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Estimation of caloric intake and lipid profile of hemodialysis patients

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Abstract
Chronic Kidney Disease leading to progressive loss of renal function is accompanied by abnormalities in lipid metabolism. Objective of this study was to estimate the total caloric intake and analyse the lipid profile of hemodialysis patients. 60 subjects were taken from both sexes, 30 were on hemodialysis and 30 were healthy. Dietary status particularly estimated total caloric intake/day was assessed by using 24-hour dietary recall method and calculated with the help of Pakistan food composition table 2001. Blood samples were taken from arterio-venous fistula for lipid profile in hemodialysis patients before starting dialysis procedure and healthy subjects by vein puncturing. The results indicated that estimated intake of calories was lower than the recommended intake for hemodialysis patients as compared to healthy subjects. This study depicts that assessment and management of daily caloric intake of hemodialysis patients plays a pivotal role in preventing the risk of malnutrition in them.

Keywords: calories, kidney failure, lipid profiling, haemodialysis

1. Introduction
In developing countries millions of people are affected with chronic kidney disease. In 2015 Global Burden of Disease Study, it is concluded that 1.1 million deaths are due to kidney disease [1]. It is estimated that the annual prevalence of new cases of end-stage renal disease (ESRD) is >100/million population in Pakistan [2]. Most of the population don't even know about their failing kidneys due to lack of screening and delayed risk identification. Though early detection and possible treatment can preclude the development of kidney disease to kidney failure [3].
If chronic kidney disease is not treated efficiently, it may leads to final stage of kidney damage known as end stage renal disease ESRD. This stage is categorised by a decrease in glomerular filtration rate to less than 15 ml/min/1.73m^2. At this point of ESRD, patient requires a kidney substitute treatment either in the form of dialysis or kidney transplant [3].The prevalence of chronic kidney disease (CKD) is high in Pakistan because of higher incidence of hypertension and diabetes in our inhabitants observed highest in the world. Short report showed alarming increase in chronic kidney disease patients in Pakistani population [4].With the passage of time, ESRD (end stage renal disease) patients getting hemodialysis is increasing alarmingly [5].
Nutritional needs of chronic kidney disease (CKD) individuals change as the disease progresses. This affects the way in which the patient receives dietary components [6]. Despite the fact that hemodialysis patients undergo frequent dialysis along with enough protein intake, they may become malnourished in addition to other co-morbid conditions [7]. There are number of biochemical abnormalities in hemodialysis patients including hyperlipidemia. The major cause of death in particular individual is cardiovascular ailment [8].
Abnormal lipid profile of chronic kidney disease (CKD) individuals is a key risk factor leading to cardio-vascular diseases that ultimately leads to death. The incidence of hyperlipidemia increase when kidney function decreases. Increase in low density lipoproteins and triglycerides are directly linked to the extent of kidney damage [6]. At early stage of chronic kidney disease lipids abnormalities were measured as problem of dialysis subjects and may vigorously contribute in atherosclerotic vascular diseases. In general population, different studies concluded that dyslipidemia associated with decrease in renal function [9] suggested that rise in level of serum lipids could be a cause of kidney damage and contributes to the development of kidney disease. It is obvious that (CKD) chronic kidney disease is linked with acceleration of (CVD) cardio vascular disease with a very high death rate. Recently it is showed that usually high number of CKD individuals die from cardiovascular disease, even before having the dialysis treatment [8].
Kidney failure is considered as the basic reason of disability and mortality of dialysis patients. Lipid Profile disorders are main cause of CVDs and low caloric intake is a major issue for malnutrition. In developing countries, available data regarding dietary status and lipid profile of hemodialysis patients is insufficient. Considering this fact, mortality and CVD risk in patients of HD (Hemodialysis) associated with malnutrition in Pakistan has been assessed by comparing estimated total caloric intake and lipid profile status of renal failure patients undergoing hemodialysis to healthy ones.

2. Materials and Methods
The work of current study was carried out in the Institute of Food Science and Nutrition (IFSN), Bahauddin Zakariya University Multan. Samples were procured from Government

Hospital, Multan. The study group comprised of total sixty patients out of which thirty were healthy who had no history of renal disease and thirty subjects with (ESRD) End Stage Renal Disease /Renal failure undergoing haemodialysis (Table 1).

Table 1: Base-line characteristics of healthy participants and hemodialysis patients

Parameters	Healthy	HD
Total participants	30	30
Less than 40 years	15	15
More than 40 years	15	15
Male	21	21
Female	09	09
Rural	04	07
Urban	26	23

Healthy individuals were selected from healthy hospital staff and relatives of patients while Haemodialysis (HD) subjects selected from Government Hospital, Multan. Haemodialysis frequency of study group was 2 to 3 times in a week and period duration was about 4 hrs. General information of each subject and other factors like age, gender and body mass index (BMI) of healthy persons were also noted.

2.1 Evaluation of dietary pattern

Data regarding dietary intake of patients was gathered by noting particulars of patient's meal by using a twenty four hour recall questionnaire method [10]. The respondents were asked to recall and report all foodstuff including beverages consumed in the former twenty four hours. The recall was estimated by face-to-face interview from patients and their relatives who were there at the time of dialysis. The respondents were questioned in a subsequent way to get more precise and comprehensive data about their meals.

First of all "quick list," of food intake was noted, in which the respondent reports all the consumed foods and beverages. Evaluator asked about forgotten foods, list of any food categories commonly absent in twenty four hour recall reporting. Meal portion sizes were converted into grams and total dietary caloric intake was calculated of each participated individual by using Pakistan food composition table 2001 [11]. To help the participants, photographs were printed to assure more accurate estimation of portion size

2.2 Analysis of lipid profile

Lipid profiling was evaluated by using commercially available kits of Merck Internationals with spectrophotometer (Biosystems BTS-330).

2.2.1 Sample collection and analysis

After eight to twelve hours of fasting, four to five millilitre blood samples of subjects were drawn from the arteriovenous fistula before starting dialysis session. Four to five millilitre blood was taken from each healthy individual by vein puncture procedure for analysis of lipid profile. Blood was allowed to clot and by centrifugation, serum was separated. Samples were transferred from hospital to institute laboratory and stored at -80 °C.

2.2.2 Determination of lipid profile

By using CHOD–PAP method serum cholesterol level was determined [12]. (GPO–PAP) method was used for the determination of serum triglycerides [13]. By HDL Cholesterol Precipitant method high density lipoprotein (HDL) was determined [14]. Using Friedl Wald formula LDL was calculated.

These readings were arranged in Microsoft excel sheets and statistical analysis were conducted by using COSTAT software. Completely randomized designs (CRD) was used for this study as statistical design. The results were arranged in table form and P value ≤ 0.05 was considered as significant level.

3. Results and Discussion

The hemodialysis patients went through dialysis treatment; two to three times per week and each session took about four hours. There was non-significant difference between BMI of HD patients as compared to the healthy group (23.34 and23.00 kg/m^2) (Table 2).

Table 2: Hematological characteristics of healthy participants and hemodialysis patients

Parameters	Healthy	HD
Dialysis frequency (per week)	-	2-3
Dialysis session (hours)	-	4
Body mass index (BMI) (kg/m^2)	23.00	23.34
Hemoglobin (g/dL)	11.3	7.75
White Blood Cells (µl/dl)	81550	5972
TLC (µl/dl)	272300	284454
Lymphocytes (%)	59.11	55.36
Neutrophils (%)	32.5	39.09

The hemoglobin (11.3 and 7.75 g/dL) and white blood cells levels in healthy participants were lower as compared to HD patients respectively. Total lymphocytes count, and neutrophils were not significantly different between both studied groups.

Table 3: Biochemical parameters of healthy participants and hemodialysis patients

Parameters	Healthy Mean ± SD	Hemodialysis Mean ± SD
Estimated total caloric intake (Kcal./day)	1954.15 ± 287.89	1685.63 ± 270.93
Cholesterol (mg/dL)	167.44 ± 47 90	209.61 ± 82.67
Triglycerides (mg/dL)	132.46 ± 45.49	235.98 ± 60.43
High density lipoproteins (mg/dL)	46.75 ± 11.62	37.18 ± 9.31
Low density lipoprotein (mg/dL)	96.65 ± 45.76	125.23 ± 78.96

Results are expressed as Mean ± SD

*P value represents significant results **P value represents highly significant results

Table 3 showed significant (P<0.05) results of biochemical parameters (Estimated caloric intake, serum cholesterol, triglycerides and HDL of studied population) except LDL. It was observed that the estimated total caloric intake (1685.63±270.929KCals/day) of hemodialysis patients was significantly lower as compared to healthy participants (1954.15±287.89 KCals/day). Serum cholesterol was slightly

higher in hemodialysis patients (209.61± 82.67 mg/dl) as compared to healthy ones (167.44± 47.90 mg/dl). The serum triglyceride was significantly higher in HD patients (235.98± 60.43) as compared to healthy participants (132.46± 45.49) while HDL was significantly lower in HD patients (37.18± 9.31 mg/dl) as compared to healthy population. The most common abnormality observed among HD patients was low HDL cholesterol followed by increased serum triglycerides.

Nutritional therapy plays an important role in dealing many chronic diseases especially CKD like other medical therapies. Effective dietary pattern can overcome the disease effects [15]. Current study results slightly deviated from the study [16] who determined that the daily intake of mean estimated total energy in hemodialysis patients was 1169.87 K Cals/day nevertheless their recommended energy intake was 2121.97 K Cals/day, although caloric intake is influenced by energy use [17] and many other factors, such as gender, age, pregnancy, hormonal status, and dietary manners [18].

A study conducted by [19] which stated the mean levels of cholesterol in hemodialysis patients are (211.4 mg/dl) and (162.9 mg/dl) in healthy group, strongly supports current results. The findings of [20] are also in line with current results, according to which the mean levels of serum cholesterol in hemodialysis patients are (172.3 mg/dl) as compared to that of healthy group (171.97 mg/dl).

Findings of current study regarding triglycerides are also in agreement with the results of [20] which stated that the levels of triglycerides in hemodialysis patients are (243.67 mg/dl) and in healthy group are (138 mg/dl). The results of our study are similar to the reported values of [21] who also noted the levels of triglycerides in hemodialysis patients as (270.74 ± 231.65 mg/dl) and in healthy group as (71.68 ± 20.71mg/dl).The main function of HDL is to collect surplus cholesterol from peripheral tissues and carry it to the liver for metabolization [22]. The well-known capability of HDL is to promote the transport of cholesterol out from the cells. Moreover, HDL also possess antioxidant properties and anti-inflammatory functions [23].

Current HDL study results are similar with the results of [19-21] who reported (24.62 ± 6.43&50.48 ± 9.47 mg/dl), (27.79±15-05&45.6±10.90 mg/dl), (37.18± 9.31&39.4 ±7.08 mg/dl) in hemodialysis patients and healthy groups respectively. Present results regarding LDL are lined up with the study [20] who reported the levels of LDL in hemodialysis patients (102.64 ± 21.05 mg/dl) and in healthy individuals (106.26 ± 13.52 mg/dl).

4. Conclusion

In current research, many hemodialysis patients were recognised with significantly low estimated energy intake, slightly high cholesterol, hypertriglyceridemia, and reduced High density lipoprotein (HDL), however Low density lipoprotein (LDL) were found in normal range when it compared to healthy individuals. These lipid abnormalities might be the prime risk factor for the onset of malnutrition, atherosclerosis and other diseases linked to CVDs. Estimated caloric intake in HD patients is the main element for evaluation of malnutrition. Thus, patient's lipid profile and his quality of life can be improved under careful monitoring by Nutritionists / Registered Dieticians / Medical team. Consumption of fruits 2-4 servings/day might be helpful in the reducing the risk of cardiovascular diseases. For initial control of lipid abnormalities, modification in diet, moderate exercise on regular basis and dietary counselling should be applied. Lipid profile levels and blood pressure can be reduced by modest reduction in salt and saturated fats. It may help in reducing the load of CVDs. Diets/Foods, high in fats mainly saturated fats should be minimised, while consumption of unsaturated and polyunsaturated comprising foods should be encouraged. Fish oil is a good source of polyunsaturated fatty acids and diet supplemented with fish oil helps in lowering elevated triglycerides levels.

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6. References

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