Tikrit Journal of Pharmaceutical Sciences 2023; 17(1):1-9
http://doi.org/10.25130/tjphs.2023.17.1.1.1.9

IRAQI Academic Scientific Journals

Tikrit Journal of Pharmaceutical Sciences

Available online at: https://tjphs.tu.edu.iq

ISSN: 1815-2716(print); ISSN: 2664-231X (online)

T. J. Ph. S.

Menarche age and its association with BMI and socioeconomic status among some school girls in Tikrit City

Alaa Mufaq Musleh[1]

[1] *department of medical physiology / College of medicine / Tikrit University / Iraq*

ARTICLE INFO.

Article history:

-**Received**: 11/05 /2023
-**Accepted**: 08/06 /2023
-**Available online**: 25/ 06/2022

Keywords:

Menarche, Body mass index, Increase rate of the body mass index, Puberty

***Corresponding author:**

Alaa Mufaq Musleh
Email : alalmu31@gmail.com

Contact To Journal
E-mail: tjops@tu.edu.iq

Citation:
Musleh A. M., Menarche age and its association with BMI and socioeconomic status among some school girls in Tikrit City. Tikrit Journal of Pharmaceutical Sciences 2023; 17(1):1-9. http://doi.org/10.25130/tjphs.2023.17.1.1.1.9

Abstract

Body mass index (BMI) is useful for categorizing under- and over-nutrition. It is the weight in kilogram divided by the height in meters and squared. **Socioeconomic status (SES)** is an economic and sociological combined total measure of a person's work experience and of an individual's or family's economic access to resources and social position in relation to others.**Menarche** is defined as the first menstrual period in a female adolescent. The purpose of this study to find out the effect of BMI and socioeconomic state on menarche among school girls in Tikrit. **Methodology :** In this study 100 female, aging 11-13 years old were selected in Al-Marjan secondary school of Tikrit region. Height and weight were measured. The body mass index (BMI; kg/m2) was used as an index of relative weight. The socioeconomic status were assessed according to the educational and occupational levels of parents of the girls. The age at menarche were evaluated . This study was done from December 2021 to March 2022. **Results :** The mean and standard deviation (SD) of menarche age was 12.87 ± 1.17 years. About 60.3% of girls had normal BMI and 31%, 6.8%, and 2% of them were underweight, overweight, and obese, respectively. There was no significant relationship between higher BMI and menarche age. There was no significant relationship between socioeconomic status, physical activity, and birth season, attitude towards menarche, nutritional status, and number of brothers with age of menarche .While there was a significant association of number of sisters and the menarche age. **Conclusions**: The results showed a no significant relationship between menarche age and BMI. The age of menarche in this region was also different compared to other regions of the globe.

عمر الحيض وارتباطه بمؤشر كتلة الجسم والحالة الاجتماعية والاقتصادية لدى بعض طالبات المدارس في مدينة تكريت

الاء موفق مصلح
فرع الفسلجة الطبية / كلية الطب / بجامعة تكريت

الخلاصة:
مؤشر كتلة الجسم (**BMI**) مفيد في تصنيف نقص التغذية والإفراط في التغذية. هو الوزن بالكيلوجرام مقسومًا على الطول بالأمتار ومربعًا. الوضع الاجتماعي والاقتصادي (**SES**) هو مقياس إجمالي اقتصادي واجتماعي مشترك لخبرة عمل الشخص والوصول الاقتصادي للفرد أو العائلة إلى الموارد والمكانة الاجتماعية فيما يتعلق بالآخرين. يُعرَّف الحيض بأنه أول دورة شهرية للمراهقة.

الهدف من هذه الدراسة هو معرفة تأثير مؤشر كتلة الجسم والحالة الاجتماعية والاقتصادية على الطمث لدى طالبات المدارس في تكريت. في هذه الدراسة تم اختيار ١٠٠ طالبة تتراوح أعمارهن بين ١١-١٣ سنة في مدرسة المرجان الثانوية بمدينة تكريت. تم قياس الطول والوزن. تم استخدام مؤشر كتلة الجسم كمؤشر للوزن النسبي. تم تصنيف المراهقات في ثلاثة أوضاع اجتماعية واقتصادية وفقًا للمستويات التعليمية والمهنية لوالديهن. تم تقييم عمر الحيض. أجريت هذه الدراسة من ديسمبر ٢٠٢١ إلى مارس ٢٠٢٢.

النتائج: كان متوسط الانحراف المعياري (**SD**) لعمر الحيض ١٢.٨٧ ± ١.١٧ سنة. حوالي ٦٠.٣٪ من الفتيات كان لديهن مؤشر كتلة جسم طبيعي و ٣١٪ و ٦.٨٪ و ٢٪ منهن كن يعانون من نقص الوزن وزيادة الوزن والسمنة على التوالي. لا توجد علاقة ذات دلالة إحصائية بين الحالة الاجتماعية والاقتصادية ، والنشاط البدني ، وموسم الولادة ، والموقف من الحيض ، والحالة التغذوية ، وعدد الإخوة مع سن الحيض.

الاستنتاجات: أظهرت النتائج عدم وجود علاقة ذات دلالة إحصائية بين عمر الحيض ومؤشر كتلة الجسم. كان عمر الحيض في هذه المنطقة مختلفًا أيضًا مقارنة بمناطق أخرى من العالم.

Introduction

Menarche is defined as the first menstrual period in a female adolescent. Maturation is a process that leads to physical and sexual evolution, and secondary sexual characteristics lead to changes in body composition along with growth and psychological puberty (1). The menarche is an important indicator of the onset of puberty and can be affected by environmental and socioeconomic conditions in each community (2). The age at menarche reflects various aspects of the health among the population, including the growth and nutritional status among different cultures and societies (3, 4). Based on existing evidence, the menarche age has declined in the last century throughout the developed and developing countries, resulting in early sexual activity, which can lead to sexual risky behaviors in girls (5, 6). Several studies have shown the association of menarche age with different variables consisting of psychological factors, genetics, socioeconomic status, physical activity, presence of chronic diseases, diet, maternal and child factors such as weight, height, BMI, low birth weight, lack of breastfeeding, single child, birth order, family size, birth season, preeclampsia, mother smoking, childhood residency (urban or rural), parents occupation and education, and race or ethnicity (7-8). The consequences of early menarche include overweight, nutrition disorders, diabetes, breast and ovarian cancer, cardiovascular diseases, depression, and educational drop (9-10). The role of height, weight, and body structure on the menarche age has been reported in some previous studies; however, there is an uncertainty about their roles (11-12) . According to the previous studies, which have been conducted in different ethnicities and societies, the menarche age has been found to be different (13-14) . Since knowing information about menarche age is essential for health policymakers, especially in the provision of health services and menstrual health education to school girls, and also there is no data or comprehensive study on menarche age and its related factors among school girls in Tikrit, therefore, the purpose of this study to find out the effect of BMI and socioeconomic state on menarche among school girls in Tikrit.

Subjects and methods

A cross-sectional study with a first stage of secondary school was carried out during the period from December 2021 to March 2022 in Tikrit city .

In the first stage, selection of schools was done. Sample of the study was 100 female students from urban area . The girls with a medical problem as chronic disease were excluded from study. Arrangements were done to get approvals from the directorate of education in Al-Marjan secondary for the selected schools to conduct the study. All students included in the study of the secondary school was visited. The height and weight were measured after taking a permission for ethical prove.

The weight of the girls was measured with uniform clothes taking off outer clothes and without shoes. The height of girls was measured by letting the girl to stand barefooted near the height measuring board, with both heals touching the board, her back straight to the board and the examiner checked the knee to be also at straight position touching the board. The head also straight looking forward with the head-part measuring board touching the head from above.

BMI can be calculated using this formula [BMI = weight (kg) /(height m)^2].

Table 1: BMI Categories according to WHO (2000) [23]

BMI Categories	BMI Kg/m^2
Under weight	< 18.5
Normal weight	18.5 - 24.9
Overweight	25.0 - 29.9
Class(1)	30.0 - 34.9
Class (2)	35.0 - 39.9
Class (3)	> 40

Categorization of socioeconomic class was based on the occupation and education of the parents by applying the Hollingshead index [14]

Table 2: Five educational levels and five occupational categories were used to identify socioeconomic classes (Hollingshead scoring) .

Educational level	Score	Occupation	score
No education	0	No occupation	0
Elementary school	1	Workman	1
Junior school	2	Blue collar worker	2
High school	3	White collar worker	3
University	4	Professional	4

A score of 0 was given to the lowest level of education and occupation, and a score of 4 was given to the highest. Three socioeconomic classes were identified, ranging from lowest to the highest, on the basis of the sum of scores . The first and second socioeconomic classes in Hollingshead scoring were defined as low and middle socioeconomic classes, respectively. The third and fourth classes were defined as high socioeconomic class. Mean values of age at menarche, height and weight in groups classified according to socioeconomic status .

Source of knowledge about menarche, premenstrual complaints, and reactions to menarche in each socioeconomic status were compared by means of the T test. Pearson correlation analysis was used to determine the relation between menarcheal age and body mass index. Multiple regression analysis was used to reveal the effects of menarcheal age and socioeconomic status on BMI. Data processed using SPSS package (version 23), independent student test was used for the testing the relation between variables. P value < 0.05was identified as significant.

Results

The mean and standard deviation of menarche age was 12.87 ± 1.17 years. The mean and standard deviation of weight and height were 47.73 ± 10.3 kg and 154.28 ± 10.5 cm, respectively. Among the participants, 60.3% of girls had normal BMI and 31%, 6.8%, and 2% were underweight, overweight, and obese, respectively , Table (3). In the majority of study subjects, (50%), menarche had occurred in warm seasons of year, namely (20.3%) and (30.7%) in spring and summer, respectively (Figure1).

Table 3. The menarche and BMI of the sample according to the age

Age at Menarche	BMI Classification			Total 100
	Normal	underweight	overweight/obese	
Not Menarche	5	10	0	15
	9.1%	50.0%	0.0%	15.0%
11 years	30	0	5	35
	54.5%	0.0%	20.0%	35.0%
12 years	15	10	5	30
	27.3%	50.0%	20.0%	30.0%
13 years	5	0	15	20
	9.1%	0.0%	60.0%	20.0%
Total	55	20	25	100
	100.0%	100.0%	100.0%	100.0%

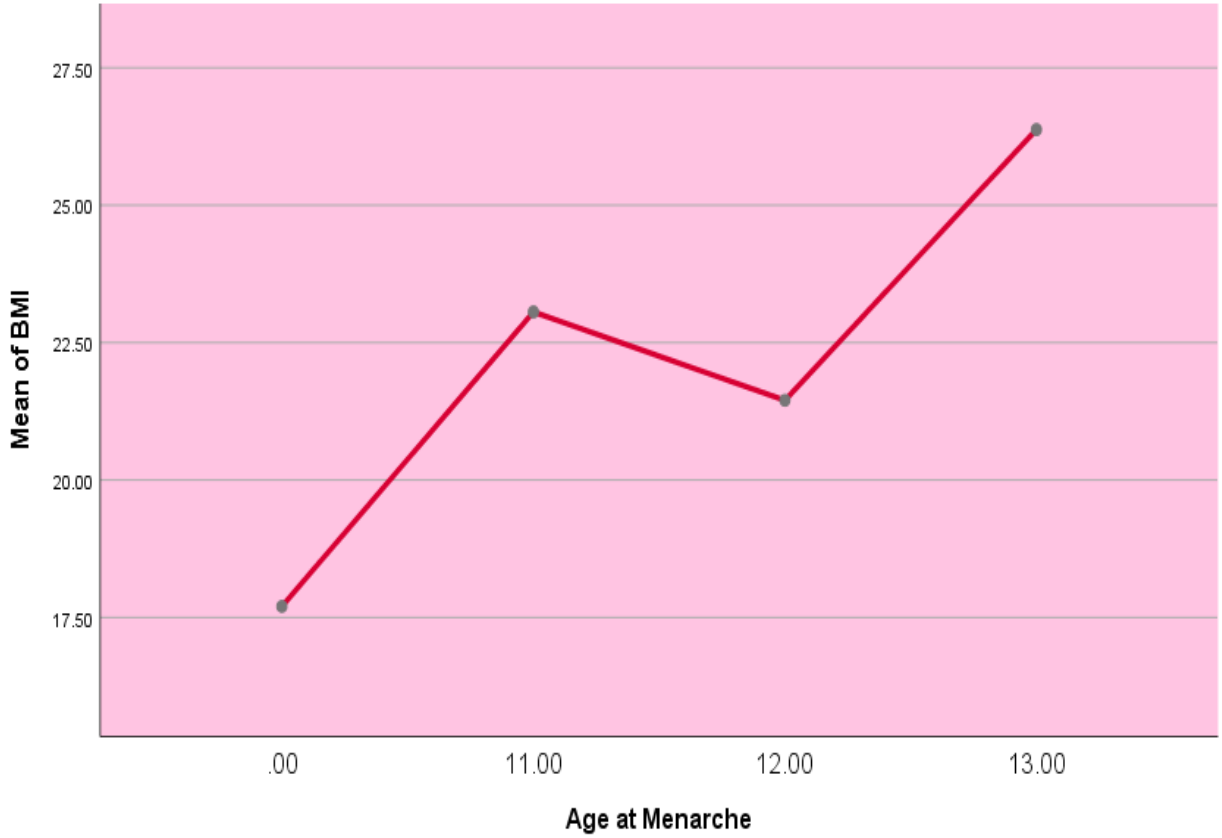

Figure 1. The distribution of the sample according to the age at menarche and mean BMI

Table 4. The distribution of the sample according to the age at menarche and mean BMI value

Age at Menarche (year)	BMI			
	Mean	Std. Deviation	Minimum	Maximum
Not Menarche	17.7	4.71	14.40	23.10
11.00	23.05	4.83	18.40	33.10
12.00	21.45	8.5	15.90	38.40
13.00	26.37	5.6	18.40	30.80
Total	22.44	6.4	14.40	38.40

F= 1.149, P value 0.37 (not significant) (ANOVA test)
There's non-significant weak correlation between the age at menarche and BMI

Table 5. The correlation between the age at menarche and BMI

		Age at menarche
BMI	Pearson Correlation	0.2 (not significant)
	P value	0.519

Table 6. Association between some studied variable and Age menarche .

Variable	Mean(SD)	P Value
✓ Socioeconomic state		0.2
High class.	12.67 (1.07)	
✓ Physical activity		0.43
Active	12.68 (1.22)	
Passive	12.81 (1.16)	
✓ BMI (kg/m^2)		0.2
< 19	12.86 (1.11)	
19 - 25.	12.82 (1.19)	
> 25.	12.23 (1.17)	
✓ Birth season		0.08
Spring	12.85 (1.15)	
Summer.	12.65 (1.17)	
Autumn	12.85 (1.18)	
Winter	13.11 (1.11)	
✓ Attitude toward the menarche		0.4
Positive	12.77 (1.17)	
Negative	12.88 (1.12)	
✓ Number of sisters		0.007
0	12.73 (1.19)	
1	12.79 (1.13)	
2	12.74 (1.07)	
3 and above.	13.31 (1.17)	
✓ Numbers of brothers		0.55
0	12.83 (1.15)	
1	12.79 (1.19)	
2	12.82 (1.13)	
3 and above	12.59 (1.17)	
✓ Nutritional status		0.7
Undesirable	12.86 (1.11)	
Fairly Desirable	12.78 (1.18)	

Discussion

This study is one of the studies for menarche age and its association to BMI and socioeconomic status among school girls in Tikrit and compared it to what was already known from other studies .

A study in Al-karch side of Baghdad governorate showed the age of menarche 11.8±1.8 years (15) .In another study in Kuwait, it was 12.4 years (16). In a study of Saudi Arabia in 2014, the mean age of the menarche was 11.5 ± 1.48 years (17),In comparison with studies conducted in developed countries, this study results are agree with studies in Canada, mean age of menarche was 12.72 ± 1.05 years (18), and in the other study in the UK, the mean age of menarche was12.7 ±1.5 years (19).

In Tehran, the mean age of menarche occurrence was 13.6 ± 1.24 years (20) ,while in Turkey the menarche age was 13.30 years (21), which are higher than the menarche age in the present study.

It seems that the existing differences between the present study and other mentioned studies could be somewhat due to geographical variation, racial diversity, and nutrition as well as weather conditions of different areas.

Another previous study in Baghdad, the mean weight of the menstruating girls is 52.05±10.94 Kg, their mean height is 154.89 ± 5.66

Cm, and their BMI is 21.62±3.99 Kg/m^2 (22)and the relationship between BMI and menarche age was significant that high BMI is associated with early age of menarche and this is not agree with this study. Studies done in some regions of the world, including Kirchengast in Austria (23), Lee in South Korea (24), Goonin Nigeria (25), and Wang in China (26) showed that the relationship between BMI and menarche age is controversial, thus, underweight girls with lower levels of fat have a delayed menarche. On the other hand, excessive obesity has a negative effect on the mechanism of the hormone axis of the hypothalamus-pituitary with increasing body fat and decreasing the secretion of sex hormones, even leptin delays the onset of menarche (27).

It seems that endo-biological process of relationship between the occurrence of menarche and BMI is partly unknown; however, some reasons have been stated in previous studies. One reason may be that the girls who arrive early at menarche have had a high BMI and positive energy balance for a long period of time (28). The other reason can be derived from this fact that fat-derived leptin protein secretion in obese girls is one of the causes of hypothalamus stimulation to increase the secretion of the GnRH hormone that activates the pituitary-ovarian axis and initiates puberty phenomenon (29).

Some studies have pointed to the activity of sex hormones caused by pituitary and hypothalamic hormones at puberty as the cause of weight changes in girls (30).

In this study the number of sisters was an important factor. Girls who had more sisters had delayed menarche. This result is similar to the result of the Matchock study in the United States indicating that an increase in the number of sisters, especially older sisters, has delayed menarche age (31).

Some studies suggest that age at menarche is not declining despite increased the body mass index (BMI) in the US, and also argue that BMI is not related to age at menarche (32) , and this is agree with this study. Similar to that reported by Khabazan *et al* in Tehran (33). The mean ages of menarche among Iranian girls reported in two other studies (1990, 1999) were 13.86 and 13.65 years respectively (34).

Finally, there was no significant association between socioeconomic status, birth seasons attitude towards menarche ,nutritional status and number of brother with age of menarche .

Conclusions

The results showed a no significant relationship between menarche age and BMI. The age of menarche in this region was also different compared to other regions of the globe.There was no significant association between socioeconomic status,birth seasons ,nutritional status and number of brother with age of menarche.While , increase in the number of sisters has delayed menarche age.

Recommendation

1.Further elaborated study is required to estimate the of menarche age of Iraqi girls, because menarche age can vary by location, it may not be possible to generalize these results to other communities in the Iraq.

2. Further studies are necessary to identify the inherent in the Iraq population, which relate to and influence the age of menarche.

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