



## MEAN AGE OF MENARCHE AND THE PROBABILITY OF ATTAINING MENARCHE FOR NIGERIAN GIRLS

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### Abstract

Different menarcheal ages have been reported in Nigeria. This work estimated the mean of age at menarche (MAM) in Nigeria from analysis of a systematic review of published articles that reported different MAMs. The MAM and median ages of menarche were estimated to be 13.54 and 13.44, with a standard deviation of 0.83.

The mean age of menarche obtained was imputed in the probability

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density function (PDF) of the Poisson distribution which yielded probability of attaining menarche at 8 to 18 years. The result will present information for management and counselling of girls during menarcheal stages of their lives.

### **Introduction**

Onset of puberty signals the advent of sexual maturation in humans propelled by hormonal changes. Menstruation is the hallmark of sexual maturation as it implies fertility. The first menstrual flow is called *menarche* and can occur at different ages. Menarche comes after other pubertal changes such as secondary breast development (thelarche) and the emergence of pubic hairs (adrenarche) [1].

A significant gap exists in the low income countries regarding information on the measurement of the timing of menarche [2]. While other countries have reported the gradual decline in menarcheal age (mean age at menarche), scarce information is available for developing countries [3]. A dearth of information on the mean age at menarche (MAM) is a public health concern as guardians, parents and medical experts do not have the required information for counselling and manage the psychological and physiological challenges experienced by girls in this stage of their lives. Effective management of menarcheal stage helps to alienate feelings of shame, reproach and anxiety and hence, helps to prevent absenteeism in schools, internalizing behaviours [4], bullying [5] and regression of academic performance. Post menarche menstrual cycle varies considerably based on age, weight, nutrition and hereditary diseases [6]. Treatment and management of menstrual problems such as irregular menstrual cycles, menorrhagia and dysmenorrhea depend largely on proper sex education and counselling [7]. The anatomical transition from childhood to adulthood of which menarche is an undeniable integral part is not being managed properly in developing countries because of poverty, illiteracy, ignorance, superstitious beliefs, cultural and religious variables, lack of access to quality health care, political and social instabilities, insecurity, poor

educational and health facilities, deplorable social infrastructures needed to sustain the health sector and dearth of medical personnel as a result of brain drain. In some areas, menarche is anxiously anticipated for early sexual debut [8] or child marriage proceedings [9] to be initiated. The early sexual debut is sometimes due to rape or sexual exploitation, although some cases of pre menarche rapes are prevalent [10].

This work produced a working MAM based from analysis of systematic analysis of all the reported menarcheal ages in published papers about menarche in Nigeria. Another contribution of the paper is to obtain the probability of MAM at different ages, which is yet to be reported. The present work creates order and proposes a MAM of Nigerian girls based from data extracted from peer reviewed papers.

A steady decline of menarcheal ages has been reported [11, 12]. Socioeconomic, sociodemographic [13, 14], geographical [15, 16] psychosocial and nutritional factors have been cited as responsible. The relationship between menarche and body weight often measured as body mass index (BMI) have been reported most frequently [17, 18] and it is concluded that being obese or overweight triggers the early onset of menarche [19]. A decline of MAM means that mothers have different menarcheal ages than their daughters [20]. Recently, it has been observed that year at menopause, which is the opposite of menarche is increasing while menarcheal age is declining [21]. Sadly, the onset of early menarche is a predictor of breast cancer and several cardiovascular diseases [22].

## Methods

The following steps were followed to arrive at the results.

(1) A search was queried in the Scopus database using the keywords “Menarche AND Nigeria”.

(2) The search yielded 100 search results, the first paper was published in 1976 and the most current was published in 2020. It should be noted that

the search was done between 20<sup>th</sup> and 27<sup>th</sup> April, 2020. The data can be assessed in [2, 10, 23-68].

(3) MAMs were retrieved from 53 of the articles.

(4) Descriptive statistics were performed and the result is presented in Table 1.

(5) The mean age of menarche obtained from Table 1 was imputed in the probability density function (PDF) of the Poisson distribution.

(6) The probability of attaining menarche at 8 to 18 years were computed using the Poisson distribution probability distribution function and presented in Table 2.

## Results

The Scopus database was chosen because of its wide coverage. The data collection is systematic in nature and MAM was retrieved from 53 out of the 100 articles. The remaining 47 were excluded because of the theme and inability to retrieve their respective MAMs. Descriptive statistics as presented in Table 1 showed that the MAM in Nigeria is 13.54 years or 13 years and 6 months while the median age at menarche is 13.44 or 13 years and 5 months. A standard deviation of 0.833 or 10 months is an indication that there is a high likelihood that any randomly selected Nigeria girl has menarche between 12 years 8 months and 14 years 4 months. The positive skewness shows that the mean is greater than the median and the observations appear to cluster around the mean. The small value of the variance means that no significant extreme MAM were reported by the various articles. The minimum and maximum reported MAM were 12 years and 16.2 years, respectively.

The PDF of Poisson distribution is employed to calculate the probability of Nigerian girls attaining menarche from ages 8 to 18. The various probabilities are presented in Table 2. Poisson distribution was used because the age is discrete and the menarche can occur uniformly within the space or time continuum. Moreover, the events are independent. The result is likely to

deviate from the observed value because the mean and variance are quite different. However, the use of Poisson is justified because the age is continuous (probability of extreme ages are very close to zero) and this is not a case of Poisson regression where the condition of the mean equals to variance is needed.

**Table 1.** Summary of the descriptive statistics

Statistic	Value
Mean	13.5365283
Standard error	0.114465022
Median	13.44
Mode	13.7
Standard deviation	0.833317942
Sample variance	0.694418792
Kurtosis	2.368890475
Skewness	1.193897258
Range	4.2
Minimum	12
Maximum	16.2
Sum	717.436
Count	53

**Table 2.** Probability and percentages of attaining menarche in Nigeria

Year	Probability	Percentage
8	0.036957135	3.695713498
9	0.0555857	5.55857004
10	0.075243741	7.524374065
11	0.092594457	9.25944568
12	0.104450624	10.44506237
13	0.108761448	10.8761448
14	0.105160887	10.51608871
15	0.094900888	9.490088826
16	0.080289285	8.028928497
17	0.063931658	6.393165754
18	0.048078483	4.807848287

It can be seen from Table 2 that girls in Nigeria experienced menarche within 12 and 14 years and the probabilities attenuates as the ages decreased from 12 years or increased from 14 years.

### **Discussion and Conclusion**

It has been established from this study that most Nigerian girls experienced menarche between the ages of 12 and 14. The prevalence of early or late menarche is low and the majority of menarche can occur within 10 months from the estimated mean age at menarche. This will present valuable information to healthcare practitioners in monitoring and counseling girls about this important stage of their lives. Efforts should be intensified to guide the girls against the risk associated with early sexual initiation for those that bleed earlier have more odds in having their first vaginal sexual intercourse [69]. The likelihoods of teenage pregnancy and sexually transmitted infections should be made known to them. Hygienic measures must be adhered [70] and psychological assistance is the key to dealing with emotional and psychosocial changes associated with the first menstrual experience [71]. Anxiety over delay in menarche or behavioural disorders associated with menstrual pains, shaming or sexual debut should be addressed adequately by counselling or medication to guide against negative outcomes [72]. Once thelarche and adrenarche have been observed, then, awareness and counselling on the next stage (menarche) should begin in earliest to prepare the girl child on the journey to sexual maturation since breast development and emergence of pubic hairs precede menarche [73].

Although many countries have reported low average menarcheal ages, the findings from the present study corroborate the findings of [74, 75] that high fertility, poor nutritional status and high mortality in low income countries may be responsible for delayed menarche and puberty in those countries. High levels of poverty endemic in Nigeria, which consequently affect the nutritional status lead to stunting and malnutrition. Poor nutritional status greatly increases menarcheal age [76]. Environmental pollution and exposure to toxic elements alters menarcheal age and consequently, the

reproductive systems [77]. Hence, strict environmental laws are needed to protect the girl child and the general public from the harmful effects of exposure to environmental pollution and industrial waste especially in the Niger Delta region of Nigeria.

This research presents vital information in counselling adolescents and implementing policies that will help in delaying sexual debut since the menarcheal age is declining in Nigeria. A timely intervention will help in reducing incidences of teenage pregnancies, sexual transmitted diseases and complications from unsafe abortions since abortions are still illegal in Nigeria. The intervention will improve the quality of life of the girl child in a country where the health sector is on its knees due to years of underfunding, systemic corruption and industrial actions [78-80].

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