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REVIEW ARTICLE OPEN ACCESS

A CRITICAL REVIEW ON THE EFFECT OF SAUNA BATH ON CARDIOMETABOLIC HEALTH

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ABSTRACT:

Introduction: Sauna bath is a passive thermotherapy, in which temperature exposures varies from 45 degree Celsius to 100 degree Celsius. Saunas are eliminative in nature. Intense short-term heat exposure increases the peripheral blood flow and thus helps in elimination of toxins. Sauna bath is usually used for the purpose of pleasure, wellness and relaxation but beyond its use for pleasure, it is associated with a reduction in the risk of vascular diseases such as high blood pressure and cardio vascular diseases, neuro cognitive diseases, non - vascular conditions such as pulmonary diseases, mental health disorders etc. **Data Source:** various interventional, observational, epidemiological and mechanist studies, related websites, literature and articles from MEDLINE, google scholar and PubMed were scrolled to collect data. **Review Method:** After scrolling various literatures, articles and trial works, all the health benefits of Sauna Bath and its working mechanism were assembled and complied for easy understanding. **Results:** Sauna bath being eliminative in nature provides beneficial effects on health especially on cardiovascular, respiratory, neuroendocrine and immune system. It stabilizes the autonomic nervous system, reduces blood pressure, inflammation, circulating bad cholesterol, arterial stiffness and vascular resistance and sauna bath is inexpensive and widely accessible. **Conclusion:** Regular sauna can be used as a lifestyle intervention for the enhancement of health and wellness, particularly in population that faces difficulty in exercising.

KEYWORDS: Sauna bath, cardiovascular diseases, cholesterol.

INTRODUCTION

Ancient people used to bath in heat for the purpose of cleansing, purification and healing as seen in various ancient cultures. Now a days variation in in thermal therapy is seen in the form of Steam bath, Sauna bath, Woan therapy and Hot water immersion bath[1]. The concept of Sauna emerged from Finland over 2 thousand years back, it is a tradition used there for wellness, pleasure and relaxation, but now a days it is used world wide due to its multifaceted health benefits on human health. Accumulating evidences implicates that regular sauna usage delay or prevent the risk of many acute and chronic diseases [2]. In last few years multiple researches were conducted in many countries to understand the potential health benefits and working of Sauna. This review summarizes various interventional, observational, epidemiological and mechanist studies, literature and articles linking the efficacy and working of Sauna bath on various vascular and non- vascular disease conditions.

SAUNA BATHING

'Sauna' word is a Finnish word which means traditional Finnish bath or bathhouse.

In Finnic or other languages 'Sauna' always doesn't mean a place for bathing, it may also mean a small cottage or cabin. Sauna traditionally originated from Finland over 2 thousand years back, it is a tradition there used for wellness, pleasure and relaxation. Now a days it is used world-wide due to its multiple benefits on human health. Both acute and chronic diseases can be corrected by the daily use of sauna bath. As per Guinness book of world records, 'Koi Sauna' in Germany is the largest sauna in the world. It can accommodate 150 people at a time and measures 166 square meters along with a 'koi Aquarium'[3].

PROCEDURE

Sauna are special rooms made up of wood logs. It is a type of passive heat therapy, combined of heating and cooling phase. Person is exposed to high temperature for short period. The temperature of sauna room varies, mostly lie between 70 degree Celsius to 100 degree Celsius. In saunas relative humidity is low, that is between 10 to 20 % [4]. Some literature says that humidity in sauna room can be increased by pouring water on heated rocks. Ideally sauna bathing is a complete package that includes heating and cooling. Typical sauna bath includes 2 phases:[5]

i) Heating period
ii) Cooling off phase - either by taking shower, swim or resting at room temperature.

Initially the person is allowed to sit in a heated room, after that he or she is asked to take cold shower then again asked to sit in sauna room.

So, in one sitting of sauna bath, alternate heating and cooling of body is done repeatedly 2 to 3 times. Time duration of sauna bath is not universal it may depend on the comfort of bather, temperature of sauna and habitat. Total duration of sauna usually lies between 5 to 30 mins. Sauna bath can be taken daily, alternately or once a week, it totally depends on individuals'[6] thermoregulatory reactions, sex, age, functioning of cardiovascular and respiratory system as well on the climatic conditions. Now a days various variations of sauna bathing are seen like steam sauna, infrared saunas etc. Steam sauna is one with comparatively lower temperature and high humidity while Infrared sauna are comparatively had low temperature but without steam. Traditionally used Finnish sauna is the most effective one, because it includes alternate heating and cooling, allowing heat exchange with environment.

PRECAUTIONS

Sauna is a very safe therapy can be used by both healthy as well as diseased person, some points should be kept in mind like don't continue sauna for more than 20 mins in a single sitting, avoid during hot and summer days, after every heating session cooling off period is must, head, eyes and genitals should be covered.

TYPES OF SAUNAS

Now a days a wide variety of sauna options are available. Heat can be generated from woods, gas, electricity or solar power. Sauna can be classified on the basis of sauna chamber or on the basis of kind of stove used. The most common types of available now a days are:

1. Dry sauna
2. Smoke sauna
3. Steam sauna
4. Infrared sauna
5. Wood stove sauna
6. Electric stove sauna
7. Mobile sauna

On the basis of stove used there are two types of saunas:

1. Heat storage type stove
2. Continuous heating stove

➢ **Heat storage type stove:**

In this type, the sauna is heated once and the heat is retained by pile of stones and emitted during whole procedure. This type of sauna takes time to heat up but once heated can be used for longer duration. The saunas that fall in this category are

1. Smoke sauna

- Also known as '*Savusauna*'.
- A wooden room is constructed without any chimneys.
- Woods are burnt inside the sauna and the smoke fills the room.

- Once the room is heated up, the fire is extinguished and room is ventilated.
- The heat is retained by the piles of stone present in that room.
- When proper ventilation is achieved, the bather is allowed to enter the sauna.
- The sauna is constructed in such a way that it remains heated for longer time.
- This type of sauna is the most common sauna in Finland.
- They are cheap, easy to build up and durable.

2. Wood stove sauna

- In this type of sauna metal stoves is placed having stones in the top.
- The stove is burnt using birch wood, other types of wood can also be used but birch wood is mostly preferred due to its smell, durability and good quality.
- Its functioning is same as that of smoke sauna.

➢ **Continuous heating stove**

In this type, the saunas are continuously heated during the whole procedure. It takes lesser time to heat up but is suitable for short duration therapy.

1. Electric stove sauna

- This type of sauna is most common among cities.
- In this type an electric stove is kept inside with rocks in the top.
- Stove is heated by electricity, so doesn't require much arrangements, just on the switch.
- It is easy because do not require burning wood.

2. Mobile sauna

- These are similar to that of electric stove sauna.
- Saunas are built inside cars, trucks, buses etc.
- These types of saunas are available on rents.

3. Infrared sauna

- John Harvey Kellogg invented infrared sauna in 1891.
- He took patent for it.
- His idea of infrared sauna became popular in Germany.
- Infrared sauna is different from other traditional sauna techniques, as in this sweat is produced more quickly because heat it directly absorbed by skin, in the form of radiation.
- In this type heat transfer doesn't require conduction or convection methods of heat transfer, heat is directly transferred as radiant heat.
- It gives the same benefits as other types of saunas but in less time.

HISTORY OF SAUNA BATH

The concept of sauna emerged from 'Finland'. In Finland saunas were made by digging pits in slope and framed by wooden logs, stones were heated by burning fire to create high temperature inside, so that people can stay there in winter. Ideally Finnish sauna are similar to what known as '*Savusauna*' or 'smoke sauna' that are popular now a days. After industrial revolution 'metal wood stoves' or '*Kiuas*' became popular. When Finns migrated to other places, they spread the culture of sauna bath to that place. Later in 1938 Metos Ltd in Vaasa designed electric sauna stove. After second world war sauna became very popular among German speaking regions, because the soldiers used to enjoy sauna during war. After that sauna became popular in nearby countries like Netherland, Switzerland, Belgium etc. In 15th century sauna made by wood were also popular known as '*Hanjeungmak'* or Korean Sauna. These '*Hanjeungmak'* were used to treat illness and for various health benefits. Today there are multiple types of saunas are available like wet saunas, dry saunas, infrared saunas, smoke saunas, steam saunas.

HEALTH BENEFITS OF SAUNA

Sauna bath helps in lowering systemic blood pressure [7], controls hypertension, increases cardio- respiratory fitness (CRF), improves arterial compliance, intima media thickness and arterial stiffness. It increases cardiac output, improves endothelial functioning [8].

Regular sauna usage reduces oxidative stress and inflammation [9], decrease CRP, Fibrinogen and leukocytes reducing inflammation. It also increases the levels of plasma renin, growth hormone and cortisol, so has protective effect on neuro cognitive diseases [10] and boosts immunity.

It improves lung functioning, enhances ventilation, increases vital capacity and tidal volume (TV) of lungs, increases forced expiratory volume (FEV) [11], improves breathing in asthmatic patients or chronic bronchitis [12], reduces the incidence of common cold, reduces the risk of pneumonia [13] and respiratory diseases.

Alleviates pain, improves symptoms of disorders like osteoarthritis, rheumatoid arthritis, fibromyalgia and improves tension type headache and its related disorders [14].

It corrects lipid profile by decreasing the levels of Total Cholesterol, LDL and Triglycerides and increasing the HDL levels [15].

Sauna bathing has protective effects on skin health, increases the hydration of skin, maintains skin pH and water loss helpful in psoriasis like condition by removing hyperkeratotic scales [16].

ADVERSE SIDE EFFECTS AND CONTRAINDICATIONS:

Though sauna have very safe profile with multiple benefits. There are many theories that support that cardiovascular patients should avoid sauna as it may cause sudden death. But overall findings from studies suggest that person with stable cardiovascular diseases can use sauna, as it improves oxygen consumption, increases cardiac output, reduces systolic and diastolic blood pressure so improve overall symptoms. It was also said that pregnant women should avoid taking sauna in 1st trimester as heat was considered as teratogenic, but recently studies have proved it wrong. Alcohol consumption and sauna bathing should be avoided as it can cause sudden death or any other major accident as it increases the risk of cardiac complication like hypotension [1].

Contraindicated conditions are unstable angina type chest pain, unstable myocardial infarction, severe cardiac disease patient should avoid for 4- 8 weeks after the incident. Patient with orthostatic hypotension or with aortic stenosis should avoid sauna. Acute infections, fever, diseases like rheumatoid arthritis specially in inflammatory phase should avoid taking sauna. Skin conditions like urticaria, oozing rashes and abrasions should avoid sauna bathing [6].

HEAMODYNAMIC CHANGES IN SAUNA BATHING:

Sauna is a type of heat therapy, when body is subjected to heat body combats the thermal stress by cutaneous vasodilation, skin blood flow and heart rate increases along with profuse sweating. Heart rate increases two folds leading to increased cardiac output. This ultimately decreases peripheral resistance of the vessels but the stroke volume is not affected at all. The diastolic and mean arterial pressure decreases but no significant effect on arterial blood pressure [6].

DISCUSSION

Sauna bath is a passive heat therapy, which was earlier used for pleasure and relaxation which explains the reduction of stress. But new researches in past few decades have given various mechanistic pathways that reflects the effects of sauna bath on various disease conditions. Various researches proves that sauna bath produces the same effect as those produced by moderate exercise. When the body temperature rises it affects cardiovascular, neuroendocrine system and crypto protective mechanism, they all work together to maintain homeostasis. Sauna bath acclimatize the body to heat stress and prepares it for future such conditions. When a person is exposed to heat, it increases his/her core body temperature. This excessive heat is

transported to blood and cause various changes in body. The aim of the body to get rid of this excessive heat, in order to do so, variety of changes occurs in body and each and every organ or system starts responding and tries to normalise this change. The very first response is activation of thermoregulatory system in hypothalamus, it causes vasodilation as well as stimulation of sweat gland to produce more sweat, it causes increase in heart rate, cardiac activity and cardiac output, so more blood is pumped into circulation, this causes more blood to peripheral circulation mainly to skin to facilitate sweating, this causes removal of toxins accumulated in organs and microchannels. Heavy metals like aluminium, cadmium, cobalt and lead are also removed via sweating. Regular usage of sauna reduces systolic and diastolic blood pressure, left ventricular ejection fraction is increased while the ejection time is decreased. Arterial compliance is enhanced resulting in improved endothelial functioning, nitric acid bioactivity and decrease in arterial stiffness. It positively alters natriuretic peptides and cardiac Troponin T thereby improving cardio-respiratory fitness [1]. Regular sauna usage increases blood supply to body that flushes out inflammatory markers also heat stress causes decreases in the levels of inflammatory markers like CRP (C- Reactive Protein) and increases the levels of IL-10 in body, which is an anti-inflammatory marker also helpful in improving depressive symptoms. While talking about its effect on respiratory system-sauna bath reduces oxidative stress and inflammation, it also increases blood supply to lung tissue there by increasing vital capacity, Tidal volume (TV), Forced Expiratory Volume (FEV), and decreases pulmonary congestion. Hence improving ventilation so, beneficial in conditions like asthma, chronic bronchitis, COPD etc. It also boosts immunity, reducing the recurrent infection of cold and other infections.

Heat shock proteins (HSPs) are adaptive heat response of our body against heat stress. When the core body temperature rises HSPs are released which prevents protein aggregations, repairs and resynthesise damaged protein slows muscular atrophy and promotes longevity by protecting against neurodegenerative diseases like- Parkinson's, Alzheimer's and Huntington's diseases. These HSPs also protects against cardio-vascular diseases like Heart failure, cardiomyopathy and Atherosclerosis. A protein known as BDNF (Brain Derived Neurotropic Factor) is responsible for growth of new neurons by acting on neurons of central and peripheral nervous system. It is seen that heat stress or

exercises are responsible for increasing the levels of BDNF thereby reducing stress and depression by modulating neuronal plasticity [17].

Neurodegenerating diseases are mostly caused due to reduced blood flow to brain, sauna bath enhances blood flow to all body parts also increases the levels of protein BDNF and HSPs which are responsible for preventive from such diseases.

Regular sauna usage effects the sensory nerve endings in skin and increases the levels of beta- endorphins which is responsible for pain management and feeling of relaxation and wellbeing, thereby, relieving chronic painful conditions. Many studies have showed that regular sauna usage regulates the levels of serum cholesterol and lipoproteins in blood. Thereby modulating dyslipidaemia which is a strong risk factor for cardiovascular diseases.

It also stimulates hormonal changes increasing levels of plasma renin, cortisol and growth hormones which promotes health.

CONCLUSION

This review summarizes the potential health benefits of sauna bathing and its mechanism of working. Various studies proves that sauna is safe, inexpensive and can be used for health promotion and prevention especially for those who faces difficulty in exercising.

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