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Original Article

Relationship between age at menarche and exposure to sexual content in audio-visual media and other factors in Islamic junior high school girls

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Abstract

Background In recent decades, girls have experienced menarche at earlier ages, which may have negative effects on health. Exposure to audio-visual media and other factors may influence the age at menarche, although past studies have produced inconsistent results. Objective To assess for relationships between the age at menarche and audio-visual media exposure, socio-economic status, nutritional status, physical activity, and psychosocial dysfunction in adolescent girls.

Methods This cross-sectional study was conducted from August to October 2015 in students from two integrated Islamic junior high schools in Medan, North Sumatera. There were 216 students who met the inclusion criteria: aged 10-16 years and experienced menarche. They were asked to fill out questionnaires that had been previously validated, regarding their history of exposure to audio-visual media, physical activity, and psychosocial dysfunction. The data were analyzed by Chi-square and Fisher's exact tests in order to assess for relationships between audio-visual media exposure and other potential factors with the age at menarche.

Results Of 261 female students at the two schools, 216 had undergone menarche, with a mean age at menarche of 11.6 (SD 1.13) years. There was no significant relationship between age at menarche and audio-visual media exposure (P=0.68). Also, there were no significant relationships between factors such as socio-economic and psychosocial status with age at menarche (P=0.64 and P=0.28, respectively). However, there were significant relationships between earlier age at menarche and overweight/obese nutritional status (P=0.02) as well as low physical activity (P=0.01). Multivariate logistic regression analysis showed that low physical activity had the strongest influence on early menarche (RP=2.40; 95%CI 0.92 to 6.24).

Conclusion Age at menarche is not significantly associated with sexual content of audio-visual media exposure. However, there are significant relationships between earlier age at menarche and obese/overweight nutritional status as well as low physical activity. **[Paediatr Indones. 2017;57:323-8 ; doi: http://dx.doi.org/10.14238/pi57.6.2017.1323-8].**

Keywords: *audio-visual; age at*

Puberty is a transitional period from childhood to adulthood. At the time of puberty, the development of secondary sexual phenomena in females include the breast and pubic hair growth as well as menarche.[1] Menarche is the first menstrual cycle. Generally, menarche occurs within 2 years of breast development, at a mean age of 12.8 years and an age range of 10 to 16 years.[1] The Basic Health Survey (*Riskesdas*) in 2010 reported that the national mean age at menarche was 13-14 years.[2]

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The age of puberty in girls is earlier now than in the previous century. The age at menarche in developed countries in Europe and the Americas has decreased an average of 2 to 3 months per decade in the last 100 to 500 years.[3,4] Earlier age at menarche has also been seen in girls in developing countries.[5,6] The age at menarche has important health implications, as early menarche has been associated with increased risk of cardiovascular disease and breast cancer.[7] The age at menarche is influenced by many factors such as race, ethnicity, exposure to audio-visual media with sexual content, and other influences that include socio-economic and nutritional status, physical activity, and psychosocial dysfunction.[3] Global information content is readily accessible to children and adolescents, many of whom have adopted bad habits such as watching movies and accessing sexual content from television, or the internet via computers and cell phones. Exposure to audio-visual media that contains sexual content is known to accelerate menarche at adolescents' early age.[8]

One Indonesian study stated that there were significant relationships between audio-visual media exposure and environmental influences with age at menarche in female teenagers although the results are inconsistent.[8] In previous studies from various countries, subjects had different cultural backgrounds, thus results were varied. A study on the age at menarche has been limited in students from religious-based environments with more intensive hours of learning. Therefore, we aimed to assess for associations between age at menarche and exposure to sexual content in audio-visual media as well as environmental factors in adolescent girls from integrated Islamic junior high schools.

Methods

This analytical study with a cross-sectional design was conducted at Siti Hajar and Darul Ilmi Murni Integrated Islamic Junior High Schools, Medan, North Sumatera, from August to October 2015. The 216 subjects who fulfilled the inclusion criteria were 10- to 16-year-old girls who had already experienced menarche. The exclusion criteria were girls who used hormonal drugs, had a history of chronic disease, or had congenital disorders. The data about the exposure audio-visual media containing sexual content were obtained from questionnaires.

The staging system utilized most frequently was that published by Marshall and Tanner and the sequence of changes, commonly referred to as "Tanner stages", was described below (**Figure 1** and **Table 1**).

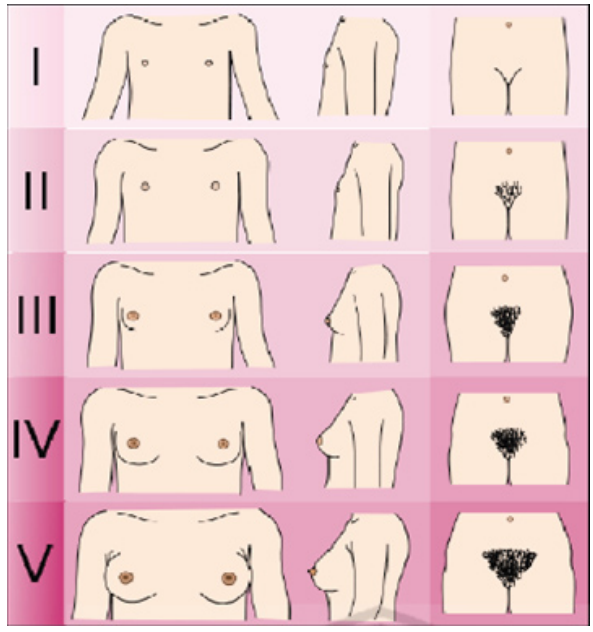

Figure 1. Female's Tanner Stage

Tabel 1. Female's Tanner Stage

Stage	Breast	Pubical hair
Stage 1	Prepubetal	Prepubertal (can see velus hair similar to abdominal wall)
Stage 2	Breast bud stage with elevation of breast and papilla; enlargement of areola	Sparse growth of long, slightly pigmented hair, straight or curled, at base of penis or along labia
Stage 3	Further enlargement of breast and areola; no separation of their contour	Darker, coarser and more curled hair, spreading sparsely over junction of pubes
Stage 4	Areola and papilla form a secondary mound above level of breast	Hair adult in type, but covering smaller area than in adult; no spread to medial surface of thighs
Stage 5	Mature stage: projection of papilla only, related torecession of areola	Adult in type and quantity, with horizontal distribution ("feminine")

Subjects' nutritional status was obtained by calculating actual body weight percentage (actual weight size) on ideal body weight, classified according to Waterlow 1972 as follows: obese > 120%, overweight >110-120%, normal 110-90%, malnutrition 70-90%, and severe malnutrition < 70%. Then grouped into two categories, namely groups with undernutrition-normal nutrition and groups with overweight-obese.

Physical activity from questionnaires about the respondents' daily activities within a 24-hour period divided to: light activity (when 75% light activity and 25% moderate and heavy activity), moderate activity (when 40% light activity and 60% moderate and heavy activity), and heavy activity (when 25% light activity and 75% moderate and heavy activity). Then grouped into two categories: group with inadequate activity (subjects with light activity) and adequate activity (subjects with moderate and heavy activity).

Socio-economic status by parental monthly income which devided into high and low socio economic. High socio economic status if the parent had monthly income more than standar minimum wage in city of Medan and low socio economic status if the parent had monthly income belowthe standar minimum wage in city of Medan which state by Governor of North Sumatra Rp. 2.037.000/month and psychosocial dysfunction was assessed by the *Pediatric Symptom Checklist 35 (PSC 35)* questionnaire. This study was approved by the Ethics Committee of the University of Sumatera Utara Medical School. Informed consent was obtained from subjects' parents.

The data were analyzed using *SPSS*, with Chi-square and Fisher's exact tests to assess for a possible relationship between age at menarche and audio-visual media exposure and other factors. Multivariate logistic regression analysis was used to analyze potential associations between age at menarche and audio-visual media exposure, psychosocial dysfunction, socio-economic status, nutritional status, and physical activity.

Results

Of 261 female students aged 10 to 16 years who underwent initial screening, 216 had experienced menarche and met the inclusion criteria. Subjects reported their age at menarche, then they were allocated to one of two groups: early menarche (at <10 years of age, 35 subjects) and normal menarche (at 10 to 16 years of age, 181 subjects).

Subjects' mean age at menarche was 11.64 (SD 1.13) years and their ethnicites consisted of 34.3% Javanese, 33.8% Batak, 27.3% Malay, and 4.6% others. Parental occupations also varied, but the majority were entrepreneurs (57.4%). All subjects were above Tanner stage 2 (**Table 2**).

Table 2. Characteristics of study subjects

Characteristics	N=216
Mean age at menarche (SD), years	11.64 (1.13)
Ethnicity, n (%)	
Javanese	74 (34.3)
Batak	73 (33.8)
Malay	59 (27.3)
Others	10 (4.6)
Parental occupation, n (%)	
Government employee	71 (32.9)
Entrepreneur	124 (57.4)
BUMN* employee	21 (9.7)
Tanner stage, n (%)	
Stage 1	0
Stage 2	0
Stage 3	115 (53.2)
Stage 4	89 (41.2)
Stage 5	12 (5.6)

**BUMN=Badan Usaha Milik Negara* (state-owned enterprise)

Fisher's exact test revealed no significant relationship between exposure to audio-visual media with sexual content and age at menarche (P=0.68). We noted that over 90% of girls in both groups had been exposed to audio-visual media with sexual content. We also evaluated several other factors that could potentially influence the age at menarche such as socio-economic status, nutritional status, physical activity, and psychosocial dysfunction. We found that the incomes of the majority of the subjects' parents were above the urban minimum wage (UMK) and their parents' occupations varied; most of them were entrepreneurs with high socio-economic status (**Table 3**). Fisher's exact test revealed no significant relationship between age at menarche and parental income (P=0.64). Chi-square test revealed a significant relationship between nutritional status and age at menarche (RP = 2.02; 95%CI 1.09-3.7; P=0.02). Significantly more overweight-obese

subjects underwent early menarche than normal menarche. We also found that early age at menarche was significantly associated with inadequate physical activity (RP=2.46; 95%CI 1.17 to 5.16; P=0.01). Subjects with inadequate physical activity had 2.46 times higher possibility of early menarche, compared to those with adequate physical activity. Chi-square test revealed no significant relationship between psychosocial dysfunction and age at menarche (P=0.28) (**Table 3**).

Logistic regression analysis was used to determine the factor with the strongest association with early menarche. Multivariate analysis showed this factor to be physical activity, with RP = 2.40, which indicated that subjects with inadequate physical activity had 2.40 times the risk of early menarche, compared to those with adequate physical activity but statistically was not significant (95%CI 0.92 to 6.24) (**Table 4**).

Discussion

In our study, subjects' mean age at menarche was 11.64 (SD 1.13) years, which was earlier than reported by the Ministry of Health (*Riskesdas*) in 2010 (13-14 years).[2] It appears that age at menarche in Indonesian children has gotten earlier in the last few years, consistent with a Yogyakarta study in 2013 which showed an early mean age at menarche of 11.8 years.[8]

Age at menarche may be influenced by many factors, one of which is exposure to audio-visual media with sexual content. Sexual stimuli from directly observing sexual activity causes the hypothalamus to stimulate secretion of specific hormones, which may eventually influence the process of reproductive organ maturity.[8] However, we found no significant

Table 3. Relationship between age at menarche with exposure to audio-visual media with sexual content, socio-economic status, nutritional status, physical activity, and psychosocial dysfunction

Characteristics	Menarche		RP	95%CI	P value
	Early (n=35)	Normal (n=181)			
History of exposure, n (%)					
Exposed	32 (91.4)	169 (93.4)			0.68**
Not exposed	3 (8.6)	12 (6.6)			
Socio-economic status, n(%)					
High	33 (94.3)	174 (96.1)			0.64**
Low	2 (5.7)	7 (3.9)			
Nutritional status, n (%)					
Overweight-obese	20 (57.1)	66 (36.5)	2.02	1.09 to 3.71	0.02*
Undernutrition-normal weight	15 (42.9)	115 (63.5)			
Physical activity, n (%)					
Inadequate	27 (77.1)	98 (54.1)	2.46	1.17 to 5.16	0.01*
Adequate	8 (22.9)	83 (45.9)			
Psychosocial dysfunction, n (%)					
No problem	22 (62.9)	96 (53)			0.28*
Problem	13 (37.1)	85 (47)			

* Chi-square test, ** Fisher's exact test

Table 4. Multivariate analysis of the potential factors influence the age of menarche

Variables	Coefficient	RP	95%CI	P value
Audio-visual media exposure	-0.16	0.86	0.21 to 3.44	0.83
Psychosocial dysfunction	-0.45	0.64	0.29 to 1.40	0.26
Parental income	-0.74	0.47	0.08 to 2.70	0.40
Nutritional status	0.56	1.75	0.76 to 4.02	0.19
Physical activity	0.87	2.40	0.92 to 6.24	0.07

relationship between age at menarche and exposure to audio-visual media with sexual content (P=0.68). Similarly, a Banten study reported no significant relationship between age at menarche and audio-visual media exposure (P=0.11).[9] However, an American study in 2005 indicated that there was a significant relationship between media with sexual content and girls' sexual maturity, and children who underwent early sexual maturity had sexual interest in seeing sexual content in movies, television and magazines.[10] In addition, a Yogyakarta study showed a significant relationship between age at menarche and audio-visual media exposure. Another factor that influenced sexual maturation in children was cultural background.[8] In our study, subjects were female students from integrated Islamic junior high schools which practiced an intensive learning system (full day school).

We also assessed other possible factors that could affect age at menarche including socio-economic status, nutritional status, physical activity, and psychosocial dysfunction. Good socio-economic status has been associated with early age at menarche in Indian girls, possibly due to parents' providing sufficient nutrition for their children.[11] A Nigerian study compared the age at menarche in girls from different socio-economic levels and found that those from middle and upper socio-economic classes underwent menarche earlier than those in the lower socio-economic class.[12] However, we found no significant relationship between age at menarche and socio-economic status (P=0.64). Almost all of our subjects were from good socio-economic background, as their family incomes were above the average minimum wage in Medan. We found no significant difference in age at menarche between the low and high socio-economic groups.

Nutritional status is considered to be an influencing factor in the development of puberty. Age at menarche and nutritional status have been correlated with body fat, with the hormone leptin playing an important role. Serum leptin concentration had a significant relationship with percentage of body fat. Leptin plays an important role not only in appetite for food, but also in the onset of puberty.[13] A Medan study conducted in 2012 showed that body mass index (BMI) was associated with menarche age.[14] Similarly, a French study showed that there was a significant relationship between good nutritional status/obesity and early menarche in female teenagers.[15] We also found in bivariate analysis a significant relationship between overweight/obese nutritional status and early menarche age (PR=2.02; 95%CI 1.09 to 3.71; P=0.02). The school administrations which this study was held are very concerned about nutritional needs of the students, as they provide lunch and snacks during recess, in order to fulfill students' needs for good nutrition, despite their hectic schedule.

Energy expenditure through physical activity is known to influence age at menarche. Intensive exercise tends to decrease gonadotropin and ovarian hormone production. Under conditions of excessive energy expenditure, the short-lived luteal phase, lower FSH levels, and higher prolactin levels can delay onset of puberty.[7] We, too, found a significant relationship between inadequate physical activity and early age at menarche (RP=2.46; 95%CI 1.17 to 5.16; P=0.01) in bivariate analysis. Similarly, a US study on adolescents who performed heavy physical activity prior to puberty had slower onset of puberty than adolescents with moderate physical activity. Low physical activity accelerates sexual maturation which causes early age at menarche.[16] In our study, most of the female students used personal vehicles to go to and from school.

Psychosocial dysfunction may result from stress-induced emotional changes. Stress and fear affect the decreased release of gonadotropin releasing hormone (GnRH) which in turn influences the secretion of estrogen and progesterone. Maladaptive stress activates the anterior pituitary axis (HPA), which causes the hypothalamus to secrete corticotropin-releasing hormone (CRH). CRH has a negative effect on the secretion of GnRH, leading to delayed sexual maturation.[17] In our study, we found no significant relationship between psychosocial dysfunction and menarche age (P=0.28).

A limitation of our study was that the history of audio-visual media exposure was only obtained from questionnaires. As such, the answers may have been subject to recall bias. Also, the nutritional status assessment was done by anthropometric examination; subjects were not asked directly about their daily diet. In addition, socio-economic status was assessed according to parental income divided into low and high socio-economic status, but more

than 90% of subjects were in the high category. Furthermore, psychosocial dysfunction was assessed by the PSC 35, no specific psychological examination was performed. Nevertheless, the results of our study reasonably describe some factors that could affect age at menarche in the Medan population, in particular. We also found an earlier mean age at menarche than in past decades.

Conflict of Interest

None declared.

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