

Menstrual cycle patterns of Indonesian adolescents

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Abstract

Background Adolescents often experience menstrual irregularity in the first few years after menarche. Abnormal menstrual cycles may increase the risk of polycystic ovary syndrome.

Objective To determine the menstrual cycle patterns of adolescent females in Indonesia and associated factors.

Methods This cross-sectional study was conducted at two senior high schools in Surakarta, Central Java, from September to October 2016. Subjects were healthy female students whose parents have given written informed consent. Girls taking hormonal drugs or with chronic diseases were excluded. Subjects filled questionnaires on menstrual cycle, diet, ethnicity, and physical activity. All subjects underwent anthropometric measurements (height and weight). Kruskal-Wallis test was used for data analysis.

Results Four hundred and forty-four subjects met the inclusion criteria. Mean age at menarche was 12.27 (SD 1.08) years. Mean menstrual cycle length was 31.1 (SD 6.5) days. Abnormal menstrual cycle occurred in 30.6% of subjects (24.5% oligomenorrhea, 5.9% polymenorrhea, and 0.2% amenorrhea). Ethnicity (Javanese, Chinese, or Arab) was significantly associated with menstrual cycle category ($P<0.05$). Girls with Chinese ethnicity having the largest proportion of oligomenorrhea. Other factors (body mass index, age, age at menarche, nutritional status, physical activity, and fat intake) were not found to be associated with menstrual cycle abnormalities.

Conclusion Menstrual abnormalities, especially oligomenorrhea, are common in Indonesian adolescent girls. Oligomenorrhea is more frequent in girls of Chinese ethnicity, compared to those of Javanese or Arab ethnicity. [Paediatr Indones. 2018;58:101-5; doi: <http://dx.doi.org/10.14238/pi58.3.2018.101-5>].

Keywords: menstrual cycle; adolescent; oligomenorrhea; polymenorrhea

The length of a normal menstrual cycle ranges from 21 to 35 days and may vary within as well as between individuals. Factors such as nutrition, ethnicity, age at menarche, physical activity, body mass index, and hormones are considered to contribute to pubertal development, but their potential effects on the length of the menstrual cycle remain unclear. Menstrual cycle irregularities, be it oligomenorrhea, polymenorrhea, or amenorrhea, may arise due to pregnancy, infection, malignancy, trauma, hormonal disturbance, emotional stress, vigorous physical activity, or dietary problems.^{1,2}

In the first few years after menarche, adolescents commonly have irregular menstrual cycles. Such irregularity is physiological in most girls, but may be associated with an increased risk of polycystic ovary syndrome and ovarian dysfunction in others. In some conditions, adolescents, parents, and clinicians need to be educated on what constitutes a normal menstrual cycle. Adolescent girls should take note of their cycles so that data is on hand when the need arises for a clinician to follow up an abnormality of their menstrual cycle, for example in the preventive monitoring for polycystic ovary syndrome.^{3,4} We aimed to determine the menstrual

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cycle patterns of female students in Surakarta, Central Java, Indonesia, and determine potential risk factors for menstrual cycle abnormalities.

Methods

Girls from two high schools in Surakarta (SMA Negeri 3 and SMA Islam Diponegoro) were screened from September 2016 to October 2016. Study subjects were healthy female students whose parents have given written informed consent and had experienced at least three menstrual cycles before the study period. We excluded girls who took hormonal drugs or had chronic diseases, such as asthma, kidney disease, diabetes mellitus, thyroid abnormalities, or cancer. Subjects were asked to complete a questionnaire regarding menstrual cycle and ethnicity data. Oligomenorrhea was defined as a menstrual cycle longer than 35 days; polymenorrhea was defined as a cycle of less than 21 days; and amenorrhea was defined as having no menstrual period for at least three months in a row.

Weight and height were measured using a digital standardized scale and a standardized microtoise, respectively. Body mass index (BMI) was calculated as body weight in kilograms divided by the square of body height in meters. Each measurement was performed three times and a mean of the three measurements was calculated for each subject. The subjects' nutritional status were categorised based on body mass index for age (BMI-for-age) according to the WHO *Child Growth Standards*.⁵ Normal weight was defined as BMI-for-age between -1 standard deviations of the mean (-1SD) and +1SD. Overweight, obesity, and underweight were defined as BMI-for-age >+1SD but ≤+2SD, >+2SD, and <-1SD, respectively.

Subjects were asked to complete questionnaires on reproductive health, physical activity (*International Physical Activity Questionnaire/IPAQ*),⁶ and dietary habits (*Semi-Quantitative Food Frequency Questionnaire/SQ-FFQ*).⁷ Physical activity level was categorized as vigorous (≥ 1500 METs min.week), moderate (600-1500 METs min.week) and low (< 600 METs min.week) (METs min.week = metabolic equivalent task minutes per week). Fat intake was obtained from the SQ-FFQ and categorized as less than once a week, once to twice a week, three times a week, or more than three times a week. Data were processed using

SPSS 20.0 and analyzed using the Kruskal-Wallis test. This study was approved by the Health Research Ethics Committee of Dr. Moewardi General Hospital/Sebelas Maret University Medical School, Surakarta.

Results

Out of 463 girls who were screened, 444 were included as study subjects. Subject characteristics are described in **Table 1**. The majority of subjects were Javanese (341 subjects; 76.8%). The subjects' BMI ranged from 14.71 to 32.64 kg/m². Sixty-seven subjects (15.1%) were overweight or obese. Subjects' mean age at menarche was 12.27 (SD 1.08) years.

Mean menstrual cycle length was 31.1 (SD 6.5) days, ranging from 12.0 to 96.5 days. Abnormal menstrual cycles were found in 136 (31.6%) subjects, consisting of oligomenorrhea in 24.5%, polymenorrhea in 5.9%, and amenorrhea in 0.2% (**Table 2**). The

Table 1. Characteristics of subjects

Characteristics	(N=444)
Mean age (SD), years	16.5 (0.96)
Ethnicity, n (%)	
Javanese	341 (76.8)
Chinese	39 (8.8)
Arab	64 (14.4)
Nutritional status, n (%)	
Underweight	114 (25.7)
Normal	263 (59.2)
Overweight/obese	67 (15.1)
Mean BMI (SD), kg/m ²	21.54 (4.66)
Physical activity level, n (%)	
Low	143 (32.2)
Moderate	105 (23.6)
Vigorous	196 (44.2)
Mean age at menarche (SD), years	12.27 (1.08)

Table 2. Menstrual cycle category and mean menstrual cycle length

	(N=444)
Menstrual cycle category, n (%)	
Normal	308 (68.4)
Polymenorrhea	26 (5.9)
Oligomenorrhea	109 (24.5)
Amenorrhea	1 (0.2)
Mean menstrual cycle length, days (SD)	31.1 (6.5)
Shortest	12.0
Longest	96.5

associations between menstrual cycle category and possible risk factors (nutritional status, ethnicity, physical activity, fat intake, BMI, age, and age at menarche) are shown in Table 3. The proportions of menstrual cycle categories differed significantly between ethnic groups. Significant differences were observed between Javanese and ethnic Chinese girls, as well as between Javanese and ethnic Arab girls ($P<0.05$; Mann-Whitney test). No significant difference was found between ethnic Chinese and Arab girls ($P=0.068$; Mann-Whitney test). The proportion of oligomenorrhea in ethnic Chinese, Arab, and Javanese subjects was 53.8%, 37.5%, and 18.8%, respectively. Current age, age at menarche, BMI, physical activity, nutritional status, and intake of foods high in fats were not significantly associated with menstrual cycle category ($P>0.05$).

College of Obstetricians and Gynecologists Committee on Adolescent Health Care (ACOG) reported in 2006 that in American adolescents, the average menstrual cycle length was 32.2 days and the menstrual cycle interval ranged from 21 to 45 days.¹ Studies in America, Turkey, Ghana, and Japan reported varying menstrual cycle lengths ranging from 20 to 45 days.^{2,11-13} Girls with menstrual cycles of more than 90 days should be evaluated for underlying conditions.⁴

There were 136 (31.6%) subjects with abnormal menstrual cycles, the majority having oligomenorrhea. Smaller incidence rates of menstrual cycle abnormalities have been reported in the United States (2-5%)² and Italy (9%).⁹ In Turkey the reported incidence of oligomenorrhea was 5.3%, in contrast to 24.5% in our study.¹⁴ On the other hand, studies in Malaysia, Turkey, Hyderabad, Central India, and Ghana have reported prevalences

Table 3. Association between menstrual cycle category and risk factors

	Normal	Polymenorrhea	Oligomenorrhea	Amenorrhea	P value
Nutritional status, n (%)					0.589*
Underweight	77 (67.6)	7 (6.1)	30 (26.3)	0 (0)	
Normal	188 (71.4)	12 (4.6)	62 (23.6)	1 (0.4)	
Overweight	43 (64.2)	7 (10.4)	17 (25.4)	0 (0)	
Physical activity, n (%)					0.892*
Low	98 (68.5)	10 (7.0)	35 (24.5)	0 (0)	
Moderate	75 (71.4)	5 (4.8)	25 (23.8)	0 (0)	
Vigorous	135 (68.9)	11 (5.6)	49 (25.0)	1 (0.5)	
High-fat food intake, n (%)					0.089*
<1x/week	29 (60.4)	2 (4.2)	17 (35.4)	0	
1-2x/week	141 (74.6)	9 (4.8)	39 (20.6)	0	
3x/week	19 (76)	2 (8)	4 (16)	0	
>3x/week	119 (65.4)	13 (7.1)	49 (26.9)	1 (0.6)	
Ethnicity, n (%)					<0.001*
Javanese	253 (74.2)	23 (6.7)	64 (18.8)	1 (0.3)	
Chinese	16 (41.0)	2 (5.2)	21 (53.8)	0 (0)	
Arab	39 (60.9)	1 (1.6)	24 (37.5)	0 (0)	
Mean BMI, kg/m ² (SD)	21.5 (4.6)	22.1 (4.9)	21.6 (5.0)		0.894*
Mean age, years (SD)	16.5 (1.0)	16.5 (1.0)	16.7 (0.9)		0.579*
Mean age at menarche, years (SD)	12.2 (1.1)	12.3 (1.0)	12.4 (1.1)		0.397*

*Kruskal Wallis test

Discussion

The mean age at menarche of our subjects was similar to that found in other studies.⁸⁻¹¹ Subjects' mean menstrual cycle length was 31.1 (SD 6.5) days. Individuals with the shortest and longest menstrual cycles were of Javanese ethnicity. The American Academy of Pediatrics (AAP) and the American

of menstrual cycle irregularities comparable to our study.^{11,12,14-17} Although menstrual irregularity in the first 5 years after menarche is considered to be physiological, the risk of polycystic ovary syndrome (PCOS) and ovarian dysfunction may evolve in the first years after menarche. A recent report stated that menstrual cycle irregularity in adolescents was not correlated to oligoanovulation, but was associated with ovarian volume.^{3,18,19}

Oligomenorrhea is one of the clinical features of PCOS.³ In our study, oligomenorrhea was the most prevalent menstrual cycle abnormality, with the proportion being the lowest in the Javanese ethnic group, significantly different from ethnic Chinese and Arab subjects. Studies on ethnicity-specific rates of PCOS in Indonesian adolescents have been limited, if any. It remains to be determined whether the higher incidence of oligomenorrhea in ethnic Chinese girls translates into a higher incidence of PCOS. Further observation should be done in girls with oligomenorrhea, since a menstrual cycle abnormality persisting more than two is a risk factor for PCOS.⁴

Many studies have investigated the role of ethnicity in early or post-menopausal women, but studies in adolescents have been limited. The proportion of menstrual cycle abnormalities in Indonesian ethnic Chinese girls in our study was higher than the proportion of irregular menstrual cycles in Malaysian ethnic Chinese girls (59% vs. 38.4%, respectively).¹⁷ However, it was unclear whether the definition of "irregular menstrual cycle" in the Malaysian study was comparable to our definition of menstrual cycle abnormalities. In the Pokhara Valley, Nepal, ethnicity was also found to have a role in adolescent menstrual patterns. The proportion of irregular menstrual cycles in this population was 64.2%, with the ethnicity group classified as "Muslim/others" having the highest proportion (73.9%), followed by the Hill Ethnic group (71.7%), Hill caste (59.8%), and Dalit (36.4%). The reason for this difference was not explained.²⁰

We found no associations between menstrual cycle category and nutritional status, physical activity, fat intake, BMI, age, or age at menarche. In contrast, a Malaysian study reported that age and being within two years of reaching menarche, in addition to smoking and suicidal behavior, were significantly associated with irregular menstrual cycles. The same study did not find a significant association between ethnic group, dieting behavior, BMI, alcohol use, and physical exercise.¹⁷ In agreement with our results, a study in Japanese young adults found that food habits and lifestyle were not associated with menstrual cycle length.¹³ In contrast to our results, a study in adolescent girls in Hyderabad, India found that BMI was significantly associated with menstrual

patterns.¹⁵ A Serbian study also noted correlations between menstrual irregularity and height, weight, BMI, and obesity.¹⁸ Zhang et al. reported that older adult women tend to have a shorter menstrual cycle length, and that among women with a shorter cycle length (<27 days) there was a higher frequency of abnormal BMI (underweight or overweight).²¹ Among women in menopausal transition, obesity was found to be associated with longer menstrual cycles.²²

A limitation of our study was that our subjects were only from a single urban area; the menstrual pattern of rural adolescents might have different characteristics. Our convenience sampling method may have led to disproportionate ethnic representation among the subjects. In addition, there may have been recall bias for some of the data, including menstrual cycle length, age at menarche, physical activity, and diet data, as we used only questionnaires to collect these data. However, we used the *Lie-Score Minnesota Multiphasic Personality Inventory* (L-MMPI) questionnaire to reduce bias caused by dishonesty.²³ Moreover, we did not assess ethnic differences in the rates of PCOS in our subjects, which would have taken our study a step further in clinical relevance.

In conclusion, there is a high prevalence of menstrual cycle abnormalities in Indonesian adolescents (31.6%). Clinicians may want to consider our data in determining what constitutes a normal menstrual cycle in Indonesian adolescents. Any abnormalities should be followed up monitor the risk of polycystic ovary syndrome. Current age, age at menarche, BMI, physical activity, and fat in the diet are not associated with menstrual cycle abnormality. Significant ethnic differences exist in the rate of menstrual cycle abnormalities.

Conflict of interest

None declared.

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