Quality of Care for Type 2 Diabetes Mellitus in Tripoli Medical Center: a retrospective study of 628 patients

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Abstract:

Introduction: Diabetes mellitus (DM) is a major public health problem. Evidence has shown that aggressive control of hyperglycemia and associated risk factors reduces the risk of both macro vascular and micro vascular complications.

Objectives: The aim of this study was to determine the proportion of diabetes patients reaching the targets recommended by The American Diabetes Association (ADA) standards for diabetes care.

Methods and Materials: This is a retrospective study, conducted at the diabetes outpatient clinics at TMC. For 628 patients with diabetes with at least two clinic visits in the 24 months before August 2010, we assessed measurement and control of HbA1c, blood pressure, and lipid, the data were collected in a specially designed data sheet, and analyzed using SPSS program. **Results:** 628 patients were studied. The mean age was 49.6±11.8years; average duration of diabetes was 6.5±5.0years; The mean last HbA1c was 8.2±2.4%. 75.1%attained a systolic blood pressure of <140 and 75.7%attained a diastolic blood pressure of <90 mmHg. Only 30.8%had LDL cholesterol of < 100 mg/dl & 49.0%had a triglyceride level of < 150 mg/dl. The rate of annual foot examination, retinal examination screening, and urine micro albumin screening were low **Conclusions**: This study demonstrates a low rate of diabetes care targets achievement among patients with type 2 diabetes treated at TMC.

Keywords: Glycemic Control, Diabetes Type 2, Libya, TMC, targets, standards, quality of care; Tertiary care

Introduction

According to the International Diabetes Federation's (IDF) statistics released, as many as 80% of people with diabetes live in developing countries, where, population growth, ageing and, urbanisation with

Diabetes mellitus (DM) is a major public health problem that is growing rapidly throughout the world, and its incidence is approaching epidemic proportions. [1]

dramatic changes in lifestyle all contribute to the dramatic pace of the epidemic. [2]

The prevalence of diabetes mellitus in Libya is not precisely known, although it has been estimated to be as high as 14.1%. [3] The prevalence of type 2 diabetes and impaired glucose regulation reported in a Libyan population based stepwise survey, which assessed the prevalence of cardiovascular risk factors among Libyans aged 25- 64.16 was 23.7%. [4] Diabetes has been associated with chronic metabolic conditions such as obesity and metabolic syndrome, as well as related macrovascular and microvascular complications, such as coronary artery disease, peripheral vascular disease, stroke, diabetic neuropathy, renal failure and blindness. [5,6] Diabetic complications result in significant disability, reduce life expectancy and impose an enormous burden on socioeconomic and public health care systems. [7-10] Direct medical costs consist of resources used to manage the disease. Indirect costs include lost productivity caused by morbidity, disability and premature mortality. [9, 10] Hypertension, obesity, hyperlipidaemia and smoking are important atherosclerotic risk factors which are more prevalent in diabetic patients and contribute to their high mortality compared with non-diabetic patients.[11, 12] Several clinical trials have demonstrated that intensive glycemic control effectively delays the onset and slows the progression of diabetic complications, such as nephropathy, retinopathy, and neuropathy. [13,14] Likewise, strong evidence has shown that aggressive control of associated risk factors such as hypertension, and hyperlipidemia reduces the risk of both micro vascular and macro vascular complications. [15,16] In addition, early detection of complications, by systematic annual screening, allows early diagnosis and early intervention. [17-20] The American Diabetes Association (ADA) recommends a set of diabetic care standards that advocate aggressive management of hyperglycemia, hypertension, and hyperlipidemia for patients with diabetes. [21] Despite the publication of the ADA and other guidelines, several studies have reported suboptimal target achievement and care provided to people with diabetes based on evidence-based quality of care standards. [22, 23] The aim of this study was to determine the proportion of diabetes patients reaching the targets recommended by the ADA standards for diabetes care.

Methods and Materials

care center. Data collection was carried out in August and September 2010.

HDL cholesterol (HDL-D), triglyceride, and total cholesterol were collected. Also, frequency of performing these measurements within the prior year follow-up was assessed. The targets used for this study were those specified by the ADA guidelines: HbA1C< 7%, LDL cholesterol(LDL) ≤ 100 mg/dl, HDL cholesterol(HDL) ≥ 40 mg/dl, total cholesterol ≤ 200 mg/dl, triglycerides ≤ 150 mg/dl, systolic blood pressure ≤ 130 mmHg, and diastolic blood pressure ≤ 80 mmHg, Fasting blood sugar (FBS) ≤ 130 mg/dl Data were analyzed using the Statistical Package for Social Science (SPSS Inc., IBM, US), 19th version. Continuous variables are expressed as mean ± standard deviation (SD) and range. Categorical data are expressed as numbers and percentages. Student's t-test was used to compare continuous variables and qualitative variables were analyzed with the chi-square test or Fisher's exact test.

This study was carried out in accordance with the principles of the Helsinki Declaration. A formal approval was obtained from institutional authorities.

This is a retrospective study, conducted at the diabetes outpatient clinics at the Tripoli Medical Center (TMC), a tertiary The records of the first registered diabetic patients at the TMC diabetes clinic were reviewed. Patients were eligible for inclusion if they were of Libyan nationality, had type 2 diabetes, according to their medical records, and had at least two visits to the study clinic in the 24 months before August 2010. A total of 713 patients was included. Information about patient demographic characteristics, smoking history, education, employment, duration of diabetes, presence of complications and the prescribed medication including lipid-lowering therapy and aspirin usage. Data for the most recent clinic visit were obtained using a chart review form. The following variables were assessed: Recorded height, weight, and blood pressure measurement during the most recent visit; body mass index (BMI) was calculated using the formula: weight (kg) / height (m2). Documentation of foot examination, retinal examination screening, and urine micro albumin screening in the prior year were recorded

The last measured value of HbA1c, creatinine level, LDL cholesterol (LDL-C),

Results

mean disease duration was 6.5±5.0 years (Range1-34). 300 (47.8%) had a positive family history of diabetes.

available in 371 (59.1%) with a mean frequency of testing was 1.5±0.8 (Range 1-5). The mean last HbA1c carried out for them was 8.2±2.4% (Range 4.0-16). 98 (26.4%) achieved the recommended goals for both blood glucose (HbA1c <6.5%), 57 (15.4%) achieved HbA1c <7.5%, but more than 6.5%, and 62 (16.7%) achieved HbA1c 7.5 - <8.5 and in 154 (41.5%) the HbA1c >8.5%. Documentation of blood pressure measurement was available in 570 (90.8%) The mean systolic blood pressure was 125.9±17.2 (Range85-200) mmHg, and the mean diastolic blood pressure was 79.6±9.4 (Range 50-110) mmHg. The distribution of patients' systolic blood pressure was: 428 (75.1%) with <140 mmHg, and 142 (24.9%) > 140 mmHg (Fig. 1). The distribution of patients' diastolic blood pressure was: 431 (75.7%) <90 mmHg and 138 (24.3%) $\geq$ 90 mmHg.

110 (17.5%) were on stations, 287 (45.7%) were on aspirin and 62 (9.9%) were on ACE inhibitors. The number of follow up in the previous year was 1.4±1.6 (Range 0-7)

64 (10.2%) had PNP based on symptoms or clinical examinations, 27 (4.3%) had

The clinical characteristics of the 628 patients, mean age was 49.6±11.8 years (18-81), 294 (46.8%) were males. The Smoking history was available in 442 (70.4%), of them 69 (15.6%) were current smoker, 28 (6.3%) were ex –smoker and 345 (78.1%) were non smokers. 67 (97.1%) of current smokers were males. Body weight and height were documented in 370 (58.9%) patients, Mean BMI was 30.8±8.4. Only 76patients (20.5%) had an ideal BMI < 25 kg/m2, 118patients (31.9%) were overweight with a BMI between 25-29, kg/m2 and 176 patients (47.6%) were obese with a BMI ≥ 30 kg/m2. Approximately 204 (32.5%) of patients had been on insulin, either alone or in combination with oral hypoglycemic agents (OHA), 292 (46.5%) were on motorman either alone or in combination with insulin and / or Sulfonylurea. 238 (37.9%) were on Sulfonylurea either alone or in combination with basal insulin and / or motorman

Table 1 summarize the proportion of patients for whom the aspect of care have been documented in their medical records. The mean fasting blood sugar was 195.0±79.5.4mg/dl (Range 31-721). HbA1c results in the previous year were

amputations and 28 (4.5%) had IHD in the form of stable angina. Annual testing for protein urea available in 43 (6.8%) patients. Results of blood urea and creatinine levels was available in 319 (50.8%) patients Results of total < 150 mg/dl. Mean high density lipoprotein cholesterol (HDL) level was 47.4±12.9 (14.5-84.6). Only 80 female patients (46.2%) and 78 male patients (56.5%) were above the recommended HDL level of 50 mg/dl and 40 mg/dl. Low density lipoprotein cholesterol (LDL) level was 123.4±50.6.1 (37.4-452). Only seventy 96 patients (30.8%) had LDL cholesterol of < 100 mg/dl (Figure1).

retinopathy, documentation of annual funds examination available in 20 (3.2%) Symptoms of claudicating were present in14 (2.2%). Examination of peripheral blood vessels done in 4 (0.6%). Two patients (0.3%) had a history of cholesterol, TG, HDL-C, LDL-C were available in 393 (62.6%), 404 (64.3%), 311 (49.5%), 312 (49.7%) of patients' files respectively. In those with available results, the mean serum total cholesterol was 187.4±72.5 (101-973). 277 patients (70.0%) had a total cholesterol < 200 mg/dL. The mean total serum triglyceride value was 170.4±104.9 (40-937). 196 patients (49.0%) had a triglyceride level of

Discussion

Diabetes is a chronic metabolic condition, which is associated with increased morbidity, disability, and mortality, largely due to microvascular complications such as nephropathy, retinopathy and neuropathy and macrovascular complications such as coronary artery disease, peripheral vascular disease and stroke. [6, 7] Several clinical trials have shown that intensive glycolic control and the associated CV risk factors such as hypertension, and hyperlipidemia in diabetic patients reduces the risk of both micro vascular and macro vascular complications. [13-16] Despite the broadly distributed diabetes care guidelines, which give clear recommendations to the glycemic, blood pressure and lipid targets in diabetic patients, several studies have indicated that achievement of these targets is suboptimal. [22-25]

In the present study, only 59.1% of patients had at least one HbA1c test results available in their files, during the year prior to last visit. The frequency of testing during that year was 1.5±0.8. Regular HbA1c measurement is important for effective diabetes management.

who are not meeting glycemic goals. HbA1c measurement is an essential indicator for optimal quality of diabetes care. Studies have found an association between adherence to HbA1c measurement and quality outputs. [26–28] Data from Kuwait 80%, 55% reported rate for poor control in Kuwait. [29, 34] Major clinical trials have shown that the target HbA1C goal, is difficult to maintain in clinical practice. According to the National Health and Nutrition Examination Survey (NHANES IV) 1999-2000, only 37% of participants with reviously diagnosed diabetes achieved the target HbA1C goal of less than 7.0%. [35]

In the United Kingdom Prospective Diabetes Study (UKPDS), HbA1c of 7.0% was achieved in only 50% of patients. [36] Barriers to achieving optimal glycemic goal include poor-compliance to diet, exercise and medications, lack of educations as well as cultural barriers. Clinical inertia may also contribute. [37, 38] In Tripoli medical center, diabetes outpatient clinic, the nurses are responsible blood pressure and body weight measurement, on each visit before the consultation. 570 (90.8%) of our patients had their BP documented, this rate is comparable to other studies, where more than 85% of patients attending the diabetic clinic had HbA1C reflects the average level of blood glucose over approximately 3 months and has strong predictive value for diabetes complications. ADA recommendation is to perform the A1C test at least two times a year in patients who have stable glycemic control and more frequently in patients found that doubling of the HbA1c measurements (from 30% to 63%) between 2010 and 2012, was associated with a decrease in the rate of poorly controlled HbA1c from around 80% to 55%. [29] Our findings regarding glycemic control are comparable with those of studies in other Arab countries, 26.4% achieved HbA1c <6.5% and 41.8% achieved HbA1c <7.5%. In a study from a university health center in Lebanon, target goal for HbA1c of <7% was met in 28.4%. [30] In a study from Saudi Arabia tertiary care hospital in Riyadh only 21.8% achieved HBA1c < 7%. [31] Another study conducted in 28 Saudi health centers, all over the country, only 27% of patients achieved the target level of HbA1c of <7%. [32] a study from a tertiary care setting in UAE in 2008, found that only 20% achieved the target of HbA1c in that year. [33] In the present study, 41.5% had HbA1c above 8.5%, this is less than the 54% reported in a study looking at diabetics in primary care settings in Saudia, and the

Blood Pressure (ACCORD-BP) trial, BP reduction to <120 mmHg compared with <140 mmHg, did not reduce mortality or overall cardiovascular outcomes, but significantly reduce stroke risk. [40] The current ADA recommendation is to achieve blood pressure levels <140/90 mmHg

of the people with diabetes that participated in the NHANES 1999–2000 survey reached the target of systolic blood pressure ≤130/80 mmHg.[35]

Several factors can contribute to poor blood pressure control, clinical inertia, with the failure of the healthcare professionals to initiate or optimize drug therapy to achieve blood pressure targets.[37, 38] Poor compliance with prescribed medication is another important factor Education and identifying and addressing the reasons for poor compliance is important to enhance medication adherence. [37, 38] In the present study, 62.6%, 64.3% of patients have documented total cholesterol and triglyceride measurement respectively, and about 49 % had documented HDL or LDL measurement. Annual lipid measurement was documented in 34% in Kuwait, 58% in Abu Dhabi, and 87% in Saudi Arabia. [29, 31]

their blood pressure checked regularly. [22, 23, 30, 39] Blood pressure control is associated with significantly lower risk of mortality, cardiovascular events, CHD, stroke, albuminuria, and retinopathy. [6, 12, 15, 17, 19] Previous ADA guidelines recommended strict BP target of <130/80 mmHg in diabetic patients. In the Action to Control Cardiovascular Risk in Diabetes to reduce cardiovascular disease (CVD) mortality and slow Chronic kidney disease progression.[21] In the present study, the overall, systolic and diastolic blood pressure goals of <140 / 90 mmHg were achieved in 65.8%, 75.1 %, 75.7% respectively. 29.0% patients achieved both systolic and diastolic blood pressure targets of <130 / 80 mmHg. In a study from Lebanon systolic and diastolic blood pressure goals of 135/85 mmHg were met in 55.4%, 65.7%, of their studied patients. [30] In a study from a tertiary care center in Saudi Arabia, involving 1188 diabetic patients the overall, systolic and diastolic blood pressure goals of < 130/80 were achieved in 39.0, 47.6 and 74.6% of diabetic patients respectively.[31]

Blood pressure control in diabetic patients is often challenging, and most patients with diabetes and hypertension require multiple-drug therapy to achieve blood pressure treatment goals.[15, 21] only 35.8%

with goal attainment rates for LDL <100 mg/dl, HDL >45 mg/dl, and for Triglycerides <150 mg/dl were 23%, 37%, and 33.8 % respectively.[39] In a retrospective study from Oman including 430 diabetic subjects from six general health centers, the proportion of patients meeting internationally recognized goals for LDL-C, HDL-C and Triglycerides were 15%, 32%, and 68%

adherence to treatment and annual screening procedures. Diabetes mellitus is a major health problem. International guidelines and evidence recommended standards of care and targets for better outcomes. Challenges for good control lie with effectively implementing them across the population.

Continuing audit of diabetes services is an important tool to assess the current practice

and highlighting deficiencies and thereby implement strategies to achieve the management goals of a good quality care.

Limitations of this study

frequency of screening procedures due to lack of documentation.

Second, factors that influence the outcome like patient's compliance was not evaluated in this study.

About 51% of patients had their triglyceride above the target level, and 53.8% of female patients and 43.5% of male patients had their HDL-c below the recommended target level. Only 30.8% of our diabetics had LDL cholesterol of < 100 mg/dl, which meets the ADA goals for LDL cholesterol in diabetics. Similar rates has been reported from a retrospective study from the United States of America, including data of 7,114 diabetic patients, respectively.[41] Despite the evidence base and guideline recommendations for specific preventive screening, such as Ophthalmological examination, foot examinations, and screening for microalbuminuria, the documentation of foot examination, eye examination, and screening for microalbuminuria were low, annual testing for protein urea available in only 6.8% and dilated fundus examination in 3.2%. Diabetes need a multidisciplinary team care approach to improve glycemic control. Nurses can play an important role in patient-oriented care, through education and facilitating of patient

First, The retrospective nature of the study, and the use of medical records to evaluate the care provided and patients' outcomes, depend on the quality of documentation, and may underestimate the actual

Conclusion

diabetes care, as advised by guidelines, would facilitate documentation and disease management. the role of nurses in diabetes care should be enhanced and nurses involvement in ordering routine laboratory and screening procedures would help ensure that, by the time patients are seen by the doctor, a number of recommended screening procedures have been done.

Despite the adaptation of ADA standards of diabetes care at our centre, this study showed that a large number of patients were not achieving the recommended treatment targets. Further studies are needed to find out the causes of the gap between guidelines and practice and help in identifying the barriers to optimal diabetes care. using a diabetes flow-sheet, which includes all the required targets of

References

1. Guariguata L, Whiting DR, Hambleton I, Beagley J, Linnenkamp U, Shaw JE (2014). Global estimates of diabetes prevalence for 2013 and projections for 2035, Diabetes Res Clin Pract 103(2):137-49.
1. International diabetes federation (IDF) (2013) IDF Diabetes atlas. edn.6, International diabetes federation, Brussels, Belgium, Europe.
2. Kadiki OA, Roaeid RB (2001) Prevalence of diabetes mellitus and impaired glucose tolerance in Benghazi Libya, Diabetes Metab 27(6), 647–654.
3. World Health Organization (2012) STEPwise surveillance of noncommunicable disease risk factors in the Eastern Mediterranean region, Available at: http://bit.ly/126n6Z1 (accessed 7.6.2013).
4. Stratton IM, Adler AI, Neil HA, et al(2000) Association of glycaemia with macrovascular and microvascular complications of type 2 diabetes (UKPDS 35): prospective observational study, BMJ 321,405–12.
5. Forbes JM, Cooper ME (2013) Mechanisms of diabetic complications, Physiol Rev 93(1), 137-88.
6. Brown JB, Pedula KL, Bakst AW(1999) The progressive cost of complications in type 2 diabetes mellitus, Arch Intern Med 159,1873–1880
7. da Rocha Fernandes J, Ogurtsova K, Linnenkamp U, et al(2016) IDF Diabetes Atlas estimates of 2014 global health expenditures on diabetes, Diabetes Res Clin Pract 117,48–54.
8. Seuring T, Archangelidi O, Suhrcke M(2015) The economic costs of type 2 diabetes: a global systematic review, Pharmacoeconomics 33, 811–311.
9. American Diabetes Association (2013) Economic costs of diabetes in the U.S. in 2012, Diabetes Care 36,1033–46.

10. Preis SR, Pencina MJ, Hwang SJ, et al(2009) Trends in cardiovascular disease risk factors in individuals with and without diabetes mellitus in the Framingham Heart Study, Circulation 120(3), 212–220.
11. Lorber D(2014) Importance of cardiovascular disease and risk management in patients with type 2 diabetes mellitus, Diabetes Metab Syndrome Obes 7, 169–183.
12. The Diabetes Control and Complications Trial Research Group(1993). The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus, N Engl J Med 329, 977-986.
13. UK Prospective Diabetes Study (UKPDS) Group(1998) Intensive blood-glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS 33), Lancet 352, 837-853.
14. UK Prospective Diabetes Study (UKPDS) Group(1998) Tight blood pressure control and risk of macrovascular and microvascular complications in type 2 diabetes: 38, BMJ 317, 703-713.
15. Costa J, Borges M, David C, Carneiro AV(2006) Efficacy of lipid lowering drug treatment for diabetic and non-diabetic patients: meta-analysis of randomised controlled trials, BMJ 332, 1115-1124.
16. S. M. Marshal and A. Flybjerg(2006) "Prevention and early detection of vascular complications of diabetes", BMJ 333, 475–480.
17. Mayfield JA, Reiber GE, Sanders LJ, Janisse D, Pogach LM (1998) Preventive foot care in people with diabetes, Diabetes Care 21(12), 2161–2177
18. Gross JL, De Azevedo MJ, Silveiro SP, Canani LH, Caramori ML, Zelmanovitz T(2005) Diabetic nephropathy: diagnosis, prevention, and treatment, Diabetes Care 28,164-176.
19. Bragge P, Gruen RL, Chau M, Forbes A, Taylor HR(2011) Screening for presence or absence of diabetic retinopathy: a meta-analysis, Arch Ophthalmol 129, 435–444
20. American Diabetes Association (2017) American Diabetes Association Standards of Medical Care in Diabetes – 2017, Diabetes Care 40 (sup 1),S1-S138
21. Grant RW, Buse JB, Meigs JB(2005) Quality of Diabetes Care in U.S. Academic Medical Centers: Low rates of medical regimen change, Diabetes Care 28,337–442
22. Cooper JG , C laudi T , J enum AK , T hue G , H ausken MF , Ingskog W , et al (2009) Quality of care for patients with type 2 diabetes in primary care in Norway is improving: Results of cross-sectional surveys of 33 general practices in 1995 and 2005, Diabetes Care 32 , 81 – 3
23. Laxy, M., Knoll, G., Schunk, M., Meisinger, C., Huth, C. and Holle, R. (2016) Quality of Diabetes Care in Germany Improved from 2000 to 2007 to 2014, But Improvements Diminished since 2007. Evidence from the Population-Based KORA Studies, PLoS ONE 11(10), e0164704.
24. Alhyas L, McKay A, Balasanthiran A, Majeed A(2011) Quality of type 2 diabetes management in the states of the Co-operation Council for the Arab States of the Gulf: a systematic review, PLoS One 6(8), e22186.
25. Cagliero E, Levina EV, Nathan DM(1999) Immediate feedback of HbA1c levels improves glycemic control in type 1 and type 2 diabetic patients, Diabetes Care 11,1785.

26. Larsen ML, Hørder M, Mogensen EF(1990) Effect of long-term monitoring of glycosylated hemoglobin levels in insulin-dependent diabetes mellitus, N Engl J Med 323, 1021–5.
27. Yang S, Kong W, Hsue C, Fish AF, Chen Y, Guo X, et al (2016) Knowledge of A1c Predicts Diabetes Self-Management and A1c Level among Chinese Patients with Type 2 Diabetes, PLoS ONE 11(3), e0150753.
28. Badawi D, Saleh S, Natafgi N, Mourad Y, Behbehani K(2015) Quality of type II diabetes care in primary health care centers in Kuwait: employment of a diabetes quality indicator set (DQIS), PLoS One. 10(7), e0132883.
29. Akel M, Hamadeh G(1999) Quality of diabetes care in a university health centre in Lebanon, Int J Qual Health Care 11, 517-21.
30. Kharal M, Al-Hajjaj A, Al-Ammri M, Al-Mardawi G, Tamim HM, Salih SB, et al(2010) Meeting the American Diabetic Association standards of diabetic care, Saudi J Kidney Dis Transpl 21(4), 678-685.
31. Al-Elq, A.H. (2009) Current Practice in the Management of Patients with Type 2 Diabetes Mellitus in Saudi Arabia, Saudi Medical Journal30, 1551-1556.
32. Alhyas L, Cai Y, Majeed A(2012) Type 2 diabetes care for patients in a tertiary care setting in UAE: a retrospective cohort study, JRSM Short Rep 3(10), 67.
33. Al-Hussein, FA(2007) Diabetes control in a primary care setting: a retrospective study of 651 patients, Ann Saudi Med 28(4),267–271.
34. Saydah SH, Fradkin J, Cowie CC(2004) Poor control of risk factors for vascular disease among adults with previously diagnosed diabetes, JAMA 291(3), 335-42.
35. Turner RC, Cull CA, Frighi V, Holman RR(1999) Glycemic control with diet, sulfonylurea, metformin, or insulin in patients with type 2 diabetes mellitus: progressive requirement for multiple therapies (UKPDS 49). UK Prospective Diabetes Study (UKPDS) Group, JAMA 281, 2005-2012
36. Schmittdiel JA, Uratsu CS, Karter AJ, Heisier M, Subramanian U, Mangione CM et al(2008) Why don't diabetes patients achieve recommended risk factor targets? Poor adherence versus lack of treatment intensification, J Gen Intern Med 23, 588-594.
37. TRIAD Study Group (2010) Health systems, patient factors, and quality of care for diabetes: a synthesis of findings from the TRIAD study, Diabetes Care 33 (4), 940–947.
38. 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.
39. UK Prospective Diabetes Study Group(1998) Tight blood pressure control and risk of macrovascular and microvascular complications in type 2 diabetes. UKPDS 38, BMJ 317, 703-13.
40. ACCORD Study Group, Cushman WC, Evans GW, et al(2010) Effects of intensive blood-pressure control in type 2 diabetes mellitus, N Engl J Med 362 (17),1575–1585
41. Al-Mandhari A, Al-Zakwani I, El-Shafie O, Al-Shafaee M, Woodhouse N(2009) Quality of diabetes care: A cross-sectional observational study in Oman, Sultan Qaboos Univ Med J 9(1), 32-6.

	No. (%)		No. (%)
Weight	543(86.5)	Total cholesterol	393 (62.6)
BMI	370(58.9)	Triglyceride	404 (64.3)
Systolic blood pressure	569 (90.6)	LDL-C	312 (49.7)
Diastolic blood pressure	569 (90.6)	HDL –C	311 (49.5)
Fasting Blood Glucose	519 (82.6)	Urea & / or creatinine	319 (50.8)
HbA1c	371 (59.1)	Microalbuminuria	43(6.8)
Total cholesterol	393 (62.6)	annual funds	20 (3.2)

Table 1: The aspect of care for whom data was documented in medical records in last visit

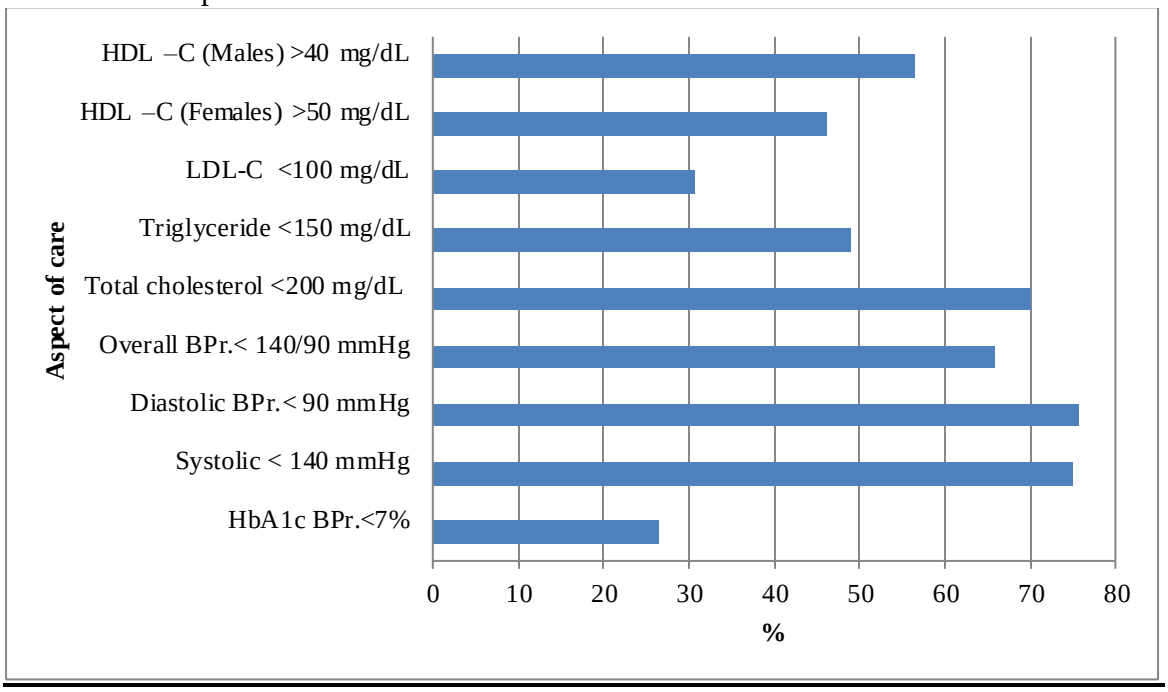

Figure 1: Proportion of patients with type 2 diabetes mellitus patients reaching the ADA standards of medical care in diabetes at TMC.