Original Article

Control to goal of cardiometabolic risk factors among Nigerians living with type 2 diabetes mellitus

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Abstract

Background: Cardiovascular risk factors contribute to morbidity and mortality among diabetic patients. National and international guidelines on management of diabetes therefore emphasize control to goals of blood glucose, blood pressure, dyslipidemia, and obesity so as to minimize the development of complications and enhance the patients' quality of life. **Objective:** To evaluate the status of control to goals of cardiometabolic risk factors among the diabetic patients attending the Diabetes clinic of University of Nigeria Teaching Hospital, Enugu. **Materials and Methods:** A survey of 233 type 2 diabetic patients recruited from the Diabetes clinic of our hospital was carried out. Standard procedures as described in the WHO STEP instrument were used to determine the waist circumference, weight, height, and systolic and diastolic blood pressure. Fasting blood glucose and lipid profiles were also assessed. Therapeutic goals used to define risk or poor control were values adopted by expert groups such as American diabetes association (ADA), National cholesterol education program (NCEP), American association of clinical endocrinologist (AACE) and International diabetes federation (IDF). **Results:** There were 98 males and 135 females with mean (SD) duration of diabetes mellitus (DM) of 6.7 (6.3) years. Suboptimal glycemic, blood pressure control and dyslipidemia were observed in 65.7%, 51.9%, 97.1% of the subjects respectively while 60.1% of the subjects were found to be overweight/obese. Comparing the mean indices of risk factors with the recommended therapeutic goals, status of control was optimal for HDL-cholesterol, waist circumference and triglycerides. All the other risk factors were suboptimal. **Conclusion:** Control to goals of cardiovascular risk factors is poor among the patients. There is the need to identify and tackle the possible contributing factors so as to reduce the morbidity and mortality in these patients.

Key words: Cardiometabolic risk, diabetes mellitus, Nigerians

Introduction

Cardiovascular complications contribute to morbidity and mortality in people suffering from type 2 diabetes mellitus. Diabetes mellitus is counted as a Coronary Heart Disease risk equivalent in Adult Treatment Panel (ATP) III report.[1] National and international guidelines on management of diabetes therefore emphasize control of blood pressure, dyslipidemia, and obesity in addition to glycemic control.[2,3]

Analysis of causes of death among patients admitted into medical wards in urban healthcare centers showed that from the fifth decade, cardiovascular diseases (CVD) replaced infection as a major cause of death.[4] Diabetes, hypertension, dyslipidemia, and obesity are cardiometabolic risk factors which frequently coexist to constitute the metabolic syndrome which has been described not only in Caucasians but also in Nigerians.[5-7]

Cardiovascular diseases have been identified as the major

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causes of morbidity and mortality in the developed nations of the world for the greater part of the 20th century. This trend is increasingly becoming a major health concern in the less developed nations of the world which many years ago were known to be battling with infectious and malnutrition-related diseases.[8,9] This process was dubbed "the epidemiological transition" by Omran and the effect is the double burden of communicable and noncommunicable diseases that now face sub Saharan Africa.[10]

The study was carried out to evaluate the status of control to goals of cardiometabolic risk factors among diabetic patients attending the Diabetes clinic of the University of Nigeria Teaching Hospital (UNTH), Enugu, a tertiary health institution in south-eastern Nigeria.

Materials and Methods

A cross-sectional descriptive survey of 233 type 2 diabetic patients consecutively recruited from the Diabetes clinic of UNTH, Enugu, was carried out. Standard procedures as described in the WHO STEPs instrument were used to determine the waist circumference, weight, height, and systolic and diastolic blood pressure.[11]

Lipid profiles: Total cholesterol was determined using the ferric perchlorate method[12] while HDL-C was determined after precipitation of LDL-C with phosphotungstate and magnesium.[13] LDL-C was calculated from the following formula:

$$LDL\text{-}C = TC - HDL\text{-}C - TG/5.[14]$$

Triglyceride was measured using the colorimetric enzymatic method.[15]

Therapeutic goals used to define poor or optimal control were values recommended by different expert groups such as American Diabetes Association (ADA), National Cholesterol Education Program (NCEP), American Association of Clinical Endocrinologists (AACE), and International Diabetes Federation (IDF).[1-3,16] The following therapeutic goals were used to assess optimal control: Fasting blood glucose (FBG) of 5.0–7.2 mmol/l, systolic blood pressure (SBP) of ≤130 mmHg, diastolic blood pressure (DBP) of ≤80 mmHg, HDL-C of ≤1.15 mmol/l for males and 1.4 mmol/l for females, LDL-C of ≤2.6 mmol/l, total cholesterol (TC) of ≤5.2 mmol/l, triglyceride (TG) of ≤1.7 mmol/l, waist circumference (WC) of ≤94 cm for males and 80 cm for females and Body Mass Index (BMI) of 25.0–29.9 kg/m² for classifying overweight and ≥30.0 kg/m² for obesity.[2]

Test of significance was done using the one sample *t*-test for quantitative variables and Chi-squared test for categorical variables. SPSS v 10 was used to run the analysis. A *P* value of ≤0.05 was regarded as significant.

Results

The group consisted of 98 (42.1%) males and 135 (57.9%) females with mean (SD) duration of diabetes mellitus (DM) of 6.7 (6.3) years. Table 1 shows the summary of the descriptive variables for the group.

Males were older and taller while females had higher mean indices of generalized and central obesity as determined by BMI and waist circumference. Significant gender differences were observed for age, height, waist circumference, hip circumference, and BMI.

Table 2 compares the mean values of the cardiometabolic risk factors with the recommended target goals.

Mean indices of glycemia, blood pressure, obesity, and lipid profile were significantly suboptimal except for WC (*P*<0.05) and HDL-C (*P*>0.05) (both in the males), and insignificant for TG.

Glycemic control was poor in 65.7% of the study subjects, of which 61.5% were females and 38.5% males.

Suboptimal blood pressure control was observed in 121 (51.9%) subjects. A higher proportion (46.6%) of the subjects had suboptimal SBP control compared to 32% who had suboptimal DBP control. Mean SBP and DBP showed significant differences between patients with optimal and suboptimal blood pressure control (117.4 ± 11.2 vs.

Table 1: Summary of clinical characteristics of the subjects

Characteristics	Mean±SD			P value*
	Total (N=233)	Males (N=98)	Females (N=135)	
Age (years)	55.7 ± 11.7	58.6 ± 13.2	53.3 ± 10.0	0.001
Duration of DM (years)	6.7 ± 6.3	7.4 ± 7.2	6.2 ± 5.6	NS
FBG (mmol/l)	10.3 ± 5.4	10.8 ± 0.6	10.0 ± 4.9	NS
SBP (mmHg)	134.6 ± 22.8	133.6 ± 25.2	135.3 ± 20.9	NS
DBP (mmHg)	80.4 ± 21.9	80.1 ± 15.3	80.5 ± 25.7	NS
Weight (kg)	71.2 ± 13.9	69.9 ± 12.7	72.1 ± 14.7	NS
Height (cm)	162.8 ± 10.0	167.1 ± 10.8	159.6 ± 7.9	<0.001
WC (cm)	92.2 ± 12.3	88.8 ± 10.7	94.6 ± 12.8	<0.001
HC (cm)	97.1 ± 11.7	93.6 ± 11.2	99.7 ± 11.4	<0.001
WHR	0.95 ± 0.09	0.95 ± 0.07	.95 ± 0.10	NS
BMI (kg/m²)	27.0 ± 6.2	25.3 ± 24.1	28.3 ± 5.5	<0.001
LDL-C (mmol/l)	3.12 ± 0.90	3.19 ± 1.20	3.08 ± 0.68	NS
TC (mmol/l)	5.30 ± 1.28	5.36 ± 1.63	5.26 ± 1.03	NS
HDL-C (mmol/l)	1.22 ± 0.42	1.17 ± 0.48	1.25 ± 0.37	NS
TG	1.56 ± 0.81	1.82 ± 1.04	1.37 ± 0.55	NS

FBG = Fasting blood glucose, WC = Waist circumference, HC = Hip circumference, WHR = Waist to hip ratio, SBP = Systolic blood pressure, DBP = Diastolic blood pressure, BMI = Body mass index, TC = Total cholesterol, LDL-C = Low density lipoprotein cholesterol, HDL-C = High density lipoprotein cholesterol, TG = Triglyceride. *Test of significant difference between the genders, NS = Not significant (*P*>0.05)

Table 2: Mean values of cardiometabolic risk factors compared to the recommended therapeutic goals

Characteristics	Status of control*	Mean observed value	Test value (recommended therapeutic goal)	P value
Glycemic control				
FBG (mmol/l)	suboptimal	10.3	7.2	<0.001
Blood pressure control				
SBP (mmHg)	suboptimal	134.6	≤130	0.002
DBP (mmHg)	Suboptimal	80.4	≤80	>0.05
Obesity control				
WC (cm)				
M	Optimal	88.8	≤94	<0.001
F	Suboptimal	94.6	≤80	<0.001
BMI (kg/m²)	Suboptimal	27.0	≤24.9	<0.001
Lipid profile				
LDL-C (mmol/l)	Suboptimal	3.12	<2.6	0.002
TC (mmol/l)	Suboptimal	5.30	<5.2	>0.05
HDL-C (mmol/l)				
M	Optimal	1.17	>1.15	>0.05
F	Suboptimal	1.25	>1.4	>0.05
TG (mmol/l)	Optimal	1.56	<1.7	>0.05

*Status of control was based on the mean observed value. FBG = Fasting blood glucose, WC = Waist circumference, HC = Hip circumference, WHR = Waist to hip ratio, SBP = Systolic blood pressure, DBP = Diastolic blood pressure, BMI = Body mass index, TC = Total cholesterol, LDL-C = Low density lipoprotein cholesterol, HDL-C = High density lipoprotein cholesterol, TG = Triglyceride. M = Males, F = Females

150.5 ± 19.0 and 72.9 ± 10.9 vs. 87.3 ± 26.8 mmHg respectively, $P<0.001$).

Dyslipidemia was very common among the subjects studied. A very high proportion (97.1%) of the subjects had at least one suboptimal lipid parameter. This occurred in 60.6% of females and 39.4% of males respectively. A total of 79.4% had mixed dyslipidemia ranging from 2 to 4 abnormal lipid parameters. Abnormal TC, LDL-C, HDL-C, and TG were noted in 38.2%, 73.5%, 61.8%, and 40% of the subjects respectively.

Overweight and obesity were noted in 60.1% of the subjects. Greater numbers (84.4%) of female subjects were identified to be at increased cardiovascular risk from central obesity using the waist circumference. Majority of these females (73.3%) had WC>88 cm; a level at which is regarded to be severe. Only 35.7% of males were exposed to the same risk due to obesity (i.e., WC>94 cm) while 11.2% had WC values >102 cm.

Discussion

We have evaluated how well cardiometabolic risk factors among our diabetic patients are controlled. The results indicated a general poor control to goal of several cardiometabolic risk factors among this group of people suffering from type 2 diabetes mellitus. People suffering from diabetes mellitus are known to be exposed to more cardiovascular risk factors than glucose tolerant individuals. These risk factors contribute significantly to morbidity and mortality.[17] Though the metabolic syndrome has been debated on a lot, the best approach to management still remains tackling the individual components or cardiovascular risk factors identified in any particular individual. No singular treatment modality apart from preventive measures can be applied to these risk factors. Some risk factors such as age, gender, and ethnicity are nonmodifiable; hence focus has been on the modifiable factors.

This study showed that cardiometabolic risk factors were still suboptimally controlled or poor in a high proportion (>50%) of our diabetic patients after a long disease duration. This is similar to a multicenter study of elderly diabetic patients which revealed that >80% of treated patients with diabetes at baseline were not achieving fasting blood glucose goals of ≤6.7 mmol/l (120 mg/dl) after 7 years of follow-up.[18] Our study showed suboptimal glycemic control in about 65% of the subjects. We may have recorded a slightly lower proportion compared to that of Smith *et al.*[18] because our subjects were younger in age. Younger subjects may be better motivated to adhere with follow-up schedules and drug intake than elderly patients. Ageing is likely to reduce the quality of life (QOL) of individuals which in turn may lead to depression especially on a background of chronic ailments many of which remain without cure for now such as diabetes mellitus. The impact of reduced QOL may be seen in its effect on the degree of adherence with therapeutic measures geared toward achieving control to goals. This study however did not consider the effect of disease duration and duration of follow-up of our patients. The use of higher therapeutic goal of 7.2 mmol/l in this study most likely would have contributed to some of the differences too. The difference in proportion may have been widened if a lower threshold was used. On the other hand, age differences may not entirely be responsible. In Trinidad, Ezenwaka and Offiah[19] noted that younger patients with type 2 diabetes had poorer metabolic control and higher prevalence rates of cardiovascular disease risk factors than the elderly patients. This greater risk was not independent of gender and ethnicity. Generally, poor health seeking behaviors may also contribute to poor control among patients. This health seeking behaviors are characterized by lack of understanding of their role in their disease management, poor affordability (poverty) and accessibility of quality healthcare services and lack of use of effective medications/health care facilities.[20-22] Difficulties with readjustment of lifestyles which form the foundation for successful management of non communicable diseases may also play some roles.[23]

Observations on glycemic control in this study should be interpreted with caution as the fasting blood glucose (FBG)

is not quite representative of long term glycemic control which is better assessed by performing glycated hemoglobin (HbA1c). This was not available in our center when the study was carried out.

Conclusion

Cardiometabolic risk factors control was poor among our diabetic patients. The presence of diabetes mellitus is already a serious problem with its attendant complications. In the presence of other comorbidities, exposure to mortality from cardiovascular events is heightened. Greater proactive measures are therefore still required from care providers in other to improve the status of control and in effect, reduce the likely burden of cardiovascular morbidity and mortality among our patients.

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