Research Article

Risk Factors for Over weight and Obesity in 10-11 Years Old Children in the District of Constantine (Algeria)

Amira Sayed*[1], Hajer Daoudi[1], Abdelkader Rouabah[1], Naim Akhtar Khan[2], Leila Rouabah[1]
[1]Laborartoire de Biologie Cellulaire & Moléculaire, Université de Constantine 1, Constantine (Algérie).
[2]Physiologie de la Nutrition & Toxicologie (NuTox), INSERM U866, Université Bourgogne Dijon, France.
***Corresponding author's E-mail:** mirasayed0411@gmail.com

Accepted on: 10-04-2014; **Finalized on:** 31-05-2014.

ABSTRACT

To assess the incidence of obesity and overweight among primary school children (10-11 years), and to find the possible association between obesity/overweight, and dietary habits, activity physical and sociodemographic differentials among body mass index (BMI) of these children. A cross-sectional descriptive study was conducted, in 2013, to estimate the prevalence of overweight and obesity and to emphasize the risk factors. We included 399 school children in the 4th and 5th grades in public primary schools in the district of Constantine (Algeria). We studied anthropometric measurements (overweight and BMI), calculated on the basis of Who 2007 criteria, followed by dietary habits, socio-demographic data through a parental questionnaire. Data analyses were analyzed using the SPSS 20 software. Pearson correlation analyses were also performed. The prevalence of overweight among the subjects was 8.5%, while that of obesity was 19.3%, the incidence of low birth weight (<2.5 Kg) was 12% for all the children (29.16% for boys and 70.83% for girls). The incidence of macrosomia (birth weight ≥4 Kg) was 8.5% for all the children (50% for boys and 50% for girls). The parents of obese and overweight children were highly educated and were concerned about the educational values. Breakfast and a practice of sport were predictors of obesity and overweight among the school children studied. The prevalence of overweight and obesity among the school children is increasing. Birth weight, less healthy dietary habits, socioeconomic status and less physical activity may be responsible for this high prevalence.

Keywords: Activity physic, BMI, Children, Constantine, Dietary, Obesity, Over weight.

INTRODUCTION

The prevalence of childhood obesity has nearly tripled since 1970[1], the highest rate of childhood obesity have been observed in the developed countries. Its prevalence is increasing in the developing countries, too[2] and emerging as a major health problem.[3] Obesity persists from childhood to adulthood through adolescence. The diseases related to obesity are now becoming more prevalent among youth.[1] In addition to long-term physical health risks, overweight and obese children and adolescents face significant mental health and psychosocial morbidities.[1] Furthermore, the progression of nutritional transition has been characterized by a reduction in nutritional deficiencies, associated with availability of high energy food, resulting in overweight and obesity not only in the adult population but also among children and adolescents.[2] The fibers, known to be associated with a decreased risk of overweight[4],are scarcely available in modern food[5].It is interesting to mention that overweight during childhood may be maintained or even increased by a high dietary restraint.[3] The sedentary situations like watching the television has been shown to be a significant risk factor for pediatric obesity.[4]

Several studies have been carried out to assess the prevalence of overweight and obesity among Algerian children; however, we wanted to emphasize on the association between eating habits, sociodemographic status differentials and obesity in these children, compared to those from the developed and developing countries. The present study provides the information for future comparison regarding the possible factors underlying the high prevalence of childhood obesity among primary school children in Constantine, Algeria.

The objectives of this study were to assess the magnitude of obesity and overweight among primary school children, and to find a possible association between obesity/overweight and dietary habits and the sociodemographic status differentials among them.

MATERIALS AND METHODS

A cross-sectional study was conducted to estimate the prevalence of overweight and obesity and to emphasize the risk factors in this epidemic.

An updated list of all public primary schools was used as the sampling frame. 11schools were stratified proportionately according to the favored/unfavored distribution in district of Constantine (Algeria) in 2013.

To overcome the sampling error by using cluster sampling technique, a proportionate stratified sampling method was applied with regard to the favored/unfavored distribution. The total final sample size comprised of 399 school children aged from 10 to 11 years.

Data collection tools and techniques

Anthropometric measurements

Standardized procedures were used to measure height and weight.[1] Height was measured with children standing

with shoes off, feet together, and their backs to a calibrated 7-foot measuring stick fastened to a wall. Children were asked to stand straight and tall while a research assistant lowered a level T-square to rest on the top of the child's head to read the height value. Height was measured to the nearest 0.125 in (0.32 cm) and, recorded 2 times. If the first 2 height measures differed by 0.25 in (0.64 cm), 2 more height measurements were taken. Weight was measured using a commercial scale with an accuracy of ±100 g. Scales were calibrated monthly using certified calibration weights. Weight was measured with children in minimal clothing; no other items that could add weight such as belts, keys, or watches. As with height, weight was measured twice, each time to the nearest 0.25 lb (0.1 kg). If the 2 weight measurements differed, 2 more measurements were taken.

Body mass index was (BMI) calculated as "body weight in kilograms/height in meters".[6] To define normal weight, overweight, and obesity in children, we used the specific cutoffs described by The World Health Organization (WHO) has also published in 2007 reference curves for BMI and BMI z-score of children aged 5 to 19 years, which complement those published previously for children between 0 and 5 years.[7]

Dietary and Sociodemographic data

- ✓ Food intake and dietary habits were assessed through a questionnaire. Inquiries regarding food habits using closed-ended questions were added; we collected information on eating patterns of the children for breakfast, lunch and dinner. The frequency of food intake was also, sometimes, cross-checked with the mothers. The field pretest was conducted for testing the contents, phrasing and sequencing of the procedure by enrolling 50 primary school children other than those in the sample from nearby primary schools.

Sociodemographic and the frequency of physical activities data were collected using a parental form, included the following items: current residence, date of birth, parental educational and occupational status. These formats were sent to the guardians at home to complete.

Data management and data processing

The original total population sampled was 420, but for data validity, 21 subjects were excluded due to incorrect responses from parents, while submitting the completed sociodemographic data and food habits. The students excluded from the analysis did not significantly differ from those included with regard to the distribution of BMI or dietary habits.

Data entry and data processing were carried out using the SPSS version 20 software. Both the descriptive and inferential data analyses were applied using the appropriate statistical tests of significance (chi-square, t-test, r: factor of correlation). A multivariate binary logistic regression model was generated by including significant variables in the univariate analysis. Two models were created; the first dealt with the sociodemographic and dietary habits, while the second was used to define the possible food items for the prediction of obesity and overweight.

Confidence interval of 95% and significant difference of ≤0.05 was found to be valid and convenient.

Ethical considerations

Written permission was obtained from the authorities of the local School Health and Education Directorate. The teaching and administrative school staffs were provided with prior information. Parents gave a written consent for the participation of the children and they were assured that the data will be collected in respect of confidentiality. They were informed about the purpose, protocol and potential risks of the study. Before commencing the procedures of interviewing and measurements, the students underwent a brief orientation.

RESULTS

A total of 399 children of primary school were included with their age from 10 to 11 year (mean 10.54±0.49 years) with weight ranging (mean 35.10±8.57 Kg). There is a significant correlation between BMI and height of children (1.40±0.06). Frequency of obesity and overweight: in the schoolchildren was as shown in the Table 1.

Table 1: Anthropometric sample characteristics in relation to the BMI

Anthropometry variables Total n= 399		Correlation of Pearson with BMI and *P* value
Weight in kg (mean ± SD)	35.10±8.57	0.93, $P<0.01^{**}$
Height in m (mean ± SD)	1.40±0.06	0.32, $P<0.01^{**}$
Age in years (mean ± SD)	10.54±0.49	0.02, $P=0.6$
Body mass index (mean ± SD)	17.71±3.38	
Thin	(34) 8.3%	
Normal weight	(255) 63.9%	
Overweight	(34) 8.5%	
Obese	(76) 19.3%	

*$P<0.05$; **$P<0.01$. (95% CI) = 95% Confidence Interval

The sex ratio is 0.98 regarding children 10 years B/G, 1.01 represents children aged 11 B/G. OR = 1.02 [0.67-1.56] $P = 0.3$.

Figure (1) shows that there is no significant difference between the distribution of weight status and sex with a (r = 0.01, P = 0.81).

Among parents who answered our questions about the birth weight of their children were 290 (72.7%), mean (SD) birth weight of all children was (3.20±0.69) Kg. The

incidence of low birth weight (<2.5 Kg) was 12% for all children, 29.16% for boys and 70.83% for girls, respectively. The incidence of macrosomia (birth weight ≥4 Kg) was 8.5% for all children, 50% for boys and 50% for girls, respectively. There is a significant correlation between birth weight and sex (r= 0.16, *P*<0.05) Figure (2). The birth weight is significantly different with BMI (r= 0.11, *P*<0.05). Figure (3)

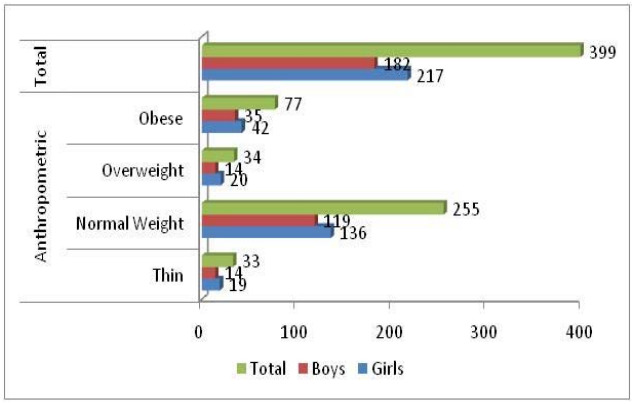

Figure 1: Relation between weight status and sex

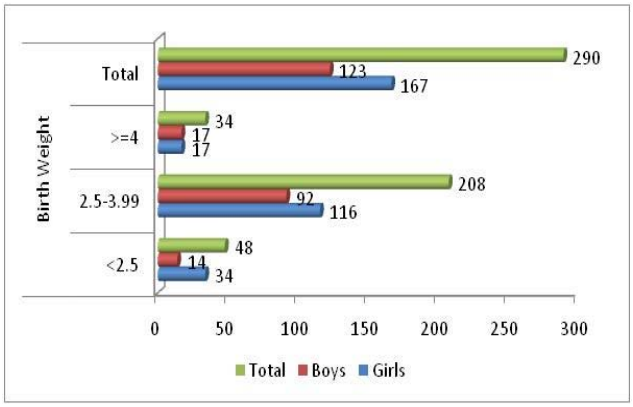

Figure 2: Relationship between Birth weight and sex

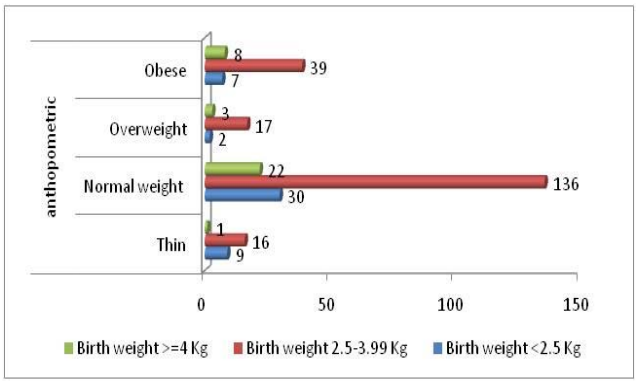

Figure 3: The birth weight and anthropometric status

The number of overweight and obese children was higher whose parents were educated (secondary and middle, university). The frequency of fathers working presents a high percentage among overweight and obese children. However, the mothers, working as house wives, are observed under a percentage higher in the same group of children, but it was not a significant correlation between sociodemographic and BMI of children. Table (2)

11.71% overweight and obese children did not eat breakfast, Table 3. These children are more likely to be overweight than students who usually ate breakfast. In a statistic analysis, there is a significant association between a frequency of eating breakfast and BMI of school children. However, there was no significant correlation with BMI (P>0.05) in children with eating habits like light meal, lunch, Collation, Dinner, Snacking.

Figure 4 shows that children are becoming more sedentary. 64.93% of obese children who do not practice sport and 67.64% of overweight children. Statistical analysis shows that there is a significant correlation between practice sport and the weight gain.

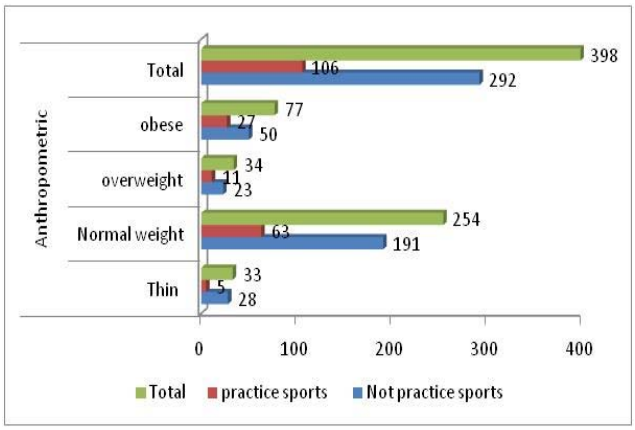

Figure 4: The frequency of practice sport and anthropometric status of children

DISCUSSION

The present study shows incidence of overweight and obesity in school children at the age 10-11 years and describes the effects and relation between sociodemographic, birth weight, dietary patterns, practice of sports and BMI of school children in Constantine-Algeria. In this study, 27.8% of the children were over weight/obese, 8.3% were lean and 63.9% had normal weight. In 2003, the prevalence of childhood obesity in the Netherlands was12%, which was the lowest in the Europe.[3] In the United States and the United Kingdom, the prevalence has been reported to be nearly double.[8] Furthermore, the study in Nova Scotia showed that 32.9% of children (grade 5 students) were overweight and 9.9% were obese.[9] In Mexico, obesity affects 10.8 and 9% of school-aged boys and girls, respectively.[10] Our results confirm the increased incidence of overweight and obesity in developing countries. A study conducted in Italy reported a prevalence of overweight/obesity to be 31.2% among school students aged 11–19 years[11], while in Brazil, this prevalence among school children aged 8–10 years was 7.4% and 17.3%, respectively.[12]

In this study, we found that high levels of birth weight, defined as child birth weight ≥4 Kg, were associated with an increased risk of overweight or obesity among the Constantine children from 10 to 11 years of age. Our results are in accordance with several studies concerning the relation between high weight at birth and childhood

overweight/obesity. This relation has been investigated in many studies[13] that show significant positive associations between high birth weight and childhood overweight. In addition, the children with the highest birth weight and fastest infant growth from birth to the age of 3 months had the highest BMI at age 7 years.[14] Furthermore, the birth weight was positively correlated with current weight in girls, but these correlations were not seen in boys.[15] The study of Li et al., 2014, confirmed a positive association between birth weight and childhood overweight or obesity from 6 months to 3 years of age.[16]

Table 2: Relation between Sociodemographic and overweight/obese children

Anthropometry variables Total n= 399	Overweight n= 34	Obese n=77 missing values	Correlation of person with Body mass index and *P* value.
Mother's education			0.03, *P*>0.05
Illiterate	(0) 0%	(2) 2.66%	
Primary	(0) 3.12%	(9) 12%	
Average level	(7) 21.87%	(16) 21.33	
Secondary	(15) 46.87%	(31) 41.33%	
University	(8) 25%	(17) 22.33%	
Father's education			0.07, *P*>0.05
illiterate	(0) 0%	(2) 2.70%	
Primary	(4)12.90%	(11) 14.86%	
average level	(12)38.70%	(19) 25.67%	
Secondary	(5) 16.12%	(27) 36.48%	
University	(10)32.25%	(15) 20.27%	
Working Mother			-0.04, *P*>0.05
Yes	(10) 29.41%	(16) 20.77%	
No	(24) 70.58%	(61) 79.22%	
Working Father			-0.05, *P*>0.05
Yes	(31)91.18%	(69) 89.61%	
No	(3) 8.82%	(8) 10.38%	

Table 3: Dietary habits of primary school children (association with their BMI)

Dietary habits: Total n= 399	Overweight/obese (n= 111)	Normal weight (n=255)	Correlation of pearson with Body mass index and *P* value
Frequency Breakfast/week			0.13, *P*<0.05*
Always	(66)59.45%	(185) 72.54%	
Often	(32) 28.82%	(56)21.96%	
Never	(13) 11.71%	(14)6.22%	
light meal / week	Messing values (2)	Messing values (4)	-0.06, *P*>0.05
Yes	(66)60.55%	(157) 62.54%	
No	(43)39.44%	(94) 37.45%	
Frequency lunch/week			-0.008, *P*>0.05
Always	(98) 88.28%	(225) 88.23%	
Often	(13) 11.71%	(29) 11.37%	
Never	---	(1) 0.39%	
Collation/week	Missing values (2)	Missing values (3)	-0.08, *P*>0.05
Yes	(50) 45.87%	(143) 56.74%	
No	(59) 54.12%	(109) 43.25%	
Dinner/week			-0.08, *P*>0.05
Yes	(107) 96.39%	(250) 98.03%	
No	(4) 3.60%	(5) 1.96%	
Snacking/week			0.009, *P*>0.05
Yes	(106) 95.49%	(235) 92.15%	
No	(5) 4.50%	(20) 7.84%	

A few studies have used the data to examine a relationship between BMI and socioeconomic status in children. Our study shows that there is no significant relationship between socioeconomic status of parents (level education) and BMI of children; however, in developing countries; a strong relationship exists between socioeconomic status and obesity among men, women and children.[9] Other studies[17, 18] have also shown the same conclusion that there exists a strong inverse relationship exists between socioeconomic status and obesity among women in developed societies. Veugelers and Fitzgerald (2005) have reported that the children in high-income neighborhoods were half as likely to be obese as their peers living in low-income neighbourhoods.[9] A reason why we found no significant association in this study may be a sample size that is too small to uncover the effect or that there was only a relatively small percentage of overweight children.

Healthy eating and being physically active are particularly important for children and adolescents. This is because their nutrition and lifestyle influence their well-being, growth and development.[19] Sedentary behaviors influence the change in BMI between adolescence and adulthood; an active lifestyle, such as participating in sports at a young age, appears to have a beneficial impact on BMI later in life.[20] We found that there is a significant correlation between eating breakfast and BMI of school children. However, some studies concluded that there was no epidemiological evidence of a consistent association between breakfast skipping and subsequent excess weight gain or obesity.[19] In our study, we found no significant association between the number of daily meals and BMI school children.[10] There is no standardized definition of a "meal" in terms of minimum or maximum energy content or amount of food eaten. It has been proposed that analyzing the amount of energy in every meal and number of meals consumed might lead to a more sensitive outcome.[21]

The definition of snacks used in this survey means that any food can count as a snack, provided it is eaten outside of main meals. The snacks are often perceived as being less healthy, a study in UK children, aged 11–12 years, found no evidence to suggest the nutrient composition of snacks was any more or less healthy than that of foods consumed during meals, and the types of foods consumed as snacks did not differ from those consumed during mealtimes.[19] Snacking between meals is commonly believed to be contributing to the increased incidence of overweight and obesity within populations. However, the evidence linking snacking and bodyweight remains inconsistent, with some studies showing positive, some negative and some no associations between snacking and bodyweight.[19, 22]

WHO in 2010 has defined physical activity as "any bodily movement produced by skeletal muscles that requires energy expenditure". Through our study, we showed the frequency of the practice of sports of overweight/obese children and normal weight. We found a significant correlation between these factors and BMI in school children.

Physical inactivity has been identified by WHO (2010) as the fourth leading risk factor for global mortality (6% of deaths globally). This follows high blood pressure (13%), tobacco use (9%) and high blood glucose (6%). Overweight and obesity are responsible for 5% of global mortality.[19] One of the main factors contributing to increased adiposity is lower energy expenditure caused by decreased Physical activity.[23] The amount of Physical activity is tightly correlated with body fat accumulation and obesity.[24,25] Being physically active in early life is of particular importance as it affects not only current health status but can also influence health in later life.

CONCLUSION

The prevalence of overweight and obesity among the school children is increasing and is comparable to that found in the developed countries. High Birth weight, less healthy dietary habits, socioeconomic status, the unconsciousness of the parents and less physical activity may be associated with the problem of obesity and overweight among the school children in the district of Constantine (Algeria).

REFERENCES

1. Nader PR, O'Brien M, Houts R, Bradley R, Belsky J, Crosnoe R, Friedman S, Mei Z, Susman EJ: Identifying Risk for Obesity in Early Childhood, Pediatrics, 118, 2006, e594–e601.
2. Amin TT, Al-Sultan AI, Ali A: Overweight and Obesity and their Association with Dietary Habits, and Sociodemographic Characteristics Among Male Primary School Children in Al-Hassa, Kingdom of Saudi Arabia, Indian J Community Med Off Publ Indian Assoc Prev Soc Med, 33, 2008, 172–181.
3. Vogels N, Posthumus DL, Mariman EC, Bouwman F, Kester AD, Rump P, Hornstra G, Westerterp-Plantenga MS: Determinants of overweight in a cohort of Dutch children, Am J Clin Nutr, 84, 2006, 717–724.
4. Hanley AJ, Harris SB, Gittelsohn J, Wolever TM, Saksvig B, Zinman B: Overweight among children and adolescents in a Native Canadian community: prevalence and associated factors, Am J Clin Nutr, 71, 2000, 693–700.
5. Katzmarzyk PT, Janssen I: The economic costs associated with physical inactivity and obesity in Canada: an update, Can J Appl Physiol Rev Can Physiol Appliquée, 29, 2004, 90–115.
6. James PT: Obesity: The worldwide epidemic, Clin Dermatol, 22, 2004, 276–280.
7. De Onis M, Onyango AW, Borghi E, Siyam A, Nishida C, Siekmann J: Development of a WHO growth reference for school-aged children and adolescents, Bull World Health Organ, 85, 2007, 660–667.
8. Hedley AA, Ogden CL, Johnson CL, Carroll MD, Curtin LR, Flegal KM: PRevalence of overweight and obesity among us

children, adolescents, and adults, 1999-2002, JAMA, 291, 2004, 2847–2850.

9. Veugelers PJ, Fitzgerald AL: Prevalence of and risk factors for childhood overweight and obesity, CMAJ Can Med Assoc J, 173, 2005, 607–613.

10. Perez-Rodriguez M, Melendez G, Nieto C, Aranda M, Pfeffer F: Dietary and Physical Activity/Inactivity Factors Associated with Obesity in School-Aged Children, Adv Nutr Int Rev J, 3, 2012, 622S–628S.

11. De Vito E, La Torre G, Langiano E, Berardi D, Ricciardi G: Overweight and Obesity among secondary school children in Central Italy, Eur J Epidemiol, 15, 1999, 649–654.

12. Triches RM, Giugliani ERJ, Obesity, eating habits and nutritional knowledge among school children, Rev Saúde Pública, 39, 2005, 541–547.

13. Dubois L, Girard M, Early determinants of overweight at 4.5 years in a population-based longitudinal study, Int J Obes, 30, 2006, 610–617.

14. Hui LL, Schooling C, Leung S, et al., Birth weight, infant growth, and childhood body mass index: Hong kong's children of 1997 birth cohort, Arch Pediatr Adolesc Med., 162, 2008, 212–218.

15. Yun Y-H, Park K, Under weight Related Factors in School-Aged Children in Daegu, J Korean Soc Food Sci Nutr, 42, 2013, 1592–1599.

16. Li N, Liu E, Sun S, Guo J, Pan L, Wang P, Liu J, Tan L, Liu G, Hu G, Birth weight and overweight or obesity risk in children under 3 years in China, Am J Hum Biol, 2014:n/a–n/a.

17. O'Dea JA, Wilson R: Socio-cognitive and nutritional factors associated with body mass index in children and adolescents: possibilities for childhood obesity prevention, Health Educ Res, 21, 2006, 796–805.

18. Lahmann PH, Lissner L, Gullberg B, Berglund G: Sociodemographic factors associated with long-term weight gain, current body fatness and central adiposity in Swedish women, Int J Obes Relat Metab Disord J Int Assoc Study Obes, 24, 2000, 685–694.

19. Weichselbaum E, Buttriss JL: Diet, nutrition and schoolchildren: An update, Nutr Bull, 39, 2014, 9–73.

20. Viner RM, Cole TJ, Who changes body mass between adolescence and adulthood? Factors predicting change in BMI between 16 year and 30 years in the 1970 British Birth Cohort, Int J Obes, 30, 2006, 1368–1374.

21. Ezendam NPM, Springer AE, Brug J, Oenema A, Hoelscher DH, Do trends in physical activity, sedentary, and dietary behaviors support trends in obesity prevalence in 2 border regions in Texas, J Nutr Educ Behav, 43, 2011, 210–218.

22. Miller R, Benelam B, Stanner SA, Buttriss JL: Is snacking good or bad for health: An overview, Nutr Bull., 38, 2013, 302–322.

23. Boreham C, Riddoch C, The physical activity, fitness and health of children, J Sports Sci. 19, 2001, 915–929.

24. Nesmith JD: Type 2 diabetes mellitus in children and adolescents, Pediatr Rev Am Acad Pediatr., 22, 2001, 147–152.

25. Zarrouk F, Bouhlel E, Feki Y, Amri M, Shephard RJ, Physical activity patterns and estimated daily energy expenditures in normal and overweight tunisian schoolchildren, J Sports Sci Med., 8, 2009, 83–88.

Source of Support: Nil, **Conflict of Interest:** None.