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国外儿科研究

Dietary predictors of childhood obesity in a representative sample of children in north east of Iran

Fereshteh Baygi[1], *Mostafa Qorbani*[2,3], *Ahmad Reza Dorosty*[4], *Roya Kelishadi*[5], *Hamid Asayesh*[6], *Aziz Rezapour*[7], *Younes Mohammadi*[8], *Fatemeh Mohammadi*[9]

(1. *Endocrinology and Metabolism Research Center, Endocrinology and Metabolism Research Institute, Tehran University of Medical Sciences, Tehran, Iran*; 2. *Department of Public Health, Alborz University of Medical Sciences, Karaj, Iran*; 3. *Department of Epidemiology, Iran University of Medical Sciences, Tehran, Iran*; 4. *Department of Nutrition and Biochemistry, Tehran University of Medical Sciences, Tehran, Iran*; 5. *Department of Pediatrics, Child Growth and Development Research Center, and Faculty of Medicine, Isfahan University of Medical Sciences, Isfahan, Iran*; 6. *Academic Instructor, Qom University of Medical Sciences, Qom, Iran*; 7. *Hospital Management Research Center, Iran University of Medical Sciences, Tehran, Iran*; 8. *Department of Epidemiology & Biostatistics, School of Public Health, Hamadan University of Medical Sciences, Hamadan, Iran*; 9. *Department of Food and Nutrition Policy and Planning Research, National Nutrition and Food Technology Research Institute, Faculty of Nutrition Sciences and Food Technology, Shahid Beheshti University of Medical Sciences, Tehran, Iran*)

Abstract: Objective The prevalence of obesity is increasing in Iranian youngsters. This study aimed to assess some dietary determinants of obesity in a representative sample of children in Neishabour, a city in northeastern, Iran. **Methods** This case-control study was conducted among 114 school students, aged 6-12 years, with a body mass index (BMI) ≥95th (based on percentile of Iranian children) as the case group and 102 age- and gender-matched controls, who were selected from their non-obese classmates. Nutrient intake data were collected by trained nutritionists by using two 24-hour-dietary recalls through maternal interviews in the presence of their child. A food frequency questionnaire was used for detecting the snack consumption patterns. Statistical analysis was done using univariate and multivariate logistic regression (MLR) by SPSS version 16. **Results** In univariate logistic regression, total energy, protein, carbohydrate, fat (including saturated, mono- and poly-unsaturated fat), and dietary fiber were the positive predictors of obesity in studied children. The estimated crude *OR*s for frequency of corn-based extruded snacks, carbonated beverages, potato chips, fast foods, and chocolate consumption were statistically significant. After MLR analysis, the association of obesity remained significant with energy intake (*OR* = 2.489, 95% *CI*: 1.667-3.716), frequency of corn-based extruded snacks (*OR* = 1.122, 95% *CI*: 1.007-1.250), and potato chips (*OR* = 1.143, 95% *CI*: 1.024-1.276). The MLR analysis showed that dietary fiber (*OR* = 0.601, 95% *CI*: 0.368-0.983) and natural fruit juice intake (*OR* = 0.909, 95% *CI*: 0.835-0.988) were protective factors against obesity. **Conclusions** The findings serve to confirm the role of an unhealthy diet, notably calorie-dense snacks, in childhood obesity. Healthy dietary habits, such as the consumption of high-fiber foods, should be encouraged among children. [**Chin J Contemp Pediatr, 2013, 15(7):501-508**]

Key words: Obesity; Dietary intake; Iran; Child

In Iran, like other developing countries, the prevalence of obesity is increasing among youngsters[1-2]. Approximately 10% of the world's school-aged children carry excess body fat, of whom 25% are currently classified as obese according to International Obesity Taskforce cut-off values[3-4]. Childhood overweight and obesity leads to increased risk of non-communicable diseases such as type 2 diabetes and cardiovascular diseases in adulthood[5]. Obesity will be the main risk factor for more than 60% of diseases and their related mortality and morbidity by 2020[6].

Obesity is the result of the combined effects of different determinants such as dietary pattern, socio-economic status, and environmental factors[7]. A complex interaction between genetic, environmental, and behavioral factors is known to be the underlying cause of

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[Biography] Fereshteh Baygi (female), M. Sc. in Nutrition, Researcher.
[Correspondence author] Fatemeh Mohammadi (female), Ph. D. in Nutrition Science, MSc, Assistant Professor (in Research) of National Nutrition and Food Technology Research Institute. Email: f_mohammadi_2001@yahoo.com.

childhood obesity[8-9]. However, findings on the role of dietary pattern in this global health problem are inconclusive[10]. Since dietary factors play an important role in the increasing incidence of obesity, identification of food patterns among school children is very important, especially for interventions and preventative programs[11-13].

This study has been designed to investigate some dietary risk factors that might affect the prevalence of childhood obesity in a representative sample of children from Neishabour, a city in northeastern Iran, in 2006.

1 Material and methods

1.1 Subjects

Subjects were selected through multi-stage cluster sampling in the first phase of this case-control study, including 1500 school children aged 6-12 years old and who were from Neishabour, a city in the northeastern Iran. Their weights and heights were measured based on standard protocols[14] and body mass index was computed[BMI = weight (kg) / height (m^2)]. In the second phase, 114 children who had a BMI ≥ 95th percentile of Iranian reference[15] were selected as cases. Controls were selected from their non-obese classmates who matched the cases by age and sex (102 persons).

This study has been approved by the ethics committee of Tehran University of Medical Sciences (TUMS). Written informed consent was completed by the parents who agreed to let their children participate in the study.

1.2 Data collection

Nutrient intake data were collected by two 24-hour dietary recalls by interviewing mothers in the presence of their child. A food frequency questionnaire was used for detecting the most common snack consumption patterns. Interviews were performed by trained nutritionists.

1.3 Statistical analysis

Data were analyzed using the SPSS software version 16. Nutrient intakes were estimated by Food Processor software version 3 and expressed as mean ± SD ($\bar{x} \pm s$) along with food frequency data. Student *t*-test and Mann-Whitney *U* test were applied to compare mean differences between parametric and non-parametric quantitative variables respectively. Univariate logistic regression was used for computing the crude odds ratio (*OR*) to examine the degree of association between the quartile of various dietary predictors and childhood obesity. Multiple logistic regression (MLR) model was fitted to data to determine the most important dietary predictors of childhood obesity after adjusting for age, sex, physical activity and energy intake. *P*-values less than 0.05 were considered statistically significant.

2 Results

The mean weight, height and BMI in 216 students (114 obese and 102 non-obese) are shown in Table 1. Significant differences in weight, height, and BMI were observed between cases and controls.

Table 1 Height, weight and BMI in case and control subjects ($\bar{x} \pm s$)

Group	*n*	Height (cm)	Weight (kg)	BMI (kg/m^2)
Control	102	130 ± 9	26 ± 5	15.3 ± 1.2
Case	114	134 ± 10	40 ± 9	21.9 ± 2.6
t value		2.994	14.39	24.67
P value		0.003	<0.001	<0.001

Total energy, protein, carbohydrate, and fat (including saturated, mono- and poly-unsaturated fat), cholesterol, and dietary fiber in obese children were significantly higher than their normal peers. Percentage of calorie derived from fat was also significantly higher in obese pupils; however, the percentage of calorie derived from carbohydrate and protein was significantly higher in normal students. Obese children took more unhealthy snacks compared to those with normal weight (Table 2).

Table 2 Nutrient intake and snack consumption in case and control subjects ($\bar{x} \pm s$)

Variable	Controls ($n=102$)	Cases ($n=114$)	t (z) value	P value
Energy (Kcal/day)	1762 ± 412	2413 ± 542	9.997	0.001
Protein (g/day)	58 ± 14	70 ± 19	5.347	0.001
Carbohydrate (g/day)	249 ± 64	332 ± 82	8.396	0.001
Total fat (g/day)	63 ± 21	95 ± 30	9.196	0.001
Calorie from protein (%)	13.1 ± 2.4	11.4 ± 2.3	4.955	0.001
Calorie from carbohydrate (%)	56 ± 5	55 ± 6	2.378	0.018
Calorie from fat (%)	31 ± 6	35 ± 7	4.229	0.001
Dietary fiber (g/day)	19 ± 6	22 ± 8	3.074	0.002
Saturated fat (g/day)	22 ± 8	35 ± 13	(7.877)	0.001
Mono-unsaturated fatty acids (g/day)	22 ± 9	34 ± 12	(7.878)	0.001
Poly-unsaturated fatty acids (g/day)	14 ± 7	20 ± 8	(5.884)	0.001
Cholesterol (g/day)	240 ± 153	289 ± 201	(2.228)	0.047
Corn-based extruded snacks (time/month)	2.7 ± 2.3	9.2 ± 5.8	(7.444)	0.001
Chocolate (time/month)	5 ± 4	14 ± 11	(7.322)	0.001
Cola (time/month)	3.7 ± 2.7	8.0 ± 5.5	(6.037)	0.001
Natural fruit juice (time/month)	4.1 ± 3.5	3.0 ± 2.5	(1.638)	0.112
Patato chips (time/month)	2.0 ± 1.7	8.4 ± 6.0	(7.658)	0.001
Fast food (time/month)	2.3 ± 1.2	6.9 ± 4.7	(7.346)	0.001

Association between macro- and micro-nutrient intake quartiles and obesity in univariate and multivariate logistic regression models are shown in Table 3. In spite of statistically significant association between many dietary factors and childhood obesity in univariate model, after adjusting for age, sex and physical activity, only energy intake ($OR = 2.489$, 95% CI: 1.667 – 3.716) remained in the model as the most important dietary intake predictor of childhood obesity in MLR analysis. In addition, after adjusting for age, sex, physical activity and energy intake, high intake of dietary fiber ($OR = 0.601$, 95% CI: 0.368 – 0.983) decreased the odds of obesity in studied children.

The estimated crude ORs for frequency of corn-based extruded snacks, cola, potato chips, fast foods, and chocolate consumption were statistically significant. The increased frequency of corn-based extruded snacks and potato chips was a risk factor for obesity in studied children in MLR analysis. The MLR showed that the increased frequency of natural fruit juice intake was associated with a decreased risk of obesity (Table 4).

Table 3 Association between nutrient intake variables and obesity in univariate and multivariate logistic regression model

Nutrient intake (Quartile)	Crude OR (95% CI)	Adjusted OR (95% CI) *
Energy	3.444 (2.463 – 4.814) [a]	2.489 (1.667 – 3.716) [a]
Protein	2.025 (1.545 – 2.655) [a]	1.102 (0.643 – 1.886)
Carbohydrate	2.937 (2.154 – 4.004) [a]	1.087 (0.496 – 2.385)
Total fat	3.389 (2.431 – 4.725) [a]	1.202 (0.637 – 2.268)
Calorie from protein	0.548 (0.423 – 0.710) [a]	1.279 (0.849 – 1.926)
Calorie from carbohydrate	0.706 (0.547 – 0.911) [a]	0.945 (0.640 – 1.396)
Calorie from fat	1.746 (1.344 – 2.269) [a]	1.023 (0.690 – 1.516)
Dietary fiber	1.377 (1.077 – 1.761) [b]	0.601 (0.368 – 0.983) [b]
Saturated fat	2.862 (2.104 – 3.892) [a]	1.090 (0.594 – 2.000)
Mono-unsaturated fat	2.934 (2.150 – 4.003) [a]	0.778 (0.428 – 1.452)
Poly-unsaturated fat	2.099 (1.595 – 2.763) [a]	0.980 (0.611 – 1.571)
Cholesterol	1.196 (0.940 – 1.522)	0.723 (0.489 – 1.070)

* adjusted for age, sex, physical activity, and energy intake. a: $P < 0.001$; b: $P < 0.05$

Table 4 Association between snack consumption pattern and obesity in univariate and multivariate logistic regression model

Snack consumption (time/month)	Crude OR(95% CI)	Adjusted OR (95% CI) *
Corn-based extruded snacks	1.352 (1.226 – 1.431) [a]	1.122 (1.007 – 1.250) [b]
Chocolate	1.103 (1.065 – 1.143) [a]	1.031 (0.988 – 1.075)
Cola	1.176 (1.103 – 1.255) [a]	1.003 (0.936 – 1.075)
Natural fruit juice	0.957 (0.907 – 1.010)	0.909 (0.835 – 0.988) [b]
Patato chips	1.346 (1.238 – 1.464) [a]	1.143 (1.024 – 1.276) [b]
Fast food	1.313 (1.211 – 1.424) [a]	1.104 (0.993 – 1.228)

* Adjusted for age, sex, physical activity, and energy intake. a: $P < 0.001$; b: $P < 0.05$

3 Discussion

This study revealed that the most important dietary predictors of childhood obesity consisted of energy intake, consumption of corn-based extruded snacks, potato chips as fatty snacks, and intake of natural fruit juice and dietary fiber.

Many studies have revealed that there are certain environmental risk factors during infancy and childhood that affect childhood obesity, including overconsumption of highly palatable, energy dense food and beverages[16-18].

Johnson et al[19] designed a study to identify dietary patterns in 5 – 9 year-old children and to assess the relation between fatness in children and dietary energy density, fiber density, and percentage of energy intake from fat. The results showed that an energy-dense, low-fiber, high-fat diet is associated with fatness in children. There is consistency between the findings of this study and investigations carried out in the US, which revealed that between 1977 and 1996, consumption of fast foods by children increased threefold[20]. In this study, there was a relationship between frequency of unhealthy (fatty/sweet) snacks intake and obesity. Consumption of corn-based extruded snacks and potato chips in studied children increased the likelihood of obesity 1.12 and 1.14 fold, respectively.

Another study demonstrated that energy intake in children who regularly consumed fast food, was 770 KJ/day more than those who did not[21]. The investigators of the mentioned study believed that regular consumption of fast food could result in an average weight gain of 2.7 kg/year in children. Prentice and his colleague[22] showed that the energy density of fast food menus was 65% more than the energy density of the British diet. Therefore, easy availability of energy dense fast foods has been considered as a major risk factor for obesity[22].

In the CASPIAN study by Kelishadi et al [23], 21111 school students aged 6-18 years from 23 provinces of Iran were included. The higher frequency of consuming vegetables and plant proteins among boys and the higher frequency of consuming dairy products and fruits among girls had a significant inverse association with BMI. However, there was no significant association between consuming unhealthy snacks and childhood obesity after adjusting for other dietary and non-dietary factors. The findings of the present study were not consistent with those of the CASPIAN study.

In another study (Isfahan Healthy Heart Program) by Kelishadi et al[1] in contrast with the present study, the mean total energy intake was not different between overweight or obese and normal-weight subjects; however, the percentage of energy derived from carbohydrates was significantly higher in the former group compared with the latter. In this study, the percentage of calorie derived from fat increased the likelihood of obesity in studied children; however, the percentage of calorie derived from carbohydrate and protein decreased the likelihood. The controversy in findings may be explained in several ways. The instrument used to collect dietary data in the CASPIAN study was a food frequency questionnaire (FFQ), while in the present study, 2-day dietary recalls combined with FFQ were used to provide a more detailed and accurate measure of foods taken by each child. Furthermore, the sample size in the CASPIAN and Isfahan Healthy Heart Program was much higher than that in this study.

Dietary fat has higher energy density and metabolic efficacy (i.e. lower thermogenesis) compared to carbohydrate and protein. Moreover, it is more palatable and its lower satiety power could lead to more energy intake and storage in the adipose tissue[24]. Therefore, it has long been known as the main cause of childhood obesity[25-27]. However, in the present study, the most important determinant of obesity in studied children was energy intake. Although dietary fiber increased the likelihood of obesity in univariate analysis, after adjusting for energy intake, it decreased the risk of obesity. This finding confirmed the important role of energy intake and improper dietary habits in triggering childhood obesity[26].

The traditional Iranian diet is wheat-based, with a variety of relatively unrefined, unleavened, whole-wheat breads comprising the main staple. Rice is the other staple grain but due both to social norms and to relative prices, comprises a larger portion of the diet for the higher socioeconomic classes than for the poor. Dairy products are consumed widely, mostly as yoghurt

and fresh (not aged) cheese. A wide variety of fruits and vegetables are grown and consumed and meat, poultry and fish are highly valued, but relatively expensive. Nuts and fresh leafy greens, including plants used in other cuisines as herbs in small quantities, are consumed regularly and in quantities that make important contributions to nutrient intake. Untargeted consumer subsidies on food, put in place during the war with Iraq to secure minimum and equitable food supplies, have been reduced substantially over the last several years, but remained in place for bread, wheat flour and sugar in the time of the present study. Additionally, subsidies in the form of ration coupons were utilized for vegetable oil, rice, meat and milk[28].

Urbanization, population growth, major shifts in diets and, in all probability, reduced physical activity put an accelerated nutrition transition into motion during the 1980s and the predictable health effects emerged during the 1990s. The dietary profile over the last two decades has been influenced on the one hand by untargeted subsidies for dietary energy and on the other by continuously rising food prices. Eating some meals out of home has also been increased in recent years which could contribute the consumption of high fat/sugar foods in children[29-31].

One of the factors that might have influenced the findings of the present study is the potential recall bias in the process of collecting food intake data from mothers in the presence of their children. Lack of data regarding frequency of healthy snacks (vegetables, fruits, and dairy products) was another limitation of the study, which makes the analysis of association between obesity and healthy snacks impossible. The cross-sectional nature of the study induces doubt about the causal relationship observed in it.

Many studies have revealed the prevalence of obesity, its contributing factors, and its outcomes in childhood; however, there are only a few long-term intervention studies (family-based or school-based) on childhood obesity. Conducting large scale interventions on childhood obesity prevention and treatment based on Iranian culture and dietary habits is recommended.

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附中文参考译文(伊朗东北部儿童代表性样本中儿童肥胖的膳食预测因素)

[**摘　要**] **目的**　伊朗儿童的肥胖患病率不断升高。这项研究旨在评价伊朗东北部城市 Neishabour 的儿童代表性样本中肥胖的某些膳食决定因素。**方法**　在这项病例对照研究中,病例组为 114 名在校学生,年龄 6～12 岁,体重指数(BMI)≥第 95 个百分位(根据伊朗儿童的参考值),而对照组为 102 名年龄和性别匹配的非肥胖同班同学。由受过训练的营养师在儿童在场的情况下与母亲面谈,进行两次 24 h 膳食回顾调查,收集了营养摄入数据;使用食物频率问卷调查了零食摄入模式;使用 SPSS 软件(第 16 版)进行了单因素和多因素 logistic 回归分析。**结果**　单因素 logistic 回归分析显示,总能量、蛋白质、碳水化合物、脂肪(包括饱和脂肪、单不饱和脂肪和多不饱和脂肪)和膳食纤维是学生肥胖的正向预测因素;玉米膨化食品、碳酸饮料、薯片、快餐食品和巧克力的摄入频率的粗估比值比(*OR*)有统计学意义。多因素 logistic 回归分析显示,肥胖与能量摄入量(*OR* = 2.489,95% *CI*:1.667～3.716)、玉米膨化食品摄入频率(*OR* = 1.122,95% *CI*:1.007～1.250)及薯片摄入频率(*OR* = 1.143,95% *CI*:1.024～1.276)显著相关;而膳食纤维摄入量(*OR* = 0.909,95% *CI*:0.835～0.988)和天然果汁摄入量(*OR* = 0.601,95% *CI*:0.368～0.983)是预防肥胖的保护因素。**结论**　该研究结果证实了不健康饮食对儿童肥胖的作用,尤其是高热量零食。应鼓励儿童养成健康的饮食习惯,如摄入高纤维食物。　[**中国当代儿科杂志,2013,15(7):501-508**]

[**关　键　词**]　肥胖;饮食摄入;伊朗;儿童

同其他发展中国家一样,伊朗儿童的肥胖患病率不断升高。全球约 10% 的学龄儿童体脂肪过多,根据国际肥胖工作组设定的临界值,其中 25% 目前被归类为肥胖患者。儿童超重和肥胖导致成年期非传染性疾病的风险增加,如 2 型糖尿病和心血管疾病。到 2020 年,肥胖将成为 60% 以上的疾病及其相关病死率和发病率的主要风险因素。

肥胖是不同决定因素联合作用的结果,如膳食模式、社会经济状况和环境因素。众所周知,遗传、环境和行为因素之间复杂的相互作用是儿童肥胖的根本原因。然而,关于膳食模式在这个全球性健康问题中的作用的研究结果是不确定的。由于饮食因素对不断升高的肥胖发病率起着重要的作用,所以学龄儿童饮食结构的确认非常重要,尤其对于干预

和预防方案的制定。

这项研究旨在调查 2006 年伊朗东北部城市 Neishabour 的儿童代表性样本中可能影响儿童肥胖患病率的一些饮食风险因素。

1 资料与方法

1.1 研究对象

本病例对照研究的第一阶段,通过多阶段整群抽样法在伊朗东北部城市 Neishabour 选择了 1500 名 6~12 岁的学龄儿童作为研究对象,根据标准研究方案测量其身高和体重,并计算体重指数[BMI = 体重(kg)/身高的平方(m^2)]。在第二阶段,病例组入组了 114 名 BMI≥第 95 个百分位的儿童(根据伊朗儿童的百分位),而对照组入组了 102 名年龄和性别匹配的非肥胖同班同学。

这项研究已得到了德黑兰医科大学(TUMS)伦理委员会的批准。同意让自己的孩子参加这项研究的父母填写了书面知情同意书。

1.2 资料收集

由受过训练的营养师在儿童在场的情况下与其母亲面谈,进行两次 24 h 膳食回顾调查,收集了营养摄入数据,并使用食物频率问卷调查了最常见的零食摄入模式。

1.3 统计学分析

使用 SPSS 软件(第 16 版)进行了数据分析。使用食物处理器软件(第 3 版)估算了营养摄入量,数据以均数 ± 标准差($\bar{x} \pm s$)表示。组间比较采用成组 t 检验或 Mann-Whitney U 检验。采用单因素 logistic 回归模型计算粗估比值比(OR),检验各种膳食预测因素四分位数与儿童肥胖之间的关联度。对年龄、性别、体育活动和能量摄入量进行校正后,采用多因素 logistic 回归模型进行数据拟合,从而确定儿童肥胖最重要的膳食预测因素。认为 $P<0.05$ 具有统计学意义。

2 结果

216 名学生(114 名肥胖学生和 102 名非肥胖学生)的平均体重、身高和 BMI 见表 1,病例组和对照组之间体重、身高和 BMI 差异均有统计学意义。

肥胖儿童总能量、蛋白质、碳水化合物、脂肪(包括饱和脂肪、单不饱和脂肪和多不饱和脂肪)、胆固醇和膳食纤维的摄入量明显高于正常同龄人。肥胖学生中,脂肪来源热量的百分比也明显较高;而碳水化合物和蛋白质来源热量的百分比在正常体重学生中明显较高。与正常体重儿童相比,肥胖儿童摄入的不健康零食更多(表 2)。

在单因素和多因素 logistic 回归模型中,宏量营养素和微量营养素摄入量四分位数与肥胖的关系见表 3。虽然在单因素模型中,多个膳食因素与儿童肥胖之间的关系具有统计学意义,但对年龄、性别和体育活动进行校正后,多因素 logistic 回归分析显示只有能量摄入量(OR = 2.489, 95% CI: 1.667 ~ 3.716)是儿童肥胖最重要的膳食预测因素;高膳食纤维摄入量降低了儿童肥胖的患病风险(OR = 0.601, 95% CI: 0.368 ~ 0.983)。

玉米膨化食品、可乐、薯片、快餐食品和巧克力摄入频率的粗估 OR 有统计学意义,多因素 logistic 回归分析中,玉米膨化食品和薯片摄入频率的升高是学生肥胖的一项风险因素;多因素回归分析显示天然果汁摄入频率的升高与肥胖患病率的降低相关(表 4)。

3 讨论

本研究显示,儿童肥胖最重要的膳食预测因素包括能量摄入量以及玉米膨化食品、薯片(高脂类零食)、天然果汁和膳食纤维的摄入量。

许多研究表明,在婴儿期和儿童期有一些引起儿童肥胖的环境风险因素,包括过量摄入口感好的高能量食物和饮料。

Johnson 等人设计了一项研究,以确定 5 ~ 9 岁儿童的膳食结构,从而评价儿童肥胖与膳食能量摄入、纤维摄入和脂肪来源能量摄入百分比之间的关系。结果表明,高能量、低纤维、高脂肪饮食与儿童肥胖相关。这项研究的结果与在美国进行的调查一致,该调查结果发现,1977 ~ 1996 年间,儿童快餐食品的消费量增加了两倍。本研究中,不健康(多脂/甜味)食品的摄入频率与肥胖之间存在相关性。被研究儿童玉米膨化食品和薯片的摄入分别使肥胖患病率提高了 0.12 倍和 0.14 倍。

另一项研究表明,经常摄入快餐食品的儿童的每日能量摄入量比不经常摄入快餐食品的儿童高 770 KJ。该研究者认为,经常摄入快餐食品会导致儿童体重每年平均增加 2.7 kg。Prentice 等研究显示,快餐食品的能量摄入比英式饮食高 65%。因此,高能量快餐食品的摄入一直被视为肥胖的主要风险因素。

在 Kelishadi 等的一项大规模 CASPLAN 研究

中,入组了来自伊朗 23 个省的 21111 名 6 ~ 18 岁在校学生。男孩摄入蔬菜和植物蛋白的频率以及女孩摄入乳制品和水果的频率与 BMI 显著负相关。然而,对其他膳食和非膳食因素进行校正后,摄入不健康零食与儿童肥胖之间无显著关联。研究结果与之不一致。

Kelishadi 等人的另一项研究(Isfahan 健康心脏计划)结果也与本研究有些不同,其研究显示,超重或肥胖受试者与正常体重受试者的平均总能量摄入量没有什么不同,而前者的碳水化合物来源能量的百分比明显较高。本研究中,脂肪来源热量的百分比增高会增大被研究儿童肥胖的可能性,而碳水化合物和蛋白质来源热量的百分比增高则降低肥胖的患病率。本研究结果与上述 Klelishadi 等的两项研究不同可以从以下几个方面进行解释:CASPLAN 研究中用于收集膳食数据的工具是食物频率问卷(FFQ),而在本研究中,两次 24 h 膳食回顾调查与 FFQ 结合应用,更详细、更准确地检测了每位儿童的食物摄入量;此外,Klelishadi 等的的样本量远远大于本研究。

与碳水化合物和蛋白质相比,膳食脂肪具有较高的能量密度和代谢作用(即较低的生热作用)。此外,膳食脂肪口感更好,其较低的饱腹感可导致更多的能量摄入,并储存在脂肪组织中。因此,人们早已认为膳食脂肪是当前儿童肥胖的主要原因。然而,在本研究中,被研究儿童肥胖最重要的决定因素是能量摄入量。尽管单因素 logistic 回归分析显示,膳食纤维增加了肥胖的患病率,但对能量摄入量进行校正后,它降低了发生肥胖的风险。这一发现证实了能量摄入量及不当的饮食习惯在引起儿童肥胖中的重要作用。

伊朗传统的饮食以小麦为主,以各种各样的相对未精制、未发酵的全麦面包作为主食。大米是另一种主食,但由于社会习惯和较高的价格,大米多出现在较高社会经济阶层的饮食中。乳制品的食用比较广泛,主要是酸奶和新鲜奶酪(而不是陈年奶酪)。各种各样的水果和蔬菜可供食用,肉类、家禽和鱼类非常受欢迎,但相对较贵。伊朗人经常食用坚果和新鲜的绿叶蔬菜,包括作为调料少量用于其他菜系的植物,其食用量较大,是营养摄入的重要来源。伊拉克战争期间,为保障最低均衡食物供给而实施的非针对性消费补贴在近几年已大幅减少,但在本研究期间,对面包、小麦面粉和糖仍有补贴。此外,对植物油、大米、肉类和牛奶采用了配给券的补贴形式。

20 世纪 80 年代,城市化、人口增长、主要饮食改变和体育活动减少(很有可能)加速了营养转型,到 20 世纪 90 年代,已经对健康造成了可预见性的影响。在过去 20 年中,饮食状况一方面已受到膳食能量非针对性补贴的影响,另一方面,已受到不断上涨的食品价格的影响。近年来,外出用餐增多,这也将导致儿童摄入高脂/高糖食物。

向母亲收集儿童食物摄入数据的过程中可能存在回忆偏倚,这是可能影响本研究结果的因素之一。而缺少关于健康食品(蔬菜、水果和乳制品)摄入频率的数据是本研究的另一局限,这让我们无法分析肥胖与健康零食之间的关联。这项研究是横断面研究,因此观察到的因果关系也有待进一步证实。

许多研究已表明了儿童肥胖的患病率及其影响因素和预后;然而,只有少数涉及对儿童肥胖的长期干预的研究(以家庭或学校为基础)。因此,有必要根据伊朗的文化和饮食习惯对儿童肥胖的预防和治疗进行大规模的干预。

(本文编辑:邓芳明)