RESEARCH PAPER

Yogic Intervention For Management Of Hypertension In Chronic Kidney Disease: A Nonpharmacological Approach

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Abstract

Background: Hypertension, commonly known as high blood pressure, a major risk factor for cardiovascular diseases, stroke, and frequently coexists with ckd which is dangerous because it is both a consequence and a cause of ckd. The eighth joint national committee (jnc) guidelines mention lifestyle modifications as the first step in management of hypertension alongside pharmacotherapy.

Introduction: Yoga is a combination of three main parts dhyan, asanas and pranayam which reduces blood pressure, heart rate, respiratory rate, oxidative stress, psychological stress. Global health authorities, including the world health organization (who) and the american heart association (aha), recommend nonpharmacological approaches as first-line therapy, especially for individuals with prehypertension or stage 1 hypertension.

Aim: To reduce onset of hypertension in chronic kidney disease patients through non pharmacological approach (yogic intervention and lifestyle modification).

Objective: To assess the changes in mabp in ckd patients after 3 months of yogic intervention.

Methods: An interventional case control study, place - department of physiology in collaboration with medicine (nephrology) department, at era's lucknow medical college and hospital lucknow, u.p, india after taking permission from institutional ethical committee. Patients were divided into two group, case group (who were on medication and with yoga practice for 3 months) and control group (who were only on medication without yoga practice).

Results: After completion of three months duration of structured yoga program, significant change in sbp, dbp and mabp has been observed.

Conclusion: Yoga had a significant effect on bp control in hypertensive patients and reduced the overall need for antihypertensive medications.

Keywords: Yoga, Blood Pressure, Ckd.

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INTRODUCTION:

Yoga is an ancient traditional science which includes asanas (yogic physical postures), pranayama (yogic breathing practices), meditations and relaxation techniques.[1]

The proposed benefits of regular yoga practice are: increase in muscular strength, flexibility and balance, reduced stress, anxiety and depression, and an enhancement of overall well-being and quality of life.[2]

Yoga is a mind and body technique which is a combination of physical exercises (Asanas) in synchronous with breathing techniques like pranayama and meditation and provides us with various beneficial effects, Yoga also improves lipid profile, heart rate variability and decrease in BP.[3] Hypertension or high blood pressure (BP) is abnormally high arterial blood pressure, a silent killer as very rarely can any symptom be seen in its early stages until a severe medical crisis

occurs, like heart attack, stroke, or chronic kidney disease.[4]

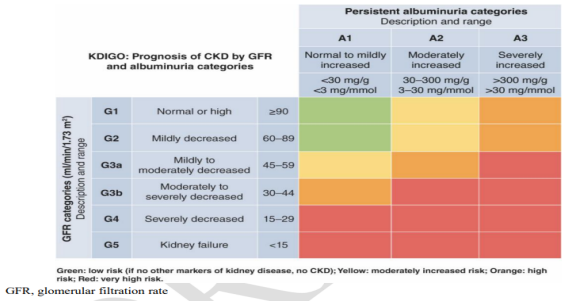
The Eighth Joint National Committee (JNC) guidelines mention lifestyle modifications as the first step in management of hypertension alongside pharmacotherapy.[5]

JNC – 8 Classification of BP

Table 3. Classification of Blood Pressure in Adults (age ≥18 years)

Classification	Systolic Blood Pressure (mmHg)		Diastolic Blood Pressure (mmHg)
Normal	<120	AND	<80
Prehypertension	120-139	OR	80-89
Stage I HTN	140-159	OR	90-99
Stage 2 HTN	≥160	OR	≥100

CKD is defined as the presence of kidney damage or decreased renal function (eGFR < 60 mL/min per 1.73 m2) for ≥3 months according to the Kidney Disease: Improving Global Outcome (KDIGO) clinical practice guideline.[6]



Chronic kidney disease (CKD) is a non-communicable disease that covers a range of different physiological disorders that are linked with an abnormal renal function and progressive decline in glomerular filtration rate (GFR). Chronic kidney disease has five stages of kidney damage, from mild kidney dysfunction to complete failure. Stage 3 or 4 of CKD patient is considered as having moderate to severe kidney damage.[7]

CKD prevalence in India from community-based representative studies- 13.24%. Prediction Intervals confirmed CKD prevalence in India in future studies will fall between 2.64% and 30.17%. This review indicates a rising trend of CKD (from 11.12% during the period 2011 to 2017, to 16.38% between 2018 to 2023) among Indians aged 15 years and above, over the past years.[8]

High blood pressure (BP) is one of the strongest predictors of CKD onset in the general population and of altered kidney function in CKD patients according to Epidemiological studies, on the basis of these findings, reducing the BP in CKD patients is essential to prevent the progression of CKD and cardiovascular diseases have highlighted by international guidelines.[9]

Hypertension is frequently coexists with CKD which is dangerous because it is both a consequence and a cause of CKD.[10]

Most often occurring problem in patients with CKD is Hypertension and its incidence and prevalence increase with declining glomerular filtration rate (GFR). Among individuals with hypertension, elevated systolic BP is associated with incident CKD and a more rapid decline in renal function. It is estimated that hypertension occurs in about 23.3%of individuals without CKD and 35.8% of stage 1, 48.1% of stage 2, 59.9% of stage 3, and 84.1% of stages4 and 5 CKD patients based on data from the US Renal Data System.[11]

NFHS-5 reported HTN prevalence of 21.3% in women (15 to 49 years) and 24% in men (15 to 54 years).[12]

Creatinine is filtered by glomerulus and thus, serum creatinine level is considered as an indirect measure of glomerular filtration. Diminishing of glomerular filtration rate results in rise of plasma concentrations of serum creatinine and urea. This rise indicates progression of kidney disease and thus serum creatinine has greater prognostic ability compared with urea for predicting the adverse outcomes. An elevated serum creatinine level is also a late sign of renal damage in essential hypertension with frankly elevated serum creatinine values predict a poor prognosis in patients with hypertension.[13]

Chronic kidney disease is associated with accumulation of metabolic waste products and multi organ involvements. These changes usually manifest as elevated blood urea and creatinine as well as hematologic, electrolyte, endocrine and skeletal disorders.[14]

Hypertension and chronic kidney disease are closely interrelated conditions as hypertension can lead to decreasing renal function and progressive chronic kidney disease can contribute to worsening hypertension, Blood pressure (BP) is one of the most important determinants of the cardiovascular and renal health of populations, this is why lowering the prevalence of hypertension, defined as a systolic BP >140 mm Hg or a diastolic BP >90 mm Hg, has been set as a major objective by the World Health Organization.[15]

Yogic Intervention for Management of Hypertension in Chronic Kidney Disease: A Nonpharmacological Approach

AIM: To reduce onset of hypertension in chronic kidney disease patients through non pharmacological approach (yogic intervention).

OBJECTIVES: To assess the changes in MABP in CKD patients after 3 months of yogic intervention.

METHODOLOGY:

STUDY TYPE- Interventional Case Control study

STUDY POPULATION- 90 diagnosed patients of CKD divided into two group,

Case group (n=45 who were on medication and with yoga practice).

Control group (n=45 who were only on medication but without yoga practice.

PLACE- Department of Physiology in collaboration with

Medicine department, at Era's Lucknow Medical College and Hospital Lucknow, U.P, India after taking permission from Ethical Committee.

DURATION- 6 days/week, 40 mins. for 3 months Pranayama were practiced for study group for 3 months- Kapalbhati, Nadishodhan (Anulom-Vilom), Sheetali, Bhramari pranayama.

INCLUSION CRITERIA-

- Age 18-60 years
- CKD diagnosed stage 3 and 4 patients.
- Patient who will give informed consent.

EXCLUSION CRITERIA-

- Age <18 and >60 years
- History of Tobacco and Alcohol intake and drug.
- Pregnant females.
- Drug abusers. H/O Tobacco and Alcohol intake, H/O Cigarette smoking.
- H/O chronic illness: (Lung disease, Heart disease, Liver disease, Malignancy, and Mental illness)
- H/O any Surgery, Organ transplant.
- CKD patients stage 1,2 and 5.

Sampling technique

- BP has been measured by using sphygmomanometer machine and MABP has been calculated accordingly MAP = DP + 1/3(SP – DP).
- Statistical analysis has been done by using SPSS-29 (Statistical Package for the Social Sciences) and result interpretation will be done.
- eGFR has been calculated by CKD-EPI equation (eGFR APP by National Kidney Foundation).

The CKD-EPI equation, expressed as a single equation[16] is:

$GFR = 141 * \min(Scr/\kappa,1)^{\alpha} * \max(Scr/\kappa,1)^{-1.209} * 0.993^{Age} * 1.018$ [if female] * 1.159 [if black]

eGFR (estimated glomerular filtration rate) = 1.73 mL/min/ m^2

S_{cr} (serum creatinine) = mg/dL

K = 0.7 (females) or 0.9 (males)

α = -0.241 (females) or -0.302 (males)

min = indicates the minimum of S_{cr}/K or 1

max = indicates the maximum of S_{cr}/K or 1

RESULTS

Systolic Blood Pressure (SBP)

The comparison of systolic blood pressure (SBP) between the case and control groups showed that at baseline, the mean SBP was 150.31±7.51 mmHg in the case group and 148.71 ± 7.01 mmHg in the control group, with no significant difference (t = 1.15, p = 0.255)

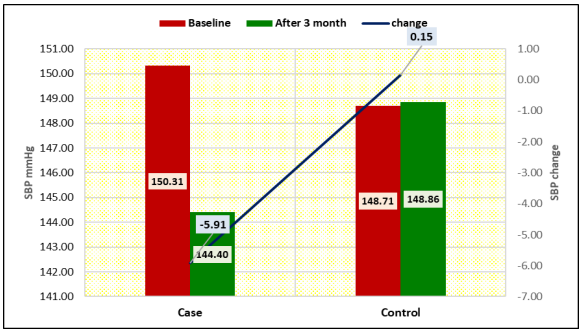
- After three months, the mean SBP decreased to 144.40 ± 8.03 mmHg in the case group, while it remained relatively stable at 148.86 ± 6.46 mmHg in the control group. The intergroup comparison at three months revealed a statistically significant difference (t = -3.22, p = 0.002).
- The mean change in SBP was a reduction of -5.91 mmHg in the case group compared to a minimal change of 0.15 mmHg in the control group.
- In intragroup analysis, the case group demonstrated a highly significant reduction in SBP (t = 10.60, p < 0.001), whereas the change was not significant in the control group (t = 0.22, p = 0.823).

Intergroup & Intragroup Comparison of SBP(stage 3and4) patients Case (n=45) Control (n=45)

SBP mmHg	Case (n=45)		Control (n=45)		unpaired t test	
	Mean	SD	Mean	SD	t-value	p-value
Baseline	150.31	7.51	148.71	7.01	1.15	0.255
After 3 month	144.40	8.03	148.86	6.46	-3.22	0.002
change	-5.91	3.74	0.15	5.54		

Intragroup	t=10.60, p<0.001	t=0.22, p=0.823	

HISTOGRAM showing comparison of SBP in CKD (stage 3 and 4) patients Case (n=45) Control (n=45)



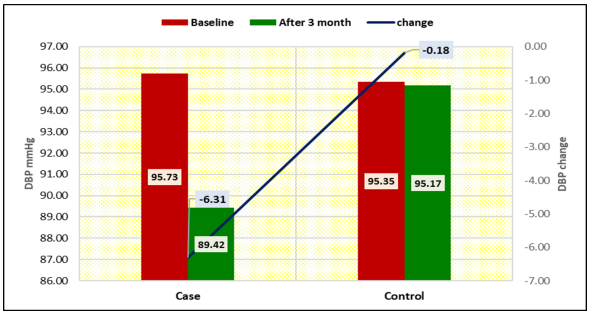
Diastolic Blood Pressure (DBP)

- The comparison of diastolic blood pressure (DBP) between the case and control groups revealed that at baseline, the mean DBP was 95.73 ± 6.17 mmHg in the case group and 95.35 ± 4.39 mmHg in the control group, with no significant difference (t = 0.38, p = 0.707).
- After three months, the mean DBP decreased to 89.42 ± 5.93 mmHg in the case group, whereas it remained relatively unchanged at 95.17 ± 3.30 mmHg in the control group.
- The intergroup comparison at three months showed a highly significant difference (t = -6.50, p < 0.001). The mean change in DBP was a reduction of -6.31 mmHg in the case group, compared to a slight decrease of -0.18 mmHg in the control group.
- In the intragroup analysis, the case group showed a significant reduction in DBP (t = 8.03, p < 0.001), while the change in the control group was not significant (t = 0.36, p = 0.724).

Intergroup & Intragroup Comparison of DBP(stage 3and4) patients Case (n=45) Control (n=45)

DBP mmHg	Case (n=45)		Control (n=45)		unpaired t test	
	Mean	SD	Mean	SD	t-value	p-value
Baseline	95.73	6.17	95.35	4.39	0.38	0.707
After 3 month	89.42	5.93	95.17	3.30	-6.50	<0.001
change	-6.31	5.27	-0.18	4.19		
Intragroup	t=10.60, p<0.001		t=0.22, p=0.823			

HISTOGRAM showing comparison of DBP in CKD (stage 3 and 4) patients Case (n=45) Control (n=45)



Mean Arterial Blood Pressure (MABP)

The comparison of mean arterial blood pressure (MABP) between the case and control groups showed that at baseline, the mean MABP was 112.71 ± 6.13 mmHg in the case group and 111.03 ± 8.78 mmHg in the control group, with no significant difference (t = 1.11, p = 0.270).

After three months, the mean MABP decreased to 106.89 ± 8.28 mmHg in the case group, while it slightly increased to 112.32 ± 4.83 mmHg in the control group.

The intergroup comparison at three months demonstrated a highly significant difference (t = -4.34, p < 0.001).

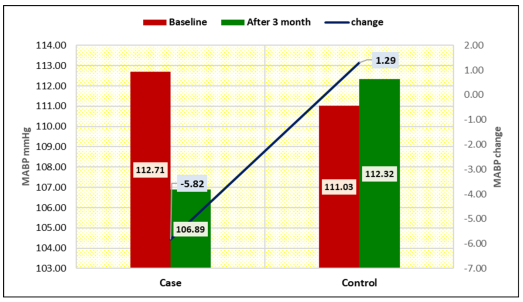
The mean change in MABP was a decrease of -5.82 mmHg in the case group compared to an increase of 1.29 mmHg in the control group.

In intragroup analysis, the case group showed a significant reduction in MABP (t = 5.00, p < 0.001), whereas the change in the control group was not statistically significant (t = 1.19, p = 0.238).

Intergroup & Intragroup Comparison of MABP

MABP mmHg	Case (n=45)		Control (n=45)		unpaired t test	
	Mean	SD	Mean	SD	t-value	p-value
Baseline	112.71	6.13	111.03	8.78	1.11	0.270
After 3 month	106.89	8.28	112.32	4.83	-4.34	<0.001
change	-5.82	7.81	1.29	8.76		
Intragroup	t=5.00, p<0.001		t=1.19, p=0.238			

HISTOGRAM showing comparison of MABP in CKD
(stage 3 and 4) patients Case (n=45) Control (n=45)



- After completion of 3 months duration of structured yoga program the SBP, DBP and MABP significantly decreased (p=0.001) in case group however the control group had no significant increase (p=0.958). Study revealed a significant reduced BP after 3 months of yoga in Chronic Kidney Disease patients (p=0.001).
- Yoga had a significant effect on BP control in hypertensive patients and reduced the overall need for antihypertensive medications this was seen in a relatively short span of time.

DISCUSSION

Yoga practices influence both somatic and psychological functions, helping individuals cope with day-to-day stressors. Adopting a yogic lifestyle has been shown to be vital in reducing stress and thereby contributing to better blood pressure control. Pranayama, the regulation of breathing, is a central element of yoga. It can be incorporated as a supportive therapy alongside pharmacological treatment in mild to moderate cases of hypertension. Slow breathing practices are particularly effective in reducing blood pressure and are recommended as a first-line intervention for low-risk hypertensive and prehypertensive patients.

Studies have demonstrated immediate benefits of the follow pranayama techniques in lowering blood pressure:

• Nadi Shodhana (alternate nostril breathing)
• Bhramari (humming breath)
• Sheetali (cooling breath)

These practices not only reduce blood pressure but also promote relaxation, autonomic balance, and psychological well-being.[17]

Yogic asanas and pranayamas minimize all types of stress of body. Documented scientific evidence strongly indicates that yoga has promotive, preventive as well as curative potential. As a non- pharmaco therapeutic and safe modality it can be used as a effective lifestyle adjunct to medical treatment to reduce drug dosage and improve quality of life of patients. It is to be emphasized that yoga is very effective for prevention as well as management of all pervading stress and stress related disorders.[18]

Data from the Framingham Heart Study showed that a 2 mm Hg reduction in DBP could reduce the risk of stroke or transient ischemic attack by 14%. While a 10 mm Hg reduction in SBP, seen with prescription drugs and in some meditation studies, is associated with a 30% relative reduction in risk of stroke. Thus smaller reductions in BP [5 mm Hg in SBP or 2 mmHg in DBP] achievable through diet, some dietary supplements and mind body therapies can be expected to significantly reduce blood pressure.[19]

Yoga may reduce blood pressure and heart rate by enhancing parasympathetic activity, reducing sympathetic overactivity, and improving vascular function. Pranayama, the controlled regulation of breathing, directly influences autonomic nervous system balance and promotes relaxation. Slow, deep breathing has been shown to modulate baroreceptor sensitivity and decrease stress-related activation of the hypothalamic-pituitary-adrenal axis, both of which are important in blood pressure regulation[20].

Pranayama, the conscious regulation of breath, forms a cornerstone of Yoga therapy, particularly in the management of hypertension. Its therapeutic efficacy is well-supported by emerging scientific evidence, highlighting its role in modulating the autonomic nervous system and regulating blood pressure. Slow, rhythmic breathing practices have been shown to improve baroreflex sensitivity, enhance vagal tone, and reduce sympathetic overactivity key mechanisms underlying the physiological relaxation response.[21]

A prospective study conducted by **Pandey et.al. (2017)** titled on Effects of 6 months yoga program on renal functions and quality of life in patients suffering from chronic kidney disease, Fifty-four patients with CKD were studied and divided into two groups (yoga group and control group) to see the effect of yoga in CKD. They concluded that in yoga group, a significant reduction of systolic and diastolic blood pressure, significant reduction in blood urea and serum creatinine levels.[22]

Dhungana R.R. et. al. (2018) conducted a multicentric, two arms, randomized, nonblinded, pragmatic trial, One hundred and forty participants randomized to treatment or control groups by using a stratified block randomization, consisting of five days of structured yoga training and practice of the same package at home with a recommendation of five days a week for the following 90 days. This study has

established the extent to which a yoga intervention package can help reduce blood pressure in hypertensive patients.[23]

An Interventional study was performed by **Banerjee AB et al. (2019)** to investigate the Effect of yoga on physical and various hematological parameters and this study shows that yoga has positive effect on health. The integration of yoga with modern medicine in resource-strained public health systems might play a vital role to provide us with a holistic health care.[24]

Sukiyaki et.al. (2020) conducted a study on Immediate effect of yoga on blood pressure and heart rate following a single yoga session in young female 55 participants with aged between 17-25 years, and results that there was healthy reduction in Systolic blood pressure, Diastolic blood pressure and Heart rate at three time interval- Baseline, after yoga and after relaxation following single yoga session in young female.[25]

A Randomised Controlled Trial done by **Kharbteng L et.al. in 2020**, on To assess the effect of a breathing training program on QOL in patients with pre dialysis CKD and concluded that Breathing training program improves QOL in patients with pre-dialysis CKD.[26]

CONCLUSION:

Yoga is an effective, time-honored, and promising approach to the management of hypertension.The three core components—yoga postures, breathing practices, and meditation—play a pivotal role in achieving these therapeutic benefits. Importantly, yoga therapy extends beyond physical practice; it encompasses the cultivation of appropriate values and attitudes toward everyday stressors. Thus, yoga should be embraced not merely as an exercise regimen but as a comprehensive lifestyle, fostering long-term cardiovascular health and overall well-being.

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