

Effect of sunbath in Psycho somatic disorders such as Hypertension and Diabetes mellitus

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ABSTRACT

Psycho somatic disorder [PD] involving both mind and body. Stress induced hypertension [HT] and diabetes mellitus [DM] stand in the peak position among these diseases. Mental factor such as anxiety and stress are root cause and also increases severity of the disease. Sun bath is a cost effective, efficient treatment modality used in the field of naturopathy. Components such as IRR and UV rays A and B of sun rays show significant benefits in reducing blood pressure level and blood glucose level in HT and DM patients respectively. In the present study total 10 subjects with HT and DM each, between age group of 30 to 50 years were selected and given sun bath for duration 30 minutes with minimum dressing in lying down position. Sun bath is given continuously for 10 days. Blood pressure and blood glucose values were recorded before and immediately after the sun bath. Parameters collected were analysed and correlated for significance. The data analysis showed significant reduction in systolic blood pressure ($p \leq 0.01$), diastolic blood pressure ($p \leq 0.01$) and blood glucose level ($p \leq 0.01$) were noted. The data analysis showed significant reduction in systolic and diastolic blood pressure and blood glucose levels.

Key words

Psycho somatic disorders, Sunbath, Diabetes mellitus, Hypertension, IRR, UV rays

Introduction

To investigate the effects of sun bath in stress induced HT and DM. Psycho somatic disorder [PD] involving both mind and body. Stress induced hypertension [HT] and diabetes mellitus [DM] stand in the peak position among these diseases. Mental factor such as anxiety and stress are root cause and also increases severity of the disease. Physical symptoms increase during release of adrenalin into blood stream when the individual is stressed. Sun bath is a cost effective, efficient treatment modality used in the field of naturopathy. Sun bath produces remarkable physiological changes among the individuals. Components such as IRR and UV rays A and B of sun rays show significant benefits in reducing blood pressure level and blood glucose level in HT and DM patients respectively.

Psychosomatic disorder

Psychosomatic disorder is a psychological condition, in which stress and psychological distress lead to diseases usually without any other medical explanation or diagnosis. It can affect almost any part of the body. It is now recognized that all diseases may have social, psychological, and behavioural

aspects as well as physical organic features. The World Health Organization defines psychosomatic medicine as “the study of biological, psychological and social variables in health and disease.”

Stress may lead to anxiety or depressive disorders, which can lead to a fast heart rate and increased chance of irregular heartbeats, which may be fatal soon after a heart attack. The modern view of psychosomatic mechanisms includes a role for stress, depression, and lack of social support alongside biological factors in the causation or outcome of disease. Several clinical studies and a systematic review of the subject have documented a positive relationship between psychosocial stress and chronic diseases. Stress can cause hypertension through repeated blood pressure elevations as well as by stimulation of the nervous system to produce large amounts of vasoconstricting hormones that increase blood pressure. Factors affecting blood pressure through stress include white coat hypertension, working environment, race, social environment, and emotional distress.

Stress hyperglycemia (also called stress diabetes) is a medical term referring to transient elevation of the blood glucose due to the stress of illness. It must be distinguished from various forms of diabetes mellitus. Stress is a potential contributor to chronic hyperglycemia in diabetes. Stress has long been shown to have major effects on metabolic activity. Energy mobilization is a primary result of the fight or flight response. Stress stimulates the release of various hormones, which can result in elevated blood glucose levels. Although this is of adaptive importance in a healthy organism, in diabetes, as a result of the relative or absolute lack of insulin, stress-induced increases in glucose cannot be metabolized properly. Regulation of these stress hormones may be abnormal in diabetes. Stress hyperglycemia is especially common in patients with hypertonic dehydration and those with elevated catecholamine levels. Steroid diabetes is a specific and prolonged form of stress hyperglycemia. People who have experienced stress hyperglycemia during severe illness have a threefold risk of developing diabetes in subsequent years, Psychological stress also induces deterioration in glycaemic control in established diabetes

Naturopathy in psychosomatic disorders

Naturopathy is defined as a system of living in harmony with the constructive principles of nature on the physical, mental, moral and spiritual planes of living. It has great health promotive, disease preventive, curative and restorative potential [2].

Cause of diseases according to naturopathy

Naturopathy believes “that any disease is a disturbance of the function or the structure of any organ or part of the body; chronic diseases are associated with an accumulation of foreign matter, waste products, dead cells, poisonous elements and dangerous toxins”. These poisonous products are the result of lowered vitality, imperfect elimination, and faulty digestion brought about by the sluggish functioning of every organ [3]. Dr. Henry Lindlahr, defined as “the primary cause of disease, barring accidental or surgical injury to the human organism and surroundings hostile to human life, is violation of nature’s laws and the effect of violation of nature’s laws on the physical human organism are

a. Lowered vitality.

b. Abnormal composition of blood and lymph.

c Accumulation of waste matter, morbid materials and poisons. Naturopathy believes in the unity of disease and unity of treatment. The cause of the disease is one-violation or dis-obedience to the laws of nature and the treatment is also one - elimination of the morbid matter from the body

Self-healing

Naturopathy believes that nature is the supreme healer. Hippocrates, the father of medicine, referred to “VisMedicatrix Naturae”: the healing power of nature [4]. His doctrine: nature is the true healer, the physicians her servant not her teacher. There are self-curative forces which are inherent in the human body, working towards health and healing .However, we have not realised fully the power of one’s body to heal itself. There are several examples of self-healing such as joining of bones after they are broken, healing of wounds etc.

Body constituents

It is said that the human body is composed of five great elements (Panchamahabhutas) .They are Prithvi, Jala, Vayu, Agni, and Akash. Imbalance of these elements creates disease. The treatment of the disease can therefore be derived using these elements. Since such elements are sourced through nature, a treatment enacted by them is called naturopathy.

Sunbath

(Heliotherapy) is one of the principle therapies used in naturopathy.

Heliotherapy/solartherapy/phototherapy is use of natural sunlight. Actinotherapy is use of artificial light for medical purpose. Here Sun, (Tej) – the ultimate, inexhaustible, and perennial source of energy, the core component of fire element is used therapeutically, by exposing the body to sunlight for appropriate period of time. Therapeutically sunlight can be used in various forms to get desired physiological effects. Ordinarily, sunlight is broken down into three major components: (1) visible light, with wavelengths between 0.4 and 0.8 micrometre, (2) ultraviolet light, with wavelengths shorter than 0.4 micrometre, and (3) infrared radiation, with wavelengths longer than 0.8 micrometre. The visible portion constitutes nearly half of the total radiation received at the surface of Earth. Although ultraviolet light constitutes only a very small proportion of the total radiation, this component is extremely important. It produces vitamin D through the activation of Ergosterol. Infrared radiation has its chief merit in its heat-producing quality. Close to half of total solar radiation received at the surface of Earth is infrared.

It has been already proven that the cardiovascular health varies with season, weather, and climate. Ultra violet radiation (UVR), present in sunlight has cardio protective activity through various mechanisms. Prevalence of hypertension also increases with the distance from the equator and seasonal and latitude variations are also seen in the incidence of acute coronary syndrome and stroke. Researches showed that Vit D deficiency is a risk factor for non-skeletal organ dysfunction condition, such as type 2 diabetes mellitus. Due to Vit D receptor presence on Beta cells in pancreas is a suspicion regarding the relationship between Vit D deficiency and Diabetes mellitus. Numerous studies have demonstrated that blood pressure and blood glucose level varies inversely with ambient sunshine

Hence this study aims at understanding the effect of sunbath on Hypertensive individuals and Diabetic individuals thereby establishing the extent of efficacy of sunbath in the management of Hypertension and Diabetes mellitus.

Materials and methods

Study setting

The study was conducted in Sree Ramakrishna Medical College of Naturopathy and Yogic Sciences (SRKMCNYS), Kulasekaram, Tamilnadu, India

Study Participants:

In this study 10 prediagnosed hypertensive individuals and 10 prediagnosed diabetes mellitus were selected using simple random sampling. Both males and females belonging to the age group between 30-50 years were selected for the study. Study was conducted during morning at around 8-9am continuously for 10 days. Written consent was obtained from all the patients and participation was voluntary.

The study was approved by the Institutional ethical committee of SRKMCNYS.

Exclusion criteria for the study included subjects with the history of photosensitivity. Subjects recruited were explained about the purpose of the study, intervention and assessment techniques and also their rights as research subjects.

Assessments

Subjects included in the study were assessed for blood pressure, and blood glucose level before and immediately after sunbath. The blood pressure was recorded in quiet and calm environment using clinically validated OMRON HEM-7120 Digital Blood Pressure monitor with the oscillometric principle. Random blood glucose level was measured using Accu-Check Instant S glucometer.

Intervention

Individuals who were assigned for the study group were given sunbath. Ordinary sun bath was given in a well featured room (approximately 25 feet wide, 10 to 11 feet height), which was airy and private. Individual who is taking the sunbath will be with minimum dressing and will expose the body parts to ambient sunshine. They were allowed to place themselves in lying down in the room during sunbathing. Duration of sunbath was 30 minutes. Proper hydration was maintained by asking individual to have 1- glass of cold water before entering into the procedure.

Data Collection

The data was collected as self-reported observations using outcome variables. The assessments were done at the beginning of the intervention (baseline data), immediately after the intervention (post assessment data). The data was organized in Microsoft Excel Sheets (Version 2010).

a) Blood Pressure was measured using Digital Blood Pressure monitor (OMRON HEM-7120). The systolic and diastolic pressures were immediately recorded.

b) Blood glucose level was measured using Accu-Check Instant S glucometer

Statistical Interpretation

All the data was recorded in Microsoft excel 2007. Paired sample t test was done to evaluate the changes within the group using SPSS software

3. Results

All enrolled participants successfully completed the study and no adverse effect has been reported in interventional group and SBP ,DBP and Blood glucose level significantly reduced after the sun bath There was a statistical significant difference in Blood glucose level, SBP, DBP before and after sun bath followed by taking rest in shadow. Results of pre and post intervention comparisons are given in table 1,2,3 respectively

TABLE 1 -Paired Samples Statistics

	Mean	N	Std. Deviation	Std. Error Mean
Pair 1 Preglu	281.10	10	55.008	17.395
Postglu	233.20	10	50.281	15.900

Paired Samples Test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1 preglu - postglu	47.900	15.366	4.859	36.908	58.892	9.858	9	.000

For Systolic BP

TABLE 3-Paired Samples Statistics

	Mean	N	Std. Deviation	Std. Error
Pair 1 Predia	83.60	10	5.873	1.857
postdia	77.80	10	5.371	1.698

Paired Samples Test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1 predia - postdia	5.800	1.476	.467	4.744	6.856	12.429	9	.001

For all 3 P value is <0.01. It is highly significant that after 10 days of treatment (sun exposure) the blood sugar level and blood pressure (systolic and diastolic) got reduced.

4. Discussion

This study reveals that after sun bath for 30 minutes followed by rested in shadow reduces SBP, DBP and Blood glucose level significantly. As diurnal creatures, we humans are programmed to be out-doors while the sun is shining and home in bed at night. This is why melatonin is produced during the dark hours and stops upon optic exposure to daylight. This pineal hormone is a key pacesetter for many of the body's circadian rhythms. It also plays an important role in countering infection, inflammation, cancer, and auto-immunity, according to a review in the May 2006 issue of Current Opinion in Investigational Drugs. Finally, melatonin suppresses UVR-induced skin damage, according to research in the July 2005 issue of Endocrine.

When people are exposed to sunlight or very bright artificial light in the morning, their nocturnal melatonin production occurs sooner, and they enter into sleep more easily at night. Melatonin production also shows a seasonal variation relative to the availability of light, with the hormone produced for a longer period in the winter than in the summer. The melatonin rhythm phase advancement caused by exposure to bright morning light has been effective against insomnia, premenstrual syndrome, and seasonal affective disorder (SAD).The melatonin precursor, serotonin,

is also affected by exposure to daylight. Normally produced during the day, serotonin is only converted to melatonin in darkness. Whereas high melatonin levels correspond to long nights and short days, high serotonin levels in the presence of melatonin reflect short nights and long days (i.e., longer UVR exposure). Moderately high serotonin levels result in more positive moods and a calm yet focused mental outlook. Indeed, SAD has been linked with low serotonin levels during the day as well as with a phase delay in night time melatonin production. It was recently found that mammalian skin can produce serotonin and transform it into melatonin, and that many types of skin cells express receptors for both serotonin and melatonin says melatonin researcher Russel J. Reiter of the University of Texas Health Science Center. This can have a major impact on melatonin rhythms and can result in improvements in mood, energy, and sleep quality.

Dr. Hollick has been researching Vit D since 1969. He was first to identify the major circulating form of Vit D in human blood as 25-hydroxyvitamin D₃, also known as 25(OH) D₃. He isolated and identified the active form of vit D as 1, 25-dihydroxyvitD₃. He determined the mechanism for how vitD₃ is synthesized in the skin. In his book 'The Vitamin D Solution' he discussed why sun and the supplements are not same. About 60 percentage of Vit D₃ taken from supplements become bound to Vit D binding protein with rest excreted through liver and bile. [6] Vit D₃ last 2-3 times longer when made in skin and 100 percent is bound to VitD binding protein and utilized by body. As soon as pre-vit D₃ is made it also absorbs UV light and is converted to other photoproducts with their own unique biological properties.

In one of the study actually showed that increased sensible sun exposure decreased the risk of many diseases and lengthened the life span. Sunscreen absorbs both UVA and UVB radiation -with about 97% absorption with SPF30 percent. While this may allow someone to be in the sun 30 times longer, it will block Vit D production. One study shows that farmers who were out at, all summer but wearing sun screen has Vit D deficiency.

Pre vit D₃ is made in the skin it is converted slowly and released into the blood stream over a couple of hours. An oral dose of Vit D₃ is absorbed into gut and goes into blood stream quickly and gone within 24 hours. When sunlight makes pre-vit D, it can be converted with additional UV exposure into other molecules after a maximum amount of Vit D₃ has been created. UV can destroy excess Vit D₃ directly within the external layer of the skin before it has even made it into blood stream. Many of the benefits and biological compounds we get from sun light exposure, cannot obtained by taking a supplements. These compounds are free just by being exposed to sunlight.

A study of 29,518 Swedish women showed those with active sun exposure habit were at a lower risk of death from cardiovascular disease and other causes. Compared to those with highest sun exposure, life expectancy for women who avoided sun was shorter. There is minimal risk for being exposed to sensible sun exposure, but there is a lot of overall health and wellbeing.

Studies have suggested that there will be reduction of either systolic or diastolic or both the aspects of blood pressure following insolation. In our study, a significant reduction was observed in SBP, DBP and random glucose level in the study group where sunbath was incorporated.

Nitric oxide (NO) an endothelium derived relaxing factor is a key vasodilator in the vascular system.[6] Photolabile which are present in human skin will decompose and lead to the formation of vasoactive NO after irradiation with the UVA component of sunlight.[7] Nitric oxide synthase isoforms (Nitric oxide, Nitrite, Nitrate) which are expressed in the dermis and epidermis, can also be mobilized by sunlight and delivered to the systemic circulation to exert coronary vasodilator and cardioprotective as well as antihypertensive effects.[8] UVA irradiation enhances the release of cutaneous NO stores, 'photo relaxes' the blood vessels and also leads to peripheral vasodilatation. Photolysed circulating nitrate by UVA radiation, will contribute to light-induced blood pressure reduction and cardio protection and in turn has beneficial effects on cardiovascular mortality. [9] Suschek and co-authors demonstrated that irradiation of healthy individuals with biologically relevant doses of UVA leads to a sustained reduction in blood pressure. [10] Hence, exposure of human skin to physiologically relevant quantities of UVA component of sunlight leads to a fall in blood pressure.

Other mechanism for cardiovascular protection is through vitamin D photosynthesis by sunlight. Vitamin D, the sunshine hormone is formed by ultraviolet B (UVB)-mediated photolysis of 7-dehydrocholesterol in the skin.[11] A study has reported that an increased 25(OH)D concentration is associated with reduced risk of hypertension, but oral vitamin D supplementation has no effect on BP and cardiovascular morbidity or mortality. In 1998, Krause R et al. reported that short term ultraviolet B exposure had blood pressure lowering effect in patients with untreated mild hypertension with increase of plasma 25(OH)D concentrations [13]. Substance P is a potent dilator of many vascular beds. When skin is exposed to the sunlight, it has the potential to produce substance P. Substance P is involved in the axon reflex-mediated vasodilatation to local heating. Local heat production will also be encountered during sun exposure. And this mechanism would also be involved in blood pressure reduction following sunbath.

Sunlight exposure will also have potential to produce serotonin that will help in improving the feel good experience of individual hereby would involve in the pathway of reducing elevated blood pressure. Being natural reward mechanism encouraging sun exposure, β -endorphins will induce a feeling of wellbeing, reduces the stress and helps in maintaining homeostasis thereby would help in reverting the blood pressure to safer range. Hence it can be suggested that sunbath has cardiovascular protective action by increasing the parasympathetic activity with a simultaneous sympathetic withdrawal. Even small UV-mediated reductions in blood pressure will definitely have its positive impact on the burden of disease and moderate exposure to sunlight will also reduce the economic burden caused by hypertension. Hence this study adds to the body of literature which shows exposure to ambient sunshine will have cardiovascular protective actions.

Vitamin D may impact on the development and management of diabetes are important areas of research. It has been reported that insulin secretion is dependent upon vitamin D in animals and isolated islets. It has also been reported that vitamin D deficiency reduces insulin secretion. In addition, recent data has demonstrated the presence of vitamin D receptors on the beta cells of the islets of Langerhans, and the ability of the islets to express 1-alpha hydroxylase thereby activating 25(OH) D. An indirect effect of vitamin D on beta cell insulin secretion is also postulated by means of increased intracellular calcium in the islet. Vitamin D receptors have also been identified in cells of the immune system. In studies of non obese diabetic mice, high doses of 1 alpha 25-dihydroxyvitamin D₃ (active form of vitamin D) have been shown to delay the onset of diabetes by means of immune modulation. This active form has been shown to protect beta cell function caused by inflammatory cytokines (IL-6 and TNF-alpha). IL-6 has been noted to inhibit insulin receptor signal transduction, and administration of this cytokine has been associated with hyperglycemia and hyperinsulinemia. Therefore, understanding the role that vitamin D receptors play in immune function for the development and progression of diabetes will be an important area of future research. Genetic variations in vitamin D receptors maybe associated with risk of diabetes. Chang e tal identified vitamin D receptor polymorphisms which were associated with diabetes in a Taiwanese population. However, these findings differ depending on the population. Most recently, variations in the CYP2R1 (vitamin D25-hydroxylase) gene, which encodes for an enzyme that catalyzes the formation of the main vitamin D metabolite, has been associated with lower levels of vitamin D and type 1 diabetes. There is also a connection with metabolic syndrome, a cluster of conditions that increases one's risk for type 2 diabetes and cardiovascular disease. A study in the September 2006 issue of Progress in Biophysics and Molecular Biology demonstrated that in young and elderly adults, serum 25(OH) D was inversely correlated with blood glucose concentrations and insulin resistance [14].

Some studies have demonstrated high prevalence of low vitamin D levels in people with type 2 diabetes, although it is not clear whether this is a cause of the disease or an effect of another causative factor-for example, lower levels of physical activity (in this case, outdoor activity in particular). People living at higher latitudes throughout the world are at higher risk of hypertension, and patients with cardiovascular disease are often found to be deficient in vitamin D.

Today, a great number of studies showing a relationship between type-two diabetes mellitus and sun exposure or UVB exposure. Vit D stimulate beta pancreatic cells to maintain calcium concentration and increases insulin secretion.vit d also reduces insulin resistance risk alongside peripheral tissue by controlling inflammation cytokine and inhibiting PPAR-gamma expression,The study was undertaken because of the observation by researchers showing that although higher 25(OH)D levels were consistently associated with a lower risk of diabetes, supplementing 25(OH)D had shown no such effects. Another of the more important investigations showed that women who had frequent sun exposure habits had a 30% reduced risk of type-two. In a 2014 study about ultraviolet light effects, scientists found that overfed mice ate less when ultraviolet (UV) light was shone on them. This UV treatment also resulted in the mice displaying fewer warning signs of type 2 diabetes, such as abnormal insulin resistance and glucose levels. Nitric Oxide (NO), which is released by the skin after exposure to sunlight (UVA rays), was linked to the UV treatment, which can help people control their metabolism and slow weight gain.

5. CONCLUSION

The current study indicated that short-term sun bath as a potentially effective approach in decreasing mental illness such as anxiety, depression, stress and thereby it helps in controlling physical illness such as HT, DM. Further studies are required to confirm our findings in large- scale population.

Abbreviations

CVD: Cardiovascular disease, DBP: Diastolic Blood pressure, NO: Nitric oxide, SBP: Systolic Blood pressure, UV: Ultraviolet radiation, WHO: World health organization, 25(OH)D: 25 hydroxyvitamin D, SAD:seasonal affective disorder

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