



Meal Frequency in Iranian Children and Adolescents at National and Sub-National Levels: The CASPIAN-IV Study

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Abstract

Background: This study aims to assess the pattern of meal frequency consumption of Iranian children and adolescents at national and subnational levels according to the socioeconomic status (SES) of the living region.

Methods: This multi-centric study was conducted in 2011-2012 among 14,880 students, aged 6-18 years, who were selected by multistage random cluster sampling from 30 provinces. Meal frequency was assessed by the World Health Organization Global School-based student Health Survey (WHO- GSHS) questionnaire. Data were compared at national and sub-national levels according to the SES of the living region.

Results: Overall, 13486 students completed this study (participation rate: 90.6%). The frequency of breakfast, lunch, and dinner skipping was 32.08% (95% CI: 30.99, 33.2), 8.58% (95% CI: 7.71, 9.54), and 10.90% (95% CI: 10.21, 11.62), respectively. The frequency of consuming 1 meal, 2 meals, and 3 meals a day was 9.60% (95%CI: 8.94, 10.31), 29.28% (95% CI: 28.31, 30.26), and 61.12 % (95% CI: 59.89, 62.34), respectively. The mean number of days per week of breakfast consumption was 5.14 (95% CI: 5.08, 5.20), the corresponding figure was 6.39 (95%CI: 6.35, 6.42), and 6.24 (95%CI: 6.21, 6.28) for lunch and dinner, respectively. These frequencies had no significant difference according to the SES of the living region.

Conclusion: Most Iranian children and adolescents consumed all three main meals, however irrespective of SES; in general skipping breakfast was more frequent than skipping lunch and dinner. Regular meal intake, notably breakfast, should be considered in health promoting programs for all children and adolescents.

Keywords: Meal frequency, Skipping meals, Children and adolescents, Prevention, Health promotion, Iran

Introduction

Eating behavior influenced by many factors including biological and cultural issues (1, 2). Meal frequency is one of the important components of

nutrition its irregularity and skipping main meals might have many adverse health effects as obesity and overweight, insulin resistance, type 2 diabetes,

preterm delivery, as well as difficulties in child social skills and engagement in school, problematic social behaviors, cognitive performance and mood, and dietary habits (3).

Many studies evaluated the health impact of meal frequency, notably breakfast consumption. Study on Portuguese adolescents showed that increased meal frequency might have a positive influence on reducing body mass index (BMI) (4). Some other studies have shown that higher meal frequency and breakfast eating may prevent overweight and obesity in children (5, 6). Another study in school-aged children showed that having family meal was a protective factor for many adolescents' risky behaviors (7). The effect of the socio-cultural context on pattern of meal intake include the kind, frequency, habit and the size of food was documented in previous studies (8).

To provide action-oriented programs for effective education and for planning healthy dietary habits in each population, the meal frequency pattern should be determined in children and adolescents with various socio-demographic backgrounds.

This paper aims to assess the pattern of meal frequency consumption of Iranian children and adolescents at national and subnational levels according to the socioeconomic status (SES) of the living region.

Methods

This study was performed in 2011-2012 as the fourth survey of a national surveillance program entitled the Childhood and Adolescents Surveillance and Prevention of Adult Non-communicable disease (CASPIAN- IV) study. The detailed methodology is published previously, and herein a brief summary is reported (9).

The study population was Iranian children and adolescents aged 6-18 yrs. The multistage, cluster sampling methods were used to select students from elementary, intermediate, and high schools of urban and rural areas of 30 provinces of Iran. After explaining the study protocol, written informed consent and verbal assent were obtained from parents and students, respectively. The questionnaire was based on the World Health Organi-

zation- Global School-based student Health Survey (GSHS); it was translated into Persian, and some questions regarding socio-demographic factors were included as an additional questionnaire for parents. The validity and reliability of questionnaire was confirmed prior to the study (10).

We assessed the consumption of main meals by following questions:

Breakfast consumption: "Usually on how many days of the week do you eat breakfast on weekdays and weekends?" / Lunch consumption: "Usually on how many days of the week do you eat lunch on weekdays and weekends?" / Dinner consumption: "Usually on how many days of the week do you eat dinner on weekdays and weekends?"

Breakfast, lunch and dinner frequency was defined as skippers (eating breakfast, lunch, and dinner 0-4 days/week) and non-skippers (eating breakfast, lunch, and dinner 5-7 days/week). Number of meal frequency was defined based on skipping meals (eating breakfast, lunch, and dinner), 1 meal (skipping two meals), 2 meals (skipping one meal), and 3 meals (consuming all main meals).

As described before, Iran is categorized into four sub-national regions based on the combination of SES and geography. SES was an index included years of schooling, family assets, and income. The Southeast and Central regions had the lowest and highest SES, respectively (11).

Statistical analysis

Percentages and 95% confidence interval (CI) are reported for qualitative variables. Mean of continuous variables are presented with 95% CI. All analyses were performed at national, regional and provincial levels using survey data analysis method. STATA version 11.0 (STATA Corp, College Station, Tex.) was used for data analysis. Figures were plotted using R software version 2.15.1.

Results

This study had a participation rate of 90.6%. Participants consisted of 13,486 students (50.8% boys, 75.6% from urban areas) with a mean age of 12.50 \pm 3.36 years. The number of students who lived in the Southeast (lowest SES), North-Northeast

(second low SES rank), West (second high SES rank), and Central (highest SES) regions were 1.18 (8.76%), 2.35 (17.49%), 6.11 (45.37%) and 3.82 (28.38%), respectively.

The frequency of skipping breakfast, lunch, and dinner was 32.08% (95% CI: 30.99, 33.20),

8.579% (95% CI: 7.70, 9.53), and 10.9% (95% CI: 10.21, 11.62), respectively (Table 1). It had no significant difference according to the SES of the living region.

Table 1: Frequency of breakfast, lunch and dinner skipping at national and regional level by gender and living area: the CASPIAN-IV Study

Region	Breakfast skipping % (95%CI)	Lunch skipping % (95%CI)	Dinner skipping % (95%CI)
Southeast (lowest SES)			
Boys (n=533)	28.36 [22.93,34.51]	7.678 [4.693,12.32]	9.107 [6.435,12.74]
Girls (n=611)	29.09 [24.79,33.81]	8.078 [5.164,12.42]	9.936 [7.426,13.17]
Urban (n=633)	30.51 [25.88,35.57]	8.865 [5.778,13.37]	10.68 [8.132,13.91]
Rural (n=511)	26.6 [21.32,32.65]	6.692 [3.999,10.99]	8.159 [5.394,12.16]
Total (n=1144)	28.75 [25.21,32.57]	7.678 [4.693,12.32]	9.548[7.598,11.93]
North-Northeast (second low SES)			
Boys (n=1184)	26.58 [23.3,30.13]	7.131 [5.495,9.206]	9.275 [7.308,11.7]
Girls (n=1167)	42.69 [38.62,46.85]	10 [7.575,13.09]	14.49 [11.9,17.53]
Urban (n=1707)	36.21 [32.97,39.59]	8.914 [7.12,11.11]	13.24 [11.15,15.65]
Rural (n=644)	30.19 [25.08,35.83]	7.609 [5.131,11.14]	8.217 [5.82,11.48]
Total (n=2351)	34.56 [31.83,37.4]	7.131[5.495,9.206]	11.86[10.17,13.79]
West (second high SES)			
Boys (n=3046)	29.46 [27.36,31.64]	8.733 [7.47,10.19]	7.882 [6.684,9.273]
Girls (n=2979)	35.37 [32.85,37.97]	10.08 [8.543,11.85]	12.98 [11.44,14.69]
Urban (n=4528)	33.19 [31.27,35.18]	9.847 [8.656,11.18]	11.06 [9.891,12.36]
Rural (n=1497)	29.9 [26.53,33.5]	8.035 [6.289,10.21]	8.401 [6.516,10.77]
Total (n=6025)	32.38 [30.7,34.1]	8.733[7.47,10.19]	10.41[9.4,11.51]
Central (highest SES)			
Boys (n=1996)	27.84 [25.5,30.3]	9.454 [7.839,11.36]	9.664 [8.171,11.4]
Girls (n=1806)	34.75 [31.95,37.66]	7.727 [6.21,9.576]	13.5 [11.56,15.71]
Urban (n=3208)	31.29 [29.32,33.34]	8.934 [7.651,10.41]	12.11 [10.71,13.66]
Rural (n=594)	30.17 [25.44,35.36]	7.023 [4.893,9.984]	8.167 [6.098,10.86]
Total (n=3802)	31.12 [29.29,33.01]	9.454[7.839,11.36]	11.49[10.27,12.83]
National			
Boys (n=6759)	28.39 [26.99,29.83]	8.579 [7.708,9.538]	8.75[7.91,9.67]
Girls (n=6563)	35.89 [34.27,37.56]	9.228 [8.221,10.35]	13.1 [12.05,14.23]
Urban (n=10112)	32.93 [31.68,34.2]	9.337 [8.543,10.2]	11.74[10.93,12.6]
Rural (n=3246)	29.47 [27.21,31.84]	7.548 [6.36,8.937]	8.282[7.065,9.688]
Total (n=13358)	32.08 [30.99,33.2]	8.579 [7.708,9.538]	10.9[10.21,11.62]

Figure 1 shows the frequency of skipping breakfast, lunch and dinner of participants at provincial level. Table 2 presents the number of meal frequency at national and regional levels by gender and living area. The frequencies of participants consuming 1 meal, 2 meals, and 3 meals were

9.60% (95% CI: 8.939, 10.31), 29.28% (95% CI: 28.31, 30.26), and 61.12% (95% CI: 59.89, 62.34), respectively. The number of meal frequency was not significantly different in adolescents from various SES levels.

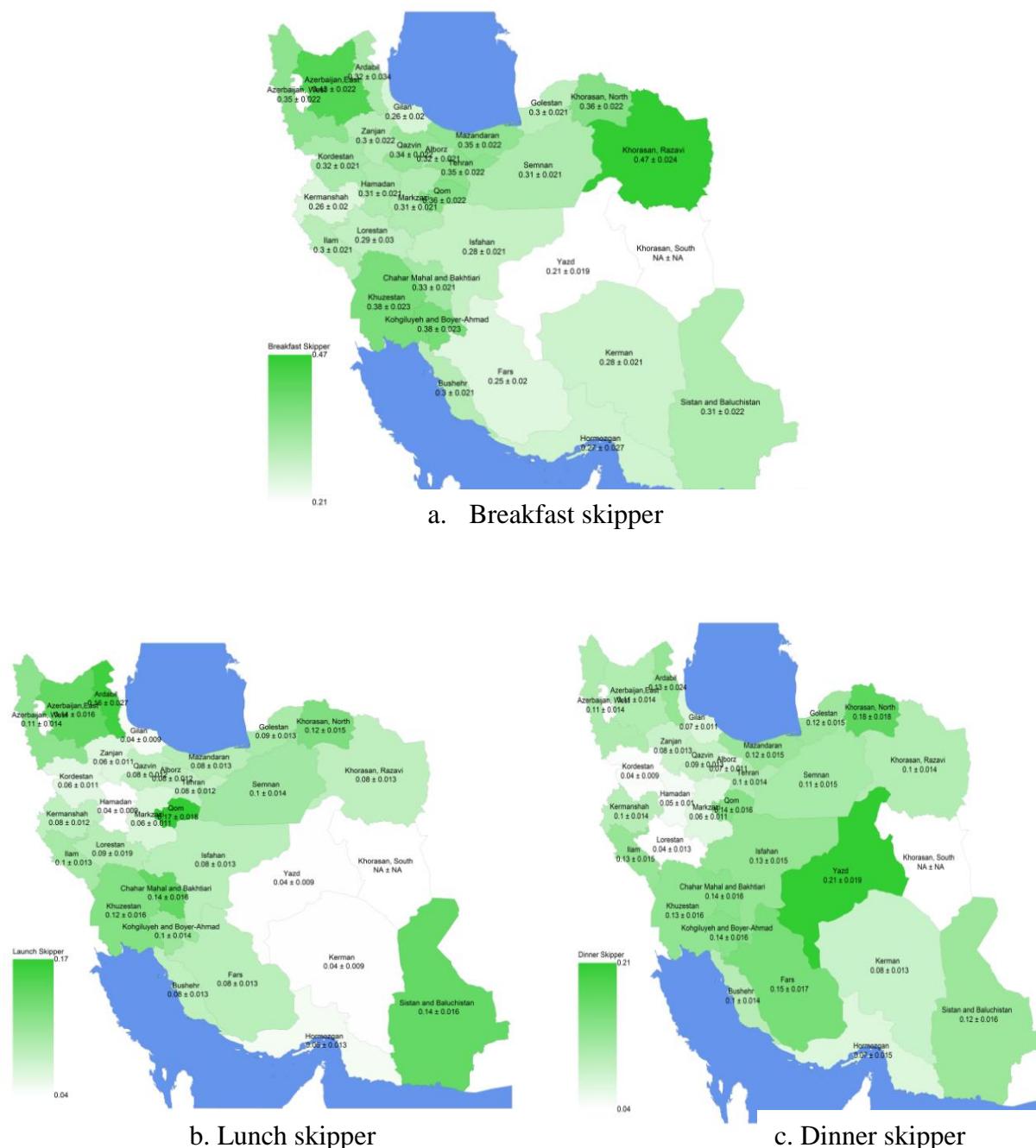


Fig. 1: Frequency of meal skipping in Iranian children and adolescents at provincial level: the CASPIAN-IV study

The mean days per week of consuming breakfast, lunch and dinner at national and regional level by gender and living area are shown in Table 3. The mean number of days per week of breakfast, lunch, and dinner consumption was 5.14 (95% CI: 5.08, 5.20), 6.39 (95% CI: 6.35, 6.42), and 6.24

(95% CI: 6.21, 6.28), respectively. These frequencies were not significantly different in regions with diverse SES.

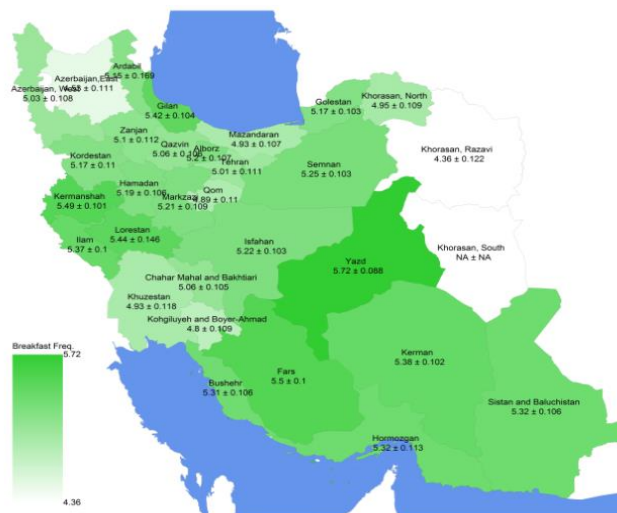
Figure 2 shows the mean days per week of meal consumption at provincial level.

Table 2: Number of meal consumption at national and regional levels by gender and living area: the CASPIAN-IV Study

Region	Number of meal consumption per day		
	1 meal % (95% CI)	2 meals % (95% CI)	3 meals % (95% CI)
Southeast (lowest SES)			
Boys (n=533)	8.791[6.143,12.43]	23.81[19.8,28.34]	67.4[61.12,73.11]
Girls (n=611)	8.13 [5.79,11.3]	27.8[23.43,32.65]	64.07[58.24,69.5]
Urban (n=633)	8.594 [6.193,11.81]	29.22[25.12,33.69]	62.19[56.41,67.63]
Rural (n=511)	8.253[5.576,12.05]	21.88[17.52,26.97]	69.87[63.27,75.73]
Total (n=1144)	8.441[6.598,10.74]	25.93[22.83,29.28]	65.63[61.29,69.73]
North-Northeast (second low SES)			
Boys (n=1184)	7.555 [5.817,9.76]	25.3[22.37,28.46]	25.3[22.37,28.46]
Girls (n=1167)	13.22[10.5,16.53]	35.87[32.43,39.46]	50.91[46.41,55.39]
Urban (n=1707)	11.23[9.177,13.67]	31.97[29.32,34.76]	56.8 [53.1,60.42]
Rural (n=644)	8.087[5.532,11.68]	26.75[22.17,31.89]	65.16[59.07,70.8]
Total (n=2351)	10.36[8.681,12.33]	30.54[28.25,32.92]	59.1[55.99,62.14]
West (second high SES)			
Boys (n=3046)	7.828[6.656,9.185]	27.3[25.31,29.37]	27.3[25.31,29.37]
Girls (n=2979)	12.06[10.46,13.87]	29.83[27.71,32.04]	58.11[55.29,60.87]
Urban (n=4528)	10.72[9.508,12.06]	28.73[27.07,30.45]	60.55[58.38,62.68]
Rural (n=1497)	7.51[5.796,9.679]	28.01[24.89,31.36]	64.48[60.57,68.2]
Total (n=6025)	9.925[8.907,11.04]	28.55[27.07,30.08]	61.52[59.63,63.38]
Central (highest SES)			
Boys (n=1996)	7.965[6.592,9.596]	28.21[25.93,30.61]	28.21[25.93,30.61]
Girls (n=1806)	10.07[8.536,11.85]	33.39[31.03,35.83]	56.54[53.58,59.46]
Urban (n=3208)	9.206[8.03,10.53]	31.24[29.42,33.13]	59.55[57.25,61.81]
Rural (n=594)	7.718[5.742,10.3]	27.68 [23.39,32.43]	64.6[59.54,69.35]
Total (n=3802)	8.97[7.924,10.14]	30.68[28.98,32.43]	60.35[58.26,62.4]
National			
Boys (n=6759)	7.899[7.103,8.775]	26.93[25.64,28.26]	26.93[25.64,28.26]
Girls (n=6563)	11.35 [10.32,12.47]	31.69 [30.3,33.12]	56.96[55.17,58.74]
Urban (n=10112)	10.19 [9.404,11.03]	30.11[29.02,31.22]	59.7[58.29,61.1]
Rural (n=3246)	7.783[6.618,9.132]	26.71[24.67,28.87]	65.5[62.96,67.96]
Total (n=13358)	9.6[8.939,10.31]	29.28[28.31,30.26]	61.12[59.89,62.34]

Table 3: The mean days per week for breakfast, lunch and dinner consumption at national and regional level by gender and living area: the CASPIAN-IV Study

Region	Breakfast (day/week)	Lunch (day/week)	Dinner (day/week)
	Mean (95%CI)	Mean (95%CI)	Mean (95%CI)
Southeast (lowest SES)			
Boys (n=533)	5.38 [5.12,5.64]	6.37[6.19-6.56]	6.30[6.14,6.45]
Girls (n=611)	5.30[5.07,5.53]	6.42[6.25-6.60]	6.23[6.09,6.37]
Urban (n=633)	5.23[4.99,5.47]	6.36[6.17,6.55]	6.20[6.07,6.33]
Rural (n=511)	5.47[5.21,5.73]	6.45[6.29,6.62]	6.33[6.16,6.51]
Total (n=1144)	5.34[5.16,5.51]	6.40[6.27,6.53]	6.26[6.15,6.37]
North-Northeast (second low SES)			
Boys (n=1184)	5.39[5.22-5.57]	6.43[6.33-6.53]	6.30[6.18,6.41]
Girls (n=1167)	4.54[4.33-4.74]	6.31[6.17-6.45]	6.09[5.95,6.22]
Urban (n=1707)	4.86[4.69,5.03]	6.35[6.25,6.46]	6.13[6.02,6.24]
Rural (n=644)	5.26[5.01,5.51]	6.42[6.27,6.56]	6.37[6.23,6.51]
Total (n=2351)	4.97[4.83,5.11]	6.37[6.37,6.46]	6.19[6.11,6.37]
West (second high SES)			
Boys (n=3046)	5.32[5.21-5.43]	6.42[6.35-6.49]	6.40[6.33,6.47]
Girls (n=2979)	4.94[4.81-5.08]	6.35[6.27-6.43]	6.15[6.07,6.24]
Urban (n=4528)	5.11[5.01,5.21]	6.38[6.31,6.44]	6.25[6.18,6.31]
Rural (n=1497)	5.19[5.00,5.38]	6.42[6.32,6.52]	6.38[6.26,6.49]
Total (n=6025)	5.13[5.05,5.22]	6.39[6.33,6.44]	6.28[6.22,6.33]
Central (highest SES)			
Boys (n=1996)	5.39[5.27-5.51]	6.38[6.29-6.47]	6.32[6.23,6.40]
Girls (n=1806)	4.97[4.82-5.12]	6.43[6.34,6.52]	6.11[6.00,6.21]
Urban (n=3208)	5.19[5.09,5.30]	6.39[6.32,6.46]	6.19[6.12,6.27]
Rural (n=594)	5.18[4.92,5.45]	6.47[6.34,6.61]	6.34[6.20,6.47]
Total (n=3802)	5.19[5.10,5.29]	6.40[6.34,6.47]	6.22[6.15,6.28]
National			
Boys (n=6759)	5.36[5.29,5.43]	6.41[6.36,6.45]	6.35[6.30,6.39]
Girls (n=6563)	4.91[4.83,5.00]	6.37[6.32,6.43]	6.14[6.08,6.19]
Urban (n=10112)	5.10[5.04,5.17]	6.37[6.33,6.42]	6.21[6.16,6.25]
Rural (n=3246)	5.25[5.13,5.36]	6.43[6.37,6.50]	6.36[6.29,6.43]
Total (n=13358)	5.14[5.08,5.20]	6.39[6.35,6.42]	6.24[6.21,6.28]



Breakfast frequency



b. Lunch frequency



c. Dinner frequency

Fig. 2: The mean meal frequency per week in Iranian children and adolescents at provincial level: the CASPIAN-IV study

Discussion

We found that most Iranian children and adolescents consumed all main meals in most days; however skipping breakfast was frequently reported. This pattern was not significantly different in various regions of the country. Many previous studies have evaluated the frequency of meal frequency in the pediatric age group of different countries. Our findings are in line with a study in the United

States that showed skipping breakfast was because of behavioral changes but not because of the population's differences in terms of socio-demographic patterns (12). Likewise, a study in English and Australian students did not document any difference in the frequency of breakfast skipping according to their age, gender, and/ or SES (13). However, our findings are not consistent with some previous studies of some other countries that revealed higher frequency of consuming

breakfast and lunch in adolescents with high SES than in those from low SES regions (14). Likewise, some studies had shown breakfast skipping was less frequent in families with higher education than in those with lower education (15-17).

A study among 12-14-year-old Chinese adolescents reported that higher SES and urban residency were positively associated with higher frequency of breakfast skipping (18).

It is also documented that diet quality was significantly associated with parental education and occupation levels. However, this association was different between northern and southern Europe (14); moreover, unhealthy eating was more frequent in lower- than in higher SES groups (19).

A study in Wales found that deprivation was associated with higher frequency of unhealthy dietary habits including skipping breakfast (20). Similar study among Korean adolescents reported that meal-skipping rates was more frequent in low-income than high-income households (7).

A study in Greece demonstrated that 64% of 10-12-year-old children skipped breakfast at least once a week (6). Another study found that American students skipped breakfast more frequently than other meals, i.e. 77% of them consumed breakfast, 94% and 95% consumed lunch and dinner, respectively (21).

A study among 10-year-old American children reported that 16% to 24% of them skipped breakfast (22). A study among American schools found that nearly 99% and 85% of the third and eighth grade students ate breakfast, respectively (23). In a study on 6-11-year-old Italian children, 45%, 33% and 2% of individuals in the low, intermediate, and high meal frequency categories skipped breakfast, respectively (24). Studies in the UK reported that 18% and 19% of 11-16-year-old adolescents skipped breakfast (25). A study in Southern Ghana revealed that 31% of students aged 12-18 years consumed breakfast less than four days a week (26). Overall, it can be assumed that irrespective of SES, skipping breakfast is common in children and adolescents of different parts of the world.

A growing body of evidence suggests that food behavior is formed and established during childhood and adolescence, and would continue into

adulthood (27-29). Although breakfast consumption has crucial importance for cognitive performance and learning (15-17,22), as well as for prevention and control of weight disorders in children and adolescents (29-33), skipping this main meal is quite prevalent worldwide (14, 33). Various suggestions should be considered to encourage children and adolescents to eat breakfast (34), and they should be trained and encouraged for healthy eating behaviors (23, 26, 35).

In the current study, 61.12% of students consumed all three main meals per day. This finding is comparable with studies in Greece and USA, in which 60.2% and 69% of children aged 10-12 year ate three or more meals per day respectively (21).

A cohort study of primary school students in Norway indicated that the number of children eating all main meals per day (regular meal frequency) decreased from the 4th grade (47%) to 7th grade (38%) (36). In a study among American students, 82% of those aged 9-15 years consumed three meals per day (37).

Franko et al. had shown the percentage of American girls eating three or more meals on all 3 days was reduced by over half (15% vs. 6%) (38).

Many study demonstrated that higher meal frequency and daily breakfast consumption might prevent overweight and obesity in children, and might decrease the risk of metabolic syndrome, as well as the risk of adiposity and central fat deposition, and might be effective in reducing the serum concentrations of total- and LDL-cholesterol in children (39).

Study limitations and strengths: The main limitation of this study is its cross-sectional nature. Moreover, we used the self-reported data. The strengths of the study are its nationwide coverage, its novelty in the Middle Eastern region, and comparing the data in different regions of the country with various socio-demographic backgrounds.

Conclusion

Most Iranian children and adolescents consumed all three main meals; however in both genders and in all age groups, irrespective of the SES, skipping breakfast was more frequent than skipping lunch

and dinner. Regular meal intake, notably breakfast, should be encouraged in all children and adolescents.

Acknowledgements

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