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Assessment of nutritional status and lifestyle pattern among Saudi Arabian school children

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Though the prevalence of obesity varies greatly in different populations of the world, various studies have shown a significant increase in the prevalence of overweight and obesity among children.[1] The epidemiologic transition in developing countries as a result of urbanization, migration, sedentary life styles, and changing dietary habits are recognized as some of the factors in the development of overweight and obesity in childhood.[2] As health-related behaviors and beliefs established during childhood have been linked to patterns of behavior in adulthood, therefore, the schools can play an important role in the health promotion of children and represent the best opportunity to acquire a healthy lifestyle not only through knowledge, but also attitude and behavior.[3] The purpose of the study was to describe the nutritional status among school children in healthy cities in the Kingdom of Saudi Arabia (KSA), using the 85th and 95th percentiles of body mass index (BMI) for age and gender as cut-off points.

This was a cross-sectional study carried out in the provinces of KSA from December 2004 to January 2006. Using a stratified random sampling technique, the sample subjects were chosen from 3 selected provinces, namely, Western, Northern, and Eastern of the 5 provinces. The ongoing 'healthy cities' program in these provinces made it convenient to carry out a study in these regions and give recommendation for its expansion. From each selected province, 3 cities each from Western and Northern provinces, and 2 cities from the Eastern province were selected randomly from a list of cities. Four schools (2 boys and 2 girls intermediate schools) from each city were randomly selected, except for one city in the Eastern province, where the study was conducted in 2 girl schools only due to certain administrative reasons. Two classes from each school were randomly selected and thereafter, each class was considered as a cluster in which all students (average 27 students per class) were enrolled in the study. Thus, a total of 30 schools were surveyed, wherein a total of 60 classes, namely, 28 boys and 32 girls (grades 1-3) were included in the sample. Approval was taken from the Ministry of Education and the Principal of the school to carry out the survey in the chosen schools and classes. The health survey questionnaire used in this study was modified and adapted from the Global School Health Survey (GSHS), which basically assesses the overall health of school students. This instrument included questions on food consumption, daytime physical inactivity, and smoking habits and, was subsequently translated to Arabic vernacular by the investigators. Furthermore, the questionnaire was pilot tested separately on boys and girls and, accordingly adapted for implementation in KSA. In each randomly chosen class, all students were briefed on the survey health questionnaire, and subsequently administered and supervised while filling the questionnaire by the investigators. Their basic demographic details were initially recorded. Subsequently, anthropometric measurement, namely, one trained male and female nurse carried out height and weight of participating school children for boys and girls. For each child, BMI was estimated by age and sex, and compared to the BMI latest World Health Organization/National Center for Health Statistics (WHO/NCHS) 2000 reference.[3] The cutoff percentiles used to classify the nutritional status of the children were underweight, BMI $p<10$; normal, BMI $p\geq10$ to $p<85$; overweight, $p\geq85$ to $p<95$; and obese, BMI $p\geq95$.

The study group included a total of 1454 children in the 3 provinces, in the age range from 12-19 years, with the mean and median age as 15 years. Out of all participating children, 45.2% were boys, and 54.8%

Table 1. Region-wise prevalence of overweight and obesity among school children.

Regions	Boys n (%)		Girls n (%)		Statistical significance	
	Overweight	Obesity	Overweight	Obesity	Overweight	Obesity
Eastern	8 (6.5)	20 (16.3)	39 (17.2)	35 (15.4)	χ^2=7.8, p=0.005	χ^2=0.04, p=0.81
Northern	24 (10.1)	43 (18.1)	46 (18.3)	24 (9.5)	χ^2=6.5, p=0.01	χ^2=7.50, p=0.005
Western	26 (9.2)	36 (12.7)	47 (15.7)	37 (12.4)	χ^2=5.6, p=0.017	χ^2=0.02, p=0.90

girls. Among boys, significant differences in nutritional status were noted according to age, with a shift to overweight and obesity among the younger age groups (χ^2=16.16, p=0.008). Among girls, no significant differences were observed according to age. Significant difference in overweight was observed between boys and girls with a higher prevalence among girls. Although the prevalence of obesity was higher among boys, however, no significant difference was observed between boys and girls. The nutritional status in both boys and girls was assessed by regions. Significant differences in nutritional status were observed in different regions both in boys and girls. However, a higher prevalence of overweight and obesity was reported among boys in the Northern Province (p=0.025) and among girls in the Northern and Eastern Province (p=0.034), compared to other provinces. Girls below 15 years were significantly more physically inactive for more than 5 hours in the daytime compared to boys. Initiation of smoking at a younger age and for a longer duration was observed among boys with an increasing proportion of children in higher age groups. Furthermore, a relationship of BMI with lifestyle pattern showed that the difference in the dietary habits, particularly vegetables (χ^2=10.2, p=0.003) and fruits (χ^2=6.2, p=0.044), were significantly related to difference in the BMI in different regions. However, physical activity and smoking did not significantly relate to BMI.

The present study shows that overweight and obesity in Saudi Arabian school children is high and reaffirms what other authors have observed in similar population groups.[1,2] With regard to inter-provincial differences, our study observed that overweight is highest both in boys and girls in the Northern region and also, boys had significantly higher obesity compared to girls, and in the Western region girls were significantly more overweight than boys (**Table 1**). Differences in overweight and obesity in another study,[1] could be explained by the difference in the reference standard used in assessment of nutritional status. In this regard, it has been noted that cutoffs to define obesity based on WHO/NCHS reference represents similar absolute BMI values between different national reference data sets, and so this provides a degree of consistency in definitions among nations.[3] Also, a systematic review/ critical evidence appraisal concluded that the evidence base for use of national BMI reference data is sufficiently strong for a recommendation for its adoption in clinical practice and epidemiology.[4] Wang[5] in his research on cross-national comparison of childhood obesity, based on the data sources from 1992-1994, showed that childhood obesity is related to socio-economic status with family income as a primary indicator. However, these differences in various studies could also be partly due to a secular trend over the past 10 years, and other attributing factors such as eating habits, lifestyle pattern, income differences, and genetics. It has been noted that economic development in KSA during the last 30 years has changed nutritional, and lifestyle habits.[1] These changes have influenced the quality and quantity of food intake and predispose people to a sedentary life.[1] To substantiate, our study has also observed differences in dietary habits in different regions with more boys and girls in the Western region, than Northern and Eastern region, preferring vegetables and fruits in their diet. In our study, the overall prevalence of obesity among younger children exhibited higher obesity prevalence in both genders, however only in boys was the differences in age groups significant. In a cross-national comparison of childhood obesity, the findings show that in both Russia and China, but not the USA, the prevalence of obesity and overweight was higher among children than among adolescents.[5] The study points towards the need for further research to investigate whether the gap is due to the differences in children's and adolescents' social and behavioral factors, such as diet and physical activity, or if it is because of the WHO/NCHS standard, which is based on data from the USA.[5] It is suspected that by using the WHO/NCHS standard we might have underestimated the obesity problem among adolescents in China, Russia,[5] and similarly also in KSA.

Physical activity is noted as one of the most important contributing factors to the increase in childhood obesity.[1,2] Boys and girls at 15 years and above are shown to be equally physically inactive, except girls below 15 years were more physically inactive. In a study on adult Saudis, it was shown that overweight and obesity prevalence is significantly high among the Saudis, where Saudi males have a significantly higher

prevalence of overweight, while the Saudi females have more obesity.[2] This predicts the future trend of overweight and obesity among boys and girls in the present study, with the current lifestyle pattern, putting Saudi school children at high risk of becoming obese in adulthood. This study therefore presents the urgent need to implement comprehensive lifestyle modification intervention programs in schools that addresses nutrition and physical education, and other healthy lifestyle habits, targeting school children, and parents, to reduce the risk of overweight and obesity and its health consequences in adulthood.

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The study of diabetes mellitus in Gorgan, Iran

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Diabetes Mellitus (DM) is a serious disease and it causes a number of chronic diseases the same as cardiovascular disease, renal failure, and neuropathy. Globally, it is expected that the prevalence of DM will double from 2000 to 2030, while public awareness remains less.[1] Several studies have demonstrated that DM has a strong negative impact on the health-related quality of life, especially in the presence of complications.[2] It is commonly linked with ecological factors such as food habit, physical activity, and obesity. These factors can increase, decrease or prevent the side effects of DM. Therefore this study was carried out to determine anthropometrical status, some biochemical indexes, and nursing supervision on 334 diabetic patients attending the Gorgan Diabetic Clinic.

The cases (109 men and 225 women) were chosen by random sampling over 3 months. The questionnaires, weight, and height were recorded for all. Serum triglycerides (TG), cholesterol, and fast blood sugar (FBS) were determined using laboratory kits (enzymatic methods), and the spectrophotometery technique (model JENWAY 6105 UV/VIS). Hemoglobin A1c (HbA1C) was measured via electrophoresis. All of the cases agreed to participate in this study. The data was saved on computer, and analyzed by Statistical Package for Social Sciences, version 11.5 software; χ^2 and correlation tests were used to compare the groups. The $p<0.05$ was considered to be significant.

In this study, 24.9% (83) of patients suffered from insulin dependent DM (IDDM), while 75.1% (251) suffered from non insulin dependent DM (NIDDM). With regard to dwelling place, 15.6% lived rurally, and 84.4% lived in an urban area. Seventy-seven percent were illiterate or had elementary education, 30.4% had been patients for 15 years. Body mass index (BMI) over 25 kg/m^2 was observed in 49.9% of IDDM patients, and 85.2% of NIDDM patients. The HbA1C in 85.3% of patients was over 8%, which is not suitable for blood glucose control. Fasting blood sugar of ≥110 mg/dl was observed in 73.2% IDDM, and 86.4% NIDDM (**Table 1**). The level of serum cholesterol in 40.6% of IDDM and 9.1% of NIDDM patients and serum TG in 1.73% ad 86.4% of these patients were higher than normal rang (Normal rang: Cholesterol; 140-250 mg/dl and TG; 50-170 mg/dl). There were statistically significant differences between the 2 diabetes types on basis of serum FBS ($p<0.005$) and serum cholesterol ($p<0.0004$). There is a reverse significant correlation between mean serum TG ($p<0.01$, r=0.098), serum cholesterol (p<0.01, r=0.193) and BMI ($p<0.01$, r=0.172) with literacy, but it has a positive correlation with HbA1C.

Some studies show that food pattern, low physical activities, and genetic factors are original agents for obesity, DM, and cardiovascular disease. In this study, the prevalence of overweight was observed in more than 80% of NIDDM, but it was less in IDDM. It is known that high body fat is common in NIDDM. High body fat causes insulin resistance and decreases glucose metabolic rate. Therefore, these patients should achieve an optimal weight for better control of blood glucose. The HbA1C was measured for control of blood glucose