How to Control Dyslipidemia in Patients with Type 2 Diabetes?

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ABSTRACT: Cardiovascular diseases (CVDs) are one of the major causes of death in diabetic diseases. Dyslipidemia (increasing LDL or decreasing HDL) are among the major causes that increase risk of CVDs. In the present study, control and treatment of blood lipids in diabetic patients is studied. For this purpose, 54 diabetic patients has been studied from 2009 and followed up for 3 successive years. On the start of study, mean of total cholesterol, triglyceride, LDL-C, HDL-C were 202.12, 203.07, 113.90, 44.72, respectively. Repeated measure analysis used for examine of significant changes in variables levels during the 36 months. According this, statistical parameters obtained showed a significant decrease of variables study during the period. Generally the results obtained from the present study show that the control level of blood lipids was successful. Results of the study have been discussed in the end of article.
Key words: Diabetic Diseases, Total Cholesterol, Triglyceride, LDL-C, HDL-C

ORIGINAL ARTICLE

INTRODUCTION

Cardiovascular diseases (CVDs) are one of the major causes of death in diabetic diseases. The risk of CVDs in diabetic patients is 2-4 times bigger than non-diabetic patients (Stamler et al., 1993). Dyslipidemia (increasing LDL or decreasing HDL) are among the major causes that increase risk of CVDs (Kreisberg et al., 2003). More than 90% of the diabetic patients were at least with one abnormal blood lipid (Turner et al., 1998: Fagot-Campagna et al., 2000). Hyperlipidemia treatment plays a major role in decreasing risk of CV complications in these patients (Haffner et al., 1998; Smith et al., 1984; Miettinem et al., 1998). The present research investigates if glycemic control, i.e. measuring HBA1C, may have unfavorable effect on LDL level. For this reason, in present study control and treatment of blood lipids in diabetic patients is studied.

METHODS AND MATERIAL

Present study is a cross-sectional one. The population under study includes the staff of Hormozgan Petroleum Company and their families (their wives and offspring). The population under study included the patients who were proved to be with diabetes in screening. The study started from 2009 and followed up for 3 successive years. At the beginning of the study, screening was conducted from the target population. There were 2607 people. Those who were 30 or above without risk factor and those under thirty years old with BMI above 25 plus one diabetes risk factor were examined in terms of having diabetes risk factors. There were 434 of the patients. The risk factors included family history of diabetes, inactivity, hypertension equal or above 140.90 mmHg, triglyceride level above 250, HDL level below 35, history of IFG (Impaired Fasting Glucose) or IGT(Impaired Glucose Tolerance), history of gestational diabetes (or gestational diabetes mellitus, GDM) or birthweight above 4 kg, history of cardiovascular disease, history of PCO or acanthosis nigricans. The results of fasting blood sugar tests of the patients with one of the above risk factors were checked at least 8 hours after being fast. After screening and taking fasting blood sugar (FBS) test, 115 of them were diagnosed with diabetes. Diabetes was diagnosed according to ADA (American Diabetes Association) criterion (blood glucose exceeding 126 mg/dl after being fast for at least 8 hours within two separate periods or patient's sugar blood exceeding 200 mg/dl 2 hours after consuming 75 g glucose or symptoms of hyperglycemia (bulimia, polydipsia, polyuria) with random glucose blood being 200 mg/dl or further.

Inclusion Criteria: The patients who have just been diagnosed with diabetes and those who were diagnosed with diabetes before while being under treatment.

Exclusion criteria: Those who had chronic kidney or liver failures, drug idiosyncrasy, drug intolerance and those who were not following up necessary tests, examination and receiving medication regularly and continuously.

At the beginning of the study, a file was made for each patient and following specifications were recorded in

it: Age, Gender, Weight, Height, History of Disease, Diagnosis Time, and Medication. Then a complete examination was made for each patient, patient's blood pressure was measured in sitting position after 15 minutes rest using a mercury sphygmomanometer, and the average of these two blood pressures was recorded in his/her file as the patient's blood pressure. Weight of patient was measured by the lightest clothing without wearing shoes. After that, Body Mass Index (BMI) was calculated and recorded in patient's file. At the beginning of each study, fasting blood sugar, hemoglobinA_1C, serum lipids and lipoproteins, blood urea, and creatinine were checked 2 hours after a meal. Then hemoglobin A_1C and serum lipids and lipoproteins were checked once every three months. Fasting blood sugar of patients were checked once every six weeks.

Blood sugar was measured through glucose oxidase method and total cholesterol, triglyceride, and cholesterol HDL were measured using Enzyme Chem Pars Azmun kits. Cholesterol level was measured using Friedewald Formula (in case triglyceride level was lower than 400 mg/dl) (Friedwald et al., 1972). NCEP-ATP criteria were used for classifying different levels of blood lipids (NCEP 2001). National Cholesterol Education Program (NCEP) - Adult Treatment Panel (ATP III): ATP III Classification of LDL, Total, and HDL Cholesterol (mg/dL):

LDL Cholesterol – Primary Target of Therapy <100 Optimal, 100-129 near optimal/above optimal, 130-159 Borderline high, 160-189 High, >190 Very high

Total Cholesterol: < 200 Desirable, 200-239 Borderline high, >240 High

HDL Cholesterol :< 40 Low, >60 High

Union Exchange Chromatography method was used by a DSS system to measure hemoglobin A_1C (HbA$_1$C).

SPSS software was used for statistical analysis. To analyze the data, mean and standard deviation indices were calculated in the descriptive statistics section and repeated measure analysis was used in the inferential section.

RESULTS

Of 115 people included in the study, 53 people (30 males and 23 females) completed the study. The results obtained from the patients were analyzed. Range of patients' age is between 26 and 72 and the mean age of the patients was 50.58 years old. Mean ages of males and females were 50.33 and 50.91 years old, respectively. On the start of study, mean of total cholesterol, triglyceride, LDL-C, HDL-C were 202.12, 203.07, 113.90, 44.72, respectively. Following table 1 shows descriptive indexes (mean and standard deviation) of the variables during the period of study.

Table1: descriptive indexes of the variables during the period of study

Variable	Cholesterol		Triglyceride		HDL-C		LDL-C	
Month	Mean	SD	Mean	SD	Mean	SD	Mean	SD
3	202.1458	41.18252	203.0784	97.00636	44.7255	7.71253	113.9074	31.27858
6	175.1667	61.35017	172.5490	87.47327	41.3137	14.26953	97.2222	38.29462
9	141.3958	82.11272	131.3725	97.64916	35.7843	18.97821	70.7407	1363.05964
12	148.2500	60.41611	144.7059	80.27435	37.5686	14.85968	82.5000	34.86294
15	131.4167	79.33335	114.7843	82.41294	34.2157	20.78299	79.3889	49.14876
18	160.5625	129.07361	119.8235	73.60046	38.8431	19.33740	82.9815	45.35499
21	139.2500	72.22380	123.9804	85.42494	38.5882	23.50079	75.6667	42.56626
24	122.1250	79.69319	111.0392	90.27269	35.3333	22.67480	73.5370	45.64412
27	147.6250	72.13570	126.8824	83.09071	42.0000	19.54073	80.9444	44.71647
30	144.6875	56.25896	126.5686	75.56646	41.8627	17.70539	79.3148	33.09952
33	113.6250	71.56804	100.3529	73.80971	35.4706	22.44670	62.1296	40.66478
36	125.5833	62.70561	118.3725	103.17460	39.0980	20.66713	69.1111	39.06147

As previously mentioned, repeated measure analysis used for examine of significant changes in variables levels during the 36 months. According this, statistical parameters obtained showed a significant total cholesterol decrease during the period ($F_{1, 53}$ =6.39, P<0.001). Diagram of changes in total cholesterol levels (diagram 1), shows a general pattern of continuous decline in total cholesterol levels. In addition, statistical parameters obtained showed a significant triglyceride decrease during this period too ($F_{1, 53}$ =9.27, P<0.001). Diagram of changes in triglyceride levels (diagram 2), shows a general pattern of continuous decline in triglyceride levels. Third analysis shows a significant HDL decrease during the period ($F_{1, 53}$ =2.21, P<0.01). Diagram of changes in HDL levels (diagram 3), shows a considerable decline in HDL levels. Finally, statistical parameters obtained showed a significant LDL increase during this period ($F_{1, 53}$ =8.69, P<0.001). Diagram of changes in LDL levels

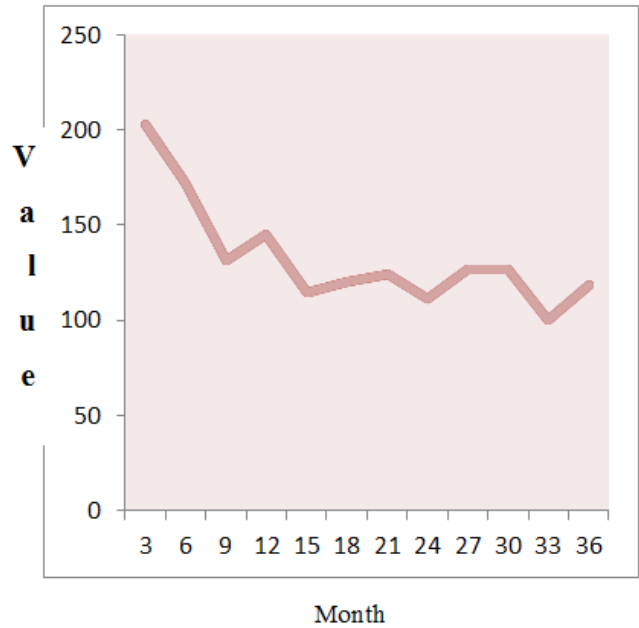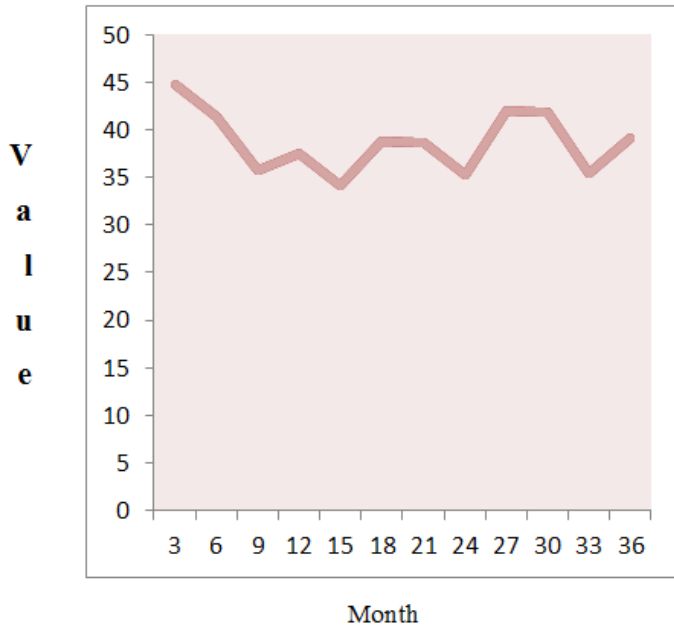(diagram 4), shows a general pattern of continuous   increase in LDL levels.

Diagram 3. Changes in level of **HDL-C** during study

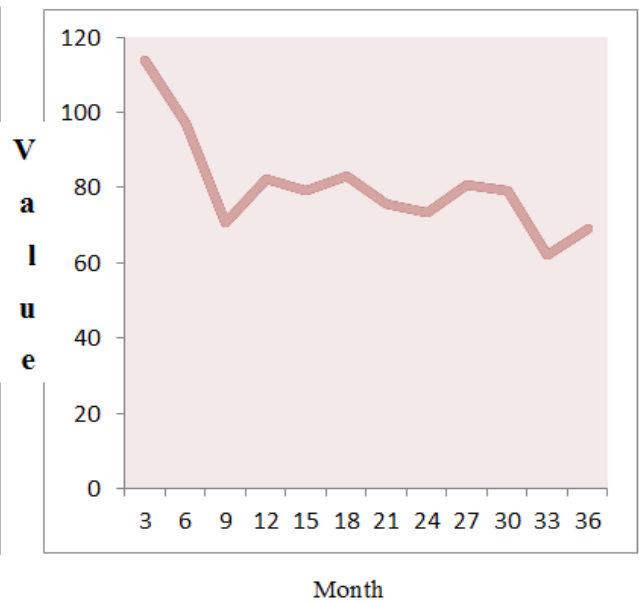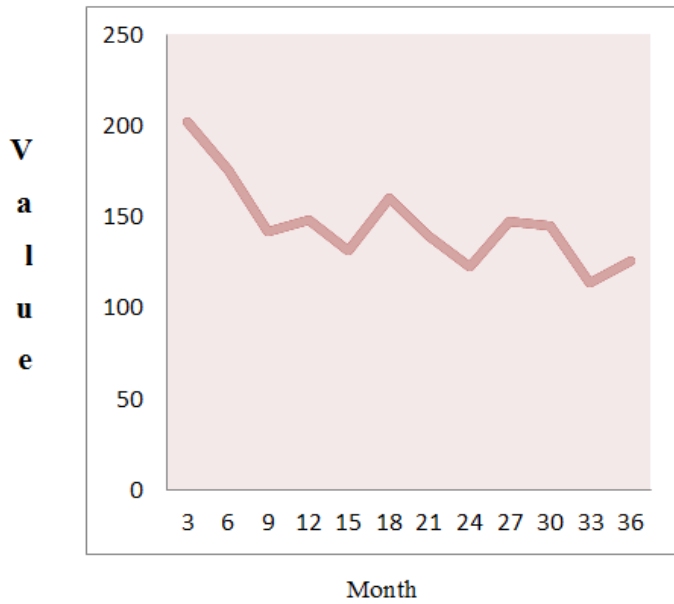Diagram 4. Changes in level of **triglyceride** during study

Diagram 1. Changes in level of **total cholesterol** during study

Diagram 2. Changes in level of **LDL-C** during

DISCUSSION

The results obtained from the present study show that the control level of blood lipids was successful. These diagrams indicate that control program principally has decreased blood lipids of the patients. Results of present study are agreed with result of earlier studies. Some studies have also conducted in other countries. In a research carried out in Malaysia on the diabetic patients with hyperlipidemia, 52.8 percent of the patients with hyperlipidemia, 32 percent with total cholesterol problems, and 51.1 percent of the patients with triglyceride problems reached a normal level after treatment and control (Mafauzy, 2006). In a study

conducted in Korea, 72.2 percent of the patients with hyperlipidemia and 52.6 percent of the patients with total cholesterol and triglyceride problems reached the target level after treatment and control (Noh et al., 2010). Research conducted by Ford et al. (2000) on the diabetic patients with hyperlipidemia during 1999-2000 indicates that 29.7 percent of the patients with hyperlipidemia reached the target level after treatment and control .In a study carried out by Harris, (2002) on the diabetic patients with hyperlipidemia, 25.1 percent of the patients with LDL and cholesterol problems and 50 percent of the patients with HDL and triglyceride problems reached a normal level (Ford et al., 2000). In a study carried out in the Unites States on 733 diabetic patients with hyperlipidemia, 32.1 percent with total cholesterol, 38.4 percent with triglyceride, 15.4 percent with LDL, and 36.8 percent with HDL problems reached a normal level after treatment and control (Beaton et al., 2004). Generally, it may be concluded that control and treatment of blood lipids can lead to control and improve of coronary artery disease in diabetic patients. It is recommended that study effects of control of weight and BMI on coronary artery disease in diabetic patients, in future studies.

REFERENCES

Beaton SJ, Nag SS, Gunter MJ, Gleeson JM, Sajjan SS, Alexander CM. (2004). Adequacy of glycemic, lipid, and blood pressure management for patients with diabetes in a managed care setting. Diabetes Care. 27: 694–698.

Executive Summary of the third report of the National cholesterol education program (NCEPIII). (2001). Expert panel on detection, Evaluation and Treatment of high blood cholesterol in adult (Adult Treatment panel III) JAMA. 285:2486-2997.

Fagot-Campagna A, Rolka DB, Beckles GL, Gregg EW, Narayan KM. (2000). Prevalence of lipid abnormalities, awareness, and treatment in U.S.adults with diabetes. Diabetes 49 (Supple 1) May 21.

Ford ES, Mokdad AH, Giles WH. (2003). Serum total cholesterol concentrations and awareness, treatment, and control of hypercholesterolemia among US adults: findings from the National Health and Nutrition Examination Survey, 1999 to 2000. Circulation; 2185–2189.

Friedwald WT, Levy RI. Fredridson DS. (1972). Estimation of the concentration of low-density lipoprotein cholesterol in plasma, without use of the preparative ultracentrifuge. Clin Chem; 18:499–502.

Haffner SM, Lehto S, Ronemaa T, Pyorala K, Laasko M. (1998). Mortality from coronary heart disease in subjects with type 2 diabetes and in nondiabetic subjects with and without prior myocardial infarction. N Engl J Med .339:229–234.

Harris MI. (2002). Health care and health status and outcomes for patients with type 2 diabetes; Diabetes Care 23: 754-758.

Kreisberg RA, Oberman A. (2003). Medical management of hyperlipidemia/dyslipidemia. Journal of Clinical Endocrinology and Metabolism, 88:2445–2461.

Mafauzy M. (2006). Diabetes control and complication in public hospitals in Malaysia. Med J Malaysia. 61; 477-83.

Miettinem H, Lehto S, Salomaa V, Mahonen M, Niemela M, Haffner SM, Pyorala K, Tuomilehto J.(1998). For the FINMONICA Myocardial Infarction Register Study Group: Impact of diabetes on mortality after the first myocardial infarction. Diabetes Care; 21: 69-75.

Noh JH, Kim SK, Cho YJ, Nam HU, Kim IJ, Jeong IK, etal.(2010). Current status of diabetes management in elderly Koreans with diabetes.

Smith JW, Marcus Fl, Serokman R. (1984). Prognosis of patients with diabetes mellitus after acute myocardial infarction. Am J Cardiol 54: 718-721.

Stamler J, Vaccaro O, Neaton JD, Wentworth D. (1993). Diabetes, other risk factors, and 12-yr cardiovascular mortality for men screened in the Multiple Risk Factor Intervention Trial.Diabetes Care; 2: 434–444.

Turner RC, Millns H, Neil HA, Stratton IM, Manley SE, Matthews DR, Holman RR, for the U.K. (1998). Prospective Diabetes Study Group: Risk factors for coronary artery disease in non-insulin dependent diabetes mellitus (UKPDS 23) BMJ; 316: 823-828.