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Food habits and nutrient intake of female soccer athletes of Mumbai city, India

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Abstract
Introduction: Athletic success is strongly influenced by sound nutrition. Healthy and balanced dietary practices have a major impact on overall wellbeing of sportspersons. Poor nutritional status of young female soccer players, mainly due to inadequate food intake and poor nutritional knowledge is detrimental to growth, health and sports performance. Adolescent female team-sport athletes are faced with the challenge of meeting nutritional requirements for growth and development, as well as sport performance. There is a paucity of evidence describing the dietary adequacy of this population in respect to these physiological demands. Therefore, the aim of this study was to comprehensively evaluate the nutrition status of young female soccer athletes.
Objective: To assess the food habits and dietary intake of female soccer athletes of Mumbai city.
Methods: Data on 235 girls playing soccer with mean age of 12.7±1.8 years was collected from Mumbai city. Food habits were accessed with help of a structured questionnaire. One- day diet recall was used to calculate nutrient intake and percentage recommended dietary allowance was calculated. The statistical methods used in this study are SPSS software, Independent sample T test and Chi-square test.
Results: From the 251 girls, 174 (69.3%) girls consumed food before playing soccer, 97 (38.6%) consumed food during playing soccer and 207 (82.5%) consumed food after playing soccer. Most girls (26.2%) either consumed cereals (alone or in combination with pulse or vegetables) or fruit juices (28.5%) followed by milk and milk products (10.5%) as a pre- game meal. During the play, water (61.6%) was the most consumed food item followed by sports drink (21.2%) and fruit juice (13.3%). Most girls (31.1%) consumed cereal (alone or in combination with pulse or vegetables or non-vegetarian food) followed by fruit juices (18%) and processed snacks (13.6%) as a post-game meal. The mean energy intake of girls was 1315 ±313 kcal/day, protein was 39.7±12.3 g/day, carbohydrate was 206.3±62.3 g/day, fat was 41.3±26.7 g/day, calcium was 350.7±186.3 mg/day and iron was 11.8±5.4 mg/day. Percentage RDA intake for energy was 61.3±15.7 %, protein was 90.8±54.4 %, calcium was 45.8±24.1% and iron was 45.9±21.9 %. Girls aged ≥13 years had significantly lower energy intake from fats and RDA intake for energy as compared to girls aged <13 years of age. There was a significant association of RDA intake for energy with age group with higher percentage of girls <13 years getting >75% of RDA as compared to girls aged ≥ 13 years of age ($\chi 2=11.7$, $p=0.008$). There was a significant association of RDA intake for protein with age group with higher percentage of girls <13 years getting >75% of RDA as compared to girls aged ≥ 13 years of age ($\chi 2=12.5$, $p=0.002$).
Conclusion: Food habits and nutrient intake of girls playing soccer were inadequate. Nutrition education camps to educate adolescent athletes about food habits and dietary intake need to be planned.

Keywords: female soccer players, nutrition, physical fitness, diet

Introduction
The game of soccer is becoming increasingly popular with women worldwide [1]. Anthropometric measurements are another component of nutrition assessment that are useful for evaluating overnutrition or undernutrition [2]. Clinical eating disorders include anorexia nervosa, bulimia nervosa, and disordered eating not otherwise specified [3]. An overall negative energy balance (caloric intake less than expenditure) was observed and hypothesized to be the most likely culprit of amenorrhea among female athletes [4]. Bone mass depends on the overall balance between resorption and deposition [5]. Proper nutrition is a fundamental component of athletes' training and performance plan [6]. Assessment of dietary intake is fundamental for the sport in order to establish adequate intake standards [7]. A thorough dietary analysis is necessary to evaluate caloric intake and eating behaviours [8]. Maintenance and meeting the nutritional needs of the players with regard to energy, protein, fat, minerals and vitamins are crucial and these nutrients needs are higher for athletes than for ordinary persons [9]. Routine physical activity can be associated with improved cognitive performance and academic achievement [10].

Methodology
Important aspects of an athlete's life are nutrition, improved stamina and their resulting performance. In order to assess these parameters, this study was undertaken. Female soccer players from 7-18 years of age were included in the study. Female athletes below the age of 7 and above the age of 18 were excluded. Males of all age groups were excluded.

Purposive sampling was used to conduct the research. The sample size was 251 girls which was divided into two groups of girls <13 years of age and ≥ 13 years of age. Data on 235 girls playing soccer with mean age of 12.7±1.8 years was collected. Food habits of the female athletes were assessed with help of a structured questionnaire which included dietary assessment, 24- hour dietary recall and food frequency. Amount of fruits and vegetables consumed, water intake, number of meals skipped by them, food allergies and intolerances, consumption of junk food; were some of the important things assessed in their diet with the help of a questionnaire. A One-day diet recall that was obtained, was used to calculate nutrient intake and percentage recommended dietary allowance. By taking a detailed dietary assessment of the female soccer players, its impact on their health and their physical activity levels were evaluated.

Analyses were performed using SPSS software for Windows (Version 16.0, 2007, SPSS Inc, Chicago IL). Data is presented as Mean±SD or frequency (percentage). Independent sample T test was used to analyze the difference in dietary intake between age groups. Cross tabulations were done for various food habits according to age groups and analyzed using Chi-square test for association. P value <0.05 was considered to be significant.

Results and Discussion

Food habits and nutrient intake data of 251 girls playing soccer with mean age of 12.9±2.0 years is presented in the current study.

Anthropometric measurements

The mean height of the girls was 151.1±9.5 cm, weight was 41±10.3 kg and BMI was 17.8±3.8 kg/m2, height for age Z score was 0.22±1.27, weight for age Z score was -0.23±1.12 and BMI for age Z score was -0.40±1.2.

General Eating habits

Of the 251 girls, 47 (18.7%) girls were vegetarians, 195 (77.7%) were non-vegetarians and 9 (3.6%) were eggitarians. From 235 girls, 17 (6.8%) consumed 2 meals/ day, 67 (26.7%) consumed 3 meals/ day, 106 (42.2%) consumed 4 meals/ day, 44 (17.5%) consumed 5 meals/day and 17 (6.8%) consumed 6 meals/day. 77 (30.7%) girls consumed breakfast rarely, 23 (9.2%) consumed breakfast 1-2 times/week, 23 (9.2%) consumed breakfast 3-4 times/week and 131 (52.2%) consumed breakfast daily. 96 (38.2%) girls consumed salad whereas 155 (61.8%) did not consumed salad. When water consumption was assessed, 84 (33.5%) consumed 5-6 glasses/ day, 74 (29.5%) consumed 7-9 glasses/day, 69 (27.5%) consumed 10 – 12 glasses/day and 24 (9.6%) consumed >12 glasses/day. Table 1 gives food habits of girls when classified according to age group. There was no significant association between type of diet and age group indicating similar percentage of girls in both groups being vegetarian, non-vegetarian or eggetarian (p>0.05) (Table 1). There was a significant association between breakfast consumption and age group with higher percentage of girls aged <13 years consuming breakfast daily as compared to girls aged ≥ 13 years of age (p<0.05) (Table 1).

Another study found that younger athletes had higher energy intakes and were more likely to eat breakfast than the 20-year old players [11].

Higher percentage of girls ≥ 13 years of age consumed salads as compared to girls <13 years of age (p<0.05) (Table 1). There was a significant association of water consumption with age with higher percentage of girls ≥ 13 years of age consuming 10-12 glasses or >12 glasses of water/day as compared to girls <13 years of age (p<0.05) (Table 1). Girls consumed 2±1 servings of vegetables and 2±1 servings of fruits each day. There was no significant difference in servings of fruits and vegetables consumed/ day in both age groups (p>0.05) (Table 1).

In a study which was conducted to assess the Nutritional Status of Junior Elite Female Soccer Athletes, A high proportion of players were not in energy balance, failed to meet carbohydrate and micronutrient recommendations, and presented with depleted iron and vitamin D status. Therefore, Suboptimal nutrition status may affect soccer performance and physiological growth and development [12].

In another study conducted on Female Collegiate Athletes to assess the Prevalence of Eating Disorders and Disordered Eating Behaviors, it was found that Few participants engaged in binge eating; most used exercise, as opposed to vomiting, dieting, laxatives, or diuretics, to control their weight. Female athletes suffered from eating disorders, and most of them experienced symptom levels that are subclinical but problematic [13].

Table 1: Food habits of girls when classified according to age

	<13 years of age (n=134)	**≥ 13 years of age (n=117)**	**$\chi 2$ (p value)**
Type of diet			
Vegetarian	26 (19.4)	21 (17.9)	1.541 (0.463)
Non-vegetarian	105 (78.4)	90 (76.9)	
Eggetarian	3 (2.2)	76 (5.1)	
Breakfast consumption			
Rarely	32 (23.9)	45 (38.5)	7.693 (0.053)
1-2 times/week	11 (8.2)	12 (10.3)	
3-4 times/week	13 (9.7)	7 (6)	
Daily	78 (58.2)	53 (45.3)	
Salad Consumption			
Yes	41 (30.6)	55 (47)	7.123 (0.008)
No	93 (69.4)	62 (53)	
Water consumption			
5 – 6 glasses/day	51 (38.1)	33 (28.2)	9.462 (0.024)
7 – 9 glasses/ day	45 (33.6)	29 (24.8)	
10 – 12 glasses/ day	29 (21.6)	40 (34.2)	
>12 glasses/day	9 (6.7)	15 (12.8)	
			P value
Servings of vegetables/day	2±1	2±1	0.429
Servings of fruits/day	2±1	2±1	0.432

Frequency of food consumption

Of the 251 girls, 247 (98.4%) consumed chapati, 246 (98%) consumed rice, 246 (98%) consumed oats, 94 (37.5%) consumed cornflakes, 147 (58.6%) consumed chocos, 247 (98.4%) consumed vegetables, 239 (952%) consumed fruits, 244 (97.2%) consumed vegetables, 54 (21.5%) consumed

soybeans, 152 (60.6), 160 (63.7%) consumed whole egg, 31 (12.4%) consumed egg white, 24 (9.6%) consumed egg yolk, 158 (62.9%) consumed chicken, 69 (27.5%) consumed mutton, 18 (7.2%) consumed beef, 103 (41%) consumed fish, 171 (68.1%) consumed cow's milk, 78 (31.1%) consumed buffalo's milk, 213 (84.9%) consumed milk products, 220 (87.6%) consumed fried foods, 222 (88.4%) consumed processed foods, 212 (84.5%) consumed baked foods, 178 (70.9%) consumed chaat recipes, 207(82.5%) consumed beverage, 232 (92.4%) consumed chocolates and sweets regularly (either fortnight/ weekly/ alternate day or daily). Table 2 gives frequency of food consumption of cereal products, vegetables, fruits and protein foods. A significant association of frequency consumption of fried foods was found with age groups with higher percentage of girls aged ≥13 years consuming fried foods on alternate days as compared to girls aged <13 years ($p<0.05$) (Table 2). A significant association of frequency consumption of chaat recipes and beverages was found with age groups with higher percentage of girls ≥13 years consuming chaat recipes and beverages on alternate and daily days as compared to girls aged <13 years ($p<0.05$) (Table 2). There was no other significant association of age with frequency consumption of cereal products, vegetables, fruits and protein foods indicating similar consumption in girls of both age groups ($p>0.05$) (Table 2).

Table 2: Food frequency consumption of cereal products, vegetables, fruits and protein foods when classified according to age

Food items	<13 years of age (n=134)					≥ 13 years of age (n=117)					χ2 (p value)
	Monthly/ Rarely/ Never	Fort-nightly	Weekly	Alternate day	Daily	Monthly/ Rarely/ Never	Fort-nightly	Weekly	Alternate day	Daily	
Chapati	2 (1.5)	0 (0)	4 (3)	28 (20.9)	100 (74.6)	2 (1.7)	0 (0)	2 (1.7)	25 (21.4)	88 (75.2)	0.453 (0.929)
Rice	5 (3.7)	1 (0.7)	12 (9)	23 (17.2)	93 (69.4)	0 (0)	1 (0.9)	6 (5.1)	15 (12.8)	95 (81.2)	7.589 (0.108)
Oats	118 (88.1)	5 (3.7)	7 (5.2)	2 (1.5)	2 (1.5)	99 (84.6)	4 (3.4)	10 (8.5)	1 (0.9)	3 (2.6)	1.694 (0.792)
Cornflakes	85 (63.4)	15 (11.2)	18 (13.4)	13 (9.7)	3 (2.2)	72 (61.5)	16 (13.7)	15 (12.8)	11 (9.4)	3 (2.6)	0.399 (0.983)
Chocos	49 (36.6)	5 (3.7)	50 (37.3)	22 (16.4)	8 (6)	55 (47)	3 (2.6)	42 (35.9)	13 (11.1)	4 (3.4)	4.057 (0.398)
Vegetables	3 (2.2)	0 (0)	4 (3)	38 (28.4)	89 (66.4)	2 (1.7)	1 (0.9)	7 (6)	30 (25.6)	77 (65.8)	2.688 (0.611)
Fruits	5 (3.7)	0 (0)	28 (20.9)	33 (24.6)	68 (50.7)	7 (6)	1 (0.9)	28 (23.9)	36 (30.8)	45 (38.5)	5.017 (0.286)
Dals	4 (3)	0 (0)	11 (8.2)	32 (23.9)	87 (64.9)	3 (2.6)	1 (0.9)	10 (8.5)	23 (19.7)	80 (68.4)	1.814 (0.770)
Soya bean	109 (81.3)	12 (9)	11 (8.2)	1 (0.7)	1 (0.7)	88 (75.2)	7 (6)	18 (15.4)	3 (2.6)	1 (0.9)	5.116 (0.276)
Nuts	49 (36.6)	12 (9)	24 (17.9)	19 (14.2)	30 (22.4)	50 (42.7)	7 (6)	17 (14.5)	11 (9.4)	32 (27.4)	3.584 (0.465)
Whole egg	46 (34.3)	3 (2.2)	33 (24.6)	24 (17.9)	28 (209)	45 (38.5)	3 (2.6)	32 (27.4)	19 (16.2)	18 (15.4)	1.638 (0.802)
Egg white	114 (85.1)	2 (1.5)	2 (1.5)	5 (3.7)	11 (8.2)	106 (90.6)	0 (0)	5 (4.3)	1 (0.9)	5 (4.3)	7.376 (0.117)
Egg yolk	119 (88.8)	2 (1.5)	0 (0)	4 (3)	9 (6.7)	108 (92.3)	0 (0)	4 (3.4)	1 (0.9)	4 (3.4)	9.147 (0.058)
Chicken	48 (35.8)	2 (1.5)	64 (47.8)	11 (8.2)	9 (6.7)	45 (38.5)	1 (0.9)	47 (40.2)	16 (13.7)	8 (6.8)	2.880 (0.578)
Mutton	102 (76.1)	2 (1.5)	27 (20.1)	3 (2.2)	0 (0)	80 (68.4)	2 (1.7)	28 (23.9)	5 (4.3)	2 (1.7)	4.045 (0.400)
Beef	124 (92.5)	0 (0)	7 (5.2)	3 (2.2)	0 (0)	109 (93.2)	1 (0.9)	5 (4.3)	2 (1.7)	0 (0)	1.354 (0.716)
Fish	80 (59.7)	5 (3.7)	39 (29.1)	10 (7.5)	0 (0)	68 (58.1)	1 (0.9)	32 (27.4)	13 (11.1)	3 (2.6)	6.600 (0.159)
Milk (cow)	39 (29.1)	1 (0.7)	3 (2.2)	12 (9)	79 (59)	41 (35)	1 (0.9)	7 (6)	18 (15.4)	50 (42.7)	8.256 (0.083)
Milk (buffalo)	91 (67.9)	0 (0)	6 (4.5)	2 (1.5)	35 (26.1)	82 (70.1)	1 (0.9)	6 (5.1)	2 (1.7)	26 (22.2)	1.652 (0.799)
Milk products	24 (17.9)	6 (4.5)	43 (32.1)	43 (32.1)	18 (13.4)	14 (12)	4 (3.4)	39 (33.3)	41 (35)	19 (16.2)	2.160 (0706)
Fried items	24 (1.9)	7 (5.2)	79 (59)	17 (12.7)	7 (5.2)	7 (6)	5 (4.3)	75 (64.1)	24 (20.5)	6 (5.1)	9.926 (0.042)
Processed items	14 (10.4)	5 (3.7)	56 (41.8)	46 (34.3)	13 (9.7)	15 (12.9)	2 (1.7)	40 (34.5)	40 (34.5)	19 (16.4)	4.257 (0.372)
Baked items	22 (16.4)	11 (8.2)	55 (41)	27 (20.1)	19 (14.2)	17 (14.5)	3 (2.6)	53 (45.3)	18 (15.4)	26 (22.2)	7.019 (0.135)

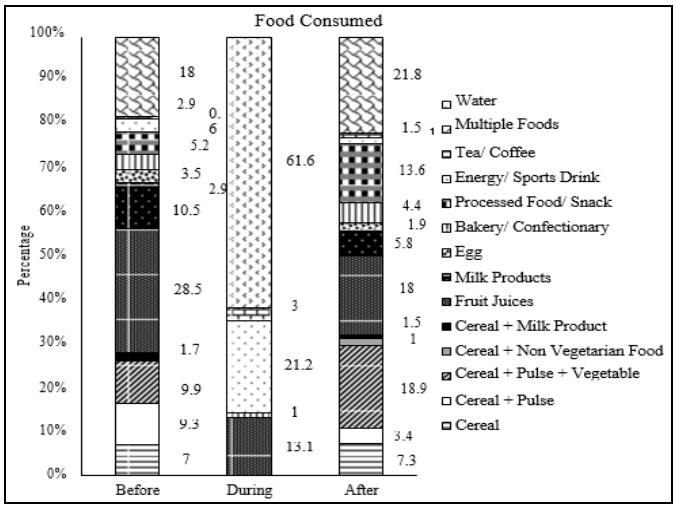
Chaat recipes	47 (35.1)	16 (11.9)	68 (50.7)	2 (1.5)	1 (0.7)	26 (22.2)	16 (13.7)	62 (53)	9 (7.7)	4 (3.4)	11.41 (0.022)
Beverages	23 (17.2)	4 (3)	82 (61.2)	13 (9.7)	12 (9)	21 (17.9)	10 (8.5)	50 (42.7)	20 (17.2)	16 (13.7)	11.30 (0.023)
Chocolates /sweets	11 (8.2)	1 (0.7)	49 (36.6)	39 (29.1)	34 (25.4)	8 (6.8)	5 (4.3)	44 (37.6)	21 (17.9)	39 (33.3)	8.037 (0.090)

Data presented as frequency (percentage)

Consumption of foods before, during and after playing soccer

From the 251 girls, 174 (69.3%) girls consumed food before playing soccer, 97 (38.6%) consumed food during playing soccer and 207 (82.5%) consumed food after playing soccer. Fore before playing soccer, 43.1% girls consumed food within half of playing soccer, 27.8% consumed half an hour-1 hour before playing soccer, 13.2% consumed more than 1 hour before playing soccer and 15.1% consumed food before soccer at random times. Similarly, for post-game meal, 43% consumed within half an hour after playing soccer, 34.2% consumed within half an hour to 1 hour after playing soccer, 16% consumed after one hour of playing soccer and 6.3% consumed food at random times after playing soccer.

Food consumed by girls before, during and after playing soccer is presented in Figure 1. As seen in Figure 1, before playing soccer, most girls either consumed cereals (alone or in combination with pulse or vegetables) or fruit juices followed by milk and milk products. During the play, water was the most consumed food item followed by sports drink and fruit juice (Figure 1). After playing game, most girls consumed again cereal (alone or in combination with pulse or vegetables or non-vegetarian food) followed by fruit juices and processed snacks (Figure 1).



Data presented as percentage

Fig 1: Food consumed by girls before, during and after playing soccer

Nutrient intake

The mean energy intake of girls was 1315 ±313 kcal/day, protein was 39.7±12.3 g/day, carbohydrate was 206.3±62.3 g/day, fat was 41.3±26.7 g/day, calcium was 350.7±186.3 mg/day and iron was 11.8±5.4 mg/day. Percentage energy intake from proteins was 12.3±3.5%, from carbohydrate was 62.5±10.6 % and from fat was 28.3±16.9 %. Percentage RDA intake for energy was 61.3±15.7 %, protein was 90.8±54.4 %, calcium was 45.8±24.1% and iron was 45.9±21.9 %. Table 3 gives nutrient intake of girls when classified according to age groups. Girls aged ≥13 years had significantly lower energy intake from fats and RDA intake for energy as compared to girls aged <13 years of age (Table 3) There was no other significant difference in nutrient intakes of 2 age groups which was probably due to low food intake on game days by girls in both groups (p>0.05) (Table 3).

Table 3: Nutrient intake in girls when classified according to age

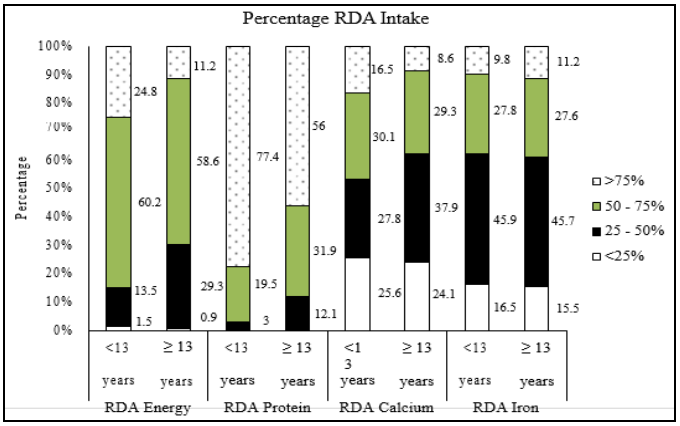
Nutrients	<13 years of age (n=134)	≥ 13 years of age (n=117)	P value
Energy (kcal/day)	1305±299	1327±330	0.566
Protein (g/day)	38.6±11.4	41.0±13.2	0.126
CHO (g/day)	202±64.1	211.3±60	0.240
Fat (g/day)	43.9±33.6	38.2±15.3	0.097
Calcium (mg/day)	365.3±189.2	333.9±182.3	0.185
Iron (mg/day)	11.3±5.3	12.4±5.4	0.114
Energy from protein (%)	12.2±3.6	12.5±3.4	0.495
Energy from CHO (%)	61.3±10.5	63.8±10.6	0.061
Energy from fat (%)	30.3±21.4	26±9	0.045
RDA Energy (%)	64.4±15.8	57.7±14.8	0.001*
RDA Protein (%)	94.7±29.2	86.4±73.3	0.231
RDA Calcium (%)	47.9±25.1	43.3±22.7	0.136
RDA Iron (%)	45.2±22.8	46.7±20.7	0.589

Data presented as Mean ± SD. *p<0.05 for significance

From 251 girls, 22.9% girls <50% RDA intake for energy whereas 77.1% got >50% RDA intake for energy. For proteins, 7.6% girls for <50% of the RDA whereas 92.4% got > 50% of RDA. For Calcium, 58.2% got <50% of RDA whereas 41.8% got > 50% of RDA. For iron, 62.2% for <50% of RDA whereas 37.8% got >50% RDA. Figure 2 gives percentage RDA achieved by girls when classified according to age group. There was a significant association of RDA intake for energy with age group with higher percentage of girls <13 years getting >75% of RDA as compared to girls aged ≥ 13 years of age ($\chi2$=11.7, p=0.008) (Figure 2). There was a significant association of RDA intake for protein with age group with higher percentage of girls <13 years getting >75% of RDA as compared to girls aged ≥ 13 years of age ($\chi2$=12.5, p=0.002) (Figure 2). There was no significant association of RDA intake for calcium ($\chi2$=6.221, p=0.101) and iron ($\chi2$=0.308, p=0.958) with age group indicating similar intake in both age groups (Figure 2).

Other studies have also reported that the dietary patterns of female football players were both quantitatively and qualitatively inappropriate. The athletes have shown proper nutritional status, but a diet deficient in energy due largely to low carbohydrate intake [5].

Another study showed that caloric intake per kilogram was found to be significantly higher among the youngest participants (Team A) than the adults (Team D) [14].

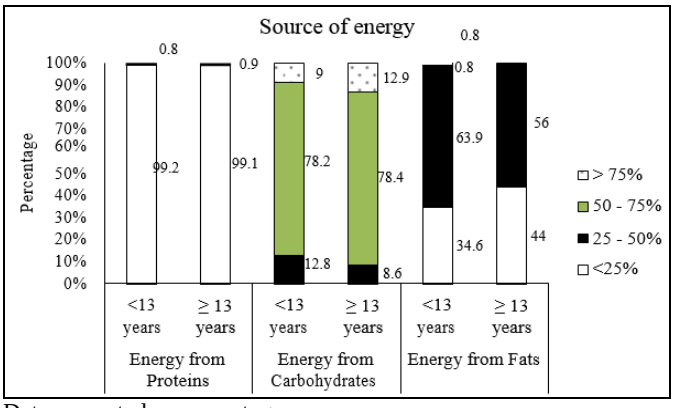


Data presented as percentage

Fig 2: Percentage RDA achieved by girls when classified according to age group

From 251 girls, 99.2% got <25% energy from proteins. For carbohydrates, 11.6% girls got 25-50% energy from carbohydrates, 77.5% got 50-75% energy from carbohydrates whereas 10.8% got >75% energy from carbohydrates. For fats, 39% girls got <25% energy from fats, 60.2% for 25-50% energy from fats, 0.4% each got 50-75% and >75% energy from fats each. Figure 3 gives percentage of energy received from fats, carbohydrates and proteins by girls when classified according to age. There was no significant association of energy intake from proteins ($\chi2=0.009$, $p=0.923$), from carbohydrates ($\chi2=1.746$, $p=0.418$) and from fats ($\chi2=3.781$, $p=0.286$) indicating similar intake in both age groups (Figure 3).

In a study, it was shown that the intakes of protein and fatty acids were above the recommended intakes [15].



Data presented as percentage

Fig 3: Percentage of energy received from fats, carbohydrates and proteins by girls when classified according to age

Conclusion

The Food habits and the overall nutrient intake of the young girls playing soccer were found to be inadequate in nature. Since nutritional intake affects the overall body compostion, functioning, stamina and their capability to excel in sports and other physical activities, Nutrition education camps must be conducted in order to educate the adolescent athletes about healthy food habits, healthy choices and alternatives, and accordingly their dietary intake needs to be planned.

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