WORLD JOURNAL OF ADVANCE HEALTHCARE RESEARCH

SJIF Impact Factor:

ISSN: 2457-0400
Volume: 9.
Issue: 7
Page N. 286-292
Year: 2025

Original Article

www.wjahr.com

FREQUENCY AND PATTERN OF DYSLIPIDEMIA AMONG TYPE 2 DIABETES MELLITUS PATIENTS IN AL SHEKHAN CITY

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Article Received date: 08 May 2025 **Article Revised date:** 29 May 2025 **Article Accepted date:** 18 June 2025

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ABSTRACT

Background: Dyslipidemia and type 2 diabetes are becoming increasingly common public health concerns, particularly in developing countries such as Iraq. Cardiovascular diseases and other non-communicable diseases are quite common and are thought to be the main cause of mortality in developing countries. The development of cardiovascular diseases, type 2 diabetes, and atherosclerosis is strongly influenced by dyslipidemia. When combined with additional coronary artery disease risk factors like type 2 diabetes, even slight lipid profile abnormalities can dramatically raise the risk of coronary artery disease. **Objectives:** The present study was designed to estimate the prevalence of dyslipidemia or one of abnormal lipids values among patients who had type 2 diabetes mellitus. **Methods:** A cross-sectional study was performed from the 15th of April to the 30th of December 2024. The studied patients were adult diabetic patients older than or equal to 18 years old who were received ongoing diabetic treatment at Al Shekhan primary health care center were involved in this study. Patients with type 1 diabetes, gestational diabetes, non-fasting patients and those below the age of 18 years were excluded from the study. A structured questionnaire was completed through direct interview followed by physical examination and laboratory investigations for assessment of fasting blood glucose, Hemoglobin Alc, and lipid profile. **Results:** In this study the percentage of dyslipidemia was 98.4%. The prevalence of LDL-cholesterol, HDL-cholesterol, triglyceride, total cholesterol were 84.8%, 77.2%, 76.8% and 58.5% respectively. Also, the study shows that more than three quarters (78%) of the diabetics were uncontrolled (HbA1C≥7) and only 22% had achieved good glycemic control (HbA1C<7). Furthermore; 87.6% of those with uncontrolled diabetes had high LDL-cholesterol compared with 75% among those with controlled diabetes (P value= 0.02). No significant association was detected between LDL-cholesterol and the other variables. Regarding triglycerides, the study found significant association between diastolic blood pressure and triglycerides, where 85.3% of those with high diastolic blood pressure had high triglycerides compared with 70.2% among those with normal diastolic blood pressure (P value= 0.005). Significantly, higher proportion of patients with abnormal HDL-cholesterol was detected among those with microalbuminuria (P value = 0.02), those who don't practice exercise (P value < 0.001), and those with uncontrolled systolic blood pressure (P value = 0.03). **Conclusion:** The dyslipidemia is a common finding among type 2 DM patients. Diabetic patient must be encouraged to do regular physical activity and total life style changes in an effort to decrease weight for better glycemic and lipids control.

KEYWORDS: Al Hamdanyia, Dyslipidemia, Iraq, Type 2 diabetes.

1- INTRODUCTION

Dyslipidemia is characterized by an imbalanced lipid profile, including low HDL-C, high LDL-C, high total cholesterol, and high triglycerides.[1] Dyslipidemia and type 2 diabetes are becoming increasingly common public health concerns, particularly in developing countries such as Iraq.[2] Cardiovascular diseases and other non-communicable diseases are quite common and are thought to be the main cause of mortality in developing countries.[3-4] The development of cardiovascular diseases, type 2 diabetes, and atherosclerosis is strongly influenced by dyslipidemia.[5]

When combined with additional coronary artery disease risk factors like type 2 diabetes, even slight lipid profile abnormalities can dramatically raise the risk of coronary artery disease.[6]

Diabetes mellitus (DM) refers to a number of metabolic disorders characterized by hyperglycemia.[7] A complex interplay of genetic and environmental variables causes several diverse kinds of diabetes mellitus.[8] Depending on the cause of the diabetes, variables that contribute to hyperglycemia include decreased insulin secretion, impaired glucose utilization, and increased glucose generation.[9] The metabolic dysregulation associated with diabetes generates secondary pathophysiologic alterations in various organ systems, imposing a great burden on both the patient and the healthcare system.[10] Diabetes is predicted to become a main cause of illness and mortality in the future, as its prevalence rises over the world.[11]

Metabolic syndrome and insulin resistance promote lipolysis by inhibiting hormone-sensitive lipase in adipose tissue. This stimulates the portal flow of free fatty acids to the liver.[12] Overproduction of triglyceride-rich lipoproteins, such as very-low-density lipoprotein (VLDL) and chylomicrons, can lead to a decrease in HDL-C and an increase in small dense oxidized LDL-C levels.[13]

There is limited evidence on the frequency and pattern of dyslipidemia among type 2 diabetes patients in Al Shekhan city. This study aimed to evaluate the prevalence dyslipidemia and related variables among type 2 diabetes patients attending Al Shekhan primary care centers at Al Shekhan city.

2-PATIENTS AND METHODS

A cross-sectional study was performed from the 15th of April to the 30th of December 2024. The studied patients were adult diabetic patients older than or equal to 18 years old who were received ongoing diabetic treatment at Al Shekhan primary health care center were involved in this study. Patients with type 1 diabetes, gestational diabetes, non-fasting patients and those below the age of 18 years were excluded from the study. A structured interviewer administered questionnaire was designed by the researcher and reviewed by the supervisors.

The first part of questionnaire shows information about general characteristic of the patients including age, sex, educational status, marital status, residency, number of household member, house ownership, number of rooms, car ownership, monthly family income, smoking and occupation. The second part of the questionnaire includes questions regarding clinical characteristics and health status of disease like family history of diabetes, duration of diabetes, history of dyslipidemia, hypertension or cardiovascular disease. This part also includes questions about regular physical activity, history and type of medications (oral hypoglycemic agents, Insulin, anti-hypertensive drugs, antiplatelet, and statins) and questions about the type and frequency of food intake.

After filling up the questionnaire form by the researcher, height in centimeter (cm), weight in kilogram (kg), waist circumferences in (cm), systolic blood pressure and diastolic blood pressure in millimeter mercury (mmHg), were measured by the researcher for all participants in a standard fashion. After ending the interview, complete the questionnaire and physical examination, all participants were asked to undergo a fasting blood sample in laboratory room under fully aseptic condition, and these investigations done for each participant (FPG in mg/dl, HbAlc %, and fasting lipid profile in mg/dl). Serum HAlc percentage and glucose concentration was estimated using diasys one HbAICFS (particle enhanced immunoturbidimetric test) which is a specific immunoassay and glucose--oxidase-peroxidase colorimetric method (Randox, UK), respectively. Serum triglycerides, total-cholesterol and HDL-cholesterol were measured using special kits (Biolabo, France). LDL-choleserol was determined by Friedewald equation. Presence of microalbuminuria is detected by a urine spot sample.

Data were analyzed using the Statistical Package for Social Sciences (SPSS, version 29). Frequency and percentage distributions tables were first presented for all collected variables. Chi square test of association was used to compare between proportions. Patients were categorized into three levels according to an 11 point scale for estimation of socio-economic status (adapted from Shabu, with some modifications). The variables used for estimating the scale were educational level (4 scores), house ownership (2 scores), income (2 scores), crowding index (2 scores), and car ownership (1 score). The 11 point scale was divided into three equal categories, low SES (< 3.7/11), Medium SES (3.7-7.3/11), and high SES (> 7.3/11).

Body mass index (BMI was calculated by dividing weight in kilogram by squared height in meter and categorized as normal if BMI< 25kg/m^2, overweight between 25 ≤ BMI< 30kg/m^2 and obesity ≥ 30kg/ m^2.[14] Good glycemic control is defined as HbAlc <7 and FPG level <130 mg/dL.[15] Microalbuminuria is considered positive if it is ≥ 30 to 299 mg/L.[16]

According to the eighth Joint National Committee (JNC-8) criteria 2), Hypertension (HTN) was defined as SBP ≥140 and or DBP >90.[17] Metabolic syndrome was diagnosed according to the criteria made by the US National Cholesterol Education Program Adult treatment Panel III in adult (which require at least three of the following: Waist circumference ≥ 102 cm for male or ≥ 88 for female, Triglycerides ≥150 mg/dl (>1.7 mmol), HDL-cholesterol < 40 mg/dL for male or < 50 mg/ dl (<1.29 mmol/I) for female, BP ≥130/≥ 85 mmHg or

treated for hypertension, and FPG ≥110mg/dI (26.1 mmo/l) or treated for diabetes.[18]

3. RESULTS

The study sample included 250 type 2 diabetic patients. Their mean age (±SD) was 56.5 ± 9.6 years, their median age was 58 years, ranging from 35 to 88 years. Less than half (43.6%) were males. The male: female ratio was 0.77: 1. Around half (46.8%) of the sample were illiterate, and 54.4% were housewives (Table 3.1).

Table 3.1: Distribution of ample by some socio-demographic variables.

Variable	Number	Percent
Age (years):		
Less than 50 year	54	21.6%
50-59	83	33.2%
60-69	95	38.0%
≥70	18	7.2%
Gender:		
Males	109	43.6%
Females	141	56.4%
Educational level:		
Illiterate	117	46.8%
Read and write	35	14.0%
Primary	25	10.0%
Intermediate and secondary	40	16.0%
Institute or college	33	13.2%
Occupation:		
House wife	136	54.4%
Employed	42	16.8%
Other	72	28.8%

Table 3.2 shows that more than half of the sample had history of dyslipidemia and hypertension, and 80.8% with family history of diabetes. Only 16% practice exercise. The majority was either overweight or obese, and 63.2% of them had abnormal waist circumference. Nearly all (96.8%) of them were on oral hypoglycemic agents, and 24.8% were on insulin. Regarding type of drugs taken, nearly all of the patients were on metformin whether alone or with sulfonylureas. More than one third of hypertensive patients were on ARBs. Atorvastatin was the mostly used antilipid drugs.

Table 3.2: Distribution of sample by history of diseases, related medical conditions, physical examination, and drug intake.

Variable	Number	Percent
Dyslipidemia	154	61.6%
Hypertension	138	55.2%
Heart diseases	71	28.4%
Chronic renal disease	2	0.8%
Liver disease	0	0%
Family history of DM	202	80.8%
Duration of DM ≥ 5 years	161	64.4%
Regular physical activity	40	16%
Microalbuminuria	91	36.4%
High waist circumference	158	63.2%
Uncontrolled systolic blood pressure	128	51.2%
Uncontrolled diastolic blood pressure	109	43.6%
Overweight	138	55.2%
Obesity	68	27.2%
Intake of oral hypoglycemic agents:	242	96.8%
-Metformin	116	47.9%
-Sulfonylurea	8	3.3%
-Both	118	48.8%
Intake of insulin:	62	24.8%
-Intermediate acting	3	4.8%
-Long acting	23	37.1%
-Mixed	36	58.1%

Intake of antihypertensive drugs:	139	55.6
-ACE inhibitors	30	21.6%
- CCBs	15	10.8%
-ARBs	50	36.0%
-Combined antihypertensive drugs	44	31.7%
Intake of antiplatelets drugs:	156	62.4%
-Aspirin	139	89.1%
-Plavix	17	10.9%
Intake of antilipids:	149	59.6%
-Atorvastatin	141	94.6%
-Simvastatin	8	5.4%

Figure 3.1 shows that almost all (98.4%) of the sample had dyslipidemia (one or more abnormal lipids values), and the majority had abnormal LDL, HDL, TG, and Total cholesterol levels.

Figure 3.1: Prevalence of dyslipidemia and lipid levels among the study participants

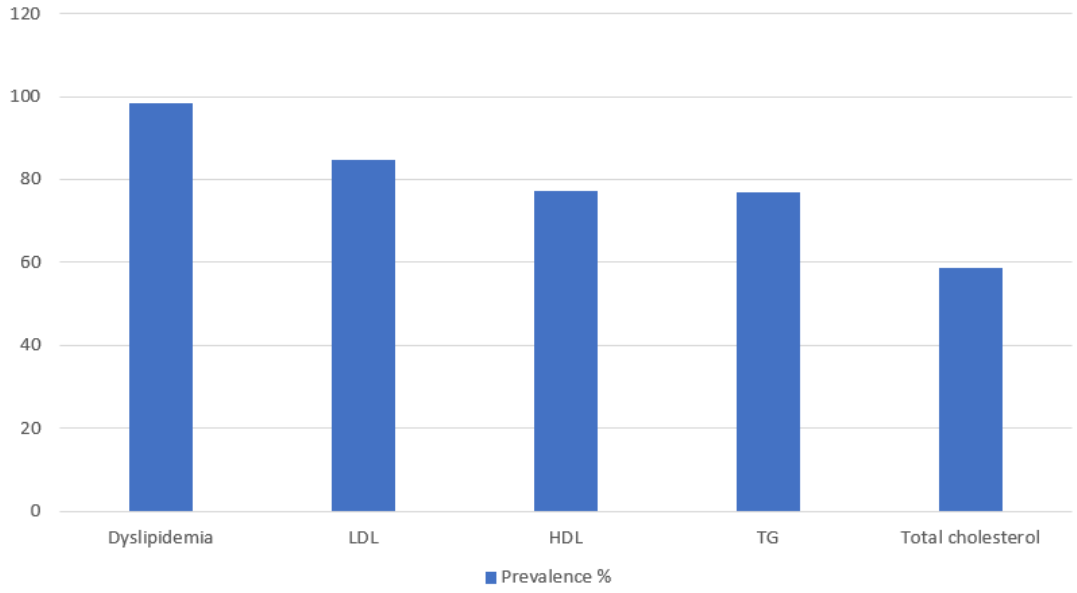

Figure 3.2 shows that more than three quarters (78%) of the diabetics were uncontrolled (HbA1c>7) and only 22% had achieved good glycemic control (HbA1c<7).

Figure 3.2: Prevalence of uncontrolled diabetes

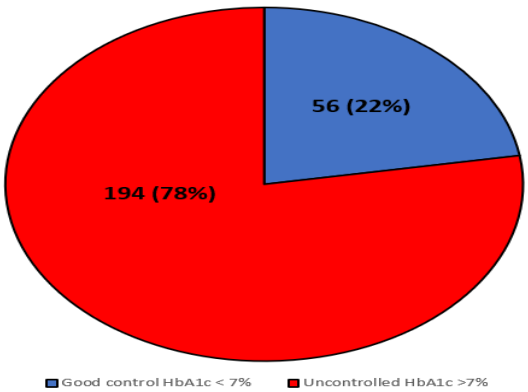

Table 3.3 shows that 87.6% of those with uncontrolled diabetes had high LDL-cholesterol compared with 75% among those with controlled diabetes (P value= 0.02). No significant association was detected between LDL-cholesterol and the other variables. Regarding triglycerides (TG), the table shows significant association between DBP and TG, where 85.3% of those with high DBP had high TG compared with 70.2% among those with normal DBP (P value= 0.005). Significantly, higher proportion of patients with abnormal HDL-cholesterol was detected among those with microalbuminuria (P value = 0.02), those who don't practice exercise (P value < 0.001), and those with uncontrolled SBP (P value = 0.03).

Table 3.3: Association of serum lipids with several varaibles.

Variable	Total number	Abnormal TC		Abnormal LDL		Abnormal TG		Abnormal HDL	
		No. (%)	P-value	No. (%)	P-value	No. (%)	P-value	No. (%)	P-value
Glycemic control: Controlled Uncontrolled	56 194	27 (48.2%) 120 (61.9%)	0.06	42 (75%) 170 (87.6%)	**0.02**	38 (67.9%) 154 (79.4%)	0.07	40 (71.4%) 153 (78.9%)	0.24
Family history of DM: Yes No	202 48	121 (59.9%) 26 (54.2%)	0.46	169 (83.7%) 43 (89.6%)	0.30	153 (75.7%) 39 (81.3%)	0.41	152 (75.2%) 41 (85.4%)	0.13
Duration: Less than 5 years More than or equal to 5 years	89 161	47 (52.8%) 100 (62.1%)	0.15	75 (84.3%) 137 (85.1%)	0.86	72 (80.9%) 120 (74.5%)	0.25	63 (70.8%) 130 (80.7%)	0.07
Microalbuminuria: Yes No	91 159	52 (57.1%) 95 (59.7%)	0.68	78 (85.7%) 134 (84.3%)	0.76	74 (81.3%) 118 (74.2%)	0.20	80 (87.9%) 113 (71.1%)	**0.002**
Physical activity: Yes No	40 210	27 (67.5%) 120 (57.1%)	0.22	35 (87.5%) 177 (84.3%)	0.60	31 (77.5%) 161 (76.6%)	0.90	22 (55%) 171 (81.4%)	**<0.001**
Body mass index (Kg/m^2) Less than 25 25-29.9 More than or equal to 30	44 138 68	21 (47.7%) 90 (65.2%) 36 (52.9%)	0.06	36 (81.8%) 119 (86.2%) 57 (83.8%)	0.75	32 (72.7%) 106 (76.8%) 54 (79.4%)	0.71	34 (77.3%) 106 (76.8%) 53 (77.9%)	0.98
Blood pressure: Systolic < 140 mmHg Systolic ≥ 140 mmHg Diastolic < 90 mmHg Diastolic ≥ 90 mmHg	122 128 141 109	65 (53.3%) 82 (64.1%) 79 (56%) 68 (62.4%)	0.08 0.31	104 (85.2%) 108 (84.4%) 117 (83%) 95 (87.2%)	0.84 0.36	91 (74.6%) 101 (78.9%) 99 (70.2%) 93 (85.3%)	0.41 **0.005**	87 (71.3%) 106 (82.8%) 103 (73%) 90 (82.6%)	**0.03** 0.07
Waist circumference Normal High	92 158	49 (53.3%) 98 (62%)	0.17	75 (81.5%) 137 (86.7%)	0.27	69 (75%) 123 (77.8%)	0.6	65 (70.7%) 128 (81%)	0.06

4. DISCUSSION

In the present study, diabetes mellitus was prevalent among females more than males, which is approximate to what was found by Saly Naser Abbas.[19] Moreover; the mean of patients' ages who were included in the study was about 56 years which consistent with Alia Ali Muhammad et al study findings (53 years).[20] The prevalence of dyslipidemia was 98.4%. More than half of participants were using lipid lowering drugs (59.6%). However, less than one half of patients achieved the target level of total cholesterol, triglycerides and LDL cholesterol (41.5%, 23.2% and 15.2% respectively) and only 22.8% of diabetic patients had achieved good HDL cholesterol. The current result approximately similar to a study conducted on 870 patients with type 2 DM in Jordan.[21]

Furthermore; the study found that (78%) of the study patients exhibited uncontrolled diabetes. This suggests a significant issue with glycemic control within the studied population. Farhan Ahmad was shown comparable result (80%).[22] In addition to that; uncontrolled diabetes patients were shown in this study to had significantly higher LDL-cholesterol level which is consistent to Mohammad Abul Hasnat et al[23] and M. Oc et al studies' findings.[24]

Patients with microalbuminuria were exhibited in this study significantly lower HDL-cholesterol level, which is parallel to the results obtained from Yashilha D et al[25] and Aijun You et al.[26] In the same way physical inactivity was shown in the current study to be significantly linked to lower HDL-cholesterol level, which is agrees with Beata Franczyk et al meta-analysis.[27] In addition to that; elevated systolic blood pressure was also shown in the present study to be significantly associated with lower HDL-cholesterol level, which is going with Kyung-Hyun Cho et al study findings.[28] In contrast to elevated diastolic blood pressure which was shown in this study to be significantly related to higher triglyceride level, Qian Cai et al also showed consistent results.[29]

Small sample size, short time for data collection, the cross-sectional nature of the study, as well as a single measurement of the variables of interest might be the main limitations of the current study.

5-CONCLUSION

The dyslipidemia is a common finding among type 2 DM and the prevalence of dyslipidemia (one or more abnormal lipids values), with the majority had abnormal LDL, HDL, TG, and total cholesterol levels. More than three quarters of the diabetics were uncontrolled (HЬA1C≥7). There is high proportion of uncontrolled diabetes among those with microalbuminuria. There is significant relation between physical activity, SBP and microalbuminuria with low HDL-C. Diabetic patient must be encouraged to do regular physical activity and total life style changes in an effort to decrease weight for better glycemic and lipids control. Although drug therapy for dyslipidemia must be individualized, however most people with DM are candidates for statin therapy, and often needed treatment with multiple agents to achieve therapeutic goals.

ACKNOWLEDGEMENT

We are grateful for the help provided by the medical team at Hamdanyia primary health care as well as the careful consideration received from the Nineveh Directorate of Health. Without the help of each of these individuals, this study would not have been possible.

CONFLICT OF INTERTEST

About this study, the authors disclose no conflicts of interest.

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