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Original Research Article

To Study the Effect of Yoga based Life style intervention and Conventional Physical Exercise on Lipid Profile and Perceived Stress in Pre-hypertensive subjects

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Abstract:

Adoption of healthy lifestyle by using Sudarshan kriya yoga and Physical exercise interventions in the early course of development of hypertension i.e. in pre-hypertension stage is useful to prevent emergence of hypertensive cases and improvement of their Lipid Profile and Stress level. A randomized controlled trial was performed to assess the effect of Sudarshan Kriya Yoga (SKY) and Physical Exercise (PE) on Lipid Profile and Perceived Stress in pre-hypertensive subjects. In this study 100 prehypertensive subjects of either gender, age group (30-60 years) were divided into SKY and PE groups having 50 subjects in each group. They were undergone regular practices of SKY and PE respectively, one hour daily for the duration of three months. Statistically significant decrease was noted in TC, TG, LDL and VLDL level ($p<0.001$) while statistically significant increase in HDL level ($p<0.001$) was noted after three months of regular SKY practices. Physical exercise performed was brisk walking which after three months also showed statistically significant decrease in TC, TG, LDL and VLDL level ($p<0.001$) while statistically significant increase in HDL level ($p<0.001$) was noted. SKY and PE interventions have resulted in statistically significant decrease in Perceived stress also ($p<0.001$). This is indicative of autonomic nervous system balance with increased parasympathetic activity while decreased sympathetic activity along with improvement of many systemic functions so they can be applied as a mass approach for prevention & control of hypertension as well as improvement of stress and lipid profile.

Keywords: Sudarshan Kriya Yoga (SKY), Physical Exercise (PE), Pre-hypertension, Hypertension, Perceived Stress Scale (PSS), Total Cholesterol (TC), Triglyceride (TG), Low Density Lipoprotein (LDL), Very Low-Density Lipoprotein (VLDL), High Density Lipoprotein (HDL).

Introduction

Hypertension is one of the major global health issues, impacting more than a billion individuals and leading to around 9.4 million deaths each year. It greatly raises the risk of the cardiovascular based issues such as the coronary heart disease and more. [1]

According to the seventh JNC criteria adult subjects with blood pressure readings of 120-139 mmHg systolic and 80-89 mmHg diastolic have been put in the pre-hypertension category. Individuals having their blood pressure in this range have been found to increased risk of getting hypertension and other cardiovascular diseases, so it becomes necessary to control and keep blood pressure lower. [2]

The recent classification system for hypertension provided by AHA designates individuals with systolic blood pressure of 120-129 mmHg and the diastolic blood pressure below 80 mmHg to be said as elevated while the individuals with systolic blood pressure of 130-139 mmHg and diastolic blood pressure of 80-89 mmHg are classified as hypertension stage 1 category; formerly the individuals with their blood pressure in this range were considered to be pre-hypertensive. [1,2]

Sudarshan Kriya Yoga is designed and recommended by H. H. Sri Sri Ravishankar ji founder of art of living. It is a package of yoga meditation with a number of components which includes pranayama, physical postures and spiritual knowledge points. In addition to holistic approach practices of yoga and meditation have many beneficial effects to improve physical and mental health of the participants as well as in the management of many psychosomatic diseases. [3]

SKY as a yoga-based lifestyle intervention has proved their beneficial role in the management of

stress as well as stress related other illnesses. It has been used as a mass approach publically to relieve post-traumatic stress disorder (PTSD) in the survivors of mass disasters. [4]

Sky and related practices have been found effective to decrease the blood pressure, total cholesterol and increase the HDL levels in hypertensive patients.[5] Yoga is an ancient system of Indian philosophy. Yoga is a way of life based on certain view of life. In simple words, yoga is a journey towards self-perfection. Improvement is the first step towards perfection. [6]

Physical exercises have been found to increase expenditure of energy by working skeletal muscles. Performing regular exercise in the form of brisk walking, which is defined as walking at a speed of three miles per hour or 20 minutes per mile, for 30 minutes may have significant health benefits when compared to a sedentary lifestyle. The usual prescribed duration of exercise is for 30-60 minutes. Exercise can serve as a preventive measure against diseases or as a treatment for existing conditions. Aerobic exercises, such as "walking, jogging, swimming, and dancing", are particularly beneficial for enhancing physical fitness and fostering overall well-being.[7]

Physical exercises offer significant potential in managing various health conditions such as cardiovascular diseases, diabetes, and mental illnesses.[8]

The perceived stress scale is a psychological tool which is applied to detect the perceived level of stress in the individuals. This scale is consisting of questionairs to perform enquiery in relation to the intensity of feelings and thoughts during the past month. [9]

The rising prevalence of hypertension among individuals is a concerning trend in society. This has sparked a strong desire to focus on pre-hypertensive individuals with the goal of preventing their progression to clinical cases. Non-pharmacological lifestyle interventions, such as Sudarshan Kriya Yoga and Physical exercise, offer promising approaches for promoting better health and preventing the development of this condition. By incorporating these practices into daily life, individuals can adopt healthier lifestyle as well as reduce their risk of deranged lipid profile and stress level.

Material and Methods

In this study 100 participants aged 30-60 with pre-hypertension were enrolled. They were divided into two groups SKY (Sudarshan Kriya Yoga) and PE (Physical Exercise) each comprising 50 individuals, they were instructed to engage in their respective activities for one hour daily over three months. SKY involved yoga practice, while PE included a regimen of "slow walking warm-up, brisk walking, and cool down". Conducted at the Department of Physiology, S.P. Medical College, Bikaner, from December 2017 to March 2022 with informed consent, the study aimed to assess the effects of these interventions on health parameters. The ethical approval for the study was obtained from the human ethical committee of S.P. Medical College, Bikaner. Before starting the intervention baseline parameters (Lipid profile and Perceived stress score) were recorded for all the study subjects, three months after completion of study period the same set of parameters was repeated. All the subjects participated voluntarily in the study. The patients suffering from coronary artery disease, diabetes mellitus, pulmonary tuberculosis, asthma, any other major illness and non-cooperative subjects were excluded from the study.

Results

Statistically highly significant results of SKY were obtained in Lipid profile and PSS in pre-hypertensive subjects. Statistically highly significant results of PE also, were obtained in Lipid profile and PSS in pre-hypertensive subjects.

Table 1: Distribution of cases according to age group

Age Group (years)	Pre HTN				Total	
	Yoga		PE			
	No.	%	No.	%	No.	%
34-40	23	46.0	14	28.0	37	37.0
41-50	19	38.0	21	42.0	40	40.0
>50	8	16.0	15	30.0	23	23.0
Total	50		50		100	
Mean	43.02		45.36			
SD	7.24		6.24			
t	1.732					
p	0.086					

Table 2: Distribution of cases according to gender

Gender	Pre HTN				Total	
	Yoga		PE			
	No.	%	No.	%	No.	%
Female	11	22.0	11	22.0	22	22.0
Male	39	78.0	39	78.0	78	78.0
Total	50		50		100	
χ^2	-					
p	-					

Table 3: Statistical analysis Lipid profile between pre and post treatment in pre-hypertensive in SKY group

Lipid Profile	Pre Treatment		Post Treatment		t	p
	Mean	SD	Mean	SD		
TC	210.48	30.94	181.80	20.69	10.909	<0.001
TG	148.74	23.51	130.60	19.46	14,155	<0.001
HDL	41.28	4.14	50.54	6.21	12.627	<0.001
LDL	137.42	30.02	103.94	22.28	10.991	<0.001
VLDL	29.74	4.72	26.26	4.07	12,226	<0.001

Table 4: Statistical analysis of PSS between pre and post treatment in pre-hypertensive SKY group

Parameters	Pre Treatment		Post Treatment		t	p
	Mean	SD	Mean	SD		
PSS	23.40	4.41	4.28	1.71	35.141	<0.001

Table 5: **Statistical analysis of Lipid profile between pre and post treatment in pre-hypertensive PE group**

Lipid Profile	Pre treatment		Post treatment		t	p
	Mean	SD	Mean	SD		
TC	210.68	27.86	195.40	23.12	13.972	<0.001
TG	155.40	16.57	142.86	16.41	23.190	<0.001
HDL	42.22	3.78	46.16	3.76	18.361	<0.001
LDL	137.32	28.43	120.30	23.87	15.389	<0.001
VLDL	31.14	3.24	28.70	3.29	16.697	<0.001

Table 6: **Statistical analysis of PSS between pre and post treatment in pre-hypertensive PE group**

Parameters	Pre treatment		Post treatment		t	p
	Mean	SD	Mean	SD		
PSS	23.48	3.64	11.04	2.24	38.913	<0.001

Discussion

Blood pressure is an important indicator of cardiovascular health. The patients of hypertension are continuously rising in the developing country like India. Continuous stress and deranged lipid profile are the risk factors to increase blood pressure also affecting functions of other organ systems. In alternative medicine there are a number of regimes like herbal, dietary supplements and mind body interventions to balance stress. Yoga meditation and physical exercise are also preferred by many people as lifestyle modification measures and living a healthy lifestyle. SKY and PE have been found beneficial to decrease stress, lipid levels and the blood pressure of the participants. There are many proposed hypothesis and underlying mechanisms of action of these interventions to decrease the blood pressure, stress and improve the lipid profile. The Effects of Sudarshan Kriya Yoga (SKY) are stimulation of vagus nerves, that causes changes in physiological functions of many organs and glands. They also influence the ascending fibers that connect to "thalamic generators, the limbic system, and cortical areas in the brain". These intricate connections showing the complex effects of SKY on the autonomic nervous system as well as higher functions of brain. [10]

Results of our study showed statistically significant decrease in lipid profile i.e. TC, TG, LDL and VLDL while HDL cholesterol was increased after 3 months intervention of SKY. Our results are consistent with Sayed et al [11] and Geetha [12] who showed that SKY significantly improved lipid profile in healthy subjects. The improvement in the Lipid profile parameters after yoga could be due to increased hepatic lipase and lipoprotein lipase at cellular level, which affects the metabolism of lipoprotein and thus

increase uptake of triglycerides by adipose tissue. [13]

Significant drops in total cholesterol and LDL (harmful) cholesterol, as well as increases in HDL cholesterol were observed in the practitioners. These findings suggest that Sudarshan Kriya improves the blood cholesterol profile, and that regular practice may therefore prove to be an effective tool in preventing and arresting hypertension and CHD. Several studies have demonstrated significant falls in cortisol (stress hormone) levels. [14]

Our findings align with a review study conducted by Wang et al, which demonstrated favorable effects of various yoga practices on stress reduction in healthy individuals. [15]

Stress reduction through yoga may involve both psychological mechanisms, such as positive affect, mindfulness, and self-compassion and biological mechanisms, including inhibition of stress-related hormones like cortisol. [16]

In prehypertensive subjects, PE resulted in highly significant decrease in mean systolic and diastolic blood pressure. These results are similar with research studies performed by Kokkins PF et al, which showed significant decrease in blood pressure in the mild hypertensive patients practicing PE intervention. [8]

The various underlying mechanisms of action of physical exercise included increased endothelial function, insulin sensitivity, improved baroreceptor sensitivity, activation of the parasympathetic nervous system and reduced sympathetic activity, among others. Additionally, regular physical exercise improves physical fitness, resilience to stress, and brain function, leading to overall improvements in physical and mental health. [17]

Kim H et al conducted a 16-weeks study demonstrating that accumulated short bouts of exercise interventions had a positive impact, significantly reducing weight, body fat and BMI in adults.[18]

In recent decades, substantial knowledge has accumulated regarding the importance of physical activity in managing numerous chronic diseases such as diabetes mellitus, hypertension, obesity, dyslipidemia, insulin resistance and coronary heart disease (CHD). Individuals who engage in physical exercises generally experience better physical fitness and quality of life compared to those who are inactive. Aerobic exercises are easier to perform and typically devoid of side effects, making them a favorable option compared to medications. [19]

The PE increases enzymatic activity that help to rise the rate of metabolism and oxidation of lipids, that is favorable to burn fat and improve lipid profile. [20]

Franklin et al favored the hypothesis that PE regulates ANS by sympathetic nervous system inhibition. They proportionately decrease the arousal state related with the stress reaction therefore beneficial to restore the health. [21]

Conclusion

Sudarshan Kriya Yoga and Physical Exercise have their role in decreasing blood pressure, improved lipid profile and perceived stress level. They an influence the autonomic nervous system establishes parasympathetic dominance with inhibition of sympathetic nervous system activity. The study may prove to be useful in the management of hypertension, deranged lipid profile and stress level of individuals. Further research is needed to know up to what extent SKY and PE can play effective role in the management of hypertension, deranged lipid and stress level and other lifestyle diseases.

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