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RESEARCH PAPER

Stress and Serum Cholesterol Levels: An Experimental Study

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ABSTRACT

With the urbanization and Westernization of our society, stress is increasing day by day. The result of which is an increased incidence of psychosomatic stress we compared the serum cholesterol levels between control & experimental group animals by colorimetric method & concluded that:

- 1. Serum cholesterol levels of male were higher as compared to females in both the groups i.e. control & experimental group animals.*
- 2. Serum cholesterol levels of stress group animals were higher as compared to control group animals of either sex & moreover these higher values were statistically significant ($P < 0.001$). So this study shows that serum cholesterol levels can be used as a possible indicator of stress.*

Key words: Immobilization, Stress, Serum cholesterol and Colorimetry.

INTRODUCTION

The magnitude of the problem of stress induced psychiatric & psychosomatic disorders is on the rise across the globe. Stress is defined as, "Non specific result of any demand upon the body" (Selye 1980).

Stress acts as an important etiological factor in the development of gastric ulcer (Das et al. 1997). Workers have tried to establish the levels of serum cholesterol as an index of stress (Francis 1979), but with variable results.

Aim of this study is to establish serum cholesterol levels as a definitive diagnostic tool in the management of stress induced disorders.

MATERIAL AND METHODS

The study was conducted on forty albino rats of both sexes (20 males & 20 females), weighing between 130-150gm, the animals were kept in separate cages under usual laboratory conditions, with food & water ad-libitum. The animals were divided into two groups of 20 each (10 males & 10 Females) as control = A group & experimental or stress group = B group.

Group B animals were subjected to immobilization stress for 4 hrs a day for a period of 3 months. Immobilization was done by keeping the rats in small transparent plastic devices. Blood samples were collected from the rats after ether anaesthesia by intra-cardiac aspiration and were subjected to estimation of serum cholesterol levels by colorimetric method.

The following reagents were used:-

Absolute alcohol

Stock ferric, Sol-20gm ferric chloride in 100ml of orthophosphoric acid (85% A.R.).

Color reagent: 8ml stock sol of ferric chloride mixed with 92ml of sulfuric acid (Sp gr 1.84).
Standard cholesterol solution 200 mg %. Calculation of serum cholesterol level was done by the following formula.

Total cholesterol level in mg% = $T/B/S-B \times 200$

Where, T, S, B are optical densities of Test.

Standard and blank respectively

After the blood samples were taken, animals were sacrificed with overdose of ether. Laparotomy of animals was done by midline incision to take out the stomach. Stomachs were taken out and opened along the lesser curvature and studied for macroscopic breach in gastric mucosa by Fluorescein staining (Strip method).

RESULTS

Fluorescein staining of gastric mucosa of experimental group of animals showed multiple ulcerated areas. The ulcers were scattered over whole surface of gastric mucosa, predominantly over the fundic region and sparing the cardiac region. Size of the ulcers varied from pin head to 3mm in diameter. Some bleeding spots were also seen in the region of ulcers.

Biochemical Observations:-Table-1 shows the level of serum cholesterol of individual rats of both control and stressed group in mg%. Serum cholesterol level of male rats of the control group ranged between 100-120 gm% with mean value of 110.6, while that of females between 90-126 mg percent with mean value of 98. The difference in serum level was not statistically significant. Serum cholesterol levels of stressed group of animals of both sexes showed much higher values as compared to that of respective controls. Males had a serum cholesterol level of 130-180 mg % with a mean value of 157 mg%, while that of female varied between 100-170 mg percent with a mean value of 142.2 mg %. Though the males of stressed group had higher range of Serum Cholesterol as compared to females, the difference was not statistically significant. While comparing the values between control group and experimental group the difference was found statistically significant in both sexes. (P<.001)

DISCUSSION

Immobilization in small transparent plastic devices produces stress in rats and has been commonly employed for experimental purposes in the present study (Coskum et al. 1995). Our findings of higher serum cholesterol of both the control as compared to that of respective females groups is comparable to the observations made in humans (Varely et al. 1991). In the present study we found a very high and statistically significant rise in Serum Cholesterol as was also noted by (Servatius et al. 1994, and Bernnan et al. 1996) in stressed rats and by (Mattiason et al. 1990) in stressed human beings. Our findings of raised Serum Cholesterol level between 42-45% are higher than that has been observed by other Scientists (Vyas et al. 1992). They found a rise of approximately 20% in pregnant women. Patterson et al. 1993 is of the view that higher Serum Cholesterol level in stressful conditions is due to hypo volemia. Koob 1985 noted that of the responses of stress in body is release of corticosteroids. Stress leads to hyper insulinemia (Alvarez et al. 1989). According to Mayes 1988, hyperinsulinemia leads to increased activity of HMG-CO. A reductase activity responsible for increased Cholesterol synthesis. The serum Serum Cholesterol level to about 42-45% in our study may be explained by putting together all these factors i.e. hypovolemia, hyper-insulinema and increased cortisone levels. It is significant to know that the normal range of Cholesterol in humans shows a wide range from 150-240 mg% but an individual will have a narrower variation in the normal range and under stress.

Our findings of a significant rise under stress may seem excessive because of assessing the rise of entire group of experimental animals as compared to the entire control group.

We are of the opinion that subsequent study should be carried out on the same individual animals as model for both control and experimental animal under stress, to obtain the exact change of Serum Cholesterol level.

Table 1. Levels of Serum Cholesterol in Control and Stressed group of animals in mgm%.

S.No.	Control Rats		Stressed Rats	
	Male	Female	Male	Female
1	114	96	176	156
2	110	100	144	140
3	100	98	156	136
4	120	100	140	120
5	116	90	180	160
6	100	98	156	160
7	114	96	140	120
8	120	106	170	160
9	100	94	178	170
10	112	102	130	100
Mean Value	110.6	98	157	142.2
S.D.	7.95	4.42	18.19	22.91

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