

Underweight in Child Aged 24-59 Months in North Sumatra: the 2014 Indonesia Family Life Survey Data

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Abstract

Underweight has the biggest risk against burden of disease. The aim of the study was to determine the factors related with underweight in child aged 24-59 months lived in North Sumatra based on three characteristics caused an underweight; there are child characteristics, maternal characteristics, and parenting characteristics. This study used cross-sectional design and using chi-square statistical analysis. The sample used in this study was 280 child aged 24-59 months living in North Sumatra province, Indonesia. The data was obtained from 2014 Indonesian Family Life Survey collected by RAND Corporation. Prevalence of underweight in child aged 24-59 months lived in North Sumatra was 26% (Girls: 32,6%, Boys: 19,9%). The statistical analyses found that female child (OR 95% CI= 0,514: p=0,02), maternal low body mass index (OR 95% CI = 3,750: p=0,04) and cigarette expenditure (OR 95% CI = 1,800: p=0,040) contribute to underweight child aged 24-59 month in North Sumatra province. Child gender, maternal body mass index, and cigarette expenditure were the significant determinants for underweight in under-five children in North Sumatra. The intervention is necessary to be implemented by all parties to decrease the prevalence of underweight.

Keywords : Underweight, children 24-59 Months, North Sumatra, child gender, maternal body mass index

Abstrak

Berat badan kurang (*underweight*) memberikan risiko terbesar terhadap beban penyakit. Tujuan penelitian ini adalah mengetahui faktor yang berhubungan dengan kejadian *underweight* pada anak usia 24-59 bulan di Provinsi Sumatra Utara berdasarkan dengan tiga karakteristik, yakni karakteristik anak, ibu, dan pola asuh. Penelitian ini menggunakan desain studi potong lintang dan menggunakan analisis *chi-square*. Jumlah sampel yang digunakan sebanyak 280 anak berusia 24-59 bulan dan berdomisili di Sumatra Utara. Data yang digunakan berasal dari data Indonesia Family Life Survey tahun 2014 yang dikelola oleh RAND Corporation. Prevalensi kejadian *underweight* pada anak usia 24-59 bulan di Sumatra Utara sebesar 26% (perempuan: 32,6%, laki-laki: 19,9%). Analisis statistik menyatakan bahwa jenis kelamin perempuan (OR 95% CI= 0,514: p=0,02), indeks massa tubuh ibu yang rendah (OR 95% CI = 3,750: p=0,04) dan pengeluaran untuk rokok (OR 95% CI = 1,800: p=0,040) berkontribusi terhadap kejadian *underweight* pada anak usia 24-59 bulan di Sumatra Utara. Jenis kelamin anak, indeks massa tubuh ibu, dan pengeluaran rokok merupakan faktor yang signifikan terhadap kejadian *underweight* pada anak usia di bawah lima tahun di Provinsi Sumatra Utara. Langkah intervensi diperlukan untuk dapat diimplementasikan oleh seluruh masyarakat untuk dapat menurunkan prevalensi kejadian *underweight*.

Kata kunci: *Underweight*; Usia 24-59 bulan; Sumatera Utara; Jenis Kelamin Anak; Indeks Massa Tubuh Ibu

Introduction

Underweight is an indicator to assess nutritional status in children besides stunting and wasting. Underweight indicate a nutritional problem that can reflect wasting (low weight according to height), which shows acute weight loss, reflected stunting (low height according to age) or reflected the condition of both stunting and wasting (1). Underweight susceptible to occur in under- five children with an incidence 462 million children or about 45% of the total number of children worldwide (2).

Underweight children under five years have the most considerable risk against disease burden in developing countries including Indonesia. Based on public health research, underweight in Indonesia has decreased from 2013 (19,6%) to 2018 (17,7%) (3). Based on that prevalence, underweight in Indonesia is categorized as a medium problem based on World Health Organization classification (1). One province with a higher prevalence of underweight than Indonesia in 2018 is North Sumatra (19,57%) (3).

Many studies showed that underweight has a short-term and long-term effect for child. Short-term effects of underweight including decreases in the immunologic capacity against infectious disease, child became apathetic (4). The Long-term impact of underweight includes increasing the risk of cardiovascular disease and decreasing child cognition (4,5).

Underweight in a child associated with many risk factors including child factors (child's age, sex, birth weight, current weight and height, nutrition history, and age of starting complementary food), parental and household factors (parent's age, marital status, maternal antenatal care history, parents education, economic status of

household), community factors (urban/rural, and region) (6). However, data on this aspect is limited. Therefore, this study aimed to determine the underweight internal factors in children aged 24-59 months living in North Sumatra. Aged 24-59 months was chosen because at this age, a child has a rapid growth and development rates and increased nutritional needs to change the eating habit (7).

Methods

This research used a cross-sectional design based on secondary data from the 2014 Indonesia Family Life Survey approved by RAND Corporation.

Retrieval of data in primary research conducted by RAND Corporation was carried out in August 2014 - September 2015. The researcher analyzed the data in March 2020-April 2020. The study population study was all child aged 24-59 months in 13 provinces in Indonesia. The minimum sample size was 280 children calculated according to the following formula (8).

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

Independent variable consists of child characteristics (child's gender, birth weight status, anaemia status, infectious disease, including diarrhea), family characteristics (maternal education, maternal nutritional status, the smoking habit, gestational age, carbohydrate expenditure, animal rich foods expenditure, plant-rich foods expenditure, fruits and vegetables expenditures, milk expenditure, food source of fat expenditure, fast food expenditure, and cigarette expenditure), parenting characteristics (basic immunization, exclusive breastfeeding history, rice

consumption frequency, egg consumption frequency, fish consumption frequency, meat consumption frequency, dairy product consumption frequency, vegetable consumption frequency, fruits consumption frequency, fast-food consumption frequency, fried foods consumption frequency, sweet foods consumption frequency, and instant noodle consumption frequency). Data regarding child characteristics were collected through interviews using the questionnaire “BUKU K”, “BUKU US”, “BUKU 4”, and “BUKU 5”. Data regarding family characteristics were collected through interviews using the questionnaire “BUKU 1”, “BUKU 3A”, “BUKU 3B”, “BUKU 4”, “BUKU US”. Data regarding parenting characteristics were collected through interviews using the questionnaire “BUKU 4” and “BUKU 5”.

Underweight defined as a child nutritional assessment based on weight for age index ($< -2SD$) for child under five years. Child gender was categorized into “boys” or “girls”. Birth weight status was categorized into “low birthweight” ($< 2,5$ kgs) or “Normal” ($\geq 2,5$ kgs). Anaemia status was categorized into “anaemia” ($Hb < 11$ gr/dL) or “Normal” ($Hb \geq 11$ gr/dL). Infectious diseases including diarrhea were categorized into “yes” or “no”.

Mother’s education was categorized into “High” or “Low”. Maternal nutritional status was classified into “Underweight” (Body Mass Index $< 18,5$ kgs/m²) and “Normal”. Mother’s smoke habit was categorized into “Yes” or “No”. Gestational age was classified into “Preterm” (< 37 weeks) or “Normal” (≥ 37 weeks). Food expenditure was categorized into “Low” ($< Median$) or “High” ($\geq Median$). Basic immunization status was categorized into “incomplete” or “complete”. Exclusive breastfeeding was classified into “Yes” or “No”. Rice,

egg, fish, meat, and dairy product consumption frequency was categorized into “Low” ($< Mean$ or $< Median$) or “High” ($\geq Mean$ or $\geq Median$). Vegetables and fruits consumption frequency were categorized into “Less” ($< Median$) or “Adequate” ($\geq Median$). Fast food, fried foods, sweet foods, and the instant noodle was categorized into “No often” ($< Median$) or “Often” ($\geq Median$).

Statistical analysis consisted of univariate and bivariate analyses. Univariate analysis used to determine the distribution of numerical and categorical data. Bivariate analysis determines the relationship between independent and dependent variable of underweight in the child. Associations were having a p-value $\leq 0,05$ were significant.

Results

Based on child’s characteristics, proportion of underweight higher in female child (32,6%), have low birth weight status (33,3%), has no anemia history (25,9%), has no infectious disease (29,7%), and has no diarrhea history (26,3%). In bivariate analysis, show a significant association between child’s gender and underweight in child aged 24-59 months ($p < 0,05$) (Table 1).

In bivariate analysis, show a significant association between underweight in child aged 24-59 months with maternal nutritional status ($p < 0,05$, OR= 3,750 (0,977-14,391)) (Table 1) and cigarette expenditure ($p < 0,05$, OR= 1,800 (1,039-3,117)) (Table 3).

Proportion of underweight higher in child with low consumption frequency in rice (37,5%), fish (30,3%), meat (28,6%), and dairy products (31,4%). But this study didn’t show significant association between these variable and underweight in child aged 24-59 months.

Table 1. Difference of Underweight Proportion based on Variable among Children aged 24-59 months on North Sumatra Province (Data Analysis Indonesia Family Life Survey 2014)

Variable	Underweight				Total		OR (95%CI)	p Value
	Yes		No		n	%		
	n	%	n	%				
Child's gender								
Boys	30	19,9	121	80,1	151	100	0,514	0,020*
Girls	42	32,6	87	67,4	129	100	(0,298-0,884)	
Birth weight								
Low Birth weight	3	33,3	6	66,7	9	100	1,431	0,701
Normal	65	25,9	186	74,1	251	100	(0,348-5,886)	
Anaemia								
Anaemia	10	18,2	45	81,8	55	100	0,637	0,289
Normal	53	25,9	152	74,1	205	100	(0,300-1,353)	
Infectious Disease								
Yes	29	21,5	106	78,5	135	100	0,649	0,133
No	43	29,7	102	70,3	145	100	(0,377-1,118)	
Diarrhea								
Yes	7	21,2	26	78,8	33	100	0,754	0,673
No	65	26,3	182	73,7	247	100	(0,312-1,820)	
Mother's Education								
Low	23	22,1	81	77,9	104	100	0,716	0,316
High	46	28,4	116	71,6	162	100	(0,403-1,273)	
Maternal Nutritional Status								
Underweight	5	55,6	4	44,4	9	100	3,750	0,040*
Normal	64	25,0	192	75,0	256	100	(0,977-14,391)	
Mother's smoke habit								
Yes	7	41,2	10	58,8	17	100	2,111	0,156
No	62	24,9	187	75,1	249	100	(0,771-5,783)	

* p value < 0,05 = significant

Table 2. Difference of Underweight Proportion based on Variable among Children aged 24-59 months on North Sumatra Province (Data Analysis Indonesia Family Life Survey 2014)

Variable	Underweight				Total		OR (95%CI)	p Value
	Yes		No		n	%		
	n	%	n	%				
Gestational Age								
Preterm	45	25,6	131	74,4	176	100	0,911	0,765
Normal	23	27,4	61	72,6	84	100	(0,506-1,639)	
Carbohydrate Expenditure								
Low	33	23,7	106	76,3	139	100	0,814	0,495
High	39	27,7	102	72,3	141	100	(0,476-1,394)	
Animal Food Source Expenditure								
Low	35	25	105	75	140	100	0,928	0,891
High	37	26,4	103	73,6	140	100	(0,543-1,586)	
Plant Food Source Expenditure								
Low	35	25	105	75	140	100	0,928	0,891
High	37	26,4	103	73,6	140	100	(0,543-1,586)	
Fat Food Expenditure								
Low	30	24,2	94	75,8	124	100	0,866	0,680
High	42	26,9	114	73,1	156	100	(0,504-1,490)	
Fast Food Expenditure								
Low	39	27,9	101	72,1	140	100	1,252	0,494
High	33	23,6	107	76,4	140	100	(0,731-2,143)	
Fruits & vegetables Expenditure								
Low	33	23,7	106	76,3	139	100	0,814	0,495
High	39	27,7	102	72,3	141	100	(0,476-1,394)	
Milk Expenditure								
Low	37	26,4	103	73,6	140	100	1,078	0,891
High	35	25	105	75	140	100	(0,630-1,842)	

*p value < 0,05 = significant

Table 3. Difference of Underweight Proportion based on Variable among Children aged 24-59 months on North Sumatra Province (Data Analysis Indonesia Family Life Survey 2014)

Variable	Underweight				Total		OR (95%CI)	p Value
	Yes		No		n	%		
	n	%	n	%				
Cigarette Expenditure								
Low	27	20	108	80	135	100	1,800	0,040*
High	45	31	100	69	145	100	(1,039-3,117)	
Basic Immunization Status								
Incomplete	55	25,0	165	75,0	220	100	0,843	0,619
Complete	17	28,3	43	71,7	60	100	(0,455-1,598)	
Exclusive Breastfeeding								
No	60	25,5	175	74,5	235	100	0,729	0,479
Yes	8	32,0	17	68,0	25	100	(0,299-1,774)	
Rice Frequency Consumption								
Low	3	37,5	5	62,5	8	100	1,765	0,428
High	69	25,4	203	74,6	272	100	(0,411-7,580)	
Egg Frequency Consumption								
Low	41	25,5	120	74,5	161	100	0,883	0,762
High	24	27,9	62	72,1	86	100	(0,489-1,592)	
Fish Frequency Consumption								
Low	43	30,3	99	69,7	142	100	1,459	0,201
High	25	22,9	84	77,1	109	100	(0,823-2,587)	
Meat Frequency Consumption								
Low	22	28,6	55	71,4	77	100	1,356	0,460
High	18	22,8	61	77,2	79	100	(0,659-2,790)	
Dairy Product Frequency Consumption								
Low	16	31,4	35	68,6	51	100	1,345	0,460
High	34	25,4	100	74,6	134	100	(0,662-2,729)	

*p value < 0,05 = significant

Table 4. Difference of Underweight Proportion based on Variable among Children aged 24-59 months on North Sumatra Province (Data Analysis Indonesia Family Life Survey 2014)

Variable	Underweight				Total		OR (95%CI)	p Value
	Yes		No		n	%		
	n	%	n	%				
Vegetables Frequency Consumption								
Low	10	24,4	31	75,6	41	100	0,699	0,616
High	12	31,6	26	68,4	38	100	(0,260-1,877))	
Fruits Frequency Consumption								
Low	3	50	3	50	6	100	5,000	0,545
High	1	16,7	5	83,3	6	100	(0,344-72,767)	
Fast Food Frequency Consumption								
Low	2	13,3	13	86,7	15	100	0,923	1,000
High	3	14,3	18	85,7	21	100	(0,134-6,335)	
Fried Food Frequency Consumption								
Low	17	28,3	43	71,7	60	100	1,483	0,336
High	20	21,1	75	78,9	95	100	(0,703-3,130)	
Sweet Food Frequency Consumption								
Low	19	26,0	54	74,0	73	100	0,933	0,876
High	46	27,4	122	72,6	168	100	(0,500-1,740)	
Instant Noodle Frequency Consumption								
Low	18	24,7	55	75,3	73	100	0,890	0,866
High	32	26,9	87	73,1	119	100	(0,456-1,737)	

Discussion

The proportion of underweight children aged 24-59 months who lived in North Sumatra based on Indonesia Family Life Survey 2014 data was 25,7%. Based on the World Health Organization classification, this proportion of underweight in North Sumatra province is categorized as high (1).

This study found a significant association between a child's gender and underweight. Girls had a 0,514 times higher risk of underweight than boys, due to a difference in the food portion between girls and boys, where girls have a smaller portion than boys (9). In female children, food consumption tends to be related to fiber, vegetables, fruit, and low food sources of fat than boys consumption habits. This affected to intake received by each child (16). The proportion of underweight was found higher in children with low birth weight history (33,3%) than children with normal birth weight (25,9%) but no significant association between underweight in children aged 24-59 months and birth weight status, which is due to the proportion of low birth weight in North Sumatra province relatively low than normal birth weight.

The proportion of underweight in North Sumatra didn't show a significant association with infectious disease and diarrhea, which is due to good nutritional status in child aged 24-59 months. Furthermore, there's a probability in early prevention about infectious disease. Underweight was not affected by anaemia history in children aged 24-59 months because the risk of being anaemia was decreased and more often in children with long-term iron deficiency (10).

This study found a significant association between maternal nutritional status and child underweight. The child from a mother with underweight status ($BMI < 18,5 \text{ kg/m}^2$) had a 3,75 times

higher odds of being underweight than a child from a mother with normal nutritional status ($BMI \geq 18,5 \text{ kg/m}^2$). Maternal nutritional status affected by maternal education level can affect the income received, thereby affect the ability to be able to buy varied and nutritious food for her child (11). The mother decided to purchase foods items related to the child's nutritional status because, at this age, the food type that the child consumed was like Family food with a small portion. Food with high nutritional value, varied, and healthy can affect child's intake to decrease the risk of becoming underweight (15).

Mother's smoking habit did not associate with children underweight, but the mothers who smoked had a higher proportion of children underweight than the mothers who did not smoke. This affected household expenditure which can be transferred to buy cigarettes, so purchasing nutritious food decreases and affects child nutritional status and inadequate food intake (12).

This study did not find a significant association between gestational age and underweight. The child born with preterm history tended to have catch-up growth during the first 6 months to have a normal growth pattern (13).

Carbohydrate, animal food source, plant food source, fast food, fat food, vegetables & fruits, and milk expenditure didn't show a significant association with underweight in child aged 24-59 months lived in North Sumatra Province, which is due to varied food items in every household so it can affect the price. Furthermore, the Indonesia Family Life Survey expenditure data didn't explain whether it was issued for children's intake only or all family members. This study found a significant association between cigarette expenditure and child underweight. The household with a high cigarette expenditure had a 1,8 times

higher risk of having a underweight child. This relevant to another study that showed high cigarette expenditure can distract household expenditure for good quality food like eggs, fish, vegetables, and fruits to increase the risk of being underweight in children (12).

Exclusive breastfeeding and basic immunization status didn't have a significant association because this study only involved children aged 24-59 months. At this age child didn't receive an exclusive breastfeeding program that only lasts for the first 6 months. In contrast, basic immunization program at this age has been completed.

This study found no significant association between fish, meat, and dairy product frequency consumption with underweight in children. However, the proportion of underweight children with a low frequency of eating fish, meat, and dairy products were higher than those with a high frequency of eating fish, meat, and dairy products. This relevant to another study that showed consumption of high protein source of foods affects the increase of the child's body weight and height after being monitored for 6 months (14).

The frequency of eating vegetables and fruits still low compared to survey data of individual food consumption which states that the age group of 0-59 months still have a lower frequency of eating vegetables and fruits, so this study found no significant association between consumption of vegetables and fruit with underweight. The frequency of consuming fast food, fried food, sweet food, and instant noodle also found no significant association with underweight. Due to high consumption each type of that foods can affect the risk of being overweight or obesity in child due to high fat content.

Conclusion

The proportion of underweight in North Sumatra province categorized as high problem based on the Indonesia family Life Survey year 2014 analysis. There were significant associations between child gender, underweight maternal nutrition, and high cigarette expenditure with underweight children aged 24-59 months in North Sumatra province after adjusting for the all the factors. The intervention is necessary to be implemented by all parties to decrease the prevalence of underweight especially in North Sumatra.

Underweight is one of the nutritional problems that remains a high problem in North Sumatra. This study about related factors to underweight in children aged 24-59 months in North Sumatra expected to be additional information and government guideline to declare the program to decrease the proportion of underweight in North Sumatra and also make people aware about how important to take a healthy life and adjust clean lifestyle

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Conflict of interest

The authors have declared that no competing interest exists

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