Original article

Outcomes of Naturopathy and Yoga intervention on 24-hour ambulatory blood pressure among primary hypertensives: A cohort study

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ABSTRACT

Objectives: Naturopathy and yoga an efficient treatment modality used in the prevention and management of many chronic lifestyle ailments. This study has been done to assess the outcomes of naturopathy and yoga intervention on 24-hour ambulatory blood pressure. **Methods:** For the research, 66 pre-diagnosed primary hypertension individuals between the ages of 30 and 60 were included. Subjects were assessed for 24 hours of ambulatory blood pressure (ABP), anthropometry, and WHRQOL questionnaire (World health-related quality of life) short form (SF-36) on the first and tenth day of their stay in the hospital. **Results:** This study results showed there was a significant reduction in the mean value of 24-hour SBP ($p<0.01$), 24-hour DBP ($p<0.01$), BMI ($p<0.01$) and WHR ($p=0.001$). WHRQOL (SF -36) showed a considerable improvement in the mean value of physical function ($p<0.01$), physical health ($p<0.01$), emotional health ($p<0.01$), well-being ($p<0.01$), social functioning ($p<0.01$), general health ($p<0.01$) and there was significant reduction in the mean value of fatigue ($p<0.01$), pain ($p<0.01$). **Conclusion:** According to the study, the sympathetic tone decreased and the sympatho-vagal balance shifted in favour of parasympathetic dominance. Thus, it may be stated that yogic intervention and naturopathy can be applied to manage primary hypertension clinically.

Key words: Ambulatory blood pressure, Blood pressure, Hypertension, Naturopathy, Yoga

A substantial fraction of global population suffers from hypertension, which is a chronic lifestyle disease. Globally, hypertension is the leading factor in the development of cardiovascular illnesses and accounts for 9.4 million deaths annually [1]. Hypertension is currently defined as having a systolic blood pressure (SBP) of 140 mmHg or higher and/or a diastolic blood pressure (DBP) of more than 90 mmHg [2]. In 2019, 49% of males and 59% of women with hypertension reported having received a previous diagnosis [3]. A community-based methodology is used in central India, where almost one-fifth of the population over 40 years old has hypertension [4]. The third most important risk factor for disease burden attributable in South Asia is hypertension [5]. Raised blood pressure is a prominent risk factor for morbidity and mortality, accounting for 10.8% of all deaths in India which constitutes 25% of urban and 10% of rural residents [6,7].

Based on a 2018 Indian study, the prevalence of hypertension is significantly greater than expected by the World Health Organization - Risk factor among age groups younger than 45 years [8]. High blood pressure is caused by a variety of variables, including obesity, insulin resistance, high alcohol and salt intake, age, stress, poor calcium and potassium intake, and sedentary lifestyles [9]. Rarely, does hypertension have symptoms instead, it is frequently discovered through screening or when someone goes to the doctor for an unrelated issue. Some people with high blood pressure also experience light-headedness, vertigo, tinnitus, impaired vision, and fainting episodes. It is also normal to get headaches, particularly in the morning [10]. There are mainly two types of hypertension. Primary hypertension is likewise referred to as essential hypertension. This kind of hypertension has no known cause. This kind of hypertension gradually worsens over time without a clear explanation. The majority of people have this kind of elevated blood pressure. Secondary hypertension is that results from an underlying ailment like thyroid or kidney disease [11]. Uncontrolled hypertension can result in complications like stroke, heart attack, aneurysm, heart failure, kidney problems, eye problems, metabolic syndrome, and dementia [12].

Access this article online

Received – 01st March 2024

Initial Review – 22nd March 2024

Accepted – 03rd April 2024

Quick Response Code

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If the systolic blood pressure is ≥140mmHg and diastolic is ≥ 90mmHg then the diagnosis of hypertension is made according to the updated 2015 eighth Joint National Committee (JNC-8) guidelines and recommendations on Hypertension [13]. Nowadays, ambulatory blood pressure monitoring (ABPM) is advised for all patients who show signs of hypertension. Though, it is sometimes forgotten in clinical practice, finding variations in 24-hour blood pressure might provide important information [14]. The guidelines have stressed how valuable it is as a prognostic, and diagnostic tool [15]. Normally, antihypertensive medications are used as part of standard medical care [16]. Naturopathy and Yoga both promote living as close to nature as possible and work well together in the management of hypertension [17]. Naturopathy and the yogic system of medicine include many natural therapies to modify the lifestyle [18]. Through lifestyle modifications, there is a reduction of high blood pressure which acts as both preventative and curative measures [19]. Hence, the current study is undertaken to understand the outcome of Naturopathy and Yoga intervention on 24-hour ambulatory blood pressure in patients with primary hypertension.

MATERIALS & METHODS

An approval was obtained from institutional (SDM college of naturopathy and yogic sciences) ethical committee before starting the study. Signed informed consent was obtained from the subjects by explaining the study objectives, methods, intervention in oral and written form.

Subjects: A sample size calculation was made by G* power version 3.1.9.7 software with 90% power, 1% level of significance and effect size of 0.5 and the total sample size (n) was found to be 66. 66 primary hypertensive individuals of both gender and age ranging between 30 to 60 years were recruited from SDM nature cure hospital, shantivana, dakshina Karnataka, Karnataka for the study.

Inclusion criteria: Both males and females are involved. Subjects with Systolic Blood Pressure (SBP) ≥ 140mmHg and diastolic blood pressure (DBP) ≥ 90 mmHg with or without hypertensive medication and were willing to participate.

Exclusion criteria: Subjects with cardiovascular diseases, liver disease, kidney disease, Micro-vascular injuries, Diabetes mellites, Thyroid disorders, Autoimmune disorders, Active malignant disease, Female subjects during menstruation, Pregnancy or lactation period, Subjects with any systemic illness, Obstructive sleep apnoea.

Intervention: All subjects were given naturopathy and yoga treatments for 10 days. A general naturopathic, yogic and diet intervention protocol was followed throughout the study **(Table 1,2,3).**

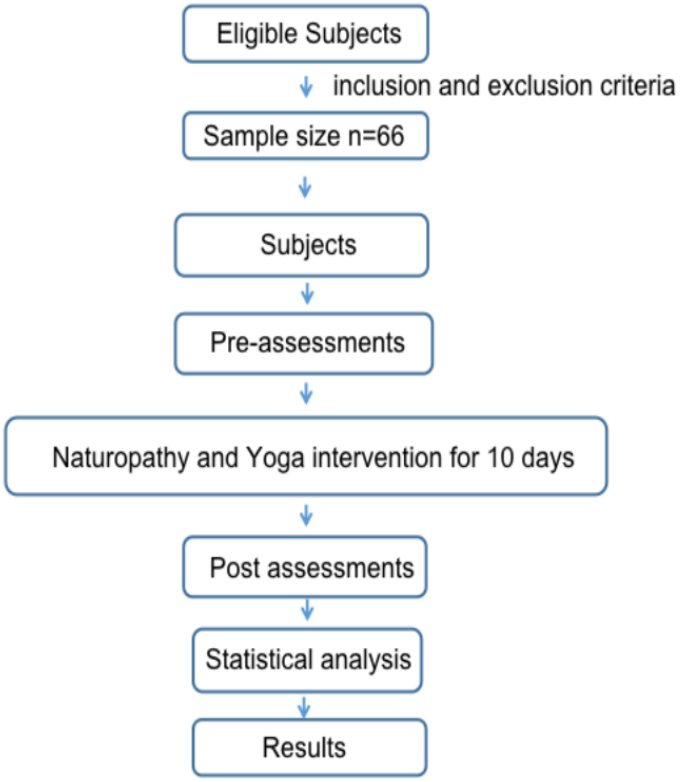

Figure 1: Illustration of study plan

Study design: It is a single-group experimental pre-post-study design.

Table 1: Naturopathy treatment protocol for 10 days.

Day	8.00am	8.30-12.00pm	2.00pm	2.30pm-4.30pm	8.00pm	total duration
1	APEP	St Bath, CCPK	APEP	CHB	HFI	100mins
2	APEP	En, FBM	APEP	CSS	HFI	120mins
3	APEP	Sa bath, CCPK	APEP	NUWM	HFI	90mins
4	APEP	En, alt DWB	APEP	HAFB	HFI	100mins
5	APEP	En, NIB	APEP	KPK	HFI	100mins
6	APEP	En, DHM	APEP	FMB	HFI	110mins
7	APEP	En, PM to abdomen, back and legs	APEP	Ice massage to head, neck, spine	HFI	90mins
8	APEP	CCJ	APEP	CHB	HFI	100mins
9	APEP	Sa bath, CCPK	APEP	CSB	HFI	90mins
10	APEP	SGOM	APEP	NIB	HFI	120mins
Total duration for 1o days						1020mins

Table 2: Yoga therapy protocol for 10 days.

Practice	Details	Duration
Starting Prayer	AUM chanting, Salutations to maharishi Patanjali	5 min
Loosening practices	Joint loosing for neck, shoulders, elbows, wrist, finger joints, hip, knees, ankles, toe joints.	20 min
Kriyas	Jala neti, kapalabati	15 min
Breathing practices	Hand in and out, hand stretch breathing, straight leg raising with breathing, setubandasana, bujangasana, Tadasana breathing.	20 min
Asana	Ardhachakrasana, padahastasana, ardakatichakrasana.	15 min
Pranayama	Chandraanuloma-viloma, chandrabedana, Sheetali, Sheetkari, Sadanta, nadishodana pranayama	15 min
Relaxation	Deep relaxation technique (DRT)	10 min
Closing prayer	AUM chanting, Shanthi mantra	5 min
Total duration		105 mins

Table 3: Diet therapy protocol for 10 days.

Days	7.30am	9.00am	11-11.30am	2.00pm	4.00pm	6.30-7pm
1	CJ	BW	BD, PP, BM	BRJ	BW	RD, PP, BM
2	CJ	BW	RD, PP, BM	BRJ	BW	PP, BM
3	CJ	BW	LHJ	LHJ	BW	LHJ
4	BRJ	BW	LHJ	PMJ	BW	LHJ
5	BRJ	BW	LHJ	PMJ	BW	LHJ
6	BRJ	BW	LHJ	PMJ	BW	LHJ
7	BRJ	BW	MJ	PMJ	BW	MJ
8	CJ	BW	PP, BM	LHJ	BW	PP, BM
9	CJ	BW	RD, PP, BM	LHJ	BW	RD, PP, BM
10	CJ	BW	BD, PP, BM	LHJ	BW	BD, PP, BM

APEP - Abdomen and eye mud pack , St Bath - steam bath , CCPK - cold chest pack , En - enema , FBM - full body massage , Sa Bath - sauna bath , Alt DWB - alternate douche to whole body , DHM - deluxe hydromassage , FMB - full mud bath , PM to Abd , bk and legs - partial massage to abdomen , back and legs , CCJ - cold circular jet , SGOM - salt glow oil massage , CHB - cold hip bath , NSS - neutral spinal spray , NSB- neutral spinal bath , NUWM - neutral underwater massage , HAFB - hot arm and foot bath , KPK - kidney pack , NIB - neutral immersion bath , NDWB - neutral douche to whole body , HFI - hot foot immersion.

BD (Boiled Diet-200gm of rice, 200gm of boiled vegetable), PP= Papaya(100gm), BM=Buttermilk (150ml) , RD (Raw vegetable, Sprouts), Buttermilk(150ml), BW= Barley water (250ml), LHJ=Lemon honey juice (200ml) , MJ=Mosumbi juice (200ml), CJ= Carrot juice (200ml) , BRJ = beetroot juice (200ml) , PMJ = pomegranate juice (200ml) .

Assessments: 24 hours Ambulatory blood pressure: Shillers BR - 102 2.293001 Opt2 (America) device was fitted on the first day after 24 hours the pre-readings were collected on the second day and the device was fitted on the ninth day after 24 hours the post-readings were collected on the tenth day of their stay in hospital. The pre and post-data was extracted device and were noted down.

Anthropometry: The data was extracted after the measurements of height, weight, waist circumference, hip circumference, waist-hip ratio on the first and tenth day of their stay in hospital.

WHRQOL (SF-36) questionnaire: The data was extracted from the WHRQOL (SF-36) questionnaire interpretation first and tenth day of their stay in hospital. All the raw data was tabulated in Microsoft Excel spreadsheet in the order and statistical analysis was done.

Data analysis and blinding: The Statistical Package for Social Sciences (SPSS) (Version 20.0) was used for the statistical analysis. The Kolmogorov-Smirnov test was used to determine if the data had a normal distribution before being analysed using t-tests. Data were not distributed normally. As a result, the Wilcoxon signed rank test, a non-parametric test, was used to compare the pre and post-test results within the group. $p<0.05$ was accepted as an indicator of significance. In this study, the statistical analyst was blinded.

RESULTS

The results showed there was a significant reduction in the mean value of 24-hour SBP ($p<0.01$), 24-hour DBP ($p<0.01$), BMI ($p<0.01$) and WHR ($p=0.001$). WHRQOL (SF -36) showed a considerable improvement in the mean value of physical function ($p<0.01$), physical health ($p<0.01$), emotional health ($p<0.01$), well-being ($p<0.01$), social functioning ($p<0.01$), general health ($p<0.01$) and there was significant reduction in the mean value of fatigue ($p<0.01$), pain ($p<0.01$). The Mean ± SD scores of ABP, Anthropometry and WHRQOL are mentioned in (Table 4,5,6).

Table 4: Descriptive Statistics of 24 hours ABPM within group

24hours ABP	Mean	Std deviation	Wilcoxon z-value	p-value	Mean change	Std deviation change
Average SBP (Pre)	132.41	7.73	-6.91	<0.01**	-11.71	-4.17
Average SBP (Post)	120.69	3.55				
Average DBP (Pre)	88.03	4.35	-6.96	<0.01**	-6.61	-2.05
Average DBP (Post)	81.42	2.29				
Wilcoxon signed ranked test						
*p-value < 0.05 is significant						
**p-value < 0.01 is highly significant						

ABP – Ambulatory blood pressure, SBP – Systolic blood pressure, DBP – Diastolic blood pressure

Table 5: Descriptive Statistics of Anthropometry within group

Anthropometry	Mean	Std deviation	Wilcoxon z-value	p-value	Mean change	Std deviation change
BMI (Pre)	26.19	4.62	-7.16	<0.01**	-1.42	-0.62
BMI (Post)	24.76	4.00				
WHR (Pre)	0.94	0.11	-3.63	0.001**	0.05	0.14
WHR (Post)	1.00	0.26				
Wilcoxon signed ranked test						
*p-value < 0.05 is significant						
**p-value < 0.01 is highly significant						

BMI - body mass index, WHR - waist hip ratio.

Table 6: Descriptive Statistics of WHRQOL (SF-36) within group

WHORQOL (SF-36)	Mean	Std deviation	Wilcoxon z-value	p-value	Mean change	Std deviation change
PF (Pre)	81.56	7.07	-5.67	<0.01**	2.34	-0.72
PF (Post)	83.90	6.35				
PH (Pre)	80.16	8.23	-5.29	<0.01**	2.57	-0.98
PH (Post)	82.74	7.25				
EH (Pre)	79.50	8.03	-6.51	<0.01**	3.25	0.27
EH (Post)	82.75	8.30				
FA (Pre)	84.37	8.78	-6.54	<0.01**	-1.27	2.93
FA (Post)	81.71	8.41				
WB (Pre)	77.42	7.85	-5.37	<0.01**	3.40	-1.52
WB (Post)	80.83	6.33				
SF (Pre)	78.28	5.77	-6.25	<0.01**	2.74	-0.39
SF (Post)	81.03	5.37				
PA (Pre)	84.00	8.77	-5.90	<0.01**	-1.28	3.06
PA (Post)	80.60	9.03				
GH (Pre)	78.59	6.80	-5.82	<0.01**	3.60	-0.09
GH (Post)	82.19	6.71				
Wilcoxon signed ranked test						
*p-value < 0.05 is significant						
**p-value < 0.01 is highly significant						

PF - physical function, PH - physical health, EH- emotional health, FA-fatigue, WB-well-being, SF -social function, PA - pain. GH-general health.

DISCUSSION

The purpose of the current study was to evaluate the effects of yoga and naturopathy on people with primary hypertension. Following naturopathy and yoga interventions there was a noticeable decrease in the mean values of 24 hours SBP, 24 hours DBP, BMI and WHR. WHRQOL (SF -36) showed that there was a noticeable improvement in the mean value of physical function, physical health, emotional health, well-being, social functioning, and general health and there was a substantial decrease in the mean value of fatigue and pain. The most significant and often relied-on markers of CVD risk are

SBP and DBP. Compared to other blood pressure variables like pulse pressure, SBP alone is a stronger indication of cardiovascular illnesses, especially in those under the age of 50. For every 10 mm Hg increase in SBP, the risk of future CVD events rises by 15% [20].

Ambulatory blood pressure monitoring can measure short-term blood pressure fluctuation over 24 hours and the declining state of the diurnal blood pressure; these metrics are said to have predictive value for cardiovascular issues [21].During blood pressure readings, ABPM devices emit tactile and sonorous stimuli, which might interfere with certain patients' sleep. The clinical effects of elevated nocturnal blood pressure readings acquired in such circumstances should be regarded with caution because sleep loss brought on by the repetitive cuff inflation during nightly BP monitoring results in BP elevation [22].In the current experiment study, integrated naturopathy and yoga intervention lowered SBP and DBP dramatically. A change in the autonomic balance toward parasympathetic dominance is associated with reduced blood pressure [23]. We saw a drop in 24-hour ambulatory blood pressure in the current study, thus we could assume that there was parasympathetic dominance.

Previous studies demonstrated that cold application, whether in the form of mud or water, causes sudden vasodilation, primarily in the small arteries, which is mediated by the axon reflex, activation of brown adipose tissue (BAT), release of local vasodilators like nitric oxide (NO), decreased release of norepinephrine from adrenergic nerve endings, and relaxation of vascular smooth muscle. An earlier opening of the arteriovenous anastomosis is caused by a decrease in sympathetic drive and a lower amount of norepinephrine release, and comparatively warm blood will result in more vasodilation [20]. DASH diet enhanced endothelial function as shown by the flexibility of tiny arteries. The key metabolite of vascular NO synthesis, plasma nitrite, has changed, suggesting an increase in NO bioavailability, and it may have changed before the physiological response. DASH's antioxidant effects on nitric oxide consumption probably are what lower blood pressure [24]. Blood pressure lowering may be achieved by a decrease in vagal tone as a result of relaxation brought on by the regulated, slow breathing utilized in pranayama as vagal tone alters the activation of the sympathetic nervous system and the vascular system as a result of parasympathetic stimulation also, Asanas induce the internal vasculature to be sheared, and they also raise the amounts and availability of the endothelial nitric oxide synthase enzyme, which results in vasodilation and a drop in blood pressure [25].

Integrating naturopathic and yoga treatments has a cardioprotective effect by increasing parasympathetic activity and, as a secondary result, lowering sympathetic activity. We advise adopting this simple technique whenever an immediate drop in blood pressure is required, whether under regular circumstances or during a therapeutic operation and incorporating it into the usual hypertension care. The Strength of the study is no earlier studies have been done on 24-hour ABPM in the field of naturopathy and yogic, it was a pre-post study with clinical application and Standard assessment equipment was used to assess ABP hence precise, reliable data was obtained. Also, Naturopathy and yoga treatments had no unpleasant side effects or discomfort. Therefore, this study presents a straightforward, affordable and efficient solution that anyone can implement.

CONCLUSIONS

According to the study findings, yoga and naturopathy both lower sympathetic tone and shift the sympatho-vagal scales in favour of parasympathetic dominance. Thus, it may be claimed that naturopathy and yoga interventions can be utilized in managing primary hypertension clinically.

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How to cite this article: Abhijna Rai, Shahsikiran HC, Sujatha dinesh, Prasanth Shetty, Navin Pakkala. Outcomes of Naturopathy and Yoga intervention on 24-hour ambulatory blood pressure among primary hypertensives: A cohort study. Indian J Integr Med. 2024; 4(2):60-65.

Funding: None *Conflict of Interest: None Stated*