



PARENTAL SMOKING BEHAVIOR AND UNDERWEIGHT AMONG CHILDREN AGED 5-12 YEARS: EVIDENCE FROM RISKESDAS 2018

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Abstract

In recent years, underweight remains a medium public health problem in Indonesia, despite the substantial decrease in prevalence, still, this long-standing issue are potentially altering children physical growth and cognitive development. This current study aims to investigate the association between parental smoking behavior and underweight in children by analyzing secondary data of the 2018 Indonesia Basic Health Research (RISKESDAS). A total sample of 39,451 children aged 5-12 years were analyzed in this study. Anthropometric measurement of body weight was obtained to identify underweight. A structure questionnaire was employed to obtained information on child sex (male or female), age (5-8 or 9-12), type of residence (urban or rural), parental age (under or older than 35), education (high: higher education graduate or under), working status (working or not working) and smoking behavior both among mother and father in the last one month. Among those who smoked, the average number of cigarettes being smoked was also questioned, as well as the experience of indoor smoking. Data were analyzed using SPSS version 25. There were 8.4% of underweight children in this study, 89.8% of parents were smoker, who 74.8% of them were father, on average smoked 14 cigarettes per day and 98.8% of them smoked inside the house. Underweight was not significantly associated with parental smoking behavior, type of residence, parental age and parental working status. Higher odds of being underweight was found among children age 5-8 years (OR 1.08, $p = 0.04$, 95% CI). While boys were protective factor against underweight (OR 0.75, $p < 0.01$, 95% CI). Despite no association found between parental smoking behavior and children underweight in current study, however, it remains relevant to remind parents that their smoking behavior, especially inside living space may hinder children physical growth and cognitive development.

Keyword: growth faltering; cigarette; nicotine; school aged children; tobacco

INTRODUCTION

Indonesia Basic Health Research (RISKESDAS) noted decrease prevalence of underweight among primary school aged children (age 5-12 years) since 2007 to 2018 (24.2% to 6.8%, respectively) (Kementerian Kesehatan RI, 2008, 2018). The latest survey in 2018 revealed severe underweight happened to 2.4% of the children with higher prevalence is among boy rather than girl (Kementerian Kesehatan RI, 2018). Underweight can hinder

children from reaching their full potential by faltering physical growth and cognitive development (Syahrul et al., 2016).

Underweight fundamentally caused by energy imbalance, prolonged low energy and protein intake derived from children daily dietary consumption (Syahrul et al., 2016). This also be compounded by unmet energy and nutrient requirement which higher during childhood (A et al., 2021). Furthermore, the presence of substance such as cigarette smoke



may also influence children to becoming underweight, as it may impair nutrients absorption and children overall well-being (Best et al., 2007; Wijaya-Erhardt, 2019).

Cigarettes, according to Government Regulation No. 19 of 2003, are tobacco products, including cigars or other forms, made from *Nicotiana tabacum*, *Nicotiana rustica*, and other species or their synthetic counterparts containing nicotine and tar, with or without additives (Peraturan Pemerintah No 19, 2003). In 2013, Indonesia was ranked first for the prevalence of adult smokers (25-64 years) in ASEAN (36.3%) (Lian & Dorotheo, 2018). In recent survey, more than half of the provinces have higher proportion of smokers than national average (32.2%) (TSCS-IAKMI, 2020). As a leading cause of death, smoking in Indonesia cause death toll to 659 people per day (Lian & Dorotheo, 2018).

Smoking behavior by parents is likely to have a direct and indirect impact on the child's growth related to their nutritional status (Sari & Resiyanthi, 2020). The impact of smoking behavior not only affects the smoker but also those around them, especially families living under the same roof as the smoker. Carcinogenic substances from unburned tobacco or cigarette smoke, known as tobacco-specific nitrosamines, form more rapidly indoors or in a smoker's home. The residues left by smokers can produce toxic substances that attach to household items, posing a danger to other occupants, especially children (Nadhiroh et al., 2020).

The association between parental smoking behavior and the nutritional status of children has been extensively studied, however, mostly focusing on stunting among under five children (Best et al., 2007; Muchlis et al., 2023; Nadhiroh et al., 2020; Wijaya-Erhardt, 2019). To the best of the author's knowledge, there is no research has studied the relationship between parental smoking behavior and undernutrition in children aged 5-12 years. Therefore, this study aims to investigate the association between parental smoking behavior on underweight among children aged 5-12 years by analyzing the secondary data of RISKESDAS 2018.

RESEARCH METHODS

Indonesia Basic Health Research (RISKEDAS) 2018 was conducted using a

quantitative approach with a cross-sectional study design. The survey aimed to determine the prevalence of certain public health issues and the predictors. Current study which analyzed the secondary data of 2018 RISKESDAS aims to determine the association between parental smoking behavior and underweight among children aged 5-12 years. The approved research proposal was granted by Health and Research Development Centre, Indonesia Ministry of Health in January 2022 and proceeded with data analysis and finished the data sorting in May 2022 after obtaining ethical approval from Research Ethics Committee of Universitas Pembangunan Nasional Veteran Jakarta in April 2022 (Kementerian Kesehatan RI, 2018).

Sample size calculation was determined using Lemeshow formula of hypothesis testing between two proportions (Lemeshow et al., 1991), with α set at 5% and 80% of power,

$$n = \frac{\left(\frac{Z_{1-\alpha}}{2} \sqrt{2\bar{P}(1-\bar{P})} + Z_{1-\beta} \sqrt{P_1(1-P_1) + P_2(1-P_2)} \right)^2}{(P_1 - P_2)^2}$$

while first proportion (P_1) was derived from proportion of malnourished children with smoker parents (0.23), and second proportion (P_2) was obtained from malnourished children with non-smoker parents (0.14) (Andriani, 2021). Confidence interval was set on 95%. Inclusion criteria was 100% of data completeness, while exclusion criteria were z-score of body mass index for age (BAZ) lies within extreme value of more or less than +/-5 SD. Detail for eligible number of samples for analysis.

Children characteristics obtained through interview to the mothers for sex (male or female), age (5-8 or 9-12 years old), parental working status (working or not working), educational attainment (high: higher education graduate or under), and type of residence (urban or rural) (Badan Pusat Statistik, 2010). In univariate analysis, parental occupation and educational attainment were broke down into specific jobs and school level. Later on, in bivariate analysis, parental occupation and educational attainment were simplified into dichotomous variable, became working status (working or not working) and education level (high: vocational and university graduate or low: less than equal to high school graduate).

Anthropometric assessment of body weight was conducted using digital scale. Underweight was defined if BAZ less than -2SD. Dichotomous variable (yes or no response) of parental smoking behavior was obtained through interview to mother with question of “did mother and/or father of children smoke in the last one month?”, other questions related to smoking behavior were number of cigarettes being smoked in a day (ratio scale) and habit of indoor smoking by questioning “did parents smoke inside of a building or indoor space” (National Institute of Health Research and Development MoH, 2018).

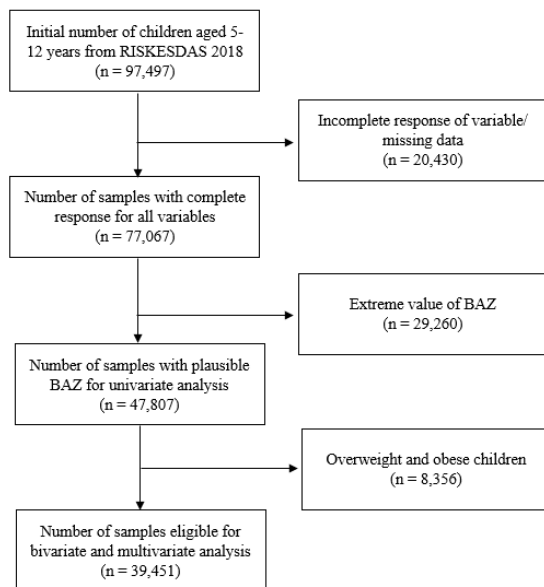


Figure 1. Flow chart for eligible number of samples

Data were analyzed using IBM Statistics SPSS 22, while the Z-score for children aged 5-12 years is determined using WHO AnthroPlus. Data were presented as percentage for univariate. Chi-square was performed to determine predictors which will proceed to multivariate analysis ($p < 0.25$). Logistics regression was conducted to define association of underweight with selected predictors.

RESULTS AND DISCUSSION

prevalence of underweight and to observe association between parental smoking behavior and underweight among children aged 5-12 years. Prevalence of underweight among children in this study is 8.4%; overweight 17.5% and normoweight 74.1%. Based on respondent characteristics (Table 1), most of the children were boy, aged 5-8 years, and living in rural

area. For parental characteristics, most of the mother aged 10-35 years, while the father was older than 35 years. Nearly half of the mother did not work, while the father worked as farmer. Nearly a third of mother and father educational attainment were secondary school graduates.

The proportion of parental smoking was 89.8%, with average consumption among mother was 8 cigarettes per day and among father was 14 cigarettes per day. Most of the fathers (74.8%) conducted indoor smoking inside the house.

In bivariate analysis, underweight among children is significantly associated with children age, sex, and parental education ($p < 0.05$, 95% CI). Multivariate analysis indicated significantly higher odds of underweight among children aged 5-8 years (OR 1.08) than another age group counterpart. A significant lower odd of underweight found among male (OR 0.75) than female counterpart ($p < 0.05$, 95% CI).

Table 1. Respondent characteristics (n=47,807)

Characteristics	n	(%)
Sex		
Male	24,537	51.3
Female	23,270	48.7
Age (years)		
5 – 8	37,216	77.8
9 – 12	10,591	22.2
Type of residence		
Urban	20,444	42.8
Rural	27,363	57.2
Age of mother (years)		
20 – 35	25,551	53.4
Older than 35	22,256	46.6
Age of father (years)		
20 – 35	14,888	31.1
Older than 35	32,911	68.9
Mother working status		
Not working	22,844	47.8
Working	24,963	52.2
Father working status		
Not working	597	1.2
Working	47,210	98.8
Mother education		
High	4,490	9.4
Low	43,317	90.6
Father education		
High	3,789	7.9
Low	44,018	92.1
Child nutritional status		
Normal		
Underweight	35,430	74.1
Overweight	4,021	8.4
Parental smoking		
Yes	8,356	17.5
No	42,930	89.8
	4,877	10.2

Characteristics	n	(%)
Parent Indoor smoking	573	1.2
Mother	35,775	74.8
Father		
Mean of cigarettes consumed per day		
Mother		8.8
Father		14.8

High proportion of parental smoking is found in this study (89.9%) with most smoker is the father. Most of underweight children in this study have smoking parents, even though no significant association was found in bivariate analysis. The possible underlying mechanism for the association remains unclear between parental smoking behavior and underweight. However, possible explanation to this result is that the cigarette smoke exposed from parental smoking to children is instead causing alteration on children metabolism which led to weight gain, lipid profile and glucose (Goney & Halisdemir, 2021). There's a possibility that parents who smoke are more inclined to have unhealthy dietary patterns or engage in a sedentary lifestyle (Andriani, 2021).

Prevalence of underweight found in this study is lower than the three previous national survey. Underweight prevalence decrease

overtime, from 24.2% in 2007 to 12.2% in 2010 to 11.2 in 2013 (RKD, 2007-2013). Current underweight prevalence in this study denoting low public health problem (De Onis et al., 2019). This improvement is acknowledged to the collective effort of parties which join forces to reducing number of underweight in Indonesia. Ministry of Health through nutrition education come up with visualization of food pyramid which deliver four pillars of balance nutrition consisted of consuming diverse food, maintaining active and healthy lifestyle and monitoring ideal body weight (Kementerian Kesehatan, 2014). Further, undernutrition has been concerned of Indonesia government since the enactment of The National Medium-Term Development Planning (RPJMN) to reduce prevalence of stunting and wasting by 14% and 7% by the end of 2024, and this simultaneously affected underweight cases of children (Peraturan Presiden RI No 18, 2020). A school-based intervention called ProGAS (Program Gizi Anak Sekolah) initiated by Indonesia Ministry of Education and Culture deliver a nutritious breakfast to school aged children evidently contribute to the reduction of undernutrition (Boro et al., 2023).

Table 2. Bivariate analysis using *Chi Square* (n= 39,451)

Variable	Underweight		Normal		P-value
	N	%	n	%	
Children characteristics					
Children age					
5 – 8	3102	7.9	27,864	70.6	0.02*
9 – 12	919	2.3	7,566	19.2	
Children sex					
Male	2285	5.8	17,691	44.8	<0.01*
Female	1736	4.1	17,739	45.0	
Type of residence					
Urban	1634	4.1	14,617	37.1	0.45
Rural	2387	6.1	20,813	52.8	
Mother characteristics					
Age					
20 – 35	2150	5.4	19,023	48.2	0.78
≥ 35	1871	4.7	16,407	41.6	
Educational level					
Low	2619	6.6	22,352	56.7	0.01*
High	1402	3.6	13,078	33.1	
Working status					
Not working	1956	5.0	17,120	43.4	0.69
Working	2065	5.2	18,310	46.4	
Father characteristics					
Age					
20 – 35	1286	3.3	11,058	28.0	0.31

Variable	Underweight		Normal		P-value
	N	%	n	%	
≥ 35	2735	6.9	24,372	61.8	
Educational level					
Low	2553	6.5	21,772	55.2	0.01*
High	1463	3.7	13,658	3.7	
Working status					
Not working	60	0.2	505	1.3	0.73
Working	3961	10.0	34,925	86.5	
Parental smoking behavior					
Yes	3,614	9.2	31,877	80.8	0.85
No	407	1.0	3,553	9.0	

*) significant association indicated by $p < 0.05$

PROGAS focuses on nutritional education and balanced nutritional intake for students, particularly through a healthy breakfast providing 400-500 kcal of energy and 10-12 grams of protein. This program has been implemented in various regions, including the South-Central Timor Regency (Kabupaten Timor Tengah Selatan) in the East Nusa Tenggara Province (Provinsi Nusa Tenggara Timur). The program involved parents and school committee to be able to provide healthy foods for children. Food ingredients mostly come from local and parents involved as the chef. This way, school may ensure food delivered are safe and nutritious.

This study found a slightly higher risk of underweight among younger children aged 5-8 years as compare to age counterparts. Possible explanation to this is that younger children have higher nutrient requirements relative to their body size. If the diet lacks essential nutrients such as protein, vitamins, and minerals, younger child may not gain weight appropriately (Csertő et al., 2023). Further, younger child is more susceptible to infections and illnesses, which can lead to reduced appetite, nutrient malabsorption, and increased energy expenditure. This can contribute to weight loss or inadequate weight gain (Gwela et al., 2019).

Table 3. Multivariate analysis using *Logistics Regression*

Variable	p	OR	95% CI	
			Lower	Upper
Children age (years)				
5 – 8*	0,04	1,084	1,003	1,172
9 – 12	1	1	1	1
Children sex				
Male*	0,00	0,759	0,710	0,810
Female	1	1	1	1

Variable	p	OR	95% CI	
			Lower	Upper
Mother education				
Low	0,21	0,949	0,874	1,031
High	1	1	1	1
Father education				
Low	0,17	0,945	0,870	1,025
High	1	1	1	1

Male children have less risk of underweight than female in this study. This finding is not in agreement with two other studies (Ghosh & Varerkar, 2019; Mansur et al., 2015). The rationale behind is the difference in growth patterns and puberty timing. Boys, on average, may experience different growth patterns than girls during certain age ranges. However, individual growth trajectories can vary widely (Hajovsky et al., 2022). The onset of puberty may differ between boys and girls, impacting their growth and weight gain. Girls often experience puberty earlier than boys (Oehme et al., 2021).

Lower education level of mother and father in this study become risk factor of underweight among children. In agreement to this finding, a study in Malaysia found 4 times higher risk of underweight among children whose parents hold lower educational attainment (Mohamad et al., 2022). The possible explanation to this is that parents with lower educational attainment may have limited access to information about proper nutrition and may lack awareness of the importance of a balanced diet for their children's growth and development (Salleh et al., 2023). Further, lower educational parents are often associated with lower income levels. Families with limited financial resources may find it challenging to afford nutritious food, leading to a less diverse and potentially less nutritious diet for their children (Li et al., 2020).

The strengths of this study including the large-scale observational data with nation-wide scope of survey to established associated factors. Further, no prior studies investigated parental smoking behavior and underweight among school age children, hence, this study first established the relationship. Several limitations present in this study. Firstly, no dietary survey was undertaken, as underweight is directly influenced by. Secondly, no information related to how long the parents have been smoking, as it may impact children growth and nutritional status chronically. Overall, implication of parental smoking behavior to children underweight status is multifaceted. Parental smoking expose children to secondhand smoke, and this can lead to negative health effect including respiratory problem and decrease immune system. Further, spending on cigarette may lead to unnecessary socioeconomic challenge and put cost for healthcare and adequate nutrition compromised.

CONCLUSION AND RECOMMENDATIONS

High proportion of parental smoking found in this study, with most smoker is the father. No association found between parental smoking and underweight among school age children. Higher risk of underweight found among boys and aged 5-8 years old. Even though no association established in this study, however, it remains relevant to remind parents that their smoking behavior, especially inside living space may hinder children physical growth and cognitive development.

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