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### RESEARCH ARTICLE

#### CORRELATES OF MENARCHE IN OMANI ADOLESCENT GIRLS.

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#### Abstract

**Background:** Age of menarche marks important points of physical and cultural maturation in adolescents. It has been known that early age at menarche is correlated with diabetes mellitus, breast cancer, elevated adult BMI, metabolic syndrome. Many of these diseases are lifestyle diseases and are severely debilitating to the quality of life. Such easily preventable diseases need a thorough research in order to understand the relation between early menarche and its correlates in adolescent girls.

**Objectives:** To study the mean age of menarche and its correlates among adolescent Omani girls.

**Methods:** A cross- sectional study was done in the grade 9 and 10 girls of Omani high schools of Sohar. A pre validated structured questionnaire was used for data collection on correlates of menarche and body mass index was measured. Data was analyzed using SPSS.

**Results:** The mean age of menarche of study population of was 12.63 years  $\pm$  1.057 SD. Age of menarche was found to be inversely associated with BMI ( $p < 0.01$ ). Girls who had painful menses had a slightly lower mean age of menarche compared to those who did not have painful menses ( $p < 0.01$ ). However, it did not have any correlation with regularity of menses and heavy bleeding during menses. Undernourished girls were more likely to have irregular menses ( $p < 0.05$ ).

**Conclusion:** The study supports the worldwide secular trend of decreasing mean age of menarche. The age of menarche of study population was found to have an inverse relation with their BMI. Dysmenorrhea was associated with lower mean age of menarche.

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#### Introduction:-

Adolescence represents a real opportunity to make a difference in life-long patterns [1]. Age of menarche marks important points of physical and cultural maturation. These ages can be predictive of health and disease status. It has been known that early age at menarche is correlated with diabetes mellitus, breast cancer, elevated adult BMI, metabolic syndrome [2]. Delays in menarche age may have detrimental effects on other health outcomes, such as bone fracture and mineral density [3]. Delays in menarche age have been seen to be associated with lower

socio economic status [4] and lower protein intake. Most developing and underdeveloped countries show a significant difference of mean menarche age between rural areas and more urbanized areas [5, 6, 7]. Therefore this study was done with the objective of assessing the mean age of menarche among adolescent Omani girls and to assess the correlates of menarche in adolescent girls.

### **Literature Review:-**

Age of menarche of girls from rural areas was found to be higher than the girls from urban areas [8]. It has been documented that the mean age of menarche decreased in many countries and there is a trend toward early pubertal development. Several studies go as far as to compute this rate of decline. Since the nineteenth century, the average age of first menarche has declined at the rate of approximately 4 months a decade. Similarly, in Europe, between 1830 and 1960, average age at menarche declined by two to three months each decade, falling from 17 to 13 years during this period. However, by 1970, it had leveled off and has not changed much since. Several other studies have reported such leveling off; in Turkish girls, the difference observed in age and pattern of menarche appears in urban areas [5]. Similar findings of a discontinuation of the decreasing trend of age of menarche have been reported in several other studies as well, mostly of developed countries.

In an Omani study done in 1991 [9], it was found that the mean age of menarche to be 13.3 +/- 0.09 years. This can be compared to a more recent study in 2011 [4] which show the mean age of menarche to be 12.37. The secular trend toward early menarche age has been associated strongly with increasing rates of childhood obesity (indicated by BMI) and socio economic status. This trend in advanced onset of menarche age has been shown to have several serious implications such as Type 2 Diabetes Mellitus [10, 11, 12]. It also contributes as a risk factor of developing the metabolic syndrome [2]. Young age at menarche was significantly associated with elevated adult body mass index (BMI), greater waist circumference, higher fasting glucose levels, and 2 hour glucose (oral glucose tolerance test) [13]. Many of these diseases are lifestyle diseases and are severely debilitating to the quality of life. Such easily preventable diseases should be thoroughly researched more so to understand the relation between early menarche and its correlates in adolescent girls.

More alarmingly, early menarche has been associated with breast cancer [14, 15, 16]. In 1989, a group of girls with early menarche was studied longitudinally for up to 13 years. They found that the serum estradiol concentrations increased rapidly at the beginning of cycle in these "early menarche" women. Their data indicates that women with early menarche are subject to a high degree of estrogen stimulation at least until approximately 30 years of age [17].

Dysmenorrhea is also seen in a few studies to be associated with early menarche [18]. Dysmenorrhea which is seen to affect 94% of the 400 adolescent high school girls under another study in Oman has been shown to be the cause of limited sports activities in 81%, decreased class concentration in 75%, restricted homework in 59%, school absenteeism in 45%, limited social activities in 25%, and decreased academic performance in 8% of the affected students [19]. Many Omani girls suffer from dysmenorrhea leading to school absenteeism affecting their academic performance [20] Also, heavy bleeding might lead to blood loss and consecutively anemia [21].

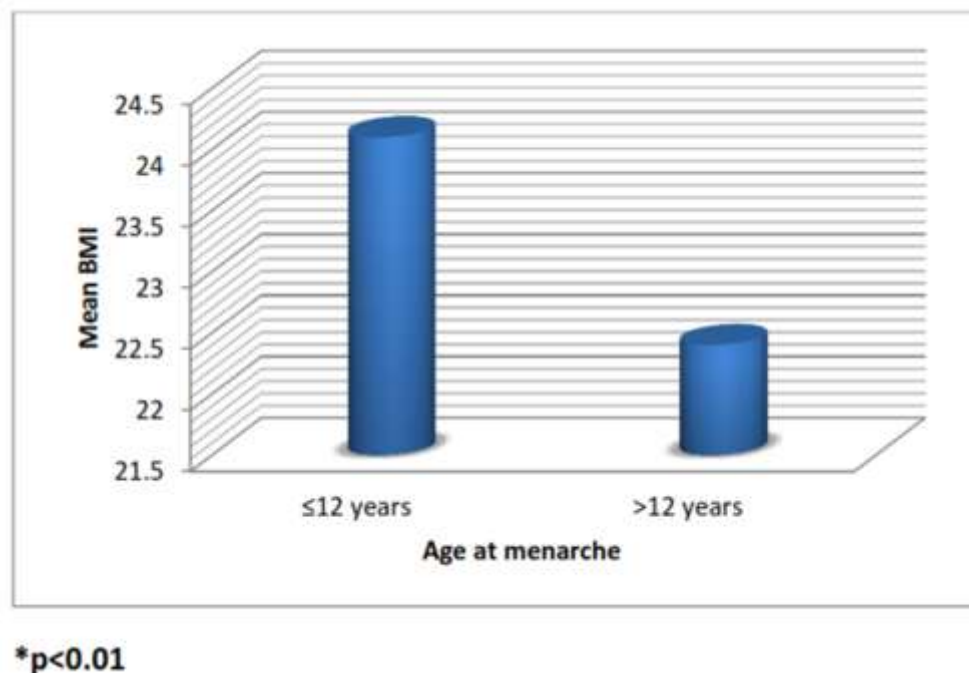
### **Methodology:-**

A cross-sectional study was carried out in Omani high schools for girls in Sohar, Oman. Girls were randomly selected from 8 high schools from grade 9 and 10 after written informed parental consent. A pretested and validated questionnaire was used to collect data individually from the girls during school visits. Girls with gynecological diseases, abdominal or pelvic surgery or married status were excluded from the study. The study was piloted in one school to validate the methodology of the study and data collection tool content and language ambiguity. A total of 359 girls participated in the study. Questionnaire included questions on the correlates of menarche like regularity of menstruation, dysmenorrhea, heavy bleeding. Height and weight was measured using to calculate body mass index (BMI) for all the girls; an important correlate of menarche. Body mass index was calculated as weight in kilogram divided by height in square meter and overweight was defined by considering the cutoff point of  $BMI \geq 24 \text{ kg/m}^2$  [22]. The association between the study variables was done by estimating the difference in proportions, using Pearson's chi-square as test of significance for categorical variables. Unpaired t tests will be used for comparing means for continuous variables. A p-value (two tailed) of less than 0.05 was considered as statistically significant. All data was analyzed with the Statistical Package for the Social Sciences Software.

### Results & Discussion:-

The age of menarche ranged from 10 to 16 years. The mean age of menarche was found to be 12.63 years  $\pm$  1.057 SD (CI: 12.52 to 12.74). Most of the girls (45.4%) attained menarche at an age of 13 years followed by 12 years (24%) and 14 years (13.6%). Only 14.4% girls attained menarche at an age less than 12 years. All of them had attained it by 16 years. These results are comparable with Al-Kindi et al (2011) in Oman, who found the mean age of menarche to be 13 years  $\pm$  1.31. [19] Accumulated with data such as that by Musaiger et al (1991) in Oman where the mean age of menarche was 13.3 years  $\pm$  0.09, one can see a decrease over the years [9]. In a study in Saudi Arabia by Zainab et al (2004), the mean age at menarche was 13.05 $\pm$ 1.32 years (range, 9-18 years). They reported that there has been a significant decline in the age of menarche among Saudi women over the previous 20 years (13.05 years now compared to 13.22 years of age 20 years ago) [23]. However more studies need to be done to assess how the mean age of menarche varies among different regions of Oman according to the urbanization of towns, and subsequent changes in lifestyle. Earlier age of menarche among these girls could be associated with increased childhood BMI, and therefore measures should be taken to curb childhood obesity.

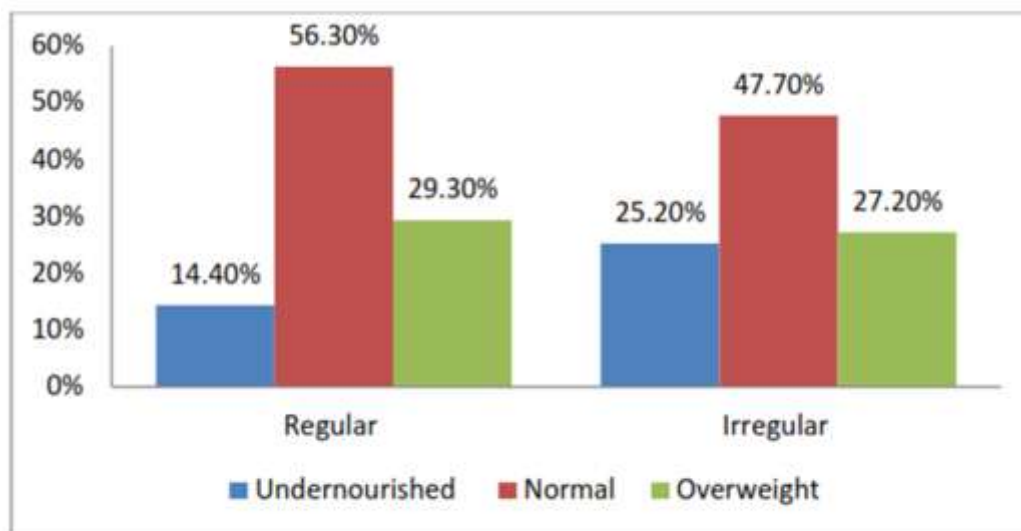
Girls who attained menarche earlier ( $\leq 12$  years) had a greater mean BMI 24.07kg/m<sup>2</sup>  $\pm$  5.31 than those who attained it later (22.37kg/m<sup>2</sup>  $\pm$  5.28) as depicted in Fig 1.



**Fig 1:-**Association between age of menarche and body mass index

More girls who attained menarche earlier ( $\leq 12$ y) were overweight (34.1%) than those who attained it later (24.9%) and this difference was highly statistically significant ( $p < 0.01$ ). This finding correlates with the decreasing trend worldwide in the mean age of menarche with increasing BMI. Such a trend has been demonstrated in other regions of the Gulf as well. Al-Awadhi et al (2013) in Kuwait, who found the mean age of menarche to be 12.41 also, reported decreasing mean age of menarche with increasing childhood BMI that comes with better socio economic status [24].

Most of the girls (81.3%) had regular menstrual cycles, while only 18.7% had irregular cycles. The menstrual cycles were irregular in 42.8% of the study subjects in a study by Zegeye et al (2009) in the secondary school students [25]. Mean age of menarche did not have an association with the regularity of menses. More girls with irregular menses were undernourished (25.2%) compared to those with regular menses (14.4%); this difference was statistically significant; p value was  $< 0.05$  (Fig 2). However Dars S et al (2014) found girls with higher BMI to have infrequent cycles [26].



**\*\*p<0.05**

**Fig 2:-**Distribution of girls with regularity of menses and body mass index

Dysmenorrhea, a common gynecological complaint, was found to be present in 85.5% of girls. Girls who had painful menses had a slightly lower mean age of menarche ( $12.56 \text{ years} \pm 1.06$ ) compared to those who do not have painful menses ( $13.02 \text{ years} \pm 0.96$ ), and this difference was highly statistically significant ( $p < 0.01$ ) (Table 1). This is comparable to Kural et al (2015) who found 84.2% girls suffering from dysmenorrhea. These authors also found a lower mean age of menarche in girls with dysmenorrhea ( $13.8 \pm 1.6$ ) [27].

**Table 1:-**Correlates of Age of Menarche

Variable	Age of menarche (in years) (Mean $\pm$ S.D)		p value
Dysmenorrhea	Yes	$12.56 \pm 1.06$	<0.01
	No	$13.02 \pm 0.96$	
Heavy bleeding	Yes	$12.61 \pm 1.02$	>0.05
	No	$12.67 \pm 1.12$	
Regularity of menses	Yes	$12.60 \pm 1.02$	>0.05
	No	$12.78 \pm 1.20$	

Almost two thirds (63.8%) of the participants reported heavy menstrual bleeding. The mean age of menarche did not have an association with the amount of bleeding. However, Akbarzadeh et al (2017) found two-thirds of students suffering from primary dysmenorrhea but no significant relationship was found with age at menarche [28]. Dysmenorrhea affects the daily and academic life of girl students, and therefore girls need to be taught about safe and effective practices of dealing with dysmenorrhea [29].

### Conclusions:-

The mean age of menarche in the study was found to be  $12.63 \text{ years} \pm 1.057 \text{ SD}$  and this when matched with previous studies in Oman supports the worldwide trend of decreasing mean age of menarche, and its inverse relation with BMI. Adolescent girls had menstrual problems like heavy bleeding, irregular menses and dysmenorrhea. Adolescent girls should be screened in schools for these problems and counselled for their effective physical and mental development and academic performance.

### Ethical considerations:-

Parents of all participant girls gave written consent for participation in the study. The Review of Ethical Research Approval Committee, Ministry of Health North Batinah governorate approved the study protocol.

**Acknowledgement:-**

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