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HYPOLIPIDEMIC EFFECT OF RICE BRAN OIL ON CHRONIC RENAL FAILURE (UNDERGOING HEMODIALYSIS) PATIENTS

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Abstract

This is a longitudinal observational study conducted after ethical committee approval about lipid profile on undergone hemodialysis CKD patients on conservative management and hemodialysis compared with non-taking RBO at the year 2016-18 on 80 CKD-5 patients on hemodialysis admitted in medical wards of the MLB, Medical College and Jhansi (U.P.) India. The primary data were obtained from all CKD patients 30 days intervals and three times first-time proper medication with hemodialysis therapy and second-time same condition patients with additional taken RBO. The data was collected in all the patients, thorough anthropometric measurement, dietary history and blood are collected for analysis of Hb, serum albumin, blood urea, cholesterol and creatinine. There was a statistically significant increase in HDL and decrees in low-density lipoprotein (LDL), very-low-density lipoprotein (VLDL), triglycerides (TG) and total cholesterol levels when compared with CKD patients not taken RBO controls. RBO add in diet and medical treatment of dyslipidemia helps to decrease mortality in CKD patients.

Key words: Cooking oil, Fatty acid profile, d-oryzanol, Polyunsaturated, Serum cholesterol chronic kidney disease, hypertriglyceridemia, Lipid profile.

Introduction

Chronic renal failure (CRF) is a major public health problem worldwide and its main consequences include loss of renal function leading to end-stage renal disease (ESRD) also known as Chronic Renal Disease (CKD), higher risk of cardiovascular disease (CVD), the significant increase in morbidity and mortality and a decrease in health-related quality of life (Adithya *et al.,* 2015; Wellings *et al.,* 2018). Bajaj *et al.,* (2019) and Moradi *et al.,* (2019) reported that in Chronic renal failure patients observed lipid disorders like deregulation of high-density lipoproteins (HDL) and triglyceride-rich lipoprotein metabolism which increases the risk of arteriosclerotic cardiovascular disease which is the leading cause of mortality among chronic kidney disease (CKD) patients. Ganesan *et al.,* (2018) and Forouhi *et al.,* (2018) concluded that in preventing hyperlipidemia major role of edible oil use in cooking the quantity and quality of dietary fat play a crucial role in the regulation of plasma cholesterol and lipid levels and hence, regular consumption of cooking oil is a potential contributing factor. An attempt, in this context, has been made to review the impact of consumption of rice bran oil (RBO), a growing choice of edible oil, on CVD risk factors RBO is rich in phytosterols, gamma oryzanol and tocopherol having beneficial impacts in lowering serum cholesterol both in animal and human model (Abozead *et al.,* 2015; Masbah *et al.,* 2017; Yue, Y. *et al.,* 2020).

Vegetable edible oil is one of the fundamentals of dietary components in food consumption Xiang *et al.,* (2020). Konuskan *et al.,* (2019) and Leong *et al.,* (2009) revealed that aetiology of developing CVD a number of the cause that prognosis of CVD and showed effect after several years after a long time, quality and quantity of dietary oil has been extensively recognised to be inextricably linked to the pathogenesis of CVD. In Indian practice of using repeatedly heated cooking oil is not uncommon as they do not know thermal oxidation. due to repeated oil using the oil unsaturated bond break and change in saturated oil that is a very direct cause of CVD, another factors oil having antioxidants and phytochemicals

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Table 1: Biochemical Tests of CKD (on Hemodialysis) patients.

Biochemical Tests Of CKD Patients	Mean ± SD of CKDPatients Undergone Hemodialysis	P Value	Statistically Significant (P < 0.05)	Mean ± SD of CKDPatients Undergone Hemodialysis consumed rice bran oil	P Value	Statistically Significant (P < 0.05)
Urea (mg/dl)	133.8±33.6	<0.038	Yes	111.11 ± 21.5	<0.0001	Yes
Random Rbs	111.78±11.82	0.26	No	120.85±15.28	<0.0001	Yes
Cholesterol (mg/dl)	183.33±26.7	<0.0001	Yes	160.5±32.3	<0.0001	Yes
HDL-C (mg/dl)	47.8±4.7	0.46	No	49.8±9.6	0.48	No
VLDL-C	33.66±8.3	<0.0032	Yes	28.16±7.2	<0.0075	Yes
Triglycerides	162.4±26.4	0.58	Yes	138.7±36.5	>0.001	Yes
LDL-C	100.18.±30.06	<0.0001	No	86.89±15.0	<0.0001	Yes
Serum. Creatine (mg/dl)	10.30±3.04	0.66	No	11.00 ± 1.95	0.56	No

HD- Hemodialysis; HDL-High density lipoprotein; VLDL- Very low-density lipoprotein, LDL- Low-density lipoprotein

that act as antioxidants, its loss if repeated oil use in food preparation sop Mariana *et al.,* (2020). Ganesan *et al.,* (2018) and Chun *et al.,* (2014) observed that prolonged utilization of them, again and again, heated edible oil has prognosis blood pressure and total cholesterol, cause vascular inflammation as well as vascular changes which prompt to atherosclerosis. The injurious effect of heated oils is endorsed to products generated from lipid oxidation during the heating process. Maurya *et al.,* (2019) and Leong *et al.,* (2009) studied that RBO has a high smoking point, hypocholesterolemia potential significant from a selective lowering of low-density lipoprotein (LDL) cholesterol. Komal, C. *et al.,* (2015) have been informed in their study that phytosterols of RBO have a quite analogue structure to cholesterol; therefore, it can inhibit the absorption of cholesterol and eventually it interferes including the transfer of cholesterol into micelles. Saboo *et al.,* (2019) observed that RBO is higher advantageous in the lowering of LDL-C levels by improving cholesterol 7-alpha-hydroxylase and it additionally elevates the metabolism of cholesterol disintegration that diminishes cholesterol retention in the intestines. Oryzanol of RBO potential effect reduces plasma non - high-density lipoproteins (HDL) - levels and raise HDL- Cholesterol by improving the deliverance of cholesterol and its metabolites. Jolfaie *et al.,* (2016) oryzanol-sitosterol, tocotrienols and other 4-desmethylsterols present in RBO showed hypolipidemic effects.

Materials and Methods

The longitudinal study was done at the Department of Medicine and dialysis unit, M.L.B. Medical College and Jhansi, (U.P.) over 18 months (March 2016-April 18). The study consisted of 80 dialysis CKD stage-5 patients; data has taken 3 times 30 days intervals. Patients have suffered CKD-5 stages minimum of 6 months and on dialysis. Patients providing informed consent. The Human Ethical Committee approval number is NO-838/SURGERY/15.CKD patients are excluded in the study that was suffering from acute or chronic, inflammatory disease, malignancy or known haematological disorder, recently severe hemorrhagic episode. Data including demographic and socioeconomic, diet habits and CKD causes were collected in a questionnaire. Venous blood samples were obtained from patients before dialysis and after an overnight fast (Maurya *et al.,* 2018). The biochemical test was measured calorimetrically using commercially available kits on fully auto analyzer of Clinical Biochemistry Laboratory. The statistical data was recorded on the Microsoft Excel programme. The comparison between two groups was done by ANOVA test in Graph Pad Prism 8 software, ANOVA and correlation analysis were used to do statistical analyses. P-value < 0.05 was considered as statistically significant (Rice, WR., 1989)

Result

Eighty patients undergoing home dialysis (M/F: 67/13) with a mean age of 46 years were recruited into the study. Among the 80 patients, 40 patients were undergoing home HD therapy whereas 40 patients were on HD therapy with recommended rice bran oil 15% of total energy requirements. The mean duration of time on dialysis was 3 months. Patient clinical data by both groups of biochemical and nutritional status are shown in (Table 1&2). In this study; we compare the biochemical test in two groups. CKD, patient yet to undergo hemodialysis, the second group that gone for hemodialysis additionally given rice bran oil. Blood urea, serum creatinine and serum albumin, carbohydrate, protein, MUAC mean value 30-day regular interval mean value was decreased with hemodialysis in both groups.

Table 2: Nutritional assessment of CKD (on Hemodialysis) patients.

Biochemical Tests Of CKD Patients	Mean ± SD of CKD Patients Undergone Hemodialysis 90 days	P Value	Statistically Significant (P < 0.05)	Mean ± SD of CKD Patients Undergone Hemodialysis RBO taken	P Value	Statistically Significant (P < 0.05)
BMI	21.89± 1.22	0.5109	No	20.4± 3.6	0.046	Yes
Hb	8.02 ± 1.04	0.04	Yes	8.64± 1.1	0.37	No
MUAC	22.58± 1.4	<0.0001	Yes	22.9± 3.76	<0.0001	Yes
KCAL	1504.5 ±140.2	<0.0001	Yes	1498.1 ±102.6	<0.0001	Yes
Protein	54.48 ± 5.11	<0.0001	Yes	58.11± 3.48	<0.0001	Yes
Carbohydrate	206.56 ± 19.9	<0.0001	Yes	214.09 ± 13.5	<0.0001	Yes
S.albumin	3.4 ± 0.37	<0.0001	Yes	3.38 ± 0.30	<0.0001	Yes

BMI- Body Mass Index; Hb-hemoglobin MUAC- Mid-Upper Arm Circumference; Kcal- kilocalorie S.albumin- serum albumin.

In (Table 1) the lipid profile constituents in group 1, mean baseline cholesterol was 183.33±26.7 (mg/dl) and in group 2 was 160.5±32.3 (mg/dl).Triglycerides, LDL-C, VLD-C in group 1 mean baseline was 162.4±26.4, 100.18.±30.06, 33.66±8.3 (mg/dl) and in group 2 was 138.7±36.5, 86.89±15.0, 28.16±7.2 (mg/dl). HDL-C mean base line value in the group was 47.8±4.7 (mg/dl) and in group 2 was 49.8±9.6 (mg/dl). Blood urea mean baseline in group 1 in 133.8±33.6 (mg/dl) and in group 2 was 111.11 ± 21.5 (mg/dl). Random blood sugar mean base line value was in group1, 111.78±11.82 (mg/dl) and in group two, was 120.85±15.28 (mg/dl).

In (Table 2) the results showed that presented anthropometrics measurements like BMI, MUAC and micronutrients (Energy, carbohydrate, protein), serum albumin, BMI significantly decreases with dialysis but under the normal level in both group 21.89±1.2 and 20.4±3.6. On dialysis CKD patients need a blood transfusion to maintain Hb level and avoid health complication. Mean Hb is elevated the first group mean value 8.02 ± 1.04 and second group 8.64±1.1 both showed statistically significant. Protein intake and total calorie intake have been significantly lowered after 90 days of hemodialysis in the first group mean value and SD is 54.48 ± 5.11 and second 58.11± 3.48 at <0.0001 P value (Table 2). BMI mean baseline group 1 was 21.89±1.22 and in group 2 was 20.4± 3.6. MUAC mean baseline group 1 was 22.58±1.4 (cm) and in group 2 was 22.9± 3.76 (cm), energy intake (Kcal) mean and SD was in the group first 1504.5 ± 140.2 and the second group is 1498.1 ± 102.6. Urea mean and SD was 133.8±33.6 and in the second group is 111.11 ± 21.5. Creatinine mean and SD was in first group 10.30±3.04 and the second group is 111.11 ± 21.5. Serum albumin mean and SD was in the first group 3.4±0.37 and the second group is 3.38±0.30.

Discussion

The present study observed that the RBO use as edible oil for 3-month duration significantly improve lipid profile fraction, increasing 2.8% HDL-C and reduced cholesterol and triglyceride, VLDL, LDL levels were 10.7%, 17%, 16.9%, 19.5%. Kliger *et al.,* (2013) studied that the degree of anaemia increases as the progressive destruction of kidney tissue occurs so CKD patients needed to blood transfusion time to time maintain Haemoglobin level. In our study, none of the subjects reported any adverse sensory effects and the oil was well accepted with good compliance. Cavanaugh *et al.,* (2016) observed that RBO is also cheaper than other oils available in the market. Appropriate measures need to be taken to enhance the production as well as the utilization of this healthy oil in India.

Maurya *et al.,* (2018) and Welling *et al.,* (2018) concluded cardiovascular disease is a major risk factor of morbidity and mortality in CKD patients. Subbiah *et al.,* (2016) and Maurya, (2018) stated that the previous study found 45% to 50% causes of death in ESRD patients due to CVD, 10 to 30% higher risk of mortality and HD patients have the risk of undernutrition so need time to time nutritional assessment through proper valid tools. CKD stage -5 patients' takes regular dialysis and long term develops CVD complication. In patients on hemodialysis common types of CVD are; atherosclerotic vascular disease particularly relating coronary and Left Ventricular, Hypertrophy and cerebrovascular arteries. Other frequent CVD manifestations are Congestive Heart Failure and peripheral vascular disease. Konuskan *et al.,* (2019) and Bajaj *et al.,* (2019) revealed that dietary oil intake has an important influence on blood lipid concentrations. Orsavova *et al.,* (2015) and Shakib *et al.,* (2014) revealed that RBO has a significant amount of linolenic acid in RBO is rather moderate among the vegetable oils (36.58% of total fatty acids) and a relatively high proportion of oleic acid (41.46%), conjugated linolenic acid (CLA) and oleic acid. These phytochemicals regulate blood glucose levels and serum lipids, help to lose weight, prevent cardiovascular disease, lower high blood pressure and reduce inflammation. Latha *et*

al., (2011) founded that RBO also contains a noticeable quantity of a-linolenic acid 1.29% that increasing the content of (n-3) greatly polyunsaturated fatty acids such as eicosapentaenoic and docosahexaenoic acids in tissue phospholipids giving anti-atherogenic biochemical property. Mäkynen *et al.*, (2012) and Maurya *et al.*, (2019) studied that phytochemicals in RBO mainly g-oryzanol (cycloartenol), a ferulate ester of triterpene alcohol with an analogous structure to cholesterol, that competes with binding sites of cholesterol. Oryzanol and Tocotrienols affect plasma HDL-C that helpful in reduces cholesterol, inhibiting the HMG-CoA reductase activity in the biosynthetic pathway of cholesterol. The potential effect of RBO is cardioprotective, reduction of Triglycerides due to the presence of oleic acid, of triterpene alcohols and phytosterols(Lai *et al.*, 2019, Sen, S. *et al.*, 2020). The present study shows that RBO can reduce the atherogenic ratio of TC / HDL-C concentration to a great level (25.15%).

Conclusion

The present study, it may be concluded that RBO, a growing choice as cooking oil, has specific hypocholesterolemic effects, especially for its principal constituent d-Oryzanol. The use of RBO, together with dietary and lifestyle modifications, may be beneficial in reducing the risk of CVD. Dietary modification together with the adoption of a healthy lifestyle, especially physically active lifestyle may be helpful to reduce the chance secondary metabolic disorder of occurrence of CVD.

Recommendation

In hemodialysis patients one of the main risk factors of CVD. Further, extensive study, especially on humans, will be useful to make a stronger statement in support of the use of RBO and its phytochemicals. Pharmaceutical drugs company need to future research of pharmacokinetics and pharmacodynamics study of RBO. CKD patient's life span depends on proper medication and dietary food habit. RBO use in the diet may useful improve quality of life HD patients without any extra economical burden. Besides, appropriate measures about cost-effectiveness and market availability need to be taken to enhance the acceptability of the oil as a cooking oil of choice.

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Conflict of Interest

The author states that there is no conflict of interest regarding the material discussed in the manuscript.

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