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The Association of Family Characteristics with Dietary Diversity among Adolescent Girls in Denpasar City, Bali, Indonesia

Hubungan Karakteristik Keluarga terhadap Keragaman Pangan Remaja Putri di Kota Denpasar, Bali, Indonesia

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ABSTRACT

Background: The three main nutritional problems in adolescent girls are chronic energy deficiency, obesity, and anemia. These problems are associated with food quality or dietary diversity, often influenced by family characteristics.

Objectives: This study aimed to determine the association of dietary diversity among adolescent girls in Denpasar City with family characteristics, such as parents' occupation, education and income, type and size of family, government social programs, and food security.

Methods: This cross-sectional study was conducted involving 516 adolescent girls selected through a multistage sampling. The first stage involved the selection of 12 villages in 4 sub-districts, and the second involved using simple random sampling to select respondents from each village. Data were obtained using the Minimum Dietary Diversity for Women questionnaire, and Multiple logistic regression was applied to identify the determinant of dietary diversity.

Results: The result showed a mean score of 6.7 (SD±1.7) with a maximum of 8.4, and the proportion of inadequate dietary diversity was 11.4%. Based on a bivariable test, six variables were found to be significantly associated with dietary diversity among adolescent girls. After including these variables in a multiple logistic regression model, it was observed that family size (AOR=6.986; 95% CI: 2.718 -17.957; p-value=0.000), mother's education (AOR =1.904; 95% CI: 1.029-3.525; p-value=0.04), and household income (AOR=0.422; 95% CI: 0.227-0.784; p-value=0.006) were significantly associated with dietary diversity.

Conclusions: In conclusion, family characteristics, such as having a family size of five or more, a lower level of mother's education, and household monthly income below the district minimum wage, were significantly associated with inadequate dietary diversity. This condition required intervention in the form of promoting food diversification at the family level.

INTRODUCTION

Late adolescence, ranging from 18-24 years old, is characterized by rapid growth and development. It is considered a critical period for acquiring health-related behaviors, such as food preferences and physical activity. Currently, adolescent girls in Indonesia are at risk of experiencing malnutrition, with approximately one in four suffering from obesity (21.8%) and chronic energy deficiencies (CED) (>25.0%) in 2018. Furthermore, nearly one in three adolescents experience anemia, accounting for 32.0%, representing a moderate public health problem. The prevalence of CED in Bali Province was lower than the national prevalence (11.6%), while obesity was higher (23.3%)[1].

The nutritional status of adolescents plays a significant role in determining the outcomes of fetal and neonatal health, including preterm births, low birth weight, stillbirths, and the additional risk of neonatal mortality[2,3]. Malnourished adolescents are at higher risk during pregnancy, indirectly contributing to maternal deaths and perpetuating an intergenerational cycle of malnutrition[4]. Consequently, this cycle significantly impacts the quality of future generations. The determinants of malnutrition can be categorized into direct and indirect causes, which include inadequate nutrient intake and infectious diseases. Dietary diversity score (DDS) is a proxy index of nutrient adequacy, the sum of food groups consumed over the 24-hour period[5]. Food diversity is a key element of good dietary quality, with a diverse diet typically consisting of at least five food groups to obtain nutrient adequacy.

External and internal factors influence the diversity of food consumption. The internal factors include age, gender, nutritional knowledge, beliefs,

values, norms, feeding selection, and health. On the other hand, external factors consist of social and cultural, peer dynamics, and family characteristics, such as family economic level, occupation, education, and parental roles[6]. Extensive studies have been conducted to establish the relationship between family characteristics and food diversity in adolescents, yielding varying results. A review of determinants factor of dietary diversity in both developed and developing countries at individual and household levels highlighted vital factors such as nutrition knowledge, food preference, household size and composition, food availability, ecological factors, time availability for food preparation, and purchasing power, e.g., income, food expenditure, and food prices[7]. A study conducted on overseas students at Sebelas Maret University Surakarta found a relationship between food consumption and factors such as gender, food expenditure, reasons for food selection, breakfast habits, nutritional knowledge, peers, and fast food[8]. Evidence suggested that poor dietary habits and sedentary lifestyles were found among Indonesian adolescents[3,6,7,8].

Adolescent girls in Denpasar City tend to consume less diverse food. However, there is no published data on the relationship between family factors and the diversity of food consumption among adolescent girls. Therefore, this study aimed to determine the relationship between family characteristics and food diversity in adolescent girls in Denpasar City. It also identified dietary diversity and associated factors among late adolescent girls in Denpasar City, Bali Province, Indonesia.

METHODS

A community-based cross-sectional study was conducted in Denpasar City, Bali Province, Indonesia, involving 516 late adolescent girls selected through multistage sampling. The first stage involved the selection of 12 villages in 4 sub-districts, while the second stage was to select respondents from each village by simple random sampling. Respondents who fulfilled the inclusion criteria, such as those aged 18-24, residents of Denpasar City, non-pregnant, and without a mental disability, were given informed consent before the interview. Furthermore, respondents were listed with the help of local administrative and village health workers, and only one was selected from each household.

The dependent variable in this study was the dietary diversity score (DDS), calculated based on ten food groups of the 24-hour individual diet recall questionnaire developed by the Food and Agriculture Organization (FAO). The score was coded "1" and "0" for inadequate and adequate dietary diversity, respectively[5], with a dichotomization of inadequate DDS (<5 groups) and adequate (≥5 groups). Ten food groups were used, including grains, white roots and, tubers, Vit. A-rich Vegetables and fruits, green leafy vegetables, other vegetables, other fruits, meat, poultry and fish, eggs, milk, pulses (beans, peas, and lentils), nuts, and milk products. On the other hand, the independent variables include age, educational and occupational status, family type and size, parents' educational and occupational status, household monthly income, number of family members at risk, receiving social government programs, and food security. A standard semi-structured questionnaire was prepared in Bahasa Indonesia to collect the characteristics data. The data collectors were public health graduates (S.KM) who were provided with a list of randomly selected respondents' identity numbers. Before the interview, data collectors introduced themselves, explained the study's purpose, and obtained written consent from the respondents.

Descriptive statistics were presented using frequency and percentage, while associated and determinant factors were analyzed by logistic regression. Adjusted odds ratios with 95% CI and variables having a p-value less than 0.05 were considered significant. This study was subjected to a thorough review process according to ethical principles. It was declared to have passed ethical clearance from the Research Ethics Commission for Research and Development of the Faculty of Medicine, Udayana University, with number 1356/UN.14.2.2.VII.14/LT/2022, dated May 25, 2022.

RESULTS AND DISCUSSION

The mean age of the respondents was 20.6 years (SD±1.7), 277 (53.7%) were aged ≥20 years old, 501 (91.7%) graduated from secondary school or above, and 364 (70.55) were employees, such as entrepreneurs, private, and government employees. In terms of family characteristics, 405 (78.5%) mothers and 473 (91.7%) fathers graduated from secondary school or above, 278 (53.9%) mothers were employees and 462 (89,5%) fathers were unemployed. A total of 417 (80.8%) households' income was below the Denpasar City minimum wage (IDR 2,800,000), and 348 (67.4%) were living in a nuclear family with 320 (62.0%) family members ≥ 5 individuals. Furthermore, 304 (58.9%) families did not face any specific risks related to their family members, 461 (89.3%) received government social programs, and 449 (87.0%) were food-secured, as shown in Table 1.

Table 1. Frequency distribution of respondents and family characteristics

Variable	Mean	n (%)
Respondents' Characteristics		
Age (years)	20.6 ± 1.7	
<20 years old		239 (46.3)
≥20 years old		277 (53.7)
Educational status		
Graduated from junior high school or below		15 (2.9)
Graduated from junior high school or below		501 (91.7)
Occupation		

Variable	Mean	n (%)
Unemployment		152 (29.5)
Employee		364 (70.5)
Nutritional Status		
Underweight and normal		427 (82.8)
Overweight and obese		89 (17.2)
Family Characteristics		
Mother's Educational status		
Graduated from junior high school or below		111 (21.5)
Graduated from junior high school or below		405 (78.5)
Mother's Occupation		
Unemployed		238 (46.1)
Employed		278 (53.9)
Father's Educational status		
Graduated from junior high school or below		43 (8.3)
Graduated from junior high school or below		473 (91.7)
Father's Occupation		
Unemployed		462 (89.5)
Employed		54 (10.5)
Family income per month		
< District minimum wage (IDR 2,800,0000)		417 (80.8)
≥ District minimum wage (IDR 2,800,0000)		99 (19.2)
Type of family		
Extended		168 (32.6)
Nuclear		348 (67.4)
Number of Family members		
≥ 5 members		320 (62.0)
< 5 members		196 (38.0)
Family Member at risk		
Yes		212 (41.1)
No		304 (58.9)
Recipients of government assistance programs		
Yes		461 (89.3)
No		55 (10.7)
Food Security		
Insecure		67 (13.0)
Secure		449 (87.0)
Dietary Diversity		
Inadequate		59 (11.4)
Adequate		457 (88.6)

The mean DDS was 6.7 (SD±1.7), with a maximum of 8.4, and 11.4% of the respondents had inadequate dietary diversity, as shown in Table 1. The respondents in this study had a more diverse diet than previous investigations conducted in Jakarta, Indonesia[3,7], Ethiopia[8], and Uganda[9]. The variation can be attributed to the different number of food groups included in the score, the reference period to calculate DDS, and the study setting. Meanwhile, the mean DDS was higher than the result of the previous studies conducted in Ethiopia, with mean DDS of 4.73±1.186 and 5.38±1.75[8,10].

Table 2 showed the dietary diversity characteristic based on food types. More than 50% of respondents consumed grains, meat, milk, poultry, fish, green leafy vegetables, milk products, other vegetables, eggs, vitamin A-rich vegetables and fruits, and other fruits. On the other hand, food groups of pulses, namely beans, peas, lentils, and nuts, were consumed in small proportions at 28.9% and 22.9%, respectively. The consumption of all these food groups was below 12% among respondents who consumed inadequate dietary diversity; specifically, nuts were almost not consumed.

Table 2. Frequency distribution of dietary diversity characteristics based on type of food

Variable	Yes	Dietary Diversity	
	n (%)	Inadequate n (%)	Adequate n (%)
Food Groups			
Grains, white roots, tubers	510 (98.8)	58 (11.4)	452 (88.6)
Vit. A- rich Vegetable and fruits	358 (69.4)	23 (6.4)	335 (93.6)
Green Leafy vegetables	400 (77.5)	25 (6.2)	375 (93.8)
Other vegetables	369 (71.5)	15 (4.1)	354 (95.9)
Other fruits	358 (69.4)	18 (5.0)	340 (95.0)
Meat, poultry, and fish	462 (89.5)	42 (9.1)	420 (90.9)
Eggs	368 (71.3)	21 (5.7)	347 (94.3)
Pulses (beans, peas, and lentils)	149 (28.9)	2 (1.3)	147 (98.7)
Nuts	118 (22.9)	0 (0.0)	118 (100)
Milk and milk products	382 (74.0)	20 (5.2)	362 (94.8)

Almost all respondents consumed grains (rice), similar to the results of other studies in Indonesia[11], Uganda[9], India[12], and Bangladesh[13], where grains were primarily produced in the whole country and had a high availability in the market. Anemia can be caused by grains and starchy foods, and high phytate content may inhibit iron absorption. The proportion of consumption pulses and nuts was lower compared to other studies[3,11,9], such as in Jakarta, where 39.1% and 39.3% of adolescent girls with anemia and obesity, respectively, consumed legumes, nuts and seeds[3].

Dietary Diversity's Associated Factors

This study analyzed 14 variables; only six were associated with inadequate dietary diversity. They include the mother's educational status, occupational status, family size, family member at risk, household's monthly income, and family that received a government social program (Table 3). These six variables were included in a binary logistic regression model, and the result showed that only the mother's educational status, family size, and household's monthly income were significantly associated with inadequate dietary diversity (Table 4).

Table 3. Bivariable analysis of the factors associated with inadequate dietary diversity

Variable	Inadequate Diversity		Adequate Diversity		COR	95% CI	p-value[a]
	n	%	n	%			
Respondents' Characteristics							
Age							
<20 years old	34	(14.2)	205	(85.8)	1	0.346-1.035	0.066
≥ 20 years old	25	(9.0)	251	(91.0)	0.598		
Educational status							
Graduated from junior high school or below	1	(6.7)	14	(93.3)	1	0.237-14.197	0.556
Graduated from junior high school or below	58	(11.6)	443	(88.4)	1.833		
Occupation							
Unemployed	42	(11.5)	322	(88.5)	1	0.569-1.884	0.908
Employed	17	(11.2)	135	(88.3)	1.036		
Nutritional Status							
Underweight and normal	51	(11.9)	376	(88.1)	1	0.333-1.593	0.427
Overweight and obese	8	(9.0)	81	(91.0)	0.728		
Family Characteristics							
Mother's Educational status							
Graduated from junior high school or below	23	(20.7)	88	(79.3)	1	0.237-14.197	0.001*
Graduated from junior high school or below	36	(8.9)	369	(91.1)	0.373		
Mother's Occupation							
Unemployed	19	(8.0)	219	(92.0)	1	1.089-3.446	0.023*
Employed	40	(14.4)	238	(85.6)	1.937		
Father's Educational status							
Graduated from junior high school or below	5	(11.6)	38	(88.4)	1	0.370-2.596	0.967
Graduated from junior high school or below	54	(11.4)	419	(88.6)	0.979		
Father's Occupation							
Unemployment	7	(13.0)	47	(87.0)	1	0.505-2.733	0.709

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Variable	Inadequate Diversity		Adequate Diversity		COR	95% CI	p-value[a]
	n	%	n	%			
Employee	52	(11.3)	410	(88.7)	1.173		
Family income per month							
< District minimum wage (IDR 2,800,0000)	23	(23.2)	76	(76.8)	1	1.797-5.710	0.000*
≥ District minimum wage (IDR 2,800,0000)	36	(8.6)	381	(91.4)	3.203		
Type of family							
Extended	39	(11.2)	309	(88.8)	1	0.5603-1.9	0.815
Nuclear	20	(11.9)	148	(88.1)	1.071		
Number of Family members							
≥ 5 members	54	(16.9)	266	(83.1)	1	0.051-0.328	0.000*
< 5 members	5	(2.6)	191	(97.4)	0.129		
Family Member at risk							
Yes	37	(17.5)	175	(82.5)	1	1.547-4.746	0.000*
No	22	(7.2)	282	(92.8)	2.71		
Recipients of government assistance programs							
Yes	58	(12.6)	403	(87.4)	1	1.055-57.259	0.008*
No	1	(1.8)	54	(98.2)	7.772		
Food Security							
Insecure	7	(10.4)	60	(89.6)	1	0.2387-2.052	0.786
Secure	52	(11.6)	397	(88.4)	0.891		

[a]Simple logistic regression
*Significantly at p-value<0.05

The odds of having inadequate dietary diversity among adolescents living in a family size of five and above were 6.98 times higher than those less than five (AOR=6.986; 95% CI: 2.718-17.957; p-value=0.000). This result is consistent with the reports of studies in South Africa and Ethiopia[14]. A large number of family members will experience an economic shortage to meet the family needs. Consequently, the focus tends to be fulfilling daily needs rather than prioritizing diet quality.

The odds of having inadequate dietary diversity among adolescents living with mothers who did not complete secondary school were 1.90 times higher than those with higher education levels (AOR=1.904; 95% CI: 1.029-3.525; p-value=0.04). In this study, the consumption behavior of a diverse diet was decreased by 57% among adolescents whose household income was under the Denpasar City minimum wage (AOR=0.422; 95% CI: 0.227-0.784; p-value=0.006) (Table 4). It was also found that mothers' knowledge can improve the family food variety and selection, which affected the eating behavior of family members. Moreover, educated families generally have a better economic ability to afford a quality diet. This result is consistent with the reports of the studies conducted in Iran, Nigeria, northern Ethiopia, and Gurage-Ethiopia[15,16,17,18].

Table 4. Multivariable analysis

Variable	AOR	95% CI	p-value[a]
Lower Mother's education	1.904	1.029-3.525	0.04*
Number of families ≥ 5	6.986	2.718-17.957	0.000*
Recipients of government assistance programs	0.134	0.018-1.002	0.05
Family income per month< district minimum wage (IDR 2,800,0000)	0.422	0.227-0.784	0.006*

[a]Binary logistic regression, backward method
*Significantly at p-value<0.05

The estimated portion size of food consumed by respondents was not addressed in this study, which is one of its limitations. Additionally, the data on dietary diversity scores were collected through a 24-hour dietary recall method, which might be prone to recall and social desirability bias.

CONCLUSIONS

In conclusion, family characteristics, such as a family size of five or above, a lower mother's education, and a household's monthly income below the district minimum wage, were significantly associated with inadequate dietary diversity among late-adolescent girls. The significant figure of dietary diversity among late adolescent girls emphasized the need for policy attention. Furthermore, socialization on the importance of diverse food consumption to adolescent girls at the family level was a good chance to break the intergenerational malnutrition cycle.

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