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The association of nutritional profile and prognosis of degenerative diseases associated with carbohydrate and lipid metabolism at high altitude of district Ziarat, Pakistan

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Abstract *Objective:* In the present study the physiological parameters, their comparative analysis with carbohydrate and lipid metabolism were studied. This study suggests life style, environmental and genetic adaptations in the studied population.

Method: One hundred and ninety eight subjects were selected from different towns of District Ziarat. General characteristics of the population according to their nutritional habits including, age, body mass index(BMI), systolic blood pressure, diastolic blood pressure, glycemia, triglycerides, serum low density lipoprotein (LDL), high density lipoprotein (HDL), very low density lipoprotein (VLDL), triglycerides (TG) were measured.

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Results: Mean cholesterol, LDL, VLDL and triglyceride values were significantly higher in men than women and the values increased with increasing age in both men and women. HDL and glucose values were significantly higher in females than males. In men with various nutritional groups such as A, B and C, the mean cholesterol ($P < 0.001$), LDL ($P < 0.014$), VLDL ($P < 0.031$) and triglyceride ($P < 0.025$) levels were significantly observed among comparable groups. However, in women with various nutritional groups such as A, B and C, the mean age ($P < 0.047$) and triglyceride values ($P < 0.033$) display statistically significant results.

1. Introduction

About 140 million persons reside at high altitudes over 2500 m, mainly in North, Central, and South America; Asia; and eastern Africa (ward et al., 2000; Sherpa et al., 2011). Pamirs, Hindu Kush, Karakorum, Koh-e-Safaid and Great Himalaya are the mountain ranges located in Pakistan. Adjacent to these ranges are different cities and villages in which people reside permanently. In Balochistan the high altitude places are Ziarat, Zhob Harboi (Kalat District) etc., these towns are located adjacent to the Sulaiman ranges and Kirthar Mountain Ranges (Khan, 1991).

It is reported by the United States centers of disease control and prevention in Atlanta that about 400,000 deaths in USA are associated with less exercise and poor diet (Mokdad et al., 2000).

High HDL, triglycerides and low LDL concentrations are risk factors for cardiovascular diseases (Steinberger et al., 1995; Hokanson and Austin, 1996). Cardiovascular diseases (CVD) are the major cause of illness and death in both developing and developed countries, and the major responsible factors for CVD are the higher levels of low density lipoprotein cholesterol (LDS) and lower levels of the high density lipoprotein cholesterol (HDL) present in blood plasma (Fruchart and Duriez, 2002). Higher HDL levels in plasma impart defense against CVDs (Gordon et al., 1989). Shift in the body measurements like BMI and waist circumference is directly linked with the metabolic conditions e.g., type 2 diabetes, hypertriglyceridemia and hyperinsulinemia (Banu et al., 2014; Diwan et al., 2012; Nakao et al., 2002). Healthy life style and dietary measures can cure many cardiovascular pathologies, inflammatory disorders and obesity (Bravata et al., 2003; De Lorgeril et al., 1999; Layman et al., 2003). Obesity is a condition which is a direct result of modern nutrition and life style which are main sources of recent degenerative diseases. It can be measured by a formula known as body mass index (BMI). It is caused by a number of reasons which include disturbed substrate oxidation, higher intake of fats, high energy density in food intake and low energy utilization (Taubes, 2001). In the south Asian populations the trend continues with high triglycerides and low HDL levels in different ethnic groups (McKeigue et al., 1985; McKeigue and Marmot, 1988; Miller et al., 1988).

Hypoxia, severe cold, high winds, intense solar radiation and increased physical activities make high altitude (5000–11500 ft) places interesting for physiologists to study human adaptations. A lower mortality rate from heart diseases has been reported in populations living in high altitude areas (Morley, 1998; Ashouri et al., 1994). While high level of serum HDL was found in the population living at high altitudes (Sharma, 1990). Higher HDL levels were measured in the migrants from lower altitudes to higher altitudes areas (Atbeave et al., 1990). Very less data are available on variations in lipid profiles in Pakistani normal healthy adults due to age, sex, BMI and life style.

The aim of the present study was to investigate/assess BMI, Glycemia, Blood Pressure, Lipid Profile and specially the effect of HDL cholesterol on living population of high altitude such as Ziarat, to analyze the degenerative diseases and associated carbohydrate and lipid metabolism.

2. Materials and methods

2.1. Data Collection

The study of the adult population was carried out from March 2008 to March 2009. The visit to the area was arranged in collaboration with the local doctors and other medical staff of the DHQ Ziarat of Government of Balochistan.

Health/medical camps were set up at Kawas town and Ziarat town in District Ziarat of Balochistan, a randomized survey and sample collection was conducted. Healthy men and women volunteers from both towns were selected. Individuals were interviewed by a medical physician using a standard questionnaire (approved by local ethics committee of BUI-TEMS), having information on age, gender, marital status, family system, ethnicity, physical activity, nutrition and history of any previous disease such as hypertension, diabetes, cardiovascular disease, and osteoporosis.

Sampling sites were chosen so as to survey among the population keeping in view their nutritional profiles, disease rates and life style.

Subjects were questioned to fill a Performa to collect information on the various parameters. At least one hundred and ninety eight subjects of both the genders mostly ranging between ages 17–80 were sampled. Blood samples were obtained by venipuncture from all participants who attended the health center/medical camp. Blood sampling was done by the certified personals.

General characteristics of the population of Ziarat according to their nutritional habits including age, body mass index (BMI), systolic blood pressure, diastolic blood pressure, glycemia, triglycerides, total serum cholesterol, serum low density lipoproteins ((LDL), high density lipoproteins (HDL), very low density lipoprotein (VLDL and Triglycerides were measured. The correlations of various parameters were found out within the populations.

The male/female population of Ziarat is divided into three nutritional groups: