

Control of Cardiovascular Risk Factors among People with Diabetes: Evaluation Revisited

Jameel Nasser, MD, MSc* Ahmed Omran, MD*

Objective: To assess control of hyperglycemia, hypertension and dyslipidemia among patients attending diabetes clinic in 2014 compared to 2005.

Design: A Cross-Sectional Study.

Setting: Primary Health Center, Ministry of Health, Bahrain.

Method: Medical records of patients attending diabetes clinic from 1 September 2014 to 31 December 2014 were reviewed. Data documented were age, sex, diabetes duration, Body Mass Index (BMI), smoking, glycated hemoglobin (A1C), oral hypoglycemic drugs and insulin regimen, blood pressure, antihypertensive drugs, lipids profile and statin type.

Result: Three hundred seventy patients' records were reviewed. One hundred-thirty (35.1%) patients were males. Two hundred four (55.1%) patients were having diabetes for more than or equal to 15 years. Glycated hemoglobin <53 mmol/l was achieved in 92 (24.9%) patients in 2014 compared to 134 (20.4%) patients in 2005 (P-Value=0.1).

Blood pressure ≤130/80 was achieved in 126 (34.1%) patients in 2014 compared to 137 (13.7%) patients in 2005 (P-value <0.0001). Low Density Lipoproteins <2.6 mmol/l was achieved in 301 (81.4%) patients in 2014 compared to 120 (12%) patients in 2005 (P-value <0.0001).

Conclusion: Significant improvements have been observed in control of the studied CV risk factors in 2014. However, control of hyperglycemia remains a challenge and needs to be improved.

Bahrain Med Bull 2016; 38(1): 15 - 17

Cardiovascular (CV) complications are by far the leading cause of death among people with diabetes. Cardiovascular mortality is common in both type 1 and type 2 and the rate increases when hyperglycemia is uncontrolled¹. On the other hand, multifactorial intervention to control CV risk factors has been consistently shown to reduce CV mortality²⁻⁴. In addition, control could lead to economical benefits and reduced costs⁵. Unfortunately, control of CV risk factors remains suboptimal despite the introduction of many new medications in the last few years^{6,7}.

In Bahrain, studies performed in the last ten years have shown suboptimal control^{8,9}. However, these studies were relatively old, and there are no studies that assess and compare the progress of care given to these patients over the last decade.

The aim of this study is to assess and compare control of CV risk factors (namely: hyperglycemia, hypertension, and dyslipidemia) among people with diabetes attending a diabetes clinic in a primary care setting.

METHOD

Medical records of diabetic patients attending diabetes clinic in health center were reviewed from 1 September 2014 to 31 December 2014. The following were excluded: patients with type 1 diabetes, less than three visits in the last 12 months, had no glycated hemoglobin (A1C), no blood pressure (BP) and lipids profile (total cholesterol, Low-Density Lipoproteins (LDL), Triglycerides) in the last 12 months. American Diabetes Association (ADA) guidelines were used to define control¹⁰.

These data were compared with data published earlier⁹. Data were analyzed using SPSS version 20. P-value <0.05 were considered statistically significant.

RESULT

A total of 370 patients' medical records were reviewed. Personal characteristics of these patients are shown in table 1.

Table 1: Patients' Characteristics (2014)

Personal Characteristics	Number (%)
Gender	Males 130 (35.1%)
	Females 240 (64.9%)
Total	370 (100%)
Smoking	Yes 20 (5.4%)
	No 323 (87.3%)
Missing Data	27 (7.3%)
Total	370 (100%)
Diabetes Duration (years)	<5 22 (6%)
	5-<10 85 (23%)
	10-<15 60 (16.2%)
	15-<20 39 (10.5%)
	≥20 164 (44.3%)
Total	370 (100%)
Body Mass Index (kg/m ²)	<25 14 (3.8%)
	25-29.9 60 (16.2%)
	30-34.9 77 (20.8%)
	35-39.9 43 (11.6%)
	≥40 176 (47.6%)
Total	370 (100%)

* Consultant Family Physician
Primary Care Health Center
Kingdom of Bahrain
Email: jnasser66@yahoo.com

Two hundred forty (64.9%) patients were females. Two hundred three (54.9%) patients had diabetes for ≥ 15 years, and 176 (47.6%) patients were morbidly obese (BMI ≥ 40 kg/m²).

Glycated hemoglobin < 53 mmol/mol (7%) was achieved in 92 (24.9%) patients. Comparison between A1C in 2005 and 2014 is depicted in table 2.

Table 2: HbA1C Level in 2005 and 2014

HbA1C mmol/mol (%)	2005, N (%)	2014, N (%)	P-Value
< 53 (7%)	134 (20.4%)	92 (24.9%)	
≥ 53	522 (79.6%)	278 (75.1%)	0.1003
Total	656** (100%)	370 (100%)	
< 64 (8%)	243 (37%)	227 (61.4%)	
≥ 64	413 (63%)	143 (38.6%)	< 0.0001
Total	656** (100%)	370 (100%)	
< 75 (9%)	332 (50.6%)	312 (84.3%)	
≥ 75	324 (49.4%)	58 (15.7%)	< 0.0001
Total	656** (100%)	370 (100%)	
< 86 (10%)	430 (65.5%)	349 (94.3%)	
≥ 86	226 (34.5%)	21 (5.7%)	< 0.0001
Total	656** (100%)	370 (100%)	

**missing data for 340 patients

The table shows that while there was no statistically significant difference in those who achieved A1C < 53 mmol/mol; fewer patients had higher A1C in 2014 compared to 2005.

Three hundred thirteen (84.6%) patients used insulin. Basal-bolus regimen was used in 143 (38.6%) patients while premixed was used in 52 (14%) patients. Insulin Glargine was used by 246 (66.5%) patients.

Co-morbid hypertension was present in 270 (73%) patients. BP $< 140/90$ was achieved in 256 (69.2%). However, only 126 (34%) patients had BP $\leq 130/80$.

Angiotensin-Converting Enzyme Inhibitors and Angiotensin Receptor Blockers were used in 158 (42.7%) and 124 (33.5%) patients, respectively. Distribution of the antihypertensive drugs used by the studied patients is shown in figure 1.

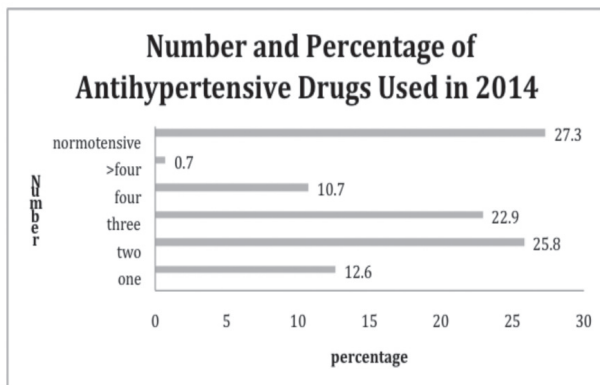


Figure 1: Antihypertensives Used

Less than 15% needed monotherapy. On the other hand, 127 (34.3%) patients needed three or more drugs to control their BP, see figure 1.

Statins were used by 362 (97.8%) patients. LDL < 2.6 mmol/l was achieved in 301 (81.4%) patients. Moderate to high-intensity statins were used in 311 (84%). BP and lipids parameters control in 2005 study is depicted in table 3.

Table 3: BP and Lipids Control in 2005 and 2014

Parameter	2005, N (%)	2014, N (%)	P-Value
BP $\leq 130/80$	137 (13.8%)	126 (34%)	
BP $> 130/80$	859 (86.2%)	244 (66%)	< 0.0001
Total	996 (100%)	370 (100%)	
Total cholesterol < 5.3 mmol/l	377 (37.9%)	340 (91.9%)	
Total cholesterol ≥ 5.3	619 (62.1%)	30 (8.1%)	< 0.0001
Total	996 (100%)	370 (100%)	
LDL < 2.6 mmol/l	120 (12%)	300 (81.1%)	
LDL ≥ 2.6	876 (88%)	70 (18.9%)	< 0.0001
Total	996 (100%)	370 (100%)	
Triglycerides < 1.8 mmol/l	376 (37.8%)	256 (69.2%)	
Triglycerides ≥ 1.8	620 (62.2%)	114 (30.8%)	< 0.0001
Total	996 (100%)	370 (100%)	

The table shows significant improvement in the control of BP and all lipids parameters in 2014 compared to 2005.

DISCUSSION

The study shows that significant improvements in control of hypertension and lipids profile was achieved in 2014. However, the number of patients that achieved A1C < 53 mmol/mol was not significantly improved despite an overall improvement in A1C level.

Ninety-two patients achieved A1C < 53 mmol/mol in 2014. The control level is not statistically significant compared to the previous study⁹. This could be due to insulin, which was used in 84.6% of patients in 2014 compared to 17.4% in 2005 and longstanding diabetes.

The duration of diabetes correlates with the achievement of A1C < 53 as found in a recent study⁷. The rate of control achieved in this study was superior to recent studies in patients using insulin^{11,12}. The presence of diabetes complications is likely in this cohort due to longstanding diabetes. In addition, the risk of hypoglycemia is high due to insulin therapy [more than one-third were on the complex regimen (basal-bolus)]. Recent guidelines stress on individualization of target A1C based on several patients' factors including risk for hypoglycemia, life expectancy, diabetes duration and presence of established diabetes complications¹³⁻¹⁵.

Blood pressure control was significantly better in 2014 than 2005. However, only 34% achieved BP $\leq 130/80$ in 2014. Target blood pressure among diabetics remains controversial among different guidelines. In 2014, ADA recommended that BP goal should be $< 140/80$ and $< 130/80$ if it could be achieved without adverse effect¹⁰. In 2015, the target was set to $< 140/90$ in line with Joint National Committee guidelines^{14,16}. However, the US and Canadian guidelines still recommend the previous target ($< 130/80$)^{17,18}. The latter recommendation is based mainly on data from the clinical trial "ACCORD" which showed significant lower risk of stroke in patients who achieved

systolic BP <120. However, the beneficial effect was at the cost of significantly increased rates of serious adverse drug-related effects¹⁹. An achievement of <130/80 is very difficult in real practice. In this study, 33.6% of patients were on 3 or more drugs, only 34% had achieved this goal. On the other hand, 69.2% had achieved the <140/90 target. Relaxation of the target led to a substantial increase in BP goal achievement in a recent study²⁰.

There is a significant improvement in total cholesterol and LDL control in 2014 compared to 2005 as shown in table 3. This is attributed to a substantial increase in the use of statins (97.8% compared to 31.7% in 2005). In addition, most patients were on moderate to high-intensity statins which is consistent with the current recommendations²¹. However, Stone et al and ADA guidelines did not specify LDL target and recommend that treatment should be based on a calculated CV risk^{14,21}. This approach had been heavily criticized because of the existence of a direct relationship between LDL level and CV risk²². Target approach is still recommended by other guidelines¹⁸.

CONCLUSION

Significant improvements have been observed in control of the studied CV risk factors in 2014. However, control of hyperglycemia remains a challenge and needs to be improved.

Author Contribution: All authors share equal effort contribution towards (1) substantial contribution to conception and design, acquisition, analysis and interpretation of data; (2) drafting the article and revising it critically for important intellectual content; and (3) final approval of manuscript version to be published. Yes.

Potential Conflicts of Interest: None.

Competing Interest: None. **Sponsorship:** None.

Submission Date: 26 December 2015.

Acceptance Date: 24 January 2016.

Ethical Approval: Approved by Health Center Council, Ministry of Health, Bahrain.

REFERENCES

- An Y, Zhang P, Wang J, et al. Cardiovascular and All-Cause Mortality over a 23-Year Period among Chinese with Newly Diagnosed Diabetes in the Da Qing IGT and Diabetes Study. *Diabetes Care* 2015; 38(7):1365-71.
- Gaede P, Lund-Andersen H, Parving HH, et al. Effect of a Multifactorial Intervention on Mortality in Type 2 Diabetes. *N Engl J Med* 2008; 358(6):580-91.
- Holman RR, Paul SK, Bethel MA, et al. 10-Year Follow-Up of Intensive Glucose Control in Type 2 Diabetes. *N Engl J Med* 2008; 359(15):1577-89.
- Yang Y, Yao JJ, Du JL, et al. Primary Prevention of Macroangiopathy in Patients with Short-Duration Type 2 Diabetes by Intensified Multifactorial Intervention: Seven-Year Follow-Up of Diabetes Complications in Chinese. *Diabetes Care* 2013; 36(4):978-84.
- Shi L, Ye X, Lu M, et al. Clinical and Economic Benefits Associated with the Achievement of Both HbA1c and LDL Cholesterol Goals in Veterans with Type 2 Diabetes. *Diabetes Care* 2013; 36(10):3297-304.
- Shivashankar R, Kirk K, Kim WC, et al. Quality of Diabetes Care in Low- and Middle-Income Asian and Middle Eastern Countries (1993-2012): 20-Year Systematic Review. *Diabetes Res Clin Pract* 2015; 107(2):203-23.
- Ji LN, Lu JM, Guo XH, et al. Glycemic Control among Patients in China with Type 2 Diabetes Mellitus Receiving Oral Drugs or Injectables. *BMC Public Health* 2013; 13:602.
- Fikree M, Hanafi B, Hussain Z et al. Glycemic Control of Type 2 Diabetes Mellitus. *Bahrain Med Bull* 2006; 28(3):105-7.
- Nasser J. Evaluation of Diabetes Care in a Primary Care Setting. *Bahrain Medical Bulletin* 2007; 29(2): 45-9.
- American Diabetes Association. Standards of Medical Care in Diabetes. *Diabetes Care* 2014; 37(1):S14-S80.
- Alonso-Fernández M, Mancera-Romero J, Mediavilla-Bravo JJ, et al. Glycemic Control and Use of A1c In Primary Care Patients with Type 2 Diabetes Mellitus. *Prim Care Diabetes* 2015; 9(5):385-91.
- Lin SD, Tsai ST, Tu ST, et al. Glycosylated Hemoglobin Level and Number of Oral Antidiabetic Drugs Predict Whether or not Glycemic Target is Achieved in Insulin-Requiring Type 2 Diabetes. *Prim Care Diabetes* 2015; 9(2):135-41.
- Fox CS, Golden SH, Anderson C, et al. Update on Prevention of Cardiovascular Disease in Adults with Type 2 Diabetes Mellitus in Light of Recent Evidence: A Scientific Statement from the American Heart Association and the American Diabetes Association. *Diabetes Care* 2015; 38(9):1777-803.
- American Diabetes Association. Standards of Medical Care in Diabetes. Cardiovascular Disease and Risk Management. *Diabetes Care* 2015; 38(1): S49-57.
- Cahn A, Raz I, Kleinman Y, et al. Clinical Assessment of Individualized Glycemic Goals in Patients with Type 2 Diabetes: Formulation of an Algorithm Based on a Survey among Leading Worldwide Diabetologists. *Diabetes Care* 2015; 38(12):2293-300.
- James PA, Oparil S, Carter BL, et al. 2014 Evidence-Based Guideline for the Management of High Blood Pressure in Adults: Report from the Panel Members Appointed to the Eighth Joint National Committee (JNC 8). *JAMA* 2014; 311(5):507-20.
- Daskalopoulou SS, Rabi DM, Zarnke KB, et al. The 2015 Canadian Hypertension Education Program Recommendations for Blood Pressure Measurement, Diagnosis, Assessment of Risk, Prevention, and Treatment of Hypertension. *Can J Cardiol* 2015; 31(5):549-68.
- Garber AG, Abrahamson MJ, Barzilay JI, et al. AACE/ACE Comprehensive Diabetes Management Algorithm 2015. *Endocr Pract* 2015; 21(4):438-47.
- Cushman WC, Evans GW, Byington RP, et al. Effects of Intensive Blood-Pressure Control in Type 2 Diabetes Mellitus. *N Engl J Med* 2010; 362(17):1575-85.
- Navar-Boggan AM, Pencina MJ, Williams K, et al. Proportion of US Adults Potentially Affected by the 2014 Hypertension Guideline. *JAMA* 2014; 311(14):1424-9.
- Stone NJ, Robinson JG, Lichtenstein AH, et al. 2013 ACC/AHA Guideline on the Treatment of Blood Cholesterol to Reduce Atherosclerotic Cardiovascular Risk in Adults: A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *J Am Coll Cardiol* 2014; 63(25 Pt B):2889-934.
- Raymond C, Cho L, Rocco M, Hazen SL. New Cholesterol Guidelines: Worth the Wait? *Cleve Clin J Med* 2014; 81(1):11-9.