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NUTRITIONAL EVALUATION OF DIETS OF LOW-INCOME RURAL POPULATION FROM NWFP, PAKISTAN

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Results are presented for the levels of protein, fat, fiber, ash, iron, iodine, CHO and total energy in different food groups and whole diets collected from ten families. The data revealed that protein content was higher in meat group (14.6%) followed by cereal (5.8%), leafy vegetable (2.1%), root vegetable (1.7%) and lowest in salad (0.7%) groups. Maximum fiber (0.8%) and ash (2.8%) were found in leafy vegetable and meat groups respectively. The average nutrient contents consumed by members of 10 families revealed that the dinner time diets contain more nutrients than the breakfast and lunch time diets. The results indicated that except for carbohydrate contents, nutrients were present in comparatively larger quantities in the diets of higher income group than the other group. Fat contents were on adequate levels in both the groups (above 80% of RDA).

Key words: Diet, Nutritional composition, Population groups, Pakistan, Northern Province.

Introduction

Pakistan, especially the North West Frontier Province (NWFP) has a peculiar geography beset with problems like poverty, ignorance, illiteracy, overcrowding and overpopulation. All these factors aggravate the problem of malnutrition and create a different and complicated situation; consequently problems related to protein deficiency have been on the increase. Seven million children in the developing countries including Pakistan die annually, due to malnutrition (UNICEF Report, 1988). Malnutrition is usually the result of a combination of inadequate dietary intake and infections. Throughout the history of man, minerals, vitamins, protein, fat and carbohydrate have been the proper answer to overcome the symptoms of a variety of deficiency diseases (Marston and Friend 1985). The deficiency of these nutrients leads to clinical and sub-clinical diseases to varying levels.

In view of the importance of nutrition for proper maintenance of health, it was considered essential that proper evaluation of various food materials and diets among different income groups of some selected areas of Peshawar be carried out; the study can be extended to other areas of NWFP including northern areas, in the future.

Materials and Methods

Food group analysis. Common food ingredients were purchased from local market of Peshawar. Each item was finely ground separately and blended/mixed in equal amounts to prepare five composite groups like (1) cereal group: wheat bread+ rice (2) meat group: fish+poultry+beef+lamb (3) leaf vege-table group: spinach+sponge gourd+gourd+bringal+ bitter gourd (4) root vegetable group: potato+turnip and (5) Cucumber (salad). The materials were then processed according to the normal household practices. These samples were analyzed for moisture, protein, fat, fiber, ash, iron and iodine contents.

Whole diet analysis. Ten low-income families were randomly selected, with family members of 8-10. Five of these were relatively in higher income group (pattern-a) while the rest of five families were belonging to the poorest strata of society (pattern-b). The samples of diets used in breakfast, lunch and dinner were collected from these families without prior information. The diet samples of "pattern-a" and "pattern-b" were grouped separately. Samples were analyzed for potential nutrients. Proximate analysis was performed in triplicate in accordance with AOAC (1994); moisture was determined in a drying oven at 105°C. Determination of fat was carried out by soxhlet extraction using petroleum ether (b.p.40-60°C) in a Soxhlet system H.T. (Tecator) and protein (%N x 6.25) by Micro-Kjeldahl method. Ash was determined by heating at 550°C in a muffle furnace and fiber by digestion with acid and alkali using Fibertec system T. (Tecator). Iron was determined following the method of Ahmad and Manan (1990). Food energy value was determined according to Martin and Arnold (1978) and iodine by Lauber (1985). Nitrogen free extract was determined by difference.

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Results and Discussion

Food ingredient analysis. The average contribution of nutrients from food group ingredients is shown in Table 1. The data revealed that protein content was higher in meat group (14.60%) followed by cereal (5.80%), leafy vegetables (2.10%), root vegetables (1.70%) groups and lowest in salad group (0.70%). The moisture content varied from 50.70 to 73.60% and fat 0.20 - 11.20%. Maximum fiber (0.80%) and ash (2.80%) were found in leaf and root vegetables and meat groups respectively while minimum fiber (0.10%) and ash (0.70%) was observed in meat and leafy vegetable groups, respectively. The levels of fiber and ash in cereals, root vegetable and salad groups were (0.6, 1.7%), (0.8 and 0.8%) and (0.5, 2.3%) res-pectively. Highest amount of iron was found in meat (1.3 mg 100 g^{-1} sample) followed by salad (1.2 mg 100 g^{-1}) and lowest in root vegetable (0.7 mg 100 g^{-1}) groups. Iodine content was higher in cereal (5.7 µg 100 g^{-1}) followed by meat (2.8 µg 100 g^{-1}), leafy vegetables (2.2 µg 100 g^{-1}), root vegetable (1.8 µg 100 g^{-1}) and salad (0.2 µg 100 g^{-1}) groups. Maximum nitrogen free extract (30.0%) and energy (244.0 KCal 100 g^{-1}) were found in cereal and minimum in salad (77.0 KCal 100 g^{-1}) groups and 45% by carbohydrates. Murphy *et al* (1985) reported 2.3 mg 100 g^{-1} iron and 2.8 - 4.5 µg 100 g^{-1} iodine in wheat bread, 1.9 mg 100 g^{-1} iron and 3.8 - 5.2 µg 100 g^{-1} iodine in vegetables and 3.0 mg 100^{-1} g iron and 3.0 - 4.8 µg 100 g^{-1} iodine in meat. Results of present studies are in good agreement as reported by Schoeder *et al* (1986).

Whole diet analysis. The average nutrient contents consumed by members of ten families (per person per day) are given in Table 2. The data revealed that on the average, the diet consumed at the dinner time contains more nutrients than breakfast and mid-day diets. In the dinner time diet, the average values for protein, fat, carbohydrates, iron and total energy content were 31.7 g, 35.3 g, 89.6 g, 2.9 mg and 803.3 calories, respectively while the values for the diets consumed at breakfast were 18.1 g, 9.0 g, 51.62, 5.1 mg and 359.8 calories, respectively. Lunch time diets contained protein 26.6 g, fat 30.5 g, carbohydrates 84.1 g, iron 2.25 mg and total energy 717.0 calories. Except for carbohydrate contents, all the nutrients were present in comparatively larger quantities in the diets of "pattern-a" families (with comparatively higher income). For the "pattern-a" the average values of various nutrients in the breakfast, lunch and dinner diets were protein (19.9, 35.0 and 39.4 g), fat (15.1, 31.0, 30.5 g), iron (9.0, 3.2, 2.9 mg) and calories (387.0, 751.0, 792.9), respectively while the same for "pattern-b" were protein (16.3, 18.2, 29.0 g), fat (2.9, 30.0, 40.2), iron (1.2, 1.3, 3.0 mg) and calories (331.7, 684.0, 813.8), respectively. On the average, carbo-hydrate consumption in "pattern-a" during breakfast, lunch and dinner time were (43.1, 83.0, 90.2 g) respectively while the same for "pattern-**b**" families were 60.1, 85.3, 89.0 g, res-pectively. On the basis of the average daily dietary requirements of essential nutrients (Hussain 1985), these results indicate that the diets consumed by "pattern-a" families provide sufficient protein (94.3 g), fat (76.6 g), iron (15.1 mg) and calories (1931.8) as compared to "pattern-b" families (Table 3).

US Food and Nutrition Board (1984) and Schroedar *et al* (1989) reported considerable variations of essential nutrients in the diets; nutrients in the range of 80-100% of the RDA in the diet are considered adequate; the range of 60-80% creates some cause of concern whereas below 60%, the individual may have a nutrient intake problem and should seek medical help. The results of the present study (Table 3) revealed that "pattern-a" families were taking insufficient carbohydrates and calories (below 80% of RDA); other nutrients were

Table 1
Chemical composition of different food groups

Diet group	Miosture (%)	Protein (%)	Fat (%)	Fibre (%)	Ash (%)	Iron (mg 100 g^{-1})	Iodine (µg 100 g^{-1})	Carbohy-drate s(%)	Energy (KCal 100 g^{-1})
Cereal group	50.70±0.20	5.80±0.01	11.20±0.10	0.60±0.00	1.70±0.10	0.80±0.00	5.70±0.00	30.00	244.00
Meat group	50.80±0.01	14.60±0.01	10.20±0.10	0.10±0.01	2.80±0.20	1.30±0.10	2.80±0.01	21.50	236.20
Leaf vegeta-bles group	73.60±0.30	2.10±0.10	10.20±0.01	0.80±0.20	0.70±0.10	1.00±0.01	2.20±0.01	12.60	150.60
Root vegetable group	70.40±0.20	1.70±0.10	10.90±0.10	0.80±0.10	0.80±0.10	0.70±0.20	1.80±0.20	15.40	166.50
Cucumber (salad)	78.00±0.10	0.70±0.10	0.20±0.10	0.50±0.10	2.30±0.00	1.20±0.10	0.20±0.30	18.30	77.00

Values are the average of 3 separate determinations ± Standard deviation.

Table 2
Nutrient contents of diet consumed per person per day

Diet description (ten families)	Protein (g)	Fat (g)	Carbohydrate (g)	Iron (mg)	Calories
Breakfast					
Pattern **a**: Slices of bread, 1.5 chapatti, one fried egg with one tablespoon ghee, two cup tea	19.90	15.10	43.10	9.00	387.00
Pattern **b**: Two cup tea, one chapatti	16.30	2.90	60.10	1.20	331.70
Average	18.10	9.00	51.60	5.10	359.80
Lunch					
Pattern **a**: Chapatti, vegetable dish containing 2-3 pieces of meat one plate	35.00	31.00	83.00	3.20	751.00
Pattern **b**: Chapatti, vegetable/legume dish one plate	18.20	30.00	85.30	1.30	684.00
Average	26.60	30.50	84.15	2.25	717.00
Dinner					
Pattern **a**: Chapatti, vegetable dish containing 2-3 pieces of meat one plate	39.40	30.50	90.20	2.90	792.90
Pattern **b**: Rice dish, vegetable/legume one plate	29.00	40.20	89.00	3.00	813.80
Average	31.70	35.35	89.60	2.95	803.35
Total daily intake from diet sources	76.40	74.85	225.35	10.30	1880.15
Recommended levels	80.90	80.00	340.00	18.00	2550.00

Chapatti=Wheat bread (250 g), Piece of meat (8 g), 1 plate (200 g), rice plate (300 g); **a**, family of high income group; **b**, family of low income group

Table 3
Comparison of nutrients intake with RDA levels (per day per person)

Nutrients	Pattern-**a** families	% intake over RDA	Pattern-**b** families	% intake over RDA
Protein (gm)	94.30	116.60% (above 80-100%)	63.50	78.40% (below 80%)
Fat (gm)	76.60	95.70% (above 80%)	73.10	91.30% (above 80%)
Carbohydrate (gm)	135.40	39.80% (below 80%)	234.40	68.90% (below 80%)
Iron (mg)	15.10	83.80% (above 80%)	5.50	30.50% (below 80%)
Calories	1931.80	75.70% (below 80%)	1829.50	71.70% (below 80%)

Nutrients values are the average of the members of 5 families

present above 80% of RDA and so the diet is considered adequate while in the "pattern-b" families all the nutrients except fat, were present below 80% of the RDA and hence the deficiencies of potential nutrient are of great attention in the population (pattern-**b** families) of this strata of the society. It is recommended that such population groups should have a well-balanced diet of cereals, fruits, vegetables, meat/eggs and milk.

The diet manuals, which are used in Western Countries, are not of much help for developing countries like Pakistan with different dietary habits, staple foods, method of cooking and meal patterns. In Pakistan, no work has been carried out to compile the data on various diets, consumed by different population groups.

Heart disease seems to be due to an exceedingly complex metabolic interrelationship, yet the rate of incidence may be decreased by eating a well-balanced diet, providing biologically utilizable poly-unsaturated fats alongwith enough exercise for good muscle tone; undoubtedly non-smokers are less prone to contracting heart disease than the smokers.

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