Onset of menarche: differences between urban and rural community in Tangerang District, Banten Province, Indonesia

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ABSTRACT

The transition of physical and sexual maturation in becoming an adult occurs in adolescence period. This transition runs in parallel with the development of cognitive, emotional, social cultural and adaptation ability. Girls sexual maturity is marked by first menstruation (menarche) which is the most important phase of reproductive development. The relationship between menarche and growth rate of body height is very close. The menarche occurs when the growth rate of the body height begins to decline. Many factors influence the onset of menarche i.e. physical activity, nutritional intake, socio economic and environmental conditions and availability of medical services. These factors vary between rural and urban area. Girls in urban area tend to have modest life style compared with their counterpart in rural area. The purpose of this study was to compare the onset of menarche of girls in urban and rural area, and to identify factors that influence the onset of menarche. This was a cross sectional study involving 220 girls students of elementary school from both urban and rural area in Tangerang District, Banten Province. The mean onset of menarche of all subjects was 11.46 ± 0.99 years, while the mean onset of menarche of girls who live in rural area (11.87±0.99 years) was significantly slower than girls who live in urban area (11.05±0.80 years) (p=0.01). The birth body weight and birth body length, physical activity and environment condition significantly influenced the onset of menarche. The girls who live in urban areas had an earlier predictor factors to achieve for onset of menarche than those who live in rural areas (OR: 3.34 [95% CI: 1.911 to 5.823] and aOR: 2.95 [95% CI: 1.410 - 6.012]).

ABSTRAK

Peralihan kematangan seksual dan fisik menjadi dewasa terjadi pada masa remaja. Peralihan ini bersamaan dengan perkembangan kognitif, emosional, sosial-budaya, dan kemampuan adaptasi. Kematangan seksual perempuan ditandai dengan terjadinya menstruasi pertama yang merupakan fase penting dalam perkembangan sistem reproduksi. Hubungan antara menstruasi dengan laju pertumbuhan tinggi badan sangat erat. Menstruasi terjadi ketika laju pertumbuhan tinggi badan mulai berkurang. Banyak faktor mempengaruhi usia menarke yakni aktivitas fisik, masukan gizi, kondisi sosial ekonomi dan lingkungan serta ketersediaan fasilitas kesehatan. Faktor-faktor tersebut bervariasi antara daerah perkotaan dan pedesaan. Perempuan perkotaan cenderung mempunyai gaya hidup menetap dibandingkan perempuan pedesaan. Penelitian ini bertujuan membandingkan usia menarke anak perempuan di perkotaan dan pedesaan dan mengidentifikasi faktor-faktor yang mempengaruhinya. Penelitian ini merupakan penelitian potong lintang yang melibatkan 220 anak perempuan sekolah dasar (SD) di perkotaan dan pedesaan Kabupaten Tangerang, Provinsi Banten. Rerata usia menarke semua anak perempuan adalah 11,46±0.99 tahun, sedangkan usia menarke anak perempuan yang tinggal di kota (11,87±0,99 tahun) lebih lambat secara nyata dibandingkan anak perempuan yang tinggal di pedesaan (11,05±0,80 tahun) (p=0.01).

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Berat tubuh dan panjang tubuh saat lahir, aktivitas fisik, kondisi lingkungan berpengaruh secara nyata terhadap usia menarke. Anak perempuan yang tinggal di kota mengalami menarke lebih awal dibandingkan anak peresmpuan yang tinggal di kota (OR: 3,34 [95% CI: 1,91-15.823] dan aOR: 2,95 [95% CI: 1,410 – 6,012]).

INTRODUCTION

Human growth and development generally refer to a process which starts with ovum fertilization, prenatal development, birth and growth to adulthood. Growth means changes in the size or values giving certain size in a maturity, whereas development covers other aspects of the differentiation of forms and functions as well as emotional or social which influenced and determined by the interaction with the environment.[1]

Adolescence is the period where sexual maturity occurs and human body reached permanent adult shape. Physical and sexual development is aligned with cognitive, emotional, social, cultural and adaptation development. In young girls, puberty or sexual maturity is marked by their first menstruation or menarche.[2] Physiologically, menarche is the most important phase of female adolescent development. Many factors influence the onset of menarche namely genetics, physical activity, nutritional intake, socio economic and environmental conditions, and access to medical services.[3]

The onset of menarche onset varies depending on the characteristics of population.[1] Previous study in America showed that the onset of menarche is about 8-13 years. However, recent study showed that the onset of menarche of girls of African-American is 6 years, while girls American is 7 years.[2] The onset of menarche is also greatly affected by geographical residence and place of living.[4] It is observed in many studies that the onset of

menarche in rural areas is slightly higher than in urban areas.[3,5] In Punjabi, India, the onset of menarche of rural girls (13.62 years) is higher than urban girls (13.31 years).[3]

Study concerning the onset of menarche in Indonesia has been reported by some authors since decades ago. Maeuleman reported that the onset of menarche of girls in Jakarta in 1938 was 12.67 years, whereas in Semarang was 13.07 years. Meanwhile, Lien reported that in 1959 in Surabaya the onset menarche was 13.96 years. In Yogyakarta, it was reported by Doerjadibroto in 1970 and by Aswin in 1985 that the onset of menarche were 14.48 year and 13.09 year, respectively. In addition, Ferdinandus in 1976 and Kurniasari in 1994 also reported that the onset of menarche were 13.20 years and 12.03 years, respectively.[6] It is in accordance with the tendency that the onset of menarche tends to be shorter. It is estimated that the onset of menarche becomes 2-3 months earlier per decade over the past 100-150 years.[7] Menarche precedes sexual maturity and leads to physical changes. Moreover, this condition will influence physiological conditions of female adolescence. Early onset of puberty may lead to psychosocial stress on adolescents who are psychologically unprepared to accept maturity.[8]

Tangerang District, Banten Province consists of three main developing Sub Districts namely Serpong, Balaraja and Tigaraksa and Teluk Naga. Serpong Sub District and its adjacent area are the center of developing housing. This area has been rapidly developed to be metropolitan city like Jakarta. Balaraja

and Tigaraksa Sub Districts are industrial area, housing and administrative center. Meanwhile, Teluk Naga and the adjacent area bordering the North Java Sea are rural area. These areas are being developed as tourist, maritime, industry, port, fishery and agriculture areas.[9] A striking difference of the environment, living condition, educational level and social economic status between the rural and urban area in Tangerang District has been observed.

This study was conducted to compare the onset of menarche of young girls who live in rural and urban area in Tangerang District, Banten Province. In addition, factors that influence the onset of menarche were also investigated.

MATERIALS AND METHODS

Subjects

This was a cross-sectional study involving 220 girls in the 4th to 6th grades of primary school in Tangerang District consisting 110 girls from rural area (Teluk Naga area) and 110 girls from urban area (Serpong area). The girls in Balaraja and Tigaraksa area were not included in this study because these areas are considered as suburban areas. The subject was selected with the inclusion criteria as follows 1) girls aged 10-14 years, 2) already reached menarche with exact knowledge of the age of menarche, 3) readily participated in the study by answering questionnaire as well as in attendance for the study and signed informed consent. The exclusion criteria were girls who suffered from chronic diseases and undergoing therapy that could affect the onset of menarche. Written inform consent was obtained from subjects and their parents. The study has been approved by the Medical and Health Research Ethics Committee, Faculty of Medicine, Universitas Gadjah Mada, Yogyakarta. The permission to conduct this study was also obtained from Tangerang District Government.

Procedure

Study was conducted by researcher and assistants (midwives). On the day that has been agreed, subjects were gathered to be selected. An explanation concerning the background, objectives, benefit of the study was given selection. Subjects who fulfilled the inclusion and exclusion criteria were given an informed consent to be taken home and signed by the parents. Subjects were also given a questionnaire to be filled at the second day of meeting. The questionnaire consists of interviewer-administered questions regarding the onset of menarche, body weight and body length at the time of birth, history of acute or chronic illnesses, occupation and income of the parents, environment, sexual education, and physical activities, etc. *Body weight* was *measured* using digital weight with accuracy of 0.1 kg and body height was measured using microtoise with accuracy of 0.1 cm.

Statistical analysis

Statistical analysis was conducted using Statistical Package for Social Sciences (SPSS) program. Descriptive statistics were used to analyze the characteristics of subjects. Data were presented as mean ± standard deviation (SD) or percentage. Distribution of continuous variable was assessed for normality using the Kolmogorov-Smirnov. Independent sample t-test was used to compare normally distributed data and Mann Whitney U test was used for data which were not normally distributed. Bivariate analysis using Chi square test and Spearman or Pearson correlation test were used to assess correlations among independent variables (mother's menarche, birth weight, birth length, physical activity, environment, protein consumption, sexual education) and dependent variable (onset of menarche). Multivariate analysis using logistic regression test was used to analyze correlations among some the

independent variables and dependent variable.[10]

RESULTS

Two hundred and twenty eligible subjects, 110 in rural primary school girls in Mauk Sub District (Teluk Naga rural area) and 110 in urban primary school girls in Ciputat Sub District (Serpong urban area) were involved in this study. The characteristics of subjects are presented in TABLE 1. All of the characteristics of subjects were different between rural and urban areas, except the education level of subjects.

TABLE 1. Characteristics of subjects

Variables	Rural n (%)	Urban n (%)	p
Ethnic			
• Javanese	96 (87.3)	44 (40.0)	
• Sundanese	14 (12.7)	27 (24.5)	0.00
• Betawinese	-	33 (30.0)	
• Others	-	6 (5.5)	
Grade			
• 4	1 (0.9)	-	
• 5	13 (11.8)	13 (11.8)	0.60
• 6	96 (87.3)	97 (88.2)	
Father's education			
• Primary high school	76 (69.1)	11 (10.0)	
• Secondary high school	33 (30.0)	88 (80.0)	0.00
• University	1 (0.9)	11 (10.0)	
Mother's education			
• Primary high school	96 (87.3)	59 (53.6)	
• Secondary high school	12 (10.9)	43 (39.1)	0.00
• University	2 (1.8)	8 (7.3)	
Father's occupation			
• Unemployed	-	1 (0.9)	
• Laborer/farmer/fisherman	76 (69.7)	16 (14.7)	
• Civil servants	1 (0.9)	12 (11.0)	0.00
• Private	26 (23.9)	74 (67.9)	
• Others	6 (5.5)	6 (5.5)	
Mother's occupation			
• Unemployed	60 (54.5)	80 (74.5)	
• Laborer/farmer/fisherman	25 (22.7)	3 (2.7)	
• Civil servants	6 (5.5)	1 (0.9)	0.00
• Entrepreneur	17 (15.5)	23 (20.9)	
• Others	2 (1.8)	1 (0.9)	
Income			
• < 1 million	76 (69.1)	41 (37.3)	
• 1-2.5 million	25 (22.7)	39 (35.5)	0.00
• 2.5-5 million	7 (6.4)	25 (22.7)	
• > 5 million	2 (1.8)	5 (4.5)	

Environment, physical activities and protein consumption of subjects both from rural and urban areas are presented in TABLE 2.

Rural area was the arid coastal suburbs areas (68.2%), while a lot of trees (77.3%) were observed in urban areas. Primary school girls

in rural areas obtained sexual education higher (64.5%) than girls in urban areas (46.4%) (p=0.00). Moreover, girls in rural areas had higher routine activities (90.0%) than girls in urban areas (29.1%) (p=0.00). Consumption of protein of girls in rural areas was also higher (63.6% of girls consumed protein < 3/week) than girls in urban areas (21.8%) (p=0.00).

TABLE 2. Environment, activities and protein consumption of primary school girls in rural and in urban areas.

Variables	Rural n (%)	Urban n (%)	p
Environment			
• Lush greenery	7 (6.4)	25 (22.7)	
• Greenery	28 (25.5)	65 (59.1)	0.00
• Arid	75 (68.2)	20 (18.2)	
Sexual education			
• Never	10 (9.1)	17 (15.5)	
• Parents	71 (64.5)	51 (46.4)	
• Teachers	10 (9.1)	31 (28.2)	0.00
• Peer group	17 (15.5)	5 (4.5)	
• Mass media	2 (1.8)	6 (5.5)	
Physical activities			
• Routine	99 (90.0)	32 (29.1)	0.00
• Not routine	11 (10.0)	78 (70.9)	
Protein consumption			
• < 3 times/week	70 (63.6)	24 (21.8)	0.00
• = 3 times/week	40 (36.4)	86 (78.2)	

Menstrual cycle of primary school girls both in rural and urban areas is demonstrated in TABLE 3. Almost all of the girls in rural areas (96.4%) had regular menstrual cycles after menarche. However, there was only 50% of the girls in urban areas who had a regular menstrual cycles (p=0.00). Similar condition was observed for the current menstrual cycle and dysmenorrhea. The number of girls in rural areas who had a regular current menstrual cycle (94.5%) was higher than the girls in urban areas (75.5%) (p=.00). Moreover, the number of girls in rural areas who had no dysmenorrhea (57.2%) was higher than girls in urban areas (30.9%) (p=0.00).

TABLE 3. Menstrual cycle of primary school girls in rural and urban areas

Variable s	Rural n (%)	Urban n (%)	p
Menstrual cycle after menarche			
• Irregular	4 (3.6)	55 (50.0)	0.00
• Regular	106 (96.4)	55 (50.0)	
Current menstrual cycle			
• Irregular	6 (5.5)	27 (24.5)	0.60
• Regular	104 (94.5)	83 (75.5)	
Dysmenorrhea			
• Yes	47 (42.8)	76 (69.1)	0.00
• No	63 (57.2)	34 (30.9)	

Menarche age of primary school girls in rural and urban areas is presented in TABLE 4. The birth weight, birth length, BMI, length of menstruation and mother's menarche of girls in rural areas were not significantly different compared with girls in urban areas (p>0.05). However, the age, body weight and body height were significantly different (p=0.00). The age of girls in rural areas (12.27±1.04 years) was higher than girls in urban areas (11.48±0.64 years), whereas the body weight (39.03±6.17 kg) and body height (139.99±5.60 cm) of the girls from rural areas were lower than from urban areas who had mean body weight of 43.37±7.51 kg and mean body height 148.47±5.37 cm.

TABLE 4. Menarche age of primary school girls in rural and urban areas

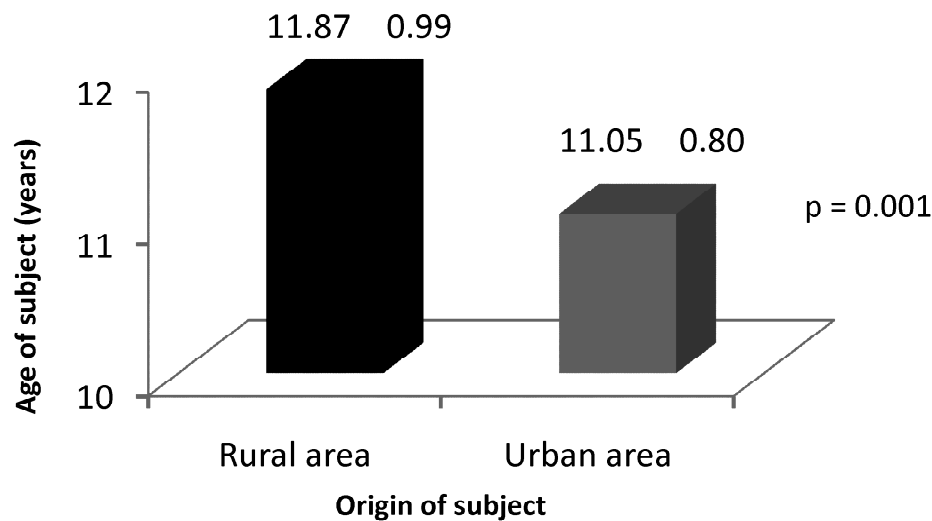| Variable s	Rural (mean±SD)	Urban (mean±SD)	p
Birth weight (g)	3.10 ± 0.35	3.06 ± 0.35	0.66
Birth length (cm)	48.02 ± 1.50	48.95 ± 1.82	0.32
Age of subjects (years)	12.27 ± 1.04	11.48 ± 0.64	0.00
Body weight (kg)	39.03 ± 6.17	43.37 ± 7.51	0.00
Body height (cm)	139.99 ± 5.60	148.47 ± 5.37	0.00
BMI (kg/m^2)	20.15 ± 2.48	19.61 ± 2.79	0.13
Length of menstruation (days)	6.21 ± 1.42	6.27 ± 1.27	0.94
Mother's menarche (years)	13.01 ± 1.10	13.03 ± 1.39	0.91

FIGURE 1. Onset of menarche in rural and urban areas girls

The onset of menarche of primary school girls in rural areas was significantly slower than girls from urban areas ((11.87±0.99 versus 11.05 ± 0.80 years) (p = 0.01). Further analysis using logistic regression test showed that the birth weight, the birth length, the physical activity and the environment had a significant correlation with the onset of menarche, with correlation values were -0.198,-0.339, 0.340 and 0.334, respectively. Meanwhile, mother's menarche, protein consumption and sexual education had no significant correlation with the onset of menarche (p>0.05) (TABLE 5).

TABLE 5. Correlation of predictor factor and onset of menarche of primary school girls in rural and urban areas

Variables	Correlation	p
Mother's menarche	0.045	0.51
Birth weight	- 0.198	0.03
Birth length	- 0.339	0.00
Physical activity	0.340	0.00
Environment	0.334	0.00
Protein consumption	0.032	0.64
Sexual education	0.054	0.42

TABLE 6. Odds Ratio

Variables	OR	95% CI
Physical activity	0.289	0.163 – 0.512
Rural-urban	3.340	1.911 – 5.823

TABLE 7. Adjusted Odds Ratio

Variable	aOR	95% CI
Rural-urban	2.95	1.410 – 6.012

DISCUSSION

The characteristics of subjects were different between rural and urban areas, except the education level of subjects (TABLE 1). Grade of subjects in primary school who had menarche in rural areas were not different with subjects in urban areas (p=0.60). They had menarche when in the 4th to 6th grade of primary shool. However, the onset of menarche of primary school girls in rural areas was significantly slower than girls from urban areas (FIGURE 1).

The ethnic of subjects in urban areas varied more than rural areas. The majority of subjects both in urban and rural areas was Javanese followed by Sundanese in rural areas and Betawinese in urban areas. The education level of the parents of subjects from urban areas were higher than from rural areas (p=0.00). Majority of the parents from rural areas graduated from primary school, while the parents from urban

areas graduated from secondary school. Moreover, majority of fathers from rural areas worked as farmers or fishermen (69.7%) with income lower than majority of fathers from urban areas who worked in private sector as entrepreneur (67.9%). Most parents from rural areas had an income less than 1.000.000. Indonesian Rupiah (IDR) per month which lower than minimum wage of Tangerang District (1.044.500 IDR/per month).[9]

Rural areas selected in this study were situated in the Java seacoast where its environment was the arid coastal suburbs area (68.2%). Environment that is more unexploited with a lot of trees (77.3%) was observed in urban areas. Girls from primary school in rural areas obtained sexual education higher (64.5%) than girls in urban areas.

As much as 64.% girls in rural areas and 46.4% girls in urban areas obtained sexual education from their parents (TABLE 2). It was indicated that talking about sexuality between parents and their children should not be considered taboo. Moreover, it seemed that the sexual education obtained from their teachers in the schools were higher in urban areas compared to those in rural areas. The primary schools in urban areas have included the sexual education in their curriculum. This sexual education development in schools is very good, considering the teenagers who are looking for their identity often trapped with wrong information. They often get information from the wrong resources, such as through the internet which provides pornography that can be accessed by teenagers in rural areas.

As much as 90% of girls in rural areas did also routinely physical activities (TABLE 2) such as morning exercise routine, morning walk at least 30 minutes for three times per week and walking to school for 5 to 30 minutes. In contrast, 70.90% girls in urban areas did not do routinely physical activities. Most of them

went to school by public transport that is easier to get in urban areas than in rural areas. Mokha *et al.*[3] and Dusek[11] reported that physical activity, both routine exercise as well as daily household chores can significantly delay the onset of menarche.

The consumption pattern for protein was different between girls in rural areas and those in urban areas (TABLE 2). The consumption pattern for animal protein of girls in urban areas was higher than those in rural areas. It was closely related to the social economic level of their parents. The parents in urban areas had higher income than the parents in rural areas and they are able to buy the animal protein. Khan *et al.*[12] suggested that girls who consume high protein will get an earlier menarche as shown in this study. The protein consumption affects the hormones production which plays an important role in the onset of menarche. However, no correlation between the protein consumption and the onset of menarche was observed in this study (TABLE 5). It was thought that the protein consumption pattern of girls in this study was different to those in other population and had not affected the hormones production, yet.

Physical activities or exercise are often considered as non pharmacological intervention for primary dysmenorrheal. Brown and Brown[13] reported that women who conducted regular exercise have less symptoms of the primary dysmenorrheal after three menstrual cycles. In this study, higher occurrence of primary dysmenorrhae was also observed on girls in urban areas (69.1%) who had less physical activities compared to girls in rural areas (42.8%).

This study showed that the birth weight, the birth length, the physical activity and the environment had significant correlation with the onset of menarche (TABLE 5). In contrast, Tam *et al.*[14] reported that there was no correlation

between birth weight and birth length with the onset of menarche. However, it was proved that the onset of menarche was influenced by the pre and post natal growth. Terry *et al.*[15] reported that birth size influenced the childhood growth and the onset of menarche. A baby who had greater birth size caused the higher childhood growth which caused the earlier onset of menarche. However, this phenomenon remains controversial. Other study showed that the smaller birth size had the earlier onset of menarche due to fetal intrauterine growth was very effective in utilizing all the intake for the body metabolism. Other predictor of the onset of menarche is the growth rate during the age 2 to 8 years. The rapid growth in this period will affect the growth in the next period. However, this study used a cross sectional design instead of a cohorts design, therefore data of the growth during the age of 2 to 8 years cannot be obtained.

Mother's menarche, protein consumption and sexual education did not correlate with the onset of menarche in this study (TABLE 5). It was not similar to the findings reported by Ong *et al.*[16] that showed the earlier onset of menarche of the mother to be marker of faster growth tempo, characterized by rapid weight gain and growth during infancy and leading to taller childhood stature, but more likely the marker of earlier maturation and therefore shorter adult stature.

CONCLUSION

In conclusion, the age onset of the menarche of girls in rural areas is slower than those in urban areas in Tangerang District. The girls who live in urban areas have predictor factors to achieve for onset of menarche 2.95 earlier than the girls who live in rural areas. The birth body weight, birth body length, physical activities and environment are correlated with the onset of menarche of the girls.

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