Nutritional Status and Age at Menarche on Female Students of Junior High School

Rihul Husnul Juliyatmi, Lina Handayani
Department of Public Health, Universitas Ahmad Dahlan, Yogyakarta, Indonesia

Article Info	ABSTRACT
	Menarche is the first menstrual period as one of the sign of puberty. There are many factors may affect the age at menarche such as nutritional status, genetic, environmental conditions, socioeconomic status, and education. The purpose of this research is to determine the relationship between nutritional status and age of menarche on female student of junior high school Ali Maksum Krapyak, Bantul, Yogyakarta. The research employed a cross sectional research design. The number of this sample was 81 female students that determined by total sampling. The statistical test used was Chi Square. The results of this research showed that there was a relationship between nutritional status and the age of menarche on female student of junior high school Ali Maksum Krapyak, Bantul, Yogyakarta (p value = 0.002) and the ratio prevalence was 3.077 (95% CI = 1.675 – 5.650); it means that respondents who have abnormal nutritional status get 3.007 times greater chance of experiencing abnormal menarche than respondents who have normal nutritional status.

Corresponding Author:

Lina Handayani
Department of Public Health,
Universitas Ahmad Dahlan
Jalan Prof. Dr. Soepomo, S.H., Janturan, Warungboto
Umbulharjo 55612, Yogyakarta, Indonesia
Email: linafkm@gmail.com

1.   INTRODUCTION

Menarche is the first menstrual period as one of the sign of puberty [1]. After experiencing menarche, there will be some other changes that support reproductive function, such as breast growth, the growth of fine hairs in certain areas, and the growth of fat hips. In England, the average age of menarche is 13.1 years old while the average age of menarche on Bundi tribe in Papua New Guinea is 18.8 years old [2]. The data result of Riskesda 2010 showed that the age of menarche in Indonesia varied between 9-20 years old and the average age of menarche is at 13 years old. In Yogyakarta, the average age of menarche was between 13-14 years old. The age of menarche happen earlier in women who live in urban areas than those who are in rural living, and it was also slower in women with heavy work [3].

Factors affecting the age of menarche include nutritional status, genetic, environmental conditions, socioeconomic status, and education [4]. From the factors mentioned, nutritional status becomes an important factor that must be considered. Researches carried out in some countries one of which showed that girls with malnutrition status would experience menarche delay compared to girls with good nutritional status [5]. The main cause of the delay is due to a decrease in calories, protein, and other nutrients which then impact on the production of gonadotropin hormone. The energy needs of girls in the age of 10-12 years were 2050 kcal, while those who were 13-15 years old need 2350 kcal.

The production of gonadotropin hormone is influenced by nutrition. Good nutrition will accelerate the formation of gonadotropin hormone and other hormones that affect the coming of menarche. The

problems which often occur in adolescents were insufficient nutritional intake and excess nutrient intake. Both of the problems greatly affect the condition of the body which then gave an impact on the reproductive system of hormones that will affect the occurrence of menarche [6]

Normal growth in adolescents required a good and well-balanced nutritional status. Nutritional status was good when necessary nutrients such as proteins, fats, carbohydrates, minerals, vitamins, and water are used by the body in accordance with the requirements. In order to determine the nutritional status in adolescents we used the body mass index formula based on age or commonly abbreviated to BMI-for-age: monitoring nutritional status, especially with regard to deficiencies and overweight [7]. Based on this matter, the researchers were interested in studying the relationship between nutritional status and age of menarche on female students in junior high school Ali Maksum Krapyak, Bantul, Yogyakarta. The reason for choosing this school was that all the female students at this school tend to consume the same food every day, but they have varied ages of menarche.

2. RESEARCH METHOD

This research was conducted at junior high school Ali Maksum Krapyak, Bantul, Yogyakarta in December 2014. This research was an analytical study employing cross-sectional research design. The population of this research was all female students in this junior high school with the total of 92 female students. The sample selection was done by total sampling with took all students become the research population– and who were willing to be respondents were 81 female students.

The independent variable in this research was the nutritional status obtained by measurements of weight and height by category using the parameter values BMI z-score through World Health Organization (WHO) Anthro Plus 2005 program and grouped into two categiries based on standard deviation (SD): normal (-2 SD up to 1 SD) and abnormal which consists of very thin (<-3 SD), thin (-3 SD up to <-2 SD), fat (> 1 SD up to 2 SD), and obese (> 2 SD). The dependent variable in this research was the age at menarche that categorized as normal (11-13 years) and abnormal that consists of early (<11 years), and delayed (> 13 years). The confounding variable in this research was the psychological aspect, social environmental factors, and socio economic status.

3. RESULTS AND ANALYSIS
3.1. Univariate Analysis
a)   The frequency distribution of nutritional status variable

Nutritional status of female students in junior high school Ali Maksum was determined according to the category of the body mass index formula based on age (BMI-for-age). The measurement of BMI-for-age was done by using scales as a device to measure weight and microtoise as a device to measure height. The frequency distribution of nutritional status on respondents in this research can be seen in Table 1.

Table 1. The nutritional status of respondents

Nutritional Status	Number	Percentage (%)
Normal	67	82.7
Abnormal	14	17.3
Total	81	100

Table 1 shows that the majority of respondents in this research had normal nutritional status which numbered to 67 people with a percentage of 82.7%. The category of nutritional status based on BMI-for-age which is considered normal is between -2 SD up to 1 SD while the one considered abnormal includes respondents with the category of very thin is <-3 SD, thin is between -3 SD up to <-2 SD, fat is between > 1 SD up to 2 SD, and obese is > 2 SD.

b) The age of menarche

The age of menarche of female students in junior high school Ali Maksum were measured by questionnaire. The age of menarche on the respondents in this research can be seen in Table 2.

Table 2. The age at menarche of respondents

Age of Menarche	Number	Percentage (%)
Normal	58	71.6
Abnormal	23	28.4
Total	81	100

Table 2 shows that the majority of respondents in this research had normal menarche which numbered to 58 people with a percentage of 71.6%. The category of the age at menarche status which is stated to be normal is menarche experienced by respondents between the ages of 11 to 13 years. On the other hand, the age at menarche category that is stated to be abnormal includes early menarche which was experienced by respondents at the age of <11 years and late menarche which is experienced by respondents at the age of > 13 years.

3.2. Bivariate Analysis

The analysis in this research was conducted by cross tabulation aimed to look at the relationship between the independent variables (the nutritional status) and the dependent variable (the age at menarche). The statistical test conducted was Chi- square with significance level of $p < 0.05$. To calculate the probability of the risks were how many times the increase or the decrease of the risks on the sample, it was seen from the value of ratio prevalent (RP) with 95% confidence intervals.

The result of the bivariate analysis between nutritional status and age of menarche is shown in the Table 3.

Table 3. The relationship between nutritional status and the age at menarche

Nutritional Status	Age of Menarche				Amount		Sig.	RP (95 % CI)
	Normal		Abnormal					
	N	%	N	%	N	%		
Abnormal	5	6.2	9	11.1	14	17.3	0.002	3.077
Normal	53	65.4	14	17.3	67	82.7		(1.675 – 5.650)
Total	58	71.6	23	28.4	81	100		

On the Table 3, it can be seen that the results of the Chi square was obtained from significance value (p value) = 0.001 at $\alpha = 0.05$ with p <α, but still found a cell which had a value of expected count less than 5 that is on cell b, thus the researcher used an alternative test namely fisher exact test, so that the value of significance (p value) became 0.002. Based on these results it can be concluded that there was a relationship between nutritional status and age of menarche on female students of junior high school Ali Maksum Krapyak, Bantul, Yogyakarta. Judging from the value of ratio prevalent (RP) that was 3.077 (95% CI = 1.675 – 5.650), it mean that respondents who have abnormal nutritional status get 3.007 times greater chance of experiencing abnormal menarche than respondents who have normal nutritional status.

3.3. Discussion

Most respondents have normal nutritional status with a percentage of 82.7%. In addition to the respondents with normal nutrition, there were 17.3% of respondents with abnormal nutrient that was the category of thin, fat, and obese. The various categories of nutritional status happen because after experiencing menarche some female students of Ali Maksum got their weight increase causing change in eating habits due to fear of obesity so that they tend to did wrong diet and often reduce the frequency of eating.

Other nutritional problem that occurs on female students of junior high school Ali Maksum was the lack of knowledge about nutrition, especially related to the diet matter to decrease of weight, most of them who were diet only consume food which they believe can lose weight without paying attention to the adequacy of nutrients needed by the body. The missunderstanding of nutrient in adolescents especially in those who go on a diet to maintain their slenderness by applying wrong nutritional maintenance principle will cause nutritional disorders [8].

Most of the respondents have normal age at menarche with a percentage of 71.6%. Besides, 28.4% of respondents have abnormal age of menarche with the category of early menarche and late menarche. The variety of category of menarche is caused by many factors.

Female students experiencing early menarche in this study were 14.8% which of them have the nutritional status of fat and obese categories. The factors that cause early menarche were macronutrient consumption factors, lifestyle factors, parents' income factors, and sports factors [9].

The students experiencing late menarche in this study were 13.6% which of them have nutritional status with thin category. One of the factors which cause the late menarche in adolescents is height status that is short or stunting. Adolescents with stunning nutritional status experience menarche slower than those who have normal nutritional status. Short height status will affect reproductive development in adolescents [10]. Mostly respondents with normal nutritional status (index W / A) experience menarche at age of <12.5 years, while respondents with the nutritional status of stunting mostly experience menarche at age> 12.5 years [11].

Based on the bivariate analysis so that obtain the significant value (p value) are 0.002 from this result, it can be concluded that there was a relationship between nutritional status and the age of menarche on female students of junior high school Ali Maksum Krapyak, Bantul, Yogyakarta. In addition, seeing from the ratio prevalent value (RP) 3.077 (95% CI = 1.675 − 5.650), it means that respondents who have abnormal nutritional status get 3.007 times greater chance of experiencing abnormal menarche than respondents who have normal nutritional status.

The age at menarche is influenced by several factors, one of which is the nutritional status. Girls with less nutritional status will experience late menarche compared to girls with good nutritional status [5]. The explanation stated by Kartono (1992) that menarche occurs at a certain weight of a certain age in a woman [6].

Nutritious foods and high fat food from animal products will lead girls to gain weight. It can increase the level of the estrogen hormone which then causes high cholesterol. It happens not only because of the fat from the body composition factors but also food intake and the absence of weaken disease.

The relationship between nutritional status and age of menarche was in line with the research on female students of junior high school Shafiyyatul Amaliyyah and Nurul Hasanah in Medan which state that the nutritional status affects the age of menarche [12]. It was also consistent with the research on female students of state junior high school 22 Bandar Lampung that there was a relationship between nutritional status and the age of menarche. Respondents who have high nutritional status or above normal will experience menarche at the fast level of age while respondents who have nutritional status in the below level will experience menarche at the slow level of age, and respondents who have normal nutritional status will experience menarche at the normal age too [13]. It was also consistent with the research of girls in Sabzevar, Iran that significant relation between BMI and menarche age (p=0.02). The results indicated that the menarche age and BMI are significantly related and the higher the BMI the Lower the menarche age [14]. Subjects who had attained menarche in early adolescence had higher BMI than their pre-menarcheal counterparts [15]. Delayed menarche may be a sign of malnutrition since as nutritional status improves; the attainment of menarche is lowered. Attainment of menarche decreases when BMI increases. There is a correlation between BMI and attainment of menarche and also, there is a correlation between early obesity and early onset of menarche. Girls with early onset of menarche had higher BMI than those with late onset of menarche [16].

The current research finding is similar to the finding of a study in India [17]. The study found that nutrition status associated with age at menarche. The highest the nutrition status, the low is the age at menarche. Gayol, Mehta and Kaur also found that menarche is delayed due to undernutrition and as the nutritional status improved, attainment of menarche is lowered [18]. Simondon et al [19] in Senegal also concluded that the age at menarche is delayed, probably due to malnutrition [19]. Mpora et al [20] also found that age at menarche dependent on nutritional status in Northern Uganda.

4.   CONCLUSION

There was a relationship between nutritional status and the age at menarche on female students of Junior High School Ali Maksum. Most of the female students in junior high school Ali Maksum were in normal nutritional status. Most of the female students in Junior High School Ali Maksum have normal age of menarche (between the ages of 11 to 13 years).Teachers need to pay attention the problems of nutritional status on female students especially those who often go on diet.

REFERENCES

[1]   Kusmiran E., "Kesehatan Reproduksi Remaja dan Wanita", Salemba Medika, Jakarta, pp. 19-21, 2011.
[2]   Proverawati A., Misaroh S., "Menarche", Nuha Medika, Yogyakarta, pp. 1-74, 2009.
[3]   Prawirohardjo S., Hanifa W., Sudraji S., Abdul BS., "Ilmu Kandungan", Edisi 3, PT Bina Pustaka Sarwono Prawirihardjo, Jakarta, pp. 98-104, 2011.

[4] Gaudineau A., at al., "Factors associated with early menarche: results from the French Health Behaviour in School-aged Children (HBSC) study", *BMC Public Health*, 2010.

[5] Kusnita P., Damarati, "Pengaruh Status Gizi Remaja Terhadap Usia Menarche Pada Siswi SDN Dukuh Mananggal Surabaya", *Journal from GDLHUB*, vol/issue: 2(1), pp. 28-31, 2013.

[6] Waryana, "Gizi Reproduksi", Pustaka Rihama, Yogyakarta, pp. 109-124, 2010.

[7] Supariasa IDN., Bakri B., Fajar I., "Penilaian Status Gizi", EGC, Jakarta, pp. 11-60, 2012.

[8] Adriani M., Wirjatmika B., "Peranan Gizi Dalam Siklus Kehidupan", Kencana Prenadamedia Group, Jakarta, pp. 284-343, 2014.

[9] Putri DRL., Melaniani S., "Analisis Faktor Hubungan Menarche Dini", *Jurnal Biometrika dan Kependudukan*, vol/issue: 2(1), pp. 42-50, 2013.

[10] Amaliah N., Sari K., Rosha BC., "Status Tinggi Badan Pendek Beresiko Terhadap Keterlambatan Usia Menarche Pada Perempuan Remaja Usia 10-15 Tahun", *Panel Gizi Makanan*, vol/issue: 35(2), pp. 150-158, 2012.

[11] Yulianto, "Perbedaan Usia Menarche dan Siklus Menstruasi Berdasarkan Keadaan Status Gizi Siswi di SLTP N 1 Karangaweng Kabupaten Demak", Undergraduate Report, Universitas Diponegoro, Semarang, 2001.

[12] Pulungan WP., "Gambaran Usia Menarche Pada Remaja Putri Di SMP Shafiyyatul Amaliyyah dan SMP Nurul Hasanah Kota Mendan Tahun 2009", Undergraduate Report, Universitas Sumatera Utara, Medan, 2009.

[13] Sylvia, Saftarina F., "Hubungan Status Gizi dengan Usia Menarche pada Remaja Putri di SMP Negeri 22 Bandar Lampung", *Medical Journal of Lampung University*, pp. 18-23, 2013.

[14] Pejhan A., Moghaddam HY., Najjar L., "The Relationship between Menarche Age and Anthropometric Indexes of Girls in Sabzevar, Iran", *World Applied Sciences Journal*, vol/issue: 14(11), pp. 1748-1753, 2011.

[15] Adesiana AF., Peterside O., "Age at menarche and body mass index (BMI) among adolescent secondary school girls in Port Harcourt, Nigeria", *IOSR Journal of Dental and Medical Sciences (JDMS)*, vol/issue: 3(5), pp. 41-46, 2013.

[16] Goyal R., Metha P., Kaur G., "Nutritional Status and Menarche in Adolescents of Punjab", *J Life Sci*, vol/issue: 4(1), pp. 63-66, 2012.

[17] A. Acharya, V.P. Reddaiah, N. Baridalyne, "Nutritional Status and Menarche in Adolescent Girls in an Urban Resettlement Colony of South Delhy", *Indian Journal of Community Medicine*, 31(4), pp: 302-303, 2006.

[18] Rajni Gayol, Promila Mehta, Ginjinder Kaur, "*Nutritional Status and Menarche in Adolescents of Punjab*", J Life Sci, 4(1), pp: 63-66, 2012.

[19] K.B Simondon, I. Simon, F. Simondon, "Nutritional Status and age at Menarche of Senegalese Adolescents", Annals of Human Biology, 24(6), 521-523, 1997.

[20] Beatrice Odongkara Mpora, Thereza Piloya, Sylvia Awor, Thomas Ngwiri, Edison A Mworozi, Zeev Hochberg, "Age at Menarche in Relation to Nutritional Status and Critical Life Event among Rural and Urban Secondary School Girls in Post-conflict Northern Uganda" BMC Women's Health, 14(66), 1472-6874, 2014.