Short Communication

Household clean and healthy living behaviors and stunting severity among children under five in Indonesia: A cross-sectional study

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Abstract

The prevalence of stunting among children under five in Indonesia reached 21.5% in 2023, underscoring a persistent public health challenge. Behavioral factors, including Clean and Healthy Living Behavior (CHLB), are known to influence health outcomes and may contribute to child growth. The aim of this study was to examine the association between household CHLB and stunting severity among children under five years of age. A cross-sectional study was conducted from September to October 2024 in the Sukajaya Primary Health Center area. Using a total sampling technique, 62 mothers of stunted children aged 0–59 months were recruited. Data were collected through direct interviews using structured questionnaires and anthropometric measurements of children's height and weight. Statistical analysis included chi-square tests and multivariable logistic regression using SPSS version 23.0. The results showed that children with severe stunting were significantly younger than those with moderate stunting (26.9±14.9 months, $p<0.001$). Overall, household CHLB implementation was suboptimal; however, no statistically significant association was identified between the overall CHLB and stunting severity ($p=0.091$). Multivariable analysis identified child age (OR=0.916, $p=0.001$) based on weight-for-age z-scores (OR=0.298; $p=0.019$) as an independent predictor of stunting severity, whereas household CHLB was not significantly associated ($p=0.132$). In conclusion, stunting severity among children under five was primarily associated with child age and nutritional status rather than household CHLB implementation. These findings highlight the importance of early-life nutritional interventions to prevent progression to severe stunting.

Keywords: Healthy lifestyle, nutritional status, undernutrition, growth faltering, early childhood

Introduction

Stunting remains a global nutritional issue among children and is characterised by impaired linear growth, making affected children appear shorter than others of the same age group [1]. Globally, the prevalence of stunting in 2022 was around 148.1 million (22.3%). Asia has the highest number of stunted children worldwide, with Southeast Asia recording the second-highest regional prevalence (26.4%). In Indonesia, the prevalence of stunting remains high at 31%, ranking second in Southeast Asia after Timor-Leste (45.1%) [2]. This figure is still far from Indonesia's National Medium-Term Development Plan (RPJMN) 2024 target of 14% [3].

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Although the national prevalence slightly decreased by 0.1% from 2022 to 2023, Aceh Province continues to rank seventh highest nationally, reporting a prevalence of 29.4%. Within Aceh, Sabang City recorded a stunting prevalence of 25.6% [4].

Stunting is a multifactorial problem influenced by direct and indirect determinants, including dietary intake, infection, caregiving practices, environmental conditions, and socioeconomic factors [5-7]. Its management requires a multidisciplinary prevention-focused approach, due to its adverse effects on physical growth and brain development in early childhood [7,8]. To address this issue, the Indonesian Ministry of Health has promoted Clean and Healthy Living Behavior (CHLB) as a household-based health guideline as one of the stunting management strategies. CHLB consists of ten indicators: exclusive breastfeeding, monthly anthropometric monitoring, use of clean water, proper handwashing, use of healthy latrines, routine mosquito larvae eradication, daily consumption of fruits and vegetables, daily physical activity, assisted delivery by health workers, and the absence of smoking within the household [9].

Nutrition plays a crucial role in the development of stunting. Inadequate nutritional intake from pregnancy through early childhood increases the risk of growth faltering in children [10]. Evidence also indicates that water, sanitation, and hygiene (WASH) practices are significantly associated with stunting among children under five, particularly handwashing practices, access to clean water, and the use of healthy latrines [11,12]. Other studies have reported significant associations between exclusive breastfeeding, hand washing practices, and stunting [13].

Infectious diseases further contribute to stunting risk. A history of malaria infection during pregnancy or early childhood has been shown to increase the likelihood of stunting, highlighting the importance of malaria prevention in endemic areas [14]. Although indirectly linked, childbirth assisted by health workers may contribute to stunting prevention through early infection control and maternal education on appropriate infant feeding and childcare practices [15]. Given that infection is a major risk factor for stunting, comprehensive implementation of CHLB indicators may influence both the occurrence and severity of stunting [16].

Household tobacco smoke exposure is also detrimental to children's growth, as it interferes with nutrient absorption and may reduce household resources available for nutritious food [17]. In addition, regular physical activity supports children’s overall growth and development when accompanied by adequate nutrition, hygiene, and a healthy environment [18]. A study at Karuwisi Health Center in 2023 reported that families of stunted children were less likely to practice CHLB [19]. Data from the Sukajaya Primary Health Center, a malaria-endemic area in Sabang City, also showed that 51 households with stunted children did not practice CHLB in 2024.

Given the multifactorial nature of stunting, integrating nutritional, environmental, and behavioural interventions is essential for effective prevention and control. Although previous studies have reported associations between CHLB indicators and stunting, evidence regarding the combined implementation of these behaviors at the household level and their relationship with stunting severity remains limited, particularly in Aceh Province. Therefore, the aim of this study was to examine the association between household CHLB and stunting severity among children under five in the working area of the Sukajaya Primary Health Center, Sabang City, to provide evidence that may inform local and national stunting prevention strategies.

Methods

Study settings

This study employed an observational analytic design with a cross-sectional approach and was conducted in the working area of the Sukajaya Primary Health Center, Sabang City, from September to October 2024. A total sampling technique was applied, involving all eligible members of the target population who met the study criteria. The inclusion criteria comprised stunted children aged 0–59 months who resided in the Sukajaya Primary Health Center area, possessed a family card, and provided written informed consent to participate. The exclusion criteria included mothers or children who were unwell during the data collection period, and mothers who were uncooperative or withdrew from the study during data collection.

Data collection instruments and procedure

Data on participants' characteristics were collected through face-to-face interviews using a structured questionnaire, adapted from the CHLB guidelines stipulated in the Regulation of the Republic of Indonesia Ministry of Health Number 2269/MENKES/PER/XI/2011 [9]. This questionnaire has been used in previous studies to assess the ten household-level CHLB indicators. Based on these guidelines, CHLB was categorized into two levels: good and poor. Good CHLB was defined as the fulfillment of at least six of the ten CHLB indicators, whereas poor CHLB was defined as the fulfillment of fewer than six indicators.

Stunting status was determined using anthropometric measurements of children's height-for-age, which were interpreted according to the Child Anthropometry Standards outlined in the Ministry of Health Regulation Number 2 of 2020 [20]. Stunting was classified into moderate stunting, defined as a height-for-age z-score between -3 SD and <-2 SD, and severe stunting, defined as a z-score <-3 SD.

Statistical analysis

Demographic characteristics of participants were summarized using descriptive statistics, with categorical variables presented as frequencies and proportions, and continuous variables presented as means or medians as appropriate. Stunting severity was treated as the dependent variable. The Kolmogorov-Smirnov test was used to assess data normality. Bivariate analysis was conducted to examine the association between independent variables and stunting severity using the Chi-Square test, while continuous variables were assessed using the Student's t-test. A p-value of less than 0.05 was considered statistically significant. Variables with $p<0.05$ in bivariate analysis were considered for multivariate logistic regression. All statistical analyses were performed using IBM SPSS Statistics version 23 (IBM Corp., Armonk, NY, USA).

Results

A total of 62 children under five years of age with stunting were included in this study, comprising 42 children with moderate stunting and 20 children with severe stunting. The demographic characteristics of the children and their mothers are presented in **Table 1**. There was a significant difference in the mean age of the children between groups (p=0.000), with children with moderate stunting being older (42.1±12.6 months) compared to those with severe stunting (26.9±14.9 months). Regarding maternal characteristics, the majority of mothers were aged 20–35 years, had a Senior High School education, and were housewives. Furthermore, most families (n=58) reported a monthly income below the Sabang City minimum wage (<Rp 3.413.666).

Table 1. Bivariate distribution of stunting based on maternal sociodemographic and child characteristics.

Variable	Stunting category		p-value
	Moderate, n (%)	Severe, n (%)	
Mother's age (years)			0.697[a]
20–35	23 (54.8)	12 (60)	
>35	19 (45.2)	8 (40)	
Number of children			0.277[a]
≤2	23 (54.8)	8 (40)	
3–5	19 (45.2)	12 (60)	
Mother's education			0.413[a]
Primary school	5 (11.9)	0 (0)	
Junior high school	9 (21,4)	6 (30)	
Senior high school	17 (40.5)	9 (45)	
Diploma/bachelor	11 (26.2)	5 (25)	
Mother's working status			0.897[a]
Working	9 (21.4)	4 (20)	
Housewife	33 (78.6)	16 (80)	
Mother's income			0.154[a]
<Rp 3.413.666 (Sabang City MSEs)	38 (90.5)	20 (100)	
≥Rp 3.413.666 (Sabang City MSEs)	4 (9.5)	0 (0)	
Child's age (months)			0.000[b]
Mean±SD	42.1±12.6	26.9±14.9	
Median (min-max)	43.5 (19–59)	23.(8–59)	

Variable	Stunting category		*p*-value
	Moderate, n (%)	Severe, n (%)	
Sex			0.277[a]
Male	19 (45.2)	12 (60)	
Female	23 (54.8)	8 (40)	
Nutrition status (WAZ)			0.044[b]
Mean±SD	-2.07±0.57	-2.48±1.00	
Median (min-max)	-2.02 (-3.10–(-0.26))	-2.59 (-3.92–0.54)	

MSE: minimum subsistence expenditure; WAZ: weight-for-age z-scores
[a] Analyzed using Chi-square test
[b] Analyzed using Student t-test

The distribution of CHLB indicators according to stunting severity is presented in **Table 2**. Overall, none of the household CHLB indicators showed a statistically significant association with stunting severity ($p>0.05$). However, children from households with good CHLB tended to have lower odds of severe stunting compared with those from households with poor CHLB (OR=0.38; 95% confidence interval (CI): 0.12–1.18; $p=0.091$). Routine eradication of mosquito larvae also demonstrated a protective tendency against severe stunting (OR=0.35; 95%CI: 0.11–1.09; $p=0.068$), although the association did not reach statistical significance.

No significant differences were observed between moderate and severe stunting categories with respect to exclusive breastfeeding, monthly anthropometric monitoring, use of clean water, appropriate handwashing practices, use of healthy latrines, daily fruit and vegetable consumption, daily physical activity, or household smoking status (all $p>0.05$). Assisted delivery by health workers could not be analysed because all respondents reported receiving assisted delivery.

Table 2. Distribution of clean and healthy living behavior (CHLB) based on stunting

Variable	Stunting		*p*-value	OR (95%CI)
	Moderate, n (%)	Severe, n (%)		
Household CHLB			0.091	0.38 (0.12–1.18)
Good	10 (23.8)	9 (45)		
Poor	32 (76.2)	11 (55)		
Assisted delivery by health workers			NA	
Yes	42 (100)	20 (100)		
Exclusive breastfeeding			0.861	1.10 (0.38–3.19)
Yes	22 (52.4)	10 (50)		
No	20 (47.6)	10 (50)		
Monthly anthropometric monitoring			0.399	0.60 (0.18–1.98)
Yes	27 (64.3)	15 (75)		
No	15 (35.7)	5 (25)		
The use of clean water			0.608	1.33 (0.44–4.01)
Yes	28 (66.7)	12 (60)		
No	14 (33.3)	8 (40)		
Appropriate handwashing practice			0.699	0.69 (0.11–4.51)
Yes	3 (7.1)	2 (10)		
No	39 (92.9)	18 (90)		
The use of healthy latrines			0.487	0.67 (0.56–0.80)
Yes	41 (97.6)	20 (100)		
No	1 (2.4)	0		
Routine eradication of mosquito larvae			0.068	0.35 (0.11–1.09)
Yes	19 (45.2)	14 (70)		
No	23 (54.8)	6 (30)		
Daily consumption of fruits and vegetables			0.166	0.28 (0.04–1.85)
Yes	2 (4.8)	3 (15)		
No	40 (95.2)	17 (85)		
Daily physical activity			0.638	1.50 (0.28–8.19)
Yes	6 (14.3)	2 (10)		
No	36 (85.7)	18 (90)		
Household smoking status			0.919	0.94 (0.27–3.23)
Yes	32 (76.2)	15 (75)		
No	10 (23.8)	5 (25)		

Multivariate logistic regression analysis

Multivariate logistic regression analysis, including child's age, nutritional status, and household CHLB, identified child's age and nutritional status as significant determinants of stunting severity. Increasing age was associated with a lower likelihood of severe stunting (OR=0.916; 95%CI: 0.870–0.964; p=0.001). Similarly, a higher weight-for-age z-score was significantly protective against severe stunting (OR=0.298; 95%CI: 0.109–0.816; p=0.019). In contrast, household CHLB implementation was not independently associated with stunting severity after adjustment for confounding variables (p=0.132). The lack of association between CHLB and stunting severity in the multivariate model may be attributable to limited sample size and the cross-sectional design, which restricts causal inference.

Discussion

This study provides insight into the complex interplay between maternal sociodemographic characteristics, child-related factors, and the implementation of CHLB in relation to stunting severity among children under five. These findings indicate that child-related factors were more strongly associated with stunting severity than maternal sociodemographic characteristics. Although no statistically significant association was observed between overall household CHLB implementation and stunting severity, child age and current nutritional status were independently associated with severe stunting. Nevertheless, several indicators showed protective tendencies, suggesting that CHLB may still play an important indirect role in influencing child growth outcomes.

Child age was the most significant factor, with severe stunting occurring more frequently among children aged 0–23 months. This finding is consistent with previous studies demonstrating that growth faltering predominantly occurs within the first 1,000 days of life. This stage of life is the most vulnerable to inadequate nutrition, infections, and suboptimal caregiving practices [21]. Nutritional insults during this window may have lasting effects into later childhood, underscoring the importance of early-life interventions focusing on maternal nutrition, infant feeding practices, and infection prevention.

A significant association was also found between nutritional status and weight-for-age z-scores (WAZ) and stunting severity. Severely underweight children had a higher prevalence and odds of severe stunting compared with those with adequate nutritional status. This finding reflects the close and bidirectional relationship between chronic undernutrition and linear growth failure [10]. Persistent energy and micronutrient deficiencies impair cellular growth, hormonal regulation, and organ development, while stunting itself may further exacerbate nutritional deterioration through increased metabolic demands and recurrent illness [22,23]. Therefore, sustained nutritional support to prevent progression to severe stunting is highly needed.

Maternal age, education, employment, and income level did not differ significantly between moderate and severe stunting groups. This lack of association may be explained by the relative homogeneity of maternal characteristics within the study population, which limited variability between groups. Nonetheless, severe stunting was more frequently observed among children of younger, less educated, and unemployed mothers. Maternal education and socioeconomic status may influence child growth indirectly through caregiving practices and household behaviors, which were partially captured by the CHLB indicators in this study [24]. Previous research has shown that maternal education improves health-seeking behaviour and caregiving practices, thereby reducing the risk of child undernutrition and stunting [25,26].

Despite the absence of a statistically significant association, several CHLB indicators revealed notable trends. Poor CHLB practices were more prevalent among severely stunted children than moderately stunted children (76.2%). The near-significant association observed for routine eradication of mosquito larvae suggests a potential indirect role of vector-borne diseases, such as malaria and dengue, in affecting nutritional absorption and child health. Recurrent infections are known to impair nutrient absorption and contribute to growth failure [14]. In addition, low adherence to dietary-related CHLB indicators, particularly daily consumption of fruits and vegetables, was observed across both groups, reflecting broader challenges related to dietary diversity and household socioeconomic constraints [27,28]. Adequate dietary diversity is

essential to ensure sufficient intake of macro- and micronutrients required for optimal growth and development [29].

Exclusive breastfeeding and regular growth monitoring remain critical components of stunting prevention. Breastfeeding provides optimal nutrition and immune protection during early life, reducing susceptibility to infections that may impair growth [30]. Regular anthropometric monitoring enables early detection of growth faltering and timely intervention, thereby preventing irreversible consequences [31,32]. Environmental health behaviors, including clean water use, proper latrine use, and handwashing, were generally well practiced in this study. The lack of significant associations may suggest incorrect or inconsistent application. Previous studies have demonstrated that WASH practices reduce stunting by preventing enteric infections and improving nutrient absorption [12]. Integrated interventions combining WASH nutrition, and environmental control are more effective than single-component approaches [33,34].

Although physical activity and household smoking exposure were not significantly related to stunting severity, secondhand smoke remains a public health concern. Exposure to tobacco smoke has been linked to respiratory infections, asthma exacerbations, and other conditions that may disrupt child growth and development [35]. However, awareness of these risks remains low among household smokers [36].

The lack of an independent association between CHLB and stunting severity in the multivariate analysis may indicate that household-level health behaviors exert their influence earlier in life or affect the occurrence of stunting rather than the severity of stunting. It is also possible that the cumulative impact of multiple CHLB indicators was insufficient to produce measurable differences within this population or that their effects were mediated through child age and nutritional status. These findings highlight the multifactorial nature of stunting and emphasize the need for comprehensive, multisectoral strategies that integrate nutritional, behavioural, environmental, and socioeconomic interventions.

This study has several limitations. Initially, the cross-sectional design precludes the potential for causal interference. Furthermore, the inclusion of solely stunted children reduced variability and prevented comparison with non-stunted peers. The relatively modest sample size may have diminished the statistical power of the study. Finally, CHLB indicators were assessed through self-reported questionnaires, which are subject to recall and social desirability bias. Despite these limitations, this study provides valuable local evidence on the relationship between household health behaviors and the severity of stunting. These findings may inform targeted interventions and future longitudinal research aimed at reducing stunting among children under five.

Conclusions

Household CHLB were not associated with stunting severity among children under five in this study. Stunting severity was significantly related to child age and nutritional status, underscoring the chronic and cumulative nature of growth failure. Future interventions should integrate early nutritional interventions, maternal education, and environmental health to effectively prevent stunting progression.

Ethics approval

This study was approved by the Ethics Committee of the Faculty of Medicine, Universitas Syiah Kuala (Approval No. 145/EA/FK/2024). The study was conducted in accordance with the 2016 Council for International Organizations of Medical Sciences (CIOMS) Ethical Guidelines. Written informed consent was obtained from parents or legal guardians of all participating children before data collection. Assent was not required due to the young age of the participants. Participant confidentiality was ensured through data anonymization, de-identification of personal information, and secure storage of data in password-protected files accessible only to the research team.

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Competing interests

All the authors declare that there are no conflicts of interest.

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Underlying data

Derived data supporting the findings of this study are available from the corresponding author on request.

Declaration of artificial intelligence use

We hereby confirm that no artificial intelligence (AI) tools or methodologies were utilized at any stage of this study, including during data collection, analysis, visualization, or manuscript preparation. All work presented in this study was conducted manually by the authors without the assistance of AI-based tools or systems.

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