

Original Research Article

Prevalence of Dyslipidemia in None Diabetic Sudanese Patients with End Stage Renal Disease on Regular Hemodialysis

Mohammed Ahammed Nouredin (MD)

Lecturer, Internal Medicine - Nephrology Department, College of Medicine, Prince Sattam Bin Abdulaziz University Alkharj, 11942, Kingdom of Saudi Arabia

***Corresponding author**

Mohammed Ahammed Nouredin (MD)

Email: mohdnoredin@yahoo.com

Abstract: Dyslipidemia is considered as one of the major risk factors for cardiovascular disease (CVD) in general population. This study was conducted to identify the prevalence of disturbance of lipid metabolism, among none diabetic Sudanese patients with end stage renal disease on regular hemodialysis. a total of one hundred patients were studied (males 69% - females 31%) in three hemodialysis centers in Khartoum State, Sudan. (The patients fast overnight for twelve hours, venous blood sample was obtained. The study done on the serum which was analyzed using colorimetric methods) written signed consent was obtained from each patient. The study showed that, 55% had low level of high density lipoprotein (HDL). Eleven percent had high level of low density lipoprotein (LDL). Total cholesterol and triglycerides (TG) disturbance is not so common (8% and 6% respectively). Malnutrition is a considerable problem among patients with ESRD as 26% of patients were under weight. Dyslipidemia is common among patients with ESRD. The main disturbance was being low levels of high density lipoprotein HDL. Therefore, every patient with ESRD on regular hemodialysis should have regular checkup for lipid disturbance and to be included in the regular follow up of dialysis patients.

Keywords: Dyslipidemia, cardiovascular disease, low density lipoprotein (LDL), Malnutrition

INTRODUCTION

Chronic kidney disease is a common health problem worldwide. It was estimated that about 10 to 16% of American population has some degree of chronic kidney disease [1]. In Sudan the prevalence of end-stage renal disease (ESRD) or renal failure has not been identified yet, but Sudan, which is part of Sub Sahara region where the prevalence is around 13.0% [2]. The commonest cause of ESRD in Sudan is still unknown with the second cause being complication of hypertension and diabetes mellitus [3]. Death from chronic kidney disease is rising from 15.7 per 100 000 in 1990 to 18.0 per 100 000 in 2010 [4]. The commonest cause of death is cardiovascular disease. Cardiovascular mortality is 30 times higher in patient with ESRD [4]. Chronic kidney disease is associated with abnormalities in all lipoprotein metabolism and this depend on the degree of renal failure, type of renal replacement therapy and primary cause of end stage renal disease [5]. Dyslipidemia, which is defined as "elevation in total cholesterol levels or low-density lipoprotein (LDL), or low levels of high-density lipoprotein (HDL) cholesterol, is one of the major risk

factors for cardiovascular disease with low level of high density lipoprotein and high level of low density lipoprotein being directly linked to Cardiovascular disease (CVD) [6]. Early detection and treatment of dyslipidemia can prevent risk for atherogenic cardiovascular disorder [7]. The rationale of this study was to detect the lipid abnormality in none diabetic patients. Dyslipidemia is clearly higher among diabetic nephropathy and those on peritoneal dialysis [8]. The overall incidence of Dyslipidemia is 29.3% [9] with low level of high density lipoprotein being the dominant, where incidence in Brazil was 59.74%, still the low level of high density lipoprotein being the dominant [10]. In India 44% of population has at least one type of dyslipidemia [11].

Dyslipidemia is common among patients with chronic kidney disease and ESRD on regular hemodialysis [8]. Among Sudanese children on regular hemodialysis it is up to 75% [12]. To the best of my knowledge, this is the first study to be conducted in none diabetic Sudanese on maintenance hemodialysis. Abnormalities in lipid metabolism occur in patients

with chronic kidney disease (including mild renal failure), on dialysis, and after renal transplantation [13, 14]. Patients with nephrotic syndrome also develop Dyslipidemia. Overall, patients undergoing peritoneal dialysis are more likely to have an atherogenic lipid profile than those undergoing hemodialysis [14-16]. This may be a direct consequence of the absorption of glucose from the dialysate solution [15, 16]. The primary finding in chronic renal failure and dialysis is hypertriglyceridemia; the total cholesterol concentration is sometimes normal or low, perhaps due in part to malnutrition in some patients [16]. Around 47% of patients with chronic renal disease and end-stage renal disease have triglyceride levels greater than 200 mg/dL and 34% have total cholesterol levels greater than 200 mg/dL while 30% percent have LDL cholesterol levels greater than 130 mg/dL, and 28% of them have low level of HDL [8].

This study was conducted to identify the prevalence of disturbance of lipid metabolism, among none diabetic Sudanese patients with end stage renal disease on regular hemodialysis.

MATERIALS AND METHODS

Patient population

This is a prospective study which was conducted in three hemodialysis centers in Khartoum state, Sudan. A total of 100 adult patients with ESRD on regular HD were studied. The study involved 69 males and 31 females. The mean of the age was 42.9 years. The minimum age was 18 years and maximum was 80 years. The exclusion criteria is: None Sudanese, age less than 14 years or diabetics

Data collection

A questionnaire was designed taking into consideration the full medical history of the individual

patient with reference to his age, gender and occupation, this includes; detailed information about the cause of ESRD, duration of hemodialysis and vascular access. History of chronic illnesses, long term medications and family history of lipid disturbance were also recorded. All patients were subjected to complete physical examination including general & systemic examination. General examination included weight, height polar, pulse, BP, signs of hyperlipidemia and goiter. In the abdominal examination, liver, spleen and palpable kidneys were all considered necessary. Waist and hip circumference were also measured.

Investigations

All patients underwent the following investigations: Renal Function Test, Fasting lipid profile and Hb. The normal range for cholesterol (less than 200mg/dl), TG (less than 200mg/dl), LDL (less than 130mg/dl), HDL were more than 30mg/dl for females and 40 mg /dl for male patients.

Statistical methods

Data were analyzed using statistical package for social sciences (SPSS) Version (21). Chi-square test was used to examine the associations between lipid levels and other variables. The significance level used at 95% confidence level (P value 0.05).

RESULTS

In this study a fasting lipid profile of 100 Sudanese patients with end stage renal disease randomly selected and tested. The duration of hemodialysis from one day up to 24 years but most of the patients have been dialyzed for 1-5 years (54%). The study showed that 8% had high serum cholesterol level as illustrated in Table 1.

Table 1: HD duration

HD duration	Frequency	Percent	Cumulative Percent
<1	28	28.0	28.0
1-5	54	54.0	82.0
6-10	13	13.0	95.0
>10	5	5.0	100.0
Total	100	100.0	

It is important to note that 6% of the patients had high serum TG level (more than 200mg/dl) (Table 2). LDL was high in 11% of the patients while HDL was below the normal level in 55% of patients as illustrated in the same Table. There is no difference in abnormal cholesterol level between males and females (4% -4%, *P value 0.226*). However, TG level showed difference (although not significant statistically) between gender as 5 males (83%) had high levels compared to one female (17%) had high levels (*P value 0.436*). There was no significant gender

difference in between patients with high LDL level , that 6 males (55%) of all affected and 5 (45%) of all affected were females (*P value 0.272*). HDL level showed significant statistical difference between males and females that was 42 patients (76%) of affected were males and only 13 (24%) were females (*P value 0.078*). Cholesterol level showed no significant difference between the patients who were dialyzed for more than 10 years and patients who were dialyzed for less than one year (*P value 0.492*). The TG level showed mild affection with duration of

hemodialysis(although statistically not significant) as it is high in the group with short term dialysis (less than one year 3 patients out of 28 patients) 10.7% and zero in patients with long term dialysis (*P value 0.574*).There is no significant difference in LDL levels in patients underwent long term or short term hemodialysis (*P value 0.639*). But HDL levels showed statistical differences between groups of different hemodialysis durations (*P value 0.376*).There is no significant different cholesterol level between both age groups (*P value 0.813*). Nevertheless it differs in TG level as all affected patients are more than 40 years (*P value 0.020*). LDL level is not affected by age as 64% of affected were more than 40 years and 36% were less than 40 years (*P value 0.497*).In HDL level the age is not making difference as 47% of affected were less than 40 years and 53% were more than 40 years (*p = 0.778*). The numbers of hemodialysis hours per week mildly affect the level LDL (*p = 0.174*). But no effect was noticed on cholesterol, TG or HDL (*p =0.254 – 0.783 – 0.929*, respectively). The study also showed that significant number of patients with end stage renal disease were underweight (26%) and 23% were having increased weight (18% overweight, 2% obese and 3% very obese). The mean waist to hip ratio for females was 0.89 and for males was 0.91. Most of the patients have AV fistulae (84%), although only 13% have adequate hemodialysis hours per week. Smoking and substance abuse (snuff) is still high among patients with ESRD (13% and 10% respectively). Signs of hyperlipidemia were present in only 4% of patients.

DISCUSSION

Coronary artery disease is a leading cause of death among patients with ESRD on dialysis [17]. There is strong association between dyslipidemia and coronary artery disease. This is the first study to be done in Sudan to estimate the prevalence of lipid metabolism disturbance among Sudanese patients with ESRD (none diabetic) on regular hemodialysis. The study included 100 Sudanese patients with end stage renal disease from three different centers of hemodialysis randomly selected and tested. The mean of the age was 42.9 years. The study involved 69 (69%) males and 31 (31%) females. Most of the patients have been dialyzed for 1-5 years (54%), 28% for less than one year and 5% for more than 10years. The study showed that 8% of the patients had high serum cholesterol level (more than 200mg/dl) (Table 1) compared to 45% in India. 6% (6 patients) had high serum TG level (more than 200mg/dl) compared to 28% [8]. LDL was high (more than 130mg/dl) in 11 patients (11%) compared to 30% worldwide [8]. HDL was below the normal level (40mg/dl) in 55% of patients (Table 2) compare to 38% in similar population in India [18]. If we look at lipid disturbance in both gender we found that there is no difference in abnormal cholesterol level between males and females (4% -4%). But TG level showed significant difference between gender as 5 males (83%) have high levels compared to one female (17%) have high levels as illustrated in Table 2.

Table 2: TG per gender

TG		Gender		Total
		Male	Female	
High	Count	5.0	1.0	6.0
	%within TG	83.3	16.7	100%
	%within gender	7.2	3.2	6.0
Normal	Count	64	30	94
	%within TG	68.1	31.9	100
	%within gender	92.8	96.8	94
Total	Count	69	31	100
	%within TG	69	31	100
	%within gender	100	100	100

There is no significant gender difference in between patients with high LDL level , that 6 males (55%) of all affected and 5 (45%) of all affected were females. Figure 1, shows LDL level showed significant

statistical difference between males and females that is to say that a total of 42 patients (76%) of affected were males and only 13 (24%) were females.

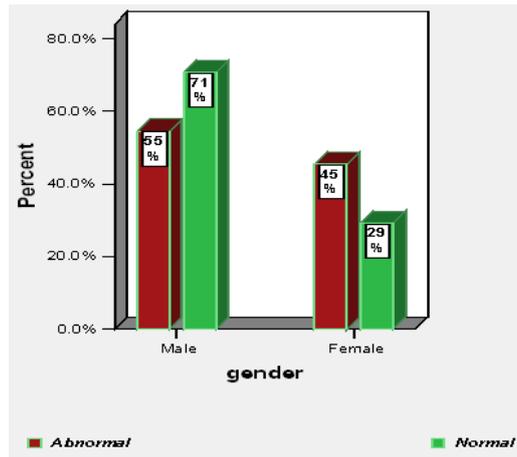


Fig-1: LDL level per gender

Cholesterol level showed mild difference between the patients who were dialyzed for more than 10 years ((20%) of affected patients) compared to only

7.1% in patients who were dialyzed for less than one year as illustrated in Figure 2.

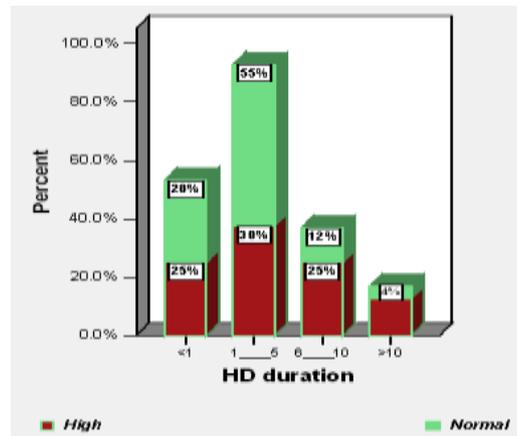


Fig-2: HD duration: Cholesterol

The opposite is right in the TG level as it is high in the group with short term dialysis (less than one

year 3 patients out of 28 patients) 10.7% and zero in patients with long term dialysis (Figure 3).

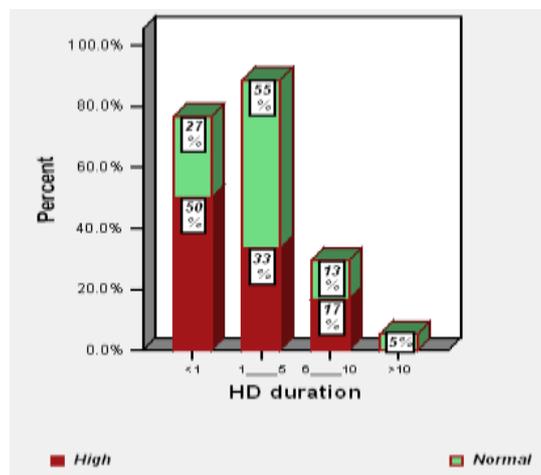


Fig-3: HD duration -TG

There is no significant difference in LDL levels in patients underwent long term or short term hemodialysis (Figure 4).

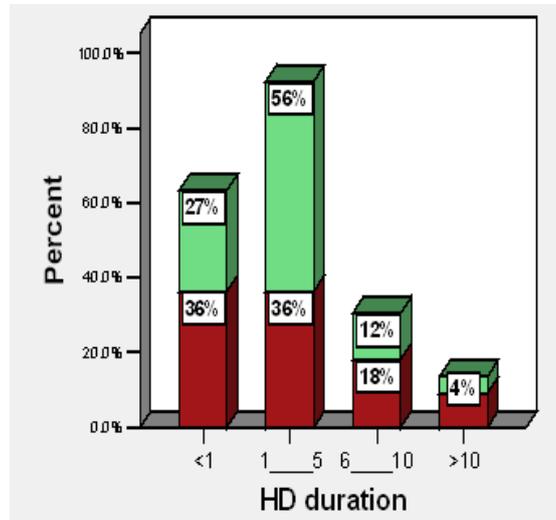


Fig-4: HD duration - LDL

But HDL levels showed statistical differences between groups of different hemodialysis durations. In short and medium term durations the evidence of low HDL levels is high (less than one year 17 patients -

31% and 1-5 years 29 patients -53%) where it is only 2% (1patient) in patients who were dialyzed for more than 10 years (figure 5).

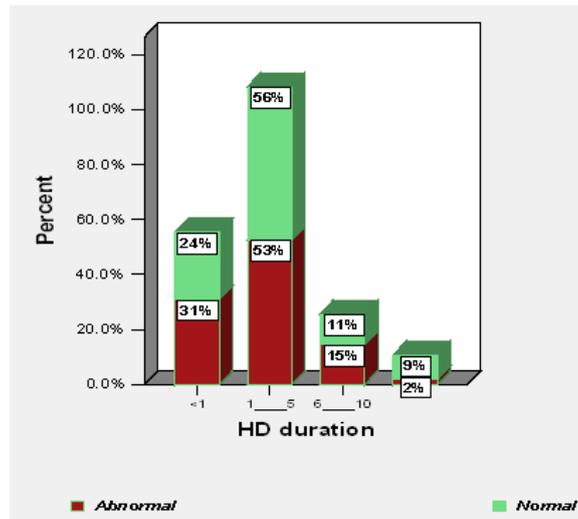


Fig-5: HD duration: HDL

There is no significant different cholesterol level between both age groups. (Figure6). But it differs

in TG level as all affected patients are more than 40 years.

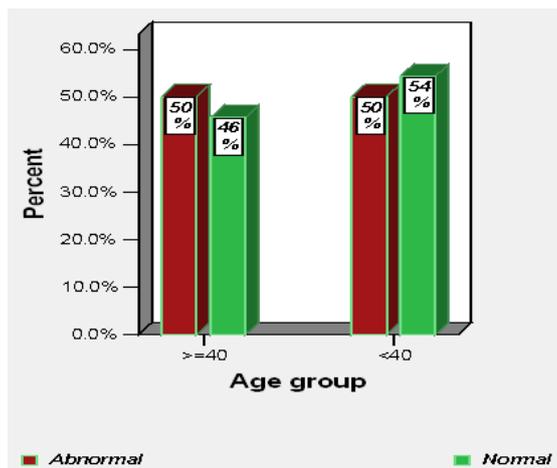


Fig-6: Cholesterol level per age group

Also LDL level is moderately affected by age as 64% of affected were more than 40 years and 36% were less than 40 years *figure* . In HDL level the age is

not making difference as 47% of affected were less than 40 years and 53% were more than 40 years (Table 3).

Table 3: Signs of Hyperlipidemia

Parameter		No	Yes	Total
Xanthelasma	Count	96.0	4.0	100
	%	96.0	4.0	100
Tendom xanthomata	Count	99.0	1	100
	%	99.0	1.0	100
Corneal arcus before 40 year	Count	96	4.0	100
	%	96.0	4.0	100
Palmar xanthomas	Count	98.0	2.0	100
	%	98.0	2.0	100

The effect of number of hemodialysis hours per is only obvious on the level of LDL as all affected patients receiving only 8 hours per week. But cholesterol, TG, and HDL generally were not affected by number of hours. Also the study showed that

significant number of patients with end stage renal disease were underweight (26%) and 23% were having increased weight (18% overweight, 2% obese and 3% very obese) (Figure 7).

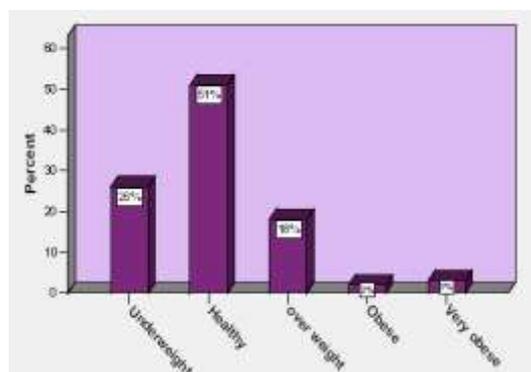


Fig-7: Patient body mass index

The mean waist to hip ratio for females was 0.89 and for males was 0.91. Most of the patients have AV fistulae (84%), but only 13% have adequate

hemodialysis hours per week. Nearly all patients were on regular supplementation of Ca, Iron, Vitamin D, and erythropoietin (Figure 8).

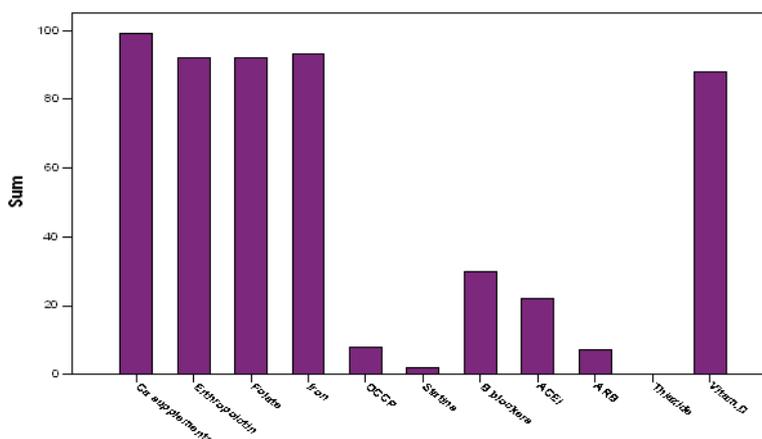


Fig-8: Regular supplementation of Ca, Iron, Vitamin D, and erythropoietin

Smoking and substance abuse (snuff) is still high among patients with ESRD (13% and 10% respectively) (Table 4). Signs of hyperlipidemia were present in only 4% of patients (Xanthelasma, Tendon

xanthomata, corneal arcus before 40 year, palmar xanthomas) figure (25) and only 2% had palpable kidney.

Table-4: Social history

Social history	No	Yes	Total	
Cigarette smoker	Count	87	13	100
	%	87	13	100
Alcohol consumption	Count	99	1	100
	%	99.0	1.0	100
Substance abuse	Count	90	10	100
	%	90	10	100

CONCLUSIONS

ESRD is a major health problem in Sudan, with very high mortality rate, with CVD being the major cause of death. Dyslipidemia is common among patients with ESRD due to low HDL. Therefore, every patient with ESRD should have regular check up for lipid disturbance at least annually. Any patients with abnormal lipid profile may benefit from receiving treatment. Malnutrition is common among patients with ESRD. Therefore, nutritional habits should be reviewed among those patients under supervision of nutrition specialist.

REFERENCES

1. Crews DC, Plantinga LC, Miller ER, Saran R, Hedgeman E, Saydah SH, Williams DE, Powe NR; Prevalence of chronic kidney disease in persons with undiagnosed or prehypertension in the United States. *Hypertension*, 2010; 55(5):1102-9.
2. Perico N, Remuzzi G; Chronic kidney disease in sub-Saharan Africa: a public health priority. *Lancet Glob Health*, 2014; 2(3):e124-5.

3. Elsharif ME, Elsharif EG; Causes of end-stage renal disease in Sudan: a single-center experience. *Saudi J Kidney Dis Transpl.*, 2011; 22(2):373-6.
4. Jha V, Garcia-Garcia G, Iseki K, Li Z, Naicker S, Plattner B, Saran R, Wang AY, Yang CW; Chronic kidney disease: global dimension and perspectives. *The Lancet*, 2013; 382(9888):260-72.
5. Tsimihodimos V, Mitrogianni Z, Elisaf M; Dyslipidemia associated with chronic kidney disease. *Open Cardiovasc Med J.*, 2011; 5:41-8.
6. Kostka T, Para J, Kostka B; Cardiovascular diseases (CVD) risk factors, physical activity (PA) and plasma plasminogen (Plg) in a random sample of community-dwelling elderly. *Arch Gerontol Geriatr.*, 2009; 48(3):300-5.
7. Dixit, AK, Dey R, Suresh A, Chaudhuri S, Panda AK, Mitra A, Hazra J; The prevalence of dyslipidemia in patients with diabetes mellitus of ayurveda Hospital. *J Diabetes Metab Disord.*, 2014; 13: 58.
8. Kronenberg F, Lingenhel A, Neyer U, Lhotta K, König P, Auinger M, Wiesholzer M, Andersson H, Dieplinger H; Prevalence of dyslipidemic risk

- factors in hemodialysis and CAPD patients. *Kidney International*, 2003; 63:S113-6.
9. Goff DC, Bertoni AG, Kramer H, Bonds D, Blumenthal RS, Tsai MY, Psaty BM; Dyslipidemia prevalence, treatment, and control in the multi-ethnic study of atherosclerosis (MESA) gender, ethnicity, and coronary artery calcium. *Circulation*, 2006; 113(5):647-56.
 10. Garcez MR, Pereira JL, Fontanelli Mde M, Marchioni DM, Fisberg RM; Prevalence of dyslipidemia according to the nutritional status in a representative sample of Sao Paulo. *Arq Bras Cardiol.*, 2014; 103(6):476-84.
 11. Joshi SR, Anjana RM, Deepa M, Pradeepa R, Bhansali A, Dhandania VK, Joshi PP, Unnikrishnan R, Nirmal E, Subashini R, Madhu SV; Prevalence of dyslipidemia in urban and rural India: the ICMR-INDIAB study. *PloS one*, 2014; 9(5):e96808.
 12. Ali EM, Ahmed SM, Abdelraheem MB; Dyslipidemia among Sudanese Children Undergoing Maintenance Dialysis. *Arab Journal of Nephrology and Transplantation*, 2010; 3(1):17-21
 13. Wheeler DC, Bernard DB; Lipid abnormalities in the nephrotic syndrome: causes, consequences, and treatment. *Am J Kidney Dis.*, 1994; 23(3):331-46.
 14. Kwan BC, Kronenberg F, Beddhu S, Cheung AK; Lipoprotein metabolism and lipid management in chronic kidney disease. *J Am Soc Nephrol.*, 2007; 18(4):1246-61.
 15. Majumdar A, Wheeler DC; Lipid abnormalities in renal disease. *J R Soc Med.*, 2000; 93(4):178-82.
 16. Chauhan V, Vaid M; Dyslipidemia in chronic kidney disease: managing a high-risk combination. *Postgrad Med.*, 2009; 121(6):54-61.
 17. Perneger TV, Klag MJ, Whelton PK; Cause of death in patients with end-stage renal disease: death certificates vs registry reports. *Am J Public Health*, 1993; 83(12):1735-8.
 18. Kapoor S; Dyslipidemias in end-stage renal disease (ESRD) patients undergoing hemodialysis: A comparison between diabetic and non-diabetic patients. *JARBS*, 2011; 3(2):105-109.