Research Article

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ANTIHYPERLIPIDEMIC EFFECT OF VESTIBULAR STIMULATION IN WISTAR ALBINO RATS

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ABSTRACT

Currently, a number of synthetic anti-obesity drugs are available and are effective but with associated side effects. Therefore, alternative therapies with minimum or no side effects are eagerly needed. The present study was under taken to provide preliminary evidence for antihyperlipidemic effect of vestibular stimulation and to develop effective treatment for obesity and related metabolic diseases. A total of 24 male rats are divided into 4 groups with 6 rats in each group by simple random sampling. Hyperlipidemia was induced by high fat diet. Caloric vestibular stimulation was applied by instilling warm (40 ^{0}C) or cold (30 ^{0}C) water into external ear. Total cholesterol, triglycerides, HDL and LDL was recorded before and after vestibular stimulation. Our study provides experimental evidence for beneficial effects on total cholesterol, triglycerides, high density lipoprotein and low density lipoprotein levels by caloric vestibular stimulation. However further neurological and biochemical investigations are recommended to clearly elucidate the mechanism of action to introduce vestibular stimulation as a therapy for metabolic disorders

Keywords: Anti-hyperlipidemic effect, Caloric Vestibular stimulation,Anti-obesity drugs, Metabolic disorders.

INTRODUCTION

Obesity is defined as excessive fat content in the adipose tissue stores; the arbitratory boundary for obesity it's generally considered to be greater than twenty percent over weight compared to normal weights. Obesity is on rise all over the world, leading the World Health Organization to coin the word globesity to describe the world wide situation.[1]

The intake of nutrients is under complex control involving signals from both peripheral and central nerve systems. Control of food intake does not depend on changes in a single signal but is determined by the integration of many inputs that provide information about body's energy status .Arcuate nucleus of hypothalamus plays a central role in both long term and short term control of food intake. Leptin is one of the most important adipokines, essential for normal body weight regulation. The major site for leptin action is arcuate nucleus. Disturbances in leptin signalling path way will cause obesity. Stress, anxiety, depression have also been shown to alter feeding behaviour.[1, 2]

Though lipids are important bio-molecules and essential for life, excess of lipids causes hazardous effects to health[3]. In India one of the leading causes of death is coronary heart diseases[4,5]. Use of tobacco, obesity, hypertension, dysglycemia and dyslipidemia were identified as major risk factors [6]. Younger patients had a more atherogenic lipid profile than the older subgroup with CAD (Coronary artery diseases)[6]. At present there are number of synthetic anti hyperlipidemic drugs available. Though they are effective but costly and associated with side effects. So there is a need for affordable alternative therapies with no or minimum side effects [3].

Vestibular apparatus provides information essential for sense of equilibrium and for coordinating head movements with eye and postural movements. Vestibular stimulation relieves stress, pain, promotes sleep, improves immunity and cognition and treats endocrine disorders.[7-11] Vestibular stimulation regulates food intake through vagus nerve, insulin, arcuate nucleus, thyroid hormones, HPA-axis and promoting sleep.[12]

The present study was under taken to provide preliminary evidence for antihyperlipidemic effect of vestibular stimulation, and to develop effective treatment for obesity and related metabolic diseases.

MATERIALS AND METHODS

The present study was approved by institutional animal ethical committee of Little Flower Institute of Medical Science and Research Centre, Angamaly, No EC/2.

Animals

24 healthy, adult male albino rats of wistar strain were used in the present study. Rats were housed under standard laboratory conditions with food and water provided ad libitum .Rats were randomly assigned into four groups.

- Group A: (n=6) control group - normal diet + water.(neither hyperlipidemia nor vestibular stimulation).
- Group B: (n=6) high fat diet + water. (hyperlipidemic group)
- Group C: (n=6) high fat diet + water + cold water caloric vestibular stimulation for 28 days (hyperlipidemic group).
- Group D: (n=6) high fat diet + water + hot water caloric vestibular stimulation for 28days (hyperlipidemic group).

Estimation of total cholesterol was performed by CHOD-PAP method, Triglycerides estimation was performed by GPO-PAP method, HDL and LDL estimation was performed by precipitation method.[1] All the parameters were recorded before and after 7th,14th, 21th and 28th days of vestibular stimulation.

Caloric vestibular stimulation: The middle ear cavity was irrigated with hot (40 degree centigrade) or cold (30 degree centigrade) water through a polyethylene tube for 28 days.[13, 14]

Data Analysis: Data was analyzed by SPSS 20.0. Statistical tests used are two way RM ANOVA and Bonferroni posttests.

RESULTS

Results were presented in figure no.1-5. Body weight significantly increased in hyperlipidemic, hot water vestibular stimulation, cold water vestibular stimulation groups, when compared with control group. No significant difference is observed between hyperlipidemic, hot water vestibular stimulation and cold water vestibular stimulation groups (Figure 1).

Significant increase in total cholesterol was observed in hyperlipidemic group when compared with control group. Total cholesterol level was significantly lower in hot, cold vestibular stimulation groups when compared with hyperlipidemic group. Significant difference is observed between hot and cold vestibular stimulation groups (Figure 2).

Triglycerides increased significantly in hyperlipidemic group when compared to control group. Triglycerides level was significantly lower in hot water vestibular stimulation group on 7th and14th day when compared with hyperlipidemic group. Triglyceride levels significantly lowered in cold water vestibular stimulation group on 7th, 28th day when compared to hyperlipidemic group. Triglyceride level was significantly different between hot and cold vestibular stimulation groups on 7th, 14th, 28th days (Figure 3).

High density lipoproteins (HDL) and Low density lipoproteins (LDL) significantly increase in hyperlipidemic group. However HDL and LDL levels were significantly low in both hot and cold water vestibular stimulation groups (Figure no 4 &5).

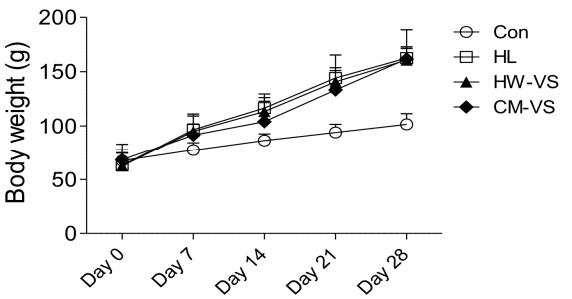

Figure 1: Body weight of wistar albino rats before and after vestibular stimulation
(Con-control group,HL-hyperlipidemic group, HW-VS-Hot water vestibular stimulation group,CM-VS-Cold water vestibular stimulation group).

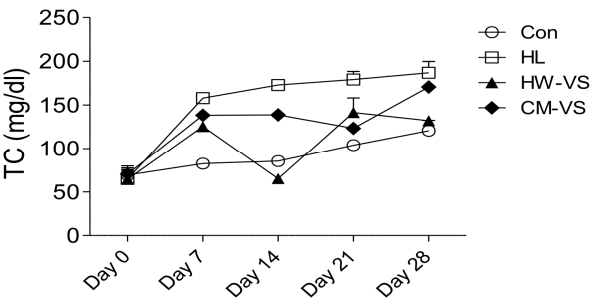

Figure 2: Total cholesterol (TC) of wistar albino rats before and after vestibular stimulation
(Con-control group,HL-hyperlipidemic group, HW-VS-Hot water vestibular stimulation group,CM-VS-Cold water vestibular stimulation group).

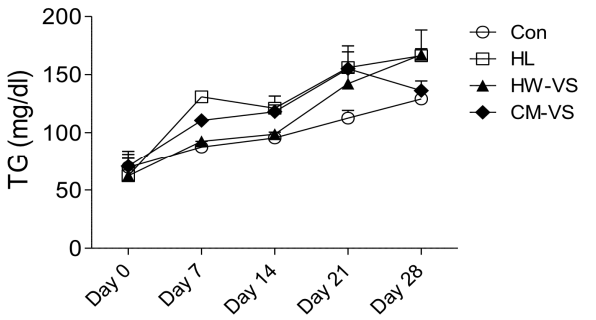

Figure 3: Triglycerides (TG) of wistar albino rats before and after vestibular stimulation
(Con-control group,HL-hyperlipidemic group, HW-VS-Hot water vestibular stimulation group,CM-VS-Cold water vestibular stimulation group).

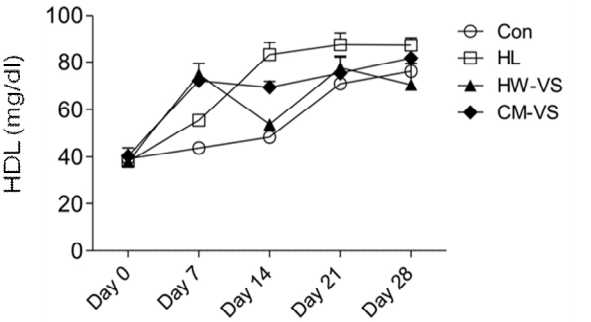

Figure 4: High density lipoproteins (HDL) of wistar albino rats before and after vestibular stimulation
(Con-control group,HL-hyperlipidemic group, HW-VS-Hot water vestibular stimulation group,CM-VS-Cold water vestibular stimulation group).

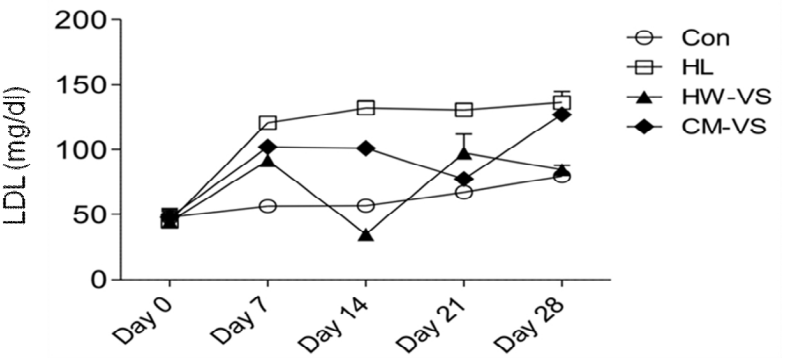

Figure 5: Low density lipoprotein (LDL) of wistar albino rats before and after vestibular stimulation
(Con-control group,HL-hyperlipidemic group, HW-VS-Hot water vestibular stimulation group,CM-VS-Cold water vestibular stimulation group).

DISCUSSION

Obesity is one of the leading causes for many diseases in India.[15] Though many interventions are available, but still Management of hyperlipidemia without side effects is challenging task to medical research.[16] This concern has related to the research on natural methods with less or no side effects. It was proposed that vestibular stimulation balance the food intake.[12, 17-26] We have under taken the present study to prove or disprove this hypothesis. In the present study we have observed significant effect of vestibular stimulation on lowering total cholesterol, triglycerides, high density lipoproteins and low density lipoproteins levels. It was reported that vestibular stimulation balance food intake through its connections with structures of the brain. However in the present study effect of vestibular stimulation on body weight is not significant. We have certain limitations that, we have used only minimum number of animals in each group and few biochemical parameters. Hence we recommend further study with higher sample size and with more parameters.

CONCLUSION

Our study provides experimental evidence for beneficial effects on total cholesterol, triglycerides, high density lipoproteins and low density lipoproteins levels by caloric vestibular stimulation. However further neurological and biochemical investigations are recommended to clearly elucidate the mechanism of action to introduce vestibular stimulation as a therapy for metabolic disorders.

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