Sub-Optimal Management of Type 2 Diabetes Mellitus – A Local Audit

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Keywords: management of diabetes

Abstract

Background: Despite increased awareness of risk factors for coronary artery disease and randomized trial data supporting comprehensive diabetic care, these risk factors continue to be largely ignored in patients with type 2 diabetes mellitus.

Objective: Cross-sectional study to determine the level of control in patients with type 2 diabetes in tertiary diabetes clinics.

Methods: Patient demographic, diabetes and cardiovascular disease related (CVD) data was collected from 150 (F:M; 98:52) randomly selected patients with type 2 diabetes mellitus attending the diabetes clinics at the three academic teaching hospitals served by the University of the Witwatersrand. Blood pressure, height, weight, body mass index and waist circumference were measured. Glycated haemoglobin and fasting serum lipid levels were obtained from patient records. Black patients contributed 68%, White 12, 7%, Indian 10, 7% and Coloured 8, 7%.

Results: Mean HbA_{1c} for the whole cohort was 8, 7%. Obesity was present in 37, 3%, hypercholesterolaemia in 29, 3% and hypertriglyceridaemia in 45, 3%. Waist circumference was ≥ 80 cm in 98% of the females and ≥ 94 cm in 69% of the males. 127 patients out of 150 (85%) were hypertensive and 74% of these had a systolic blood pressure ≥ 130 mmHg and 84% a diastolic blood pressure ≥ 80 mmHg. 43% of the patients did minimal exercise, 6% smoked and only 51% were on aspirin.

Conclusion: Comprehensive diabetic care is still largely lacking despite clinical trial data documenting improved outcomes associated not only with glycaemic control but also with use of antihypertensive, lipid lowering and anti-platelet therapy.

JEMDSA 2009;14(1):13-16

Introduction

Morbidity from diabetes is a consequence of both microvascular and macrovascular disease and atherosclerosis remains the most important cause of morbidity and mortality in patients with type 2 diabetes mellitus.[1] The Society for Endocrinology, Metabolism and Diabetes of South Africa (SEMDSA) published guidelines in 2003 for type 2 diabetes care. These guidelines have clear recommendations for glycaemic control, blood pressure and lipid goals as well as recommendations for the use of aspirin.[2]

The risk of stroke and heart disease is two to four times higher for people with diabetes. As cardiovascular disease is the ultimate cause of death in the overwhelming majority of patients with diabetes, blood pressure, lipid, anti-platelet therapy and avoidance of smoking are critical components of care. Substantial reduction in morbidity and mortality can be achieved with aggressive treatment of hypertension, dyslipidaemia, smoking cessation and daily low-dose aspirin for most patients with type 2 diabetes.[3]

In 1996 a study conducted at the Johannesburg Hospital concluded that the management of type 2 diabetes at the diabetes clinics was largely confined to the control of hyperglycaemia.[4] SEMDSA estimates the prevalence of type 2 diabetes mellitus in South Africa to be approximately 13% in the Indian, 3% in the European and 5-8% in the African population groups.[5]

The major aim of this study was to determine the number of diabetes patients reaching the recommended blood pressure, lipid and glycaemic goals as well as to establish the prevalence of obesity in patients attending our diabetes clinics.

Subjects and Methods

The study was conducted between September 2006 and June 2007. The sample of 150 patients was calculated with the assistance of a biostatistician. Height, weight, waist circumference and blood pressure were measured and glycated heamoglobin (HbA_{1c}) and fasting lipograms were obtained from patient records, on a random sample of type 2 diabetes patients aged 35 years and older attending the diabetes clinics at the three academic hospitals served by the University of the Witwatersrand namely: Johannesburg, Helen Joseph and Chris Hani Baragwanath. The sister in charge on a given day was provided with a letter stating the aims of the study and invitation to

participate. The sister was requested to randomly pick ten patient files. If the patients chosen met the inclusion criteria and were willing to participate they were provided with a patient information sheet and referred to the doctor in charge of the study.

Blood pressure measurements were done in triplicate by a single observer in accordance with the latest South African Hypertension Guidelines and The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC VII).[6,7] Systolic blood pressure of less than 130 mmHg and diastolic blood pressure of less than 80 mmHg (provided no proteinuria was present) were used for blood pressure goals as recommended by the Society for Endocrinology, Metabolism and Diabetes of South Africa (SEMDSA).

Height was measured with the patient barefoot with his/her back against the wall in accordance with the guidelines for prevention and management of obesity in South Africa.[8] Weight was measured with a standard, calibrated scale.

Waist circumference was measured with an individual in an upright position, in a horizontal plane mid-way between superior iliac crest and the rib cage in the mid-axillary line, at the end of normal expiration. The International Diabetes Federation (IDF) correlates were used to define the Metabolic Syndrome.[9] Central obesity was defined as waist circumference greater or equal to 94 cm in males and 80 cm in females.

Body Mass Index (BMI) was calculated using the Quetelet's formula-weight (kg)/height^2 and obesity and overweight was defined using the World Health Organization (WHO) classification.

Fasting serum lipograms and glycated haemolglobin using the Tina-Quant Hemoglobin A_{1c} II immunological assay were also measured. SEMDSA guidelines for type 2 diabetes were obtained from patient records not also measured. A HbA_{1c} of < 7% was considered optimal, 7-8% acceptable, and > 8% sub-optimal requiring additional action. The ideal recommended fasting lipid profile for a diabetes is a total serum cholesterol of < 5, 0 , and LDL cholesterol of < 2, 5, and HDL cholesterol of > 1, 2 and serum total triglycerides level of < 1, 5 mmol/l. The LDL cholesterol level of < 2, 5 mmol/l was adopted from the South African Heart Association guidelines in view of the fact that current literature supports that lower LDL cut-off may be appropriate. [10,11]

The study was approved by the Human Research Ethics Committee of the University of the Witwatersrand.

Data collected on the patient data sheet was tabulated using Microsoft Office Excel 2003. Estimation of the sample size was done assuming that LDL-cholesterol is normally distributed in the population. A significance level of 5%, precision 0,92 and standard deviation 5,78 was calculated using the 1996 study. Descriptive statistics were used to describe and analyze the data. Means were calculated for age, duration of diabetes, BMI, systolic and diastolic blood pressure, total cholesterol, HDL-cholesterol, LDL-cholesterol, triglycerides and HbA_{1c}. Percentage of patients meeting the recommended goals for HbA_{1c}, BMI, waist circumference, blood pressure and lipids were also calculated. In addition, calculations looking at the percentage of patients following a diabetic diet, smoking trends, lipid-lowering therapy usage in the three hospitals including its relation to achieving lipid targets, exercise trends (leisure activity), and aspirin usage were done. Statistical program used was Stata 10.[12]

Results

One hundred and fifty patients were collected from the three hospitals (each hospital contributing one third of the total). The sample included 102 (68%) Black patients, 13 (8, 7%) Coloured patients, 16 (10, 7%) Indian patients and 19 (12, 7%) White patients. Ninety eight were females (65%) and fifty two were males (35%). The mean age of the patients was 59, 8 years (SD 10, 77) - (table 1)

Table 1: Demographic data for the study cohort (n=150)

Variable	Mean	Std Dev
Age (years)	59.85	10.77
Waist circumference (cm)	101.18	13.51
Height (cm)	113.39	78.51
Weight (kg)	80.24	18.14
Body Mass Index (kg/m^2)	29.19	6.56
Systolic Blood Pressure (mmHg)	142.91	23.37
Diastolic Blood Pressure (mmHg)	78.24	10.99
Total Cholesterol (mmol/l)	4.49	1.54
Triglycerides (mmol/l)	1.56	0.93
High Density Cholesterol (mmol/l)	1.09	0.37
Low Density Cholesterol (mmol/l)	2.59	1.03
Glycated Haemoglobin (%)	8.72	2.73
Gender: Males/Females- 52/98		

68% Black patients, 12,7% White patients, 10,7% Indian patients and 8,7% Coloured

Mean HbA_{1c} for the 150 patients was 8, 7% (± 2, 7). Only forty six patients (30, 7%) had an HbA_{1c} < 7%.Twenty one patients (14%) had an acceptable HbA_{1c} of 7-8% and 83 patients (55, 3%) had an unacceptable HbA_{1c} (>8%).

Mean waist circumference was 101, 2 cm (± 13, 5). In the sample of 98 female patients only two had a waist circumference of < 80 cm. Out of 52 males 36 (69%) had a waist circumference ≥ 94 cm. Only 41 patients (27, 3%) had an ideal BMI < 25 kg/m^2, 53 patients (35, 3%) were overweight with a BMI between 25-29, 9 kg/m^2 and 56 patients (37, 3%) were obese with a BMI ≥ 30 kg/m^2.

Of the 150 patients, 127 (84, 7%) were known to have hypertension and were on treatment. The mean SBP in the hypertensive group was 142, 9 mmHg (± 23, 4) and DBP 78, 24 mmHg (± 10, 9). Of these, 100 (78, 7%) had a systolic blood pressure (SBP) ≥ 130 mmHg and 76 (59, 8%) had a diastolic blood pressure (DBP) ≥ 80 mmHg.

Mean serum total cholesterol was 4, 5 mmol/l (± 1, 5). One hundred and six patients (70, 7%) had a total cholesterol < 5 mmol/l. The mean total serum triglycerides value was 1, 6 mmol/l (± 0, 9). Eighty two patients (54, 7%) had a triglyceride level of < 1, 5 mmol/l, thus meeting the SEMDSA recommendations. Only 44 patients (29, 3%) were above the recommended HDL level of 1,2 mmol/l. Mean low density lipoprotein cholesterol (LDL) level was 2, 6 mmol/l (± 1, 03). Only seventy five patients (50, 7%) had LDL cholesterol of < 2, 5 mmol/l.

Leisure activity of the diabetic patients in the cohort was briefly looked at. 65 patients (43%) exercised minimally if at all, 32 patients exercised seven days per week (21, 3%) and 53 (35, 3%) exercised less than the recommended seven days per week.

In the SEMDSA guidelines aspirin is recommended as a secondary prevention strategy in individuals with evidence of macrovascular disease. In the current study 32 patients (21, 3%) had clinical evidence of large vessel disease but only 14 out of those 32 patients were not on aspirin.

Further analysis of the data showed that 17 patients (12%) were not following a diabetic diet despite the demonstrated benefit. 123 (82%) of the patients included in the sample denied smoking on direct questioning. 9 (6%) of the patients were current smokers and 18 (12%) were ex-smokers.

Discussion

The Society for Endocrinology, Metabolism and Diabetes of South Africa (SEMDSA) publish guidelines for management of type 2 diabetes.[2] These guidelines give clear recommendations as to the glycaemic, blood pressure and lipid targets in type 2 diabetes patients. The guidelines also provide us with clear management plan that one should adopt in order to achieve these targets. In addition to glucose, blood pressure and lipid treatment recommendations, the guidelines also emphasize aspirin and the importance of patient education and nutritional counselling. Diabetes Mellitus was considered to be a rare disease in sub-Saharan Africa up to the early 1960s but over the past few decades it has emerged as a disease of significant importance.[13,14]

In fact diabetes is now an important cause of morbidity and mortality in Africa.[15]

Prevalence and incidence of cardio vascular disease (CVD) is increased in patients with type 2 diabetes mellitus and diabetes is associated with a two to four fold increase in the risk of developing coronary artery disease (CAD). The Steno-2 study showed that target driven, long term, intensified intervention aimed at multiple risk factors in patients with type 2 diabetes and microalbuminuria can reduce the risk of cardiovascular and microvascular events by about 50%. The aim of this study was to determine how many diabetes patients at our three teaching hospitals, attending our diabetes clinics, are reaching the recommended targets. The results summarised in Table 2, clearly indicate that despite the available evidence, that supports the need for achieving recommended targets, the management of diabetes patients is still largely sub-optimal.

Table 2: Data For The Whole Cohort (N=150).

HbA_{1c} (%) < 7= 30,7% 7-8 = 14% >8 = 55,3%
Waist (cm) F < 80 = 2,0% M <94 = 30,8%
BMI (kg/m²) < 25 = 27,3% 25-29,9 = 35,3% ≥ 30 = 37,3%
Hypertension (mmHg) SBP ≥ 130 = 78,7% DBP ≥ 80 = 59,8%
Total cholesterol (mmol/l) < 5 = 70,7%
Total triglycerides (mmol/l) < 1,5 = 54,7%
HDL cholesterol (mmol/l) > 1,2 = 29,3%
LDL cholesterol (mmol/l) < 2,5 = 50,7%

Obesity remains a major problem in our setting in patients with diabetes. Only (27%) of the patients had a BMI in a normal range. It has previously been argued that obesity is less "harmful" in black women than in other groups. However it is now recognized that obesity defined as a BMI > 30 kg/m², is associated with increased risk of many health problems in all populations. The term "healthy" obesity may therefore no longer be appropriate. Weight loss usually reduces the physical, metabolic and psychological hazards facing overweight and obese individuals. While BMI provides a guide for appropriate weight for height, it does not take into account the effects of distribution of body fat. The amount of intra-abdominal fat is a better predictor of cardiovascular risk, diabetes and other endocrine abnormalities than BMI and waist circumference measurements have been shown to be a good indicator of intra-abdominal fat in adults. Our results also show that ninety eight percent of South African females in the study cohort had a waist circumference above the current recommended 80 cm. Sixty nine percent of males had waist above 94 cm. However one has to be very cautious with the current recommended IDF definition of metabolic syndrome. The figures proposed in the worldwide definition of metabolic syndrome are a guide for people of European and Indian descent. They have not been validated for use in African populations.

Strict blood pressure control is recommended for all type two diabetes patients and the South African guidelines emphasise this. This means that even stage one hypertension (SBP 140-149 and DBP 90-99 mmHg) puts a diabetic patient in the moderate risk group with stage three hypertension (SBP>180 and DBP>110 mmHg) being a very high added risk. Despite these recommendations the majority of patients in our study cohort had poorly controlled hypertension.

Lipid management of type 2 diabetes mellitus and the importance of reaching recommended targets have also been demonstrated in a large number of randomized clinical trials. Since the publication of ATP III, five major trials of statin therapy with clinical end-points have been published. These trials support inclusion of patients with diabetes in the high-risk category and confirm the benefit of LDL-lowering therapy in these patients. In high risk patients the recommended LDL goal is < 2, 6 mmol/l in SEMDSA and less than 2, 5 mmol/l using the South African Heart Association guidelines but in very high risk patients an LDL goal of less than 1, 8 mmol/l is being proposed as a therapeutic option.[11] Our results indicate that the current SEMDSA guidelines recommended targets are still not being met in a significant number of patients.

In summary the improved knowledge of the cardiovascular risk factor identification and management has not been translated into improved diabetes care. Significant number of patients are not reaching the recommended blood pressure, lipid, BMI, waist circumference and glycaemic targets. Emphasis should be placed on education of the doctors working in the diabetes clinics to encourage them to adhere to current SEMDSA guidelines in order to improve the management of the patients at our clinics. Two tertiary care diabetes clinics at Kalafong Hospital in Pretoria underwent a quasi-experimental controlled before-and –after study. The aim of this study was to determine if a physician education programme and a structured consultation schedule would improve the quality of diabetes patient care in a diabetic clinic. The introduction of physician education programme and structured consultation schedule improved the quality of care delivered at the clinics.[16] Positive outcome of this study should encourage implementation of such programme at all diabetes clinics.

It was not an aim of this study to define the reasons for lack of comprehensive care of the diabetes patients at our clinics. There are number of possible reasons. SEMDSA guidelines may not be adhered to due to lack of knowledge of the recommended targets, patient reluctance to comply with treatment, shortage of doctors and busy clinics with inadequate staff. However the above are merely speculations and now that the sub-optimal care has been identified it would be interesting to conduct further studies looking into potential causes.

Acknowledgements:

We would like to acknowledge Professor P Becker, who kindly assisted us with statistical analysis of the data.

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