

Original Research Article

Effect of yoga therapy on fasting lipid profile in chronic kidney disease: a comparative study

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ABSTRACT

Background: Lipid abnormalities are common among patients with chronic kidney disease (CKD) and it tends to persist/worsen even after initiating treatment. The cardiovascular mortality and morbidity remains significantly high in this population. The present study was carried out to assess the effect of yoga therapy on fasting lipid profile in CKD patients.

Methods: It was an interventional case control study on CKD patients with and without yoga in a tertiary care hospital. About 60 CKD patients aged >18 years were enrolled for the study and were divided into 2 groups of 30 each. Subjects in Group 1 who underwent yoga therapy. Group 2 subjects did not do yoga and they served as controls. Serum lipid profile, RFT and BP were estimated for all patients. Chi-square test, Paired and unpaired t test, mean and delta change were used for comparison. A p-value of <0.05 was considered statistically significant.

Results: Out of 60 patients, males were predominant. There was significant reduction in Triglycerides, LDL and VLDL in the yoga group. Total cholesterol also reduced but was not statistically significant. HDL also increased but insignificant statistically.

Conclusions: Yoga therapy can be a new added adjuvant and cost effective to the standard lipid lowering agent to reduce the lipid levels in CKD patients.

Keywords: Chronic kidney disease, Dyslipidaemia, Yoga

INTRODUCTION

Chronic kidney disease is a non-communicable disease, which is characterised by slow progressive loss of kidney function over a period of several years ultimately leading to permanent kidney failure. With rapidly declining

function of the kidneys, there is accumulation of dangerous levels of waste and fluid in the body. The morbidity and mortality due to cardiovascular disease (CVD) associated with all stages of chronic kidney disease remains extremely high. Patients are more at risk of dying due to cardiovascular disease than due to end

stage renal disease (ESRD) as CVD onset is much before the onset of ESRD.¹

Dyslipidemia is defined as a disorder of lipoprotein metabolism, including lipoprotein overproduction or deficiency. Dyslipidemia is commonly associated with CKD. Among all the lipid parameters it is the triglyceride level (TGL) that remains elevated in CKD individuals.^{2,3} The serum level of triglyceride rich proteins shows high values in ESRD patients as stated in few studies.^{4,5} Dyslipidemia itself presents with serious complications like CVD or CVA. So, lipid levels should be lowered either by drugs or by lifestyle modification.

Yoga is an ancient art of harmonizing system of development for the body, mind and spirit. Continued yoga practice leads to a sense of peace and well-being with feeling of being at one with their environment. Yoga is one of the ancient traditional science having yogic physical postures (asanas), yogic breathing practices (pranayama), meditations and relaxation techniques. According to multiple scientific studies, yoga has shown to reduce the blood pressure, heart rate, respiratory rate, oxidative stress, psychological stress and inflammatory conditions.⁶⁻⁸

Yoga has shown to reduce lipid levels in diabetics and obese individuals.^{9,10} Not many studies has been conducted to observe the effect of yoga on dyslipidemia in CKD. Hence this study was conducted.

METHODS

The study was conducted in MGMCRI, Pondicherry from November 2015 to May 2017. 60 patients who had raised renal parameters and confirmed by Ultrasonography KUB to be having shrunken kidneys (less than 8.5 cm bilaterally) were taken for study. Patients with previous history of CVD or renal transplant and pregnant ladies were excluded from the study. Study population was divided into 2 groups of 30 each. Group 1 included CKD patients who practiced yoga exercises. Group 2 patients did not practice yoga. A questionnaire designed for the study was fulfilled by each candidate. BMI was calculated. BMI of 18-24.9kg/m² was considered normal. BMI less than 18kg/m² was considered malnourished. BMI more than 25kg/m² was considered overweight. History of smoking, physical activity, diet and alcohol consumption was taken. Personal and family medical history of obesity, hypertension, diabetes mellitus and renal disease was recorded. Blood pressure of each patient was recorded by Sphygmomanometer. Fasting lipid profile, serum urea, serum creatinine was taken for all patients. Fasting lipid profile was measured in MGMCRI Biochemistry laboratory. Total cholesterol was measured by CHOD-PAP method. Serum triglyceride level was measured by GPO method. HDL Cholesterol was measured by DIRECT method. Hitachi 902 auto-analyzer was used for estimation of Fasting Lipid profile. Any patient having abnormal triglycerides or any of the

cholesterol parameters which was above or below the normal range in our laboratory was considered dyslipidemic. Serum urea was measured by GLDH method in Hitachi 902 auto-analyzer in the Biochemistry laboratory, MGMCRI.

Serum creatinine was estimated by JAFFE KINETIC method in Hitachi 902 auto-analyzer in our hospital. Patients with CKD had raised renal parameters. Creatinine clearance was calculated by Cockcroft-Gault Equation and staging was done accordingly for all patients.

Yoga therapy module for CKD patients in group 1 was as follows

- Individual counselling with life style modifications
- Warming up practices (Jathis)
- Breath body coordination techniques (kriyas)
- Energizing breathing techniques (pranayama)
- Mental focusing and contemplation (dharana-dhyana)
- Relaxation (shaithilya karana)

Ten to 12 supervised sessions over 3 months with home practice diary and telephonic follow up was done for each patients to ensure more than 60% compliance. Data was collected and tabulated accordingly. Comparison of fasting lipid profile was done between group 1 and group 2 after a follow-up of 3 months. Author also compared the initial and final BP for each subject.

Statistical method

Statistical analysis was carried out using SPSS version 19.0 (IBM SPSS, US) software with Regression Modules installed.

Descriptive analyses were reported as mean and standard deviation of continuous variables. Independent sample t test was used to compare the age, BMI, pulse rate, BP (systolic and diastolic), RFT (Urea and Creatinine) and FLP.

The end line results for dyslipidemia in both the groups was compared by Chi square test. Staging of CKD was done for all 60 patients and p value was calculated based on Chi square test. The difference in Initial and end point values in FLP, RFT and BP was calculated by Delta change. Delta change was calculated by the difference in the end line and base line values divided by the initial baseline value.

RESULTS

Demographic data

All 60 patients had a complete evaluation for co-morbidities and complications. All data were collected and tabulated.

Each group had 8 females (26.7%) and 22 males (73.3%) each (Table 1). The mean age in group 1 was 55.1 ± 11.6 years and 55.6 ± 11.2 years in group 2. The height and weight were calculated for each subject and BMI was

calculated. The mean BMI for patients in group 1 was $22.7 \pm 3 \text{ kg/m}^2$. And in group 2 the mean BMI was $23.3 \pm 2.5 \text{ kg/m}^2$ (Table 1).

Table 1: Baseline features of both groups.

Features	Group 1 (N=30)	Group 2 (N=30)	p value#
	Mean (SD)		
Gender			
Female	8 (26.7)	8 (26.7)	
Male	22 (73.3)	22 (73.3)	
Age in years	55.1 (11.6)	55.6 (11.2)	0.87
BMI in kg/m²	22.7 (3)	23.3 (2.5)	0.41
Pulse rate in bpm	78.9 (8.4)	80.2 (9.1)	0.56
SBP in mm of Hg	164.9 (14.1)	159.9 (14.2)	0.17
DBP in mm of Hg	97.6 (10.1)	94.5 (10.5)	0.25
Smoking	6 (20)	8 (26.7)	
Consume Alcohol	14 (46.7)	14 (46.7)	

Among the group 1, the average baseline pulse rate of 78.9 ± 8.4 bpm compared to group 2 which was 80.2 ± 9.1 bpm. The initial mean SBP between group 1 and group 2 were 164.9 ± 14.1 mm of Hg and 159.9 ± 14.2 mm of Hg respectively (p value 0.17). The mean DBP between group 1 and group 2 were 97.6 ± 10.1 mm of Hg and 94.5 ± 10.5 mm of Hg respectively (p value 0.25) (Table 1). In group 1, 6 were smokers (20%) and 14 were alcohol consumer (46.7%). In group 2 there were 8 smokers (26.7%) and 14 consumed alcohol (46.7%) (Table 1). Among the patients 20 (66.7%) in group 1

were diabetics compared to 22(73.3%) in group 2. In group 1, 21 (70%) were known hypertensive whereas in group 2, 23 (76.6%) were known hypertensive. Ten patients (33.3%) were known dyslipidemic in group 1 whereas 9 (30%) were dyslipidemic in group 2 (Table 1). In group 1 there were 2 (6.7%) patients in stage I, 1(3.3%) in Stage II, 5 (16.7%) in Stage III, 9(30%) in stage IV and 13 (43.3%) in Stage V. In the second group there were 1 (3.3%) patients in stage I, 1(3.3%) in Stage II, 5 (16.7%) in Stage III, 11(36.7%) in stage IV and 12 (40%) in Stage V (Table 2).

Table 2: Baseline details of CKD stage of both study groups.

Stage	Group 1 (N=30) N (%)	Group 2 (N=30) N (%)	P value#
I	2 (6.7)	1 (3.3)	0.96
II	1 (3.3)	1 (3.3)	
III	5 (16.7)	5 (16.7)	
IV	9 (30)	11 (36.7)	
V	13 (43.3)	12 (40)	

Table 3: Comparison between intergroup baseline and end line FLP, BP and RFT.

Features	Group 1 Parameters			Group 2 Parameters			P Value
	Mean (Standard deviation)			Mean (Standard deviation)			
	Baseline	Baseline	Baseline	Baseline	End-line	Diff	
TC (in mg/dl)	165.7 (39.1)	162.9 (31.8)	2.7 (20)	158.8 (34.9)	171.4 (35.7)	-12.5 (10)	0.001*
TGL (in mg/dl)	168.6 (73.1)	159.1 (58)	9.5 (23)	158.9 (64.2)	168.9 (53.6)	-9.9 (20)	0.001*
HDL (in mg/dl)	41.9 (10.3)	42.6 (9.8)	-0.73 (0.43)	40.6 (7.6)	41.4 (7.9)	-0.73 (0.28)	0.99
LDL (in mg/dl)	90.3 (26)	89.6 (21.8)	0.7 (4.3)	85.6 (26)	95.8 (26.8)	-10.1 (8.4)	0.004*
VLDL (in mg/dl)	33.5 (14)	31.4 (11.2)	2.2 (4.6)	31.7 (12.8)	33.4 (10.5)	-1.6 (4.4)	0.002*
Urea (in mg/dl)	76.2 (22.2)	83.7 (21.6)	-7.3 (8.9)	73.5 (19.9)	80.7 (20)	-7.1 (4.5)	0.94
Creatinine (in mg/dl)	3.99 (1.8)	4.39 (2)	-0.4 (0.4)	4.01 (1.9)	4.6 (1.9)	-0.6 (0.5)	0.15

The baseline and end line FLP and RFT was compared between the two groups. Delta change was calculated between the two initial and end point results after 3 months. There was a reduction in mean Total cholesterol by $2.7 \pm 20 \text{ mg/dl}$ in group 1 and an increase in $12.5 \pm 10 \text{ mg/dl}$ during the same period in group 2 ($p=0.001$). Mean reduction in Triglycerides in group 1 was $9.5 \pm 23 \text{ mg/dl}$ where as it increased in group 2 by $9.9 \pm 20 \text{ mg/dl}$ (p value 0.001). Mean HDL increased by $0.73 \pm 0.43 \text{ mg/dl}$ and $0.73 \pm 0.28 \text{ mg/dl}$ in group 1 and 2 respectively ($p=0.99$). Mean LDL reduction in group 1 was $0.7 \pm 4.3 \text{ mg/dl}$ whereas in group 2 there was an increase in mean LDL by $10.1 \pm 8.4 \text{ mg/dl}$ (p value 0.004). Mean VLDL in group 1 showed reduction by $2.2 \pm 4.6 \text{ mg/dl}$ and in group 2 there was an increase by $1.6 \pm 4.4 \text{ mg/dl}$ (p value 0.002). Mean Serum urea in group 1 increased by $7.3 \pm 4.6 \text{ mg/dl}$ and in group 2 there was an increase by $7.1 \pm 4.5 \text{ mg/dl}$ ($p=0.94$). Mean serum creatinine in group 1 increased by $0.4 \pm 0.4 \text{ mg/dl}$ whereas in group 2 there was an increase by $0.6 \pm 0.5 \text{ mg/dl}$ ($p=0.15$). The serum HDL, urea and creatinine were almost similar (Table 3).

DISCUSSION

60 patients with chronic kidney disease were taken up for the study. Present study population had more male population compared to females with males forming 44 out of the 60 study subjects (73.3%). Studies by Hosseinpanah F et al, and Chung CM et al. showed lower male population in the study with 41.9% and 44.1% male preponderance respectively.^{11,12} Another study done on ESRD patients in Pondicherry by Lokesh et al. revealed high male prevalence with 33 males out of 40 (82.5%) which was similar to our study.¹³ This may be attributed to the fact that male patients seek more medical attention compared to women in India.

In our study population the mean BMI for patients were $22.7 \pm 3 \text{ kg/m}^2$ and $23.3 \pm 2.5 \text{ kg/m}^2$ in both group 1 and group 2 respectively. In a similar study done by Lorenzo Gordon et al., the mean BMI of the patients in the control group was $25.74 \pm 0.50 \text{ kg/m}^2$ while that of the Yoga exercise group was $25.550 \pm 2.2 \text{ kg/m}^2$ which was more than our study population.¹⁴ Study done by Lokesh et al. on hemodialysis patients in a tertiary care hospital in South India showed BMI of $20.76 \pm 4.249 \text{ kg/m}^2$.¹³ This low BMI in Indian population can be explained on the low socioeconomic status & malnourishment in the Indian populations.

Low BMI in Indian population can be because of nutritional deficiency.

There were 10(33.3%) patients with dyslipidaemia in group 1 and 9(30%) patients with dyslipidaemia in group 2. The overall prevalence of dyslipidaemia in our study was 19 (31.7%) out of 60 which is low compared to studies done by Hosseinpanah F et al, where the evidence of dyslipidaemia was 44%.¹¹ Study done by Gordon L et

al, showed very high prevalence of dyslipidaemia in CKD patients (84.9%).¹⁴ A study done by Lokesh et al, in a tertiary care hospital in South India on ESRD patients showed very less evidence of dyslipidaemia which is similar to my study.¹³ This lower level of dyslipidaemia compared to foreign studies may be attributed to racial variation, geographical variation, and increased frequency of infections malnutrition among the Indian population.

The prevalence of CKD stages 3 to 5 in this study was more than that reported from other developed countries. There might be few probable reasons for this discrepancy. First, the risk factors of CKD including diabetes and hypertension in our population were more than in other countries. Furthermore it is possible that definition of CKD based on calculation using MDRD formula is not reliable in Asian populations because this formula has not been validated in these populations.¹¹ This may have lead to the prevalence of CKD being overestimated in our study.

Hypertension can be a cause as well as a complication of CKD. In our study there were 44 patients (73.3%) who were known hypertensive. The mean systolic BP in group 1 was $164.9 \pm 14.1 \text{ mm of Hg}$ and mean diastolic BP was $97.6 \pm 10.1 \text{ mm of Hg}$. In group 2, mean SBP was $159.9 \pm 14.2 \text{ mm of Hg}$ and mean DBP was $94.5 \pm 10.5 \text{ mm of Hg}$. In a study done by Lokesh et al the mean systolic BP was $156.25 \pm 22.152 \text{ mm of Hg}$ and Diastolic BP was $93.75 \pm 13.90 \text{ mm of Hg}$.¹³ The values in both the studies were similar. Another study done by Rajendra Kumar Pandey on CKD patients showed initial systolic BP of $147.80 \pm 17.47 \text{ mm of Hg}$ and diastolic BP of $90.56 \pm 10.98 \text{ mm of Hg}$ which was lower than our study population.¹⁵

In our study 20 (66.7%) patients in group 1 and 22 (73.3%) in group 2 were diabetics. In a study done by Lokesh et al. on dialysis patients, 36 out of 40 (90%) were diabetics which was more than our study.¹³

In Group 1, serum total cholesterol level decreased by $2.7 \pm 20 \text{ mg/dl}$ and increased by $12.5 \pm 10 \text{ mg/dl}$ in group 2 ($p=0.001$). Serum triglyceride level reduced in group 1 by $9.5 \pm 23 \text{ mg/dl}$ and increased by $9.9 \pm 20 \text{ mg/dl}$ in group 2 ($p=0.001$). There was increase in the HDL levels by $0.73 \pm 0.43 \text{ mg/dl}$ $0.73 \pm 0.28 \text{ mg/dl}$ in group 1 and 2 respectively ($p=0.99$).

The serum LDL level reduced by $0.7 \pm 4.3 \text{ mg/dl}$ in group 1 and in group 2 it increased by $10.1 \pm 8.4 \text{ mg/dl}$ ($p=0.004$). The VLDL level dropped by $2.2 \pm 4.6 \text{ mg/dl}$ in group 1 and increased by $1.6 \pm 4.4 \text{ mg/dl}$ in group 2 ($p=0.002$). Findings were similar to a study done by Gordon et al.¹⁴

Limitation: Many patients were already on lipid lowering drugs so the solo lipid lowering effect of yoga could not be calculated. As the LDL level of all patients were found to be normal or low in our study, the factors effecting the lowering of LDL cholesterol could not be assessed.

CONCLUSION

Based on the results and the methodology employed, we have concluded that the prevalence of dyslipidemia among the CKD patients (31.7%) attending MGMCRI was lower compared to studies done on western population probably due to malnourishment. In our study population, few patients had increased triglycerides and VLDL all patients had normal or subnormal levels of total cholesterol, LDL and HDL which could be probably explained by the malnourishment state of Indian population. CKD was more common in males (73.3%) than females which was also different from other studies. Yoga has significantly improved the lipid parameters such as Triglycerides, VLDL and LDL levels. Yoga is a very effective non-pharmacological method of treating blood dyslipidemia. It should be applied on a larger study population to confirm benefits.

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