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Original Article

Physical activity, sedentary behaviors and dietary patterns as risk factors of obesity among Jordanian schoolchildren

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ABSTRACT

Objective: To identify certain risk factors associated with childhood obesity related to lifestyle; dietary patterns, physical activity, and sedentary behavior.**Methods:** A cross-sectional study was conducted among 977 schoolchildren (473 boys and 449 girls) aged 7–18 years. Children were selected randomly from three main cities in Jordan: Amman, Irbid, and Mafraq by using multistage cluster sampling method. Sedentary behaviors, physical activity and child eating behaviors were measured by using validated questionnaires. Overweight and obesity were defined by International Obesity Task Force (IOTF) criteria.**Results:** Sedentary activities increase the risk of overweight among schoolchildren by 2-fold [RR(Relative risk) = 2.0, 95% CI(Confidence interval) (1.1–3.6), $p = 0.02$]. Whereas, sedentary activities for less than 3 h increased the risk of overweight by 0.8-fold [RR = 0.8, 95%CI (0.6–1.3), $P = 0.388$], Schoolchildren who spent <30 min/day in exercising decreased the risk of overweight by 0.5-fold [RR = 0.5, 95% CI (0.2–1.0), $P = 0.06$]. Both Students who ate one meal daily and daily ate snacks from schools cafeterias had a higher tendency to be obese [(RR = 1.8, 95%CI (0.5–5.9), $P = 0.368$], and [RR = 1.5, 95%CI (0.9–2.5), $P = 0.169$] respectively.**Conclusions:** Physical activity, eating meals regularly and homemade food, all together play a significant role in decreasing obesity among Jordanian schoolchildren, thus a national policy that promoting active living and healthy eating among schoolchildren is warranted.

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1. Introduction

The prevalence of childhood obesity has been increasing alarmingly; it constitutes a serious global public health challenge [1]. Globally, the prevalence of overweight and obesity in children aged rose by 47.1% between 1980 and 2013 [2]. Prevention of childhood obesity is critical as it is associated with the development of unfavorable health outcomes during adulthood [3] such as cardiovascular diseases [4], type 2 diabetes and other chronic diseases later in life [5].

Obesity is a multi-gene condition and the expression of obesity is modulated by environmental factors, but above all by a number of modified genes interacting with each other [6]. The rapid

increase in body weight results from a positive energy balance when energy intakes exceeds energy expenditure [7]. However, behaviors that may influence the energy balance have been referred to as “energy balance-related behaviors” (EBRBs) [8]. In children and adolescents, the most important behavioral determinants of overweight and obesity include over consumption of energy-dense foods, levels of physical activity and sedentary behavior [9]. Dietary and physical activity habits are formed at early life stages and have been to track into later life indicating the urgency of increasing our understanding of the origin and development of EBRBs in children [10]. A recent report showed that the total deaths attributable to low physical activity from 1,489,000 in 1990 to 2,182,000 in 2013 (465%, 640% age-standardized) [11].

Rapid changes in eating habits, lifestyle, and lack of physical activity have led to an increase in the prevalence of overweight and obesity in the Arab countries and consequently has led to a significant increase increase in chronic obesity-related non-

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communicable diseases [12]. In Jordan, between 1980 and 2013, 24% of boys and 25.4% of girls (<20 years) were either overweight or obese, and 8.0% were obese [2]; yet, there are limited studies in Jordan aimed to determine risk factors for obesity related to lifestyle, dietary habits and physical activity patterns [13]. As such, the objective of the current study was to assess the strength of the association of risk factors for childhood obesity related to lifestyle including dietary pattern, physical activity and sedentary behavior among Jordanian schoolchildren aged 7–18 years old attending public schools in Amman, Irbid, and Mafrq.

2. Material and methods

2.1. Study population

A cross-sectional study was conducted during 2009–2011. A total of 922 schoolchildren (473 boys and 449 girls) aged 7–18 years were selected randomly from 20 Jordanian public schools, by using multistage cluster sampling method, in three major cities in Jordan; Amman, Irbid, and Mafrq. Amman is the capital city of Jordan and is the largest and most populated city in the country. Irbid is the largest city in Irbid governorate which is also heavily populated but its inhabitants are less wealthy. Mafrq is the largest city in Mafrq governorate located to the North-East of Jordan. It is sparsely populated, making less than 5% of total Jordan population, and still has a Bedouin population with a nomadic lifestyle who are only semi-settled.

The study protocol was approved by the Research Review Committee, Deanship of Scientific Research, The University of Jordan, and the Ministry of Education. A written consent was obtained from parents of every study child. Data were collected and reported in confidentiality. The population sample size was determined according to the number of population of young schoolchildren from public schools in the selected governorates for the academic years 2009/2010, The Jordanian Ministry of Education.

A total of 922 schoolchildren approved to participate in the study. Unreturned consent forms were considered dropouts, constituting a rate of 15.6% for boys and 18.0% for girls. A total participants of 922 schoolchildren (473 boys and 449 girls) participated in the study. The 922 sheets of questionnaires distributed, 767 (399 boys and 368 girls) were fully completed with a response rate of 83.2% as shown in Table 1. The dropout rate for the boys was 2.6% for the normal weight, 18.2% for the overweight, and 35.1% for the obese. A similar trend was obtained for the girls with the following respective values of 2.5%, 21.8%, and 33.6%.

2.2. Data collection

The data were collected by using questionnaire consisted of three main groups: (1) demographic data, (2) dietary history and eating practices, and (3) physical activity practices. Questions

required short answers such as: yes, no, or short statements. Multiple-choice questions included three to five different choices including “I don't know” choice. The survey questionnaire took approximately 20 min for a student to complete.

To assess the content validity, a panel that included Academics of Nutrition and Physical Sciences as well as nurses, parents and young adults was asked to revise the developed questionnaire which was in Arabic language. Certain comments of the panel group were taken into consideration. In addition, a pilot study was undertaken by thirty six children comprised of two girls and two boys from each participating schools. The estimated value of internal consistency and reliability of the developed questionnaire was 0.79 using Cronbach's alpha statistics.

2.3. Anthropometric measurements

In a follow-up session, body weight (kg), height (cm) and waist circumference (cm) were measured using standard procedure. Body mass index (BMI) was calculated. The International Obesity Task Force (IOTF) age- and sex-specific BMI cutoff reference standards were used to identify overweight and obese adolescents between the ages of 2 and 17 years [14].

2.4. Statistical analysis

Data were analyzed using the graduate pack SPSS 17.0 for windows 2007. Differences among participants were examined using analysis of variance (ANOVA) for continuous variables, and chi-square tests for categorical variables. Association was tested using binary logistic regression. Data are presented as means \pm standard deviation (SD) and as frequency distributions. The degree of internal consistency of ordinal scales was determined using Cronbach's alpha statistics. All *p* values of less than 0.05 were considered statistically significant.

3. Results

Table 2 presents the anthropometric indicators for schoolchildren. Obviously, BMI and waist circumference were significantly higher among obese boys and girls as compared to normal weight and overweight children ($p < 0.05$). Table 3 shows that normal weight girls maintained regular exercise significantly higher than normal weight boys (49%, 26.5%; respectively, $p < 0.01$). The percentage of obese girls (28%) who performed physical activity for <30min three to four times weekly tended to be higher than normal weight and overweight girls (23.5% and 10.2%). Moreover, obese school children were more sedentary than normal weight with no significant difference ($p = 0.117$).

Table 4 shows that normal weight girls consumed more homemade food than boys regardless of body weight ($p = 0.003$). Regardless of body weight status, the highest proportion of study

Table 1
Distribution of the population sample according to body weight status.

	Normal weight	Overweight	Obese	Total
Boys (n=473)				
Approved to participate, n(%)	192 (97.4)	135 (81.8)	72 (64.9)	399 (84.4)
Dropouts, n(%)	5 (2.6)	30 (18.2)	39 (35.1)	74 (15.6)
Study participants	197	165	111	473
Girls (n=449)				
Approved to participate, n(%)	196 (97.5)	115 (78.2)	57 (66.4)	368 (82.0)
Dropouts, n(%)	5 (2.5)	32 (21.8)	44 (33.6)	81 (18.0)
Study participants	201	147	101	449
Total Study participants	388	250	129	

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