The relationship between menarche and nutritional status in Junior High School students in Aceh Besar. A study from 30 years of armed conflict area, Aceh, Indonesia

Hubungan usia menarche dengan status gizi pada siswa SMP di Aceh Besar. Studi dari daerah post konflik senjata di Aceh, Indonesia

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Abstract

Age at menarche is strongly associated with adolescents' nutritional status. Food insecurity is one of the factors that cause nutritional disorders. Communities living in areas of armed conflict often experience food insecurity and low levels of parental knowledge, leading to being underweight and stunting. Aceh had been plagued by armed conflict for almost three decades, which ended 23 years ago. This study aimed to measure the relationship between menarche and the nutritional status of adolescents in Aceh Besar, Aceh Province. This analytical research method used a cross-sectional survey approach. The sample consisted of 278 Junior High School (JHS) students, taken by stratified random sampling at ten of the JHS in Aceh Besar in 2021-2022. Data were collected through interviews, using questionnaires, anthropometric measurements (Weight and Height), and observations. Statistical analysis used the Chi-square test at CI 95%. 79,1% of the students' menarche was normal, and 64,7% had normal nutritional status. There was a significant relationship between age at menarche and nutritional status (p<0,05). In conclusion, menarche's age is related to adolescent girls' nutritional status at Junior High School in Aceh Besar.
Keywords: Adolescent, menarche, nutritional status

Abstrak

Usia menarche berhubungan kuat dengan status gizi remaja. kerawanan pangan merupakan salah satu faktor penyebabkan gangguan gizi. Masyarakat yang tinggal didaerah konflik bersenjata sering mengalami kerawanan pangan, tingkat pengetahuan orang tuanya yang rendah, hingga menyebabkan *underweight* dan stunting. Aceh dilanda konflik bersenjata hampir 3 dekade dan berakhir pada 23 tahun lalu. Penelitian bertujuan untuk mengukur hubungan menarche dengan status gizi remaja di Aceh Besar, Provinsi Aceh. Metode penelitian analitik ini menggunakan pendekatan *Cross-sectional* survey. Sampel sebanyak 278 siswi SMP, diambil secara *stratified random sampling* pada 10 SMP di Aceh Besar pada tahun 2021-2022. Data dikumpulkan melalui wawancara menggunakan kuesioner, pengukuran antropometri (Berat Badan dan Tinggi Badan), serta observasi. Analisis statistik menggunakan uji Chi-square pada CI 95%. Sebanyak 79,1% menarche siswa adalah normal, dan sebanyak 64,7% mempunyai status gizi normal. Terdapat hubungan antara usia menarche dengan status gizi (p<0,05). Kesimpulan, usia menarche memiliki hubungan dengan status gizi pada remaja putri di SMP Aceh Besar.
Kata Kunci: Menarche, status gizi, remaja putri

Introduction

Adolescence or puberty is a transitional period from childhood to adulthood. One of the significant events in the life cycle of adolescent girls is their first menstruation, called menarche, which is a sign of their entry into the reproductive period. Menarche is an essential indicator of pubertal development, physical maturity, nutritional status, and reproductive health in young women (Ibitoye et al., 2017). The age at menarche is a symbol that the woman is healthy (fertile), ready to have sex, and ready for marriage; this is a picture found in several regions in Asian and African countries (Nandi et al., 2020; Sommer, 2013).

Basic Health Research in 2018 shows that the average age of menarche in Indonesia is 13 years (20,0%), with an earlier occurrence at the age of less than nine years and some later up to 20 years (Indonesian Ministry of Health, 2018). The age at menarche is influenced by multiple factors such as genetics, ethnicity, psychology, nutritional status, diet and exercise habits, living environment, and economy (Carlson & Shaw, 2019). The diversity of food consumption and genetic factors play an essential role in triggering the release of gonadotropin-releasing hormone (GnRH), which determines the age of menarche in adolescent girls (Rahimi et al., 2019; Thifal et al., 2023).

Age at menarche can influence the risk factors for developing diseases in adulthood, such as increased risk of cardiovascular disease, gestational diabetes mellitus, asthma, non-alcoholic fatty liver disease, infertility, and postmenopausal depression. Age at menarche can also be related to the use of alcohol and drugs or dropping out of school (Carlson & Shaw, 2019; Rahimi et al., 2019). Adolescent girls experiencing early menarche are closely related to early sexual activity (Dars et al., 2014; Juul et al., 2017). In addition, menstrual patterns also affect BMI.

Research on menarche has been widely conducted in developed countries. However, it is rarely found in developing countries, including Indonesia, especially Aceh, as a post-conflict and Islamic Syariah law area (Ibitoye et al., 2017; Karim et al., 2021; Zhang et al., 2019).

Young women's problems related to menstruation and menarche are rarely. Even unusual cases to be discussed in the community, even though the case itself is not revealed in their own family, and comprehensive health intervention programs, especially in terms of reproductive health, nutrition, and social aspects, for young women are also minimal (Abi-esber, 2017).

The experience of armed conflict is strongly related to food and nutrition insecurity. Communities affected by conflict or stress were significantly associated with malnutrition (being underweight and stunting). Children affected by conflict face multiple burdens, malnutrition, and poor health outcomes (Burris & Wiley, 2021; Carroll et al., 2017; Ghattas et al., 2014; Loewenberg, 2015). The results also showed that stunted girls had a delayed age at menarche, similar to the reports of studies in Senegal and Kenya, which indicated that post-menarcheal girls had better nutritional status than pre-menarcheal girls (Hadush et al., 2021; Tumilowicz et al., 2019).

In addition, Aceh has experienced three decades of armed conflict that has affected its economic and social status. Conflict affects the decrease in maternal and paternal education and food insecurity and increases the number of stunts in Aceh (Yani et al., 2022). This study is part of a significant effort to obtain information on the determinants of stunting in Aceh and identify appropriate interventions to solve the problem of nutritional disorders in Aceh.

Methods

Design
This cross-sectional survey aimed to measure the relationship between nutritional status and age at menarche in junior high school students in Aceh Besar District. There are 10 Junior High Schools (JHS) in Aceh Besar District. In total, 278 respondents were obtained. Samples were obtained by conducting a stratified random sampling of schools and selecting random respondents from each school. The research period was 6 months (September 2021-February 2022).

Study Instrument and Variables
The independent variable was age at menarche, which was divided into early, normal, and late menarche (Leone & Brown, 2020). The

dependent variable. Based on the CDC-2000 graph, nutritional status was divided into thin, normal, overweight, and obese (Kemenkes RI, 2020). The enumerators were medical students who had been trained to ensure the validity of the research instruments used.

Data analysis

Univariate analysis was used to analyze patient characteristics, age at menarche, and nutritional status. Bivariate analysis was performed to assess the association between the age at menarche and nutritional status. All analyses were performed using SPSS software.

Result and Discussion

Characteristics of respondents.

Of the 278 respondents, the age range is between 10-14 years, and the average age of *menarche* was 13,77 ± 1,121).

Most respondents had a normal menarche age (79,1%), and it was interesting that only 6,5% of the respondents had experienced early menarche and 14,4% had late menarche. Most respondents had a normal nutritional status; 25

(9%) were thin (underweight), and 11% were obese.

Table 1. Characteristics respondents (n= 278)

Characteristics Age	n	%
Age		
Ten years	18	6,5
11 years old	58	20,9
12 years old	52	28,7
13 years old	110	39,6
14 years	40	14,4
Age of Menarche		
Early Menarche	18	6,5
Normal Menarche	220	79,1
Late Menarche	40	14,4
Nutritional status		
Thinness	25	9
Normal	180	64,7
Over Weight	42	25,1
Obesity	31	11,2

As shown (Table 2), 278 respondents (67,3%) were of normal age at menarche and had normal nutritional status. Interestingly, late menarche occurs in 14,4% of the respondents, and overweight and obesity accounted for 36,3%.

Table 2. The relationship between nutritional status and age of menarche in Junior High School in Aceh Besar District

Age of menarche	Nutritional status								Total		p-value
	Thinness		Normal		Overweight		Obesity				
	n	%	n	%	n	%	n	%	n	%	
Early	1	5,6	5	27,8	5	27,8	7	38,88	18	100	0,000
Normal	14	6,4	148	67,3	36	16,4	22	10,0	220	100	
Late	10	25	27	67,5	2	5,0	1	2,5	40	100	
Total	25	9,0	180	64,7	43	15,1	30	11,2	278	100	

As shown in Table 2, 278 respondents (67,3%) were of normal age at menarche and had normal nutritional status. Interestingly, early menarche mainly occurred in the obese (38,88%). Late menarche was found in most patients with a normal nutritional status (67,5%), but it was also often found in large numbers in the thin group (25%). The analysis revealed significant differences in the age at menarche and nutritional status (p= 0,000). Late menarche was associated with obese respondents, while late menarche was associated with thinness.

Nutritional Status

The results of this study indicate that most of the respondents had normal nutritional status (148

respondents, 67,3%), but 9% were thin (poor nutritional status), and 5% were obese, according to the research conducted by Juliyatmi and Handayani (2015) in Yogyakarta, where most of the students had a normal nutritional status of 47,9%.

However, the percentage of students with nutritional disorders was more significant than or equal to that of students in Aceh (28,5%). The results of these two studies were better than those of the National Health Survey in Indonesia (*RISKESDAS* 2018). It possibly due to parents' relatively low knowledge of and behavior toward providing nutritious food and a balanced menu for children.

Studies conducted in India and Pakistan have reported significantly higher rates of thinness. Mohanty and Panda (2022) reported that among 160 adolescent girls, the rate of nutritional disorders was 61,3%, of which 90% suffered from anemia. According to the researcher, this was due to the lack of awareness among young women related to limited government programs. Another study by Hassan et al. (2017) found that adolescent malnutrition was related to a lack of food security at the household level. Its study was found that 140 young women in urban communities are malnourished. Other possible causes include menstruation status and the availability of latrines, lifestyle changes, and eating habits that can also affect the amount of food and nutrients consumed, such as fear of being fat so that they do not eat breakfast and only eat once a day, the habit of not eating breakfast, and higher physical activity. Although the proportion of adolescents with malnutrition is only 9% if this condition is not corrected, it can have negative consequences; for the children themselves, even when they are married and pregnant, they will also tend to become pregnant with nutritional disorders. It contributes to the high prevalence of stunting in Aceh (Al Rahmad et al., 2020; Telisa & Eliza, 2020). Pregnant women with malnutrition can carry the risk of children being born with low weight or disabilities due to a lack of minerals, and stunting can even cause death to the mother.

Another nutritional disorder found in a study of junior high school students in Aceh Besar District was obesity. Obesity in children is a predisposing factor for future cardiovascular diseases. In this study, obesity was found in 11,2% of junior high school students; this figure is lower than the national obesity prevalence and from findings in America and China (Jacobson et al., 2019; Jiang et al., 2022; Wang et al., 2021). The 2018 National Health Survey in Indonesia (*RISKESDAS* 2018) reported that the prevalence of obesity in adolescents aged 13-15 years was 16,0%, and in adolescents aged 16-18 years, 13,5% (Kemenkes RI, 2018). While a study conducted on American adolescents by Hedley in 2000 found a prevalence of 16%, research in China reported obesity to be 17% in adolescent girls and 25% (Jiang et al., 2022; Wang et al., 2021).

No statistical analysis was performed on the causal factors in this study. However, in several studies, such as the Avon longitudinal study, there was a relationship between obesity and genetic, neuroendocrine, metabolic, psychological, and socioeconomic factors, as well as comorbid factors such as cardiovascular, kidney, and liver disorders. It will have an impact on public health in the future (Jacobson et al., 2019; Jiang et al., 2022).

The rapid flow of information, especially from the Western world, has also brought about changes in the lifestyle of teenagers, including in Indonesia, where most teenagers use their free time for inactive activities and eating factory-made snacks or processed food. It includes being more independent of choice. These choices are often inaccurate, which can lead to nutritional problems.

The Age of Menarche
This study found that the age of menarche in junior high school students in Aceh Besar District varied. Most were aged 13 years (39 %). The results of this study are consistent with those of 2018 Basic Health Research.

This study was in accordance with the research conducted by Siwi & Fitriahadi (2015) with a sample of 49 respondents, which included four students who were fast at menarche (8,2%) and five students (10,2%) who were slow at menarche, as many as 40 students (81,6%). The age at menarche varied widely, from 10 to 16 years, with an average of 12,5 years.

Relationship between Nutritional Status and Age of Menarche
This study, conducted in the Aceh Besar district, showed a significant relationship between the age (time) of menarche of female students and nutritional status ($p < 0,005$). Those who experienced early menarche were mostly obese (6,5%), while normal menarche age and late menarche were more common in normal and poor nutritional status (41,2%) and (8,9%, respectively). The results of this study did not differ from those previously reported (Jiang et al., 2022; Singh et al., 2019).

The relationship between age at menarche and nutritional status is still a matter of debate as to whether early menarche causes an increase in BMI or nutritional status, which encourages menarche to occur at an earlier age. Leptin

secreted by adipose glands affects the levels of neuropeptide Y, which in turn affects GnRH. Changes in the levels of GnRH can alter LH secretion. Leptin also affects oocyte maturation, which stimulates the maturation of the ovum produced by the ovaries (Barabás et al., 2020). Adolescent girls who have a high BMI (overnutrition) are caused by earlier puberty (menarche) rather than excessive fat (Singh et al., 2019). The same result was reported by Jiang et al. (2022), who found that girls who received early menarche at the age of 13-14 years were higher and had a higher BMI than girls of the same age but had not yet received menarche.

Very few studies have been conducted on menarche and nutritional status, particularly in conflict areas. Our study was in accordance with the results of other studies; late-age menarche was found predominantly in the thin or underweight groups, while early menarche was found to be overweight (Hadush et al., 2021; Tumilowicz et al., 2019). Information on the age of menarche is essential from a public health perspective because it is associated with a high BMI incidence and even obesity in adolescence, which has an impact on morbidity rates, such as cardiovascular risk and diabetes mellitus at an early age. The relationship between early menarche and a tendency to increase BMI and obesity has received little attention from public health experts, including clinics. It is often forgotten, even though its impact will be quite significant in the future (Alam et al., 2015; Barabás et al., 2020; Kurnia et al., 2020). This finding is beneficial for decision-makers.

Conclusion

A significant relationship was observed between nutritional status and the age at menarche. This study showed that early menarche was associated with obesity among respondents (seven out of 18 students).

Considering that Aceh is mainly Muslim and menarche or menstruation is still a closed issue, a reproductive health Communication, Information, and Education (CIE) program related to reproductive organs and personal hygiene, child marriage age (early marriage), pregnancy process, and prevention not intended to free sex is needed. In contrast, the promotion of nutrition topics is very much needed: a balanced food menu, Benefits of Macro and Micronutrients for adolescents, especially young women, obesity, and their risk of cardiovascular and metabolic diseases. The CIE was also provided to the student's parents.

Acknowledgments

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