunting. Multivariate analysis was used to identify the most influential aspects of exposure to cigarette smoke on the prevalence of stunting. Research ethics No.455/KEPK/FKM-UNEJ/III/2024.

Results

The research findings related to the characteristics of the children aged 24-59 months are presented in Table 1. The characteristics of families of the children are shown in Table 2, and the characteristics of exposure to cigarette smoke within the families of the children in the working area of the Sumberjambe Health Center, Jember Regency, are displayed in Table 3.

Table 1. Characteristics of Children Aged 24-59 Months

Characteristic of Children	Stunting			
	Case (n=67)		Control (n=67)	
	n	%	n	%
LBW History				
LBW	12	17.9%	6	9%
Normal	55	81.1%	61	91%
Gender				
Male	36	53.7%	35	52.2%
Female	31	46.3%	32	47.8%
Aged (in month)				
24-36	21	31.3%	22	32.8%
37-59	46	68.7%	45	67.2%

Based on Table 1, it is evident that the majority of children, accounting for 86.6% had a normal birth weight (≥ 2500 grams). There is no significant difference in the history of normal birth weight between stunting and non-stunting children. The gender distribution shows a higher prevalence of males among the stunting children, at 53.7%. Additionally, the age distribution indicates that stunting is more prevalent in the 37-59-month age group, comprising 68.7% of the stunting children.

Table 2. Characteristics of Families of the Children

Characteristics of Families	Stunting			
	Case (n=67)		Control (n=67)	
	n	%	n	%
Hb Levels During Pregnancy				
Anemia	30	44.8%	4	6%
Normal	37	55.2%	63	94%
Maternal's Education Levels				
Low	54	80.6%	48	71.7%
High	13	19.4%	19	28.3%
Maternal Occupation				
Housewife	64	95.5%	65	97%
Teacher	1	1.5%	1	1.5%
Other	2	3%	1	1.5%
Paternal Education Levels				
Low	54	80.6%	45	67.2%
High	13	19.4%	22	32.8%
Paternal's Occupation				
Farmer	45	67.2%	43	64.2%
Seller	15	22.4%	19	28.3%
Construction Laborers	6	8.9%	4	6%
Etc.	1	1.5%	1	1.5%
Family Income				
< 2.665.392	59	88%	50	74.6%
≥ 2.665.392	8	12%	17	25.4%

Based on Table 2, the characteristics of families of the childrens based on maternal hemoglobin (Hb) levels during pregnancy indicate that normal Hb levels were observed in both stunting (55.2%) and non-stunting children (94%). Regarding maternal education, both stunting and non-stunting children showed a predominance of low education levels, including no formal education, primary school graduation, or junior high school graduation, with percentages of 80.6% and 71.7%, respectively. In terms of occupation, mothers of stunting and non-stunting children were predominantly housewives, at 95.5% and 97%, respectively. Analysis of paternal education also revealed that a majority of fathers of stunting and non-stunting children had low education levels, comprising 80.6% and 67.2%, respectively. Regarding occupation, the fathers of the children were predominantly farmers, accounting for 67.25% and 64.2%. Family income analysis showed that families of stunting and non-stunting children in the Sumberjambe Health Center area had incomes below the Jember Regional Minimum Wage (IDR 2.665.392), at 88% and 74.6%, respectively.

Table 3. Characteristics of Cigarette Smoke Exposure

Characteristics of Cigarette Smoke Exposure	Stunting			
	Case		Control	
	n	%	n	%
Smoking Household (n=67)				
Yes	56	83.6%	41	61.2%
No	11	16.4%	26	38.8%
The Number of Family Members (n=41)				
≥ 2 person	13	31.7%	9	22%
1 person	28	68.3%	32	78%
Smoking Status of Family Members (n=41)				
Grandfather	14	34.1%	13	31.7%
Father	27	65.9%	28	68.3%
Smoking Location (n=41)				
Inside	39	95.1%	15	36.6%
Outside	2	4.9%	26	63.4%
History of Smoking (n=41)				
>5 years	37	90.2%	25	61%
1- 5 years	4	9.8%	16	39%
Duration of Smoking Per Day (n=41)				
≥ 3 hours/day	16	39%	1	2.4%
< 3 hours/day	25	61%	40	97.6%
Type of Cigarettes Consumed (n=41)				
Filter	40	97.6%	39	95.1%
E-Cigarette	1	2.4%	2	4.9%
The Number of Cigarettes Consumed (n=39)				
>11 sticks	22	56.4%	1	2.6%
1-11 sticks	17	43.6%	38	97.4%

According to Table 3, the characteristics of cigarette smoke exposure, it is evident that the prevalence of stunting and non-stunting children from smoking households stands at 83.6% and 61.2%, respectively. Exposure to cigarette smoke within the household for both stunting and non-stunting children predominantly originates from a single family member, accounting for 68.3% and 78%, respectively. The smoking are primarily fathers, with 65.9% in the stunting group and 68.3% in the non-stunting group. Among families with stunted children, a higher proportion of smokers consume cigarettes inside the house (95.1%). Most smokers have been smoking for over 5 years, in both the stunting group (90.2%) and the non-stunting group (61%). The most commonly used type of cigarette within these families is the filtered/white cigarette, with 97.6% and 95.1% usage rates. Additionally, 39% of families with stunted children report smoking for ≥3 hours/day. Observed that families with stunted children consumed more than 11 cigarettes per day (56.4%), compared to families with non-stunted children.

Table 4. Chi-Square Test Result Variable of LBW

Variable	Stunting				p-value	OR	95% CI
	Case (n=67)		Control (n=67)				
	n	%	n	%			
LBW							
LBW	12	17.9%	6	9%	0.129	0.451	0.158-
Normal	55	82.1%	61	91%			1.283

Based on Table 4, the variable of LBW weight exhibits a p-value > 0.05 (p-value = 0.129). This indicates that a history of low birth weight is not significant correlation with the incidence of stunting among children aged 24-59 months in the Sumberjambe Health Center area.

Table 5. Chi-Square Test Result Variable of Cigarette Smoke Exposure

Variable	Stunting				p-value	OR	95% CI
	Case		Control				
	n	%	*n*	%			
≥ 2 person	13	31.7%	9	22%	0.391	1.651	0.614 – 4.441
1 person	28	68.3%	32	78%			
Grandfather	14	34.1%	13	31.7%	0.814	0.895	0.356 – 2.250
Father	27	65.9%	28	68.3%			
Inside	39	95.1%	15	36.6%	0.000	33.800	7.127 - 160.306
Outside	2	4.9%	26	63.4%			
> 5 years	37	90.2%	25	61%			
1-5 years	4	9.8%	16	39%	0.002	5.920	1.770-19.802
≥ 3 hours/day	16	39%	1	2,4%	0.000	25.600	3.194 – 205.153
< 3 hours/day	25	61%	40	97,6%			
Filter	40	97,6%	39	95,1%	0.556	0.488	0.042 – 5.597
E-Cigarette	1	2,4%	2	4,9%			
> 11 sticks	22	56,4%	1	2,6%	0.000	49.176	6.119 – 395.216
1-11 sticks	17	43,6%	38	97,4%			

Based on Table 5, the chi-square test results indicate that the variable of cigarette smoke exposure is significant correlated with the incidence of stunting among children aged 24-59 months in the Sumberjambe Health Center area, with a p-value < 0.05. Specific aspects of cigarette smoke exposure that show significant associations include the smoking location (p-value = 0.000), history of smoking (p-value = 0.002), number of cigarettes consumed (p-value = 0.000), and the duration of smoking per day (p-value = 0.000). Meanwhile, three aspects of cigarette smoke exposure were not significantly associated with stunting: the smoking status of family members (p-value = 0.895), the number of smoking family members (p-value = 0.391), and the type of cigarettes smoked (p-value = 0.556). Smoking locations inside the house with duration ≥ 3 hours/day which mean cigarettes consumed >11 sticks will cause toddlers to inhale the smoke exposure, making them secondhand smokers. Additionally, the history of smoking of family members for >5 years will lead to toddlers becoming secondhand smokers for an extended period.

Based on the result of bivariate analysis of the four aspects of exposure to cigarette smoke (smoking location, history of smoking, duration of smoking per day, the number of cigarette consumed). Multivariate analysis can be conducted as the results significance criterion of p-value < 0.25.

Based on the Table 6, the multivariate analysis with regression logistic demonstrated that two aspects of cigarette smoke exposure exert the most significant influence on the prevalence of stunting in toddlers aged 24 to 59 months in the Sumberjambe Health Centre. These aspects are the smoking location (p-value 0.001) and the number of cigarettes consumed (p-value 0.002).

Table 6. Regression Logistic Test Result

Model	Variable	p-value	OR	95% CI
Model 1	Smoking Location	0.003	0.021	0.002-0.269
	History of Smoking	0.819	1.264	0.170-9.380
	Duration of Smoking Per Day	0.135	7.487	0.536-104.569
	The Number of Cigarettes Consumed	0.023	20.167	1.523-267.104
Model 2	Smoking Location	0.002	0.020	0.002-0.241
	Duration of Smoking Per Day	0.124	7.802	0.568-107.089
	The Number of Cigarettes Consumed	0.020	21.010	1.614-273.415
Final Model	Smoking Location	0.001	0.025	0.003-0.219
	The Number of Cigarettes Consumed	0.002	61.127	4.325 – 863.866

Discussion

The test results indicate that a history of Low Birth Weight (LBW) is not correlated with the incidence of stunting among children aged 24-59 months in the Sumberjambe Health Center area. This result is consistent with previous research, who also reported no correlation between LBW and stunting in children at the Tamalate Health Center.[15] Similarly, other research explains revealed no correlation between LBW and stunting in children.[18]

Birth weight serves as a principal indicator of a child's growth trajectory. Nevertheless, if children with a history of LBW receive adequate and sufficient nutritional intake during their growth period, they have the potential to achieve catch-up growth.[19] During the growth period, a number of factors may contribute to stunting, in addition to a history of LBW. These include inadequate food intake and limited access to healthcare services. In addition to a history of LBW, the research conducted with previous research identified other factors that could influence the nutritional status of stunted children, including infections and insufficient nutrition.[18]

These findings are in accordance with the results of the study conducted at the Sumberjambe Health Center, which indicate that the nutritional status of stunted children is influenced by additional factors, namely, the habit of smoking inside the house and smoking for more than five years. These factors result in inadequate nutritional intake for children from the earliest stages of development, namely during pregnancy. Pregnancy-related complications, such as anemia, can elevate the risk of stunting. The study also revealed that anemia during pregnancy was more prevalent among mothers of stunted children compared to mothers of non-stunted children. Furthermore, low maternal education levels may contribute to stunting. A low level of maternal education affects parenting and the selection of foods that meet the nutritional needs of children.[20]

The bivariate analysis of the number of smoking family members and stunting showed a p-value of 0.391 (p-value > 0.05), indicated no significant association between the number of smoking family members and the incidence of stunting in children aged 24-59 months in the working area of Sumberjambe Helath Center. During the study, it was observed that in some families with multiple smokers, one of the family members refrained from smoking at home, thereby preventing exposure to cigarette smoke for the young children. This situation suggests that the number of smoking family members is not a relevant factor in cigarette smoke exposure related

to stunting. The researcher's findings are consistent with those of previous research, who argue that the presence of smoking family members already indicates a lack of concern for family health, as smoking is perceived as a normal behavior.[21]

The bivariate analysis about the smoking status of family members and stunting revealed a p-value of 0.814 (p-value > 0.05), indicating no significant association between the smoking status of family members and the incidence of stunting in children aged 24-59 months in the working area of Sumberjambe Health Center. This finding can be attributed to the fact that smoking family members were predominantly fathers, regardless of whether the children were stunted or not. The results are consistent with the study by previous research, which also found no significant relationship between the position of smoking family members and the occurrence of stunting.[7] Smoking habits within families are largely attributed to fathers, who as the primary breadwinners, often smoke to alleviate drowsiness and stress.[22]

The bivariate analysis between smoking location and the incidence of stunting revealed a p-value of 0.000 (p-value < 0.05), indicating a significant association between smoking location and stunting in children aged 24-59 months in the working area of Sumberjambe Health Center. The likelihood of stunting in children with family members who smoke indoors is 33.8 times greater than in those with family members who smoke outdoors. These findings are in accordance with those reported by prior research, who observed a significant relationship (p-value 0.004) between the smoking location of family members and the incidence of stunting in children.[23] The act of smoking indoors results in the accumulation of cigarette smoke components, such as tar and nicotine, which remain in the environment for extended periods. This can impede the absorption of nutrients in the body.[16]

The bivariate analysis of the duration of family members' smoking habits revealed a significant correlation with the incidence of stunting in children aged 24-59 months in the working area of Sumberjambe Health Center (p-value 0.002 < 0.05). The OR value was 5.920, indicating that children with family members who have been smoking for more than five years are 8.320 times more likely to experience stunting compared to children with family members who have been smoking for less than five years. Prolonged exposure to cigarette smoke during pregnancy has been linked to an increased risk of adverse outcomes in the perinatal period and in early childhood. Prenatal exposure to cigarette smoke also linked to complications related to blood pressure, which can subsequently impact growth and development.[24] However, these findings are not entirely consistent with those reported by similar previous research, who observed no significant correlation between the duration of smoking habits among family members and the incidence of stunting in children (p-value 0.068).[7]

The study on the duration of smoking and the incidence of stunting indicated a significant relationship, with a p-value of 0.000 (p-value < 0.05). The results showed that family members of

stunted children consumed cigarettes for a duration of ≥3 hours/day more frequently. According to research that has been conducted, smoking has detrimental effects on both the smoker and others within a short period due to the presence of 4,000 types of harmful chemicals in cigarette smoke.[21] Cigarette smoke affects blood vessels and blood distribution to tissues, disrupting nutrient absorption, which negatively impacts the growth and development of young children.[25] This study aligns with the findings of similar research, which reported that family members of stunted children tend to smoke for ≥3 hours/day.[7] Children exposed to cigarette smoke for more than 3 hours daily are at a higher risk of respiratory infections and increased nicotine levels in their blood, which can hinder the absorption of vitamins and minerals.[7]

The study on the type of cigarettes consumed by family members of children aged 24-59 months in the working area of Sumberjambe Health Center revealed a p-value of 0.488 (p-value > 0.05), indicating no significant relationship between the type of cigarettes consumed and the incidence of stunting. This finding aligns with similar research, which also reported no significant association between the type of cigarettes and stunting (p-value 0.665).[16] Most smoking family members in the study area consumed filtered/white cigarettes. Regardless of the type, all cigarettes are harmful due to two main chemicals: nicotine and tar. Nicotine hinders nutrient absorption, impairs brain function, and increases adrenaline, while tar is carcinogenic and can trigger cancer.[23]

The bivariate analysis of the number of cigarettes consumed by smoking family members and stunting revealed a p-value of 0.000 (p-value < 0.05), indicated a significant relationship between the number of cigarettes consumed daily by family members and the incidence of stunting in children aged 24-59 months in the working area of Sumberjambe Health Center. The majority of smoking families had incomes below the Jember minimum wage, potentially leading to reduced capacity to meet nutritional needs. The similar research has been conducted state that stunted children from low-income families often face limitations in accessing adequate food because parents prioritize purchasing cigarettes.[26]

The multivariate analysis aspects are the smoking location (p-value 0.001) and the number of cigarettes consumed (p-value 0.002). These two aspects indicate that toddlers aged 24-59 months in the Sumberjambe Health Center area are exposed to cigarette smoke and become secondhand smokers inside the house and continuously exposed cigarette smoke cause the cigarettes consumed >11 sticks in a day. The majority of stunted children in this study had smoking fathers with a smoking duration of more than five years and a smoking duration of approximately three hours per day. This suggests that exposure to cigarette smoke continuously and over a long period of time, can increase the risk of stunting in children under five. In addition, family members who smoke more often smoke inside the house and increase the risk 0.025 higher than the location of smoking outside the house.

High exposure to cigarette smoke in toddlers makes them susceptible to respiratory infections such as ISPA and pneumonia. Sustained respiratory infections lead to inflammation and fever, thus increasing the need for nutrients for metabolism and the child's appetite. These findings are in accordance with those reported by previous researchers, who observed a significant relationship (p-value 0.004) between the smoking location of family members and the incidence of stunting in children.[23] Consumed cigarettes >11 sticks/day will lead to a reduction in spending on adequate food due to the prioritization of cigarette purchases. Another study conducted by researchers who have conducted similar research, also explained that toddlers with exposure to cigarette smoke more than 3 hours per day increased the risk of stunting by 10,316 times.

This study provides basic knowledge that the incidence of stunting in children is not only caused by factors directly related to nutrition such as inadequate nutritional needs and nutritional status but also due to other factors such as exposure to cigarette smoke. The factors that cause stunting in children under five must be reviewed in more depth so that appropriate treatment can be carried out. In addition, this study can increase knowledge about the occurrence of stunting, which can improve people's perceptions, which then shape positive behavior towards efforts to prevent stunting in children.

However, the research method employed in this study was still weak, which may limit the generalizability of the study's findings. A limitation of this study is that the observation of the relationship between risk factors and effects may not be conducted concurrently. Exposure to cigarette smoke may have occurred in the past, but the assessment is carried out at this time. Consequently, further research on the occurrence of stunting can be conducted with a case-control or prospective approach. Additionally, this study provides recommendations for experimental research on methods of providing health promotion for the prevention of stunting.

Conclusion

The incidence of stunting in children aged 24-59 months in the working area of Sumberjambe Health Center is not influenced by a history of low birth weight, as evidenced by a p-value of 0.135. However, stunting in this region is significant influenced by exposure to cigarette smoke, specifically smoking location, history of smoking behavior (more than 5 years), duration of smoking per day (≥3 hours/day), and cigarettes consumpted (>11 sticks/day). With the most influenced on the prevalence of stunting are aspects smoking location and cigarettes consumpted (>11 sticks/day). Families with children aged 24-59 months are advised to refrain from smoking inside the house. Furthermore, families are encouraged to gradually reduce the number of cigarettes consumed.

Acknowledgment

This research was supported by the Public Health Program at Universitas Jember.

Funding

This research was funded by the author without any sponsors.

Conflict of Interest

There is no conflict of interest for the authors in this research.

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