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Physical Activity and Balanced Diet: Basic Parameters to Prevent Obesity and Serum Cholesterol Elevation

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Abstract: A comparative study of age matched 50 obese and 50 lean adults was undertaken. The blood samples were collected after overnight fast. The diet sampling was done on the spot without prior information over a period of three months. The results showed that mean serum cholesterol level of obese persons was higher than leans. The frequency of its occurrence was high in case of sedentary people. More than 70% adults were not involved in enough physical activity where as 10% were benefited from moderate activity. The physical activity is more pronounced in young persons, decreases with age and is less common among the obesese. The average diet of obesese contained higher percentage of nutrients and calories. Except for fat contents of leans, the other nutrients were present in adequate amounts over RDA in both groups. The data revealed that both the parameters under study, significantly control the serum cholesterol elevation and obesity. The other factors and sources which may cause rise in serum cholesterol level and obesity have been indicated. The adverse effects of physical inactivity and imbalanced nutrition are briefly discussed in perspective of human health.

Key words: Physical activity, diet, serum cholesterol, obesity

Introduction

Obesity, the condition of being 10% or more over the recommended body weight, is usually caused by eating too much and exercising* too little rather than hormonal disturbances (Brownell, 1984). Obesity raises the risk of high cholesterol, hypertension, type II diabetes, colon cancer, heart diseases and stroke (Anonymous, 1991). Both saturated fats and high cholesterol are thought to be involved in various cardiovascular diseases (USPHS, 1995). One major factor underlying the aetiology of obesity is dietary imbalance. The metabolic machinery reacts differently for the different food intake. The ideal metabolism occurs when a balanced diet is taken regularly (Anderson, 1984). A diet with high amount of saturated fats and modern labor saving devices has made it unnecessary for us to expend energy as a result, we burn off fewer calories. It has been estimated that if we didn't have machines working for us, we would need 80 servants to be able to live the way we do (Wardlaw and Insel, 1995).

Epidemic of obesity can be controlled by increasing energy expenditure through physical activity and at the same time by reducing the energy intake from fat and carbohydrates while maintaining the protein intake at normal level (Anonymous, 2000). In view of the importance of physical activity and nutrition for proper maintenance of health, present study was carried out to establish the relationship between physical activity, nutrition, serum cholesterol and obesity in lean and obese people.

Materials and Methods

The experiments were conducted in the Department of Chemistry, AJK University, Muzaffarabad, during March to May, 2003. Anthropometric measurements of body height, weight and circumference were carried out. Out of 100 adults, body weight of 50 was 10% higher than the standard while other 50 adults' body weight was less than the desirable weight as fixed by Food and Nutrition Board (1989). Former referred as obesese while later as leans.

Determination of Serum Cholesterol: The serum cholesterol of obesese and leans was estimated by the method of Abell *et al.* (1952).

Blood Sampling: The blood samples were taken with sterilized syringe after an overnight fast. 0.5 ml of the serum was treated with alcoholic KOH. The liberated cholesterol was extracted with petroleum ether, an aliquot of ethereal extract was evaporated to dryness and dry residue was treated with Libermann-Buchard reagent, consisting of acetic acid, acetic anhydride and Sulphuric acid. The colour developed was read in spectrophotometer at 630 nm. The concentrations of pure cholesterol reference standard were 200, 400, and 600 mg %.

Diet Sampling and Analysis: The diets used in dinner, lunch and breakfast were collected from obese and lean adults, without prior information. Then diet were grouped

* "Exercise" is meant to include all physical activities walking, gardening, housecleaning and any other activity that uses up calories.

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Table 1: Serum cholesterol level by age in normal persons

Serum cholesterol Level (mg/dl)	20-30 years	30-40 years	40-50 years	50-60 years	60-70 years	Total
100-120	1	1	---	---	---	02
120-140	1	---	---	---	---	01
140-160	1	1	1	---	---	03
160-180	2	2	---	2	2	08
180-200	3	5	3	3	3	17
200-220	1	1	4	4	4	14
220-250	1	1	1	1	1	05
Total.	10	11	9	10	10	50
Over all mean \pm SD	190.75 \pm 13.25					

Table 2: Serum cholesterol level by age in obese persons

Serum cholesterol Level (mg/dl)	20-30 years	30-40 years	40-50 years	50-60 years	60-70 years	Total
100-120	---	1	---	---	---	01
120-140	---	1	1	---	---	02
140-160	1	3	5	6	1	16
160-180	---	1	5	4	1	11
180-200	---	---	---	2	2	04
200-220	---	---	---	6	3	09
220-250	---	1	5	---	1	07
Total	1	7	16	18	8	50
Overall mean \pm SD	223.21 \pm 14.09					

separately and processed according to the normal household practices. These samples were analyzed for proteins, fats, carbohydrates and calories contents. Proximate analysis was performed in triplicate in accordance with AOAC (1994). Determination of fat was carried out by extraction using petroleum ether in Soxhlet apparatus, protein by Kjeldahl method and carbohydrates by titrimetric method, using Benedicts reagent. Food energy values were calculated according to Mortin and Arnold (1978).

Results and Discussion

The serum cholesterol levels of the obesese and leans are given in Table 1 and 2. The results (Table 1 and 2) indicate that all leans had their cholesterol level in the range 190.75 \pm 13.25 mg% while the same number of obesese had the mean serum cholesterol level in the range 223.21 \pm 14.09 mg%. This difference in the serum cholesterol level is statistically significant. The obesese had higher values of serum cholesterol as compared to leans. A diet high in animal fat increases the serum cholesterol level without producing any clinical sign. But when the blood vessels become sufficiently blocked by cholesterol, chest pain during physical activity may be developed (Mors *et al.* 2000). Regular physical activity and balanced nutrition reduce people's risk for heart attack, diabetes, colon cancer, high blood pressure, and stroke. These also help to control epidemic of obesity, contribute to healthy bones, muscles and joints (Aronne,

2003). Despite the proven benefits of physical activity, present study (Table 3) reveals that more than 70% (obese and lean) adults do not get enough physical activity to provide health benefits. Out of these 44% are not active at all in their leisure time, 18% are engaged in vigorous physical activity while 10% adults of all ages benefit from moderate physical activity. The highest number of sedentary adults i.e. 36%, whose serum cholesterol levels are in the range of 200 to 250 mg/dl. The serum cholesterol level above 200 mg/dl is the key value for predicting heart disease risk (Schaefer *et al.*, 2001). It had also been noted that activity decreases with age and sufficient physical activity is less common among obesese than leans.

With regards to nutrition, results (Table 4) indicate that the average consumption of proteins, fats, carbohydrates by leans were 106 g, 82 g, 315 g while obesese's diet contained proteins, fats and carbohydrates 122 g, 145 g, 510 g respectively. Data also revealed that obesese consumed more calories (3833) than standard and energy intake of leans (2422) is slightly less than RDA value. Table 5 shows that lean obtained fats within permissible range while obesese exceeded 30% of total energy intake. The American Heart Association suggests that in case of balanced diet 30% energy is derived from fats. Cholesterol intake can be restricted to 250 mg/dl by consuming more polyunsaturated fats than saturated ones. A low fat diet may reduce the risk of cancer, atherosclerosis, decrease fluid retention in the

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Table 3: Percentage of obese and lean adults involve in different types of physical activities

Serum cholesterol Level (mg/dl)	Sedentary activity	Light activity	Moderate activity	Vigorous activity	Total
100-150	04	---	---	10	14
150-200	02	04	02	06	14
200-250	36	26	08	02	72
Total	42	30	10	18	100

Chapatti, rice, meat, milk, egg and vegetables/ legumes are included in routine meal of obese and lean adults

Table 4: Average dietary nutrient components consumed by per person per day

During dinner, lunch and breakfast	Protein (g)	Fat (g)	Carbohydrates (g)	Calories (Kcal.)
Obese	122	145	510	3833
Lean	106	82	315	2422

Table 5: The percentage of nutrient intake per person per day

Nutrient	Lean	% Intake	Obeses	% Intake
Protein (g)	106	17.5%	122	12.7%
Fat (g)	82	30.5%	145	34%
Carbohydrates(g)	315	52%	510	53%

body and promote weight loss (Carola *et al.*, 1991). Both obesese and leans consumed carbohydrates 52% and 53% of total energy intake respectively (Table 5).

Carbohydrates in average diet provide 46% of the body's energy. About 22% of these come from complex carbohydrates, 6% from naturally occurring sugars and 18% from refined and processed sugars. Sucrose alone may provide 15% of the total of the refined and processed sugars; it has little nutritive value and contributes to obesity, dental carries, and other homeostatic imbalances (Jequier, 1994). Nutritionists suggest that consumption of 200 g to 300 g carbohydrates per day is important to prevent ketosis, additional carbohydrates intake helps to spare protein and meet energy needs (Christensen, 1984). This study (Table 5) also shows that leans and obesese consumed dietary proteins 17.5 and 12.73 percent of the total energy intake, respectively. Proteins are used as fuel for muscle functioning, their contribution is relatively small, compared with that of carbohydrates and fats. Only about 5% of body's energy comes from proteins whereas they contribute significantly, 10% of total calories in endurance exercise (Food and Nutrition Board, 1989). Moreover, proteins become more beneficial when they are balanced with all twenty necessary amino acids (Shills *et al.*, 1994). On the bases of the average dietary requirements (Hussain, 1985), the results of the present study reveals that the diets consumed by obese adults provide sufficient nutrients (proteins, carbohydrates, and fats) and calories than lean adults.

The energy exchange systems and diet manuals of U.S.A. and European countries are not much helpful for developing countries like Pakistan due to different environment, life styles, staple foods, dietary habits, meal patterns and method of cooking. In Pakistan no

work has been done to assess the importance of the physical activity and balanced nutrition among different population groups. The other factors and sources responsible to develop obesity such as behavior, environment, genetic and hormonal disturbances need to be studied carefully. However, the present study indicates that the highest (90%) percentage of adults is not benefited from moderate physical activity. It is also suggested that such people should have a well balanced diet of cereals, fruits, vegetables, meat/egg and milk to overcome epidemic of obesity and serum cholesterol elevation.

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