



Perceived Barriers and Needs of Dietary Macro Nutrient Intake in Adolescent Schoolgirls in Small Island

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ARTICLE INFO

Article History:

Received Nov, 2nd, 2021

Accepted Jul, 22nd, 2022

Published online Sept, 30th, 2022

Keywords:

Adolescent girls;
macronutrient intake;
barriers;
needs;

ABSTRACT

Adolescence is an important period of rapid change in biological, psychosocial and cognitive growth and development marked by significant increases in nutrition and energy needs. The study aimed to explore perceived barriers and needs regarding dietary macronutrient intake in adolescent girls in Barrang Lompo Island in Makassar City, South Sulawesi Province, Indonesia. The qualitative design drew on constructs from social cognitive theory. The sample consisted of 18 adolescent girls and their mothers from grades 8 to 11 whose dietary macronutrient intake was less than the recommended dietary allowance. A semi-structured interview protocol was used to explore perceived barriers and needs regarding dietary macronutrient intake, and the data were subjected to thematic analysis and analytic generalization. To ensure adequate dietary intake, adolescent girls need support from family and friends and access to preferred foods. Barriers include laziness about eating key foods, feelings of fullness due to snacking, addiction to cellphones, and lack of raw foodstuffs for making their favorite dishes. Social cognitive theory used to identify needs and barriers showed environmental and individual factors from adolescents play important role in appropriate food consumption in teenage girls. The findings may help to improve future interventions to enhance dietary patterns in adolescent girls who live in small island.

INTRODUCTION

Thinness, defined with BMI Z-score value is -2.01 and -3.00,¹ still becomes a problem in adolescent of school age girls in low and middle income country. A study by Candler et al., showed that there were 7.64% thin girls from 40 countries which Asia has the higher rate than other continents.² In Indonesia, adolescent's thinness also remains a problem. Approximately 9% of adolescents aged 13–15 years are thin, and approximately 6% were girls.³ Adolescents underweight contribute to increase risk of morbidity.⁴ It has important impact for healthy development and the economic productivity.⁵ in adolescent girls, thinness is a consequence of acute malnutrition that indicate a lack of food intake during a certain period that can have negative implications both for themselves and for their future children if they become mother.⁶

Adolescence is an important period of rapid change in biological, psychosocial, and cognitive growth and development marked by significant increase in nutrition and energy needs.⁷ Adolescent psychosocial development often shapes the development of health-related food and lifestyle habit. Globally, school age adolescents do not regularly consume fruits and vegetables and often consume carbonated drinks.^{8,9} In Indonesian adolescents, there is evidence of poor dietary habits in both rural and urban areas, and about 53% of those aged 13–18 years old consume less than 70% of their recommended dietary allowance.¹⁰ One study in Barrang Lompo, a small island in Makassar City, reported that more than 80% of adolescents consume macronutrients for less than 80% of their recommended dietary allowance.¹¹

Adequate consumption of macronutrients such as carbohydrate, protein and fat have positive impact to health status in adolescents. Consuming healthy fat adequately may reduce systemic inflammation.¹² Higher intake of total protein has positive correlation with lower risk of all causes of mortality.¹³ In addition, adequate macronutrients intake particularly in women in reproductive age have implication not only on their health such as undernutrition and potentially impact on chronic diseases, but also in the future may negatively influence pregnancy and

child outcomes.¹⁴

In general, poor dietary patterns on macronutrients intake have direct effects on nutritional status,¹⁵ and understanding the factors that influence adolescent's eating behavior is a critical precursor for effective intervention to prevent malnutrition in this age group. In Bandura's social cognitive theory, change of health behavior is influenced by environmental factors, personal factors, and behavior itself.¹⁶ Perceived barriers and facilitators are hypothesized to influence health behavior indirectly through the process of self-regulation. Exploration of perceived barriers and needs lead adolescents to understand the determinants of themselves better in practicing healthy eating behaviors and physical activity.^{17,18}

To the author's knowledge, no previous published study has explored these issues in relation to adolescents' food consumption, especially in those who live in small island. This study explores the determinants of eating behavior in these adolescents. To gain a deeper insight into the factors that influence eating behavior, the present study draws on the Social Cognitive Theory (SCT) of behavior change,¹⁶ to capture the personal factors that influence these behaviors in adolescent girls. Specifically, the study aimed to explore perceived barriers and needs regarding dietary macronutrient intake in adolescent girls in Barrang Lompo Island, Makassar City, South Sulawesi Province, Indonesia.

MATERIAL AND METHOD

The study's qualitative design involved semi-structured in-depth interview through face-to-face. The study was conducted in two high schools in Barrang Lompo Island, a sub district of Makassar City which is the capital of Indonesia's South Sulawesi Province. Barrang Lompo Island has a population of about four thousand and covers an area of approximately 19 hectares.¹⁹ A regular one-hour boat service links the island to the capital. There is only one private senior high school and one public junior high school in this island.

The informants in this study consisted of adolescent school age girls and their mother. We involved adolescent girls from grade 7 to 12 purposively. Several inclusion criteria were used in

selecting informants. Participants attend school in Barrang Lompo Island and they had lived on this Island for at least 5 years, the girls school principal and their parents gave permission for their participation and signed a consent form before they were interviewed, using 24-hour recall questionnaire, the researcher interviewed the girls to assess the adequacy of their food intake, those with a macronutrient intake of less than 80% RDA (recommended daily allowance) for Indonesian adolescents,²⁰ and agreed to participate in this study were identified by a trained research assistant as target informants. Furthermore, adolescents' mother who agree to participate in this study were invited to be interviewed.

The study was conducted within two months from April to May 2021. Social Cognitive Theory (SCT) was used to explore the personal factors as well as environmental factors that influence the girls' eating behavior and energy intake. Previous study on implementing SCT which involved mother, has positive impact on outcome of intervention.²¹ However, the previous study focused to address overweight issue in adolescents. Therefore, in this study we involved mothers in representing the environmental factors in addressing under nutrition issues in adolescents. During the interview, we explored pattern of food consumption for breakfast, lunch, and dinner in terms of frequency and amount of them, to guide informant in expressing their dietary macronutrients intake.

Using interview guideline for data collection, the key questions explored adolescents' perceived needs and barriers in relation to adequate food intake pattern. After interviewing adolescents, we also interviewed their mother with a similar theme that we asked to their children separately. All interviews were conducted at a private location approved by the informant and lasted 40 minutes on average. COVID-19 health protocols were maintained during the interviews. At the beginning of each interview, the researcher welcomed the participants, explained the aim of the study, and assured them that their anonymity and confidentiality would be protected. All interviews were recorded and subsequently transcribed verbally. SCT constructs were used to code the transcribed material to capture energy intake barriers and needs in terms of personal and environmental factors.

Data management and thematic analysis were manually performed by researcher with relevant qualitative expertise. To enhance the validity of the findings, both data sources (adolescents and mothers) and data collection methods (observation, group discussion and in-depth interview) were triangulated. Exploration of information from mother aimed to enrich information from adolescents on perceived needs and barriers of adolescents in consuming macronutrients adequately. The study was approved by the Research and Ethics Committee of the Public Health Faculty at Hasanuddin University. The ethical approval number was 7262/UN4.14.1/TP.02.02/2020.

RESULTS

Socio-Demographic Characteristics of Informants

The mean age of the 18 adolescent girls who participated was 15.33 ± 1.7 years, and the mean age of the 6 interviewed mothers was 40.17 ± 2.9 years. Initially, we aimed to interview all mothers of adolescents, however, only 6 of 18 mothers agreed to participate in this study. Most of parents were educated to elementary school level and Most of informants came from fishery families (Table 1).

Perceived Barriers to Adequate Food Intake

Most adolescents agree that barriers to adequate food consumption relate to both internal and external factors. For these adolescent girls in Barrang Lompo, internal factors related mostly to personal reasons, including laziness about eating main foods, lack of appetite, unavailability of served favorite foods, lack of variety of served food, feeling full as a result of snacking and addiction to playing with cell phones to the extent of forgetting to eat. External factors seen as barriers to adequate food consumption included unavailability of raw food stuff to make their own favorite dishes and low purchasing power. These issues are summarized in the following thematic (domain) analysis chart (Figure 1).

The interview results identify laziness about eating main foods as a barrier to adequate food consumption in adolescents. This was confirmed by a mother in the group discussion.

I usually skip my lunch. I am lazy about eating, and I feel full. Having breakfast leaves, me feeling full in the

evening. Every night I eat one plate; if I eat more, I get a stomachache. (Adolescent 1)

She will not eat. She is lazy about eating. She says she has no appetite. I have forced her to eat regularly, but she does not want to eat. (Mother 1)

Participants' portion sizes was also smaller than the daily recommended intake for their age.

I think, my portion sizes is inadequate and inappropriate for my needs. I only have a main meal once or twice per day-usually breakfast and dinner, very rarely for lunch. I have no appetite. (Adolescent 2)

I eat less because I feel full even though I have not eaten anything. I think it is because I drink water. (Adolescent 3)

Her father (my husband) told her to increase her meal portion, but she still ate insignificant portion of food, and she did not want to eat. (Mother 2)

Adolescents said they have lack of appetite because the served meal was not their favorite food. According to mothers, the reason for this lack of appetite was the lack of variety in the food served.

I do not have any appetite. I lost my appetite because of the dishes were served. Almost every day, it was egg, and I do not like it anymore. I like fried fish with soy sauce. (Adolescent 3)

The amount is sometimes enough and sometimes not. I do not like vegetables and fish. I do not eat too much; I eat when I want to eat. (Adolescent 4)

The daily menu is not adequate sometimes it is the same from day to day: rice with vegetables like water spinach, no side dishes. That's it. I know she does not have any appetite, but what can I do? I pre-served what we have in the house like that. (Mother 2)

Street foods is alternative that the adolescents like. When they arrive home from school, they seldom eat because they have felt full, therefore, they choose sleeping over lunch.

I eat one plate of rice per day. For dinner, I eat meat balls or instant noodles, it's delicious. For my breakfast, I buy fried snacks or yellow rice. I do not like lunch, I prefer sleeping to having lunch. (Adolescent 4)

Another perceived barrier for these adolescents was cellphone usage. According to both mother and their daughter, the girls forgot to eat when playing with their cellphones which they perceived as more important than having a meal.

I play with my cellphone all day. It is interesting for playing games, social media and watching YouTube, and I forget to eat. My mother frequently reminds me about having a meal. (Adolescent 2)

I asked her to buy milk, but because of the cellphone and YouTube, she used the money to buy an internet quota. (Mother 2)

The external factors identified by adolescents as barriers to adequate food consumption were economic. According to the informants, lower purchasing power to access raw food can be a barrier to a balanced diet.

I think the lack of money means there is less availability of food. The food at home is not balanced. (Adolescent 1)

My husband is a fisherman, so he only earns money when the weather is good for catching fish. However, it is for the modality of the next activity. In terms of food, all we can provide is the preserved food that we can buy. (Mother 3)

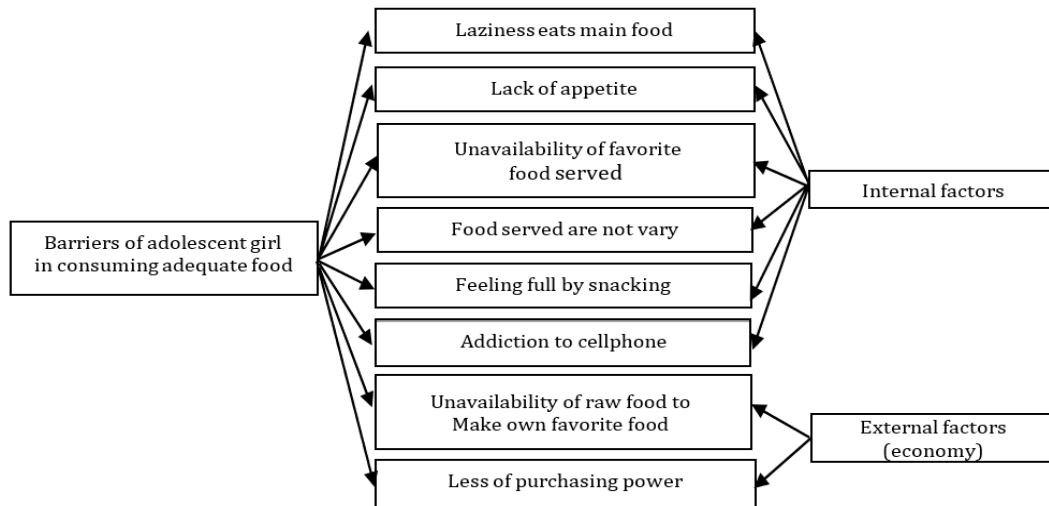
Table 1. Socio Demographic Characteristics of Informants (Adolescents and Mothers)

Characteristics	Adolescents (n = 18)	Mothers (n = 6)
Age (Years) (Mean± SD)	15.33±1.7	40.17±2.9
Mother Education		
Elementary	12	6
Junior High	4	0
Senior High	2	0
Mother Occupation		
Housewife	16	6
Small Business	2	0
Father Education		
Elementary	15	0
Junior High	1	0
Senior High	2	0
Father Occupation		
Fisherman	16	0
Small Business	2	0

Source: Primary Data, 2020

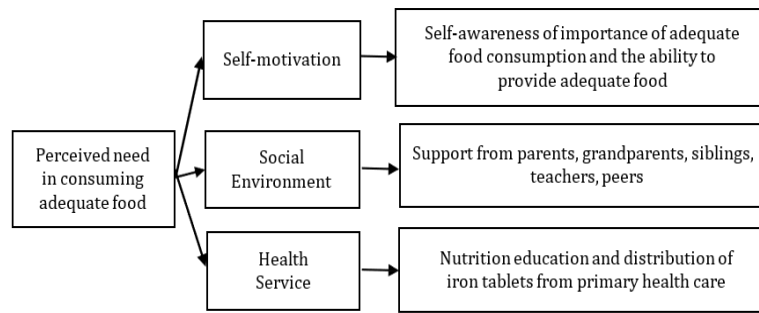
Perceived Needs for Adequate Food Intake

Adolescent girls need personal, environmental, and health service support for adequate food consumption. They need self-awareness and the ability to access preferred foods based on their needs. In terms of environment, adolescents need support from family members, including parents, grandparents, and siblings, and at school from their teachers and peers. Informants identified a balanced diet as a priority, and the family income was used to ensure food availability. Support from health services was also considered necessary including education about healthy food and monitoring of iron tablet supplements for adolescent girls. These needs are summarized in the following thematic analysis chart (Figure 2).



Source: Primary Data, 2020

Figure 1. Thematic Analysis of Perceived Barriers to Adequate Food Consumption



Source: Primary Data, 2020

Figure 2. Thematic Analysis of Perceived Needs to Adequate Food Consumption

At a personal level, adolescents need an awareness and belief in the importance of adequate food intake. Teenagers also need cooking skill to be able to provide nutritious food that meets their need and desire.

The desire to eat a lot comes from myself; I am sure I can eat whatever portion I want. So, I can eat a lot-it all depends on myself. (Adolescent 1)

I cook raw fish, vegetables, and rice. If there is nothing at home, I go shopping alone and then cook for myself. (Adolescent 1)

Young people need strong support from family members who live at home with them, including mother, father, grandparents and older siblings. The school social environment is no less important, and wholehearted support from both friends and teachers is critical for adolescents. Teens will eat or eat together when asked or ordered to, supported, or given polite advice or praise.

My father asked me to eat a lot. He told me it was be-

cause he wanted me to look bigger. My mother did the same. I ate more when they told me so. My brother bought me milk. (Adolescent 1)

Sometimes my mother or my grandmother will stay with me when I have my meal to make sure that I eat properly. (Adolescent 2)

My teacher said that eating balanced food is healthy. My friend encourages me to increase the size of my meals. She said that right now I am beautiful when I eat more, I will look more beautiful. I like having a meal with my friends; I eat more when I am with them. (Adolescent 3)

Primary health care health workers also play an important role in supporting adolescent girls' efforts to improve nutritional practices. For example, the distribution of iron tablet supplements needs to be supported by additional explanations because adolescents have lack of clear understanding on the program despite its introduction at school. Most informants said they did not consume the supplement because of its odor.

A medical doctor and some primary health care workers came to my school and gave us iron supplements one tablet per week, they said. I do not understand why we must take this tablet. I do not like its smell, and the color and shape look like red stone, so I threw it out. (Adolescent 4)

I asked my friends, and none of them took the supplement, so neither did I. I give supplements to the boys. (Adolescent 1)

DISCUSSION

The study aimed to explore perceived barriers and needs regarding dietary macronutrient intake in adolescent girls in Barrang Lompo Island in Makassar City, the capital of Indonesia's South Sulawesi Province. This study confirmed that adolescent girls who live in Barrang Lompo Island experience barriers to adequate food consumption due to internal and external factors. The girls referred to personal problems that include laziness about eating and preferring snacks to main meals, and this aligns with evidence from previous studies.²² The participating adolescents reported that they feel full after eating snacks and therefore skip their main meal. Street snacks such as meatballs, instant noodles, *tela-tela* (made from mashed wheat flour, mixed with a bit of green onion, formed into small balls, and then fried) are sold in several places in the island as alternatives that are preferred by teenagers. They get snack for two to three times per day. Eating snack food frequently makes them feel full, and these snacks replace the main food. Snack consumption of 4.3 per day is a known risk factor for poor dietary quality in adolescents,²³ the worldwide recommendation for snacking frequency is two nutrient-dense snacks per day.²⁴

For adolescents, barriers to adequate eating include lack of appetite, no appetite because their preferred foods are unavailable, lack of variety in food at home and dislike of fish and vegetables. The present findings also align with earlier evidence that picky adolescents are more likely to eat only their favorite foods and eat less than the relevant recommendation.²⁵ Technology also creates barriers to adequate food consumption in teenagers, including forgetting to eat because of addiction to cell-phone usage and preferring to buy internet quotas rather than nutritious food. This island is limited in terms of places to hangout for young people such as mall

or other crowded places to spend free time with friends. To fill their spare time, they are active on social media using smartphones. This is supported by the availability of transmitter providers in this island. The findings align with existing evidence that teen age usage of smartphone, iPad, computers, and Internet is significantly higher in female (35.5%; $p = 0.00$). It is also clear that problematic use of cellular phones can be addictive which affect 20.5% of cell phone users.²⁶

Informants also identified a lack of purchasing power and the unavailability of raw foodstuffs for making their own favorite dishes as external factors. There is a correlation between the location of the island and the availability of fresh food sources for processing. Study from Mustafa, et al (2020) in Barrang Caddi Island, an island that has distance 15 km from Makassar City, showed that 64% of the households on Barrang Caddi Island have direct access to food.²⁷ Based on food quality indicators, most of household food quality come from animal protein. Only 10% of households have access to food from animal and vegetable sources. This shows that the food sources that can be reached by the people in the small island are less varied.

It is related to economic condition, and most of the participants in the present study came from fishery family which can be categorized as low-income households. This can be correlated with family purchasing power and food availability. For example, one study in Bangladesh showed that membership of the poorest households was related with inadequate dietary diversity.²⁸ Insufficient purchasing power to acquire food for cooking can also hinder access to nutritious food.

Personal factors are also relevant in this context including awareness and belief in the importance of nutritious food which depends on the adolescent's personality. Additionally, teenagers need essential cooking skills to be able to provide nutritious food that meet their needs and desires. Most available food sources in the island come from animal protein sources such as fish. Fish preparations made by parents are always monotonous and this is what makes teenagers' appetites decrease. Adolescents want to eat fish if it is processed in a different way. Other studies have shown that to help adolescents to

eat healthier foods, it is important to make healthy food taste and look better, to limit the availability of unhealthy choices, to make healthy food more readily available, and to teach children about good cooking and eating habits from an early age.²⁹

Adolescents also need effective support from family members who live at home with them, including mother, father, grandparents, and older siblings. They eat properly when they eat with their family or get attention by getting their favorite food from other family members. Previous studies have shown that parental control affects food choices in adolescents who live in rural areas,³⁰ and the school social environment is also no less important. In this regard, the full support of both friends and teachers is crucial for adolescents.³¹ When they are asked, facilitated, or ordered or when given polite advice or praise, teens will eat or eat together. More generally, adolescents need support for healthy physical, mental, and social development, and other studies confirm that positive relationship with family, friends and teachers are consistently related to health and well-being during adolescence.

Support from health services is essential for adolescents. They need education on healthy food. A review of the relevant literature indicates that health services can be expected to play a key role in this context as nutrition education provided by schools, families and health services have been shown to contribute to significant improvements in adolescent nutrition.³²

CONCLUSION AND RECOMMENDATION

The present findings confirm that social cognitive theory used to identify needs and barriers showed environmental and individual factors from adolescents play important role in appropriate food consumption in teenage girls. Support from family and friends may help adolescent girls in practicing appropriate food consumption. The findings may help to improve future interventions to enhance dietary pattern in adolescent girls who live in small island.

ACKNOWLEDGMENTS

The authors would like to thank adolescent girls and their mothers who participated in this study, and acknowledge to school principal,

teachers and staff schools in Barrang Lompo Island for their meaningful help and support. Our gratitude to the provincial and local government of Makassar City, South Sulawesi Province for their approval and administrative support. Finally, the author is grateful to Hasanuddin University for financial support.

AUTHOR CONTRIBUTIONS

The contributions of each authors are described as follows. HH, ART, and SM conceived and designed the study; HH and SM conducted data collection, cleaning data and analyzed quantitative data; MR contributed to qualitative data Analysis; HH, RI wrote the paper; DV and LHF contributed in reviewing the entire manuscript and provided input from a nutritional perspective to enrich the manuscript. HH = Healthy Hidayanty; ART = Abdul Razak Thaha; SM = Sam-suar Manyullei; MR = Mesra Rahayu; RI = Rahayu Indriasari; DV = Devintha Virani; LHF = Leng Huat Foo.

CONFLICTS OF INTEREST

The authors declare no conflict of interest. The funding sponsors had no role in the design of the study; in the collection, analysis or interpretation of data; in the writing of the manuscript and in the decision to publish the results.

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