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DIETARY INTAKE PATTERNS AND FOOD VARIETY SCORES OF YOUNG UNIVERSITY STUDENTS AT THE BASE OF HEALTH STATUS

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ABSTRACT

Unhealthy dietary intakes and dietary patterns are a major risk for many chronic as well as degenerative disorders. The current cross sectional study was carried out on 237 young university female students residing in University of Peshawar, Pakistan dormitories. A self constructed food frequency questionnaire was used to determine the Food Variety scores and Dietary Diversity patterns. Anthropometry and hemoglobin were assessed to correlate dietary intakes with health status. The data indicated good breakfast intake, poor snacks selection, and "westernized dietary patterns" being characterized by high consumption of starchy high fat foods and avoidance of plant based foods. The sample with a mean age of 17 years showed mean height of 159.39 ±5.69 being 2% lesser than the reference value for height- for -age standard indicating the prevalence of poor dietary intakes and malnutrition in the childhood. Mean weight of the sample (54.71±8.97kg) was +0.5% of the standard weight- for- height reference indicating adequate caloric consumption. The mean hemoglobin was 9.48±2.21g/dL was quite low indicating prevalence of moderate anemia in this age group. Food Variety Scores of the respondents showed low scores for vegetables (19 ±28.51) and fruits (12.4±15.2). The FVS for

starch based food was quite high (49.45±15.89) followed by oils and sugar group (39±29.8). The overall scores showed less varietal scores indicating lack of dietary diversity in the food intake of the young females. The study conclude that poor dietary patterns and poor health status can be a potential risk factors in the etiology of many chronic disorders in these young females and nutrition education at all levels shall be made an integral part of the curriculum along with the provision of healthy food choices to these students.

Keywords: Food Variety scores, dietary Intake Patterns, Anthropometry, hemoglobin levels

1. INTRODUCTION

Over the years dietary quality of adolescents and young adults has declined. The diets consist of fast foods, soft drinks, and salty snacks with a decline in fruits and vegetables intake [1-3]. These trends have raised the prevalence of obesity in adolescents dramatically [4]. Unhealthy food habits if adopted in early years of adults pose major health risks for chronic diseases [5, 6]. The nutrition transition particularly across the developing countries is causing more frequent chronic disorders [7, 8]. In these countries the traditional Mediterranean diets are replaced by more westernized dietary patterns progressively [9, 10].

Young adults particularly the university students are mostly affected by this nutrition transition [11, 12]. Young adults leaving their parents to live away from home to attend college undergo various health – related behavioral changes, the most being adopting unhealthy dietary habits [13, 14]. These behaviors are being attributed to drastic changes in the environments, resources available, frequent exposure to unhealthy foods, and limited money to purchase food of high quality [15]. This has caused replacement of nutrient- dense foods with energy- dense but nutrient- poor foods [16].

Dietary intake patterns and their association with chronic disorders is a complex and poorly understood phenomenon. Studies on dietary intake patterns have been suggested to be an insight into this complex relationship [17]. As defined dietary intake pattern is the distribution and frequency of food in the habitual diet [18]. Dietary intake patterns approach have utility owing to the facts that human diet does not consist of a single nutrient or food rather it represent a complex set pf highly correlated exposures [19, 20]. Such approaches can also be useful for public health initiatives as overall healthy dietary interventions are more effective in preventing

and treating disorders such as hypertension and cancers [21, 22].

Several studies have analyzed the dietary intakes of adolescents, mostly being observing nutrients, energy intakes, or intake of food groups. Little information exists regarding the stability of food intake patterns in young students. The primary aim of the current study was to assess the dietary intake patterns and food variety scores of female university students living in the hostels of the University of Peshawar, Pakistan and their subsequent effects on the health status of these girls.

2. MATERIALS AND METHODS

2.1 Sampling

In order to minimize the impacts of diverse family dietary patterns and establish the generalize food preferences of girls a sample of 237 college students, aging 16-19 years residing at girls hostels (dormitories) at the University of Peshawar was selected at random. Data was collected through a self-constructed questionnaire consisting of the ABD (Anthropometry, Biochemical blood indices, and dietary intake record) of the nutritional status assessment.

2.2 Inclusion and Exclusion criteria

Apparently healthy, non athlete teenage girls without any infections or near history of infection, in the mid of academic session (to avoid the stress of examination), low history of regular medications and with normal history of menarche were included in the sample. Students with regular history of medications, B-complex supplementation, irregular/heavy menstruation, and heavy caffeine intake were omitted.

2.3 Anthropometric Measurement

All the subjects were subjected to anthropometric measurement for height weight, skin fold thickness, BMI as per WHO procedures and standards [23].

2.4 Hemoglobin Analysis

For hemoglobin estimation Hemocue B-hemoglobin was used by pricking the middle finger and putting the blood in disposable microcuvettes inserted into hemoQ for results.

2.5 Dietary Intake Record

A self constructed FFQ was administered. The FFQ asked how often each food item, group, or beverage was usually consumed with five possible answers for each of the food categories: (1) never, (2) two times or less per week, (3) three to six times per week, (4) at least one time per day, and (5) at all meals. These five response categories were later merged into four categories for analysis purposes, namely: (1) never, (2) once or twice per week (3) three to six times per week, and (4) consumption on daily basis.

Food intake of sample was recorded for 7 days in the hostel dining room. Each serving was weighed before serving and the left over as well in order to estimate portion size. For the breakfast and snacks each subject was provided with pre-weighed paper cups, plates, glasses and spoon along with diet record sheets.

2.6 Calculation of Dietary Diversity and Food Variety Scores

$$FVS = \frac{\text{Number of respondents that consumed specific foods in 24 hrs}}{\text{Total number of respondents}} \times 100$$

$$DDS = \frac{\text{Number of respondents that consumed specific food group in a week}}{\text{Total number of respondents}} \times 100$$

FVS= Food Variety Score

DDS= Dietary Diversity Score

The most common food items were cooked in the food preparation labs in order to standardize recipes and to evaluate dietary intake for nutritive value evaluation through Food Composition Tables of Pakistan. [24]

3. RESULTS & DISCUSSION

3.1 Anthropometric & Hemoglobin Distribution of the Respondents

Data regarding anthropometry showed mean age to be 17.21 years. The mean for height was 159.39 ±5.69 (range 147.3- 172.7) which was 2% i.e. lesser than the reference value of 162.5 for height- for -age standard. Mean weight of the sample was 54.71±8.97kg (range 41-83kg) and was +0.5% of the standard weight- for- height reference. The results showed that mean BMI was 21.60±4.75 (range 15.50-41.40) which was +0.4% of the given normal range of 19-24 for BMI for this age group. The triceps skin fold thickness of the sample was 1.93±-.55 cm (range 1.00-3.00 cm) the percent reference value was + 7.2% higher of the standards (**Table-1**).

The findings of the current study showed that weight status of the sample was satisfactory however the less heights might be attributed to early childhood malnutrition. The present data coincide with the findings of other studies whose findings were of 1.8 cm for the skin fold thickness and weight status as compared to dietary intake among the

teenage girls [25, 26]. The weight status based on BMI was also satisfactory. These results were according to the findings of Hanan et al who found that 42.07% of the teenage girls were underweight 60% had normal BMI and 1% were overweight [27]. The prevalence of moderate anemia was the most striking finding of the current study and these results are in accordance with the findings of Ahmad H. S who found that moderate anemia was more common (43.11%)followed by mild anemia (23.7%) and 88.4 anemia students overall in Sharjah [28]. These results are also clearly in line with the findings of other researchers who found anemia being highly prevalent among young females and confirm the findings of WHO which stressed on the prevention of iron deficiency anemia among the teenage population [29-31].

Weight distribution of the sample (Figure 1) when compared with WHO classification of BMI 22% of sample fell in the underweight category while 66% were of normal weight. About 9% of the sample was overweight and 3% obese.

Biochemical variables for blood iron values indicated that mean hemoglobin was 9.48±2.21 against the recommended standard of 12 g/dl for this age group (Figure 2). The prevalence of moderate anemia was the most striking finding of the current study and these results are in accordance with the findings of Ahmad H. S who found that moderate anemia was more common (43.11%)followed by mild anemia (23.7%) and 88.4 anemia students overall in Sharjah [28]. These results are also clearly in line with the findings of other researchers who found anemia being highly prevalent among young females and confirm the findings of WHO which stressed on the prevention of iron deficiency anemia among the teenage population [29-31].

3.2 Dietary Intake Patterns

The prevailing breakfast practices among the respondent indicated **(Table-2)** that 82% of the girls residing in the hostel took daily breakfast, 12% took occasionally while 26% never took breakfast at all. Results regarding the types of commonly consumed breakfast showed fried egg with bread and tea as the most common (56%) breakfast pattern. This was mainly due to the fact that each student is provided with 2 bread slices and one egg daily for breakfast and tea they make for themselves. The second common breakfast pattern was jam on bred with tea (18%), followed by fried rotie with tea (16%). The present results indicated that breakfast consumption was good among the hostel students as against the highest percent of non

boarding teenage students who occasionally consume breakfast in the study of Akhtar et al however the present results of breakfast as a meal never being taken coincide with their findings (26% vs. 23%) [32]. Other studies also reported same pattern of breakfast postulating breakfast as the most often skipped meal [33, 34]. As reported by the respondents of the current study the reasons for skipping breakfast were lack of time and non availability of space in the kitchenettes made for this purpose in the hostels.

Snacking patterns of the respondents indicated **(Table-3)** samosas (fried patties with potato fillings) was the most common snacks during college timings(44%) followed by dahi bhalay (24%) pop corns (16%), biscuits (4%), chocolates, candies etc (10%), potato chips, Nimko, Imli etc. (4%) along with carbonated drinks as the common beverage (20%). Snacking pattern in the evening showed tea with biscuits was the most favorite (60%). About 12% of the respondents took carbonated drinks as beverages in the evening. As reported by the respondents their food choices during snacks are highly affected by availability of food, their limited pocket money and lack of time to prepare snacks for themselves.

3.3 Dietary Diversity from Food Groups

Data regarding the frequency and contribution of the four main food groups **(Table-4)** indicated gains and cereals as the dominant group in the meal pattern of the adolescent girls in the present study. Vegetables in cooked form were the second frequently consumed group. Intake of milk in the form of tea was almost daily however, yoghurt, meat and poultry was far below as recommended by the Food Guide Pyramid .This poor dietary intake pattern with marginal intake of fresh fruits and vegetable can be a contributing factor in the prevalence of anemia in the present sample. Similar findings are also reported by other studies proposing fresh fruits and vegetables in the diet of young adults are an important source of vitamin C and folates needed for the absorption of iron from the diet. In the current study poor dietary intake patterns with marginal intake of fresh fruits and vegetable were observed which might can be a contributing factor in the prevalence of anemia in the present sample. As reported, fresh fruits and vegetables in the diet of young adults are an important source of vitamin C and folates needed for the absorption of iron from the diet [35, 36]. The intake of carbohydrate based diet might have added to the normal weight status of the sample but with compromised blood iron

indices. Similar observations were also made by Downey et al who reported that carbohydrate intake is at peak during adolescence (10-19 year) [37]. Mean iron intake per day in our study was much lower (13.52 mg) than the recommended allowance. Daily intake of protein against the RDA was 81.8 % while that of energy intake was 93.4 5 further clarifying carbohydrates as the main source of energy in the diet of the present sample. These finding are in accordance with the results of kuriwan et al who reported an average 43.8 g/day proteins in the anemic and 45.3 g/day in non anemic subjects in Indonesia [38]. Thanckachan et al also reported low intake of heme iron [38]. Results of the present study are also in agreement with the findings of Akhtar et al who reported that though the daily iron or protein intake of Pakistani population may be higher than RDA but the overall food composition affect its bioavailability [32, 39].

3.4 Food variety Scores

The food variety score **(Table 5)** of the respondents showed highest score for wheat-based starchy food consumption being the highest. The scores for protein rich meat and meat products were also good but it was attributed mainly to the intake of daily egg which was added to this group and was not calculated separately. The scores for sugars & oil group was also higher mainly due to the intake of higher consumption of samosas , fries, biscuits and soft drinks. The scores for vegetables and fresh fruits were quite low. These finding are in close agreement with the reported results from the university students of Lebanon [40].

3.5 Nutrient Intake Patterns

The average daily nutrient intake as calculated with Food Composition Tables for Pakistan and compared with the recommended daily allowances indicated **(Table-6)** that mean intake of carbohydrates (292 gm) was 97% of the reference values. Mean intake of iron per day was 13.52$\pm$1.72 mg and was 52.7% of the reference values (18 mg) per day for this age group. Caloric intake per day was 1762$\pm$67.6 kcal which was 93.9% of the reference value (2100 kcal) for this age as recommended for Pakistani teenage girls. Results of carbohydrate intake confirm the findings of Downey et al that carbohydrate intake is at peak during adolescence (10-19 year) [37]. Mean iron intake per day was much lower (13.52 mg) than the recommended allowance. Daily intake of protein against the RDA was 81.8 % while that of energy intake was 93.4 5 further clarifying carbohydrates as the main source of energy in the diet of the present

sample. These finding are in accordance to other reported results being an average 43.8 g/day proteins in the anemic and 45.3g/day proteins in non anemic subjects in Indonesia [38]. Thanckachan et al (2007) also reported low intake of heme iron [39]. Results of the present study are also in agreement with the findings of Akhtar et al who reported that daily intake of Pakistani population was higher than RDA but food composition affects its bioavailability [32].

Correlation coefficient among the nutrient intake indicated that all the variables were significantly correlated at 0.01% level of significance **(Table 7).** Correlation between carbohydrates and proteins show less significance (r=0.652) due to the fact that foods rich in carbohydrates content usually lack good amount of proteins. Same was true for carbohydrates having less significant correlation (r=0.362) with iron and significant correlation (r=0.849) with energy. Carbohydrate rich foods like grains, pulses and beans are good sources of energy as well. Significant correlation (r=7.13) was also found between proteins and iron and proteins and energy (r=0.738) indicating foods containing good content of protein are usually better sources of iron. These findings are similar to the findings of another study [40].

Table- 1: Anthropometric Data of the Sample

Variables (N=100)	Range	Mean ±SD	% Ref. value*
Age (years)	16-19	17.21	
Height (cm)	147.30-172.70	159.39±5.69	-21%
Weight (Kg)	41-83	54.71±8.97	+0.5
BMI	15.50-41.40	21.60±4.75	+0.4
Skin fold Thickness (cm)	1.00-3.00	1.93±0.55	+ 7.2%

*WHO standards (1978)

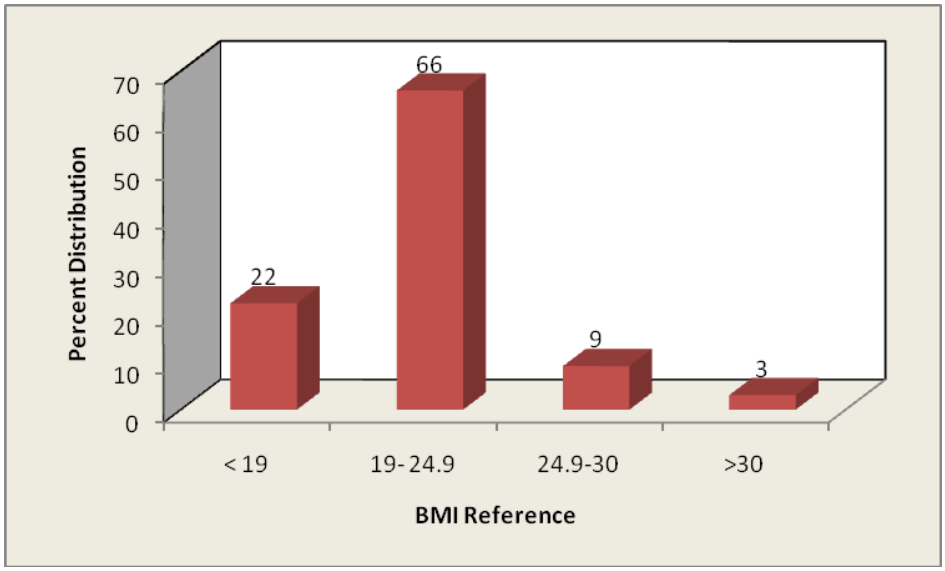

Figure 1: Weight Distribution of the Sample

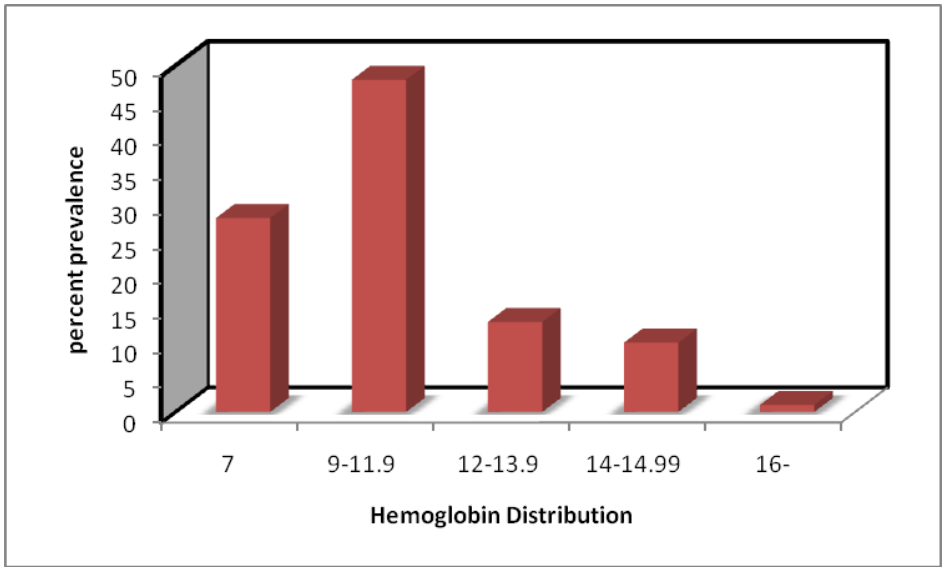

Figure 2: Hemoglobin Indices of the Respondents

Table 2: Common Breakfast Patterns of the Sample

Parameters	N	% Age
Frequency of breakfast **i. Daily** **ii. Sometimes** **iii. Never**	 **194** **28.44** **61.62**	 **82%** **12%** **26%**
Breakfast patterns **1. Fried egg, bread tea**	 **133**	 **56%**

2. Bread, jam, tea	42	18%
3. Fried rotie and tea	39	16%
4. Mayonnaise on bread	10	4%
5. Honey and bread	10	4%
6. Only tea	3	1%
Total	237	100

Table 3: Snaking Patterns of the Sample

Food items	N	Percentage
Mid morning snacks		
Samosas	104	44%
Popcorns	57	24%
Biscuits	38	16%
Chocolates/candies	23	10%
Chips, ice cream	9	4%
Carbonated drinks	71	30%
Evening Tea		
Biscuits and tea	142	60%
Nimko	47	20%
Potato chips	47	20%
Chocolates	15	6%
Carbonated beverages	52	22%

Table 4: Food Intake Patterns of the Sample Based on Four Food Groups in the Main Meals

Food Groups	% contribution	Mean portion weight
Milk & Milk products		
i. Milk in tea	100 %(daily)	125 ml
ii. Yoghurt	21.5 %(3 times a week)	125 gm
Meat & poultry	21 % (3 times a week)	1.5 Oz
Grains, Cereals & Beans		
i. grains (wheat & rice)	100 %(daily)	263 gm
ii. cereals & beans	100 % (daily)	188 gm
Vegetables		
i. Cooked	35 %(5 times a week)	240 gm
ii. Raw/salad	14% (2 times a week)	50 gm
Fruits	14 % (2 times a week)	125 gm

Table 5: Food Variety Score of the Respondents According to Food Groups

Food Items	Range Score	Mean	Standard Deviation
Wheat Rotie, bread, rice, noodles, cereal/wheat based products, tuber/root vegetables	55-167	49.45	15.89
Vegetables	0-56	19	28.51
Fruits	0-39	12.4	15.2
Poultry, meats, legumes, beans	7-141	37.02	29.78
Milk & Milk Products	5-49	22	16.34
Fats, oils, sugars	15-156	39	29.8
Total Food Variety Score	19-561	139.5	58.93

Table 6: Daily Nutrient Intake of the Sample

Nutrients	Range	Mean $\pm$Sd	RDA
Carbohydrates (gm)	130 - 420.5	292$\pm$72.1	250-300 gm
Proteins (gm)	32.80 - 48.73	36.8$\pm$12.7	45 gm
Iron (mg)	7.5 - 19.47	13.5$\pm$1.72	18gms
Energy (kcal)	763 - 2070.6	1962$\pm$67.6	2100 kcal

Table- 7: Correlation among the Nutrient Intake by the Sample

	Carbohydrates	Protein	Iron	Energy	Body weight
Carbohydrates		**-0.652***	**0.362**	**0.849***	**0.695***
Protein			**0.713***	**0.738***	**0.058**
Iron				**0.595**	**0.023**

***correlation is significant at ≤0.01**

CONCLUSION

This study can be concluded on the findings that poor food choices, irregular meals and inadequate nutrient intake have bearing on the poor health status among the adolescent girls residing in the hostels.

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