



EFFECT OF KUTI SWEDA (SAUNA BATH) ON CARDIOMETABOLIC HEALTH A RANDOMIZED CONTROLLED STUDY

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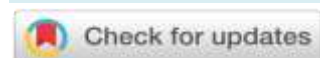
<https://doi.org/10.46607/iamj0211062023>

(Published Online: June 2023)

Open Access

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Article Received: 31/05/2023 - Peer Reviewed: 15/06/2023 - Accepted for Publication: 19/06/2023.



ABSTRACT

Introduction: Effect of *Kuti Sweda* (Sauna Bath) on cardiometabolic health biomarkers of apparently healthy individuals.

Methods: It was a randomized, controlled, open-label clinical trial. 60 healthy individuals were equally divided into 2 groups group A and Group B. In group A, placebo capsules (roasted wheat flour) 1 capsule BD was given for 1 month. In group B, 5-20 mins of sauna bath was given early in the morning with an empty stomach after whole body oil application and having 1-2 glasses of water, 5-6 days a week for 30 days. The parameters used for assessment were resting heart rate, systolic blood pressure, diastolic blood pressure, BMI, serum cholesterol, serum triglycerides, serum HDL, serum LDL and fasting blood sugar (FBS). For intra-group comparison 'paired t-test' was used and for inter-group comparison 'an unpaired t-test' was used. All the statistical tests were considered significant at a 5% p-value ($p < 0.05$). **Results:** In group A not statistically significant difference was seen after the completion of 1 month of trial, while in group B statistically significant difference was observed in resting heart rate, systolic blood pressure, diastolic blood pressure, BMI, serum cholesterol, serum triglycerides, serum HDL, serum LDL and fasting blood sugar (FBS) after the completion of 1 month of trial. In a comparison of the two groups, a statistically significant difference was seen in outcomes. **Conclusion:** *Swedana* modality in the

form of *Kuti sweda* or Sauna bath is very effective in improving the cardio-metabolic health of individuals living a sedentary lifestyle.

Keywords: Sauna bath, *Kuti sweda*, cardiometabolic health, sedentary lifestyle, BMI, FBS

INTRODUCTION

At present time sedentary lifestyle or behaviour is a major concern, it is acting as a risk factor for decreasing cardiometabolic health, the same as that of smoking or alcohol consumption for cardio-vascular diseases. Cardiometabolic health is an umbrella term, it includes all the cardiac and metabolic activities. It cannot be measured by a single parameter but can be assessed by biomarkers like lipid profile, BMI, heart rate, blood pressure, glucose level, etc. According to WHO,- 63% of deaths in India are due to non-communicable diseases, and out of them 27% are due to CVDs, these deaths can be prevented just by having routine check-ups and adopting a healthy lifestyle^[1]. Metabolism in our body is controlled by *Agni*, the status of *Agni* is very essential for the equilibrium of *Dosha*, *Dhatu*, and *Mala*. Disease manifestation has 6 stages where disease can be checked - *Sanchayaya*, *prakopa*, *prasara*, *sthana sanshraya*, *vyakta*, and *Bheda*,^[2] *Nidana sevan* in the form of *Aahara* and *Vihara* is the initial stage when (obstruction in channels) *Shrotorodha* occurs it results in manifestation of symptoms. We require a treatment modality that either enhances *Agni* or removes *Shrotorodha*, *Swedana* is one such modality that fulfils both above purposes. Modern medicine also accepts the concept that cardiometabolic disorders can only be prevented by lifestyle change. So, *Swedana* in the form of a Sauna bath can play a vital role in improving cardiometabolic health.

Swedana is a procedure that is used to induce perspiration so that we can eliminate toxins by enhancing the physiology of the body itself. A sauna bath is a naturopathic procedure that simply means a cabin made up of wooden logs in which an electric heater is used to produce heat. It is very much similar to *Kuti Sweda* (Cabin Sudation) as per *Ayurvedic* texts. A sauna bath is a form of whole-body thermotherapy, it generally involves short exposure (5- 20 mins) at a

temperature of 80-100 degree Celsius with hot and dry air^[3], probably *Ruksha sweda*. These are eliminative in nature, enhance the core body temperature, cause vasodilation, and activate the endocrine system, it increases cardiac output, letting more blood flow in circulation so that our body system works more efficiently. Saunas in the long term are very helpful in removing stress, providing strength to blood vessels, and pulmonary tissue, and increasing hormonal levels in the body, which also enhances immunity. So *Swedana* by its *Ushna*, *Tikshana*, and *Sukshma guna* enters all the channels and eliminates all the toxins through perspiration there by opening all the micro-channels on the other hand boosts *Agni* which improves metabolism. This clinical study was planned to assess the role of *Swedana* in the form of a sauna bath on cardiometabolic health biomarkers in apparently healthy individuals following a sedentary lifestyle.

METHODS

It was a randomized, open-label, controlled clinical trial. The institutional ethical committee (IEC) granted ethical clearance and study design approval vide letter no. IEC/ACA/2020/3-104, this trial was registered under the clinical trial registry of India, vide no. CTRI/2021/04/032638. All the participants were recruited from the premises of the National Institute of Ayurveda, Jaipur, and Jaipur city as well.

Inclusion criteria:

Healthy persons between the ages of 20-60 years of either sex.

Exclusion criteria:

A person having any local and severe systemic diseases, a person doing exercise a minimum 3 times a week, pregnancy, lactation, during menstruation, cardiac disease and hypertension, hyperacidity, skin allergy or any other *paittika* diseases, known case of heat sensitivity and claustrophobic person.

Discontinuation criteria:

A person facing any major illness requiring any intervention, therapy compliance less than 80 percent, a person who does not want to continue the trial, the person not following the instructions, or facing any complications during the trial.

Trial interventions:

Participants were enrolled after filling a screening proforma, the screened persons were briefed about the procedure and consent was taken in written documentation. All the relevant information of the registered individuals was recorded in a clinical case proforma, and laboratory investigations as per assessment criteria were done.

60 enrolled persons were divided randomly into two groups, group A was the placebo group, and placebo capsules (roasted wheat flour) were given 1-1 capsule in the morning and evening with plain water. In group B, 30 individuals were given a sauna bath for 5-20 mins for 5-6 days a week, continued for 1 month early in the morning with an empty stomach after oil application and having 1-2 glasses of water. Details of the intervention are given in [Table 1]

Outcome measures:

The outcome of the trial was to assess the effect of sauna baths on cardiometabolic health biomarkers in apparently healthy individuals. Cardiometabolic health biomarkers - resting heart rate, systolic blood pressure, diastolic blood pressure, BMI, serum cholesterol, serum triglycerides, serum HDL, serum LDL and fasting blood sugar (FBS) were assessed before and after the intervention.

Statistical analysis:

Data were analysed using InStat Graphpad 3 software downloaded from www.graphpad.com. For intra-group comparison of parametric data 'paired t-test' was used and results were obtained individually in each group. For intergroup comparison of parametric data 'an unpaired t-test' was used to assess the results. The significance of the statistical test was assessed at 5% ($p < 0.05$).

RESULTS

Effect of therapy on the outcome:

- In Group A (Placebo group) statistically no-significant result ($p\text{-value} > 0.05$) was found in objective parameters like Heart rate (0%), systolic BP (0.5%), Diastolic BP (0.4%), Serum Cholesterol (0.13%), Serum LDL (1%) and FBS (0.19%).
- While weight, BMI, Serum Triglycerides, and Serum HDL showed Significant results ($p\text{-value} < 0.05$) with a 1%-2% change in mean value.
- In Group B (Sauna bath group) Extremely Significant result (ES) with $p\text{-value} < 0.0001$ was seen in objective parameters like Heart rate (19.6%), systolic BP (3.47%), Diastolic BP (11%), Weight (0.9%), BMI (1 %) change, Serum Cholesterol (18.5%), Serum LDL (30.5%) and FBS with (8.46%) changes.
- While Serum HDL showed a Very Significant (VS) result with a $p\text{-value} < 0.001$ and (9.81%) change in mean value.
- A significant (S) result with a $p\text{-value} < 0.05$ was seen in Serum Triglycerides with a 7.8 % change in mean values.

Safety and tolerability:

No adverse outcomes were observed during the trial.

DISCUSSION

This study suggests that *Aahara* like *Snigdha*, *Madura*, *Guru*, *Pishtannsevan*, *Madhyapan*, and *Vihara* like *Chestadvashi* (sedentary behaviour), *Diwaswapana* (daytime sleeping), *Shayyashana sukha ratah* (habit of longer sitting or relaxing on the bed) leads to cardiometabolic diseases or *Santarpanjanya vyadhis*^[4] as per *Ayurvedic* texts. It was seen that most of the participants were having improper and frequent meals, late night sleep, irregular bowel habits, stress, disturbed dietetic habits, and sedentary nature of work, they spent most of the time sitting or lying at a place vitiating *Doshas* specially *Vata* and *Kapha Dosh*. These all are predisposing factors for vitiating *Agni* which ultimately disturbs metabolism and cardiometabolic health. *Swedana* means 'to perspire', it is a procedure best known for treating *Vata* and *Kaphaj Vyadhis*^[5] by enhancing *Agni*, clearing *Srotas* (body channels), and clearing accumulated toxins through sweating. It performs actions like

Stambhaghna, Gauravghna, Shitghna, Sweda karkavta, Agnideepti, Tvak mardvata, Tvak prasadam and Sandhi chestakar^[6]. There are various types of Swedana, one of them is Kuti Sweda^[7] (cabin sudation), its a Sagni type of Sweda and very much similar to a naturopathy procedure sauna bath. A sauna bath is a type of bathing that uses dry heat to induce perspiration, it is a wooden chamber in which an electric heater is used to produce heat^[8]. Swedana relieves stiffness by pacifying Vata Dosha, relieves the feeling of coldness and pain by its Ushna Guna, and stimulates sweat glands by Sukshma Guna causing vasodilation and more Sweda production^[9]. When a person is exposed to high temperatures the body starts to acclimatize itself towards heat stress with the help of the cardiovascular system, neuroendocrine system, and crypto protective mechanism^[10]. High temperature causes an increase in core body temperature, and this excessive heat is transported to blood, in order to get rid of this excessive heat, the thermoregulatory system activates and causes vasodilation and stimulation of sweat glands to produce more sweat, which causes an increase in cardiac activity, more blood flow and utilisation of more energy^[11], ultimately leads to removal of toxins accumulated in microchannels. Regular sauna usage provides strength to blood vessels, increases their flexibility^[12], flushes out inflammatory markers, and increases blood supply to lung tissue causing improved ventilation^[13], heat shock proteins (HSPs) are released which resynthesis of damaged proteins, slows muscular atrophy^[14], it also reduces serum cholesterol levels and lipoproteins due to its more utilisation of energy, increased blood flow and increasing metabolism. Regular sauna usage reduces insulin resistance, more glucose uptake by skeletal muscles, and more burning of calories leading to reduced glucose level^s^[15] and weight. The sauna provides strength and flexibility to blood vessels, and calms the mind through its relaxation effect thereby reducing stress and reduces peripheral resistance. This causes a reduction in systolic and diastolic blood pressure. Any adverse effects or complications were not observed during the trial suggesting that the sauna bath

is safe and effective, it can be used as a preventive module for prevention of health and prevention of disease. Cardiometabolic biomarkers significantly improved in the sauna bath group, while no major change was seen in the placebo group.

Due to the smaller sample size, short duration of the trial and not controlling other confounding factors like diet, stating concrete conclusions may not be right. This study should be elaborated with a longer duration of the trial, follow-up period, and controlling diet to see the actual effect of sauna bath therapy on cardiometabolic biomarkers.

CONCLUSION

It can be concluded that sauna bathing is a safe, effective, inexpensive, and less time-consuming procedure to improve cardiometabolic health and help to build a healthier society.

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Source of Support: Nil

Conflict of Interest: None Declared

How to cite this URL: Monika Yadav & Durgawati Devi: Effect of Kuti Sweda (Sauna Bath) on Cardiometabolic Health a Randomized Controlled Study. *International Ayurvedic Medical Journal* {online} 2023 {cited June 2023} Available from:

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Table 1: Details of the trial intervention

GROUP A	GROUP B
Participants were screened, laboratory investigations were done as per assessment criteria, and vital were recorded, the person was given an envelope containing 60 capsules and was advised to take 1 capsule in the morning and 1 in the evening with plain water for 30 days. After 30 days again samples were taken for laboratory investigation as per assessment criteria.	Registered persons were called on an empty stomach for laboratory investigation. Vitals like BP, heart rate, and RR were noted, <i>Dashmoola Tail</i> was given for oil application, the sauna chamber was preheated (30-40 degree Celsius), and the person was allowed to enter the sauna in minimum clothes after having 1-2 glasses of water. After 5 to 30 mins or when starts perspiring, the subject starts to come. He was allowed to rest for 15-30 mins then again BP, HR, and RR were assessed. This procedure was done 5-6 times per week and was continued for 1 month. After the completion of the trial again laboratory investigations were done.

BP- blood pressure, RR- respiratory rate, HR- heart rate,

Table 2: Effect of sauna bath on cardiometabolic biomarkers in Group A

Variables	MEAN			% of Change	SD	SE	t value	P value	Result
	BT	AT	Diff.						
Heart rate	73.133	73.133	0	0	2.877	0.5252	0	>0.9999	NS
Systolic BP	125.97	125.27	0.7	0.55	3.142	0.5737	1.22	0.2322	NS
Diastolic BP	81.733	81.333	0.4	0.4	1.221	0.2228	1.795	0.0831	NS
Weight	61	61.383	-0.3833	0.6	0.9552	0.1744	2.198	0.0361	S
BMI	22.504	22.688	-0.1837	0.81	0.446	0.081	2.256	0.0318	S
Serum Cholesterol	160.36	160.14	0.2233	0.13	3.089	0.5639	0.396	0.695	NS
Serum Triglycerides	95.163	96.477	-1.283	1.34	2.85	0.5203	2.466	0.0198	S
Serum HDL	53.79	52.937	0.8533	1.58	2.174	0.3969	2.15	0.04	S
Serum LDL	87.270	88.163	-0.8933	1	2.518	0.4598	1.943	0.0618	NS
FBS	95.493	96.68	-0.1867	0.19	2.53	0.3008	0.6207	0.5397	NS

BT- before trial, AT- after trial, BP- blood pressure, BMI- body mass index, HDL- high-density lipid, LDL- low-density lipid, FBS- fasting blood sugar, SD- standard deviation, S- significant, NS- not significant

Table 3: Effect of sauna bath on cardiometabolic biomarkers in Group B

Variables	MEAN			% of Change	SD	SE	t value	P value	Result
	BT	AT	Diff.						
Heart rate	71.367	85.4	-14.033	19.6	6.139	11.121	12.52	<0.0001	ES
Systolic BP	122.93	118.67	4.267	3.47	3.473	0.6341	6.728	<0.0001	ES
Diastolic BP	79.067	70.267	8.8	11.1	4.189	0.7647	11.507	<0.0001	ES
Weight	64.144	63.510	0.6340	0.9	0.2580	0.0471	13.462	<0.0001	ES
BMI	23.775	23.524	0.2510	1.05	0.1011	0.0184	13.597	<0.0001	ES
Serum Cholesterol	203.65	165.86	37.787	18.5	23.219	4.239	8.914	<0.0001	ES
Serum Triglycerides	112.99	104.17	8.82	7.8	20.417	3.728	2.366	0.0249	S
Serum HDL	49.687	54.563	-4.877	9.81	8.197	1.868	3.258	0.0029	VS
Serum LDL	131.39	91.26	40.13	30.5	24.615	4.494	8.929	0.0001	ES
FBS	91.8	84.03	7.77	8.46	6.416	1.171	6.633	0.0001	ES

BT- before trial, AT- after trial, BP- blood pressure, BMI- body mass index, HDL- high-density lipid, LDL- low-density lipid, FBS- fasting blood sugar, SD- standard deviation, ES- extremely significant, S- significant, VS- very significant.

Table 4: Comparative effect of procedures in Group A and Group B

Variables	MEAN		SD		SE		t value	P value
	GpA	GpB	GpA	GpB	GpA	GpB		
Heart Rate	0.2	-14.033	2.87	6.139	0.5239	1.121	11.504	<0.0001
Systolic BP	0.8333	4.8	3.108	2.858	0.5675	0.5217	5.146	<0.0001
Diastolic BP	0.4	8.7333	1.221	4.25	0.2228	0.776	10.322	<0.0001
Weight	-0.1167	0.6340	1.025	0.2580	0.1871	0.0471	3.89	0.0003
BMI	-0.1837	0.2510	0.446	0.1011	0.08143	0.0846	5.206	<0.0001
Serum Cholesterol	0.2233	37.787	3.089	23.219	0.5639	4.239	8.714	<0.0001
Serum Triglycerides	-1.283	8.82	2.850	20.417	0.5203	3.728	2.684	<0.0095
Serum HDL	0.8533	-4.877	2.714	8.197	0.3969	1.497	3.701	<0.0005
Serum LDL	-0.8933	40.13	2.518	24.615	0.4593	4.494	9.081	<0.0001
FBS	-0.1867	7.77	1.647	6.416	0.3008	1.171	6.579	<0.0001

BP- blood pressure, BMI- body mass index, HDL- high-density lipid, LDL- low-density lipid, FBS- fasting blood sugar, SD- standard deviation, SE- standard error