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Prevalence of Genu Valgum in Obese and Underweight Girls

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Abstract: The purpose of this study was to determine the prevalence of genu valgum among obese girls in Rasht (north of Iran). 454 high school students were selected cluster random sampling. Height and weight of subjects were measured by using standard apparatus. BMI (weight/height^2) was considered as the index of adiposity and international BMI cut-off values to categories each subject as obese (values>95thpercentile), overweight (85 th-95th percentile), desirable weight (15th-85th percentile) and underweight (15th percentile<values). The degree of valguse was assessed with the distance between the intermalleolar. Prevalence of obesity and overweight was about 18/7%,prevalence of desirable weight and under weight were %67,%13.9 and prevalence of genu valgum was %28 among girls. We found that overweight and obesity are related to genu valgum in high-school girls. It was concluded that elevated BMI increases loading of the knees and lower extremity.

Key words: Overweight % Abnormality % Girls % BMI % Knee structure

INTRODUCTION

Obesity during childhood is a matter of growing concern [1]. The prevalence of childhood overweight and obesity has more than doubled in the past 25 years [2]. Several reports show increasing rates of obesity even in developed countries [1]. Some countries with the highest prevalence's of overweight are located mainly in the Middle East. For many years, complications arising from obesity were considered unusual in childhood. However, a plethora of minor and major problems may arise in children and adolescents with obesity; most of these problems have considerable impact on quality of life and some may reduce life expectancy [3]. Childhood and adolescent overweight and obesity are related to health risks, medical conditions and increased risk of adult obesity, with its attendant effects on morbidity and mortality rates 22). A broad range of diseases and health complaints are associated with obesity [4]. Overweight is associated with a higher prevalence of intermediate metabolic consequences and risk factors, such as insulin resistance, elevated blood lipid levels, increased blood pressure and impaired glucose tolerance. Perhaps the most significant short-term morbidities for overweight/obese children are psychosocial and include social marginalization, decreased self-esteem [5]. Most of these problems have considerable impact on quality of life and some may reduce life expectancy [6]. Obesity also increased the odds of several rare diseases such as pancreatitis and health complaints such as chronic fatigue [4]. Changes in the gait pattern due to fatigue will lead to altered knee kinematics at heelstrike and consequently decreased shock absorption [7]. Obesity is associated with musculoskeletal pain and osteoarthritis [8]. The principal risk factors of osteoarthritis of the knee are: age, obesity and gender [7].

On the other hand, changes in body configuration that may affect the physical activity may play a role in the orthopedic disorders such as genu valgum and genu varum and caloric consumption and led to the development of obesity [9]. Genu valgum is commonly referred to as "knock knees", a condition where the knees angle in and touch when the legs are straightened.

Persons with severe valgus deformities are typically unable to touch their feet together while simultaneously straightening the legs.

Mild genu valgum is relatively common in children up to two years of age and is often corrected naturally as children grow and develop. However, the condition may continue or worsen with age, particularly when it is the result of a disease, such as rickets or obesity.

If physiologic genu varum or genu valgum persists beyond seven to eight years of age, orthopedic referral is indicated [10]. Pathologic conditions should be referred for appropriate management [11]. If the condition persists or worsens into late childhood and adulthood, a corrective osteotomy may be recommended to straighten the legs. In addition to cosmetic concerns, adults with uncorrected genu valgum are typically prone to injury and chronic knee problems such as chondromalacia and osteoarthritis[12]. Osteoarthritis (OA) of the knee leads to restrictions of physical activity and ability to perform

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activities of daily living. Obesity is a risk factor for knee OA and it appears to exacerbate knee pain and disability [13]. In some cases, total knee replacement (TKR) surgery may be required later in life to relieve pain and complications resulting from severe genu valgum [12]. Whereas obesity increases overall loading of the knee, limb malalignment concentrates that loading on a focal area, to the level at which cartilage damage may occur [14]. Also significant associations were demonstrated between increasing BMI and meniscal surgeries in both genders, including obese and overweight adults [15].

Furthermore obese females are at an overall higher risk of developing osteoarthritis than males. This gender discrepancy may be explained by the fact that females have a higher percentage of body fat content (lower proportion of lean mass) that may increase the rate of quadriceps fatigue [7].

Consequently, while it is widely speculated that obesity causes increased loads on the knee leading to joint degeneration, this concept is untested among high school girls in Rasht, Iran. Also, the purpose of the study was to identify the prevalence of genu valgum in obese and underweight among different classes of age in girls.

MATERIALS AND METHODS

Subjects: The study population consisted of high-school girl students (41511) that educated during 2003-2004. Out of a total of population, 382 samples were considered according to Udinsky sample estimation table [16]. Finally, 454 girls participated in the study. A two stage stratified cluster sample was selected. The sample units at the first stage were the schools at the north, south, east, west and center of city. The frame for the selection of the primary sampling units was based on a list provided by educational authorities in Rasht city. The second stage was sampling 20 students within classes in the schools.

Procedure: Before the study began, the school authorities met, explained the purpose of the study and sought their consent. Agreement was reached on conducting the study, with due regard for national ethics, local customs and parents' wishes. Researchers sent on preplanned scheduled visits, at the convenience of the school authorities, with least disturbance of the students.

The Following Information Was Recorded from Each Subject: date of birth, school name, grade, hours of any exercises per week, height and weight.

Height and weight were measured on subject in light clothes and without shoes using standard apparatus. The weighing scale used could be read to the nearest 0.1 kg. It was calibrated at the beginning of each working day and at frequent intervals throughout the day.

Height was measured to the nearest 0.5 cm, using a measuring tape. To measure height, the measuring tape was fixed to the wall. Height was measured while the subject stood with heels, buttocks, shoulders and occiput touching the vertical tape. The head was held erect with the external auditory meat us and the lower border of the orbit in one horizontal plane. All measurements were taken by one observer.

Subjects were classified as underweight, desirable weight, overweight and obesity groups using the international cut-off for body mass index (BMI) as follow [17].

Cut-off values: underweight (15^{th} percentile <values), desirable weight (15^{th}-85^{th} percentile), overweight (85-95 percentile) and obesity (values>95^{th} percentile)

BMI (kg/m^2) was calculated weight (kg) divided by square of the height (m). According to following classification: underweight<20, desirable weight 20-24.9, overweight 25-29.9 and obesity>30.But,this classification is commonly used to weight classes among adults and recommended to identify children and adolescents weight status based on cut-off BMI [6].

The degree of valgus was assessed with both patellas facing forward and touching; the distance between the intermalleolar was then measured for assessment. A distance of less than 10 cm requires no radiological evaluation, but a distance of more than 10 cm that persists over 3 years should be investigated for an underlying abnormality [18].

Statistical Analysis: Data analyzed with SPSS/pc version 10 packages. Mean and standard deviation (SD) and frequency were calculated and chi-square test and Pearson correlation coefficient were used. The results are given in 95% confidence interval (CI). 95% CI was estimated by Confidence Interval Analysis Software 8. All tests for statistical significance were two tailed and performed at <0.05.

RESULTS

A total of 456 girls (age=142 yrs) were included in the study. The mean and SD of weight, height and BMI measurements are shown in Table 1.

The mean and SD of BMI in girls (20.4 4.1) is about desirable range. The range of underweight in subjects is 13.9% and range of total of overweight and obesity is 18.7% (Table 2).

When we analyzed weight classes of girls in different age (11-17 yrs) the highest and lowest prevalence of

Table 1: Mean and SD of characteristics of subjects

Measurement	Girls
Weight(kg)	50.311.5
Height(cm)	156.215.6
BMI	20.44.1

Table 2: Weight classes in high-school girls

Weight class	N	%
Under Weight	63	13.9
Desirable Weight	306	67.6
Over Weight	56	12.3
Obesity	29	6.4
Total	454	100

Table 3: Prevanlence of genu valgum in girls by age

Age	N	Frequency	%
11	32	19*	59.4
		13**	40.6
12	87	69	79.3
		18	20.7
13	79	62	78.5
		17	21.5
14	71	52	73.2
		19	26.8
15	76	53	69.7
		23	30.7
16	63	41	65.1
		22	34.9
17	46	31	64.3
		15	35.7

*No deformity, **Deformity

Table 4:Relationship between obesity and genu valgum

P^2 obs	P^2 cri	relationship
11.31	3.84	*

Table 5: Number of hours spent in exercise per day, according to weight class

Weight class	MeanSD	95% CI
Under Weight	1.20.5	0.530.47
Desirable Weight	0.60.4	0.510.39
Over Weight	0.30.5	0.390.73
Obesity	0.40.7	0.611.06

overweight in order are in 15 and 13 years old. And the highest and lowest under weighting prevalence values in order are in 11 and 16 yrs old. The highest and lowest desirable weights in order are in 11 and 16 yrs old. As it is observed in Table 3, the highest and lowest genu valgum values are in 11 and 12 years old. Prevalence of genu valgum is shown in Table 3.

There is a relationship between obesity and overweight with genu valgum (Table 4).

Table 5 shows the average numbers of hours spent in exercise per day by weight class. About %60 percent (57.6%) respondents did not take any regular exercise. There were no statistically significant differences between BMI in subjects who did not take any regular exercise.

Pearson correlation coefficients were used to examine the relationship of weight and height with BMI in girls. BMI is strong correlated with weight (n=0.91) (95%CI: 0.87-0.93), but not with height (r=0.09) 95% CI: 0.06-0.15). Also our results showed that 76% of girls experienced puberty in this year. Therefore overweight and underweight rates before and after mature is greater than mature stage.

DISCUSSION

The main findings of this study indicated association between obesity and genu valgum. The prevalence of underweight was notably high among pre-adolescents girls in Rasht city.Whereas the prevalence rate of obesity and overweight observed in girls seemed to be lower than that reported in some western and Asian countries [3]. Recently, researchers have begun to document the impact of elevated BMI on health-related quality of life [19]. Some studies have reported that body mass is linked to assessments of general health and functional health in adolescents. They suggested that physical functioning decreased as BMI moved away from normal limits [19-22].

Whereas obesity increases overall loading of the knee, [23] it is most strongly linked to deformities at the knee. Reported fractures, musculoskeletal discomfort, impaired mobility and lower extremity malalignment are more prevalent in overweight than non-overweight children and adolescents [20].

This study has two unique strengths; first, we tested BMI in a nationally representative sample and second, measurement of both BMI and genu valgum in pre-mature and post-mature. These allowed us to examine differential amount of prevalence in two important ages. We found that overweight and obesity are related to genu valgum in high-school girls. When mature comes prevalence of genu valgum decreases and after mature it increase too.

If physiologic angular variations persist beyond seven to eight years of age, orthopedic referral is indicated [8]. Pathologic conditions should be referred for appropriate management. Unilateral deformity, progressive deformity, or lack of spontaneous resolution should alert the physician to the possibility of pathologic angular deformity [24].

Although elevated BMI increases the risk of knee deformities progression, the effect of BMI is limited to knees in which moderate malalignment exists, presumably because of the combined focus of load from malalignment and the excess load from increased weight [14]. A careful physical examination, explanation of the natural history and serial measurements are usually reassuring to the parents. Treatment is usually conservative. Special shoes, cast, or braces are rarely beneficial and have no proven efficacy. Surgery is reserved for older children with deformity from three to four standard deviations from the normal [24].

We conclude, prevalence of genu valgum is an important in age 11-12; because it increases at 11 (yrs) and decrease at 12 (yrs). The condition may continue or worsen with age particularly when it is the result of obesity. Therefore parents should pay attention to overweight and obesity in these ages. Also physical examination and serial measurements of knees is recommended to parents.

REFERENCES

1. Onis, M. and M. Blossner, 2000. Prevalence and trends of overweight among preschool children in developing countries. AJCN., 72 (4):1032-1039.
2. Patterson. R., L. Frank, A. Kristal, E.A White, comprehensive examination of health conditions associated with obesity in older adults. American J. Preventive Med., 27(5): 385-390.
3. Goodman, S., P.R. Lewis, A.J. Dixon and C.A. Travers, 2002. Childhood obesity of growing urgency. Med J. Aust., 176 (8): 400-401.
4. Sass, P. and G. Hassan, 2003. Lower Extremity Abnormalities in Children. Am. Fam. Physician, 68(3): 461-468.
5. Ogden, CL., K.M. Flegal, M.D. Carroll, CL. Johnson Prevalence and Trends in Overweight. Among US Children and Adolescents, 1999-2000. JAMA. 2002. 288: 1728-1732.
6. Must, A., G.E. Dallal and W.H. Dietz, 1991. Reference data for obesity: 85th and 95th percentiles of body mass index (wt, ht2) and triceps skin fold thickness. Am J. Clin Nutr., 53: 839-846.
7. Syed, I.Y. and B.L. Davis, 2000. Obesity and osteoarthritis of the knee: Med. Hypotheses, 54(2): 182-185.
8. Pinto, Ana L de Sá., M de. Barros Holanda, Patricia, S. Radu, Ari, MF. Villares, Sandra and R Fernanda, Lima. Musculoskeletal findings in obese children. J. Paediatrics Child Health, 42(6): 341-344.
9. Bonet Serra, B., A. Quintanar, Rioja· Alavés Buforn J. Martinez Orgado, 2003. Presence of genu valgum in obese children: cause or effect. An Pediatr (Barc), 58(3): 232-235.
10. Alizadeh, H., R. Gharakhanlou, H. Daneshmandi, 2002. Corrective exercises. 4th Edn., Iran.
11. Planinsec, J. and C. Matejek, 2004. Differences in physical activity between non-overweight. Coll Antropol., 28(2): 747-754.
12. Freemark/M., Obesity. Last Updated. 2006. 25.
13. Miller, G.D., W.J. Rejeski, J.D. Williamson and T. Morgan *et al*., 2003. Diet and Activity Promotion Trial (ADAPT): design, rationale and baseline results. Control Clin Trials, 24(4): 462-480.
14. Felson, D.T., J. Goggins, J. Niu, Y. Zhang and D.J. Hunter, 2004. The effect of body weight on progression of knee osteoarthritis is dependent on alignment. Arthritis Rheum, 50(12): 3904-3909.
15. Gregory, M., T. Ford, Kurt, Hegmann, 2005. Associations of body mass index with meniscal tears Medicine. American J. Preventive Med., 28(4): 364-368.
16. Udinsky, B.F., S.J. Osterland and S.J. Lynch, **0000.** Evaluation resource handbook, gatering, analying, reporting data. Edit.
17. Cole, T.J., M.C. Bellizzi, K.M. Flegel and W. Dietz, 2000. Establishing a standard definition for child overweight and obesity worldwide; international Survey. BMJ., 320: 1240-1243.
18. Davies, A.M. and V. Cassar-Pullicino, 2003. Imaging of the knee Apr., 1: 78.
19. Reither, Eric, N., M.A. Karen, A. Haas, Steven and Meier, 2005. Ann. Overweight, Obesity and Health-Related Quality of Life among Adolescents. The National Longitudinal Study of Adolescent Health. Pediatr., 115(2): 340-347.
20. Taylor, E.D., KR. Theim, M.C. Mirch and S. Ghorbani, *et al*., 2006. Orthopedic Complications of Overweight in Children and Adolescents. Pediatr., 117(6):2167-74.
21. Friedlander, Samuel, L., K. Larkin, Emma, Rosen, Carol L., M. Palermo Tonya and S. Redline, 2003. Decreased Quality of Life Associated with Obesity in School-aged Children. Arch Pediatr Adolesc Med., 157:1206-1211.

22. Nader, P.R., M. ONBrien, R. Houts, R. Bradley, J. Belsky, R. Crosnoe, S. Friedman, Z. Mei and E.J. Susman, 2006. Identifying Risk for Obesity in Early Childhood. Pediatr, 118 (3): 594-601.
23. Gardner, M.J. and D.G. Altman, 1989. Statistics with confidence. British Medical Association: London.
24. Peltonen, M., A.K. Lindroos and J.S. Torgerson, 2003. Musculoskeletal pain in the obese: A comparison with a general population and long-term changes after conventional and surgical obesity treatment. Pain, 104(3): 549-557.