MENARCHEAL AGE AND NUTRITIONAL STATUS AMONG SCHOOL GIRLS' IN PORT HARCOURT, SOUTHERN NIGERIA.

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ABSTRACT

Background: Menarche is a significant indicator of maturity and puberty in adolescent girls. There has been a decline in menarcheal age over the years with many factors including nutrition having an influence on it. The aim of this study is to determine the age at menarche and its relationship with anthropometric measurements among Secondary School girls' in Port Harcourt.

Subjects and Methods: A cross sectional study was carried out on 864 secondary school girls' aged 10 – 20 years, using a structured questionnaire to obtain data on their age at menarche. Weights and height were measured using standard methods. The Body Mass Index (BMI) was calculated from their weights and heights in kg/m.^{2} The relationship between age at menarche and anthropometric measurements were ascertained.

Results: Seven hundred and eighty four (90.7%) of the subjects were post menarcheal, while 80 (9.3%) were pre menarcheal. The mean age at menarche was 12.45 ±1.24 years. There was a significant relationship between menarcheal age and nutritional status in these adolescents.

Key words: Menarche, Adolescents, Nutritional status, Nigeria.

INRODUCTION

Menarche has been used as a sensitive indicator of the developmental milestones in adolescent girls.[1-3] The age at menarche varies according to the characteristics of the population[4] and is dependent on genetic and nutritional factors amongst others. The transforming growth factor alpha gene is thought to control the onset of puberty.[5,6] The percentage of body fat is thought to play a critical role in the onset of menarche, with a minimal fatness of 17% of body weight being necessary for the onset of menstrual cycles.[4] Thus, the higher the nutritional status, the higher the percentage of body fat and the earlier the age at menarche.[5,7]

There have been varied reports concerning the relationship between nutritional status and menarche. While, Stark et al[8] reported that in affluent populations, nutrition is relatively unimportant, other studies have indicated that girls who attain menarche are significantly heavier and taller with higher BMIs than those of their pre menarcheal peers.[9-12] In a study comparing age at menarche and anthropometric characteristics between girls from Nigeria and Niger Republic, it was found that the Nigerian girls' had comparably

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higher anthropometric indices with comparably lower ages at onset of menarche.[13]

There have been different reports on the age at menarche in different populations over time. In Africa, Gumanga and Kwame-Aryee[14] reported a mean menarcheal age of 12.50 ± 1.28 years in Ghanian girls, whilst, Tunua et al[15] reported a menarcheal age of 15.20 ± 2.1 years in urban girls in Sokoto, Northern Nigeria. There have been varied reports from different studies in Port Harcourt, Southern Nigeria with a lowering of the menarcheal age over time.[11,16] While Ikaraoha et al[16] reported a menarcheal age of 13.19 ±1.32 years, Adesina and Peterside[11] in a recent study, reported a menarcheal age of 12.80 ± 1.22 years. Menarcheal age has been reported to decrease over time in different populations due to improved socio-economic and nutritional status.[11,14,15] It is therefore necessary to investigate this trend in adolescents in Port Harcourt, Southern Nigeria.

The present study intends to determine the age at menarche and its relationship with anthropometric measurements among Secondary School girls' in Port Harcourt.

METHODOLOGY

A cross-sectional study was carried out between May and June 2014 of 864 secondary school girls' aged 10 – 20 years selected through a multi-staged stratified sampling technique. The schools were first stratified into public and private schools, and eight secondary schools (4 public, 4 private) were selected by simple random sampling. The study was conducted in Port Harcourt city, Southern Nigeria over a period of eight weeks. It is an urban city, highly industrialized and oil and gas exploration is the mainstay of the economy.

Permission was obtained from the Rivers State Ministry of Education and from the Head teachers of the 8 selected schools and the parents or guardians and assent from the selected students. This study was carried out on school days in the various schools and the subjects were interviewed on age at menarche and other relevant information. Apparently healthy secondary school students aged 10 to 20 years in the selected schools, who gave assent for the study, and whose parents/ guardians gave consent, made up the study population. Students with known chronic illnesses such as sickle cell anaemia, renal diseases, endocrine diseases and asthma were excluded, as these conditions could negatively affect their growth status. Weight was measured using a well-calibrated, portable bathroom scale (Hana scale, model BR-9011) in kilograms. Height was measured using a portable stadiometer well calibrated up to 2 meters. The Body Mass Index (BMI) for each student was calculated using the formula weight/ height^2 (kg/m^2). The nutritional status of the students was calculated using the BMI percentile charts for age and gender as recommended by the World Health Organisation.[17] The students were classified as underweight when the BMI was less than the 5th percentile; normal weight when the BMI was equal to the 5th to less than the 85th percentile; overweight when the BMI was equal to the 85th to less than the 95th percentile, and obese when the BMI was equal to or greater than the 95th percentile. Those whose height for age was < the 3rd percentile were said to be stunted.[17]

DATAANALYSIS

Data entry and analysis was done using SPSS software version 21.0 (IBM Corporation, Atlanta, GA, USA). These results are presented as tables in simple proportions. Bivariate analysis was done with chi-square (χ^2) test to examine the relationship between menarcheal age and anthropometric

indices. In all cases, a probability value (p value) of < 0.05 was regarded as statistically significant.

RESULTS

Eight hundred and sixty four girls were recruited for this study. They were aged 10 – 20 years, with a mean age of 16.13 ± 1.67 years. As shown in Table 1, one hundred and forty four of them were in early adolescence, 581 (67.2%) were in mid-adolescence while 139 (16.1%) were in late adolescence.

Anthropometry of the subjects

The weights of the subjects ranged between 27 kg to 86 kg with a mean weight of 52.96 ± 8.69 kg. Their heights ranged from 1.21 m to 1.79 m with a mean height of 1.59 ± 0.07 m. The BMI of the subjects ranged from 14.60 kg/m^2 to 30.47 kg/m^2 with a mean BMI of 20.88 ± 2.87 kg/m^2. Table 2 shows the anthropometry of the subjects according to their age groups. The mean weights, heights and BMI of the subjects increased with increasing age. The relationship between the anthropometry of the subjects and their age was statistically significant ($p = < 0.001$) as shown in Table 2.

Three hundred and sixty nine (42.7%) of the subjects had normal weights, 350 (40.5%) were underweight, while 123 (14.2%) were overweight and only 22 (2.5%) were obese. Twenty five (2.9%) of the subjects were stunted as shown in Table 3.

MENARCHE IN THE SUBJECTS

Of the 864 subjects, seven hundred and eighty four (90.7%) were post menarcheal, while 80 (9.3%) were pre menarcheal. The youngest age at menarche was 8 years, whilst the oldest age was 17 years, with a mean menarcheal age of 12.45 ± 1.24 years. Table 4 shows that 65.3% of the subjects in early adolescence were post menarcheal, while 100% of those in late adolescence had attained menarche.

Relationship between menarche and Anthropometry

Table 5 shows the relationship between menarche and the anthropometry of the subjects. The post menarcheal subjects were significantly heavier and taller than their pre menarcheal counterparts ($p = <0.001$).

Table 6 shows that all obese subjects (100%) had attained menarche, while the underweight category had the least proportion (88.9%) of post menarcheal subjects. This relationship was however, not statistically significant ($p = 0.087$). Table 7 shows the lowering of menarcheal age with increasing BMI. The mean menarcheal age of 12.73 ± 1.22 years in the underweight subjects, is higher than the overall mean menarcheal age of 12.45 ± 1.24 years of the study population. Table 8 shows that only 8% of the stunted subjects were pre menarcheal compared to 9.3% in the normal weight subjects, however, this difference was not statistically significant ($p = 0.826$).

DISCUSSION

The mean age at menarche in the present study was 12.45 ± 1.24 years. This compares favorably with the 12.53 ± 1.33 years reported two years ago, in a recent study in Zaria, Northern Nigeria.[18] This is lower than the 13.19 ± 1.32 years and 12.80 ± 1.22 years reported by previous researchers in Port Harcourt,[11,16] where the present study was done. Different researchers have reported that there seems to be a decrease in menarcheal age over time, due to improved socio-economic conditions and nutritional factors. Hence this may be the reason for the difference in this study and the previous studies[11,16] done 10 years[16] and 5 years[11] ago in Port Harcourt. The age at menarche in this study, however, contrasts with higher menarcheal ages of 15. 0 ± 2.0 years and 15.26 years reported 10 years

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ago in Ebonyi State[19] and 6 years ago in Sokoto.[15] The differences between these studies[15,18] and the present study may be multifactorial, including socio-cultural, nutritional and economic factors. The age at menarche in this study is however in keeping with the 12.50 ± 1.28 years and 12.06 – 12.16 years from reports in Ghana[14] and United States of America.[20]

The mean weight at menarche in this study of 53.85 ± 8.32 kg is significantly higher than the 48.12 ± 8.5 kg reported by Tunau et al[15] in urban girls in Sokoto, Northern Nigeria. It then goes to explain that the lower menarcheal age in this study compared to the Sokoto study[15] may also be also due to the difference in the nutritional status between the two studies, as a higher body weight has been demonstrated to correlate strongly with an earlier attainment of menarche.[21,]

In this study, the post menarcheal girls were significantly taller and heavier than their pre menarcheal counterparts. Similar findings were reported by other researchers in Nigeria[9,10,21,22] and Ghana.[14] The menarcheal age in this study, lowered significantly, with increasing BMI, as the underweight subjects had a higher menarcheal age than the normal weight and obese girls. Similar findings have been reported by other researchers in Nigeria[10,11,23] and India[24]. Adesina and Peterside[11] found a similar trend in their study conducted in Port Harcourt, same location as the present study. Infact, Danborno and Oyibo[13] studied the anthropometric and menstrual characteristics of girls from Nigeria and Niger Republic and found that the Nigerian girls had significantly higher BMI and significantly lower menarcheal ages when compared with their Niger Republic counterparts. In the present study, the post menarcheal subjects were more stunted than their pre- menarcheal counterparts. This is similar to findings by Simondon et al[25] in Senegal who reported that significantly stunted girls attained menarche earlier than mildly stunted girls. Similar findings have been reported by other researchers in Nigeria[10,23,26] and India.[24] Bosch et al[27] in Bangladesh, India reported that adolescent stunting was the most important determinant of menarcheal age.

CONCLUSION

The mean age at menarche in adolescent girls in secondary schools in Port Harcourt was 12.45 ± 1.24 years. Determinants of menarcheal age in these adolescents were weight, height and BMI.

Table 1: Stage of adolescence by age in the subjects Frequency of Age Groups

Age groups	No.	%
10 – 13	144	16.7
14 – 16	581	67.2
17 – 20	139	16.1
Total	**864**	**100.0**

Table 2: Anthropometry Of The Subjects According To Age Groups By Stages Of Adolescence

Age Groups	Mean weight (kg)	Mean height (m)	Mean BMI (kg/m^2)
10 – 13	47.85 ± 8.26	1.54 ± 0.08	20.05 ± 2.74
14 – 16	53.36 ± 8.65	1.60 ± 0.07	20.82 ± 2.92
17 – 20	56.58 ± 6.75	1.60 ± 0.05	22.05 ± 2.43
Total	**52.96 ± 8.69**	**1.59 ± 0.07**	**20.88 ± 2.87**
F statistics	**41.153**	**40.512**	**19.122**
p-value	**0.000**	**0.000**	**0.000**

Table 3: Height For Age In The Study Subjects

	No	%
Stunted	25	2.9
Normal	839	97.1
Total	**864**	**100.0**

Table 4: Relationship Between Menarche And Age In The Subjects

Age Groups	Menarche		Total (%)
	Yes (%)	No (%)	
10 – 13	94 (65.3)	50 (34.7)	144 (100)
14 – 16	551 (94.8)	30 (5.2)	581 (100.0)
17 – 20	139 (100.0)	0	139 (100.0)
Total	**784 (90.7)**	**80 (9.3)**	**864 (100.0)**

Fisher's Exact = 107.043, p = <0.001

Table 5: Relationship Between Menarche And Anthropometry In The Subjects

	Menarche		T-test	p-value
	Yes	No		
Weight (kg)	53.85 ± 8.32	44.21 ± 7.25	11.165	0.000
Height (m)	1.60 ± 0.07	1.53 ± 0.09	7.595	0.000
BMI (kg/m^2)	21.10 ± 2.84	18.70 ± 2.18	9.086	0.000

Table 6: Relationship between Menarche and BMI in the subjects

Nutritional Status	Menarche		Total (%)
	Yes (%)	No (%)	
Under weight	311 (88.9)	39 (11.1)	**350 (40.5)**
Normal weight	334 (90.5)	35 (9.5)	**369 (42.7)**
Over weight	117 (95.1)	6 (4.9)	**123 (14.2)**
Obese	22 (100.0)	0	**22 (2.5)**
Total	**784 (90.7)**	**80 (9.3)**	**864 (100)**

Fisher's Exact = 6.212, p = 0.087

Table 7: Mean Age At Menarche In The Different Weight Categories

Nutritional Status	No	Mean age at Menarche
Under weight	311	12.73 ± 1.22
Normal weight	334	12.31 ± 1.20
Over weight	117	12.18 ± 1.29
Obese	22	12.09 ± 1.31
Total	**784**	**12.45 ± 1.24**

Fisher's Exact = 9.390, p = <0.001

Table 8: Relationship between Menarche and stunting in the subjects

Height for age	Menarche		χ^2	p-value
	Yes (%)	No (%)		
Stunted	23 (92.0)	2 (8.0)	0.490	0.826
Normal	761 (90.7)	78 (9.3)		
Total	**784 (90.7)**	**80 (9.3)**		

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