



Effect of steam sauna bath on weight loss and lipid profile

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Abstract

Objective: *The aim of the study is to assess the effects of steam sauna bath on weight loss and lipid profile.*

Material & Methods: *Ninety physically active subjects in the age group of 30-50 years were selected for the study. Forty-five males and forty-five females were subjected to seven steam sauna baths on alternate days. The temperature was maintained at 50°C. The duration was 15 minutes for each sauna bath. The weight, total serum cholesterol [TC], serum triglycerides [TG], low density lipoprotein (LDL) and high density lipoprotein (HDL) were estimated before and after seven steam sauna baths.*

Results: *Serum total cholesterol, TG, and LDL were significantly decreased and HDL was significantly increased after seven steam sauna baths. There was significant reduction in weight after seven steam sauna baths.*

Conclusion: *Steam sauna bath helps weight reduction and improves lipid profile.*

Keywords: *hyperthermia, weight loss, lipid profile, steam sauna bath.*

Introduction

Steam baths have been known throughout history to help relax and improve one's overall health and promote well being. Medical clinics use supervised steam saunas to detoxify the body of toxic chemicals. Sauna helps blood chemistry changes leading to detoxification process^[1]. Sweating in a steam sauna is much more beneficial for detoxification than sweating during exercise.^[2] The blood chemistry changes include decreased total cholesterol [TC] and triglyceride [TG] levels and increased high density lipoprotein [HDL] levels with weight loss. Skin plays an

important role in helping the kidneys, liver, lungs and other organs to control and remove toxins from the body.

We live in a world of toxins and we have to enhance body's ability to detox. Life style modifications and exposure to environmental toxins has led to increase in the incidence of obesity and metabolic syndromes like diabetes and hypercholesterolemia. Diet modifications and exercise are well known, but steam bath helps in not just weight loss but better control over lipid metabolism.

The weight loss is set to be due to loss of water by perspiration which can be regained by hydration but the increase in circulation and increase in metabolic rate results in as much as 600 calories burnt in one steam session^[2,3,4]. In steam bath the hyperthermia causes a rise in the rate of metabolism and fats are broken down as a source of energy. A brief 15 min steam bath can eliminate the same amount of toxins through sweat which the kidneys eliminate in 24 hrs.

Material and Methods

The present study was carried out in a tertiary care centre during the period of December 2013 to February 2014.

Inclusion criteria: In this study 45 males and 45 females in the age group 30 -50 years were taken with informed consent.

Exclusion criteria: People who were unwilling to participate, persons with recent myocardial infarction, unstable angina pectoris, fever, skin diseases, persons taking drugs causing lipid metabolism modification and people who are doing some form of physical exercise were excluded.

Procedure: Height and weight of each subject was recorded. Then, after initial collection of fasting sample of blood, the subjects were given 7 steam saunas by portable 'STEAMLIFE' machine on alternate days. Weight was measured before and after 7 steam sauna baths. The temperature of the sauna was maintained at 50°C. The time duration of each steam bath was 15 minutes. The subjects were asked to drink plenty of water

before and after steam bath. Steam bath was well tolerated by all the subjects and no untoward reactions or intolerances were noted during and after the procedure.

Blood sample collection: With all aseptic precautions 5ml of blood sample was collected in plain vacutainer tubes after 14 hours of fasting. After clot formation, the sample tubes were centrifuged and serum was separated and stored in storage vials for analysis.

The above procedure of collection of blood sample was repeated after 7 steam saunas. All serum samples were analyzed for the following estimations:

Estimation of

- 1) Serum Total Cholesterol [Ch]
- 2) Serum triglycerides [TG]
- 3) Serum high density lipoprotein [HDL]
- 4) Serum low density lipoprotein [LDL]

Equipments used

- 1) Fully automated analyzer.
- 2) Centrifuge.
- 3) Colorimeter
- 4) Weighing machine

All the estimations were performed on fully automatic biochemical analyzer and weighing machine Estimation of serum total cholesterol [chod/pap method]^[5,6,7,8].

Table 1: Sex distribution of subjects

SEX	Frequency	Percent
Female	45	50
Male	45	50
Total	90	100

Table 2: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
AGE	90	30	51	41.23	7.28
Height	90	143	185	159.68	8.59
Pre Weight	90	36	97	70.22	12.22
Pre CH	90	130	344	206.42	47.31
Pre TG	90	44	402	130.43	53.85
Pre HDL	90	20	62	37.63	9.75
Pre LDL	90	56	260	140.41	44.05
Post CH	90	100	260	185.41	30.90
Post TG	90	43	220	101.13	32.89
Post HDL	90	28	64	47.06	8.17
Post LDL	90	43	186	118.22	29.47
Post Weight	90	36	95	69.02	11.78

Table 3: Pearson correlation of weight loss with lipid profile

Weight loss [Kg]	Pearson Correlation	Pre Ch	Pre TG	Pre HDL	Pre LDL
	Sig. (2-tailed)	0.066	-0.017	0.044	0.108
	N	0.534	0.871	0.681	0.311
		90	90	90	90
Weight loss [Kg]	Pearson Correlation	Post Ch	Post TG	Post HDL	Post LDL
	Sig. (2-tailed)	-0.074	-0.147	0.048	-0.06
	N	0.49	0.167	0.655	0.574
		90	90	90	90

Table 4: Correlation of lipid profile and weight loss before and after sauna

Parameters	N	Mean	Std deviation	Paired t	P value
Pre TG	90	130.43	53.85	6.103	0.000
Post TG	90	101.13	32.89		
Pre HDL	90	37.63	9.75	-8.198	0.000
Post HDL	90	47.06	8.17		
Pre LDL	90	140.41	44.05	5.009	0.000
Post LDL	90	118.22	29.47		
Pre weight	90	70.22	12.22	10.142	0.000
Post weight	90	69.02	11.78		

Discussion

The regulation of the speed of metabolic changes in the human body depends mainly on the functioning of the nervous and endocrine system and the activity of the key enzymes in peripheral tissues. Steam baths cause an increase in metabolic rate resulting from excitation of the sympatho-adrenal system, endocrinal changes and an increase in the internal temperature of the body. The hormones influence the lipid metabolism mainly by regulating the speed of key enzyme synthesis and modification of the activity of those enzymes. In the present study, the influence of steam bath on male and female subjects showed significant changes in the lipid levels maybe due to hyperthermia and hyperactivity of ACTH, cortisone etc^[12,13,14].

There were 90 subjects with 45 males and 45 females (Table 1). Table 2 shows overall improvement in the lipid profile post sauna as compared to the pre sauna levels. Mean weight pre sauna of 70.22 kg reduced to 69.02 kg. Table 3 suggests Pearson correlation of lipid profile with weight loss. Table 4 shows that serum cholesterol, triglycerides and serum LDL cholesterol were significantly decreased in post-sauna subjects as compared to pre-sauna levels and it was statistically highly significant [p=0.000]. There

was significant [p= 0.000] increase in the serum HDL levels.

Exercise lowers cholesterol levels. Researchers studied several mechanisms: First, exercise stimulates enzymes that move LDL from blood and liver and then the cholesterol is converted to bile and excreted. Second, exercise increases the size of lipoproteins [proteins which carry cholesterol in blood]. Sufficient amount of routine exercise can lower total cholesterol and LDL and increase HDL cholesterol along with body fat loss.^[10,11]

“Sensible perspiration” is created by heating the body in steam bath. As the peripheral temperature is raised, the rate of metabolic reactions is increased, so the body breaks down fatty tissues to use for energy. Sweating is part of the complex thermoregulatory process of the body. If an increase in metabolism can augment the amount of body heat that is produced, and then conversely, given enough heat, the body can and does increase its speed of metabolism. The metabolic rate rises about 6% for every degree Fahrenheit rise in the body temperature. The results of heating the body from an external source are not identical to results from an internally generated fever. During fever, the hypothalamus deliberately elevates the core body

temperature and keeps it there. In steam bath, the body temperature is elevated by external heat application and the hypothalamus is unwilling to allow a significant rise in core body temperature. As the body temperature rises in steam bath, thermo-receptors in hypothalamus detect the rise in temperature. Hypothalamus activates mechanisms to cool the body; these are skin vasodilatation and sweating.

Steam bath is an excellent way to benefit from overheating therapy. "Artificially induced fever leads to profuse therapeutic sweating." The brief 15 minute steam bath session, through sweating can eliminate the same amount of fat-stored chemicals as would require 24 hours for the kidneys to excrete^[15,16].

Sauna therapy decreases weight in obese people, decreases blood pressure and thus is an effective therapeutic modality for patients with cardiovascular disease by improving vascular endothelial function and left ventricular ejection fraction. This suggests a preventive role of thermal therapy for atherosclerosis^[9,17].

The alterations in the parameters is due to—Increased removal of LDL particles—results in the formation of LDL with a higher affinity for LDL receptor, which are catabolised more rapidly. Increase in HDL production and stimulation of reverse cholesterol transport. It increases the production of Apo A-1 and Apo A-2 in liver and contributes to increase in plasma HDL concentration and a more efficient reverse cholesterol transport.

Moderate exercise will raise HDL levels. Steam bath gives the same benefits of moderate exercise without the exertion, and exercise is involved in increasing the production and action of several enzymes that function to enhance the reverse cholesterol transport system^[18,19].

This was due to the increased activity of the enzyme hormone - sensitive lipase. The main function of hormone - sensitive lipase is to mobilize the stored fats. This enzyme functions to hydrolyze the fatty acids. It is capable of hydrolyzing a variety of esters. It converts

cholesterol esters to free cholesterol for steroid hormone production and in adipose tissue hydrolyses stored triglycerides to free fatty acids. Hormone - sensitive lipase is activated when the body needs to mobilize energy stores, and so responds positively to catecholamine, ACTH. It is inhibited by insulin.^[20]

Exercise training induces several changes in lipid metabolism in liver and affects VLDL secretion and fatty acid oxidation. It is well established that physical inactivity is related with excess TG concentration and increases the risk of atherosclerosis, fatty liver, diabetes and obesity^[17,21]. Thus the decrease in the levels of serum triglycerides could be attributed to the increased activity of the enzyme hormone - sensitive lipase and lipoprotein lipase. But moderate exercise has been considered one of the best non-pharmacological strategies for preventing and treating cardiovascular disease.

There was a reduction in TG and increase in HDLc, leading to a hypothesis of existence of a threshold of energy expenditure associated with changes in lipid profile. Moderate exercise that induces energy expenditure of 1000-1500Kcal has greater effect on HDLc when compared to acute exercise. Thus exercise intensity plus energy expenditure appear to modulate the rate of VLDL-TG secretion and levels of HDL.

High density lipoprotein cholesterol [HDL-C] levels are strongly, inversely and independently associated with coronary heart disease [CHD]. Increased physical activity is associated with reduced CHD mortality. Most likely, the exercise -induced changes in HDL-C are the result of interaction amongst exercise intensity, frequency, duration of each exercise session and length of the training period. Favorable changes occur in HDL-C with approximately 7-10 miles per week or 1200-1600kcal. In 12-16 weeks this volume of exercise can be associated with increase HDL-C and reduction in total cholesterol and LDL-C levels.^[11] Steam bath gave this effect after seven saunas. Steam sauna gives the benefit of exercise without the exertion. It also improved fitness and

overall health. Researchers aren't entirely sure how exercise lowers cholesterol, but now they believe that these mechanisms are involved. First, exercise stimulates enzymes which are involved in efficient reverse cholesterol transport of HDL. It increases the production of ApoA-1 and ApoA-2 in the liver. Second, exercise increases the size of the protein particles that carry cholesterol in the blood-lipoproteins. The increase in the blood flow increases shear stress which increases nitric oxide synthetase [NOS] activity thus improving endothelial function. It has been reported that 4 weeks of cycle training for 30 min 3 times a week significantly increases the basal release of nitric oxide [NO] in healthy volunteers suggesting that the elevated shear stress contributes to the increased basal release of NO. These are similar to those induced by steam bath and the advantage is applicable to subjects who are unable to exercise. Thus steam bath improves endothelial function suggesting a preventive role in atherosclerosis^[17].

Conclusion

Steam bath gives the benefits of moderate exercise without the exertion. It is beneficial to patients who are unable to do any form of exercise to help reduce their weight. With weight loss, the total cholesterol, triglyceride and LDL levels are also lowered and an increase in the HDL levels were seen. This could help in reducing the risk of diabetes, cardiovascular diseases and other lifestyle related diseases which are now considered to be endemic.

Limitations of the study

Short term study and small number of subjects are the limitations of this study. More detailed long term study on a larger group of subjects is required which might help subjects with obesity and hypercholesterolemia with this non-pharmacological treatment.

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Conflict of interest: None

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Abbreviations

- Total cholesterol [TC]
 Triglycerides [TG]
 Very low density lipoproteins [VLDL]
 Low density lipoproteins [LDL]
 High density lipoproteins [HDL]
 Coronary heart disease [CHD]
 Nitric acid synthetase [NOS].