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Correlation between Nutrition and Early Puberty in Girls Living in Jeddah, Saudi Arabia

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Abstract

Background: The puberty ages in females living in western and middle eastern countries is declining rapidly because of many underlying causes including consumption of animal protein, caloric intake (fat, soft drinks), and fruits and vegetables (fiber).

Aim: To investigate the relationship between early puberty and the intake of various types of protein (chicken, beef and fish), fruits, vegetables, dairy products, caffeine and soft drinks.

Study design: This cross-sectional study was conducted in Jeddah. The sample included 568 young women from different areas; pubertal staging was conducted using the Tanner staging, and relevant data were collected through a questionnaire. Data was analyzed using the Pearson's correlation coefficient; we assumed that the data followed a normal distribution based on the large sample size of 568 girls.

Results: Early breast and pubic hair development was significantly correlated with meat, fast food, French fries, and soft drink consumption. It was also observed that the age at menarche was significantly correlated with chicken consumption.

Conclusion: A significant relationship between early pubertal development and excessive consumption of chicken and beef was observed along with varying relationships between fat, soft drink, caffeine, calcium, and fruit and vegetable intake and pubertal development. Reduced organic chicken and beef intake was highly recommended.

Keywords: Protein; Fat; Fruit; Vegetable; Caffeine; Soft drinks; Calcium; Early puberty

Introduction

Puberty refers to increased rate of growth and development exhibited by remarkable changes in the body shape, size and composition. It was estimated that puberty occurs between the ages of 9 to 13 years in females. It is important to notify that there has been a rapid shift in the menarcheal ages observed around the globe owing to many contributing elements. The most important factors include dietary quality and amount of consumption that might be responsible for genetic and hormonal changes [1-3]. The decrease in the menarcheal ages among females is observed consistently over the past 100 years. This issue has created an alarming situation among the medical researchers and the exploration of probable causes of early menarche is still under process. It is suggested that excess of fat in the body and high consumption of meat are the possible contributing factors to the declining age of puberty [4].

While analyzing the different predictors of early menarcheal age, it was discovered that the body mass index (BMI), socio economic status, unfavorable psychological experiences and last but not the least, nutritional status are the major underlying factors [5,6]. Most of our daily protein intake comes from concentrated animal feeding operations (CAFOs). CAFOs fatten up their animals quickly, using growth hormones and steroids. Sex hormones are also used in food preparation, which affects the level of sex hormones in the body and causes early puberty [1]. Moreover, many studies have confirmed that the frequent consumption of soft drinks also causes a decrease in the menarcheal age because of its relationship with obesity. In fact, a high proportion of teenagers do not consume even one vegetable per day. Instead, they consume fast food, which is high in fat and calories, and low in nutrients. The associated increase in overweight in children and teens can lead to precocious puberty [2,3]. In contrast, a higher fiber intake during childhood is associated with late menarche and other health benefits [4,7]. Early puberty is a causative agent for variety of disease in later life. The major issue of concern associated with early puberty is the increased risk of breast cancer in females. It is suggested that the increased exposure to the ovarian hormones is the underlying cause of the disease in women [7-9]. The factors that have known to be affecting the age at menarche of girls in Saudi Arabia include inadequate diet, socioeconomic status, lack of physical activity and hereditary factors. The environmental determinants are known to play a vital role in the development of early puberty among girls in Saudi Arabia. The intake of unhealthy food and lack of physical activity among girls corresponds to the increase in the body mass index and the development of puberty among girls.

Definition

We categorize the hormonal changes as early on the basis of age. In regard to this the breast development before 8 years and pubic hair development before 9 years, while the start of menarche before 10 years is considered to be early as per definition.

Materials and Methods

This cross-sectional study collected data via a questionnaire. A set of standardized data collection sheets containing a series of

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multiple choice questions was utilized. The study population selected consisted of a random set of young girls with ages varying from 6 to 14 years. The study subjects were randomly selected and were medical students found at local shopping malls in Jeddah, Saudi Arabia. The questionnaires were collected over the course of one month (July 2014). The questionnaires were completed by the participants. The questions pertained to exposure to xenoestrogen products, nutritional adequacy and history of early puberty in the family. For the purpose of this study, the grouping of nutrition products included consumption of various types of animal protein, fiber, dairy products, soft drinks, and caffeine; their effects on early pubertal development and appearance of secondary sex characteristics in young girls were determined.

Participants with insufficient data owing to incomplete questionnaires were excluded. Informed consent was taken verbally and in writing from the study participants along with their parents before the collection of data through questionnaire. Data analysis was conducted using the SPSS software version 16.0 under the license of SPSS Inc., Chicago, IL, USA. The data collected was then analyzed and compared by applying different tests i.e. Student t-tests, Mann-Whitney U tests, and Kruskal-Wallis tests. Chi-square tests and cross tabulations are also applied where necessary for analysis of categorical data. A p-value<0.05 was determined to be statistically significant for individual variables.

Girls that are in the age group greater than 14 years are not included in this study. Further, the study participants were medical students only and all other girls were excluded from this study.

Results

Chicken, beef, fast food, French fry, and soft drink intake were significantly correlated with both early breast and pubic hair development. There was a significant relationship between chicken consumption and the age at menarche only (p=0.022) owing to the low number of girls who had already experienced menarche in our sample (Table 1).

Relationship with the pubic hair development was significant with the early breast development in girls (Table 2).

	p-value	Correlation coefficient (r)	Relationship
Chicken	0.0001	0.272	significant
Beef	0.0001	0.236	significant
Fish	0.137	0.083	not significant
Fast food and French fries	0.001	0.155	significant
Fruits and vegetables	0.198	0.075	not significant
Caffeine-containing beverages	0.075	0.091	not significant
Soft drinks	0.0001	0.180	significant

Table 1: Relationship between breast development and different types of food.

	p-value	Correlation coefficient (r)	Relationship
Chicken	0.0001	0.205	significant
Beef	0.001	0.171	significant
Fish	0.195	0.073	not significant
Fast food and French fries	0.004	0.140	significant
Fruits and vegetables	0.397	0.050	not significant
Caffeine-containing beverages	0.519	0.034	not significant
Soft drinks	0.001	0.172	significant

Table 2: Relationship between pubic hair development and different types of food.

Higher body mass indices (BMIs) were significantly correlated with the age at menarche (r=-0.259, p=0.015), indicating that the age at menarche is lower with higher BMIs.

Discussion

It is postulated from a number of studies that the commencement of menarche is more rapid in girls and is observed at a much earlier age in many countries of the world. The average menarche age in girls in the United States was found to be 14.2 years in 1900. Later in 1920s, it reduced to 13.3 years and it further reduced to 12.3 years in 2002. More or less similar average menarche ages were observed in other western countries also. Likewise, the menarche ages observed in Ireland was 13.5 years in 1986 and was decreased to 12.5 years in 2006. An observational study in Italy showed that the menarche ages in girls have decreased at a rate of 3 months earlier as compared to their mothers [2,3]. In the present study, we found a difference of almost 1.5 years between the menarche ages in young girls and that of their mothers. The mean menarcheal age in girls was found to be 11.5 years compared with 12.9 years for their mothers.

In the last few years, a number of studies have been conducted for determining the factors contributing to early menarche, and the most significant factor is reportedly nutrition [2,3,7,8]. It was deduced from various research studies that the increased consumption of meat intake is a major nutritional factor associated with the early occurrence of menarche. A definite link between the consumption of meat by young women and the early onset of menstruation has been reported. A greater consumption of animal protein between the ages of 3 and 7 years results in a greater likelihood of menarche before the age of 12 years [1,9]. A British study also demonstrated that a high consumption of animal protein in childhood is positively associated with earlier menarcheal age [10-12].

In an Italian study, the possible nutritional factors triggering puberty at a younger age were determined. The study was conducted on school meals containing beef and poultry products to analyze the effects on school children. These food products were found to possess residues of steroid hormones, which were suggested as a potential reason for breast enlargement in pupil at a very young age [13]. In addition, multiple studies were conducted on girls in the American population, first in 1970 and later in 1987. It was evident from the study findings that vegetarian diet has contributed significantly in delaying the process of menarche in girls and a higher vegetable intake between the ages of 3 and 6 years in girls was manifested to delay puberty and the start of menarche. It helps in delaying the process of growth and holds the body hormones from achieving peak high velocity in girls [7].

Recent studies on the modifiable factors of early puberty could be of extreme health to the public health departments. The Obesity epidemic particularly in children and teenagers is found to be a triggering factor for early hormonal alterations in girls. Many observational studies associated early puberty with the dietary habits of children. It is suggested that increased vegetable intake delays the maturation process in girls up to 7 months, whereas, the increased use of meat protein speed up the process causing hormonal maturation 7 months before. It is also observed that high amount of isoflavone intake in girls causes early breast development and other hormonal changes [14]. The study findings are consistent with the fact that there is a significant relationship between the increased consumption of animal protein (chicken and beef) and early development of pubertal signs. In contrast, fruit and vegetable intake was inversely correlated with the age at menarche, indicating that a high fiber intake might delay menarche.

The present study findings revealed that girls in Saudi Arabia are used to have unhealthy diet, which is a cause of early menarche and this factor is also depicted from various other studies as mentioned above. Further, it is elaborated that intake of cola drinks, beef, French fries and other junk foods excessively in the daily diet are the underlying reasons of increasing obesity among girls in Saudi Arabia and resulting early puberty.

Conclusion

The present study demonstrated a significant relationship between the age at puberty and consumption of beef and chicken among young girls participating at local shopping malls in Jeddah, Saudi Arabia, assisted by medical students. It was concluded that unbalanced nutrition has been a major cause of early maturation in the young girls. It is therefore highly recommended to take healthy nutrition with lower quantities of meat. Public health measures are required to improve the issue of malnutrition among females and to increase awareness about healthy dietary habits.

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