

# Factors contributing to adolescent obesity

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## ABSTRACT

تعتبر السمنة لدى الأطفال من أبرز اهتمامات صحة المجتمع. خلال العقد الماضي لوحظ أن هناك ارتفاع في نسبة انتشار الوزن الزائد والسمنة لدى الأطفال والمراهقين في الأردن. السمنة في مرحلة الطفولة لها عواقب تستمر حتى سن الرشد وتشمل الإصابة بأمراض مزمنة كثيرة وزيادة في النفقات الصحية للفرد والمجتمع. تهدف هذه الورقة إلى مراجعة العوامل التي تؤثر على السمنة في مرحلة المراهقة وتركز على السلوك والبيئة. إن سلوك الفرد مثل تناول الأغذية ذات السعرات الحرارية العالية، كثرة الجلوس وعدم ممارسة النشاط البدني من أهم العوامل التي تؤدي إلى السمنة، إضافة إلى تأثير البيئة الحالية سواء في المنزل، المدرسة أو المنطقة المحيطة والتي تحد من إتباع نمط حياة صحي سليم. تحتاج معالجة السمنة في مرحلة الطفولة إلى برنامج استراتيجي صحي شامل للمجتمع ككل، وتحتل الممرضات موقع قيادي متميز في بناء برنامج هادف لإتباع نمط سلوكي وحيات صحي سليمة في مرحلة المراهقة، بحيث يتم تبني هذه الأهداف في الحياة اليومية.

Obesity in children is a significant public health concern. The prevalence of overweight and obesity in Jordanian children, and adolescents has increased in the last decade. The consequences of obesity to health in childhood and adulthood have both medical, and economic cost to individuals and society. This paper reviews the factors that contribute to adolescent obesity and emphasizes behavioral and environmental factors. An individual's behaviors such as increased consumption of high caloric foods, increased sedentary activity while decreasing physical activity has been identified as key issues in the development of obesity. Additionally, the current environment in homes, schools, and neighborhoods tend to discourage a healthy lifestyle. A comprehensive approach that involves the whole community is the best strategy for preventing adolescent obesity. Nurses are in a unique position to provide leadership in developing programs for healthier lifestyle choices for adolescents' and adoption of these goals into their daily lives.

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Obesity is a growing problem in Jordan and elsewhere, and is currently the subject of common health inquiry. The most recent estimates for Jordan showed that 14.3% of adolescent boys and 3.9% adolescent girls are either overweight or obese, but in adults the prevalence is much higher.<sup>1,2</sup> A major concern regarding adolescent obesity is that obese adolescents tend to become obese adults,<sup>3</sup> facing an increased risk for diabetes, cardiovascular diseases (CVD), and many other chronic diseases. However, even before reaching adulthood, overweight and obese adolescents already are experiencing medical and psychological effects related to their overweight condition.<sup>4,6</sup> Moreover, obesity is an important risk factor for mortality in adult life.<sup>5,7</sup> Indeed, obesity is even associated with an increase in economic costs for families and health care systems.<sup>8,9</sup> This paper gives a definition of obesity, the epidemiology of obesity in Jordan, describes health consequences of childhood obesity, and reviews the literature on factors contributing to the development of overweight and obesity in adolescents with major emphasizes on modifiable factors.

**Definition and classification of obesity.** The definition of obesity varies greatly across the literature, as there is no "clear" standard agreement for the best measurement of obesity in adults or children.<sup>10</sup> The most commonly cited definition states obesity is an excess in body fat that endangers health.<sup>11</sup> The most widely used measure of obesity is the body mass index (BMI) (weight in kilos divided by height in square meters, kg/m<sup>2</sup>). Overweight and obesity in children, and adolescents requires additional consideration, since BMI increases with age in growing children.<sup>12</sup> The criteria for measuring

weight status must be adjusted to correct for instability of BMI values in this age group. Different cut-off points have been used to define overweight and obesity in children depending on age. A practical approach to evaluate overweight in young people is to determine the individual's BMI- for age according to international age and gender appropriate BMI cut-off points. These international BMI cut-off points for children were developed by using 6 large nationally representative data sets drawn from population surveys.<sup>13</sup> The international threshold are preferred over the Centers of Disease and Control (CDC) percentile curves; because the CDC curves were developed using solely a US sample. A reference population obtained from a pooled data set of several sources allows for universal generalization of childhood overweight across different nationalities and ethnicities. Similarly, these international percentile curves are used to determine the cut-off points for overweight, and obesity by gender between the ages of 2-18 years is identified as passing through the BMI of 25 and 30 kg/m<sup>2</sup> at age 18 on the distribution of BMI. It is at this point on the BMI distribution where the health risk of overweight starts to rise steeply and is linked to the widely used adult obesity cut-off points of 30 kg/m<sup>2</sup>. These suggested cutoff points are shown in (Table 1), and were endorsed by the International Obesity Task Force (IOTF) in 2000.<sup>13</sup>

**Epidemiology of overweight and obesity. Scope of the problem in Jordan.** Jordan was faced with rapid nutritional transitions after World War II, particularly after independence and establishment of the Hashemite Kingdom of Jordan in 1950. This change in nutrition was part of the "demographic transition" the shift from a pattern of high fertility and mortality to one of lower fertility and a reduction in mortality and an "epidemiological transition" the shift from a pattern of high prevalence of infectious diseases that were associated with malnutrition, poverty, and inadequate sanitation to one of high prevalence of chronic diseases associated with an urban industrial lifestyle.<sup>14,15</sup> This transformation has affected the Jordanian populations' health and lifestyle.<sup>15</sup> Similar patterns are being observed elsewhere in the Middle Eastern regions. The rapid economic growth and urbanization resulted in less need for physical effort in adults and their children, timesaving technology, and mobility through new modes of transportation, all of these changes have diminished people's need for physical activity. At the same time, this economic growth, and urbanization, has introduced to Jordanian culture fatty high-preservative fast food. Those shifts in diet and physical activity patterns have led to an increase in risk of chronic diseases including diabetes, and CVD.<sup>2</sup> Chronic diseases are the leading causes of death in Jordan. According to the Jordanian Ministry of Health

(MOH) mortality statistics, 33.5% of deaths in 2004 were attributed to CVD, 13.1% to cancers, and 6.4% to diabetes mellitus.<sup>16</sup> Furthermore, it is well documented that, obesity is a major risk factor for diabetes, high blood pressure, high cholesterol leading to CVD, and it also aggravates asthma. Evidence suggests that the problem is worsening rapidly.<sup>17</sup> Jordan has a population

**Table 1 -** The IOTF BMI cut-off points for overweight and obesity by gender between 2-18 years of age.

Age (years)	Overweight		Obese	
	Body mass index >25 kg/m <sup>2</sup>	Body mass index >30 kg/m <sup>2</sup>	Body mass index >25 kg/m <sup>2</sup>	Body mass index >30 kg/m <sup>2</sup>
	Males	Females	Males	Females
2	18.4	18.0	20.1	20.1
2.5	18.1	17.8	19.8	19.5
3	17.9	17.6	19.6	19.4
3.5	17.7	17.4	19.4	19.2
4	17.6	17.3	19.3	19.1
4.5	17.5	17.2	19.3	19.1
5	17.4	17.1	19.3	19.2
5.5	17.5	17.2	19.5	19.3
6	17.6	17.3	19.8	19.7
6.5	17.7	17.5	20.2	20.1
7	17.9	17.8	20.6	20.5
7.5	18.2	18.0	21.1	21.0
8	18.4	18.3	21.6	21.6
8.5	18.8	18.7	22.2	22.2
9	19.1	19.1	22.8	22.8
9.5	19.5	19.5	23.4	23.5
10	19.8	19.9	24.0	24.1
10.5	20.2	20.3	24.6	24.8
11	20.6	20.7	25.1	25.4
11.5	20.9	21.2	25.6	26.1
12	21.2	21.7	26.0	26.7
12.5	21.6	22.1	26.4	27.2
13	21.9	22.6	26.8	27.8
13.5	22.3	23.0	27.2	28.2
14	22.6	23.3	27.6	28.6
14.5	23.0	23.7	28.0	28.9
15	23.3	23.9	28.3	29.1
15.5	23.6	24.2	28.6	29.3
16	23.9	24.4	28.9	29.4
16.5	24.2	24.5	29.1	29.6
17	24.5	24.7	29.7	29.8
17.5	24.7	24.8	29.7	29.8
18	25	25	30	30

IOTF - International Obesity Task Force, BMI - body mass index.  
(Reproduced with permission from Cole et al).<sup>13</sup>

with 59% of its citizens under the age of 25 and the largest age group is between 10-18 years.<sup>18,19</sup> Therefore, it behooves Jordan to invest in its youth, the future generation of Jordanians. Adolescence is a vulnerable period for developing unhealthy eating habits, as well as, a physically inactive lifestyle. Adolescents are in the process of forming behavioral patterns. This is the stage of development when they strive for independence and begin to make their own decisions. They engage in new life experiences outside their homes and their need to belong to peer groups is paramount. At this stage of their development, adolescents behave in a way that complies with peer values and norms,<sup>20</sup> that may promote physical inactivity and obesity through the consumption of "fast food. Additionally, many also prefer sedentary activities such as videos or computer games. Moreover, the physiologic changes, and secretion of sex hormones during adolescence results in the development of excessive fat cells that promote overweight, and obesity, and weight control becomes a challenge.<sup>4</sup> Healthy habits, and lifestyles established in adolescence are likely to continue throughout life<sup>21,22</sup> and have long-term consequences for an individual's health, and well-being and for the health of society in general.<sup>5,23</sup> It is estimated that up to 80% of overweight adolescents will become obese adults.<sup>3</sup> This notion only adds to the seriousness of adolescents' obesity. Indeed, the National Institute of Health (NIH) (1998) identifies that obesity is a serious health risk among children, and adolescents of all age groups.<sup>24</sup> As illustrated in (Table 2), several studies showed that the prevalence of overweight and obesity in Jordanian children and adolescents has dramatically increased<sup>1,25-30</sup> Some studies included only boys, and therefore precluded gender specific information.

Furthermore, obesity is defined in numerous ways (for example World Health Organization (WHO), CDC, or ITOF) making direct comparison of studies difficult. This increase in adolescents' obesity parallels the large increase in the prevalence of adult obesity that has been observed over the past decades. The prevalence of obesity among Jordanian adults increased from 12.8% to 19.5% between 2002 and 2004; a 50% increase.<sup>2,31</sup> The WHO used standard methods for projecting, estimated that by 2015 the prevalence of overweight and obesity among Jordanian adults (above 30 years of age) would remain relatively constant at 69% in men and will increase to 81% in women.<sup>32</sup> We are facing a future of overweight and obese adults. If obesity is not treated now, it is likely to become an even greater problem when the current generations of Jordanian adolescents reach adulthood. Possibly obesity becomes even a greater problem than what it is presently in perhaps Jordanian adults. Since obesity is a risk factor for many chronic diseases, it will present an enormous challenge to our health care system. Thus, an urgent need exists to take effective action through research, education, practice, and policy. Obesity prevention during childhood is an essential component of the efforts to combat obesity in adults.<sup>33</sup> Actually it is economically and health wise to prevent obesity through primary prevention of public health programs than treating obesity when it is presents.<sup>34</sup>

**Health consequences of childhood obesity.**  
**Physiologic impact on health.** Overweight and obesity are associated with numerous and varied health consequences, ranging from premature death to several chronic health problems that adversely impact quality of life.<sup>7</sup> Overweight and obesity increase the risk of chronic diseases, including cardiovascular diseases (CVD) (heart disease, stroke, and hypertension), type

**Table 2 -** Prevalence of overweight and obese children and adolescents in Jordan.

Year	Data	Age/years	% Overweight		% Obese	
			Boys	Girls	Boys	Girls
1997	All military schools <sup>25</sup>	7.5	-	-	5.8	11.6
		17.5	-	-	8.5	20.6
1997-1998	Military high school boys, Mutah University <sup>26</sup>	17-19	14	-	2.2	-
2002	Military school boys in 2 regions a. Middle b. Southern <sup>27</sup>	13 years	-	-	10.9	-
			-	-	2.2	-
2004	National survey (GSHS) <sup>28</sup>	13-15	16.5	11.3	4.3	2.8
2006	North Jordan survey <sup>29</sup>	6-12	18.8	19.9	5.6	5.5
2007	National survey (GSHS) <sup>1</sup>	13-15	18.1	9.8	5.5	2.1
2008	Urban and semi-urban <sup>30</sup>	3-6	20.8	19.1	3.8	7.2

GSHS - global school-based health survey

2 diabetes, respiratory dysfunction, several types of cancer, and physical disabilities, particularly when the onset of obesity is early in life.<sup>35</sup> Furthermore, obesity is associated with pregnancy complications, menstrual irregularities, infertility, high blood cholesterol, and increased surgical risks. The metabolic and physiologic changes associated with childhood obesity, along with obesity itself, tend to track into adult life, and eventually increase the risks of diseases, disability, and death.<sup>4,5,35-38</sup> In the Bogalusa Heart Study of obese children (5-17 years),<sup>39</sup> approximately 60% of those studied had at least one risk factor for cardiovascular disease (CVD). These risks factors included elevated total cholesterol, triglycerides, insulin, and blood pressure. Further, 25% had 2 or more such risk factors. Type 2 diabetes is increasingly diagnosed in overweight, and obese children and adolescents, and the onset of diabetes in children as young as 5 years of age can result in serious complications such as CVD, kidney failure, and blindness.<sup>40</sup>

**Psychosocial impact on health.** Children who are obese have been found to experience damaging psychosocial consequences. These include bias, discrimination (isolation and marginalization), and social stigmatization (teasing and bullying) that are inflicted by society and have an adverse effect on health. Dietz<sup>5</sup> reported that obese children are targets of discrimination, such as teasing and mocking; and as they grow older the discrimination of obese adults becomes more subtle but difficult nevertheless. Children and adolescents who are overweight or obese face harassment from their peers. As a result, these youths grow up with a lower self-esteem, and lack of confidence. Strauss<sup>6</sup> compared self-esteem of obese and non obese adolescents. Although there was no significant change in the self-esteem levels of obese boys, obese Hispanic girls, and Caucasian girls exhibited lower self-esteem when compared to their non-obese peers. In general, obese children tend to have low self-esteem and report being lonely, sad, and nervous, and they are more likely to smoke and drink alcohol. The specific psychological consequences associated with childhood and adolescent obesity includes a lowered self-concept, shame, being less popular among peers, and having a negative self-image. Having a negative self-image has an impact on decision making and interactions with peers.<sup>41,42</sup> An important psychosocial issue for overweight and obese children and adolescent is a reduction in quality of life. Research on quality of life in this population is limited, and the existing studies have focused on overall measures of quality of life rather than obesity-specific measures. In one study of severely obese children in the USA,<sup>43</sup> the quality of life scores was substantially lower than those of non-obese children, and was similar to the

scores of children diagnosed as having cancer. In other studies, obese children reported a lower quality of life that was manifested in lower physical and emotional health, self-esteem, school, and social functioning compared to non obese children.<sup>44,45</sup>

**Economic impact to society.** Obesity among adolescents is associated with an increase in economic cost to the family and the health care systems through direct and indirect medical costs.<sup>38,46,47</sup> Direct health care costs pertain to preventive, diagnostic, and treatment costs, such as physician visits and hospital care. It was estimated that hospital costs for obesity-related diseases in adolescents increased in the US from \$35 million in 1979-1981 to \$127 million between 1997 and 1999, which represents more than a 3 folds increase compared to 20 years ago.<sup>9</sup> Additionally, loss of productivity due to overweight and obesity accounts for the indirect costs to the society. Indirect costs are divided into 2 categories. (1) Morbidity costs, which are the wages that are lost by the people who are unable to work because of illness or disability, and (2) mortality costs, which are the value of future earnings that are lost due to premature death.<sup>38,48</sup> The annual indirect costs attributable to obesity in adults using a 1995 dollar value were more than \$47.6 billion. The indirect cost of overweight, and obesity are staggering and will continue to impact the USA economy unless this epidemic trend is reversed,<sup>49</sup> such economic assessment is not available for children because the contribution of children to a nation's economy is highly variable. Such economic facts are also not available presently in Jordan.

**Factors contributing to the development of overweight and obesity.** Obesity occurs when there is an energy imbalance of more calories consumed than expended over an extended period, usually resulting from multiple factors that include, social, cultural, environmental, genetic, and behavioral.<sup>50</sup> The environmental and lifestyle behaviors have been found to be significant factors that contribute to overweight and obesity in children. Hill<sup>51</sup> and his colleagues found that the current environment, and lifestyle encourages energy consumption and discourages energy expenditure. Factors that encourage excessive consumption include the easy availability of large meal portions, energy dense, flavorful (high fat), and inexpensive fast foods. Complicating the equation are environmental factors that discourage physical activity including fewer jobs that require physical labor, less energy expended at home and school, and increased time devoted to sedentary activities such as television watching, video games, and computers.<sup>52,53</sup> In addition, the decrease in physical activity over the past 30 years can be attributed to a variety of lifestyle changes including communities that are designed to discourage physical activity. Perceived safety in neighborhoods,

increased use of the automobile, and decreased funding for after school programs for sports. All these factors interact with each other to promote the development of overweight and obesity. These problems of “unfriendly communities” with respect to physical activities are especially evident in developing countries such as Jordan, where there is a lack of systematic city planning. A further challenge to the promotion of physical activity to maintain optimum weight is the cultural norms that do not permit girls to move freely in public without being escorted by a male relative. These modifiable risk factors of obesity can be targeted by direct intervention and will be reviewed next.

**Modifiable risk factors.** Targeting individual behaviors such as dietary practices and physical activity are a complex undertaking and require nursing, medical, nutritional, exercise, and behavioral expertise. Furthermore, interventions need to take parental practices, social, and cultural perspectives into consideration to be successful.

**Behavioral influences.** Although evidence is strong that genetics play an important role in an adolescent’s weight, an individual’s behavior is also a strong factor in producing overweight. Understanding how much of the increase in obesity in the last 30 years is due to changes in eating habits, and lack of physical activity has been the focus of a considerable research.

**Food intake.** Considerable evidence supports the notion that excess dietary intake is responsible for overweight and obesity. Factors that are named frequently as contributors to relative excess energy intake include restaurant food, sweetened beverages, 100% fruit juice, large portion sizes, and the frequency of meals and snacks.<sup>54</sup> Therefore, increases in weight are the result of calorie surpluses, meaning more calories are consumed than are needed for a given individual’s energy requirements and level of activity. Daily total energy intake has significantly increased by 113 calories among adolescent girls and by 243 calories among adolescent boys.<sup>55</sup> Other data suggest that energy intake increased by 15% over time and the consumption of food items with a higher energy density were also increased.<sup>56</sup> However, several studies failed to demonstrate that the significant increase in caloric consumption is the cause of obesity.<sup>57</sup> The 2 most likely explanations for such apparent failure are: (1) typical food intake data are prone to measurement error and frequent under-reported;<sup>58</sup> and (2) studies that do not take the balance of energy intake and energy output into consideration are likely to obtain a misleading or incorrect explanation of obesity. Some of the reasons for inaccurate reporting among adolescents include inattention to portion sizes, and frequent mindless snacking, which is likely to go unreported.<sup>58</sup> Another explanation is that earlier studies

evaluated behavioral factors contributing to obesity were conducted by researchers from a single discipline for example, exercise science and clinical nutrition linking the increase in obesity either to greater food intake or to reduced energy expenditure. In more recent times it has become apparent that multidisciplinary expertise is needed to address a complex problem as obesity in order to obtain valid explanation.

**Beverage intake.** In the absence of evidence on drastic changes in total energy intake and possible measurement error in reporting, researchers have probed food intake data to determine if changes in types of food eaten, and locations where adolescents eat to explain the prevalence of obesity today. These efforts focus on an increase in consumption of high sugar-sweetened beverages, more frequent snacking, and more meals eaten away from home. The latest data from the US, reported significant shifts in the type of beverages consumed by adolescents (aged 12-19 years) between 1977 and 2002.<sup>59</sup> Consumption of soda drinks increased 59% and was the most top beverage consumed among adolescents. Average soda consumption among those who drank soda was 25 ounces per day (or approximately 2 cans).<sup>59</sup> Adolescents increased their consumption of partial juice beverages by 37% and 100% juice by 78%, although these were ranked below soda in total quantity consumed. Milk consumption did not change significantly and was ranked third in total energy consumed from beverages.<sup>59</sup> Fifty percent of beverages consumed by fourth to sixth graders were sweetened beverages, leading to an excess of approximately 330 calories per day.<sup>60</sup> A recent review of 30 studies examined the effect of sugar-sweetened beverages on weight found 5 cross-sectional studies, 3 prospective studies, and 2 experimental studies in children and adolescents with positive and significant associations between sugar-added beverages and obesity.<sup>61</sup> A longitudinal study using a logistic regression analysis found that for every sugar sweetened drink consumed there was a significant corresponding increase in BMI (0.24 kg/m<sup>2</sup>) and frequency of obesity (odds ratio = 1.60) in children (mean age 11.7 years).<sup>62</sup> More importantly, an experimental study aimed to reduce soda consumption through a 12 month educational program at schools found that BMI of the control group increased 7.5% compared to a 0.2% decrease in the BMI of the intervention group.<sup>63</sup> Therefore, reducing easy access to and consumption of such drinks by children and teenagers may help to limit their risk of becoming overweight or obese. This latter study provided strong evidence that interventions to modify excess caloric intake through unhealthy beverages can control weight gain. Thus evidence exists for what can be carried out, however without strong and effective intervention through policy implementations regarding

vending machines, and other food options available at schools such efforts may not produce desired results.

**Snacking.** Although drinking soda purchased while at school reflects a relatively small percentage of total consumption of sugar-sweetened beverages per day, soda consumption now makes up 50% of total beverages intake by adolescents compared to 29% in 1977-78.<sup>59</sup> Unhealthy choices of snacks, includes an increase in calories from sugar sweetened beverages follows an upward trend in calories from snacking in general. Not only are adolescents more likely to snack than younger children, but cross-sectional data report that adolescents today eat a higher proportion of total calories from snacks than they did in the past. The percentage of adolescent's energy intake from snacks increased from 13.6% in 1977-1978 to 20.8% in 1994-96.<sup>64</sup> The most frequently consumed snacks were desserts (21.5%), salty snacks (14.2%), soft drinks (12.7%), and candy (7.8%).<sup>64</sup> The same snacks ranked in the top 4 in 1977-78, with the exception of milk which ranked second in frequency behind desserts. By 1994-96, soft drinks had displaced milk, pushing it to fifth in frequency as a snack.<sup>64</sup> The relationship of snacking to obesity, however, is not well established. Studies investigated the snacking behavior of obese and non-obese adolescents found that both groups eat a similar number of calories from snack foods. Bandini et al<sup>65</sup> asked 22 non obese and 21 obese adolescents to track their consumption of candy, chips, soda, baked goods, and ice cream for 2 weeks. They found that the percentage of calories from these snack foods was the same for both groups. Exceptions for the percentage of calories from ice cream, which non-obese adolescents reported eating in higher frequency. Similarly, a 10 year longitudinal study of initially non-obese girls found no relationship between total calories from snack foods and BMI or percent body fat. The only significant relationship reported from the study was between soda consumption and BMI, where adolescents in the third and fourth quartiles of soda intake had a BMI on average of 0.17 kg/m<sup>2</sup> higher than those in the first quartile.<sup>66</sup>

**Eating out.** Changes in snacking behavior have been reported to occur due to the numerous eating occasions outside the home. The 1977-78 and 1994-96 National Health and Nutrition Examination Survey (NHANES) survey data indicate a significant decrease in the percentage of food consumed at home versus at school. Prior to the rise in the prevalence of obesity, adolescents reported eating 74.1% of their total daily calories at home and 10.9% at school. By 1994-96 this had declined to 60.5% and 7.9%.<sup>64</sup> The decrease in foods obtained from home and school was largely replaced by an increase in total energy consumed from restaurants and fast food establishments. During that same time,

total energy consumed from restaurants and fast food increased from 6.5% to 19.3%. With reference to type of eating event (snack or meal), adolescents reported in 1977-78 eating 6.2% of total calories from meals in restaurants and fast food establishments compared to 21.5% in 1994-96. Sources of energy from snacks also increased over this period from 8.2% to 10.9%.<sup>64</sup> The nutritional quality of foods consumed at restaurants, and fast food establishments are generally less healthy than foods consumed at home.<sup>67</sup> Data from the national 1994-96 Continuing Survey of Food Intake by Individuals indicate that nearly one-third of children and adolescents consume fast food on any given day.<sup>68</sup> As might be expected, more frequent consumption of fast food by adolescents was associated with greater than recommended energy intake from fat and inversely related to consumption of fruit, vegetables, and milk. However, overweight status was not significantly associated with frequency of eating fast food.<sup>68</sup> A study comparing energy intake from fast food consumption of overweight and normal weight adolescents, found that both overweight and normal weight adolescents consume more calories when eating fast food, the normal weight adolescents maintain energy balance throughout the day while the overweight do not.<sup>69</sup>

**Consumption of fruits and vegetables.** Eating a healthy diet rich in fruits and vegetables can lower an individual's risk for chronic diseases such as certain cancers and CVD,<sup>70,71</sup> since fruits and vegetables have few calories relative to volume, are high in vitamins and minerals, eating them can be beneficial for weight management.<sup>71,72</sup> Yet, children and adolescents do not eat the minimum daily recommended servings of 5 fruits and vegetables.<sup>71</sup> The 2007 Youth Risk Behavior Survey (YRBS) of U.S. high school students showed that 79% of all students eat less than the recommended 5 or more servings of fruits and vegetables. However, the dietary intake of fruits and vegetables did not vary significantly among racial and gender subgroups.<sup>73</sup>

**Breakfast consumption.** It has also been shown that a considerable number of boys and girls do not eat breakfast this is considered to be an unhealthy habit.<sup>74</sup> and children of working mothers were more likely to report skipping meals, possibly leading to overeating later in the day.<sup>75</sup> The role that breakfast plays in the development of overweight and obesity in children was examined. One study conducted by Sekine et al<sup>76</sup> found that most students eat breakfast every day and there were no significant differences between the students who were overweight and those who were not. However, a National Longitudinal Study of Adolescent Health with strong methodological features found that eating breakfast was the only predictor that influenced weight in adolescent boys.<sup>77</sup> What children ate for breakfast was examined,

results showed that the principle predictor of high BMI in children 6-18 years was the type of breakfast they ate. This evidence supports that eating patterns plays a major role in the development of obesity in children and adolescents.<sup>78</sup>

**Physical activity behavior.** Decline in physical activity levels observed during the past decades is often linked to the rise in prevalence of overweight.<sup>79</sup> Physical activity is defined as any activity that increases heart rate and respiratory rate or "getting out of breath" some of the time.<sup>80</sup> Physical activity can be achieved through sports, playing with friends, or walking to school. The current guidelines from several different pediatric organizations recommend that children and adolescents should get at least 60 minutes of cumulative physical activity per day.<sup>81,82</sup> A 2002 US survey of children in grades 9-12 recorded that less than 39% of children participated in at least 60 minutes of activity on at least 5 out of 7 days.<sup>83</sup> Furthermore, this study found that 10% had not participated in any activity at all. Despite extensive research supporting the benefits of physical activity, including reduction in risk of a variety of health conditions, a 10-year longitudinal study found substantial decline in physical activity during adolescence in girls.<sup>84</sup> Additionally, a larger increase in BMI was observed in girls and boys who reported higher caloric intake, less physical activity, and more time with sedentary activities such as watching TV, playing video games, and spending time on the computer.<sup>85-88</sup> In addition to the general decline in physical activity, there has also been an increase in sedentary leisure time activities. Sedentary behavior is defined as limited body movement or minimal energy expenditure.<sup>89</sup> Sedentary lifestyle is not only the absence of activity, but includes physically passive activities such as watching television, video games, reading, driving, eating, using a computer, and talking on the telephone. Several research studies reported a positive association between the times spent viewing television/video games and spending time on a computer and an increased prevalence of overweight in children.<sup>73,86,87,90,91</sup> Sedentary activities, specifically television viewing, displace time children spend in physical activities. Television viewing contributed to increased energy consumption through excessive snacking and eating meals in front of the TV, since fast food ads influenced children in making unhealthy food choices through exposure to poor nutritional quality food advertisements, at a time children's metabolic rate is lowered.<sup>73,92</sup> According to Lowry et al,<sup>73</sup> television viewing represents the single greatest source of physical inactivity among U.S. children, and adolescents. The YRBS indicates that watching television for more than 2 hours a day correlates with being overweight and eating inadequate fruits and vegetables. In addition,

the NHANES III data showed that the prevalence of obesity among U.S. children increased as hours of television watching increased and the prevalence of obesity was lowest among children with one hour or less of television viewing per day.<sup>90</sup> Similarly, Dowda et al<sup>93</sup> found that girls who watched more than 4 hours of television per day were more likely to be overweight than those who watched less than 4 hours per day. According to Eisenmann et al, the prevalence of obesity in 12- to 18-year olds increased 2% for every additional hour of television viewing per day. Therefore, the odds of being overweight or obese among adolescents who watch television, work on computers, and read is a critical consideration in any obesity study.<sup>92</sup>

**Environmental influences.** The environment includes an individual's home, work, school, leisure time places and/or neighborhood. In the case of adolescent obesity,<sup>3</sup> environments have been the target for research-home, school, and neighborhood environments.

**Home environments.** The family is believed to be a key social environment in which health related behaviors are shaped.<sup>94,95</sup> Family interactions are thought to influence the development and alteration of child health behaviors including dietary habits, abstinence from smoking, and physical activity.<sup>95</sup> Research shows that parents mold children's health behaviors through interactions surrounding food, and activity as well as social modeling.<sup>96</sup> For example, parental control at mealtime, verbal prompts, and rewards surrounding eating, structuring of the home food environment, and of portion sizes appear to influence childhood eating behaviors.<sup>96</sup> One study reported that soft drink consumption of parents were strongly associated with soft drink consumption in children and adolescents.<sup>97</sup> Fewer family meals resulted in lower fruit and higher soft drink consumption among adolescents.<sup>98,99</sup> Better family relationships were also associated with higher fruit and lower soft drink consumption.<sup>100</sup> Authoritatively parenting styles that combined a higher levels of parental control were associated with higher fruit intake.<sup>101</sup> On the other hand permissive parenting such as giving adolescents more decision-making power on food was associated with less healthy eating behaviors.<sup>94,102</sup> The literature regarding determinants of healthy eating concluded that an authoritarian parenting style, characterized by restricting unhealthy food items, and using healthy food items as a reward, was found to increase intake of unhealthy food items once restriction was removed. Parents also appear to have a strong influence on physical activity behavior. The mechanisms can be either direct (by providing a supportive, nurturing environment), indirect (through modeling), or, more likely, both.<sup>103,104</sup> One study showed that similar to eating behaviors, a non-authoritative

parenting style was also positively associated with physical inactivity in adolescents.<sup>105</sup>

**Neighborhood environments.** Extending from the home environment to the community, several studies have started to investigate the associations between factors in neighborhoods where children live and eat, choose to do physical activity, and the effect of these environments on obesity. Very few studies agree on the most important correlates of neighborhood environments, making it difficult to assess how obesity or its related behaviors might be affected. In the past, children used to engage in physical activity as a part of their daily routine activities. They used to get all of their needed exercise simply by playing outside and interacting with friends. Since the late 1970's, however, there has been a 25% decrease in the time spent by children in play and another 50% decrease in other outdoor activities.<sup>106</sup> Norman found that children in the US spend an estimated 75% of the day being inactive.<sup>107</sup> One of the major reasons for the decrease in playing outside or participating in other outdoor activities among children is due to the lack of vacant land for recreational purposes.<sup>108</sup> Suburban sprawl, absence of sidewalks is viewed as a contributing factor to the decrease in levels of exercise by children and adolescents.<sup>109</sup> Children are also more likely to spend more time playing indoors than playing outdoors because playing outdoors might be dangerous due to traffic or other safety concerns. Thus, the parents concerns regarding the safety of their children, the television or computer have become a substitute babysitter for their children.<sup>108,109</sup>

**School environments.** Adolescents spend a large part of their day at school. Schools provide a setting in which it is possible to increase knowledge and awareness of healthy food options and restrict the availability of foods that are low in nutrients and high in fats and sugar. Student's eating patterns can be impacted by the school meals and environment. The school environment can also have a significant impact upon adolescent food choices.<sup>110</sup> The Institute of Medicine's "Health in the Balance" set forth recommendations in 2004, that schools "enhance health curricula to devote adequate attention to nutrition, and to include a behavioral skill focus."<sup>111</sup> Research of environmental influences via schools has focused on school meal programs, physical education requirements, and transportation trends. Most of the research is descriptive, but valuable in identifying the changes that have promoted increases in adolescents' obesity. The literature provides support to the idea that there have been many changes in today's school environment, particularly in the availability of fast foods and beverages and the decline in mandatory physical education offerings. Generally, most adolescents rely on vending machines for food during school time,

which allows for the purchase of high-caloric foods like soda, chips, and candy.<sup>111</sup> The School Health Policies and Programs Study (SHPPS) conducted by the CDC assessed school health policies, and programs on the state, district, school, and classroom levels in 2006. The survey investigated the vending of competitive foods such as soft drinks and fast foods in schools. The results indicate that 71.3% of middle schools, and 89.4% of high schools offer foods high in fat, sodium, or added sugars through vending machines, school stores, canteens, or snack bars. The most commonly sold items were sports drinks, soda pop, or fruit drinks (less than 100% juice), and salty snacks<sup>112</sup> around 20% of schools offer brand-name fast foods to students. Interestingly, these schools allow for less than 20 minute breaks to eat lunch, which gives an alternative meaning to fast foods.<sup>113</sup> The role of physical education (PE) in schools and its relationship to adolescent obesity remains controversial. Physical education class requirements decline drastically as student's go up in grade levels.<sup>114</sup> The typical instruction of PE is of low quality and limited activity when compared with ideal PE classes.<sup>115</sup> Many schools have reduced their responsibility to provide students with sufficient regular physical activities. This reduction has been attributed to budget cuts and the pressure to increase academic course offerings in order for schools to maintain educational standards, and remain competitive with other schools.<sup>111</sup> In addition, schools are not always equipped with time or resources to provide daily PE to all students.<sup>114</sup> Another reason for the decrease in physical activity among children is the increase in the miles driven in a vehicle per person, thus, resulting in fewer children walking to school or to other locations.<sup>116</sup> The suburbanization of communities has dispersed homes, schools, shops, and employment centers, increasing the distance one must travel. This necessitates driving, making the automobile the most practical and the predominant mode of travel, even for short distances.<sup>115</sup> Findings from the National Personal Transportation Survey (NPTS) conducted by the USA Department of Transportation found that there was a clear and significant decrease in the percentage of children, aged 5-15 years, walking to and from school.<sup>115</sup> Many of the school based interventions in recent years have included classroom curricula, PE curricula, changes in school meals, vending machines, and cafeterias, and after-school programs, have promoted healthful eating and physical activity in children and adolescents.<sup>117,118</sup> Many of these interventions have not been very effective in changing body weight or body fatness. Future research needs to more specifically focus on the energy balance; health promotion interventions need to be of sufficient duration and intensity taking into consideration the adolescent's lifestyle in school and at home.<sup>118</sup>

**Prevention/treatment of obesity.** Prevention must clearly be the primary focus of any efforts to address the problem of obesity, evidence suggesting that obesity, once established, is extremely hard to treat.<sup>119</sup> Throughout their time at school, children should have their BMI measured annually, perhaps by the school nurse. In approaching childhood obesity, we can consider 3 levels of prevention that include assessment of the child and family history of positive risk factors. First level, which aims toward maintaining normal BMI throughout childhood and adolescence, these children and their families, should receive support in maintaining healthy lifestyle behaviors; second level, is directed toward preventing overweight children (BMI: 85th to 94th percentiles) from becoming obese, children in this category are at increased health risk, and should be referred for further complete medical and laboratory assessment for the presence of cardiovascular risk factors. Depending on the results some children receive counseling on healthy lifestyle, whereas others could receive more-active interventions,<sup>33</sup> the third level is to treat obese children (BMI>95th) to reduce co morbidities and reverse overweight and obesity, if possible.<sup>33</sup> Given the current epidemic of childhood obesity with the subsequent increasing risk of type 2 diabetes mellitus, hypertension, and cardiovascular disease in older children and adults, improving lipid and lipoprotein concentrations during childhood and adolescence is a very important strategy to lower the lifelong risk of CVD. The American Academy of Pediatrics<sup>120</sup> emphasized the need for prevention of CVD by following Dietary Guidelines and increasing physical activity. A fasting lipid profile is the recommended screening approach for children and adolescents. This screening can be part of the routine clinical visits. If values are within the normal range on initial screening, the patient should be retested in 3-5 years. Children with positive family history of dyslipidemia or premature CVD, screening should take place after 2 years of age but no later than 10 years of age. Screening before 2 years of age is not recommended. Overweight children belong to a special risk category of children and are in need of cholesterol screening regardless of family history or other risk factors.<sup>120</sup>

**Nurses role in the Middle East.** In recent years, the prevalence of overweight and obesity became exceptionally high in many Arab countries in the Eastern Mediterranean Region (EMR).<sup>121-126</sup> These countries have undergone a rapid epidemiological transition, “a complex change in patterns of health and disease and on the interactions between these patterns and their demographic, economic, and sociologic determinants and consequences”.<sup>127</sup> One of the most noteworthy consequences of these countries’ transitioning to

western lifestyles are changes in the amount and types of food consumed, which have led to an increase in childhood obesity.<sup>38,128</sup> Obesity is a major challenge facing the Arab nation’s health, and preventing and treating the condition is a complex undertaking. Nurses and other health professionals have a central role to play in identifying overweight and obesity in children. Advancements in nursing education have included, at the baccalaureate and even more so at the master’s degree level, a focus on prevention. This makes it possible for nurses becoming much more active in health promotion disease prevention and risks factor reduction. Nurses can be at the forefront to address the multifaceted issues surrounding the obesity epidemic. Nurses work in diverse health and community settings that provide numerous opportunities for health promotion and obesity prevention. They have a key role in collaborating with other health care providers, communities, and government policy makers to address this serious public health issue. Community nurses often spend more time with patients than other health care providers during clinical visits and health promotion activities, or illness prevention functions. Especially in areas where there is a shortage of physicians, nurses take on an even more important role in teaching the public on health practices. Therefore, nurses have multiple opportunities to initiate and facilitate identification, education, and physical activity that will have a positive impact on childhood obesity.<sup>129</sup> Identification of a child’s BMI can be performed during routine assessment of clinical visits, primary care centers, or during school health screening. Assessing the child’s parents is also very helpful in identifying a child who is at risk of becoming obese. Once a child is identified as being overweight and at risk of becoming obese, education regarding obesity is of utmost importance. A nurse should take every opportunity possible to educate children and their parents. For effective prevention and treatment, nurses should consider the psychosocial and cultural dynamics that affect health behaviors, as well, as the comorbidities associated with being overweight or obese. Patient motivation and readiness to change are essential for the management of obesity, and particularly for the maintenance of weight loss. Nurses are encouraged to promote healthy family lifestyle patterns across the lifespan. For example, the encouragement of breastfeeding, physical activity, regular meals, and nutrition and weight counseling are important interventions that help reduce the risk of obesity at all stages of human development. Nurses are in a unique position to provide leadership in assisting families to make healthier lifestyle choices and incorporate these into their daily lives. Nurses, regardless of the practice setting, must take any opportunity to assess children’s

risk for obesity, and counsel parents regarding healthy lifestyles. Families may need a referral for assistance to find creative strategies to develop and maintain healthy lifestyles. Nurses in the community setting should work within the community to find methods to overcome barriers to healthy living. Nurses can assess the family, especially the parents and the community, versus the individual child's lifestyle. The strongest influence on young children's lifestyle behaviors is their family. They soon learn what foods to eat, or whether it is fun to watch TV or be physically active by what the parent introduces and models for the child. The community nurse should address the safety issues of a community or develop creative partnerships within the community to find ways for children to be active in play. Continued research, testing of culturally appropriate strategies is needed to address how families perceive obesity, barriers, and facilitator's in incorporating healthy lifestyles, and how health care providers relate their concerns to parents or the community regarding obesity.

In conclusion, the increase in prevalence of overweight reflects a population shift toward positive energy balance. Dietary intake and physical activity represent the behavioral but, modifiable aspect of this equation. Available research shows that adolescent obesity is not due to one factor; but rather, multiple factors are implicated that simultaneously result in increased energy intake and decreased energy expenditure in the child, resulting in an energy imbalance that subsequently leads to obesity. Changes in society and behavioral patterns of communities over recent decades, increased consumption of more energy-dense, nutrients-poor foods with high levels of sugar, saturated fats, combined with reduced physical activity and the sedentary nature of modern life such as use of computer and video games contribute to the current low levels of physical activity and subsequent childhood obesity. Solutions to the problem of obesity need to be multifaceted and must recognize the true complexity of this problem, they must address environmental as well as individual factors, and needs be designed to bring on long-term, sustainable change, rather than promising overnight results. Obesity is also an issue which demands the action of policymakers. It is vital to ensure that the public are fully aware of the dangers of obesity and the importance of healthy eating, and that they also have the practical skills and information they need to implement these messages in their daily lives. Moreover, successfully combating the epidemic of adolescent obesity; could result in an immediate and long-term improvement in quality of life for the adolescent and prevent adult obesity, resulting in substantial savings in health care costs through prevention, and treatment of obesity, and its complications. In view of the alarming increases of

obesity in Jordan and other Middle Eastern regions, the time has come to learn from the many lessons learned from the US, and elsewhere, and use these lessons and adapt them to the unique social, cultural, and climatic requirements of our region. Employees of Ministries of Health and health care providers in our countries can find creative and culturally appropriate ways to combat the problem of childhood obesity.

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