

should be screened for these infections, until the opposite is strongly evidenced by the results of large-scale randomized-controlled trials.

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Progression of obesity among Seeb school children in Oman. A preliminary study

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Obesity is considered as the most prevalent form of malnutrition in developed countries and now it is also becoming increasingly prevalent in some developing countries. Its fast and widespread throughout the world can be compared to a communicable disease epidemic. Modern trends

towards a sedentary lifestyle and over-consumption of energy dense foods are likely to result in obesity. Moreover, more and more obesity cases are now rooted in childhood, and these seem to be the most difficult to reverse.¹

Obesity presents as a serious problem in the Gulf region and present indicators show that Omani society is not an exception to such trends.² The rapid socio-economic development, which started in 1970, has led to rapid modernization accompanied by decreased physical activity and increased energy consumption. Although no information is currently available on obesity trends in childhood, recent data on the adult population are quite alarming. The National Health Survey 2000 of Omani adults shows that in the lowest surveyed age group of 20-34, 36.1% were overweight or obese, 26% with hypercholesterolemia, 17.7% with hypertension, and 8.4% having diabetes or glucose intolerance. Such prevalence figures increased rapidly with age reaching to 59.3%, 60.9%, 63.1% and 32.1% respectively for the age group of 55-64.³ Obese children are known to suffer life long consequences, not only physical but also emotional and psychological. In addition, obese children suffer from several psychological implications such as poor body image and eating disorders related to low self-esteem.¹ In addition, the heavier body weight tends to act as an impediment to physical activity, which further compound the obesity problems. Nevertheless, recent reports from the Gulf region showed an association between obesity and hypertension among primary-school children. The overall prevalence of hypertension among primary-school children was found to be 5.1% in Kuwait and 4.8% in the Kingdom of Saudi Arabia. Furthermore, the increased prevalence of type 2 diabetes at a younger age suggests another implication of increasing child obesity. Child obesity is a precursor to adult obesity, as 70% of obese children become obese-adults with all increased health risk and associated chronic diseases, such as type 2 diabetes, hypertension, and hyperlipidemia. In this light, we attempted to study the progression of weight status among the same cohort of Omani school children at 3 successive ages; 6-7, 12-13 and 15-16 years, and compared such progression between the 2 genders.

We carried out the study among students enrolled in 2 public high schools in the Seeb district of the national capital region of Muscat, Sultanate of Oman. A cohort of 550 students in the age group of 6-7 years, who registered for the first time at the primary school level during the year 1993, formed the material of the study. This constituted a random sample of 400 males and 150 females. As a national policy, all students have to undergo a routine health examination at first entry to the primary level at age 6-7 years and subsequent entries to the preparatory level at age of 12-13 years and secondary level at

age of 15-16 years. Results of student's medical examinations and anthropometrically measurements are recorded in a dossier for each school entry level.

Based on school records, weight and height information of every child was obtained retrospectively at each of the 3 entry levels. The weight and height were measured by calibrated scales provided by Oman Ministry of Health. Body mass index (BMI) of every student was calculated as $BMI = \text{weight}/\text{height}^2$ in kg/m^2 . The weight status was then categorized into one of underweight, normal weight, overweight and obese, using BMI cut-off points as follows. For overweight and obese, we used international cut-off points for boys and girls aged 2-18 years, which are defined to pass through BMI of 25 and 30 at age of 18.⁴ However, in the absence of an international definition of underweight, we took as a cut-off point the fifth percentile of BMI for age using most recent standard charts of American boys and girls.⁵ The changes in BMI and weight status were tracked for each child throughout the 3 successive school levels, and the data obtained provided repeated measurements for each child. The statistical analysis was carried out using Statistical Package for Social Sciences for Windows.

Table 1 provides the distribution of each of the 4 weight status categories at the 3 consecutive school levels corresponding to ages 6-7, 12-13 and 15-16 years. This table reveals that the incidence of overweight and obesity progressively increased from a combined rate of 7.3% at age of 6-7 to 16% at age of 12-13 (an average increase of 1.5% per year) and further increased to 23.3% at age of 15-16 (an average increase of 4.3% per year). Thus, the increasing incidence of overweight and obesity substantially accelerated as the children grew older. Previous studies on Omani children were more

concerned with malnutrition or communicable diseases, since child obesity was not much of a concern prior to modernization brought forth by an oil-based economy. Our analysis shows that the Omani school children observed in this study have the tendency for becoming overweight and then obese as they grow up. Mean value of BMI as well as the incidence of overweight and obesity progressively increased with age, with a higher rate of increase, as the children grew older. As the children grew older from the first school level to the third, the overall prevalence of overweight and obesity increased from 7.3-23.3% an addition of 16% of the total sample population. However, when examining only those children who were not above normal weight, we observe that 26.1% of them turn overweight or obese. The latter figure shows that the phenomenon of child obesity is much more serious than what it seems when examining the prevalence as a fraction of the total population at large. Under normal healthy conditions, when children turn into puberty they go through an increase in their height, which should reduce their BMI, rather than increase it. This is opposite to what we observed in our study population, which certainly confirms an unhealthy trend of increased obesity. Our results further showed that the risk of overweight and obesity at age of 15-16 was higher among those students who were previously overweight or obese at ages 6-7 or 12-13 than those who were not. Furthermore, the later our schoolchildren exceeded the normal weight level, the more likely they would retain such weight condition at age 15-16 (75% risk at age 12-13 versus 52.5% at age 6-7). These results are consistent with those reported elsewhere that child obesity is more likely to persist when it starts at a later age. They suggest that a higher priority should

Table 1 - Gender-wise distribution of weight status at 3 school levels.

Weight status	Age in years											
	6 - 7				12 - 13				6 - 7			
	Male		Female		Male		Female		Male		Female	
n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	
Underweight	193	(48.2)	19	(12.7)	104	(26)	16	(10.6)	18	(4.5)	16	(10.7)
Normal	190	(47.5)	108	(72)	236	(59)	106	(70.7)	283	(70.8)	105	(70)
Overweight	13	(3.3)	16	(10.7)	42	(10.5)	22	(14.7)	62	(15.5)	20	(13.3)
Obese	4	(1)	7	(4.7)	18	(4.5)	6	(4)	37	(9.3)	9	(6)
Total	400	(100)	150	(100)	400	(100)	150	(100)	400	(100)	150	(100)
<i>p</i> -value	<i>p</i> <0.001				<i>p</i> <0.01				<i>p</i> <0.05			

be given to dealing with child obesity at a later school stage such as high school, where the likelihood of returning back to normal weight without intervention are slimmer.

Overall, our results give comparable trends to those reported in several other countries, such as Australia, Canada, United States of America and Kuwait. Moreover, various studies in those countries show accelerating trends of increased obesity prevalence, and Oman is likely to have similar trends, although this issue remains to be examined in future studies. There is one difference, however, between our results and those of some other studies, when comparing the performance between male and female students. At age 6-7, our females are observed to start with a substantially higher incidence of overweight and obesity than their male counterparts, but the 2 genders end up with a comparable incidence at age 15-16. This is also confirmed when observing the mean BMI values, as females had significantly higher BMI at the younger ages of 6-7 and 12-13 than males, but the 2 genders were comparable at age 15-16. Such observations may be explained from the Omani perspective as follows. At pre-school age, Omani boys are known to be more active and spend more time playing outdoors than Omani girls who tend to spend more time engaged in lighter indoor activities. As the girls grow into their teenage years, many of them become more conscious on their body image due to social and media influences and may thus become preoccupied with preserving a slim figure (but not necessarily a healthy one). At the same time, teenage boys begin to follow a more sedentary lifestyle, as they grow up, dominated by sitting at the computer or watching television or movies, while snacking at energy-dense junk foods and drinks. These teenage boys also tend to socialize with their friends by dining out in fast-food restaurants, ice-cream parlors, and so forth, all of which are notorious for serving energy-dense foods and drinks. In Oman, like many other countries, the emphasis on unhealthy and energy-dense foods is ubiquitous, and cannot be easily escaped especially by our young generation. Everyone seems to be falling prey to the strong influence of commercialism, as long as there is no adequate awareness or education to fend off such influences.

Our study covered 2 public schools in the capital area of Muscat, which may represent only one socio-economic segment of Omani society. Similar studies are therefore needed to cover other socio-economic segments such as students of private schools in the capital area as well as rural public schools. However, our study does point to a serious problem of rising child obesity in the Sultanate, if not in the whole Gulf region. Omani's are becoming overweight and obese at younger ages. As the health risks associated with obesity increase, Oman will face greater health risks among

its younger population. Consistent with our results, obesity is reported to track throughout life, meaning that its presence at any age will increase the persistence at subsequent ages. Many of lifestyle behaviors associated with the development of obesity are adopted in childhood, and it is more difficult to treat adult obesity that is rooted in childhood. Thus, strategies to promote healthy lifestyle need to focus on this learning period. There is therefore an urgent need for preventive and intervention measures to reduce future risks of obesity-related chronic diseases as the children grow into adulthood. Such measures should include: school education programs on healthy eating for healthy weight focussing on good eating habits, sports and gym facilities for the youth to encourage both genders getting involved in sports, improved variety of healthy foods and snacks in school cafeterias and food stores, community and media awareness programs to teach parents on how to shop and prepare healthy foods at home, while discouraging their children from eating foods, which are high in fat and low in nutritional value. Parents to spend quality time with their children, to educate them and play outdoors with them, while acting as role models for leading a healthy lifestyle. Further, parents and teachers should help their obese children to cope with social stigma, build their self-esteem, control their weight and develop healthy habits to stay fit for life; public health clinics to screen for obese children and enroll them into weight-management intervention programs, especially at the high school level because of the greater tendency to remain obese throughout adulthood.

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