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Comparative Study of Biochemical Variables of High and Low Altitude Male Rajput Residents

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Abstract

Aim: To study biochemical variables of high and low altitude male rajput residents.**Method:** Present study was carried out on 400 male rajput residents, residing at High and Low altitudinal areas of Himachal Pradesh. Blood glucose and lipid profile was measured. **Results:** The total cholesterol, triglyceride and HDL was significantly lower in high altitude (HA) than low altitude (LA) in group-1 (p-value < 0.0001). **Conclusion:** It was concluded in terms of biochemical variables triglycerides, blood sugar, total cholesterol, HDL of residents inhabiting high altitude had better level of adaptation due to their healthy life style.

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Introduction

Around the world, millions of people have habituated the altitude as high as 3000 m or above, permanently. At high altitudes, expose to harsh environmental conditions, comprising of mosaic of stresses namely hypoxia, cold, rugged terrain, high solar radiation and limited resources etc. is common (Ward, 2003). While sojourners visiting altitudes for various reasons experience initial discomfort, which sometimes culminates in high-altitude disorders (Hackett et al., 2001), high altitude natives who have occupied the highlands for thousands of years do not suffer from such disorders (Morpurgo et al., 1981; Rupert et al., 2001). The state of Himachal Pradesh is an important and integral part of Union of India, most of which is comprised of hills or high altitude regions. Due to its more diverse nature, more strong economy as compared to other high altitude states, and rich in culture, people of Himachal Pradesh have been the subject of various serological and anthropological studies for decades (Bhasin et al., 1992; Singh et al., 1994: Bhasin and Walter, 2001). However, biochemical and genetics investigations targeting the distribution of various serum protein and erythrocyte enzyme polymorphisms has begun only in early eighties of the century (Papiha et al., 1982). While high level of serum HDL was found in the population living at high altitudes (Sharma, 1990). 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 (LDL) 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 (Nakao et al., 2002; Diwan et al., 2012; Banu et al., 2014). This is an attempt to study the biochemical variables in high and low altitude areas of Himachal Pradesh.

Material and Methods

The comparative study was conducted on male Rajputs of high altitude (> 2200 meter sea level) residing at Bulah, Pataru, Sangalwada, Rail Chowk, Tunga Dhar areas of Distt. Mandi. The testing of samples was carried out at the lab present in the government primary health center at Janjheli, Distt. Mandi, Himachal Pradesh. For low altitude samples (≤ 400 meter sea level), male Rajputs residing in Baddi area of Distt. Solan, Himachal Pradesh were included. A total of 200 number each from high and low altitude area male Rajputs of age group ranged from 20-40 years were selected. Their testing was carried out in the Ambuja lab situated at Nalagarh. All the subjects were divided into following four groups on the basis of age of 5 year interval. Each group comprised of 50 subjects.

Group -1: 20 to 25 years; Group-2: 26 to 30 years ; Group -3: 31 to 35 years; Group -4: 36 to 40 years

Blood Glucose- Random blood sample of the subject was taken.

Lipid Profile-Fasting samples of the males were withdrawn to estimate Total Cholesterol, Triglycerides, HDL

Biochemical estimations were carried out in Erba-Chem 5 blood analyzer which was calibrated and standardized using quality control serum.

Results

The triglycerides of high altitude (HA) subjects was compared with low altitude (LA) subjects statistically, which revealed that difference between high and low altitude subjects in group 1 was significant ($p \leq 0.001$) while difference among other groups was not significant ($p \geq 0.05$) (Table 1).

Table 1: Mean and Standard Deviation of Triglycerides

Variable	Group 1 (20-25 yrs)		Group 2 (26-30 yrs)		Group 3 (31-35 yrs)		Group 4 (36-40 yrs)	
	HA	LA	HA	LA	HA	LA	HA	LA
Triglyceride (mg/dl)	95.0 ±3.0	148.8±4.9	134.0±4.7	129.3±4.0	134.9±4.4	128.4±4.3	133. ±4.0 00	126.3 ±3.7

The HDL of high and low altitude male rajput residents was compared, which revealed that difference between high and low altitude subjects in group 1 was significant ($p \leq 0.001$) while difference among other groups was not significant. ($p \geq 0.05$) (Ttable 2).

Table 2: Mean and Standard Deviation of HDL

Variable	Group 1 (20-25 yrs)		Group 2 (26-30 yrs)		Group 3 (31-35 yrs)		Group 4 (36-40 yrs)	
	HA	LA	HA	LA	HA	LA	HA	LA
High density lipoproteins (mg/dl)	38.9 ±5.0	44.3 ±8.5	39.8 ±5.1	39.5 ±6.0	39.9 ±5.5	40.0 ±5.0	40.1 ±5.3	39.8 ±5.7

The total cholesterol data of high and low altitude male rajput residents was compared, which revealed that difference between high and low altitude subjects in group 1 (20-25 yrs) was significant ($p \leq 0.01$) while difference among other groups was not significant (Table 3).

Table 3: Mean and Standard Deviation of Total Cholesterol

Variable	Group 1 (20-25 yrs)		Group 2 (26-30 yrs)		Group 3 (31-35 yrs)		Group 4 (36-40 yrs)	
	HA	LA	HA	LA	HA	LA	HA	LA
Total cholesterol (mg/dl)	160.7 ± 2.3	185.6 ± 3.3	188.3 ± 1.9	187.2 ± 2.3	191.0 ± 2.2	189.5 ± 2.5	190.4 ± 2.0	197.3 ± 2.3

The blood glucose of HA subjects was compared with LA subjects statistically, which revealed that difference between high and low altitude subjects only in group 4 was significant ($p \leq 0.01$).
The data of high altitude subjects was compared with low altitude subjects statistically, which revealed that difference between high and low altitude subjects only in group 4 was significant ($p \leq 0.01$) while difference among all other groups was not significant ($p \geq 0.05$) (Table 4).

Table 4: Mean and Standard Deviation of Blood Glucose

Variable	Group 1 (20-25 yrs)		Group 2 (26-30 yrs)		Group 3 (31-35 yrs)		Group 4 (36-40 yrs)	
	HA	LA	HA	LA	HA	LA	HA	LA
Blood glucose (mg/dl)	110.3 ±1.3	114.5 ±1.8	106.4 ±2.1	110.0 ±1.3	107.0 ±1.4	110.7 ±1.6	106.8 ±1.2	112.0 ±1.0

Discussion

Studies on health related fitness and metabolism at different altitudinal and ecological situations in the Himalayas are very much limited. the level of total cholesterol was estimated and it was observed that difference only in group 1 was statistically significant ($p \leq 0.001$) while in groups 2 to 4, the difference in total cholesterol values of high altitude subjects to low altitude subjects was not statistically significant ($p \geq 0.05$). All the estimated factors amongst lipid profile showed comparable similar trend in the results. Sharma et al. (1990) observed that total cholesterol level decreased with increase in altitude with an increase in high density lipoproteins from low altitude to high altitude. Ranhotra and Sharma, (2010) demonstrated decreased cholesterol (29%), triglyceride (27%), and LDL cholesterol (42%) level in the high altitude subjects of Shillong as compared to low altitude subjects. The level of blood sugar amongst four groups of high altitude subjects was statistically compared with that of low altitude four group subjects. The results indicated that only group 1 has statistically significant difference ($p \leq 0.01$) while difference in all other groups was found to be not significant ($p \geq 0.05$).

Conclusion

It was concluded in terms of biochemical variables triglycerides, blood sugar, total cholesterol, HDL of residents inhabiting high altitude had better level of adaptation due to their healthy life style.

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