ORIGINAL RESEARCH ARTICLE

Age of Menarche among Basic Level School Girls in Medina, Accra

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Abstract

The current study was designed to determine the age at which menarche occurs among school girls in Madina, Accra. A survey was conducted among 529 girls selected using multi-stage sampling from basic schools in Madina, Accra. Respondents completed a questionnaire that recorded age-at-first menstruation by recall, household characteristics, and anthropometry. Mean age at menarche was 12.74 ± 1.15 years; probit analysis yielded a median age of 12.09 years. Menarcheal age was significantly correlated with current age (r=0.48; p<0.01). Most girls (90%) had first menstruation before age 13. Their mothers' mean age at menarche was 13.6 ± 1.08 years. In a multivariate linear regression model, household wealth (p<0.01) and body mass index (p<0.01) were the main modifiable independent predictors of age at onset of menarche. School girls in Madina attained menarche earlier than previously estimated. Our study suggests an influence of household level improvement in socio-economic status on menarcheal age (*Afr J Reprod Health 2011; 15[3]:103-110*).

Résumé

Age de l'établissement de la menstruation chez les écolières à Medina, Accra : L'étude actuelle a été conçue en vue de déterminer l'âge auquel la menstruation s'établit chez les écolières à Medina, Accra. Une enquête a été menée auprès des 529 filles à l'aide d'un échantillon à multiples étapes tirée des écoles à Medina, Accra. Les enquêtées ont rempli un questionnaire qui a enregistré l'âge à la première menstruation à travers le rappel, les caractéristiques familiales et l'anthropométrie. L'âge moyen à la première menstruation était 12,74±1,15 ans ; une analyse par la méthode des probits a donné un âge médian de 12,09 ans. L'âge qui se rapporte à l'établissement de la menstruation était remarquablement corrélé avec l'âge actuel (r=0, 48 ; p<0,01). La plupart des filles (90%) avaient leur première menstruation à l'âge de 13ans. L'âge moyen de leurs mères au moment de la menstruation était 13,61±08 ans Dans un modèle de régression linéaire multifactoriel, la richesse du ménage (p<0,01) et l'indice de masse corporelle (p<0,01) ont été les principaux indices modifiables de l'âge au commencement de la menstruation. Quelques écolières à Medina ont commencé la menstruation plus tôt qu'on avait prévue. Notre étude montre qu'il y a une influence de l'amélioration du niveau du ménage dans l'état socio-économique sur l'âge qui se rapporte à l'établissement de la menstruation (*Afr J Reprod Health 2011; 15[3] :103-110*).

Keywords: Menarche, Ghana, School girls, menstruation, Teenagers

Introduction

There is overwhelming evidence of the declining age at which menarche occurs.[1-3] The role of enhanced living situation, measured as improved access to health care, optimal nourishment and appreciating socio-economic status on the onset of menarche has been reported in both developed and developing countries.[4,5] As girls become fertile, their risk for unplanned pregnancies increases and puts them at risk of well-documented complications and adverse outcomes associated with teen and adolescent sexual behavior, aggression, and drug use.[6,7] Awareness of the prevailing age at which girls experience menarche

is therefore a useful public health imperative for policy formulation and program implementation.

In 1989, Adadevoh and colleagues[8] reported the first study on age at first menstruation among Ghanaian teenage school girls in Kumasi. Subsequently, there have been no recent follow-up studies to determine how societal and lifestyle changes have influenced menarcheal age among teenagers in Ghana, over a period of more than two decades. In 2003, Adanu and collegues,[9] contributed to bridging this gap. They estimated menarcheal age in a subsample of adult urban-dwelling Ghanaian women aged 18 years and above who were enrolled in the Accra Women's Health Study. The current study was designed to provide further evidence on age at menarche among school girls in a sample selected from Madina, Accra. The study is part of a set of complementary studies on the health situation in the Ga East Municipality of Accra.

Methods

Study site and design

The current study was carried out in Madina as part of a Municipality-wide health status assessment of the Ga East Municipality in Accra, Ghana. Located about twenty minutes drive from the central business district of Accra, the Ga East Municipality comprises of four administrative sub-units with a combined estimated population of 161,873. Madina is mostly peri-urban and a major business community.

A Cross-sectional survey was conducted in four out of the 25 public and private basic schools in Madina. The four schools were selected by ballot from a list of schools provided by the Municipal Education Service office. In each selected school, all girls in classes five through second year in Junior High were invited to participate, after the study protocol had been explained to them. The eligible girls (those in the indicated classes) were given questionnaires as well as consent form to take home and complete if their parents consented to their participation, and they also assented to participate in the study. Any questions the girls had were explained at the time the questionnaires were handed to them.

Subsequently, the weight and standing height of those who returned the completed questionnaires were measured using standard methods.[10]

The questionnaires were designed to collect data on demographic characteristics of the girls (present age, class, birth weight, place of birth, and birth order) and family characteristics (education of parents/caregiver, household size, wealth, parental ethnic background, and family structure). Date at first menstruation was obtained by recall from the girls, with the help of their parents. Weight was measured to the nearest 0.1kg using a digital Seca floor scale (Seca Precision Weighing Balances, Bradford, USA); standing height was measured to the nearest 0.1cm using a stadiometer (Shorr productions, Marvland, USA).

Ethical approval for the study was obtained from the Ghana Health Service ethical review committee. Additionally, permission was obtained from the Director of the Ga East Municipal Education Service as well as respective Head teachers of the participating schools. Written Informed Consent was obtained from the parents/guardians of the study participants.

Data Analyses

Data analysis was performed using Statistical Package for Social Sciences (SPSS) version 16 (SPSS Inc, Chicago, USA). Participant characteristics were described using frequencies. Age at menarche was described using means and standard deviation. Among participants who were able to provide a full date of birth and date of first menstruation (including the day and month), age at menarche was estimated as the difference in the dates using the <Datediff> function in SPSS. Among those who could only provide the month and year of menstruation, the 15th day of the month was used for calculation. If only the year was indicated, the 15th day of the 6th month of the year was use for calculation. Among participants who provided an age estimate, rather than a date of menarche, 0.5 years was added to the reported age to obtain an adjusted age at menarche,[11,12] based on the assumption that women reporting age at menarche from recall tended to report the age at the last birthday preceding menarche.

The age at menarche determined by recall was averaged for all girls who had their menses prior to the survey. Probit analysis was also used to estimate the median age at menarche onset as described by Padez.[11] A univariate analysis using one-way ANOVA was applied to identify predictors of age at menarche. The variables that were significantly associated with age at menarche at p<0.05, in the univariate analyses, were included in a multivariate ANOVA model to determine the associated between age at menarche and predictor variables.

Results

A total of 529 out of the selected 600 girls completed and returned the survey, constituting a response rate of 88%. Table 1 describes the characteristics of the study participants and their households. The current ages of the girls included in the study ranged between 9 and 18 years, with a mean and a standard deviation of 13.9 ± 2.2 years. More than 80% were between ages 11 and 16 years. About two-thirds of the respondents (67.3%) were born in urban settings. Birth weight data was unavailable for 36% of respondents (data not shown). Almost half of the girls (43.1%) were classified as undernourished, based on a low body mass index (BMI) <18.5kg/m^2. Over 80% of the girls lived in households of more than three persons. A majority (72.9%) were living in households classified as low to middle income status.

Table 1 also shows the proportion of girls who had attained menarche by their household characteristics. Almost three quarters of the girls surveyed (73.5%) had already attained menarche. Among class five pupils, more than half (52.3%) had already attained menarche. Among those in second year of Junior High, the proportion who had attained menarche was 88.4%. The proportion of attained menarche was highest among girls in households classified as high or highest wealth quintile (>98%), low maternal education (89.1%), and small household size (91.2%).

Mean age at menarche was estimated at 12.74 ± 1.15 years, by the recall method, among girls aged 11-17 years (Table 2). Using probit analysis, 12.1 years was estimated as the median age of

menarche onset. The age at first menstruation reported among the girls ranged from 9 to 17 years. Among girls who had attained menarche, 24.9% attained menarche before age 12 year. By age 13 years, most girls (92%) had already attained menarche. A significant correlation was observed between age at first menstruation and current age (r=0.48; p<0.01), suggesting that the younger girls were attaining menarche at an earlier age than older girls. About 70% (372) of respondents also reported the age at which their mothers had their first menstruation. Age at mother's first menstruation was estimated at 13.6 ± 1.08 years with a range between 10 and 16 years.

As expected, several explanatory variables indicating improved living situation were associated with age at menarche in univariate analysis, including BMI (p<0.01), birth order (p<0.01), and Wealth Quintile (p<0.01), as shown in Table 3. In addition to the overall group differences, a significant dose-dependent association was observed between age at menarche and the following variables: BMI (p<0.01), birth order (p<0.01), number of respondent siblings (p<0.01), birth weight (p<0.01), wealth quintile (p<0.01), and current stage of education (p<0.01).

Table 4 show a multivariate ANOVA model that controlled for father's education, current age and current stage of education. The independent predictors of age at menarche were BMI (p<0.01), wealth quintile (p<0.01), and mothers' age at first menstruation (p=0.04). While the model accounted for about 65% of the variance, BMI and Wealth quintile accounted for about 65% of the explained variance in the estimated age at menarche.

Discussion

The age at onset of menarche is an important marker of sexual maturation in females. An assessment of the mean age at menarche is therefore an important guide for teenage and adolescent sexual and reproductive health programs.[13] The current study estimated the mean age at menarche among school children at 12.74 ±

Table 1: Characteristics of School girls and proportion who had attained menarche, Madina, Accra, 2010

Characteristics	All Respondents (N=529)		Attained menarche (N=389)	
	%	n	%	n
Age groups				
9-10	6.6	35	0	0
11-12	20.4	108	43.5	47
13-14	29.5	156	80.8	126
15-16	30.3	160	91.2	146
17-18	13.2	70	100	70
Place of birth				
Rural	32.7	173	70.5	122
Urban	67.3	356	75.0	267
Fathers education completed				
None	4.7	25	80.0	20.0
Primary	4.9	26	80.8	21
Junior High/Middle School	45.0	283	76.9	183
Senior Secondary or higher	45.4	240	68.8	165
Mothers education completed				
None	8.7	46	89.1	41
Primary	11.3	60	78.3	47
Junior High/Middle School	51.6	273	74.0	202
Senior Secondary or higher	28.4	150	66.0	99
Mother's age at menarche				
10-11	2.5	13	53.8	7
12-13	21.9	116	80.2	93
14-16	45.9	243	83.1	202
Missing[*]	29.7	157	55.4	87
Household size				
1-3	19.3	102	91.2	93
4-6	48.4	256	78.9	202
7-9	26.8	142	54.2	77
10+	5.5	29	58.6	17
BMI category				
Undernourished	43.1	228	58.3	133
Normal	45.9	243	81.9	199
Overweight	11.0	58	98.3	57
Class				
Primary 5	24.6	130	52.3	68
Primary 6	18.3	97	61.9	60
Junior High 1	29.5	156	84.6	132
Junior High 2	27.6	146	88.4	129
Wealth quintile				
Lowest	12.1	64	68.8	44
Low	25.5	135	60.7	82
Middle	35.3	187	64.7	121
High	16.6	88	100.0	88
Highest	10.4	55	98.2	54
Total	**100.0**	**529**	**73.5**	**389**

[*] *Mothers did not provide their menstruation data*

Table 2: Distribution of age at menarche onset among school girls in Madina, Accra

Characteristic	Age at menarche		
	Mean	SD	n
Current age			
11	10.63	0.18	9
12	11.50	0.38	38
13	12.45	0.70	62
14	12.83	0.99	64
15	12.86	1.02	83
16	13.12	0.92	63
17	13.30	1.52	48
18	13.55	1.19	22
Current stage in school			
Class 5	12.31	1.08	68
Class 6	12.30	1.17	60
JSS 1	12.88	1.14	132
JSS 2	13.03	1.08	129
Total	12.74	1.15	389

1.15 years, using a recall approach and a median age of 12.1 years using probit analysis. As expected, the current estimate was lower, by about 15 months, compared to the estimate (13.98 ± 1.42) observed about 25 years ago among school girls in Kumasi using similar methods.[8] This finding suggests a downward trend in age at menarche onset over time. The estimated age at menarche of the girls' mothers also suggests that urban dwelling Ghanaian girls are having their first menstruation earlier than their mother's did. A more recent retrospective analysis involving urban-dwelling women aged 18 years and above, reported a mean menarcheal age of 15.5 years, using the life tables approach.[9] In the same study, a slightly lower estimate of 14.5 years was observed among women <20 years, providing further evidence consistent with a downward trend in menarcheal age among Ghanaian women. It has been suggested that a longitudinal study design, collecting data prospectively, will be ideal to confirm the downward trend demonstrated in these cross-sectional studies.[9]

It is interesting to note that by class 5 (mean current age, 12.7±1.0), more than half of school girls had already attained menarche; by Junior High 2, almost all girls (about 90%) had attained menarche. These findings have implications for the design of adolescent and teenage policies and programs in Ghana, particularly those relating to sexual and reproductive health behaviour change at home and at school.

The Multivariate ANOVA model showed that controlling for the girl's age, and current stage in school, household wealth and current nutritional status accounted for the largest proportion of the explained variance, as has been reported in earlier studies.[14,15] The observed relationship between menarcheal age and nutrition has been described in other studies.[16-19] The cross-sectional study design used in the current study, however, does not allow us to separate out the effects of current as opposed to earlier nutritional exposures occurring in the prenatal and early childhood stages. In the study reported by Al-Sahab and colleagues, greater duration of exclusive breastfeeding was independently associated with lower age at menarche.[18] The role of birth weights in predicting menarcheal age is uncertain. Our data shows, in univariate analysis, that increasing birth weight was inversely associated with age at menarche. However, in the subsequent multivariate ANOVA model, birth weight was excluded as a predictor because about 36% of the girls did not provide birth weight data and also because it did not contribute much to the explained variance as reported elsewhere.[20] Our findings are also consistent with others which have reported that age at menarche is lower among girls from high socio-economic status households[11,18,21-23] Improvement in socio-economic status is possibly contributing to increased access to health care and dietary quality.[24,25]

In addition to nutritional status and household wealth, our data supports a relationship between mothers' age at menarche and that of their offspring similar to findings reported by Cho and colleagues.[14] This relationship suggests a genetic effect[26] although others have reported that this genetic effect could be modified by overweight status.[27] Some authors have reported that a stressful family environment accelerates onset of menarche.[28,29] Our data cannot confirm this association probably due to challenges of measuring historic events by asking young girls to record events during their early childhood. We also did not observe a relationship between

Table 3: Univariate predictors of age at menarche (One-way ANOVA)

Explanatory variable	n	Mean $\pm$ SD			p-value
Body Mass Index Status					
Underweight (<18.5 kg/m^2)	133	13.43^a	$\pm$	1.10	<0.01‡
Normal (18.5-24.9 kg/m^2)	199	12.72^b	$\pm$	0.74	
Overweight ($\geq$ 25 kg/m^2)	57	11.21^c	$\pm$	1.15	
Parity order of respondents					
First	114	12.34^a	$\pm$	1.21	<0.01‡
Second	134	12.75^b	$\pm$	1.05	
Third	100	13.14^c	$\pm$	1.13	
Fourth or higher	41	12.87^{a,b,c}	$\pm$	1.04	
Place of Birth					
Rural	112	12.80	$\pm$	1.21	ns
Urban	267	12.71	$\pm$	1.13	
Number of respondent's siblings					
1	60	12.20^a	$\pm$	1.24	<0.01‡
2	116	12.57^a	$\pm$	1.15	
3	136	12.99^b	$\pm$	1.05	
4 or more	77	12.98^{a,b,c}	$\pm$	1.09	
Birth weight					
Low (<2.5kg)	63	11.77^a	$\pm$	1.12	<0.01‡
Normal (2.5-4.0kg)	138	13.11^b	$\pm$	1.01	
High (>4.0kg)	44	13.16^{b,c}	$\pm$	0.93	
Father's completed education					
None	120	12.72	$\pm$	1.03	ns
Primary	21	12.83	$\pm$	1.03	
Junior Higher/Middle School	183	12.67	$\pm$	1.13	
Senior Secondary or higher	165	12.81	$\pm$	1.22	
Mother's age at first menstruation, y					
10-11	7	11.63	$\pm$	1.22	ns
12-13	93	12.96	$\pm$	1.18	
14+	202	12.74	$\pm$	1.19	
Wealth quintile					
Lowest	44	13.35^a	$\pm$	0.86	<0.01‡
Low	82	13.44^a	$\pm$	0.97	
Middle	121	13.13^a	$\pm$	0.80	
High	88	12.90^b	$\pm$	0.84	
Highest	54	11.29^c	$\pm$	0.86	
Current stage of education					
Primary 5	68	12.31^a	$\pm$	1.08	<0.01‡
Primary 6	60	12.29^a	$\pm$	1.17	
Junior High 1	132	12.89^b	$\pm$	1.14	
Junior High 2	129	13.03^b	$\pm$	1.11	
Ethnicity					
Ewe	106	12.92^a	$\pm$	1.13	0.01†
Akan	153	12.51^b	$\pm$	1.20	
Ga/Dangme	72	12.84^{a,b}	$\pm$	1.05	
Northerner	58	12.90^{a,b}	$\pm$	1.11	
Religion					
Christian	330	12.76	$\pm$	1.16	ns
Islam	59	12.65	$\pm$	1.10	

p-values: † show main group differences; ‡ shows significant trend relationship exists; Means: superscripts with different alphabets indicate significant differences

Table 4: Independent predictors of age at menarche (Multi-ANOVA)

Independent Explanatory variable	F statistic	p-value	Partial eta squared	Adjusted R2
Current stage of education	6.73	<0.01	0.07	0.64
Wealth quintile	23.97	<0.01	0.25	
Body Mass Index status	30.15	<0.01	0.17	
Mother's age at first menstruation	3.20	0.04	0.02	
Father's completed education	2.13	0.09	0.02	

household size and menarche onset as reported by.[30]

The current study is limited by the challenges associated with estimating age at menarche by recall.[1] In addition, about a third of the respondents did not provide birth weight data and thus this variable was not included in the final multi-ANOVA model.

Implications and contribution

Among this small sample of urban dwelling girls in Accra, our data adds to the already known phenomenon whereby declining trend in age at menarche onset is observed as populations experience improved access to social services including access to health and nutrition interventions. With the current findings, we are able to speculate that the declining age at menarche may partly explain the current high rates of teenage pregnancy among Ghanaian girls. However, further studies may be needed to determine the relative independent contribution of early menarche to the teenage pregnancy burden in Ghana. We anticipate that the findings will also serve as tools for advocacy and review of existing adolescent reproductive health interventions. Considering that some girls in the upper primary classes had attained menarche, there is justifiable basis for exploring the socio-cultural acceptance of implementing reproductive and sexual health interventions that start early outreach to children in primary schools.

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