Associations among self-efficacy, fruit and vegetable consumption habits, and vitamin C intake in adolescents at MTsS Al-Hasanat Kaleke

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Abstract. Adolescence is a critical period for establishing dietary habits and meeting micronutrient requirements. Vitamin C is relevant during this stage because it contributes to collagen synthesis, antioxidant protection, immune function, and non-heme iron absorption. This cross-sectional study examined the associations among self-efficacy, fruit and vegetable consumption habits, and vitamin C intake in adolescents at MTsS Al-Hasanat Kaleke, Sigi Regency, Central Sulawesi, Indonesia. Of the 57 enrolled students, 55 participated; two students declined or withdrew during recruitment. Data were collected using a 12-item self-efficacy questionnaire, a Food Frequency Questionnaire, and two non-consecutive 24-hour dietary recalls. Spearman correlation analysis was performed. Most respondents had inadequate vitamin C intake (92.7%), and fruit and vegetable consumption was 1-2 times/week. Self-efficacy showed a weak positive but non-significant correlation with vitamin C intake (r=0.236; p=0.083), whereas vegetable consumption frequency (r=-0.041; p=0.767) and fruit consumption frequency (r=-0.040; p=0.770) showed negligible non-significant correlations. These findings suggest that individual confidence may be insufficient to improve vitamin C intake without a supportive school food environment and access to vitamin C-rich foods.

1 Introduction

Adolescence, the transition from childhood to adulthood, is a critical stage for physical growth, cognitive development, and the formation of long-term health behaviours [1]. Adequate micronutrient intake is therefore essential. However, low fruit and vegetable remains common among Indonesian adolescents. National data from Riskesdas indicate that the prevalence of inadequate vegetable and fruit consumption remains high. In 2018, 96.8% of adolescents aged 10–14 years consumed fruits and vegetables below the recommended level. At the local level, only 5.87% of residents in Sigi Regency met the recommended intake of fruits and vegetables [2]. Because fruits and vegetables are major dietary sources of vitamin C, low consumption may contribute to suboptimal vitamin C intake.

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Vitamin C is particularly relevant during adolescence, when metabolic demands and tissue development increase. Physiologically, vitamin C supports collagen synthesis, which is important for tissue formation and repair, and acts as an antioxidant that helps protect cells from oxidative stress [3]. It also enhances non-heme iron absorption, which is important for preventing iron deficiency that can impair concentration, learning capacity, and physical performance [4].

Behavioural determinants may influence adolescents' dietary practices. Self-efficacy, a key construct of Social Cognitive Theory, refers to an individual's belief in their ability to perform a specific behaviour. Recent evidence indicates that stages of behavioural change and self-efficacy are related to healthy dietary markers among adolescents and young adults [5]. However, limited studies have examined self-efficacy, fruit and vegetable consumption habits, and actual vitamin C intake in a school setting. This study aimed to analyse the association between self-efficacy, fruit and vegetable consumption habits, and vitamin C intake among adolescents at MTsS Al-Hasanat Kaleke.

2 Research methods

This analytical quantitative study used a cross-sectional design, conducted from February to March 2024 at MTsS Al-Hasanat Kaleke, an Islamic junior secondary school located in Sigi Regency, Central Sulawesi Province, Indonesia. The study population consisted of all enrolled students (n=57) and total sampling was applied. Of the 57 eligible students, two declined to participate during recruitment although they had been approached and informed about the study procedures. Therefore, the final sample consisted of 55 respondents who met the inclusion criteria and provided informed consent.

Primary data were collected through structured interviews using a self-efficacy questionnaire, a Food Frequency Questionnaire (FFQ), and two non-consecutive 24-hour dietary recalls. Secondary data obtained from school records were limited to the number of enrolled students and used to define the study population and sampling frame. Self-efficacy was defined as adolescents' perceived confidence in consuming fruits and vegetables in different daily situations. The instrument was based on the Social Cognitive Theory framework. It consisted of 12 statements scored from 0 to 100, with higher scores indicating greater confidence. The average self-efficacy score was calculated for each respondent, and the median of these average scores (58) was used as the cut-off point: <58 was categorized as low self-efficacy and ≥58 as high self-efficacy.

Fruit and vegetable consumption habits were assessed using an FFQ with six frequency categories, ranging from never to >1 time/day. Dietary vitamin C intake was assessed using two direct 24-hour dietary recall interviews conducted on different days. Descriptive statistics were used to summarize participant characteristics and variable distributions. Spearman rank correlation was used to examine associations, with statistical significance set at $p<0.05$.

3 Results and discussion

3.1 Results

A total of 55 adolescents participated in the study. Most respondents were male (52.7%) and aged 13-15 years (80.0%). The majority had inadequate vitamin C intake (92.7%).

Slightly more than half of the respondents had high self-efficacy (52.7%), while the highest frequency of fruit and vegetable consumption was 1-2 times/week.

Table 1. Characteristics, vitamin C intake, self-efficacy, and fruit and vegetable consumption of respondents (n=55).

Characteristic/Variable	n	%
Sex		
Male	29	52.7
Female	26	47.3
Age (years)		
13–15	44	80.0
16–18	11	20.0
Vitamin C Intake (RDA 2019)		
Inadequate	51	92.7
Adequate	4	7.3
Self-efficacy		
Low (<58)*	26	47.3
High (≥58)*	29	52.7
Vegetable Consumption Frequency		
Never	2	3.6
<3 times/month	14	25.5
1–2 times/week	34	61.8
3–6 times/week	3	5.5
1 time/day	2	3.6
>1 time/day	0	0
Fruit Consumption Frequency		
Never	2	3.6
<3 times/month	9	16.4
1–2 times/week	35	63.6
3–6 times/week	9	16.4
1 time/day	0	0
>1 time/day	0	0

*Median self-efficacy score=58

Spearman's correlation analysis showed a weak positive correlation between self-efficacy and vitamin C intake (r=0.236), but the association was not statistically significant (p=0.083). Vegetable consumption frequency (r=-0.041; p=0.767) and fruit consumption frequency (r=-0.040; p=0.770) showed negligible negative correlations with vitamin C intake; both associations were not statistically significant.

Table 2. Correlation between self-efficacy, vegetable and fruit consumption with vitamin C intake (n=55)

Variable	Correlation Coefficient	p-value
Self-efficacy	0.236	0.083
Vegetable consumption	-0.041	0.767
Fruit consumption	-0.040	0.770

Spearman rank correlation; significance at p<0.05.

3.2 Discussion

The present study revealed a high prevalence of inadequate vitamin C intake among adolescents, with 92.7% failing to meet the recommended dietary allowance. This finding is consistent with Widnatusifah et al. (2020), who reported that only 3.4% of adolescents met daily vitamin C requirements, while 96.6% were categorized as inadequate [6]. Although several types of fruits and vegetables were consumed, their frequency remained low, predominantly 1–2 times per week. Similar findings were reported by Woisiri et al. (2021), who documented low average vegetable (4.41 g/day) and fruit intake (38.59 g/day) among adolescents [7].

Regarding self-efficacy, slightly more than half of respondents were classified as having high self-efficacy. The highest-rated statement indicated confidence in consuming fruit even when it required peeling or cutting (mean score 70), whereas the lowest score was related to purchasing fruit at school canteens or eating places (mean score 40). This suggests contextual differences in perceived behavioural control related to access and availability.

Despite theoretical expectations, no significant association was observed between self-efficacy and vitamin C intake. This finding aligns with Fayasari et al. (2020), who reported no significant relationship between self-efficacy and fruit and vegetable consumption among adolescents in rural areas [8]. Previous studies that identified significant associations often involved larger sample sizes and included additional psychosocial variables such as parental and peer influence or adjustment variables. In studies incorporating behavioural stage models and adjustment variables such as nutrition knowledge, self-efficacy remained significantly associated with dietary behaviour [5].

Furthermore, no significant association was found between fruit and vegetable consumption frequency and vitamin C intake. One possible explanation is that the FFQ captured frequency but not detailed portion size or the vitamin C content of the specific foods consumed. Field observations indicated that adolescents more frequently consumed sweetened snacks and beverages sold at school rather than fruits and vegetables. Palayukan et al. (2021) similarly reported no significant association between adequacy of vitamin C and E intake and family capacity to fulfil fruit and vegetable consumption ($p=1.000$) [9]. These findings suggest that reported consumption frequency alone may not directly reflect actual micronutrient adequacy among adolescents.

This study has several limitations. First, its cross-sectional design does not allow causal inference. Second, the sample was relatively small and limited to one school, which may restrict the generalizability of the findings. Third, the FFQ assessed frequency but not quantitative portion size, and two 24-hour recalls may still be affected by memory and reporting bias. Finally, this study did not collect broader contextual and psychosocial variables, such as socioeconomic status, nutrition knowledge, attitudes, food access, parental influence, peer influence, and snack consumption patterns. Future studies should include these variables and apply multivariable analysis to better capture the multifactorial nature of adolescent dietary behaviour.

4 Conclusion

Most adolescents at MTsS Al-Hasanat Kaleke had inadequate vitamin C intake, and fruit and vegetable consumption was generally infrequent. Self-efficacy showed a weak positive but non-significant correlation with vitamin C intake, whereas fruit and vegetable consumption frequency showed negligible and non-significant correlations. These findings suggest that improving adolescents' vitamin C intake requires not only strengthening

individual confidence but also creating supportive food environments. School-level strategies, such as improving fruit availability in the canteen, reducing the dominance of sweetened snacks and beverages, and implementing nutrition education that targets low self-efficacy areas, may be considered. Future research should involve larger samples, include contextual and psychosocial determinants, and use more robust analytical approaches, such as multivariable regression.

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