Adolescent Height : Relationship to Exercise, Milk Intake and Parents' Height

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Abstract

The investigators studied the height of adolescents in the age range of 12 to 18 years from 2 schools in Bangkok. Questionaires asking their rates of organised exercise per week, of milk intake per day and their parental heights were given to a total of 545 male and 615 female students. The completed questionaires were analyzed. We could categorize these subjects into 3 groups according to their heights which were Group I (height>97th%-ile), Group II (height between 50-97th%-ile) and Group III (height<50th%-ile). Those in Group I had parents, whose height was significantly greater than those of the other groups. There was no difference in organized exercise among the 3 groups. Milk intake of female adolescents from Group I was significantly more than the other groups. It is concluded that parents' height in both males and females and milk intake in females contribute to a greater adolescent height.

Adolescent height is ultimately related to final adult height. Young adolescents are always concerned about their height and always seek ways to increase it. Minerals and vitamins are always requested for supplementation to their daily diets. Some even ask for growth hormone injections to increase height. It is known that parents' height is the best index in predicting their children' height. If both parents are tall, it is most likely that their children will be tall too. Likewise, if both parents are short, their children will be short. Thompson et al recently showed the linkage between stature and a region on chromosome 20 which supported the role genetics plays in children's height(1). Interestingly, there are some children who grow against the rule. These children are taller than their peer group whose parents are the same height. From Jirapinyo's studies(2,3), children in Bangkok

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were taller than children from other parts of the countries. Environment as well as genetics also plays a role in children' height. Rona et al[4] reported results of a longitudinal study of school children from 1972 to 1994. In this study, height of children from Scotland was markedly improved which confirmed that environmental factors play a role. These studies confirmed the proposal that other factors besides race and parents' height might determine the final height of these children. Either exercise or high milk intake might play a role in increasing the height of these children. We, therefore, studied these two factors as well as parents' heights in relation to a group of young adolescents.

MATERIAL AND METHOD

Male subjects aged between 12-18 years were recruited from Suankularb Vithayalai school and female subjects in the same age range were recruited from Strivithaya school.

After heights were measured in these subjects, questionaires were distributed concerning parents' height, subjects' milk intake and amount of organized exercise per week during the past 3 years.

Subjects were divided into 3 groups according to their height. They were classified into group I if their height was more than 97th%-ile of standard Thai children[5]; into group II if their height was in between 50th%-ile and 97th%-ile of standard Thai children ; and, into group III if their height was below 50th%-ile of standard Thai chil-

Table 1. Age distribution and numbers of subjects of the study groups.

Age (years)	Male (n = 545)	Female (n = 615)
12	38	41
12 1/2	37	36
13	46	57
13 1/2	52	56
14	42	44
14 1/2	55	50
15	49	53
15 1/2	49	46
16	44	71
16 1/2	40	49
17	48	52
17 1/2	25	37
18	20	23

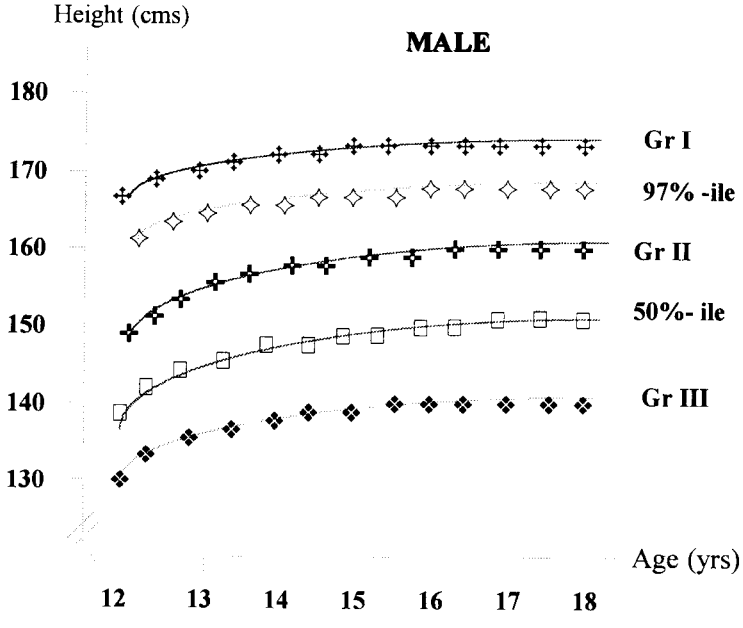

Fig. 1. Average height of Gr I, II and Gr III of male adolescents compared to standard Thai males.

dren. We analyzed any correlation between parents' height, milk intake and exercise in these three groups by analysis of variance.

RESULTS

A total of 1,160 students with completed data were included in the analysis. There were 545 males and 615 female. Ages and number of subjects are shown in Table 1. Fig. 1 and Fig. 2 depict mean values of height of group I, II and III of male and female adolescents compared to those of standard Thai children.

Tables 2 and 3 show paternal, maternal and midparental height in each group of male and female adolescents. Paternal, maternal and midparental height in group I is significantly higher than other groups ($p<0.0001$). There is no significant difference in the average time of organized exercise among the 3 groups of male adolescents (about 6 hours/week in each group), as well as in female adolescents (about 4.6 hours/week in each group). Table 4 shows the average milk intake of male and female adolescents in the 3 groups during the past three years. Female adolescents of group I had higher milk intakes than the other two groups ($P<0.05$).

DISCUSSION

Paternal, maternal and midparental height are closely related to adolescent height both in males and females. These factors should be the first index when these adolescents come in to consult about their height. From Table 1, it is interesting that paternal and maternal height of lower than 167 and 156 cms, respectively, would mostly produce short male and female adolescents. In contrast, paternal and maternal height above 172 and 162 cms, respectively, would produce tall male and female adolescents.

Exercise is always claimed as a factor contributing to height, but from this study, there was no difference in amount of exercise in each group. It is difficult to exclude this factor as a positive factor in enhancing height, since the questionaires were focused on organized sports. Non-organized exercise in children and adolescents is far more common than organized exercise. It is difficult to evaluate the amount of non-organized exercise in children[5].

These days, everyone claims that high milk intake is a factor in accelerating growth in children. In boys, we found no difference in milk intake among the 3 groups. Milk which is rich in

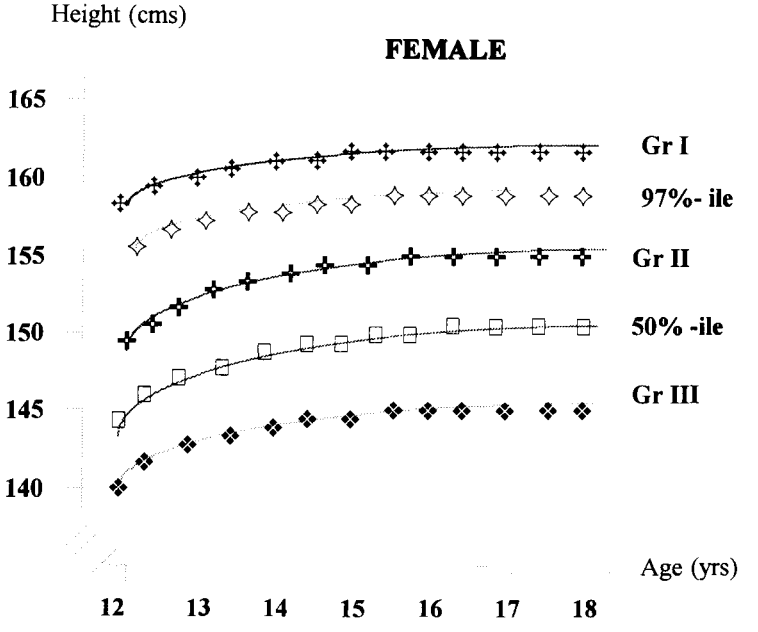

Fig. 2. Average height of Gr I, Gr II and Gr III of female adolescents compared to standard Thai females.

Table 2. Average height of paternal, maternal and midparental height of 3 groups of male adolescents (Mean±SEM, * P<0.0001).

Groups	Father (cms.)	Mother (cms.)	Mid parental height (cms)
I (n=145)	172.0±0.5*	162.4±0.4*	167.2±0.3*
II (n=330)	168.9±0.3	159.6±0.3	164.2±0.3
III (n=70)	166.8±0.8	156.2±0.7	161.5±0.6

Gr I = height > 97%-ile, Gr II = height between 50% ile-97%-ile, Gr III = height < 50%-ile

Table 3. Average height of paternal, maternal and midparental heights of 3 groups of female adolescents (Mean±SEM,* P<0.0001)

Groups	Father (cms.)	Mother (cms.)	Mid parental height (cms)
I (n=144)	172.1±0.4*	162.1±0.4*	166.1±0.3*
II (n=396)	168.0±0.3	157.7±0.2	162.8±0.2
III (n=75)	164.7±0.6	155.5±0.6	160.1±0.4

Gr I = height > 97%-ile, Gr II = height between 50-97%-ile, Gr III = height < 50%-ile

Table 4. Average milk intake among 3 groups of male and female adolescents during the past 3 years (*p<0.05).

	Male (ml/day)	Female (ml/day)
Group I	400	500 *
Group II	400	360
Group III	400	360

energy, protein and calcium can be replaced by other food sources. Thus, it is likely that the male groups which took less milk might take other foods which are high in these nutrients, such as fried pork plus green vegetables. However, we found the tallest groups in female adolescents group I took more milk than the others. There are two explanations which are 1) female adolescents may need more milk in accelerating their growth, or 2) female adolescents needed more nutrients especially calcium to fulfill their growth potential, Taking more milk or taking more calcium then resulted in increased height. Scireg et al showed in their survey in Nicaragua that children with progressive stunting did not receive any form of milk[6]. Spontaneous calcium intake and physical exercise resulted in more bone mineral density. Dietary calcium of lower than 1,000 mg/d caused less bone mineral density[7,8]. In summary, this study shows that paternal, maternal and midparental heights in both sexes of adolescents as well as increased milk intake in female adolescents are the crucial factors which determine their height.

SUMMARY

We studied the relationships of parents' height, exercise and milk intake of 3 groups of adolescents classified according to their height. Those in the tallest group had parents, whose height was significantly greater than those of other groups. There was no difference in organized exercise among the 3 groups. Milk intake of female adolescents from the tallest groups was significantly more than the other groups. Parents' height and milk intake in the female contribute more to adolescent height.

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ความสูงของเด็กวัยรุ่น : เปรียบเทียบกับความสูงของบิดา มารดา, การออกกำลังกาย และการดื่มนม

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ผู้รายงานได้ทำการวัดส่วนสูงของเด็กนักเรียนช่วงวัยรุ่นอายุระหว่าง 12-18 ปี จากโรงเรียนสวนกุหลาบวิทยา และโรงเรียนสตรีวิทยา แล้วให้ตอบแบบสอบถามโดยถามถึงความสูงของบิดาและมารดา ความบ่อยของการออกกำลังกายที่เป็นกิจลักษณะ และอัตราการดื่มนม ซึ่งทั้ง 2 คำถามนี้จะถามย้อนหลังไปประมาณ 3 ปี พบว่าผู้ที่ตอบแบบสอบถามครบถ้วนเป็นจำนวน 1,160 คน เป็นนักเรียนชาย 545 คนและเป็นนักเรียนหญิง 615 คน ได้แบ่งนักเรียนออกเป็น 3 กลุ่ม ตามความสูงดังนี้ กลุ่มที่ 1 มีความสูงมากกว่าเปอร์เซ็นไทล์ที่ 97 กลุ่มที่ 2 มีความสูงระหว่างเปอร์เซ็นไทล์ที่ 50-97 และกลุ่มที่ 3 มีความสูงน้อยกว่าเปอร์เซ็นไทล์ที่ 50 โดยใช้ความสูงของเด็กไทยทั่วประเทศเป็นมาตรฐาน พบว่าความสูงของบิดา มารดา และค่าเฉลี่ยของความสูงบิดาและมารดาของกลุ่มที่ 1 มีค่ามากกว่า กลุ่มที่ 2 และกลุ่มที่ 3 อย่างมีนัยสำคัญ เด็กผู้หญิงในกลุ่มที่ 1 ดื่มนมมากกว่ากลุ่มที่ 2 และ 3 อย่างมีนัยสำคัญเช่นกัน แต่ไม่มีความแตกต่างในการเล่นกีฬาในทั้ง 3 กลุ่ม โดยสรุป ความสูงของเด็กวัยรุ่นจะแปรตามความสูงของทั้ง บิดา มารดา และค่าเฉลี่ยความสูงของทั้งบิดาและมารดา การดื่มนมในเด็กผู้หญิงที่ตัวสูงจะมากกว่าเด็กผู้หญิงที่มีความสูงต่ำกว่า

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