Nubani-Husseini M, Berry E, Abdeen Z, Donchin M. Dietary patterns and physical activity among Palestinian female schoolchildren in East Jerusalem (Original research). SEEJPH 2016, posted:15 February 2016. DOI 10.4119/UNIBI/SEEJPH-2016-92

ORIGINAL RESEARCH

Dietary patterns and physical activity among Palestinian female schoolchildren in East Jerusalem

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Abstract

Aim: This study aims to assess the Palestinian girls' dietary habits and physical activity patterns as a baseline for intervention.
Methods: A cross-sectional study of grade 4 and 5 pupils (mean age: 11 years) in 14 all-girl schools in East Jerusalem, of four different types of school ownership (overall N=897), was conducted, using self-administered questionnaires and height and weight measurements. Logistic regressions were conducted to determine predictors of healthy behaviours.
Results: Only 36.6% of the pupils reported eating breakfast daily, with UNRWA schools having the highest rate of daily breakfast consumption (42.6%). About 28% reported eating the recommended daily quantity of five portions of fruits and vegetables. Only 15% of the pupils reported being active at least five days a week and more than one third of the schoolchildren viewed TV for ≥4 hours a day. The prevalence of overweight and obesity was 22.2% and 7.6%, respectively, with private schools having the highest rates, 29.6% and 12.8% respectively (P=0.001). Additional predictors of overweight and obesity were: being the first child in the family, watching TV for more than four hours a day, always eating while watching TV and being physically active less than five days a week.
Conclusions: Most Palestinian pupils miss breakfast, eat less fruits and vegetables than recommended and have sedentary behaviours. These findings raise serious concerns and point to the urgent need for tailored interventions.

Keywords: dietary and physical activity behaviour, obesity, Palestinian female schoolchildren.

Conflicts of interest: None.

Source of funding: This study is a part of Ph.D. degree. Maha Nubani-Husseini received a scholarship from Joint Distribution Committee (JDC). She thanks Nutrition and Health Research Institute Al-Quds University for funding part of the research. The Linda Joy Pollin Cardiovascular Wellness Center for Women at the Division of Cardiology of Hadassah University Medical Center, directed by Dr. Donna Zfat funded the mothers' activities and lectures towards the end of the intervention, as well as the implementation of the programme at the control schools one year after the study ended, as they were promised when they got selected.

Acknowledgments: The authors thank the participating schools, the Palestinian Ministry of Education, the UNRWA Office of Education and Jerusalem Municipality for facilitating fieldwork. Their gratitude also goes to Mr. Radwan Qasrawi (Al-Quds University), Dr. Marrio Baras and Dr. Deena Jaffeh (Hebrew University) for statistical support, and to Mrs. Suzy Daher for editing.

Introduction

Healthy nutrition and physical activity are the key factors in preventing and reducing obesity in children (1). Additionally, adapting such a healthy lifestyle throughout one's life span is essential for optimal physical growth and intellectual development (1). Obesity is known to be a significant risk factor for chronic diseases including type II diabetes mellitus, cardiovascular disease and certain types of cancer (2,3), and imposes a substantial economic burden (4). The obesity trend is especially alarming considering the increasing prevalence in children and adolescents. The need for effective preventive measures to control obesity has therefore become a major public health issue.

In Palestine, rapid urbanization, modernization and sedentary lifestyle have contributed to the increasing prevalence of overweight and obesity in all age groups (5). However, there are few local studies focusing on eating habits and physical activity patterns. One study was part of the Health Behaviour School Children survey (HBSC) conducted in 2004 in the West Bank and Gaza strip. This survey acknowledged problems such as skipping breakfast particularly among girls, low consumption of vegetables and fruits and low intake of milk (6). Such data is lacking for female schoolchildren from East Jerusalem. The current study is done to fill this gap and is part of a baseline study of a school-based intervention programme in East Jerusalem to promote healthy eating and physical activity among schoolchildren, their mothers and teachers.

The purpose of this paper is to describe nutritional and physical activity habits and their socio-demographic determinants among Palestinian girls in East Jerusalem schools of different types of ownerships.

Methods

Study design and population

A cross-sectional study was performed in April-June 2011 to provide the baseline data in a randomized controlled programme trial, before allocating schools into intervention and control groups. The primary target population was girls in grades 4 and 5, as those elementary schoolchildren are old enough to be able to answer the questions, however, they are not yet close to puberty when hormonal changes could have altered the results.

All schoolgirls from the different types of ownership in East Jerusalem were eligible for the study. This included 31 Jerusalem Municipality (JM) schools with 2,759 students, 23 Palestinian Authority (PA) schools with 2167 students, 40 Private schools with 820 students and eight United Nation Relief and Works Agency (UNRWA) schools with 1218 students. Average number of students per class is 34, with different numbers according to school type of ownership.

Sampling was done in two stages: i) stratified sampling of schools according to their ownership; ii) a random selection of classes (by lottery). All students in the selected classes were included.

Sample size calculation was based on the estimated prevalence of healthy behaviours relating to physical activity (>5 days per week), which was estimated at 25% among girls in grade 6 in the HBSC study (6). Assuming that this behaviour will increase among the intervention schools to 40%, and will remain at 25% in the control group, with a significance level of 5%, a power of 90%, intra-class correlation of 0.001 and a cluster size of 34, a sample of 14 schools was needed in order to provide 13% of the eligible population (952/6962). A random sample of schools was drawn in each of the four strata. This corresponded to six schools from the Jerusalem Municipality, four PA, two Private and two UNRWA schools, with 28 classes

and 935 students.

Data collection

A structured self-administered anonymous questionnaire was given to the pupils based on the HBSC questionnaire (6),which in turn was based on the WHO format (7). It focused on dietary assessment (eating breakfast, drinking before leaving for school, consumption of fruit and vegetables, milk consumption), physical activity (mode of transport to and from school, days per week active in sport for at least one hour per day), physical inactivity (watching TV) and knowledge (recommended daily consumption of fruits and vegetables).

The class teacher supervised filling the questionnaire by reading out aloud each question and then asking for an immediate response. The main researcher (MH) was present during administration of the questionnaires to clarify questions if required.

Respondents were informed that answering was voluntary and that information would be treated confidentially.

The height and weight of each student were measured after they completed the questionnaire, Students' weights were measured in their lightweight clothes (schools' uniform with no jackets) and without shoes before 10 o'clock break according to a standard protocol and instrument. Care was taken to ensure that the measurements were done sensitively and separately in a private room with the presence of the class teacher's supervisor.

Mothers' level of education and occupation was based on the mothers' self reported questionnaire and school files of the children for missing data.

Measures

Eating breakfast was assessed based on the question *"Do you always eat breakfast before you leave for school?"* with response options (1) yes, every day, (2) yes, sometimes, (3) never. Whereas drinking in the morning: (1) yes, always, (2) yes, sometimes, (3) never. Next, both questions were categorized into Yes (yes, every day) or No (sometimes or never). Daily consumption and quantity of fruits and vegetables were calculated and converted to two categories <5 serving per day ≥5 servings per day. Physical activity assessment was categorized into: (1) physical activity >5 days a week; (2) ≤5 days a week. BMI-for-age was computed for each child using the WHO software AnthroPlus 2007 program. This program deduced z-score and percentiles using the exact age in days (8). Overweight was determined if a child's z-score fell between ≤ + 1SD and +2 SD (85^{th} percentile). Obesity was determined if the child's z-score fell above and equal 2 SD (97^{th} percentile), while underweight was determined if z-score fell below minus 2 SD (3^{rd} percentile). Mothers' education was divided into three categories; (1) less than secondary, (2) secondary, (3) diploma and higher. Employment was divided into two categories; (1) yes, (2) no. Crowding index (the ratio between number of residents at home and number of rooms) was used as a proxy for socio-economic status and divided into (1) less than one; (2) 1-2, (3) more than 2.

Statistical analysis

Data analysis was performed using SPSS version 20. Chi-square tests were used to calculate associations between categorical variables by school ownership, grade, socio-demographic/economic variables. A stepwise forward logistic regression model was built for identifying independent predictors of eating breakfast daily, eating the recommended quantity of fruits and vegetables, physical activity and overweight and obesity. The variables in the final model of the stepwise forward logistic regression were tested again by entering them into the logistic regression models.

Ethical considerations

Approval from the Israeli Ministry of Education, Palestinian Ministry of Education, UNRWA Office of Education Department and private school principals was obtained. The research program was approved by the Hebrew University of Jerusalem/Authority for Research Students Committee.

Results

Sample characteristics

All 14 selected schools agreed to participate in the study. Of the 935 eligible schoolchildren, 897 (95.9%) participated (49.9% children were from grade 4 and 50.1% were from grade 5). Non-response was due to absence from school on the day of data collection. Table 1 presents the socio-demographic characteristics of the study population by school ownership.

Table 1. Socio-demographic characteristics of the study population by school ownership

Variable	School Type				
	Municipality (n=400)	**PA (n=236)**	**UNRWA (n=136)**	**Private (n=125)**	**Total (n=897)**
Grade (%):					
4th Grade	49.8	50.0	49.3	51.2	49.9
5th Grade	50.3	50.0	50.7	48.8	50.1
Age:					
Mean	11.02	11.00	11.10	10.98	11.02
SD	0.70	0.78	0.87	0.71	0.71
Order in the family (%):					
1	19.2	19.1	16.9	29.6	20.6
2-3	39.0	30.9	37.5	51.2	38.4
4	15.6	16.1	15.4	9.6	15.2
≥5	24.8	33.9	30.1	9.6	25.9
Sibling (%):					
0-2	14.5	6.8	5.9	43.2	15.2
3-4	44.8	42.4	38.2	46.4	43.4
≥5	40.8	50.4	55.9	10.4	41.4
Crowding index (%):					
<1	9.0	6.4	8.1	17.6	9.4
1-2	54.5	66.1	51.5	62.4	58.3
>2	36.5	27.1	40.4	20.0	32.3
Religion (%):					
Muslim	100.0	100.0	100.0	59.2	94.3
Christian	0.0	0.0	0.0	40.8	5.7
Mother education (%):					
Less than secondary	45.6	49.0	52.7	7.1	42.2
Secondary	40.0	34.3	36.4	38.1	37.7
Diploma & higher	14.4	16.7	10.9	54.9	20.1
Mother employment (%):					
Yes	16.6	15.9	14.5	33.9	18.5
No	83.4	84.1	85.0	66.1	81.5

The age of students ranged between 9-14 years (mean: 11.02, SD±0.71). About 94% were Muslims and 6% were Christians, all attending private schools. The mean family size was

7.1; Schoolchildren from Municipality, P.A and UNRWA had more siblings compared to those in Private schools. Schoolchildren from Municipality and UNRWA schools lived in higher crowding index (residents per room) compared to PA and Private Schools. About 81% of the mothers did not work and 20% had a diploma or higher education.

Dietary habits

The percent of schoolchildren who reported having breakfast was 36.6%. There was a significant difference between school ownership with UNRWA schools having the highest rate of daily breakfast consumption (42.6%), compared to Municipality, PA and Private (P=0.032) (Table 2). More Muslim schoolchildren (29.7%) consumed breakfast compared to Christian schoolchildren (25.5%) in Private schools.

Table 2. Dietary pattern, physical activity, knowledge perception, overweight and obesity (%) by school type and crowding index

BEHAVIOURAL CHARACTERISTICS	School ownership				Crowding index		
	JM N=400	PA N=236	UNRWA N=136	Private N=125	<1 (n=84)	1-2 (n=522)	>2 (n=290)
Dietary pattern							
Always eating breakfast	38.3	34.7	42.6	28.0*	56.0	33.3	33.6†
Always drinking in the morning	46.0	42.0	51.5	47.0	52.2	48.8	45.2
Always eating vegetable at 10 o'clock break	18.3	8.5	22.8	16.0‡	23.8	15.7	14.5
Always eating fruits at 10 o'clock break	18.3	11.4	20.6	16.1	16.7	15.9	17.6
Eating ≥5 serving of vegetables and fruits/day	35.8	22.1	14.0	27.2‡	29.8	27.2	27.2
Eating vegetables once or more per day	21.3	27.5	13.2	23.2*	26.2	21.5	21.4
Eating fruits once or more per day	23.3	19.6	16.9	23.2	29.8	22.2	17.0*
When thirsty water is the most used drink	69.5	90.3	79.0	68.0‡	78.6	74.7	78.3
Drinking milk every day	43.3	40.7	27.2	52.0‡	59.5	41.8	35.5‡
Lunch is the main meal at home	74.2	77.5	61.0	77.6*	76.2	73.9	72.3*
Eating with family or at least one parents	79.5	77.0	77.2	72.8	77.4	78.1	76.6
Eating while watching TV	27.0	21.7	20.6	32.0‡	28.6	24.9	25.3
Eating while using computer	5.3	1.70	8.1	4.80†	3.6	4.6	5.2
Eating when bored/angry/stressed/frustrated	6.5	4.2	4.4	1.6†	4.8	5.2	4.5
Physical activity pattern							
Walking to school in the morning	65.3	71.6	93.4	39.2‡	57.1	64.4	76.2‡
Walking back after school	73.3	76.3	97.1	40.0‡	61.9	70.3	80.7†
Physically active ≥5 days a week	16.8	13.6	8.1	16.0	20.2	16.5	9.30
Sedentary behaviours							
Using computer >4 hours	20.0	14.0	7.4	17.6†	22.6	14.9	16.2
TV viewing ≥4	33.0	36.0	38.2	38.0‡	33.3	33.5	34.5
Knowledge							
Acknowledge importance of breakfast	91.7	94.5	94.0	94.4	94.0	93.7	92.0
Acknowledge importance of fruits & vegetables	97.7	97.0	95.6	100.0	96.4	98.1	96.9
Acknowledge importance of water	98.0	95.8	100.0	99.2*	97.6	98.1	97.9
Know recommended serving vegetables/fruits	12.5	12.0	10.3	14.4	25.0	21.3	23.5
BMI							
Overweight	24.8	14.4	21.3	29.6	29.8	19.3	25.2
Obese	7.5	3.4	10.3	12.8‡	7.1	8.4	6.2

* P<0.05; † P<0.01; ‡ P<0.001.

Eating breakfast daily was associated with the socio-economic status of the family, measured by crowding index. Those living in a house with fewer than one person per room had a 2.4-

fold increase in the likelihood of eating breakfast (OR=2.38, 95%CI=1.36-4.18), controlling for school type (logistic regression, Table 3). UNRWA schoolchildren were more likely to eat breakfast (OR=1.75, 95%CI=1.07-2.88) compared to other school types of ownership. If mothers always prepared breakfast for their daughters, there was a 4-fold increase in the likelihood of the child eating breakfast (OR=3.83, 95%CI=0.82-17.96), although this finding was not statistically significant. These three determinants contributed independently to having breakfast daily (logistic regression, Table 3). The mother's level of education and employment status, beliefs, and knowledge regarding the importance of breakfast meals and birth order were found to have no effect on eating daily breakfast. "Not feeling hungry" was the main reason for skipping breakfast (78.6%).

Table 3. Determinants of eating breakfast – logistic regression models[*]

Variable	Number	OR	P-value	95%CI
Crowding index:			**<0.001 (2)[†]**	
<1	73	2.38	0.003	1.36-4.18
1-2	432	0.75	0.099	0.53-1.06
>2	230	1.00	-	reference
School ownership:			**0.004 (3)**	
JM	341	1.00	0.640	0.62-1.34
PA	193	0.91	0.030	1.07-2.88
UNRWA	86	1.75	0.018	0.34-0.90
Private	115	0.55	-	reference
Mother preparing breakfast to her daughter:			**<0.001 (2)**	
Never	13	1.00	-	reference
Sometimes	235	1.41	0.67	0.29-6.76
Always	487	3.83	0.089	0.82-17.96

[*] The last variables left of the stepwise forward logistic regression were entered into the logistic regression model.

[†] Overall p-value and degrees of freedom (in parentheses).

The most commonly consumed food for breakfast was za'ater and oil with bread. This choice varied widely between school ownership type (P<0.001), where UNRWA schoolchildren consumed the most (61.6%). Other relevant variables were Muslim religion (P<0.001) and mothers who had not attained secondary education (P<0.001).

The proportion of schoolchildren who reported drinking in the morning before leaving for school was 46.2%. This was not found to be associated with school ownership, grade, or with socio-economic variables.

About 28% of the schoolchildren reported consuming the recommended number of daily servings of fruits and vegetables (five servings a day), with a significant difference between school types of ownership (P<0.001) and the mother's level of education (P=0.01). Only 12.3% of schoolchildren reported the correct answer for the daily recommended consumption of fruits and vegetables. Children of mothers with a diploma or higher level of education had a higher proportion of consuming the recommended number of servings (47.9%). School type of ownership and the mother's level of education remained statistically significant in the final multilevel logistic regression model. Being in a JM school increased the probability of consuming the recommended quantity of vegetables and fruit by 1.55 times (OR=1.53, 95%CI=0.76-1.96). Having a mother with a diploma or higher education increased it by 1.8

times (OR=1.80, 95%CI=1.25-2.60). The mother's employment status, religion, and crowding index were found to have no effect.
School ownership had a significant effect (P<0.001) on daily milk consumption, with private schools having the highest consumption (52%). Another predictor was the crowding index, which was inversely associated (P<0.001).
Most of the schoolchildren had lunch as the main meal which they ate with at least one parent.

Physical activity
The majority of schoolchildren reported walking to and from the school (67.6% and 72.9%, respectively). There was a significant difference between school ownership type (Table2), with UNRWA schools having the highest level (93.4% and 97.1%, respectively, P<0.001).
The overall reported physical activity in schoolchildren showed that pupils were only slightly active in sport. About 14% of schoolchildren reported being active at least five days a week (Table 2). This proportion was significantly inversely associated with the crowding index (20.2%, 16.5%, and 16.5% for up to one, between 1-2, and more than two, respectively, P=0.006). A positive significant association was also found with mothers' level of education (12.9%, 13.4% and 21.5% for less than secondary, secondary and diploma or higher education, respectively, P=0.027). No other tested variables were associated with physical activity.

Sedentary behaviours
One-third of the students (33.9%) viewed TV for ≥4 hours a day and this was significantly associated with the school ownership (P<0.001). The highest percentages reporting viewing television were found in UNRWA and Private Schools (38.2% and 38.0%, respectively). (Table 2). Sedentary behaviour was not associated with the crowding index, mothers' education or employment. No correlation was found between television viewing and being physically active.

Body weight
The overall prevalence of overweight and obesity was 22.2% and 7.6%, respectively. The difference between school ownership types was statistically significant (P<0.001), where the highest proportion was among Private schoolchildren (42.4%). More Christian schoolchildren in the private schools (47.1%) were overweight and obese compared to Muslim schoolchildren (39.2%). About 1% of schoolchildren were underweight, with highest rates among PA schoolchildren (3%) (Table 2). A significant higher prevalence of overweight and obesity was noticed with the first child in the family. The other independent determinants of overweight and obesity (logistic regression) were: watching TV more than four hours a day (OR=4.13, 95%CI=2.93-5.82); being physically inactive (less than five days a week) (OR=1.95, 95%CI=1.17-3.24) and always eating while watching TV (OR=3.42, 95%CI=2.27-5.13) (Table 4).
No association was found with crowding index, mothers' level of education or employment. About 75% of overweight/obese children considered their weight as normal, whereas 66% of those who perceived themselves as "high weight for their age" were actually overweight/obese children (data not shown).

Table 4. Determinants of overweight and obesity – logistic regression models[*]

Variable	Number	OR	P-value	95%CI
Family order:			**0.003 (3)[†]**	
1	185	1.00	-	reference
2-3	343	0.48	0.001	0.31-0.74
4	136	0.91	0.74	0.54-1.56
≥5	231	0.57	0.024	0.35-0.93
School ownership:			**<0.001 (3)**	
JM	399	1.00	-	reference
PA	235	0.38	<0.001	0.24-0.59
UNRWA	136	0.90	0.660	0.56-1.45
Private	125	1.71	0.026	1.07-2.75
Physical activity:				
<5 days/week	761	1.95	0.010	1.17-3.24
≥5 days/week	135	1.00		Reference
TV viewing:				
≤4 hours/day	597	1.00	<0.001	2.93-5.82
>4 hours/day	299	4.13		Reference
Eating while watching TV:			**<0.001 (2)**	
Never	315	1.00	-	reference
Several times a week	534	0.71	0.010	0.48-1.07
Every day	266	3.42	<0.001	2.27-5.13

[*] Overweight and obesity were combined. The last variables left of the stepwise forward logistic regression were entered into the logistic regression model.

[†] Overall p-value and degrees of freedom (in parentheses).

Discussion

The aim of this study was to provide baseline information of schoolchildren living in East Jerusalem as the first stage of a randomized controlled intervention programme. The results showed that most children fail to meet the international dietary and physical activity recommendations. There was a significant independent difference between school ownership and socio-economic groups, measured by the crowding index, but no significant difference was observed between grades for all the studied variables.

Approximately one third (36.6%) of female schoolchildren ate breakfast before school. This finding is consistent with the finding of dietary habits among Palestinian adolescents where 34.7% ate breakfast (9). Most of the schoolchildren reported "not feeling hungry" as the main reason for skipping breakfast, which is a growing concern worldwide, especially among females (10). In private schools, although the pupils come from higher social classes and are assumed to be in a better position to provide good food for their children, the level of skipping breakfast was the highest.

Za'ater and olive oil with bread is the most commonly consumed breakfast meal. This could be because of its prominent role in cultural heritage, due to the widely held belief that za'ater helps to keep mind alert especially prior to exams or school. Olive oil is known to be a main component of the Mediterranean diet, a rich source of monounsaturated fatty acids and an antioxidant agent, which has several beneficial biological functions for health (11). Studies also have proved that olive oil intake is associated with the reduced risk of cardiovascular disease and mortality in individuals at high risk (12).

Drinking milk was reported only by 40% of schoolchildren. Adequate calcium intake for children is essential for the development of bone mass and mineral density (13) and in the maintenance of health and prevention of chronic diseases (14). Strategies to encourage milk consumption by schoolchildren need special attention.

The reported fruit and vegetable intake was lower in our study than that found in the 2004 Palestinian HBSC survey (6). This could be due to rapid and progressive shifting among Palestinian adults to Western-style food patterns (9). Less than one third of schoolchildren reached the recommended daily dietary intake of five servings of fruits and vegetables (1). This means that these children may fail to obtain appropriate nutritional intakes of vitamins, mineral and fiber to protect them from diet-related chronic diseases (15), including overweight and obesity (16,17), despite the fact that Palestinian markets have a wide variety of vegetables and fruits at low prices. Therefore, the need to promote the consumption of more vegetables and fruits is viable and a public health priority.

Regular physical activity plays an important role in improving the quality of life. Although more than two thirds of schoolchildren reported walking in the morning to and from school, respondents did not engage in regular sport and physical activity in leisure time. Therefore, they do not achieve the recommended level of being one hour or more physically active per day (18). In Arab countries, including Palestine, women are prohibited by the socio-cultural norms from participation in outdoor sports activities. Therefore, there is a need to develop good physical education practices (e.g. skipping, which can be performed at home) to increase physical activities among girls.

In parallel, there is an increase in sedentary behaviours among schoolchildren, which is due mainly to time spent watching television, as in many other countries (15). This is because television is so accessible and available. Current recommendations are that children should spend no more than two hours watching television a day (19).

The problem of obesity

The prevalence of overweight and obesity is high among Palestinian schoolchildren, associated with lack of physical activity and increased sedentary behaviours. Childhood obesity is an increasingly worldwide problem. This study found that the prevalence of overweight is 22.2% and obesity is 7.6% which is higher than adolescents in the Gaza strip (17.0% and 5.45%, respectively) (20), Ramallah (18.9% and 3.3%, respectively), Hebron (14.9% and 2.0%, respectively) (9), but slightly lower than a previous study conducted in East Jerusalem in 2002 (24.3% and 9.9%, respectively) (21).

The overweight/obese schoolchildren were found more likely to watch television for more than four hours. This is in accordance with several cross-sectional and longitudinal studies showing very strong associations between television viewing and childhood obesity (22,23). Significant positive associations were found between eating while watching television and the risk of becoming overweight/obese. Watching television for many hours may lead to a snacking while watching (24), which is independently associated with overweight/obesity among children (25).

Schoolchildren in private schools have higher standards of living. Several studies have demonstrated that socioeconomic status is directly related to childhood obesity in developing countries (26), which is higher in urban areas (27,28). The discussed culture restrictions placed on girls which results in their staying at home with easy access to food, contribute to their increased risk of overweight and obesity. Evidence suggests that measures should be introduced as early as possible, so that healthy lifestyle habits are learnt from childhood (29).

Study limitations

The study involved a cross-sectional design, and therefore cannot address causality. Another limitation is using a self-reported questionnaire from schoolchildren in grades 4 and 5 which could have influenced its validity and reliability. However, studies show that results from self-administered questionnaires tend to minimize social desirability bias compared to interviewer-administered questionnaires (30).

Conclusion

This study shows that Palestinian girls miss breakfast, eat less fruits and vegetables than the recommended requirements, and have sedentary behaviours, which is associated with high prevalence of overweight and obesity. There is a need for developing effective intervention programmes to promote healthy eating and physical activity among Palestinian schoolchildren.

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