

PAPER • OPEN ACCESS

Lipid profile of type 2 diabetics in Almajmaah, Saudi Arabia

To cite this article: W Sami and M R Ab Hamid 2019 *J. Phys.: Conf. Ser.* **1366** 012131

View the [article online](#) for updates and enhancements.



IOP | ebooks™

Bringing you innovative digital publishing with leading voices to create your essential collection of books in STEM research.

Start exploring the collection - download the first chapter of every title for free.

Lipid profile of type 2 diabetics in Almajmaah, Saudi Arabia

W Sami^{1,2} and M R Ab Hamid¹

¹Department of Public Health & Community Medicine, College of Medicine, Majmaah University, Al-Majmaah, 11952, Kingdom of Saudi Arabia.

²Faculty of Industrial Management, Universiti Malaysia Pahang, 26300 Gambang, Kuantan, Pahang, Malaysia.

¹E-mail: w.mahmood@mu.edu.sa

Abstract. This research evaluated the lipid profile of type 2 diabetics in Almajmaah, Saudi Arabia. There is scarcity of literature about the assessment of lipid profile of type 2 diabetics in Saudi Arabia with very few studies addressing this issue. The data was collected from 350 diabetic patients visiting the primary healthcare centres in Almajmaah, Saudi Arabia. The questionnaire comprised of socio-demographic and clinical data information. Systematic random sampling technique was used to collect the data from available sample frame of type 2 diabetics. The median age of the patients was 45 (40 – 51) years. Majority of the patients were males as compared to females (57.7% vs 42.3%). A significant dyslipidaemia was observed in diabetics. Patients had significantly high LDL, and TG level ($p < 0.001$) respectively. HDL-C of males was significantly high, whereas, for females, it was at borderline ($p < 0.001$) respectively. However, TC was not statistically significant ($p = 0.405$). The prime focus when treating diabetics is to introduce preventive and therapeutic lifestyle changes measures into a comprehensive treatment programme. The treating doctor must keep an eye on the lipid profile of diabetics that can be useful for the patients to reduce the morbidity from macrovascular complications.

1. Introduction

Dyslipidaemia means the presence of high amount of fats and lipids in the blood. Diabetic dyslipidaemia refers to high Total Cholesterol (TC) or Triglyceride (TG) levels, low High-Density Lipoprotein-Cholesterol (HDL-C) and increased level of Low-Density Lipoprotein-Cholesterol (LDL-C). Dyslipidaemia can be a major cause of Cardiovascular Disease (CVD) and stroke which is a macrovascular complication of Type 2 Diabetes Mellitus (T2DM) [1,2]. Several dietary interventional studies recommended nutrition therapy and lifestyle changes as the initial treatment for dyslipidaemia [3,4]. Consuming diet mainly composed of fruits, vegetables, olive oil and fish, but limiting the intake of diet like meat, fats and refined carbohydrates have shown to be beneficial for diabetics with dyslipidaemia. Previous international literature also reported that elevated TC, LDL-C, TG and low level of HDL-C are clear risk factors for Coronary Artery Disease (CAD) [5-7]. Diabetic patients have a high risk of developing CVD for which dyslipidaemia is a sole imperative risk factor. The result from clinical trials suggested treating dyslipidaemia in order to prevent macrovascular complications of Diabetes Mellitus (DM) [8]. A study compared the effects of high-monounsaturated fatty acid and high-carbohydrate diets on body weight and glycaemic control in type 2 diabetics. Results showed a significant beneficial effect on body weight, body composition, cardiovascular risk factors, and glycaemic control [9]. In Kingdom of Saudi Arabia (KSA), there is a scarcity of literature related to diabetic dyslipidaemia and CAD with only a few studies addressing this issue [10]. Dyslipidaemia in

KSA is emerging as a serious health problem due to the economic shift and sedentary lifestyle [11]. A study conducted on dyslipidaemia among Saudi adults reported that prevalence of dyslipidaemia in KSA is increasing at a rapid pace which prophecies that CAD will be a major health problem in the coming years [12]. Adopting a healthy lifestyle including dietary modification, exercise, and regular health monitoring can lessen the risk of cardio-metabolic troubles in type 2 diabetics.

2. Methodology

The data was collected from 350 diabetic patients visiting the primary healthcare centres in Almajmaah, Saudi Arabia. The questionnaire comprised of socio-demographic and clinical data information. Blood sample was taken from the patients after informed consent to test the current level of lipid profile. Systematic random sampling technique was used to collect the data from available sample frame of type 2 diabetics. The sample size was calculated using the level of precision formula. The collected data was entered and analysed using IBM SPSS Statistics for Windows, version 23 (IBM Corp., Armonk, N.Y., USA). Normality of quantitative variables was checked through One-Sample Kolmogorov Smirnov (K-S) test. Descriptive statistics are reported in order to describe frequencies, percentages and medians and quartiles (25th – 75th) for non-normally distributed quantitative variables. Quantitative lipid profile values were categorized. One-sample chi-square test was used to determine whether the distribution in a single categorical variable follows a known or hypothesised distribution.

3. Results

3.1. Socio-demographic characteristics of patients

The median age of the patients was 45 (40 – 51) years. Majority of the patients were males as compared to females (57.7% vs 42.3%). Major chunk of the patients was married (n = 322; 92%), a few numbers of patients 3.1% were single / divorced / separated and only 1.7% patients were widow. Almost one quarter (32.9%) of patients received education till primary followed by secondary / middle (n = 85; 24.3%), illiterates were (n = 69; 19.7%), graduates were (n = 51; 14.6%) and a few number of patients had postgraduate degrees (n = 30; 8.6%). Most of the patients were doing own business (n = 163; 46.6%), around 30% were housewives, one-fourth patients were government employees (n = 74; 21.1%), and only 3.1% patients were unemployed. Majority of the patients (n = 113; 32.2%) were not earning (housewives + unemployed). Those who were earning, bulk of them (n = 65; 18.6%) had monthly income between 3000 – 5000 SAR, followed by 17.4% who had monthly income between 5,001 – 10,000 SAR, patients earning < 3000 SAR were (16%), 11.4% patients were earning between 10,001 – 15,000 SAR and only 4.3% had monthly income > 15,000 SAR. Almost two-quarter of the patients were performing a low physical activity (n = 222; 63.4%), moderate physical activity was observed in one-quarter of patients (33.4%), and only 3.1% were performing intense physical activity. The results are presented in Table 1.

Table 1. Sociodemographic Characteristics of Patients (n = 350).

	n (%)		n (%)
Gender		Occupation	
Male	202 (57.7)	Unemployed	11 (3.1)
Female	148 (42.3)	Government Employee	74 (21.1)
		Own business	163 (46.6)
		Housewives	102 (29.1)
Marital Status		Monthly Income (SAR)	
Married	322 (92.0)	< 3000	56 (16.0)
Single	11 (3.1)	3000 – 5000	65 (18.6)
Widow	06 (1.7)	5001 – 10,000	61 (17.4)
Divorced / Separate	11 (3.1)	10,001 – 15,000	40 (11.4)
		>15,000	15 (4.3)
		Not Earning	113 (32.2)

Education Status		Physical Activity	
Illiterate	69 (19.7)	Low physical activity	222 (63.4)
Primary	115 (32.9)	Moderate physical activity	117 (33.4)
Secondary / Middle	85 (24.3)	Intense physical activity	11 (3.1)
Graduate	51 (14.6)		
Postgraduate	30 (8.6)		

3.2. Lipid Profile Descriptive Analysis

The median LDL-C of patients was 148.65 (119.69 – 173.43) mg/dl. The minimum and maximum values were 77.2 mg/dl and 350.88 mg/dl respectively. Majority of the patients' LDL-C was abnormal (n = 156; 44.57%) followed by borderline (n = 75; 21.4%), near optimum (n = 65; 18.6) and optimum (n = 54; 15.4%). Median HDL-C for males was 39.77 (31.66 – 46.49), whereas, for females the median HDL-C was 52.22 (36.87 – 56.98) mg/dl. A significant association was observed between HDL-C levels of males and females ($p < 0.001$). More than 50% of the male patients had a high HDL-C level, followed by borderline (n = 63; 31.2%) and only 17.3% had an optimum HDL-C level. Whereas, HDL-C level of the bulk of female patients was at borderline (n = 67; 45.3%), followed by high (n = 54; 36.5%) and only 18.2% had an optimum HDL-C level. Median TG level of patients was 194.69 (157.52 – 246.64) mg/dl. Minimum TG level was 76.91 mg/dl, and the maximum was 614.66 mg/dl. Highest number of patients had abnormal TG level (n = 170; 48.5%), followed by borderline (n = 102; 29.1) and normal (n = 78; 22.3%). The Median TC level of patients was 220.07 (184 – 284.25) mg/dl. The minimum level of TC was 136 mg/dl, and the maximum was 370 mg/dl. More than one-quarter of patients had high TC level followed by normal (n = 114; 32.6), and around 31% patients had borderline TC level.

Table 2. Lipid Profile of Patients (n = 350).

Lipid Profile	Result	Cut-off	n (%)
LDL-C	Optimum	<100 mg/dl	54 (15.4)
	Near optimum	100 – 130 mg/dl	65 (18.6)
	Borderline	131 – 159 mg/dl	75 (21.4)
	High	160 – 190 mg/dl	101 (28.9)
	Very high	>190 mg/dl	55 (15.7)
HDL-C	Optimum	>60 mg/dl	35 (17.3)
	Borderline	40 – 59 mg/dl	63 (31.2)
	High	<40 mg/dl	104 (51.5)
Female	Optimum	>60 mg/dl	27 (18.2)
	Borderline	50 – 59 mg/dl	67 (45.3)
	High	<50 mg/dl	54 (36.5)
			78 (22.3)
TG	Normal	<150 mg/dl	
	Borderline	150 – 199 mg/dl	102 (29.1)
	High	200 – 499 mg/dl	144 (41.1)
	Very high	\geq 500 mg/dl	26 (7.4)
TC	Normal	<200 mg/dl	114 (32.6)
	Borderline	200 – 239 mg/dl	108 (30.9)
	High	\geq 240 mg/dl	128 (36.6)

3.3. Lipid Profile Inferential Analysis

Results of one-sample chi-square test presented in Table 3 showed the presence of significant dyslipidaemia in diabetics. Patients had significantly high LDL, and TG level ($p < 0.001$) respectively. HDL-C of males was significantly high, whereas, for females, it was at borderline ($p < 0.001$) respectively. However, TC was not statistically significant ($p = 0.405$).

Table 3. Significance of Lipid Profile (n = 350).

Lipid Profile	Result	n (%)	χ^2 (df)	p – value
LDL-C	Optimum	54 (15.4)	21.31 (4)	< 0.001
	Near optimum	65 (18.6)		
	Borderline	75 (21.4)		
	High	101 (28.9)		
	Very high	55 (15.7)		
HDL-C	Optimum	35 (17.3)	35.77 (2)	< 0.001
	Borderline	63 (31.2)		
	High	104 (51.5)		
Male	Optimum	27 (18.2)	16.87 (2)	< 0.001
	Borderline	67 (45.3)		
	High	54 (36.5)		
	Normal	78 (22.3)		
Female	Borderline	102 (29.1)	83.14 (3)	< 0.001
	High	144 (41.1)		
	Very high	26 (7.4)		
	Normal	114 (32.6)		
TG	Borderline	108 (30.9)	1.80 (2)	0.405
	High	128 (36.6)		
	High	128 (36.6)		

4. Discussion

Our study results are consistent with a recently published study [13] who also reported presence of significant dyslipidaemia among type 2 diabetics, however, levels of LDL-C (64.4%), HDL-C (64%) and TG (53.77%) were reported to be higher in comparison to our study. TC (30.3%) was the only profile marker which was elevated more in our study patients. Results of another study [14] reported that despite using lipid-lowering drugs, most type 2 diabetics have dyslipidaemia. LDL-C was high in almost (80%) of the patients. In comparison to our study, LDL-C was high is (44.6%) of the patients. Results of our study are also consistent with a study [11] which revealed the same pattern of presence of significant dyslipidaemia among type 2 diabetics i.e., elevated TC, TG, LDL-C and low levels of HDL-C. Our study result is consistent with another study [15] who also reported the presence of significant dyslipidaemia in Saudi adults. A study reported extremely high dyslipidaemia among Saudi adults [16], results showed that low HDL-C was the most prevalent (88.6%) followed by hypertriglyceridemia (34%). Comparing this study results showed that in our study TG had the highest prevalence follow by LDL-C, TC, and HDL-C. According to another study [17], high frequency of dyslipidaemia was found in Saudi type 2 diabetics, TC (56.6%), TG (23.6%), LDL-C (77.1%) and HDL-C (48.9%). Findings of our research also revealed the presence of significant dyslipidaemia in type 2 diabetics, however, in our study, TG had the highest prevalence followed by LDL-C, TC, and HDL-C.

In our study, more than 50% of the patients had hypercholesterolemia, and one-fourth of patients had hypertriglyceridemia, these high levels can also be the predictors for development of CAD

in our study patients. Our study results are congruent to a study conducted in 2013 [18] where female diabetics had significantly lower HDL-C level than male diabetics ($p < 0.001$). Many other published studies conducted on type 2 diabetics' associated lifestyle with dyslipidaemia [19-21]. The cornerstone of keeping lipid profile in acceptable ranges is to make changes in lifestyle which can be best achieved using patient empowerment approach. The approach of patient empowerment makes patients choose purposeful and realistic goals like that of weight loss, nutrition and other physical activities [22]. Our study results demonstrated that urgent need is required to develop primary prevention strategies for treatment of dyslipidaemia among type 2 diabetes in KSA. Diet and exercise are the most important factors to focus on when talking about lifestyle changes. The healthcare provider should empower the patients by describing benefits of healthy eating and weight loss and their positive effect on lipid profile. Weight loss alone has also been proved to decrease TC, TG, and LDL-C and increase HDL-C levels.

5. Conclusion

The prime focus when treating diabetics is to introduce preventive and therapeutic lifestyle changes measures into a comprehensive treatment program. The treating doctor must keep an eye on the lipid profile of diabetics that can be useful for the patients to reduce the morbidity from cardiovascular complications. The healthcare provider should empower the patients by describing benefits of healthy eating and weight loss and their positive effect on lipid profile.

Acknowledgements

The authors are thankful to Majmaah University, Kingdom of Saudi Arabia for giving the ethical approval (Reference No: MURECApril.02/COM-2016) and Universiti Malaysia Pahang, Ministry of Higher Education, Malaysia for funding this research (Research Grant Vote No: RDU 130612).

References

- [1] Gadi R, Samaha FF 2007 Dyslipidemia in type 2 diabetes mellitus *Curr Diab Rep.* **7** 228-34.
- [2] Mooradian AD 2009 Dyslipidemia in type 2 diabetes mellitus *Nat Clin Pract Endocrinol Metab.* **5** 150-9.
- [3] Bantle JP, Wylie-Rosett J, Albright AL, Apovian CM, Clark NG, Franz MJ 2008 Nutrition recommendations and interventions for diabetes: a position statement of the American Diabetes Association *Diabetes care.* **31** S61-S78.
- [4] Franz MJ, Powers MA, Leontos C, Holzmeister LA, Kulkarni K, Monk A 2010 The evidence for medical nutrition therapy for type 1 and type 2 diabetes in adults. *J Am Diet Assoc.* **110** 1852-89.
- [5] Soedamah-Muthu SS, Chaturvedi N, Toeller M, Ferriss B, Reboldi P, Michel G 2004 Risk factors for coronary heart disease in type 1 diabetic patients in Europe *Diabetes care.* **27** 530-7.
- [6] Menotti A, Puddu P, Lanti M, Kromhout D, Blackburn H, Nissinen A 2003 Twenty-five-year coronary mortality trends in the seven countries study using the accelerated failure time model. *Eur J Epidemiol.* **18** 113-22.
- [7] Vasan RS, Massaro JM, Wilson PW, Seshadri S, Wolf PA, Levy D 2002 Antecedent blood pressure and risk of cardiovascular disease *Circulation.* **105** 48-53.
- [8] Niemeijer-Kanters S, Banga J, Erkelens D. Dyslipidemia in diabetes mellitus 2001 *Nederlands tijdschrift voor geneeskunde.* **145** 769-74.
- [9] Ferland A, Brassard P, Lemieux S, Bergeron J, Bogaty P, Bertrand F 2009 Impact of high-fat/low-carbohydrate, high-, low-glycaemic index or low-caloric meals on glucose regulation during aerobic exercise in Type 2 diabetes *Diabetic Med.* **26** 589-95.
- [10] Al-Shehri AM 2014 Prevalence and pattern of lipid disorders in Saudi patients with angiographically documented coronary artery disease. *J Family Community Med.* **21** 166.
- [11] Bobby D, Vinodha R 2016 Dyslipidemia in type 2 diabetes mellitus—a major risk factor for cardiovascular morbidity *Int J of Med Res and Rev.* **4**
- [12] Al-Nozha, Arafah MR, Al-Maatouq MA, Khalil MZ, Khan NB, Al-Marzouki K 2008 Hyperlipidemia in Saudi Arabia *Saudi Med J.* **29** 282-7.
- [13] Thapa SD, KC SR, Gautam S, Gyawali D 2017 Dyslipidemia in type 2 diabetes mellitus *Journal of Pathology of Nepal.* **7** 1149-54.

- [14] Daya R, Bayat Z, Raal F 2017 Prevalence and pattern of dyslipidaemia in type 2 diabetes mellitus patients at a tertiary care hospital *JEMDSA*. 1-5.
- [15] Al-Kaabba AF, Al-Hamdan NA, El Tahir A, Abdalla AM, Saeed AA, Hamza MA 2012 Prevalence and correlates of dyslipidemia among adults in Saudi Arabia: results from a national survey *Open J Endocr Metab Dis*. **2** 89.
- [16] Al-Daghri NM, Al-Attas OS, Alokail MS, Alkharfy KM, Sabico SLB, Chrousos GP 2010 Decreasing prevalence of the full metabolic syndrome but a persistently high prevalence of dyslipidemia among adult Arabs *PLoS One*. **5** e12159.
- [17] Habib SS 2006 Frequency distribution of atherogenic dyslipidemia in Saudi type 2 diabetic patients *Pak J Physiol*. **2** 20-3.
- [18] Kuhail ME 2013 *Assessment of Dietary Habits on Risk Profiles and Complications among Type 2 Diabetic Patients at Al-Remal Clinic in Gaza Strip Al-Azhar University Deanship of postgraduate Studies and scientific Research Pharmacy College*.
- [19] Carson JAS 2003 Nutrition therapy for dyslipidemia *Curr Diab Rep*. **3** 397-403.
- [20] Miao Z, Li C, Chen Y, Zhao S, Wang Y, Wang Z 2008 Dietary and lifestyle changes associated with high prevalence of hyperuricemia and gout in the Shandong coastal cities of Eastern China *J Rheumatol*. **35** 1859-64.
- [21] Stone NJ 2006 Successful control of dyslipidemia in patients with metabolic syndrome: focus on lifestyle changes *Clin Cornerstone*. **8** S15-S20.
- [22] Anderson, Funnell MM 2010 Patient empowerment: myths and misconceptions *Patient Educ Coun*. **79** 277-82.