

# Effects of 6 months yoga program on renal functions and quality of life in patients suffering from chronic kidney disease

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## ABSTRACT

**Aim:** To study the effect of 6 months yoga program in patients suffering from chronic kidney disease (CKD).

**Materials and Methods:** 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. Patients in the yoga group were offered yoga therapy along with other conventional treatment modalities, while the control group was only on conventional treatment. Subjects in yoga group were trained to perform specific yogic *asanas* for at least 5 days a week for 40–60 min a day. Regular monitoring of blood pressure, renal function, requirement of a number of dialysis, and quality of life (QOL) indicators were done. Fifty patients (yoga – 25; control-25) completed 6 months follow-up.

**Results:** In yoga group, a significant reduction of systolic and diastolic blood pressure, significant reduction in blood urea and serum creatinine levels, and significant improvement in physical and psychological domain of the World Health Organization QOL (as assessed by BREF QOL scores) were seen after 6 months. In control group, rise of blood pressure, deterioration of renal function, and QOL were observed. Poststudy comparison between the two groups showed a statistically significant reduction of blood pressure, nonsignificant reduction in blood urea and serum creatinine, and significant improvement in physical and psychological domain of QOL in yoga group as compared to control group. For subjects in yoga group, the need for dialysis was less when compared to control group although this difference was statistically insignificant. Except for inability of some patients to perform certain yogic *asanas* no adverse effect was found in the study.

**Conclusion:** Six months yoga program is safe and effective as an adjuvant therapy in improving renal functions and QOL of CKD patients.

**Key words:** Chronic kidney disease; quality of life; World Health Organization.

## INTRODUCTION

Chronic kidney disease (CKD) has increasingly been recognized as emerging health problem in India. The major contributory factors leading to the development of CKD are diabetes and hypertension.<sup>[1]</sup> In Canada, 1.9–2.3 million people have CKD.<sup>[2]</sup> The U.S Centers for Disease Control and Prevention found that CKD affected an estimated 16.8% of the U.S adults aged 20 years and older, during

1999–2004.<sup>[3]</sup> The UK estimates suggest that 6% of men and 7% of women have symptomatic CKD.<sup>[4]</sup> In Indian scenario, the prevalence is increasing although the exact figures vary among different studies. In a study by Singh *et al.*,<sup>[5]</sup> the prevalence of CKD taking both decreased GFR and proteinuria into consideration was found to be 4.2% by modification of diet in renal disease (MDRD) criteria

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and 13.3% by Cockcroft-Gault equation corrected to the body surface area (CG-BSA) while it was found to be 6.3% by MDRD criteria and 16.69% by CG-BSA in results from kidney disease screening project.<sup>[6]</sup> Management of CKD includes management of its complications such as fluid retention, electrolyte imbalance, metabolic acidosis, bone disease, anemia, and cardiovascular abnormalities. In end-stage renal disease, kidney function can only be replaced by dialysis or by a kidney transplant. Dialysis is not a permanent cure as the patient requires it regularly. Kidney transplantation offers the best outcomes and quality of life (QOL). However, not every candidate is suited for kidney transplantation. Patients with immunocompromised state and those having HIV or active hepatitis were not considered for transplantation because of increased risk of opportunistic infections. The presence of potentially harmful antibody against the donor's kidney is another absolute contraindication to transplant. These include natural antibodies against ABO blood group antigens and antibodies against human leukocyte antigen.<sup>[7,8]</sup>

All these therapeutic modalities are expensive and beyond the reach of majority of patients in India. Besides, such procedures are focused on treating the manifestation of disease and not the underlying cause of disease. Researches in the past have shown that yoga does play an important role in controlling hypertension and diabetes.<sup>[9-11]</sup> In one study, it was found that the Corpse pose (*shavasana*) reduces blood pressure and the need for antihypertensive medication.<sup>[12]</sup> Another study showed that yoga is effective in reducing blood pressure, blood glucose level, serum cholesterol, and body weight.<sup>[13]</sup> Kashinath *et al.* in their hypothetical review article described how yoga can work in CKD.<sup>[14]</sup> As diabetes and hypertension are major causes of CKD and yoga has a definitive role in controlling them, it is logical to think that it would be beneficial in CKD also. With this background, we undertook this study to find out whether the old Indian science of yoga could emerge as a viable and safe tool in the management of CKD.

## MATERIALS AND METHODS

The study was conducted at the Department of Medicine, Lala Lajpat Rai Memorial Medical College, Meerut, India, during 2009–2010. The study involved 54 patients with CKD who were admitted to medicine ward. This was a prospective study. Patients with CKD were followed for a period of 6 months to see the effect of yoga on them.

### Inclusion criteria

Patients admitted in our institute who were diagnosed as having CKD on the basis of clinical profile and relevant investigational finding. Those between 20 and 80 years of age, who gave written informed consent for completing the

entire span of project for 6 months and who were mentally and physically fit up to a minimum level to understand and perform yogic *asanas* were included.

### Exclusion criteria

Those aged <20 years and more than 80 years. Those with a history of any substance abuse, mental illness, or conditions which in opinion of investigator would make it difficult for the potential participant to participate in the intervention such as ischemic heart disease, postcoronary artery bypass grafting, those with comorbid CAD, morbid obesity, uncontrolled diabetes, uncontrolled hypertension, those with single working kidney, congenital renal malformations, h/o carcinoma in the past, or any other renal pathology or surgery in past were excluded from the study.

Detailed history, clinical examination, and QOL scores World Health Organization QOL (WHOQOL-BREF)<sup>[15]</sup> were recorded at start of study. WHOQOL-BREF consists of questionnaire for four domains, i.e., physical, psychological, social, and environmental. Score for each domain was calculated separately. Total score for each domain is 20. Baseline investigations including complete blood count, blood urea, serum creatinine, serum sodium, serum potassium, serum calcium and phosphate, screening for HIV, hepatitis-B and hepatitis-C, and renal ultrasound were done in every patient. Other investigations which may be considered appropriate for individual patients such as Vitamin D, parathyroid hormone, 24 h urinary protein, renal Doppler, and renal biopsy were carried out in selected patients.

The patients were selected using simple random sampling by coin test and written informed consent was taken as per Helsinki Declaration after offering sufficient explanation about the study and its aim. Patients were assigned to one of the following two groups:

- a. Yoga: Yoga + conventional treatment for 6 months
- b. Control: Only conventional treatment.

In follow-up, patients were reassessed on the basis of clinical status, QOL scores, and renal functions. Repeat investigations were done at 3 and 6 months.

### Intervention

Patients in the study group were advised strict yoga-based lifestyle modification. They were trained in yoga techniques and *asanas* (specific body postures) useful for kidneys and motivated to participate in integrated yoga program. The yoga intervention consisted of:

1. Physical postures done with awareness (*asanas*), sessions of 15–20 min consisting of following:

- Standing *asanas* – Mountain posture with arms stretched up (*TadasanaUrdhvaHastasana*) and with bound hands (*TadasanaUrdhvaBaddhaHastasana*), standing forward bend (*Uttanasana*), hand-to-foot pose (*Padahastāsana*), and half-waist-rotation pose (*Ardha Kati Chakrāsana*)
  - Sitting *asanas* – Seated forward bend (*Paschimottanasana*), sitting half spinal twist (*Ardha Matsyendrasana*), extension of the front body (*Purvottānāsana*), and hare pose (*Shashānkāsana*)
  - Supine *asanas* – Sphinx pose (*Salamba Bhujangasana*), bridge pose (*Setu Bandhasana*), boat pose (*Naukasana*), reclining bound angle posture (*Supta Baddhakonasana*), bow pose (*Dhanurasana*), crocodile pose (*Makrasana*), and corpse pose (*Shavasana*).
2. Breathing techniques (*Pranayama*), total of 10–15 min session-hands in and out breathing, hand stretch breathing, alternate nostril breathing (*Nādisuddhi*), left nostril breathing (*Chandra AnulomaViloma*), humming bee breath (*Bhramari*), cooling pranayama (*Sitali*), and abdominal breathing in lying-down position in 2 min
  3. Yogic relaxation techniques with imagery or mindfulness-based stress reduction for 20 min at the end of *asanas* and *pranayamas*.

Techniques and illustrations of these along with the necessary precautions were given to each participant in the form of a booklet, *yog pustika*, published in Hindi, the local language. Participants were told to practice yoga regularly for at least 5 days a week for 40–60 min a day. All *asanas* were not mandatory. Patients were advised to maintain a diary of attendance which they had to show to investigator in every follow-up visit. About 80% attendance was necessary for inclusion in the study.

### Data analysis

For statistical analysis, results of all clinical parameters and QOL domain scores were tabulated. Mean of each of these parameters and standard deviation (SD) along with change on these parameters were calculated for each group at baseline and at 6 months. All the data were expressed till two decimal places and presented as  $\pm 1$  SD unless stated otherwise. Significance of difference within each group was calculated by paired *t*-test and between yoga and control groups was calculated by independent *t*-test. The significance level of 5% has been considered for reporting the results. The calculations were done either manually or using Statistical Package for Social Sciences version 10.0 (IBM India Private Limited).

### RESULTS

The present study involved 54 patients. Twenty-five out of 28 (89.29%) in yoga group and 25 out of 26 (96.15%) in

control group completed their 6 months follow-up. Among those who completed follow-up, there were 11 males (44%) and 14 females (56%) in yoga group and 12 males (48%) and 13 females (52%) in control group. The baseline characteristics of the patient population are detailed in Table 1. There was no significant difference between the study and the control groups at baseline in any of the characteristics examined (independent *t*-test  $P > 0.05$ ). Subjects in yoga group received yoga therapy in addition to conventional treatment modalities while subjects in control group were only on conventional treatment (such as antihypertensives, diuretics, dialysis as when required, and other supportive medications).

### Within the group comparison

In yoga group [Table 2], significant reduction of systolic blood pressure (SBP) (paired *t*-test  $P < 0.0001$ ) and diastolic blood pressure (DBP) (paired *t*-test  $P = 0.006$ ) was observed after 6 months. Blood urea and serum creatinine also showed significantly decreasing trend (paired *t*-test  $P = 0.006$  and  $0.01$ , respectively). There was nonsignificant reduction of serum sodium (paired *t*-test  $P = 0.14$ ) and serum potassium (paired *t*-test  $P = 0.33$ ). There was a

**Table 1: Baseline characteristics of yoga and control group**

Parameter	Yoga group	Control group	P (independent t-test)
Mean age (years)	43.32±13.32	44.40±13.68	0.79
SBP (mm of hg)	147.68±17.47	139.84±12.79	0.08
DBP (mm of hg)	90.56±10.98	88.96±7.21	0.55
Blood urea	98.78±52.02	90.20±53.56	0.57
Serum creatinine	6.27±3.11	5.7±2.89	0.51
Serum sodium	140.80±3.77	141.08±4.16	0.80
Serum potassium	3.99±0.53	4.01±0.58	0.89

There is no significant difference in any characteristics between yoga and control group at baseline ( $P>0.05$ ); subjects in yoga group received yoga therapy in addition to conventional treatment modalities and subjects in control group received only conventional treatment (such as antihypertensives, diuretics, dialysis as when required, and other supportive medications). SBP = Systolic blood pressure, DBP = Diastolic blood pressure

**Table 2: Within-group comparisons at the end of study**

Parameter	Baseline	Poststudy	P (paired t-test)
Yoga group			
SBP (mm of hg)	147.80±17.47	136.40±11.05	<0.0001
DBP (mm of hg)	90.56±10.98	85.60±5.69	0.006
Blood urea	98.78±52.02	83.76±37.36	0.006
Serum creatinine	6.27±3.11	5.24±2.39	0.01
Serum sodium	140.80±3.77	139.8±2.94	0.14
Serum potassium	3.99±0.53	3.90±0.25	0.33
Control group			
SBP (mm of hg)	139.84±12.79	146.4±8.9	0.006
DBP (mm of hg)	88.96±7.21	90.32±6.68	0.31
Blood urea	90.20±53.56	93.52±36.67	0.62
Serum creatinine	5.7±2.89	6.33±2.88	0.001
Serum sodium	141.08±4.16	140.52±2.84	0.44
Serum potassium	4.01±0.58	4.34±0.7	0.03

SBP = Systolic blood pressure, DBP = Diastolic blood pressure

significant improvement in physical and psychological domain of QOL (paired *t*-test  $P < 0.001$ ) after 6 months [Table 3].

In control group [Table 2], rising trend in SBP (paired *t*-test  $P = 0.006$ ), DBP (paired *t*-test  $P = 0.31$ ), blood urea (paired *t*-test  $P = 0.62$ ), and serum creatinine (paired *t*-test  $P = 0.001$ ) was seen at 6 months. No significant change was observed in serum sodium and potassium levels. There was a significant improvement in physical domain (paired *t*-test  $P < 0.001$ ) of QOL while no change in psychological, social, and environmental domain [Table 3].

### Between the group comparisons

At baseline [Table 1], there was no significant difference in any parameter between yoga and control group. At 6 month [Table 4], there was significant reduction in SBP (independent *t*-test  $P = 0.001$ ), DBP (independent *t*-test  $P = 0.01$ ), and serum potassium (independent *t*-test  $P = 0.006$ ) and nonsignificant reduction in blood urea, serum creatinine, and serum sodium (independent *t*-test  $P = 0.35, 0.29$  and  $0.38$ , respectively) was seen in yoga group as compared to control group. Significant improvement in physical (independent *t*-test  $P < 0.001$ ) and psychological (independent *t*-test  $P < 0.001$ ) domain of QOL was seen in yoga group as compared to control group [Table 3]. In yoga group, lesser number of dialysis was required in comparison to control group although the difference was not statistically significant [Table 5].

### DISCUSSION

The present study demonstrates the favorable role of yoga in improving blood pressure, renal function, and physical and psychological aspects of QOL in patients with CKD.

Yoga is an ancient Indian way of life, which includes changes in mental attitude, diet, and the practice of specific techniques such as yogic postures (*asanas*), breathing practices (*pranayamas*), and meditation to attain the highest level of consciousness. The anatomical overview of postural exercises in yoga suggests that these exercises are centered toward stretching and strengthening of muscles and increasing blood supply.<sup>[16]</sup> *Pranayama* practices stretch the lung tissue producing inhibitory signals from action of slowly adapting receptors and hyperpolarizing currents. These inhibitory signals coming from cardiorespiratory region involving vagi are believed to synchronize neural elements in the brain leading to changes in the autonomic nervous system, and a resultant condition characterized by reduced metabolism and parasympathetic dominance. *Pranayama* modifies various inflatory and deflatory lung reflexes and interact with the central neural element to bring new homeostasis in the

**Table 3: Quality of life scores comparisons**

Parameter	Within-group comparison		
	Baseline	Poststudy	P (paired <i>t</i> -test)
Yoga group			
Physical domain	9.50±1.50	11.76±2.01	<0.001
Psychological domain	9.04±1.69	11.39±1.19	0.001
Social domain	14.74±1.72	14.61±1.84	0.35
Environmental domain	12.78±0.99	12.78±0.99	0.13
Control group			
Physical domain	9.36±1.55	10.11±1.75	0.001
Psychological domain	9.29±1.44	9.31±1.49	0.87
Social domain	14.91±1.72	14.76±1.96	0.31
Environmental domain	12.36±1.05	12.38±0.96	0.86
Parameter	Between-group comparison		
	Yoga group	Control group	P (independent <i>t</i> -test)
Baseline comparison			
Physical domain	9.50±1.50	9.36±1.55	0.65
Psychological domain	9.04±1.19	9.29±1.44	0.38
Social domain	14.74±1.72	14.91±1.72	0.63
Environmental domain	12.65±1.02	12.36±1.05	0.17
Poststudy comparison			
Physical domain	11.76±2.01	10.11±1.75	<0.001
Psychological domain	11.39±1.69	9.31±1.49	<0.001
Social domain	14.61±1.84	14.76±1.96	0.71
Environmental domain	12.78±0.99	12.38±0.96	0.05

Data presented here were calculated from total score of 20

**Table 4: Between-group comparisons at the end of study**

Parameter	Yoga group	Control group	P (independent <i>t</i> -test)
SBP (mm of hg)	136.40±11.05	146.4±8.9	0.001**
DBP (mm of hg)	85.60±5.69	90.32±6.68	0.01**
Blood urea	83.76±37.36	93.52±36.67	0.35
Serum creatinine	5.52±2.39	6.33±2.88	0.29
Serum sodium	139.8±2.94	0.52±2.84	0.38
Serum potassium	3.90±0.25	4.34±0.7	0.006**

SBP = Systolic blood pressure, DBP = Diastolic blood pressure, \* $P < 0.05$

body.<sup>[17]</sup> In a study, it was found that 30 min of hath yoga practice daily for 4 months showed a significant reduction in oxidative stress (malondialdehyde, protein oxidation, and phospholipase A2 activity) and increase in antioxidant activity (superoxide dismutase and catalase activities) in patients with CKD who were on hemodialysis.<sup>[18]</sup> Researches had shown that higher sympathetic tone is potentially involved in the progression of CKD, promoting hypertension, and causing target organ damage.<sup>[19,20]</sup> There is evidence that suggests yoga reduces sympathetic tone and improves parasympathetic tone thereby reducing pulse rate, SBP, DBP, and metabolic rate.<sup>[21,22]</sup> The present study supports previous studies that yoga plays a statistically significant role in stabilizing both the systolic as well as the DBP levels. The present study also unfolds the significant role played by yoga in controlling renal dysfunction as assessed by blood urea and serum creatinine values. The patients undergoing the yogic exercise regime along with conventional treatment showed a significant reduction in blood urea and serum creatinine values over a period of 6



**Table 5: Number of dialysis in 6 months follow-up**

	Group	Mean±SD	P (independent t-test)	Mean difference	Difference in percentage
Dialysis at 3 months follow-up	Yoga group	5.17±3.77	0.78	0.31	5.66
	Control group	5.48±3.30			
Dialysis at 6 months	Yoga group	9.35±4.16	0.25	1.70	15.38
	Control group	11.05±5.46			

SD = Standard deviation

months, whereas there was rising trend in patients kept in the control group. This can be attributed to the significantly beneficial impact of yoga on renal functions.

Dysnatremia is common in CKD. Normal renal function guarantees that the tubular reabsorption of filtered sodium and water is adjusted so that urinary excretion matches intake. In CKD, this balance is disrupted such that dietary intake of sodium exceeds its urinary excretion resulting in sodium and water retention. This causes extracellular fluid volume expansion which in turn contributes to hypertension that itself can accelerate the nephron injury. Similarly, in CKD, there is disruption of potassium secretory mechanism in distal nephron that can result in hyperkalemia. Here, we found that poststudy serum sodium ( $P = 0.38$ ) and serum potassium ( $P = 0.006$ ) were lower in yoga group as compared to control group. This effect might be due to improved renal function and increased excretion which in turn normalizes blood pressure and prevents further nephron injury. There is another view that an important cause of the defect in renal excretory function in hypertension is an increase in renal sympathetic nerve activity.<sup>[23]</sup> Yoga by improving sympathetic tone reduces blood pressure. This in turn improves excretory mechanism and results in normalization of water and electrolyte balance.

In another randomized controlled study on hemodialysis patients, 12 weeks yoga intervention has proven to be safe and significantly effective in managing the pain, fatigue, sleep disturbance along with significant improvement in hand grip, significant reduction in creatinine, blood urea, alkaline phosphatase, and cholesterol along with significant improvement in erythrocyte and hematocrit count.<sup>[24]</sup> The present study shows that in addition to improving renal function, the need for dialysis is reduced in patients undergoing yoga therapy over a period of 6 months. Yoga thus helps in decreasing economic burden on the patient which is especially desirable in a country like India where the socioeconomic condition of the majority of the population is below average.

Many CKD patients experience psychological symptoms including depression, anxiety, distress, and mood disturbances as a consequence of long-standing disease. Previous studies suggest the role of yoga in improving QOL in various disorders such as lupus nephritis patients

with CKD, cancer, Parkinson's disease, chronic low back pain, and depression.<sup>[25-27]</sup> Our study also substantiates the profound effect of yoga on the QOL of patients with CKD. In the present study, we used WHOQOL-BREF questionnaire developed by the WHO to assess the QOL. It was observed in the study that there is a significant improvement in physical (independent  $t$ -test  $P < 0.01$ ) and psychological aspect of QOL (independent  $t$ -test  $P < 0.01$ ) of patients in the yoga group at the end of 6 months *vis-a-vis* the control group. However, there was no significant change in social and environmental aspects of QOL at 6 months with yoga therapy. Further studies are required over a longer period of time to study the impact of yoga on these aspects of life.

Barring a few limitations like small sample size and inability of some patients to do complex yogic exercises the study otherwise proves fruitful in establishing the positive role played by yoga in combating the physical, social, and financial aspects of CKD.

## CONCLUSION

Six months yoga program is safe and effective measure as adjuvant therapy to conventional treatment modalities in reducing blood pressure, improving renal function, decreasing the need for dialysis, and improving QOL in patients with CKD. As CKD had a chronic course whether the results of our short-term study can be extrapolated to long-term benefits is yet to be explored. Large scale and multicentric trial with longer follow-up and comprehensive approach are needed to calibrate the benefits of yoga therapy and to assess its impact on the natural history of the disease.

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## Conflicts of interest

There are no conflicts of interest.

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