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Knowledge, attitude and practice of balanced diet and correlation with hypochromic microcytic anemia among adolescent school girls in maros district, South Sulawesi, Indonesia.

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Abstract

Anemia among adolescent girls is remaining a public health problem in Indonesia. This study was aimed to assess the association of balanced diet behavior and microcytic-hypochromic anemia among adolescent girls. A cross-sectional study has been conducted among 200 adolescent girls in five senior high schools in Maros regency on March to April 2015. Assessment of anemia was performed by Flow Cytometry and SLS-hemoglobin method, data of balanced diet behavior was collected using structured questionnaire. Data was analyzed by using chi-square test with SPSS software for windows. The prevalence of microcytic-hypochromic anemia was 19.5%. There were 41% subjects had low knowledge about balanced diet, more than a half (55.5%) had negative attitude to balanced diet, and 46.5% had a poor practice of balance diet. Knowledge and attitude about balanced diet had no association with microcytic-hypochromic anemia. In contrast, the practices of balanced diet had a significant association with microcytic-hypochromic anemia (p=0.048). It is suggested to conduct an intervention for balanced diet education among adolescent schoolgirls to improve their balanced diet behavior.

Keywords: Balanced nutrition, Behavior, Microcytic-hypochromic anemia, Female adolescent.

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Introduction

In Indonesia, the slogan of "Healthy Four Perfect Five (H4P5)", launched in 1952 and used as an eating guideline, has deeply rooted in society containing five food groups. In terms of "Healthy 4" includes staple foods source, side dishes, vegetables, and fruits whereas "Perfect 5" was milk [1, 2, 3]. However, this slogan was not appropriate with recent science and nutritional problems in Indonesia, so that the government of Indonesia changed this slogan into "guideline of balanced nutrition". This guideline has 4 pillars: (1) consume various food, (2) hygiene behavior, (3) physical exercise, and (4) maintaining and monitoring ideal body weight [3].

One of nutritional problems that prevalent among pre-married adolescent girls (15-19 years old) in Indonesia is nutritional anemia. The prevalence of anemia among adolescent girls about 46.6% and it has been considered as a public health nutrition problem [4]. Menstrual abnormalities and inadequate diet are two major cause of anemia among adolescent girls [5]. Anemia can result in development and cognitive function impairment [3, 4], loss of productivity, and increase the susceptibility to infection, that would widely affect the economic burden [6].

Adolescent phase is an important period to establish lifelong behavior including eating behavior [7]. Lancet (2013) in the series of maternal and child nutrition has identified the importance of nutrition of female adolescent for women's health and maternal nutrition [8]. Making adolescence as a key to give effect (general education and health) is a positive thing. It is one of the important steps taken to improve women's health [7].

Waisbord [9] revealed the importance of behavioral studies which applied to child survival programming. Behavior manifested in three forms, namely knowledge, attitudes, and practices [10]. Social determinants become an important point to encourage the occurrence of nutrition and health problems. Therefore, this research is important to assess one of social determinants such balanced diet behavior (knowledge, attitude, and practice balanced diet) in relation to microcytic-hypochromic anemia which is

still very limited. In addition, according to our knowledge, there is still no current research about this topic especially in Indonesia, so it can be used as evidence based in designing the intervention strategies to overcome nutrition problem among female adolescence for long term period.

Material and Methods

This study was cross sectional design and conducted in 5 high schools in district of Maros, South Sulawesi from March to April 2015. This study has been given a approved by the ethics committee from health research of Medical Faculty of Hasanuddin University, Education hospital of Hasanuddin University, and Public Hospital of Dr. Wahidin Sudiro Husodo (Registration No: UH15020073). Samples, 200 adolescent girls in grade 10th, were selected by using stratified random sampling. Grade 10th was chosen due to this study was part of a longitudinal study conducted three years longitudinally. Characteristics data of students and their families as well as balanced diet behavior including knowledge, attitude and practice of balanced diet were collected by using a structured questionnaire. There were 21 questions for balanced diet knowledge, 17 questions for balanced diet attitude, and 15 questions for balanced diet practices. Scores on balanced diet knowledge and practices in the range of 0-2. When the respondent did not know and did not practice of balance diet, the score given is "0". Then if they answer “false” and practice "sometimes", the score is "1" while if they answer “true” and “practice” the score is "2 ". Scores on attitude was based on the Likert scale stated in positive question with score 4 for "strongly agree", score 3 for "agree", score 2 for "disagree", and score 1 for “strongly disagree", whereas for negative questions were scored 4 for "strongly disagree", score 3 for "disagree", score 2 for "agree", and score 1 for "strongly agree". The size of red blood cells to determine the mean level of cell volume (MCV) and mean of cell hemoglobin concentration (MCH) was obtained by taking a blood sample from Mediana Cubiti vein about 3 cc of EDTA (Ethylene Diamine Tetra-Acetic Acid) and then analyzed using Flow cytometry and SLS-hemoglobin in the laboratory of Prodia Makassar (Private laboratory).

All data were processed using statistical package for the social science (SPSS) software for windows. Descriptive subset of the statistics (frequency, mean, and percent) was performed to elucidate the characteristics of subject, the balanced diet behavior (knowledge, attitude and practices) and the prevalence of microcytic-hypochromic anemia. Chi-square test was used to assess the relationship between behavior (knowledge, attitudes, practices) of balanced diet and microcytic-hypochromic anemia among adolescent schoolgirls.

Results

Subject and Family Characteristics

The age of adolescent girls involved in this study ranging from 14 to 18 years old, and almost two third (71.5%) of them are in ranged from 16 to 18 years old. Subjects had their first menstruation in average 13 years old with the

Table 1*. Girls' adolescent and family characteristics*

Characteristic	Mean ± SD	Min-Max	n	%
Age (yrs)	15.8 ± 0.6	14 – 18		
• 14 - 15			57	28.5
• 16 - 18			143	71.5
Age of menstruation(yrs)	13.1± 0.9	10 – 15		
• 10-12			50	25
• 13-15			150	75
Number of sibling (person)	3.1 ± 1.8	0 – 10		
• ≤ 2			85	42.5
• 3-4			77	38.5
• ≥ 5			38	19.0
Family size (person)	5.4 ± 1.8	2 – 12		
• ≤ 4			61	30.5
• 5-6			90	45.0
• ≥ 7			49	24.5
Father's education level				
· None			3	1.5
· Low			109	54.8
· Middle			71	35.7
· High			16	8.0
Mother's education level				
· None			6	3.0
· Low			114	57.0
· Middle			62	31.0
· High			18	9.0

range of 10 to15 years. The numbers of subject siblings were in average of 3 persons and the family member number is ± 5 persons. Most of the family member (45%) ranged from 5 to 6 persons. More than half of subject's parents had low-level of education. There were 199 of 200 subjects able to provide information about the education level of their father, whereas another one subjects did not know her father's educational level due to her parents have divorced (Table 1).

The average score of knowledge about balanced diet were 29.92. According to average score, it was found that 59% of subjects had good knowledge about balanced diet. However, there were still several questions answered "True" by subjects when in fact it is "wrong" such as "every meal should be varies", "always drinking sugary drinks is good for health", and "Healthy 4 Perfect 5 is a healthy eating guideline" (60%, 58.5%, and 96%, respectively). In addition, about a quarter of subjects answered "False" for questions about rice can be replaced by noodles (33.5%), and white rice can be replaced by sticky rice (26%). A number of questions were answered "do not know" by most respondents such as animal protein can be replaced by vegetable protein (50.5%), cheap fruit is lack of vitamins (29.5%), supplement are needed if the body lacks of nutrients (31.5%), milk is as good as meat for protein source (25%), monitoring of ideal body weight is an indicator to determine the adequacy of nutrition and health status (34%), short, thin, and fat are a matter of nutritional disorders (36.5%) (Table 2).

In Table 3, it was found that more than half of respondents (55.5%) have a negative attitude towards balanced diet based on the attitude mean score of subjects (49.07). Many respondents answered "agree and strongly agree" on a number of negative questions such as "source of protein per day consumption of 2-3 servings" (90.5%), "exercise once a week is enough" (57.5%), "drinking milk alone is enough to make healthy body" (54%), and "Healthy 4 Perfect 5" is the same as with balanced diet" (98%).

Balanced diet practices committed by adolescent girls were mostly classified as good (53.5%) based on the calculation of a mean score of balanced diet practices (15.84). Most of the subjects often consume vegetables and fruits (green and colorless). It was only a third (31%) of respondents who had breakfast in the morning and 4% of the subjects brought lunch box to school. Hygiene practices by washing hands with water+soap before and after meal were practiced by three-quarters (76%) of respondents (Table 3). The mean frequency of eating in a day was less than three times (2.6) (58.5%), the average frequency of vegetable consumption was 2 times a day with a portion

Table 2. *Balanced diet knowledge among adolescent girls*

	Answer Choices		
	True (%)	**False (%)**	**Not Know(%)**
Each meal should be diverse	22.5	60.0	17.5
Rice can be replaced with noodles	52.0	33.5	14.5
Rice can be replaced with glutinous rice	51.0	26.0	23.0
Rice can be replaced with corn	66.5	20.5	13.0
Rice can be replaced with bread	79.5	13.5	7.0
Vegetable & fruit are sources of vitamin-mineral	93.0	5.5	1.5
Cheap fruit contains less vitamin	47.5	23.0	29.5
Animal protein can be replaced with vegetable proteins	33.5	16.0	50.5
Fish can be replaced with tempeh, tofu and nuts	82.5	5.5	12.0
Milk as well as meat as a protein source	66.5	8.5	25.0
Nuts are a healthful food	72.5	4.5	23.0
Always drink sugary drinks are good for health	16.5	58.5	25.0
Supplements consumption required if the body lacks nutrients	51.0	17.5	31.5
Walking is healthier than riding	88.0	2.5	9.5
Sports prevent obesity	79.5	5.5	15.0
Ideal body weight monitoring is an indicator of nutritional adequacy & compliance of health status	61.5	4.5	34.0
Wash hand with soap+water before and after eating can prevent infectious disease	82.5	8.0	9.5
4 health 5 perfect is a healthy eating guide	0.5	96.0	3.5
Balanced diet is the composition of the food consumed daily contains nutrients in the types and amounts according to the needs of the body with due regard to the principle of diversity, physical activity, hygiene & ideal body weight =	99.0	1.0	0.0
Balanced diet is a guide to daily food consumption and healthy behavior =	89.0	2.5	8.5
Short, thin, fat, are a malnutrition problem	47.5	16.0	36.5

Table 3. *Balanced diet attitude and practices among adolescent girls*

Questions	Agree&Strongly Agree (%)	Disagree&Strongly Disagree (%)
Attitude toward of balanced diet		
Breakfast makes it easier to learn	96.0	3.0
Need to eat a variety of foods so that the body gets all the nutrients	92.0	8.0
Healthy food is food that is expensive	19.5	80.5
Consumption of 2-3 servings of fruit per day	85.0	15.0
Consumption of 3-5 servings of vegetables per day	82.0	28.0
Vegetables & Fruits are very important to keep the body healthy and fit	96.5	3.5
Green & orange vegetables are better than no color	76.5	23.5
Animal protein is better than vegetable protein	68.0	32.0
Eating fish makes worms	9.5	90.5
Drinking milk alone is enough to make a healthy body	54.0	46.0
Consumption source of protein per say as much as 2-3 servings	90.5	9.5
Drinking water a day at least 8 glasses or 2 liters	93.0	7.0
Exercise just once a week	57.5	42.5
Weight monitoring can be done at any time or at least once a month	88.5	11.5
Cutting & cleaning of nails for healthy behavior	98.5	1.5
4 health 5 perfectly same as with balanced diet	98.0	2.0
Ideal body can be achieved by the application of balanced diet in everyday life	97.5	2.5
Practice of balanced diet		
Questions	**Yes, every day (%)**	**Yes, several times a week (%)**
School snacks	63.0	35.5
Consumption of green vegetable	29.0	66.0
Consumption of orange vegetable	17.0	69.5
Consumption of colorles vegetable (cabbage, etc)	17.5	69.5
Consumption of colored fruits	15.5	78.5
Consumption of colorles fruit	24.0	79.0
	Yes (%)	**Seldom (%)**
Breakfast	31.0	53.5
Bring lunch for school lunch	4.0	40.5
Every day eat vegetables	41.0	45.0
Every day eat fruit	11.5	72.5
Every meal, eat vegetable	22.5	65.0
Every meal, eat fuit or fruit juice	9.0	57.5
Wash hands with water+soap every meal (before & after)	76.0	11.0

only 1.6, while the mean frequency of eating fruit in a day less than 2 times a day with a portion only 1.4.

Based on MCV and MCHC level, it was found that the prevalence of microcytic anemia among adolescent girls was 87.5%, hypochromic anemia was 20.5%, and microcytic-hypochromic anemia was 19.5%. Prevalence of anemia based on hemoglobin level was 15.5%. Chi-square test results showed that the knowledge and attitudes of balanced diet had no association with microcytic-hypochromic anemia ($p>0.05$). In the contrary, balanced diet practices was associated significantly with microcytic-hypochromic anemia ($p=0.048$). The percentage of subjects who have practiced balanced diet poorly and suffer from microcytic-hypochromic anemia was 61.5%.

Discussion

Assessments of the knowledge about balanced diet among female adolescent showed that almost all respondents (96%) stated that the "Healthy 4 Perfect 5" as a healthy eating guidelines. This study is in line with the findings of Hidayanti et al. [11] that 92% of mothers of primary school pupils considered the "Healthy 4 Perfect 5" same as with "balanced diet", as well as the study by Achadi et al. [12].

It was also found that among the four pillars of balanced diet, only the first pillar that is not largely understood well by the subjects. The 2nd, 3rd, and 4th pillars have been known correctly by the majority of subjects. However, the type of nutrition problems (short, thin, and fat) as a result of the implementation of balanced nutrition that is not

correct in everyday life. It was still found that more than a half of the subjects did not know it properly. Based on the calculation of balanced diet knowledge score, it was classified that 59% of subjects have quite good knowledge about balanced diet, in line with the finding by Maria [13] that 56.7% of adolescent having a good knowledge of balanced diet.

About the attitude of balanced diet on adolescent girls, more than half of respondents (55.5%) had a negative attitude towards balanced diet. It contrary to their knowledge, which is categorized as a good knowledge. In contrast to the results of the study by Ibrahim et al. [14] that 66.6% of female in schools

(17-21 years) had a positive attitude towards of balanced diet. In addition, the findings of this study reinforce the theory that a good knowledge is not always followed by a positive attitude. It was proven from one of the results of this study that the majority (60%) of subjects answered "incorrectly" even do not know (17%) that each meal should be varied, while from the aspect of attitude was seen that almost all subjects (92%) to be positive that it is necessary to eat a various food in order the body gets all the nutrients.

Contrast result showed on practices, where most of adolescent girls had a well-balanced diet practices (53.5%) and almost equal in number to subjects who have a good knowledge of balanced diet. Other study by Choi et al. [15] has confirmed this result that the eating behavior of women is positively correlated with nutrition knowledge. However, in contrary with the findings of Sakamaki et al. [16] that nearly 85.6% of students aware of the concept of a balanced nutritious diet (nutritionally balanced food), but only a few (7%) applying this concept when choosing food.

Balanced diet practices committed by female adolescent were mostly classified as good (53.5%). It could be seen that more than half of the subjects were eating three times a day (54.5%), followed by eating two times a day (38.5%), consumption of vegetables 2 times per day (48.8%) and most of the female adolescent eat fruit once a day (47.8%). The results of this study are similar to the research results found by Pareek and Hafiz [17] that 56% of female adolescent (14-16 years) in secondary school had their meals 3 times a day and 39% of the subjects ate two meals a day. Vegetable consumption of 2 times per day of students is even greater in China (almost 80%) and finding by Sakamaki et al. [16] compared to the results of this study. These results are supported by studies conducted by Maria [13] in Bogor Indonesia that found 41.7% of adolescent girls have a well-balanced diet practices. But it is in contrast to the results of the study conducted by Bano et al. [18] that most young girls having unhealthy habit of eating practice.

The prevalence of anemia among adolescent girls was slightly lower compared to study in East Kalimantan Indonesia (15.5% vs 18.8%) [19]. Another study by Patimah et al. [20] found that 50.5% of adolescent girls was anemia. In contrast, this study finding was higher compared to Hanan et al. [21]. In addition, it was also found that more than three-quarters subjects in this study have microcytic-anemia (87.5%) higher than the study by Htet et al. [22] in Myanmar (82%) and Al Hassan [23] in Saudi Arabia (81%). Prevalence of microcytic- hypocromic anemia in this study lower than finding in prior study by Chaudhary and Dhage [24] and Dutt et al. [25] (19.5% vs 25.4% vs 31%). But this result higher than prevalence of anemia among reproductive-age women found by Panigrahi et al. [26], and among adolescent girls at senior high school in Maros after receiving iron-folic acid supplementation and multi-micronutrient supplementation (46.3% and 36.8% respectively) [20].

This study found a significant association of balanced diet practice with hypochromic anemia (p=0.048) among adolescent girls. We assume that because of some subjects practice the balanced diet poorly (46.5%), and among them were found 61.5% suffering with microcytic-hypochromic anemia. The type of balanced diet practice that relatively poor i.e. eating a complete meal every meal (rice + fish / eggs + vegetables + fruit + water) was only 39.5%, although this was higher than results of the study conducted by Dwiriani et al. [27] that found the eating practice among majority adolescent in senior high school in three (3) large cities (Bandung, Yogyakarta, Padang) in Indonesia was only 15.5% who eat completely in each meal time. Similarly for having breakfast, more than a half of respondents rarely eat breakfast, only a third of the subjects have their breakfast every day, and skip breakfast was 15.5%. This finding is higher than the study by Abalkhail and Shawky [28] that found 14.9% of students skipping their breakfast. This can be understood because the characteristics of adolescent eating patterns characterized by often refusing to eat, skipping meals, and diet to lose weight excessively resulted in less intake of nutrients and can lead to anemia [5]. Furthermore, only a few female adolescent consume green vegetables every day. It was slightly higher than the findings of Patel et al. (29% vs 24%) [29]. Three kind of plants (green and orange vegetables, and colored fruits) are source of nutrients (iron, folic acid, vitamin C, beta caroten, vitamin E, vitamin B2) [30, 31] which can help to prevent microcytic- hypochromic anemia. Panigrahi [26] confirmed the results of this study found that microcytic-hypochromic anemia in women associated with poor diet. In addition, the consumption of inadequacy of green leafy vegetables positively correlated with microcytic-hypochromic anemia (p=0.031). There is a definite role of nutritional deprivation in the development of anemia and lack of balanced diet especially deficient in protein group has much stronger association with the type of anemia [32].

It is suggested to optimally socialize the Indonesian balanced diet guidelines to all levels of community,

including public schools. We believe that it can be used as a guideline in realizing an optimal public nutritional status and health.

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