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Poor Nutritional Habits Are Risk Factors for Overweight and Hypertension in Children

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Abstract: To evaluate the relationship between the nutritional habits of Saudi children with health parameters related to cardiovascular risk. One hundred and sixty Saudi child representing different socio-economic districts who were attending the outpatient clinics at hospital of pediatric, King Saud Medical Compound, Riyadh City. They were randomly chosen. Their ages ranged between 6 and 13 year (62males and 98 females). This study was carried out from October 2010 to June 2011. Data were collected from the pediatric nutrition clinic (PNC) of the outpatient department (OPD); these children were referred to the nutrition clinic by the pediatricians for nutritional assessment and to be follow-up by dieticians for further nutritional treatment. A questionnaire was administered to the mothers of all children and was considered consent for their children's participation in the study. Dietary assessment: Daily dietary record over 3 consecutive days was used to assess typical child intake of macro-and micro-nutrient. The dietary reference intakes (DRIs) used is recommended values for the children by age and sex. Anthropometric and blood pressure (BP) were measured. More than quarter of the studied group was found to be obese (29%). The prevalence of overweight and obese females children were increased compared to overweight and obese males children. As regards the dietary habits, the majority of the children followed unhealthy eating habits, they often eat snacks daily with less frequency vegetables but more frequency fatty and fried food. According to DRI, the children have high energy intake, they revealed an excessive contribution of fat to total energy intake, which exceeded the recommended intake. Regarding to blood pressures of studied children both systolic and diastolic blood hypertension increase with age. The highest prevalence was at age 10 years for both pressures. Females have significantly higher diastolic pressure than males. There was a positive significant correlation between energy from fatty food group consumption and BMI as well as BP in both sexes, ($p<0.05$). A positive significant correlation was found between numbers of snacks, sweet food and duration of eating while watching T.V or computers and BMI ($p<0.05$). A negative correlation was found between consumption of fibers, vegetables and exercises and BMI as well as BP (SBP and DBP) in both sexes ($p<0.05$). Finally it could be concluded that irregular and infrequent meals together with a low vegetable and fruit intake were the most common unhealthy eating habits of the participants. Lifestyle modification is important, especially in young age groups to improve healthy habits earlier in life. Our findings suggest that preventive interventions should focus not only on obesity, but also to related diseases.

Key words: Obesity · Nutritional habits · Blood pressure · Cardiovascular risk

INTRODUCTION

Obesity is now considered as one of the important predisposing factors for many chronic diseases. Excessive weight has been a problem in developed countries and recently it started spreading in developing world [1]. Half of the obese children at age 6 were also obese at age 12 and the degree of obesity is predictive for adult obesity [2]. Obesity appears as a complex multi-factorial condition resulting from an imbalance between energy intake and expenditure, which has been associated not only with the genetic background (more than 50 genes have been located in the human gene map associated to obesity), but also with environmental forces such as reduced physical

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activity and with over consumption of fat-rich and high energy yielding foods. It also related to family variable including parental obesity, family size, age, socio-economic status and television viewing and its impact on food intake and activity [3]. Economic development in Saudi Arabia during the last 30 years has changed nutritional and life style habits [4].Unhealthy eating habits are major cause of morbidity and mortality in the US. Contributing to greater than 300.000 deaths each year [5]. Poor nutritional habits represent a very important component in the etiology of chronic diseases including cardio vascular disease and obesity [6].

Cardio vascular diseases have been reported to constitute one of the main causes of mortality in developed countries. Hypertension is one of the most common diseases in the world and a major risk factor for cardiovascular, renal and neurologic diseases. It seems that hypertension and overweight in children are a growing epidemic [7]. Thus, there is an urgent need for comprehensive nutritional assessment studies to characterize contemporary health and nutritional behavior in more detail in young people [8]. That will aid public health professionals in the development of more optimal nutrition education programs in universities and even in the general community, to ensure appropriate nutrient recommendation and to prevent diet related disease.

The objective of this study was to evaluate the relationship between the nutritional habits of the children aged 6-13 with health parameters related to cardiovascular risk.

MATERIALS AND METHODS

The subject studied constituted 160 Saudi child representing different socio-economic districts who were attending the outpatient clinics at hospital of pediatric, King Saud Medical Compound, Riyadh City, Kingdom of Saudi Arabia. They were randomly chosen. Their ages ranged between 6 and 13 year (62males and 98 females). This study was carried out from October 2010 to June 2011. Data were collected from the pediatric nutrition clinic (PNC) of the outpatient department (OPD); these children were referred to the nutrition clinic by the pediatricians for nutritional assessment and to be follow-up by dieticians for further nutritional treatment. Their main problems were obesity, diabetes, anemia and others. Exclusion criteria include subjects with any congenital abnormalities or cancer diseases.

Tools of the Study: A questionnaire was administered to the parents of all children and was considered consent for their children's participation in the study. The interview was carried out by the researcher for approximately 20 minutes for each subject, at the out patient diet clinic. At the beginning of the interview, the purpose was explained to the mother and assurance was given that all information will be treated with strict confidentiality and will be used for research purpose only. The patients/subjects medical record number was used to complete the medical history. The questionnaire included socio-demographic data, medical record number, age, sex, parents educational levels, occupation of the parents. The medical history comprised of medical illnesses such as hypertension in the subject or his or her parents. Assessment of physical activities, which include life style such as watching TV and exercise.

Dietary Assessment Section: Daily dietary record over 3 consecutive days was used to assess typical student intake of macro-and micro-nutrient, including food and beverages in the home and outside; energy and nutrient intake were measured. To properly record the weight of food consumed, each mother was provided with weighing scale and a questionnaire to write down the type and quantity of food that the child was eaten. The software program ESHA [9] was used to analyze the nutrient content of diet consumed by subjects under study-after supplements with information about Saudi dishes were loaded in the program after referring to its ingredients. Detailed information about the intake of food producing energy, protein, CHO, fat, dietary fiber and basic food groups (e.g. cereals, vegetables, fruits, milk-bean products) were obtained. The dietary reference intakes (DRIs) [10] used is recommended values for general population by age and sex. The average dietary energy intake was estimated to maintain energy balance in a healthy person, adjusting or practice location, gender, age, weight, height and physical activity level. The values used were based on a sedentary and active person at the reference up to the age of 19 years.

Anthropometric Measurements: Anthropometric measures comprised height, weight, mid-arm circumference, subscapular, triceps and skinfold thickness. Height was measured to the nearest cm by stadiometer, obtained without shoes, back straight with buttocks and shoulders touching a wall and head forward.

Weight was measured, to the nearest 0.5 Kg, by a spring balance. Calibration of the scale was made on a daily basis using two different standard weights. The child was weighed in light clothes (no shoes or heavy outer garments). The mid-arm circumference was measured after measuring the left upper arm length was measured from the acromion to the olecranon with the metal tape. The child's forearm was raised to make 90° angle during the measurement. The midpoint between the acromion and olecranon determined and marked on the dorsal surface of the arm. The midarm circumference was measured at the previously marked midpoint of the upper arm. The child's arm was hung loosely at his side, while the examiner took the measurement without compressing the arm. Skin fold thickness was measured at two sites, Triceps and subscapular skin folds. It was measured with a Lange skin fold caliper to the nearest 0.1 cm. During the measurement, the child used to stand with his arm pendant. The triceps skinfold was measured between the acromion and olecranon and the subscapular skinfold was measured below the tip of inferior angle of scapula. The examiner standing behind the child, grasped the dorsal skinfold parallel to the long axis over the triceps muscle with the thumb and forefinger of the right hand. Allowing the skinfold to slide free of muscle, the examiner gently compressed and measured the skinfold and then recorded the result. The measurement was performed three times during the examination. Percentiles for the anthropometric measures as weight and height [11], midarm circumference [12]. Triceps and skinfold thickness were obtained [11]. The measurements of the present study were related to age and sex and plotted on the percentile curves. Body Mass Index (BMI) it was used as an indicator for obesity and was defined as weight over height squared: [wt in kg/ (ht in m)^2], Obesity was defined as ≥ 95th percentile [11].

Blood Pressure Examination: Blood pressure was measured for all children by one trained examiner using random zero sphygmomanometer [13]. The child was seated at rest for at least 5 minutes before measurement. Two successive readings were taken approximately one minute apart [14]. The mean of the two readings was used to represent the individual's blood pressure. Systolic blood pressure (SBP) and diastolic blood pressure (DBP) were related to age and sex and plotted on standard percentile curves [11]. The children were considered hypertensive if they were on ≥ 95th percentile for both systolic and diastolic blood pressures.

Statistical Analysis: Data were expressed as mean ± S.E. and were analyzed statistically using SPSS version 12.0 software (SPSS, Chieage, III). The variables were compared using T-test and Chi-square test. Differences were considered statistically significant at P=0.05. Pearson correlation and stepwise regression analysis were used to investigate the relationships between blood pressure and anthropometric measurements [15].

RESULTS

Data presented in Table 1 illustrated that the studied sample of 160 children, 62 males and 98 females. The mean age of the sample was 8.8± 2.7 years that ranges from 6 to13 As regards their socio-demographic data and family history of diseases. Nearly half of the children's' fathers received below essential education (46) and 19% were university graduates, 30% of fathers were employees. Nearly half of the mothers received below essential education and 15% were university graduates, the majority of mothers were house wives. On describing the family income; most of the family of both sexes was sufficient and saving. As regards family history of diseases 15% of fathers and 13% of mothers have hypertension, While 7% of fathers and 6% of mothers have coronary heart diseases. Data in Table 2 illustrated that the children response to questionnaire related to their life style practice including eating habits, exercise and TV watching. The majority of the children followed unhealthy eating habits; 52% of females and 41% of males eat meals (3 times /day) and 44% of females and 43% of males often eat snacks daily. Also 40% of both sexes consumed vegetables once to 2 times /week, the majority of children (36% of females,40% of males) drink full cream daily, also the majority of children (36% of females,41% of males) eat fatty foods (3-4 times/week). The percent of female's children were 37% and 39% of males consumed fruits once to 2 times /week. High percent of female's children 41% and 42 % of males consumed sweet foods daily. Also 27 % of females and 26 % of males often drink juices, while 25 % of females and 26 % of males often eat chips during TV watching. The percent of females and males rarely make exercise were 34% and 45% respectively. There was no statistically significant difference was found between females and males for all items of the table ($p > 0.05$).

Table 3 shows energy and macronutrient intake of female and males children. Based on DRI, percent of energy from CHO was found to above the recommended

Table 1: Socio-demographic characteristics of studied children

Variables	No. (160)	%
Mean age (years)	8.8±2.7	6-13
Gender		
Male	62	39
Female	98	61
Father's education		
Illiterate	34	21
Read and write	40	25
Predatory	30	19
Secondary	26	16
University	30	19
Mother's education		
Illiterate	50	31
Read and write	22	14
Predatory	26	16
Secondary	38	24
University	24	15
Father's occupation		
Professional	10	6
Employee	48	30
Manual	102	64
Mother's occupation		
Working	48	30
Housewife	112	70
Family income		
Sufficient and saving	96	60
Sufficient	54	34
Insufficient	10	6
History of diseases of the studied group:		
Diabetes	26	16
Anemia	10	6
Others	24	15
Parental characteristics of the studied sample		
Father's disease		
Hypertension	24	15
Coronary heart disease	11	7
Diabetes mellitus	10	6
Chronic renal disease	1	0.5
ve history of diseases	115	71.5
Father's B.M.I	30.6±2.5	
Mother's disease		
Hypertension	21	13
Coronary heart disease	10	6
Diabetes mellitus	6	4
Chronic renal disease	1	0.6
Ve history of diseases	122	76.4
Mother's B.M.I	29.9±4.6	

intake, however, a comparison between each sex group and normal population revealed an excessive contribution of fat to total energy intake. The fat profiles for both studied group showed a high intake of mono-unsaturated and saturated fats. The mean daily intake of fiber in both sexes was statistically different ($p<0.05$) and below the recommended intake. The mean protein intake for students was found to be 14% in females and 16% in males.

Table 4 shows modified BMI for age was used to define obesity in children, 29% of children with normal weight range was between 5-85 percentile. while 32% of children with BMI >85 percentiles (overweight) and 29% of children with BMI >95 percentiles (obese). Table 5 shows that the prevalence of systolic and diastolic hypertension in relation to gender among studied children. Systolic hypertension of all samples is 7% and of diastolic hypertension of all samples are 4.3 % and both types (1%). Females have significantly higher diastolic blood pressure than males. Table 6 shows the distribution of systolic and diastolic hypertension among different age groups of studied children. Both systolic and diastolic blood hypertension increase with age. The highest prevalence was at age 10 years for pressures, 37 % for systolic pressure and 25% for diastolic pressure. The table shows that females have significantly higher diastolic pressure than males.

Table 7 shows the Means and standard deviations of systolic and diastolic blood pressures, anthropometric measurements and body mass index at 6-9: It is observed that females show higher the mean midarm circumference is 18.9±4 cm. The mean triceps and sub scapularæ skin fold thickness are 10±7 cm and 9.2±8.1 cm, respectively. The mean body mass index is 16.6±2.5 kg/m^2, the mean systolic blood pressure is 99.62±3 mm Hg, the mean diastolic blood pressure is 62.9±11.4 mm Hg than males, while males showed the mean mid arm circumference is 18.1±1.4 cm. The mean triceps and subscapular skinfold thickness are 10 ±3 cm and 9.01±5.1 cm respectively. The mean body mass index is 23.7±6.8 kg/m^2, the mean systolic blood pressure is 98.8±1.2 mm Hg, the mean diastolic blood pressure is 60.1±4.3 mm Hg. here was no significant differences of height, body mass index, mid arm, triceps, sub scapular skin fold thickness and blood pressure ($p > 0.05$). The table shows that females have significantly higher weight than males ($p <0.05$). Table 8 shows the Means and standard deviations of systolic and diastolic blood pressures, anthropometric measurements and body mass index at age 9-13: It is observed that females show higher the mean midarm circumference is 20.7±4 cm. The mean triceps and sub scapular skinfold thickness are 13.2±6.3 cm and 11.7±8.2 cm, respectively. The mean body mass index is 26.9±6.6 kg/m^2, the mean systolic blood pressure is 119±27.3 mm Hg, the mean diastolic blood pressure is 72.9±14 mm Hg than males, while males show

Table 2: The dietary habits of the studied groups

	Females		Males		
Parameters	No. (98)	%	No. (62)	%	P value
The regularity of meals					
Regular	42.0	43	27.0	44	> 0.05
Always irregular	56.0	57	35.0	56	
No. of meals/ day					
One meal	18.0	18	7.0	12	> 0.05
Two meals	24.0	25	15.0	24	
Three meals	51.0	52	25.0	41	
More than 3 meals	5.0	5	20.0	23	
No. of vegetable eat by subject/day					
Daily	27.0	27	15.5	25	> 0.05
3 or 4/week	29.0	30	15.5	25	
1 or 2/week	39.0	40	25.0	40	
Rarely	3.0	3	6.0	10	
No. of snacks taken by subject/day					
Daily	43.0	44	27.0	43	> 0.05
3 or 4/week	21.5	22	15.0	24	
1 or 2/week	21.5	2	10.0	17	
Rarely	12.0	12	10.0	16	
Types of milk drink by subject/day					
Full cream	35.2	36	25.0	40	> 0.05
Low fat	33.3	34	20.0	33	
Free fat	24.0	25	12.0	10	
No drinking	5.0	5	5.0	7	
No. of fatty or fried foods eat by subject/day					
Daily	8.0	8	5.0	9	> 0.05
3 or 4/week	35.2	36	26.0	41	
1 or 2/week	30.3	31	19.0	30	
Rarely	24.0	25	12.0	20	
No. of sweet food eat by subject/day					
Daily	40.0	41	26.0	42	> 0.05
3 or 4/week	21.5	22	15.0	24	
1 or 2/week	21.5	2	10.5	17	
Rarely	15.0	15	10.5	17	
No. of fruits eat by subject/day					
Daily	24.0	25	13.0	21	> 0.05
3 or 4/week	30.0	31	20.0	33	
1 or 2/week	36.0	37	24.0	39	
Rarely	6.0	7	5.0	7	
Types of food eating while watching TV or computer					
Juices	27.0	27	16.0	26	> 0.05
Chips	24.0	25	16.0	26	
Sweets	20.0	20	11.0	18	
Sandwich	15.0	15	10.0	16	
Others	13.0	13	9.0	14	
Duration of watching					
Half hour-hour	19.0	19	12.0	20	> 0.05
2-3 hours	43.0	44	26.0	42	
More than 3 hours	36.0	37	24.0	38	
No. of exercise / week					
Daily	7.0	7	6.0	9	> 0.05
3-4/week	29.0	30	19.0	31	
1 or 2/week	28.0	29	9.0	15	
Rarely	34.0	34	28.0	45	

Table 3: Energy and macronutrient intake of females and males children according to DRI [10]

	Females (98)		Males (62)	
Variables	% g/d	DRI	% g/d	DRI
Energy per day (KJ/d)	1990*±300	1600-1800	1876±500	1800-2000
CHO				
% energy from CHO	39	45-65	38	45-65
Fat				
% energy from fat	46	20-35	45	20-35
Saturated	14		14	
Poly unsaturated	11		11	
Mono unsaturated	21		20	
Protein				
% energy from protein	14	10-35	16	10-35
Dietary fiber per day (g/d)	16±0.1	26	18.9±2	36

Table 4: The prevalence of obesity among studied children according to percentile

	Studied group (n=160)			
BMI growth charts	No.	%	Females (%)	Male (%)
Under weight	16	10	4	6
Normal weight BMI range was between 5-85 percentile	46	29	15	14
Over weight BMI > 85 percentiles	51	32	21	11
Obese BMI > 95 percentiles	47	29	16	13

Table 5: Prevalence of Systolic and Diastolic hypertension in relation to gender among studied children

	Females (n=98)		Males (n=62)		All (n=160)		
Types of hypertension	No.	%	No.	%	No.	%	P value
Systolic hypertension	7	7	4	6	11	7	> 0.05
Diastolic hypertension	5	5	2	3	7	4.3	> 0.05
Both types	1	1	1	2	2	1	> 0.05

Table 6: Distribution of systolic and diastolic hypertension among different age groups of studied children

	SBP		DBP	
	≥ 95th Percentile (n=11)		≥ 95th Percentile (n=7)	
Age group (year)	No.	%	No.	%
6-	0.3	3	0.4	6
7-	1.1	10	1.1	16
8-	0.7	6	1	13
9-	2.3	21	1.5	22
10-	4.1	37*	1.9	26
11-	1.9	17	1	14
≥ 12	0.7	6	0.21	3

*P ≤ 0.005

Table 7: Means and standard deviations of systolic and diastolic blood pressures, anthropometric measurements and body mass index at age 6-9

Variables	Females children (Mean ± SD)	Males children (Mean ± SD)	P value
Anthropometric measurements			
Mid arm	18.9±4	18.1±1.4	> 0.05
Triceps	10±7	10. ±3	> 0.05
Sub scapular	9.2±8.1	9.01±5.1	> 0.05
Weight	26.7±5.6	23.7±6.8	< 0.05
Height	126.2±6.2	119.3±16.3	> 0.05
BMI	16.6±2.5	16.3±3.18	> 0.05
Blood pressure			
Systolic blood pressures	99.6±2.3	98.8±1.2	> 0.05
Diastolic blood pressures	62.9±11.4	60.1±4.3	> 0.05

T-test was used to determine the P-value

Table 8: Means and standard deviations of systolic and diastolic blood pressures, anthropometric measurements and body mass index at age 9-13

Variables	Females children (Mean ± SD)	Males children (Mean ± SD)	P value
Anthropometric measurements			
Mid arm	20.7±4	19.9±9.4	> 0.05
Triceps	13.2±6.3	13±3.1	> 0.05
Sub scapular	11.7±8.2	11.01±5.1	> 0.05
Weight	46.9±21.3	44.3±11.0	< 0.05
Height	132.1±21.19	131.1±19.6	> 0.05
BMI	26.9±6.6	25.4±11.3	> 0.05
Blood pressure			
Systolic blood pressures	119±27.3	118±1.2	> 0.05
Diastolic blood pressures	72.9±14	63.1±0.3	< 0.05

T-test was used to determine the P-value

Table 9: Correlation coefficients between systolic, diastolic blood pressure, age and Anthropometric measurements

	Systolic blood pressures		Diastolic blood pressures	
Variables	Correlation coefficient (r)	P value	Correlation coefficient (r)	P value
Age	0.371	< 0.01	0.277	< 0.01
Weight	0.616	< 0.01	0.467	< 0.01
Height	0.450	< 0.01	0.370	< 0.01
BMI	0.490	< 0.01	0.344	< 0.01
Mid arm	0.522	< 0.01	0.376	< 0.01
Sub scapular	0.470	< 0.01	0.343	< 0.01
Triceps	0.459	< 0.01	0.300	< 0.01

Table 10: Correlation coefficient(R) between energy and macronutrient intake, food group serving intake, BMI, blood pressure measured in female and male children

	Females			Males		
Variables	BMI (kg/m^2)	Systolic blood pressures (mm Hg)	Diastolic blood pressures (mm Hg)	BMI (kg/m^2)	Systolic blood pressures (mm Hg)	Diastolic blood pressures (mm Hg)
Energy (KJ/d)	0.290*	0.064	0.258*	0.420**	0.136	0.145
% energy from fat	0.347**	0.362**	0.324**	0.360**	0.401**	0.390**
% of fiber consumption	-0.300*	-0.377**	-0.411**	-0.299*	-0.295*	0.351**
No. of snacks	0.311**	0.173	0.183	0.363**	0.189	0.144
Vegetable group	-0.256*	-0.286*	-0.214*	-0.311**	-0.324**	-0.291*
Sweet food	0.328**	0.176	0.104	0.316**	0.155	0.173
Meats group	0.033	0.043	0.061	0.044	0.172	0.201
Fatty and fried foods group	0.309**	0.244*	0.227*	0.321**	0.255*	0.243*
Exercises	-0.400**	-0.156	-0.040	-0.372**	-0.168	-0.200
Duration of eating while watching TV or computer	0.328**	0.178	0.204	0.316**	0.155	0.173
Father's BMI	0.321**	0.134	0.200	0.323**	0.175	0.176
Mother's BMI	0.300**	0.179	0.151	0.299**	0.122	0.144

Person correlation were used for all variables;* p = 0.05; ** p = 0.01 and (-) negative

the mean mid arm circumference is 19.9±9.4cm. The mean triceps and sub scapular skin fold thickness are 13±3.1 cm and11.01±5.1cm, respectively. The mean body mass index is 25.4±11.3 kg/m^2, the mean systolic blood pressure is 118±1.2 mm Hg and mean diastolic blood pressure is 63.1±0.3mm Hg. The table shows that females have significantly higher weight, body mass index diastolic blood pressure than males ($p<0.05$). Since a significant positive correlation is detected between systolic and diastolic pressure and age ($r=0.371$ and $r=0.277$ $p<0.01$, respectively, weight ($r=0.616$ and $r=0.467$ $p<0.01$, respectively), height ($r=0.450$ and 0.370), BMI ($r=0.490$ and 0.344), mid arm circumference, triceps and sub scapular skin fold thickness (Table 9). Table 10 shows the correlation between nutrient intake and relevant health parameters (BMI and BP). There is a positive significant correlation between energy from fatty food group consumption and BMI as well as BP in both sexes, ($p<0.05$). A positive significant correlation was found between numbers of snacks, sweet food, parent's B.M.I and duration of eating while watching TV or computers and BMI of the child ($p<0.05$). A negative correlation was found between consumption of fibers, vegetables and exercises and BMI as well as BP (SBP and DBP) in both sexes ($p<0.05$).

DISCUSSION

Poor nutritional behavior associated with many risks that endanger health not only during later life but also during early adulthood. Obesity is the most common health problem facing children. The present study was carried out to identify the prevalence of obesity in Saudi children aged 6-13 yrs and to identify the main risk factors associated with obesity. The present study revealed that the prevalence of obesity was (29%) (Who have BMI $\geq$ 95th percentile) The prevalence of overweight and obesity in our study were higher than that reported from Abha City, where over weight and obesity for age group 6-18 years were 11.0 % and 15.9% respectively [16]. In the present study, the prevalence of overweight and obese females children (21% and 16%; respectively) were increased compared to overweight and obese males children (11% and 13%; respectively). This is consistent with Figueroa *et al.* [17] in Alabama, USA, concluded that the significant prevalence of childhood obesity and an associated complication, increased blood pressure, emerge in school aged children. It was significantly greater in girls at age 5 years (23% in blacks and 10% in whites) than boys (13% in blacks and 6% in whites). The prevalence of obesity in our study was more than in Qatar, they reported that, 3.2% and 8.8% were overweight and 1.6% and 5.4% of both boys and girls were obese, respectively [18]. The obtained data in our study showed that, female subjects were more obese than male subjects. This could be explained by reduced activities levels of the girls in the school or out the school. Farghaly *et al.* [16] evaluated the life style and dietary habits of school students, reported that, overweight and obesity were significantly more prevailing among females of primary schools. As regards socio economic status we observed that all studied group with high economic status and these results were in accordance with Al Qauhiz *et al.* [19] who reported that economic development in Saudi Arabia during the last 30 years has changed nutritional and life style habits.

Regarding to blood pressures of studied children, both systolic and diastolic blood hypertension increase with age. The highest prevalence was at age 10 years for both pressures, 37% for systolic pressure and 25% for diastolic pressure and females have significantly higher diastolic pressure than males. According to Kelishadi *et al.* [20] study from Isfahan, Iran, which was done in 2006, the overall prevalence of systolic, diastolic and systolic or diastolic hypertension among Iranian children are 4.2%, 5.4% and 7.7%, respectively. Comparison of these figures with the prevalence of hypertension in cohort study [21] showed that childhood hypertension is on the rise; and prevalence is similar to those recently reported in the other countries. Fuiano *et al.* [22] from Italy reported the prevalence of elevated blood pressure at first screenings which was 35.1% in boys and 41% in girls and the relative risk was significant for overweight patients. They concluded that these results showed an increasing epidemic of cardiovascular risk in children, as evidenced by an increase in the prevalence of overweight and hypertension. As regards the dietary habits, the majority of the children followed unhealthy eating habits, they often eat snacks daily and this may be due to its palatability, availability and convenience. A previous survey by the American Dietetic Association indicated that the obesity or being severely overweight was fast food related issue [23]. Moreover, the present study revealed that the majority of the children with less frequency vegetables and fruits consumption but more frequency fatty and fried food. These present findings were in accordance with King *et al.* [24] and Knol *et al.* [25] which stated that obesity was associated with

unhealthy diet high intake of fast food and other foods high in fat, law intake of fruits and vegetables. According to DRI, the children have high energy intake, they revealed an excessive contribution of fat to total energy intake, which exceeded the recommended intake. The fat profiles for both study groups showed a high intake of monounsaturated and saturated fat. The National Academics of Sciences [10] reported that, range of the percent of energy for children age 4-1 8 years should be between 45-65% from carbohydrate, between 10-30% from protein and between 25-35% from the fat.

Data presented in Table 10 illustrated that there was a positive significant correlation between energy from fatty food group consumption and BMI as well as BP in both sexes, ($p<0.05$). A positive significant correlation was found between numbers of snacks, sweet food and duration of eating while watching TV or computers and BMI ($p<0.05$). A negative correlation was found between consumption of fibers, vegetables and exercises and BMI as well as BP (SBP and DBP) in both sexes ($p<0.05$). Similar finding were obtained by Turner *et al.* [26] and Joshipura *et al.* [27], they indicated that there was a significantly correlation between overweight and cardiovascular disease in children and adolescent and strong association between energy expenditure and BMI.

In the present data, it was observed that a positive correlation between fatty foods consumption and BP in both sexes. The diet high in saturated fat and hydrogenation unsaturated fat can increase serum low density lipoprotein cholesterol (LDL-C) level [28] and can precipitate on the walls of the arteries and can resulting in clogged or blocked arteries. Also fatty foods can medicate inflammation within the coronary arteries which further increase the risk for heart disease and hypertension [29]. The present results showed that a negative correlation was detected between BMI and exercise in both sexes. These results are in agreement with those obtained by Fisberg *et al.* [30, 31] who reported that regular participation in physical activity with eating healthy diet strongly influences health status and reduce risk of obesity and overweight which related to cardiovascular disease. Also, physical exercise was lowering factor that blood lipids are one of risk factor for hypertension. Exercise improves blood circulation and increase activity of the muscles and loss calories so reduce the weight and the subjects who practiced regular exercise took more energy than the subjects who did not practiced regular exercise. This could be explained by the fact that, exercise will increase energy requirement and decrease fat deposition. Hilbert *et al.* [32] reported that lack of physical exercise was one of the main causes of obesity in young age.

The present results showed that high percent of female's children 44% and 42 % of males were eating while watching TV or computers The common types of food eaten in front of the T.V were juices followed by chips then sweets. This could explain the increased prevalence of obesity due to eating dense energy food with lack of exercise [33]. American Dietetic Association [34] reported that, as part of management of obesity, patients should take food low in energy and high in fiber. Teaching healthy behaviors at a young age is important since change becomes more difficult with age. Behaviors involving physical activity and nutrition are the cornerstone of preventing obesity in children. Obesity was the most common diet related health disorder among the parents of the subjects. A positive correlation was detected in this study between child's BMI and parental BMI. Similar finding were obtained by study of Katzmarzyk *et al.* [35] that indicated that family environment can contribute to the development of obesity and parent eating behavior was related to parent's BMI but there was only a weak relationship between parent's BMI and child adiposity. While, Strauss [36] reported that maternal obesity was the most significant predictor of childhood obesity.

It is postulated that aggregation of adiposity within families is due to shared genes and environments [37] reported that genetic factors may play a role in obesity more than in over weight. This could be explain by the fact that, obesity aggregates within families because of shared genes and environments, children may had the same parents dietary habits and life style such as eating high calorie foods, lack of exercise [32]. Gibson *et al.* [38] and Al-Rukban [39] studied a group of subjects age 12-20 years from Saudi Arabia to assess the relationship between obesity and socio-demographic data and physical activities he reported that family history and lack of physical activity were associated with adolescent obesity.

CONCLUSION

Irregular and infrequent meals together with a low vegetable and fruit intake were the most common unhealthy eating habits of the participants. Lifestyle modification is important, especially in young age groups to improve healthy habits earlier in life. Our findings

suggest that preventive interventions should focus not only on obesity, but also to related diseases. This requires strategies and coordinated efforts at all levels (family, schools, community and government) to reduce the tendency of overweight and obesity and to promote healthy eating habits and physical activity in young age.

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