



Age at Menarche, Menstrual Characteristics and Associated Factors among Adolescent Girls in Indigenous Population in Niger Delta Region, Nigeria

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Authors' contributions

This work was carried out in collaboration between both authors. Author OMA designed the study, performed the statistical analyses, wrote the protocol and wrote the first draft of the manuscript. Author VTE managed the analysis of the study and literature searches. Both authors read and approved the final manuscript.

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ABSTRACT

Aim: Age at menarche varies among different populations, and is dependent on interaction between genetic and environmental factors. The aim of this study was to determine the age at menarche, menstrual characteristics and associated factors among adolescent girls in indigenous population in Niger Delta region, Nigeria.

Study Design: A cross-sectional study on 903 adolescent school girls from 6 secondary schools in Rivers state selected by multi-staged random sampling technique.

Place and Duration of Study: Indigenous ethnic populations in urban and rural (coastal rural and upland rural) areas in Rivers state were surveyed between April and June 2019.

Methodology: Data collected with questionnaire: menarcheal age, menstrual and demographic characteristics of participants.

Results: Age at menarche was 12.10 ± 1.37 years, while urban area had 11.62 ± 0.13 , coastal rural

(11.69±0.04) and upland rural (13.24±0.10) years; with early menarche (10%) and delayed menarche (5%). Geographical area, ethnicity and fathers' occupation significantly ($P=0.001$) influenced menarcheal age; with Ethnic groups: Ekpeye (12.96±1.36) > Ogoni (12.89±0.71) > Ikwerre (12.43±1.72) > Kalabari (11.69±0.99); Fathers' occupation: Professionals/public servants (11.82±1.14) and fishing (11.75±0.94) < artisans/traders (12.02±1.36) and farming (12.69±1.45). Menstrual cycle length (days), was 28.04±1.57 (21-35), with majority (91.50%) having 26-30 days; and significantly different among geographical area ($P=0.003$), and ethnicity ($P=0.001$). Menstrual bleeding duration (days) was 4.55±1.03 (2-7), with majority (72.1%) having 4-5 days; and is statistically different according to geographical areas ($P=0.001$), ethnicity ($P=0.001$), and fathers' occupation ($P=0.14$). Dysmenorrhoea was experienced by majority (56.6%) of subjects, and associated with increase in menarcheal age ($P=0.01$) and menstrual cycle length ($P=0.001$). **Conclusion:** This study shows a low age at menarche, with earlier onset in urban and coastal rural areas than in upland rural areas. Ethnicity and geographical area, strongly influenced the menarcheal age and menstrual characteristics of subjects.

Keywords: Menarche; menstrual characteristics; adolescent girls; Niger Delta region; Nigeria.

1. INTRODUCTION

Adolescence in girls has been recognized as a special period which signifies the transition from girlhood to womanhood. This transitional period is marked with the onset of menstruation (menarche), which is an important milestone in the reproductive life of a woman. Adolescence period is very crucial since it involves the formative years in the life of an individual when major physical, endocrinological and physiological development took place in terms of attainment of menarche [1]. Menstruation is a normal physiological process that begins during adolescence, and is characterized by periodic and cyclic shedding of progestational endometrium accompanied by loss of blood. Evaluation of menstrual cycle is a vital component in assessment of the overall health status of female, as it highlights the reproductive hormonal status of the female, and can predict future Risks [2].

The age at menarche varies from 9 to 18 years among different populations. In the United States it is 12 years and 8 months while in India is 12 years [3,4]. The age at onset of menarche is dependent on the interaction between genetic and environmental factors, and is a sensitive indicator of various characteristics of the population such as nutritional status, geographical location, environmental conditions and socio-economic status [4-6]. Estimating age at menarche is also important for patient education and may guide the clinical evaluation to identify deviations from normal [7].

Reports on age at onset of menarche and factors influencing them among indigenous populations

in Nigeria, especially the Niger Delta Region, is scarce. Also, no study in Nigeria has considered the indigenous coastal rural populations in determination of menarcheal age and menstrual characteristics, as previous studies have relied mainly on data from upland areas as representative of rural populations. This study therefore was aimed at evaluating the age at onset of menarche, and menstrual characteristics among adolescent girls in indigenous population in Niger Delta Region, Nigeria, and to find the influencing factors and their associations.

2. MATERIALS AND METHODS

2.1 Study Design and Participants

This descriptive cross-sectional study was conducted between April to June 2019 to investigate age at menarche, menstrual characteristics and associated factors among adolescent girls in indigenous population in Niger Delta, Nigeria. A multi-stage random sampling technique was used in selection of 6 secondary schools from the states in the region and 23 local government areas in Rivers state was done. The schools were distributed in urban and rural (coastal rural and upland rural) areas respectively, in order to reflect the ethno-cultural, geographical and socio-demographic heterogeneity of the state and region. The sample size was derived from the formula: $n = (z^2 p(1-p)) / d^2$, where n = the number of samples, $z = 1.96$ for 95% confidence interval, $p = 0.5$, and 5% margin of error ($d = 0.05$) were considered. From the above formula, the minimum sample size required for this study was 385.

2.2 Inclusion and Exclusion Criteria

Participants in this study were apparently healthy adolescent (10-19 years of age according to WHO) [8] girls from indigenous populations in Rivers state, who have attained menarche at least 6 months before interview date, domiciled in area of residence at least two consecutive years before menarche, non contracepting, and voluntarily gave informed consent and agreed to join this study. Adolescent girls from populations not indigenous in Niger Delta region were excluded.

2.3 Data Collection

A self-administered anonymous questionnaire, was used for collection of information from the subjects. After any male student present were made to leave the classrooms, the purpose of the study was explained to the female students, and informed verbal consent voluntarily agreeing to participate was obtained from each willing participants. The questionnaires were then administered to the female subjects under supervision of female research assistants.

The questionnaire included information about the respondent's age, ethnic group, occupation of father, age when menarche (first menstruation) occurred, town of residence during menarche, and years of residency in the town preceding menarche. The age at menarche was determined using the recall (retrospective) method, by questioning the subjects if they have started menstruating, and if yes, how old (years) were they when they first experienced menstrual flow. Questions related to menstrual characteristics include: Cycle length (period between the first day of menstrual bleeding and the day immediately prior to the next menstrual bleeding); duration of menstrual bleeding (number of days during which menstrual blood is discharged); amount of menstrual flow (based on subjective assessment according to the number of pads each subject uses per day) [9]; and pain during menstruation (dysmenorrhoea).

A total of 1200 questionnaires were distributed, 1107 were returned correctly filled and, out of these, 903 respondents fulfilled the inclusion criteria and were then used for further analyses. Based on normal physiological cycle length of 21-35 days, we categorised the subjects' menstrual cycle into short (21-25 days), medium (26-30 days) and long (31-35 days) cycles

respectively, while the menstrual flow was categorised into mild (≤ 3 pads/day) and severe (> 3 pads/day) flow as previously described [9]. Also, age at menarche was classified into: early menarche, as occurring < 11 years of age [10,11], and, late or delayed menarche, as occurring > 14 years of age [12]. A geographical description of town of domicile was made by categorising them into coastal rural, upland rural, and urban areas.

2.4 Statistical Analyses

Data were analysed using statistical package for social sciences (SPSS) version 25. Descriptive statistics were calculated for the categorical variables, as well as the means and standard deviations of the dependent variables, while differences in the means were determined using analysis of variance (ANOVA) or t-test, as may be appropriate. Chi square test was done to determine association between age at menarche and socio-demographic factors. Differences in mean, or associations between variables were considered significant at $P < .05$. The results were presented as frequencies, percentages, and mean \pm standard deviation.

3. RESULTS AND DISCUSSION

The results show that the mean age of the subjects studied was 14.39 ± 1.52 years, with a range of (12 - 19) years; while the gynaecological age was 3.29 ± 1.43 (1- 8) years. For the total population (903) studied, the mean age at menarche was 12.10 ± 1.37 years (Table 2). Majority 517 (57.3%) of subjects had menarche between 11 to 12 years, 251 (27.8%) attained between 13-14 years, 90 (10%) had early menarche (< 11 years), while 45 (5%) had delayed menarche (> 14 years) (Table 1). The menarcheal age was significantly different for subjects according to their geographical area of domicile ($P = .001$), ethnicity ($P = .001$), and fathers' occupation ($P = .001$) as shown in Table 2.

Girls resident in upland rural areas had a significantly ($P < .001$) higher age at menarche (13.24 ± 0.10), compared to those in coastal rural areas (11.69 ± 0.04) and urban areas (11.62 ± 0.13) respectively. However, there was no significant difference ($P > .05$) in menarcheal age between girls in the rural coastal areas and urban areas. A Chi-square analysis of association between age at menarche and geographical area of domicile (Table 3), shows that majority of subjects from coastal rural areas

387 (68.1%) and Urban areas 48 (53.9%) had menarche between 11-12 years of age; while majority 117 (47.8%) of those from upland rural areas had menarche between 13-14 years of age. Early onset of menarche (<11 years) was more prevalent among girls in urban areas 18(20.2%) and coastal rural areas 69 (12.1%) compared to upland rural areas 3(1.2%); while delayed onset of menarche (>14 years) was more in upland rural areas 43 (17.6%) compared to coastal rural areas 1 (0.2%) and urban areas 1 (1.1%) respectively. A significant association was observed between age at menarche and the geographical area of domicile ($\chi^2=222.32$, $P=.001$).

Ethnic differences ($P=.001$) exist in the mean age at menarche (years), in the order: Ekpeye has the highest (12.96 ± 1.36) > Ogoni (12.89 ± 0.71) > Ikwerre (12.43 ± 1.72) > Kalabari (11.69 ± 0.99) with the lowest age at menarche (Table 2). Majority of the girls from Ekpeye 56 (53.8) had menarche between 13-14 years, while only 3(2.9%) had early menarche (<11 years). On the other hand, menarcheal age for majority of those from Ikwerre 39 (42.4%), Ogoni 61 (43.0%) and Kalabari 385 (68.1%) were 11-12 years. Only 1 (0.2%) of respondent from Kalabari had menarche at age >14 years (Table 3). A chi-square analysis (Table 3) shows a significant association between age at menarche and ethnicity among adolescent girls in Rivers state ($\chi^2=158.81$, $P=.001$).

Occupation of the girls' fathers was also considered, and observed to significantly ($P=.001$) affect age at menarche (Table 2). Girls whose fathers' occupation were categorised as professionals/public servants, or as fishing, have lower mean age at menarche, with fishing (11.75 ± 0.94 years), being the lowest, with almost all of the girls 49 (80.3%) attaining menarche between 11-12 years age. On the other hand, adolescent girls of those categorised into artisans/traders, or farming have higher age at menarche. Farming has the highest menarcheal age (12.69 ± 1.45 years), with majority of the girls 17(43.6%) and 16(41.0%) attaining menarche at ages 11-12 years and 13-14 years respectively. A chi-square analysis shows a significant association between age at menarche and fathers' occupation, among indigenous adolescent girls in the population studied ($\chi^2=39.548$, $P=.001$)(Table 3).

The distribution of subjects according to their menstrual characteristics is presented in Tables

1 and 2. The menstrual cycle length was 28.04 ± 1.57 (21 - 35) days, and was observed to be statistically different for subjects according to geographical areas of domicile ($P=.003$), ethnicity ($P=.001$), and fathers' occupation ($P=.06$), (Table 2). Of the total sampled population, majority 826 (91.50%) had a cycle length of 26-30 days, while only 38 (4.20%) and 39 (4.30%) had shorter (21-25 days) and longer (30-35 days) cycle lengths respectively (Table 1). Girls domiciled in coastal rural areas have the shortest cycle length (27.97 ± 0.06) while those in urban areas have the longest cycle length (28.58 ± 0.14) as shown in table 2. Among the ethnic groups (Table 2), Ekpeye and Ikwerre girls have longer menstrual cycles (28.71 ± 1.43 and 28.63 ± 1.59 days) respectively, compared to Kalabari (27.97 ± 1.48) and Ogoni (27.45 ± 1.69) who have shorter cycles.

The Duration of menstrual bleeding was 4.55 ± 1.03 (2-7) days, Majority 651(72.1%) of the adolescents bleed for 4-5 days, 155 (17.2%) had short duration (2-3 days), while 97(10.7%) bleed for longer duration of 6-7 days (Tables 1). Statistical differences were observed in the mean duration of menstrual bleeding according to geographical areas of domicile ($P=.001$), ethnicity ($P=.001$), and fathers' occupation ($P=.14$) (Table 2). The intensity of menstrual flow among majority 766 (84.8%) of respondents was light, while only 137(15.2%) had moderate flow. Also, dysmenorrhoea (painful menstruation) was reported by majority 453 (56.6%) of respondents, compared to 347(43.4%) with no dysmenorrhoea (Table 1). Among girls experiencing dysmenorrhoea, an increase in menarcheal age ($P=.01$), cycle length ($P=.001$), and menstrual bleeding duration ($P=.72$) was observed, compared to those with no dysmenorrhoea (Table 2).

The mean age at menarche of 12.10 ± 1.37 years found in this study is similar to the findings obtained in Lagos, Nigeria 12.0 years [13]; Benin city, Nigeria 12.3 ± 1.18 years [14]; Davangere, India 12.14 ± 1.09 years [15]; and Egypt 12.10 ± 1.6 years [16]; suggesting similar socio-economic and nutritional status of subjects in these populations; but however comparatively higher than 11.40 years obtained in Bangkok, 11.94 years in Korea, 11.70 years in Brazil, and 11.60 years (Bangladesh) [17,18].

Higher menarcheal ages have been reported in some Nigerian populations: 13.07 years in Benue, 13.08 years in Ile-Ife, 13.66 years in

Ibadan and Ogbomoso, and 13.1.0 years in Abakaliki [10-22]. This indicates that in these populations, the prevailing influence of factors such as socio-economic, dietary, lifestyle and geographical locations are likely different from that obtained in the Niger Delta region of Nigeria.

This study reported one of the lowest age at menarche among similar studies in the Niger Delta region. Its also among the lowest for the various studies in Nigeria. Several factors such as variations in the populations with its associated differences in socio-economic,

Table 1. Distribution pattern and menstrual characteristics of indigenous adolescent girls in the population studied

Menstrual Variables	Subgroup	Number (n)	Percentage (%)
Age at menarche (years)	<11	90	10.0
	11-12	517	57.3
	13-14	251	27.8
	>14	45	5.0
Cycle length (days)	21-25	38	4.2
	26-30	826	91.5
	31-35	39	4.3
Duration of bleeding (days)	2-3	155	17.2
	4-5	651	72.1
	6-7	97	10.7
Intensity of flow	Light(≤3 pads/day)	766	84.8
	Heavy (>3 pads/day)	137	15.1
Dysmenorrhoea	Yes	453	56.6
	No	347	43.4

Table 2. Influence of Socio-demographic and Physiological factors on menstrual characteristics of indigenous adolescent girls in the population studied

Variables	Sub group	Menstrual characteristics		
		Menarcheal Age (years)	Cycle Length (days)	Duration of Bleeding (days)
Total Population		12.10 ± 1.37	28.04±1.57	4.55 ± 1.03
Geographic Area of Domicile	Urban	11.62 ± 0.13	28.58± 0.14	4.54 ± 0.11
	Coastal Rural	11.69 ± 0.04	^a 27.97±0.06	4.73 ± 0.04
	Upland Rural	^{a,b} 13.24± 0.10	28.01± 0.11	^{a,b} 4.13 ± 0.07
	Rural (coastal +upland)	^a 12.15 ± 1.38	^a 27.98±1.58	^b 4.55 ± 1.03
	ANOVA	<i>P</i> = .001	<i>P</i> = .003	<i>P</i> = .001
Ethnicity	Ekpeye	12.96 ± 1.36	28.71± 1.43	4.34 ± 1.06
	Ikwerre	12.43 ± 1.72	28.63± 1.59	4.40 ± 1.06
	Kalabari	11.69 ± 0.99	27.97 ±1.48	4.73 ± 0.98
	Ogoni	12.89 ± 0.71	27.45± 1.69	4.07 ± 0.98
	ANOVA	<i>P</i> = .001	<i>P</i> = .001	<i>P</i> = .001
Father's Occupation	Professionals / public services	11.82±1.14	28.09±1.68	4.59±1.01
	Artisans/Traders	12.02±1.36	28.22±1.31	4.64±0.98
	Farming	12.69±1.45	28.77±1.40	4.31±1.17
	Fishing	11.75±0.94	28.08±1.67	4.77±1.07
	ANOVA	<i>P</i> = .001	<i>P</i> = .06	<i>P</i> = .14
Dysmenorrhoea	Yes	12.03±1.31	28.36±1.35	4.62±1.03
	No	11.80±1.16	27.94±1.69	4.60±1.01
	Z-test	<i>P</i> =.01	<i>P</i> =.001	<i>P</i> =.72

a= significantly different compared with urban area. *b*= significantly different compared with coastal rural area.

nutritional, lifestyle, geographic and genetic factors, could be responsible [23,24]. For instance, this is the first study in Nigeria and the Niger Delta region that has considered coastal rural populations of indigenous dwellers in the assessment of age at menarche.

The prevalence of early menarche observed to be 10.0%, was similar to earlier reports of 10.3% and from Zanjan, Iran and Kuwait respectively [10,11]; but however lower than that reported for Black (12.3%) and Hispanic (13.6%) American girls [25]. The difference may be due to the age limit used to define early menarche which is neither definitive nor universal. While in this study we defined early menarche as occurring <11 years of age [10,11]; some reports used <12 years of age while others used 5th percentile [26] or one standard deviation below the estimated mean age at menarche [27].

The high menarcheal age for girls in upland rural areas (13.24 ± 0.10 years) observed in this study

is consistent with reports from similar studies on other upland rural, farming populations in the region, with menarcheal ages of 13.0 ± 0.07 and 14.22 ± 1.47 years respectively for Engenni and Etche [28,29]. This is possibly due to a more physically active life style [30] among these subjects, such as walking long distances to schools and farms, or supporting parents in manual farming activities. On the other hand, the low menarcheal age for school girls from the coastal rural areas (11.69 ± 0.04 years), and urban areas (11.62 ± 0.13) could be due to their relatively more inactive life style because they walk shorter distances or, are conveyed by boats or by buses to and from school. It also suggest improved socio-economic and nutritional status. These differences in lifestyle and physical activities prior to or around menarcheal period can be implicated in the variations in age at menarche observed in different geographical areas of domicile .

Table 3. Association between socio-demographic factors and age at menarche among indigenous adolescent girls in the studied population

Variable	Subgroup n (%)	Age at menarche (years)				Total n (%)	Chi square(χ^2) (df) P-value
		<11	11-12	13-14	>14		
Geographic area of domicile	Rural coastal	69 (12.1)	387 (68.1)	112 (19.7)	1 (0.2)	569 (100)	$\chi^2 = 222.32$ (6) $P = 0.001$
	Rural upland	3(1.2)	82 (33.5)	117 (47.8)	43 (17.6)	245 (100)	
	Urban	18 (20.2)	48 (53.9)	22 (24.7)	1 (1.1)	89 (100)	
	Total N (%)	90 (10)	517 (57.3)	251 (27.8)	45 (5.0)	903 (100)	
Ethnicity	Ekpeye	3 (2.9)	32 (30.8)	56 (53.8)	13 (12.5)	105 (100)	$\chi^2 =$ 158.813 (9) $P = 0.001$
	Ikwerre	12 (13.0)	39 (42.4)	28 (30.4)	13 (14.1)	92 (100)	
	Kalabari	67 (11.9)	385 (68.1)	112 (19.8)	1 (0.2)	565 (100)	
	Ogoni	8 (5.6)	61 (43.0)	55 (38.7)	18 (12.7)	142 (100)	
	Total N (%)	90 (10)	517 (57.3)	251 (27.8)	45 (5.0)	903 (100)	
Father's Occupation	Professionals / public service	42 (12.0)	220 (62.9)	83 (23.7)	5 (1.4)	350 (100)	$\chi^2 = 39.548$ (9) $P = 0.001$
	Artisans / Traders	40 (12.5)	173 (54.1)	91 (28.4)	16 (5.0)	320 (100)	
	Farming	1 (2.6)	17 (43.6)	16 (41.0)	5 (12.8)	39 (100)	
	Fishing	2 (3.3)	49 (80.3)	9 (14.8)	1 (1.6)	61 (100)	
	Total N (%)	85 (11.0)	459(59.6)	199 (25.8)	27 (3.5)	770 (100)	

This study also identified ethnic-racial differences in the age at menarche, where Kalabari girls experience menarche earlier (11.69 years) than girls from Ikwerre (12.43 years), Ogoni (12.89 years), and Ekpeye (12.96 years) which has the highest menarcheal age. This is similar to reports where black girls experienced menarche earlier (12.3 years) than did white girls (12.6 years) [31]. These differences may be due to genetic factors, or geographical location of the ethnic groups which influences the occupation of the girls' fathers and therefore the nutrition of the girls. For instance, Ekpeye, Ogoni and Ikwerre ethnic groups are in upland areas with predominant farming activities, while Kalabari is in coastal area with predominant fishing activities.

Also, the lower age at menarche observed among girls whose fathers' occupation were categorised as professionals/public servants, and fishing, compared to those of Artisans/Traders and farming emphasises the impact of father's occupation on the nutritional intake and menarcheal age of their adolescent girls. This lower menarcheal age is similar to that observed among girls domiciled in urban and coastal rural areas. The occupation of a father affects his socio-economic status, area of residence, lifestyle and quality of nutritional intake of his family, which have been reported to affect age at menarche [29,32]. While professionals/public servants are believed to have better capacity to purchase the readily available animal and fish proteins in urban areas than Artisans/Traders could do, girls in coastal rural areas are exposed to readily available, accessible and affordable fish protein, than girls in upland rural areas, who rather supplement with plant protein. This supports earlier reports that high animal versus vegetable protein ratio during childhood years are associated with early menarche [33], and that better nourished girls attain menarche earlier than poorly nourished and undernourished girls [8].

In general, the variations in menarcheal age observed in this study could be attributed to genetic, nutritional, ethnic and geographical differences among the populations studied. Reports attribute about 10-15% of these variations to genetic factors [34], while nutritional status is considered as one of the most important non genetic factors [8,35]. Further more, the observed menstrual cycle length of 28.04 ± 1.57 days, inter-menstrual interval of 21-35 days, and bleeding duration of 4.55 ± 1.03 days, were similar to that reported for majority of girls in central

India, while the dysmenorrhoea reported in 56.6% of the girls, was similar to 56.15% reported in central India [36], and was significantly associated with higher age at menarche and cycle length, as reported in earlier studies [37,38].

4. CONCLUSION

The results from this study shows that the age at menarche among adolescent girls in indigenous populations in Niger Delta was 12.10 ± 1.37 years, with menstrual cycle length of 28.04 ± 1.57 days, and menstrual bleeding duration of 4.55 ± 1.03 days. Girls domiciled in urban and coastal rural areas, and / or whose parents are professionals, public servants, or in fishing occupations have lower age at menarche, compared to those in upland rural area, and/or whose parents are Artisans, Traders and farmers. Ethnicity was also a strong influencer of menarcheal age, menstrual cycle and duration of bleeding. Subjects with high age at menarche and long cycle length are more likely to experience dysmenorrhoea during menstruation. These results indicate an improved socio-demographic and nutritional status of adolescent girls in indigenous populations in the Niger Delta region. They also emphasise the influence of ethnic and geographical factors on age at menarche and menstrual characteristics.

This study is the first to assess the menarcheal age among girls in indigenous homogeneous populations, as well as the coastal rural areas in the Niger Delta. However, its limitations include the few ethnic groups surveyed, as well as lack of data on the sociocultural and dietary lifestyle of the populations studied, and therefore are recommended in further studies.

CONSENT

As per international standard or university standard, Participants' written consent has been collected and preserved by the author(s).

ETHICAL CONSIDERATION

Ethical approval was given by the institutional Research and Ethics Committee of the University of Port Harcourt, Port Harcourt. All researchers are committed to the principles of the Helsinki Convention and patients' information was protected.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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