Association of Body Mass Index to Onset of Puberty in Male

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Abstract

Background: Puberty is the period where the developmental process takes place, marks the transition from childhood to adulthood with physical and physiological changes. This study was conducted to discover association between body mass index (BMI) and onset of puberty in male.

Methods: A cross-sectional study was conducted from May to November 2013 using simple random sampling which was part of bigger research study by Nutrition and Metabolism Working Group on Jatinangor Cohort, especially Puberty Survey in Jatinangor, by Department of Epidemiology and Biostatistics Faculty of Medicine Universitas Padjadjaran. Respondents were 286 males, 9–15 years old from Elementary School (Sekolah Dasar/SD) and Junior High School (Sekolah Menengah Pertama/SMP). Inclusion criteria were students who are healthy at the time and do did not have obvious disease, attained puberty within 1 year or did not yet attained it, and voluntarily followed the study procedure. The questionnaire was provided after getting informed consent from the respondents. The data analysis was done conducted using Pearson Correlation.

Results: The magnitude of association of BMI to the onset of puberty in male among school students in Jatinangor was 0.243 which showed there was positive correlation coefficient between BMI to onset of puberty in male. Test results with the t-test showed t-value of 2.683 with p-value of 0.008.

Conclusions: There is association of BMI to the onset of puberty in male among school students in Jatinangor. Positive correlation indicates that the higher the BMI, the faster the onset of puberty in male. **[AMJ.2016;3(1):12–16]**

Keywords: Body mass index, male students, nutritional status, onset of puberty

Introduction

The time of dramatic transformation in human lifecycle is termed as puberty.[1,2] This is the period where there is the biologic transition between immature and adult reproductive function.[3] The changes are not only in terms psychologically, but also rapid changes in size, shape, and composition which are sexually dimorphic.[4] Due to the changes, it is required to understand the physical changes that occur during puberty in order to evaluate and treat the aberrations of pubertal development.[5]

Prospective studies for male puberty frequently use pubic and facial hair growth, voice change , and genital growth such as testicles and penis, but these changes can be unreliable and may be poorly recalled.[6] These studies have disregarded such measures and examined self-perception of pubertal onset.[6] For males, it is recommended to use first sexual attraction, first nocturnal emission or termed as wet dream and first masturbation as assessment for onset of puberty.[6] There are a number of factors that acts independently to influence the growth and maturation. More recently nutrition status by assessing the body mass index (BMI) on the timing or onset of puberty in male has become topic of interest.[7] Leptin or fat cells and estradiol are the factors that will alter the onset of puberty in male if BMI is taken into account.[7] There is a relatively extensive literature demonstrating or showing an inverse association between body fat and age at pubertal onset in girls, that is higher BMI leading to earlier age of menarche but the

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similar studies in male are still lacking.[7] So this study enables to understand whether there is any association or correlation between BMI and the onset of puberty in male and how it is correlated.

Methods

This cross sectional type of study was conducted from May to November 2013 in schools that were included in bigger study conducted by Nutrition and Metabolism Working Group in Jatinangor Cohort, especially Puberty Survey in Jatinangor, by Department of Epidemiology and Biostatics Faculty of Medicine Universitas Padjadjaran which collected data from all grade 7 and 8 students from several Junior High School (Sekolah Menengah Pertama, SMP) and all grade 4 and 5 students from several Elementary School (Sekolah Dasar, SD) in Kecamatan Jatinangor. The study was conducted after getting clearance from the Health Research Ethics Committee Faculty of Medicine Universitas Padjadjaran. Validated and reliable questionnaires were provided to students after getting permission from the head of the school.

The sampling method used was simple random method. The subjects were comprised of male school students aged 9–15 years old. The total of 286 respondents were given questionnaires with their consent. The onset of puberty was accessed through the age of onset of wet dream and the BMI was measured by taking height and weight using stadiometer and weighing scale. The subject of the study were included if they were healthy at the time and did not have obvious illness, attained puberty in one year and voluntarily followed the research procedure. The subjects were excluded from the study if they did not attend the school when the survey was conducted and who refused to answer the questionnaires.

In order to measure the height and weight for detecting BMI, it is essential to know the correct and reliable procedure or method to prevent error during recording. To measure height, the following procedure was followed. Firstly, the procedure was started by asking the students identity such as name, age, school, and the students were asked to take off their shoes before the measurement, and to stand with their back against the board (part of the body touches the board such as heel, buttock, back of the body, and head), body weight was evenly distributed on both feet, arm hung freely by the sides of the body, palms faced the thighs, legs were placed together, brought knees or ankles together, the student stood erect; heads was up and faced straight ahead, verified the body position front and left by the examiner, positioned head in Frankfort Horizontal Plane. The students were asked to inhale deeply and held their breath without moving head or body, brought headpiece down onto the upper most point on the head; compressed the hair, asked them to exhale, then height was recorded to the nearest 0.1 cm (or appropriate unit for the stadiometer) and the examiner had to convert into meter later. The standardized method to measure weight was shown below. The scale was adjusted to "zero" by examiner and if the scale was accurate and there was no any zero error, the assessment had begun. The students were asked to remove extra layers of clothing, and any heavy items in their pockets, the child is asked to stand in the scale to ensure that the body weight is evenly distributed between both feet, arms is hang freely by the sides of the body, palms toward thighs, head is up and facing straight ahead, weight is recorded to nearest 0.1 kg (or appropriate unit for the scale). After finding the average height and weight, the BMI was calculated using the formula weight (kg) over height (m2), so it can be categorized into underweight (<18.5 kg/m2), normal (18.5–24.99 kg/m2), obese (25–29.99 kg/m2) and finally obese (≥30 kg/m2) to find the correlation of fat mass to the onset of puberty.[8]

The respondents were included only if the difference of age of onset of wet dream and the current age of the student was less than or equal to 1 year, students were healthy at the time and did not have obvious illness, and respondents voluntarily followed the research procedure. Only students with difference of age of onset of wet dream and the current age less than or equal to 1 year were included because male with difference of age more than 1 year would attain the pubertal growth spurt which may alter the BMI measurement. From these criteria, 117 students were included in the study and the rest were excluded. The association of BMI and onset of puberty was found through correlation studies of bivariate variable using Pearson method that was analyzed through Statistical Package for the Service Solutions (SPSS) programm. Statistically, significant result was considered when $p<0.05$.

Results

There were 117 subjects included in the big study and were assessed according to the

Table 1 Respondent Characteristic

Respondent Characteristics	Frequency (n=117)	Percentage (%)
Onset of puberty		
Early	NA	NA
Normal	93	79.49
Late	24	20.51
BMI		
Underweight	50	42.74
Normal	59	50.43
Overweight	8	6.84
Obese	0	0

Note: NA=Not Available

characteristics of the subjects which were BMI and age of wet dreams, which signified duration of puberty. The BMI assessment was according to World Health Organization (WHO) classification. The age of wet dreams or the duration of puberty was classified into 3 categories; early onset (<9 years), normal onset (9–13 years old) and late onset (≥14 years).

The BMI average of the respondent was 19.41 and standard deviation of BMI of the respondent was small enough which was equal to 2.64. Students with late onset of puberty were far less if compared to normal onset of puberty. Half of the students belonged to the BMI classification normal (Table 1).

Those with normal onset of puberty, who were most of the students, were classified into normal BMI. The least number of students were from late onset of puberty with BMI classification obese (Table 2).

The magnitude of BMI association to the onset of puberty in male among school students in Jatinangor analyzed by Pearson correlation was 0.243. Test results with the t-test showed t-value of 2.683 with p value of 0.008. If compared to significance level α=5%, the p value was worth less.

Discussions

A tumor is an abnormal growth of tissue, Based on the onset of wet dreams, there were about 93 students, 79.49% with normal onset of puberty in between 9–13 years, whereas only 24 students which is 20.51% with late onset of puberty (≥14 years). There was no data available for early onset of puberty which

Table 2 Cross Tabulation of BMI and Onset of Puberty

BMI	Onset			Total
	Early	Normal	Late	
Underweight	NA	43	7	50
%	0.00	36.75	5.98	42.74
Normal	NA	47	12	59
%	0.00	40.17	10.26	50.43
Overweight	NA	3	5	8
%	0.00	2.56	4.27	6.83
Obese	NA	0	0	0
%	0.00	0.00	0.00	0.00
Total	NA	93	24	117
%	0.00	79.49	20.51	100

Note: NA=Not Available

was <9 years old. This is because the study population did not comprise students aged <9 years old. The mean age of attaining puberty based on the study was 12.72 years. The students who earliest attain puberty were at the age of 9 years and those who latest reach puberty were at the age of 15 years. According to Jaruratanasirikul and colleague in Thailand[9], the youngest boy who attains earliest onset of puberty is 8.2 and 9.2 years and the range of mean is around 10.8–12.4 years if assessed according to Tanner 2 testicular enlargement and Tanner 2 pubic hair. Compared to the result in Thailand[9], onset of puberty in Jatinangor is latter because the criteria used to assess onset of puberty was wet dreams. The onset of puberty according to Tanner is faster than wet dreams.

The mean of BMI was 19.41 with standard deviation of 2.64. Around half of the subjects which is 59 students (50.43%) had normal range The data showed that there were big number of students who were underweight with a frequency of 50 students and a small number of students who were overweight. Therefore, it can be concluded that half of the students in the population had poor nutritional status. A study conducted by Rajeev[10] in India showed that the mean of BMI is 17.36 (3.08%) in 2005. Compared to that result, the BMI of Jatinangor adolescence were higher than Indians.[10]

Based on the study, there was association between BMI and onset of puberty. The result signified positive correlation that high BMI correlated with early onset of puberty. This study result is similar to the longitudinal prospective study conducted by Lee et al.[7] on BMI and timing of pubertal initiation in male. Study by Lee et al.[7] showed that there is strong association between BMI and onset of puberty in male. However, instead of using questionnaire, this particular study used Tanner genitalia staging as main outcome measure to detect onset of puberty, even the reliability and validity of this method has been questioned.

On the other hand, other similar studies by Tremblay and Lariviere[11] found that there was no significant association in male. This study used validated questionnaire as an instrument and included 569 boys total aged between 9, 13, 16 years. The samples were taken as randomized stratified samples. Besides that, this study used other environmental factors which may alter BMI such as peer influence during the study.

There are several limitations in this study that may interrogate the variables that have been measured. Instead of showing negative correlation, this study, showed positive association which high BMI had early onset of puberty. This correlation theoretically against the current proposed hypothesis. This study only measured the BMI after attaining the growth spurt because the BMI was not assessed during the onset of puberty, but within 1 year after attaining, the onset of wet dreams as the consequence the BMI may be altered by the growth spurt during the 1 year period of puberty. So, to overcome this problem, it is highly recommended to conduct cohort study embedded to Usaha Kesehatan Sekolah (UKS), the health monitoring in schools so the method will be effective in measuring the BMI on the onset and at the same time, the reproductive health education can be reached among school students. Besides that, by self-answering question, the respondents may feel uncomfortable which may alter the finding of the study. Instead of self-answering monitored by the researcher, online questionnaire could be more reliable and effective. Besides that, this study used secondary data to detect age of the onset of puberty where it may have recall bias. The school students probably faced difficulty in recalling the exact year at the first time they had wet dreams. Furthermore, in order to get more accurate date of the onset of puberty it is required to educate male student on the importance of reproductive health. Finally, the population samples of this study contained limited number of obese students. Therefore, the BMI of the population were not normally distributed and mostly comprised of underweight and normal BMI. To overcome this problem, the study can be conducted in different setting with more obese male students or it is recommended to conduct cohort study. In conclusion, there is association of BMI to the onset of puberty in male among students in Jatinangor Sub District. Positive correlation coefficient indicates that the higher the BMI, the faster the onset of puberty in male will be. It adds the controversies on the correlation of nutritional status and onset of puberty. Further study with better design and measurement method is needed and it will be better to embed this study into established program such as UKS.

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