Environmental and Socio-demographic Determinants of the Age at Menarche among Secondary School Girls in the Niger-Delta Region of Nigeria

Onohwakpor EA[1], Omo-Aghoja LO[1] & Omotoso JO[1]

Abstract

Background: Menarche is one of the most significant events in the transition to reproductive capability. It is believed to be influenced by genetic, physiological, environmental and social factors.

Methods: It was a cross-sectional survey over a two month period of two cohorts of 400 secondary school girls from two different communities of Rivers State Nigeria to determine the age at menarche and identify any peculiar environmental or socio-economic variables that may influence this.

Results: The mean menarcheal age (years) for the respondents from school 'A' was 13.99 + 1.060 SD and that for school 'B' was 14.53 + 1.148 SD. The earliest age of menarche was 9 years for school 'A' and 11 years for school 'B'. The latest age of menarche of 17 years was same for both schools 'A' and 'B'. Only one respondent who is an athlete from school 'A' was involved in strenuous physical exercise, she was 14 years old and had not attained menarche. The differences in the post-menarcheal mean heights and weights of the respondents from schools A and B at their current ages were statistically significant and when compared against a standard female normogram for height and weight, there were more small framed respondents from school 'B' compared to the individuals from school 'A'.

Conclusion: Respondents from the more affluent background had significantly lower age of menarche than girls from the less affluent setting. Better socio-economic status, nutrition, greater height and weight are positively associated with a lower age of menarche.

Keywords: *Environmental, socio-demographic, determinants, menarche, secondary school girls, Niger-Delta region of Nigeria*

Department of Obstetrics and Gynecology, Delta State University, Abraka, Nigeria

Correspondence: *Dr. Lawrence O. Omo-Aghoja, Associate Professor of Obstetrics & Gynecology, Faculty of Clinical Medicine, College of Health Sciences, Delta State University, Abraka, Nigeria. Tel: +234 8039377043, Email: eguono_2000@yahoo.com*

Introduction

Menstruation is an important feature in the reproductive life of a woman. Menarche, the first menstruation, is one of the most significant events in the transition to reproductive capability that occurs at puberty. Over the past few decades, it has been observed in various parts of the world that there has been a secular trend associated with the decline in the age of onset of menarche[1-4]. This trend has been very well documented in the developed countries particularly the United States and some Western countries1. General improvement in nutrition and health has been suggested to explain the downward trend. The same pattern of earlier age

of attainment of menarche is being seen in developing countries like Bangladesh[5] and Nigeria[6]. However, over the past few decades, this trend seems to have reached a plateau or even reversed in most parts of Europe and other developed countries[3]. It is hypothesized that this might be due to either the effect of a ceasing improvement of environmental factors/infrastructural facilities or the impact of reaching the genetically determined limits of normal menarcheal age for those populations[3,7,8].

Few studies on puberty and menarche from developing countries including Nigeria are available[1,3,9-16]. Earlier study from Rivers State Nigeria indicated that urban school girls had a lower mean age of menarche than rural school girls, and socioeconomic status and sports were reported as important correlates of age of attainment of menarche in that study[1]. Similar trend have been reported by other researchers[1,9-16].

Menarche is believed to be influenced by genetic, physiological, environmental and social factors[3,6,16]. Rivers State is a typical African settlement. Because of her geographical terrain two sets of environments are discernable. The riverine and the upland, and these have effect on the occupation and possibly nutritional status of the communities with its attendant effect on the age of attainment of menarche. It is against this background that this study was conceptualized and conducted in two girls' secondary schools located in two different communities within the state viz; a typical riverine area and a typical upland area with the overall goal of determining the age at menarche and identify any peculiar environmental or socio-economic variables that may influence this.

Methodology

This was a cross-sectional survey over a two month period of two cohorts of secondary school girls from two different communities of Rivers State – one in a typical riverine community and the other from a typical upland community to assess the influence of environment and socio-economic factors on the age of menarche in Nigerian girls. The first cohort of 200 girls from the riverine area was recruited from Government Girls Secondary School at Bonny (Headquarters of Bonny Local Government Area – [LGA]) and was referred to as school 'A' in this study. The other cohort of 200 girls from the upland area was recruited from the community Secondary School Isiokpo (Headquarters of Ikwerre LGA) and was referred to as school 'B'. The girls recruited were within 10-20 years age bracket and this was confirmed from their school registers. To ensure that the confounding effect of different set of environmental conditions was eliminated, only those born within the respective LGA, lived there and had their primary education within were recruited in the respective schools. The respondents from school 'A' were from the community where their parents were predominantly fishermen, while the respondents from school 'B' were from the community where their parents were mainly peasant farmers.

The survey was undertaken using a data collection sheet designed for the purpose of this study. It was in two parts, the first part was the segment of a pre-tested and validated questionnaire which was administered on the respondents by the researchers after careful explanation to the respective interviewed students. This was done in the presence of their female class teachers who acted as chaperone to eliminate fear and undue embarrassment. The specific information elicited were the date of birth and age of the respondents, place of birth, place of primary education, the age of onset of menarche, sporting activities if any, chronic ill-health, parents occupation and determination of their social class. The social class in this study was determined using the employment status and cadre of their parents.

The girls were accordingly classified into three different social groups: Low social group if the parents were unskilled workers (farmers, fisherman amongst others), medium social group if parents were civil servants/small scale business personnel and high social group if the parents were professionals/large scale entrepreneurs. The second part contained the anthropometric measurements – height (in centimeters) and weight (in kilograms) of the respondents. The height and weight were taken using a standard commercial height/weight scale, the Detecto height and weight scale manufactured by Detecto Scales Inc., Brooklyn, U.S.A. Their weights were measured with their shoes off and they had their uniform made from light cotton material on.

The authorities of the schools and the girls concerned were informed and educated on the study to be carried out. Also, informed consent was obtained from all the girls and the school authorities before the study was carried out.

The completed data collection sheets were collated, coded and entered into the computer using statistical packages for social scientist (SPSS PC+). The data was analyzed using same statistical packages for social scientist (SPSS PC+). This consisted of univariate analysis and comparisons of identified relationships. Test of the statistical significance was based on 95% confidence interval using students' t test or Chi –square test with the Yates or Fischer exact correction where applicable.

Results

Of the 400 hundred girls recruited into the study, 309 (77.3%) were menstruating and the remaining 22.7% were premenarcheal. There were 140 (70.0%) postmenarcheal girls in school 'A' and 169 (84.5%) postmenarcheal girls in school 'B'. The mean menarcheal age (years) for the respondents from school 'A' was 13.99 + 1.060 SD and that for school 'B' was 14.53 + 1.148 SD. The difference was statistically significant (p-value <0.05). The earliest age for attainment of menarche was 9 years for school 'A' and 11 years for school 'B', the difference was statistically significant. The latest age for attainment of menarche of 17 years was same for both schools 'A' and 'B'. The median family size was 11 and 10 for respondents from schools 'A' and 'B' respectively with a range of 3-26 for school 'A' and 4-24 for school 'B'. Only one respondent from school 'A' was involved in strenuous physical exercise being an athlete, she was 14 years old and had not attained menarche. None of the respondents from school 'B' was involved in strenuous physical exercise. The respondents interviewed did not volunteer any history of chronic illness and no observed physical habitus suggestive of chronic medical disorder in any of them. However malaria and helminhtic infestation are reported to be quite common in the two communities. We indirectly assessed the nutritional status of the respondents by measuring their post-menarcheal mean heights and weights at their current ages and compared against a standard female normogram for height and weight (not shown). Almost all the respondents from school 'B' were small framed individuals while about 42.9% of the respondents from school 'A' were small framed individuals and the remaining were between small and medium framed individuals which falls within the

Table 1: *Socioeconomic Group Frequency Distribution versus Mean Menarcheal Age*

Socioeconomic Group	Frequency (%)		MMA (yrs)		SD	
	A	B	A	B	A	B
High	17 (12.1)	21 (12.4)	13.5	14.2	1.009	1.380
Medium	76 (54.3)	88 (52.0)	14.1	14.5	1.146	1.030
Low	47 (33.6)	60 (35.6)	14.4	14.9	0.865	1.032

F ratio = 10.28, P-value < 0.05

Table 2: *Frequency distribution of the menstrual age versus the socioeconomic group*

MENSTRUAL AGE TO THE NEAREST WHOLE NUMBER	FREQUENCY A	B	HIGH A	B	MEDIUM A	B	LOW A	B
9 years	1	-	-	-	1	-	-	-
10 years	-	-	-	-	-	-	-	-
11 years	1	2	1	1	-	-	-	1
12 years	9	8	4	4	5	2	-	2
13 years	25	20	5	2	15	13	5	5
14 years	48	41	5	6	23	27	20	10
15 years	39	81	1	8	19	40	19	31
16 years	16	16	1	-	12	6	3	10
17 years	1	1	-	-	1	-	-	1

Table 3: *Anthropometric parameters of respondents from both schools*

Age (years)	Mean weight (kg)		Mean height (cm)	
	A	B	A	B
20	54.5	50.8	171. 0	162.0
19	55.5	51.1	162.2	161.5
18	56.5	52.1	165.2	160.1
17	54.1	50.8	161.1	153.6
16	53.5	50.5	160.6	153.6
15	52.6	49.9	160.0	158.1
≤14	48.6	44.0	155.6	157.0

p-value for weight <0.05, p-value for height <0.05

normogram for growth. The girls from school 'A' were therefore more physically developed age for age more than the girls from school 'B'.

The socioeconomic group distributions versus the mean menarcheal age of the respondents are as presented in table 1. A greater proportion – 54.3% and 52.0% of the parents of respondents from schools 'A' and 'B' respectively were of medium social group. This was closely followed by the low social group with 33.6% of school 'A' respondents belonging here and 35.6% of respondents from school 'B' belonging here. Compared to respondents that belonged to the high social class (12.1% and 12.4% from schools 'A' and 'B'' respectively), the differences were statistically significant (p-value <0.05). The frequency distribution of the menstrual age versus the socioeconomic group is presented in table 2. The modal menarcheal age for school 'A' was 14 years and that for school 'B' was 15 years.

The weight and height for age of the respondents are presented in table 3. The height and weight for age in the respondents from school 'A' was higher than that for respondents from school 'B'.

Discussion

All over the world available evidence indicates that the literature is replete with data on the age at which menarche is attained[1-21]. Several Nigerian authors have similarly documented on this important subject from the different regions of the country[3,6,17-19]. Numerous factors such as socioeconomic status, nutrition, geography, genetics and chronic disease states amongst others are known to influence the age and physical size of girls at menarche and there appears to be a secular trend related to improvements in nutrition and healthcare[15].

The mean menarcheal age (MMA) of girls from Rivers State in south-south Nigeria compares favorably with that gotten from an earlier study in rivers state6 and also from school girls in non-urban areas of Plateau State[14]. However the MMA reported from Europe and other developed nations of the world are much lower than the figure from this study[3,16]. The income per capita is much higher in Europe and other developed settings compared to developing nations including Nigeria. The effect of socioeconomic effect is further underscored by the fact that this study demonstrated that a higher and or improved socioeconomic status was a factor responsible for an earlier age of menarche, such that girls in each of the schools from a lower socioeconomic group seemed to have menstruated at a slightly higher age. Similar findings have earlier been reported[6,15].

The difference in the MMA of the girls from both schools was statistically significant. We hypothesize that this is due to the fact that girls from school A were of more affluent background as compared to girls from school B. Additionally, there was ready availability of various sea foods in the riverine community of Bonny where school A was situated as compared to Isiokpo community where school B was located, and these scarcely available commodities in Isiokpo community are usually costly and beyond the reach of majority. The inhabitants of Isiokpo community were largely peasant farmers and their meals most probably consisted more of carbohydrate as staple diets. Nutrition has been demonstrated to affect the reproductive efficiency just as it affects the age of commencement of menstruation[20.] A higher incidence of difficult deliveries due to feto-pelvic disproportion in women from upland areas compared to women from typical riverine areas of the state was previously observed and the possibility of dietary differences in the two groups of communities was advanced as being responsible (personal communication). A review of the British historical data from the nineteenth century on nutrition showed similar trend[20]. This is further buttressed by the fact that when we indirectly assessed the nutritional status of the respondents by measuring their post-menarcheal mean heights and weights at their current ages the differences were statistically significant and when compared against a standard female normogram for height and weight, there were more small framed respondents from school 'B' compared to the individuals from school 'A'. Better nutrition certainly must be a factor as to why the girls from school 'A' were more physically developed age for age more than the girls from school 'B'.

The possibility of physical exercise being a determinant of the age of attainment of menarche may be weakly deduced from this study as the only respondent who was an athlete from school 'A' and involved in strenuous physical exercise was 14 years old and had not menstruated. This corroborates an earlier report that active sports increase the age of menarche[6,21]. This may be due to the release of androgenic hormones (aldosterone) in sporting girls which is likely to delay menarche.

In conclusion, the mean menarcheal age (years) for the respondents from school 'A' was 13.99 + 1.060 SD and that for school 'B' was 14.53 + 1.148 SD respectively. Girls from the riverine

areas therefore had significantly lower age of menarche than girls from upland areas. Better socio-economic status, nutrition, greater height and weight are positively associated with a lower age of menarche.

References

1. Prakash C, Srivastava B, Gaur S, Bala R, Rai A, Roham. Age of menarche in girls Uttarakhand. J Indian Acad Forensic Med, 32 (1): 49-51.
2. Kapoor AK, Kapoor S. The effects of high altitude on age of menarche and menopause. Int. J. Biometeor., 1986; 30: 21.
3. Adetokunbo OT, Oluwarotimi IA, Lukeman AJS, Osinusi BO. Appraisal of menstrual awareness and pattern among female secondary school students in Lagos. Scientific Research and Essay, 2009, Vol. 4 (11), 1271-1274.
4. Padez C, Rocha MA. Age at menarche in Coimbra (Portugal) School Girls: a note on secular changes. Ann. Hum. Biol. 2003; 30(5): 622-632.
5. Chowdhury S, Shahabuddin K, Seal AJ, Talukder KK, Hassan Q, Begum RA, et al. Nutritional status and age at menarche in a rural area of Bangladesh. Ann Hum Biol 2000; 27: 249-256.
6. Ikaraoha CI, Mbadiwe IC, Igwe CU, Allagua DO, Mezie O, Iwo GTO, et al. Menarcheal age of secondary school girls in Urban and Rural areas of Rivers State, Nigeria. Online J Health Allied Scs. 2005; 2:4.
7. Padez C. Secular trend in Portugal. J. Hum. Ecol. 22 (1): 15-22.
8. Hauspie RC, Vercauteren M, Susanne C. 1996. Secular changes in growth. Horm Res 45 (Suppl 2):8–17.
9. Akingba JB. Some aspects of menstruation in Nigerian females. J. Nig. Med. Assoc.1968, 5: 27-32.
10. Oduntan SO, Ayeni O, Kale OO. The age of menarche in Nigerian girls. Annals Human Biol.1978. 3, 269-274.
11. Sogbamu MO, Aregbesola YA. Menarcheal age in Nigerian girls: Its relationship to their height, weight and menstrual profile. Int. J. Gynaecol. Obstet. 1979. 16: 339-340.
12. Fakeye O.The interrelationships between age, physical measurements and body composition at menarche in schoolgirls at Ilorin. Int J Gynaecol Obstet. 1985; 23(1):55-58.
13. Marinho AO. Menarcheal age, height, weight, dysmenorrhoea and menstrual regularity in Nigerian School Girls. Trop J of Obstet. Gynaecol. 1984. 4:1-8.
14. Wright EA. Menarche in Plateau State of Nigeria. West African J of Med. 1984. 9 (3): 204-207.
15. Ikechebelu JI. The age of menarche in Nigerian school girls, its relationship to socio-economic status with comments on the secular trends. Orient J Med 1991; 1: 182-185.
16. Goon DT, Toriola AL, Uever J, Wuam S, Toriola. Growth status and menarcheal age among adolescents school girls in Wannune, Benue state, Nigeria. BMC pediatrics 2010, 10:66. http//www.biomedcentral.com/1471-2431/10/60.
17. Abioye-Kuteyi EA, Ojofetimi EO, Anina OL, Kio F, Aluko Y, Mosuro O. The influence of socio-economic and nutritional status on menarche in Nigeria school girls. Nutri Health. 1997, 11: 186-195.
18. Dare FO, Oguniyi SO, Makinde OO. Biosocial factors affecting menarche in mixed Nigerian population. Cent Afri J Med. 1992; 77-81.
19. Toriola AL, Mathur BN. Menstrual dysfunction in Nigerian athletes. Br J Obstet Gynaecol 1986; 979-985.

20. Stager JM, Hatler LK. Menarche in athletes: The influence of genetic and pre-pubertal training. Med Sci Sports Exerc. 1998; 29:269-273.

21. Frisch RE. Population, food intake and fertility. Science, 1978. 199: 22-30.