Internet Journal of Medical Update

Journal home page: http://www.akspublication.com/ijmu

Original Work

Treatment to targets in type 2 diabetics: analysis of out-patients practice at a remote Western Nigerian hospital

Dr. E. A. Ajayi[Ψ] FWACP, Dr. A. O. Ajayi FWACP, and Dr. O. E. Olalekan M.B;B.S

Department of Medicine, Federal Medical Centre, Ido Ekiti, Nigeria

(Received 13 September 2009 and accepted 05 October 2009)

ABSTRACT: Diabetes mellitus (DM) is a leading cause of morbidity and mortality all over the world. Tight control of diabetes in the outpatients will reduce complications and hospitalizations. This study of Nigerian patients with diabetes examined the adequacy of glycemic and BP control in line with current guidelines. A 4 month retrospective analysis of type 2 diabetics attending Medical Outpatients Department (MOPD) of Federal Medical Centre, Ido Ekiti, Ekiti State, Nigeria between June and September 2008 was carried out using medical records of the patients. SPSS 13 software was used to analyze data. Data are expressed as mean ± Standard Deviation (SD) and frequency expressed as a percentage where necessary. A total of 308 type 2 diabetes mellitus patients, aged between 35 and 85 years were analyzed. Their mean age was 60.90 ± 11.60years. There were 125 males (40.6%) and 183 females (59.4%) giving an M: F ratio of 1:1.46. Mean duration of clinic attendance was 26.18 ± 24.46 months. Glycemic control was achieved in only about a third of the patients (29.3% and 32.5% using IDF-Europe and ADA criteria respectively). Blood pressure control was achieved in 24.5% and 48.7% had BMI ≥ 25kg/m2. No correlation between mean fasting plasma glucose (FPG) and body mass index (BMI). Frequencies of insulin and low dose aspirin use were low (5.3% and 37% respectively). The results from this study showed poor control of blood glucose, BP and weight in the patients. We are of the opinion that current practices are not aggressive enough to manage a substantial proportion of type 2 diabetes patients.

KEY WORDS: Diabetes mellitus; Glycemic control; BP control

INTRODUCTION

Diabetes mellitus (DM) is a leading cause of morbidity and mortality all over the world. It is considered an ambulatory care–sensitive condition in which many hospitalizations are potentially preventable[1]. There is compelling evidence from randomized, controlled trials that diabetic microangiopathy and neuropathy can be reduced by tight glycemic control[2,3]. A favorable influence on macrovascular complications has also been observed when glycemic control is tight in diabetics[4]. In type 1 DM, the gold standard of treatment, which is aimed at glycated hemoglobin (HbA1c) <7%, is intensive insulin therapy, appropriate nutrition and blood glucose self-monitoring. However, such common pharmacological treatment approach is less well accepted in type 2 DM. The Diabetes Complications and Control Trial recommended HbA1c <7% as accepted target for diabetes management[5], though there is fear that aggressive diabetes control with HbA1C <6% may be detrimental in CVD patients; hence it is pertinent to closely watch for latest consensus guidelines for tight glycemic control[6]. Nonetheless, various diabetes associations have advocated target fasting plasma glucose (FPG) as tools for assessing glycemic control in DM. For instance, the American Diabetes Association's (ADA) FPG target is <6.7mmol/L[7] and ≤ 6.0 mmol/L for International Diabetes Federation –Europe (IDF-Europe)[8]. Disappointingly, two-thirds of people with diabetes are currently above this target[9]. The use of target FPG to monitor glycemic control is relevant in the developing and resource- scarce countries where facilities for HbA1c are scarce and affordability for patients is still a serious issue.

[Ψ]**Correspondence at:** Department of Medicine, Federal Medical Centre, Ido Ekiti, Nigeria; Email: lifecareado@gmail.com

In DM, hypertension often co-exist[10] and it is up to three times more common in type 2 DM than non-diabetic subjects[11]. In the presence of obesity, increasing age and onset of renal disease, the prevalence of hypertension in diabetic patients is further increased. Control of blood pressure (BP) to target in diabetics is as important as tight glycemic control to lower the severity and progression of cardiovascular complications. The United Kingdom Prospective Diabetes Study (UKPDS) and Hypertension Optimal Treatment (HOT) study revealed that an intensive blood pressure-lowering treatment strategy is associated with a lower incidence of cardiovascular complications in patients with diabetes[12,13]. Studies reveal that many patients with DM do not reach the recommended target of a blood pressure (BP) <130mmHg systolic and <80mmHg diastolic[14].

Little is known about how many type 2 diabetic patients have specific target BP, blood glucose and BMI in Ekiti area of Nigeria. In light of this, we conducted a retrospective study of type 2 diabetics attending out-patient clinics (a) to determine what proportion of patients with diabetes have fasting plasma glucose and BP to targets; (b) to determine patient characteristics associated with having a blood glucose and BP target; (c) to determine the pattern of prescription of medications in these patients.

METHODOLOGY

Medical records of type 2 diabetic patients who were attending medical outpatients department (MOPD) of the Federal Medical Centre, Ido Ekiti, Ekiti State, South- western Nigeria and who honored their appointments for routine clinic attendance between June 2008 and September 2008 were retrieved from the Medical Information and Records Department of the hospital and analyzed. Data extracted from the case records included personal data, weight, height, duration of clinic attendance in months, average of three previous consecutive fasting plasma glucose (mean FPG), drugs prescribed and presence or absence of coexisting hypertension. Both IDF-EUROPE and ADA target levels were considered[7,8]. In this hospital, plasma FPG was usually done in the morning of the day the patient was to see the attending physician in the clinic.

Data are expressed as mean ± Standard Deviation (SD) and frequency expressed as a percentage where necessary. Computation of p-values was done by t-test and chi-squared analysis. Bivariate correlation was performed using Pearson's correlation coefficient. $P < 0.05$ was considered statistically significant. All statistical analyses were performed with commercially available computer program SPSS 13.

RESULTS

A total of 308 patients were studied. There were 125 male (40.6%) and 183 female (59.4%). Their mean age was 60.90 ± 11.60 years with a range of 35 – 85 years. Mean duration of clinic attendance was 26.18 ± 24.46 months. The mean body mass index (BMI) of the patients was 25.47 ± 4.55 kg/m^2. Two hundred and thirty four patients (76.3%) had coexisting hypertension. The demographic, clinical and biochemical characteristics of the patients with coexisting hypertension compared with normotensive diabetics are shown in **table 1**. Patients with coexisting hypertension were significantly older, with higher BMI and longer mean duration of clinic attendance. There was no significant difference in their mean FPG.

Table 1: Demographic clinical and biochemical characteristics of hypertensive diabetics (HDM) and normotensive diabetics (NDM)

Characteristics	HDM (n=234)	NDM (n=72)	P value
Age (years)	62.19 ± 11.47	56.88 ± 12.81	0.001
Weight (kg)	68.94 ± 11.83	64.10 ± 12.81	0.005
Height (m)	1.65 ± 0.08	1.66 ± 0.08	0.422
BMI (kg/m2)	26.06 ± 4.77	22.82 ± 2.29	<0.001
Clinic duration	29.86 ± 27.71	13.71 ± 16.87	<0.001
Mean FPG (mmol/L)	8.05 ± 3.07	7.21 ± 2.21	0.077

Glycemic, Blood Pressure and weight control

Using the IDF-EUROPE control target of <6.0mmol/L (**Figure 1**), 29.3% of the patients had target mean FPG control. Only 32.5% of the patients had mean FPG control with the ADA control target of <6.7mmol/L. Those with target glucose control using either IDF-Europe or ADA criteria were significantly older with longer duration of clinic attendance (**Table 2**). There were

no significant differences in their BMI and BP. **Figure 2** shows the proportion of patients in different strata of blood pressure. Using the recommended BP targets in diabetics, only 24.5% of the patients had BP < 130/80mmHg.

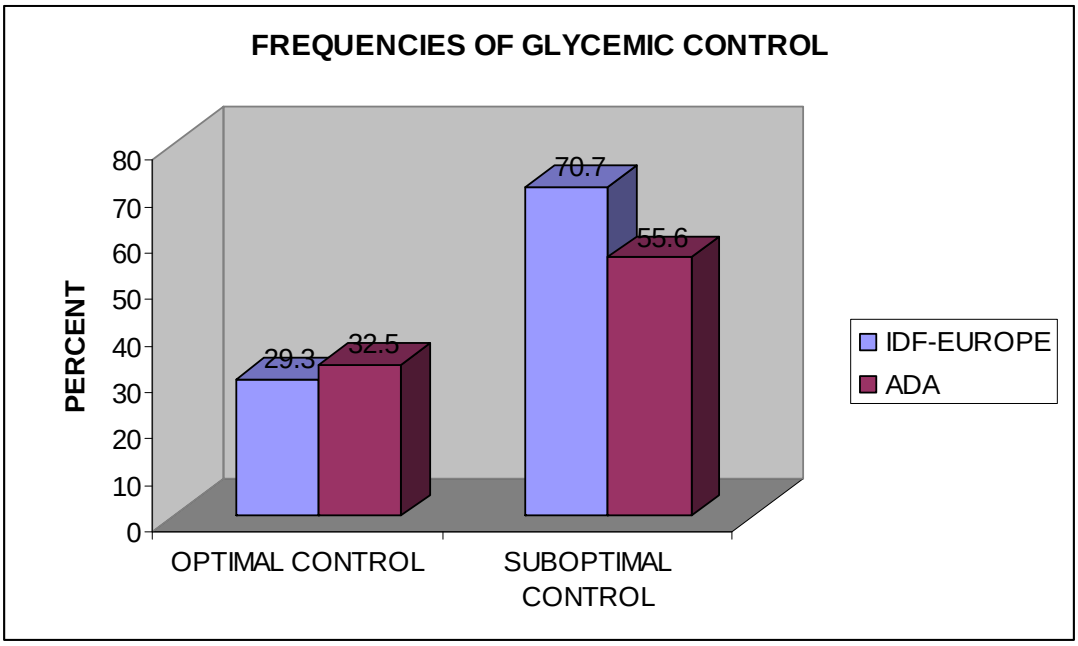

Figure 1: Frequencies of glycemic control

Table 2: Glycemic control target and patients' clinical parameters

Clinical parameters	IDF-EUROPE target level		ADA target level	
	<6.0mmol/L	>6.0mmol/L	<6.7mmol/L	>6.7mmol/L
Age (years)	64.0 ± 11.7	59.0 ± 10.6**	62.4 ± 9.9	58.9 ± 11.8**
BMI (kg/m2)	26.4 ± 3.5	25.5 ± 5.4	25.2 ± 4.0	26.0 ± 5.7
CD (months)	33.2 ± 12.9	22.7 ± 8.8**	33.0 ± 11.8	20.4 ± 9.2**
SBP (mmHg)	137.7 ± 24.6	134.9 ± 18.9	135.2 ± 21.5	136.2 ± 19.3
DBP (mmHg)	77.0 ±11.6	78.4 ± 9.8	77.2 ± 10.6	78.6 ± 10.2

NB: CD= Clinic duration; ** = p value significant at < 0.05

As shown in **figure 3**, 48.7% (150) of the patients were either overweight or obese. It was noted that out of these 150 overweight/obese patients, 113 (75.3%) of them had coexisting hypertension (x^2=20.9, DF=4, p<0.001). With the IDF-EUROPE control target for blood glucose, 8.4% and 12.7% of those who had target FPG had normal BMI and overweight/obesity respectively while 39.0% and 39.9% of those above the target level had normal BMI and overweight/obesity respectively (x^2=8.7, p=0.109). For ADA control target for plasma glucose, 19.1% and 28.3% of those who had target FPG had normal BMI and overweight/obesity respectively while 20.1% and 52.5% of those above the target level had normal BMI and overweight/obesity respectively(x^2=9.2, p=0.55).

As shown in **table 3**, there was no significant correlation between BMI and FPG level in the study population (r=0.045, p=0.623). Patients aged 70years and above compared with those less than 70years of age had longer duration of clinic attendance (33.60 ± 22.97 VS. 23.84 ± 27.12 months; p=0.008), higher BMI (27.03 ± 3.66 VS. 24.92 ± 4.73 kg/m2; P=0.014), higher SBP (145.97 ± 19.50 VS 131.90 ± 19.98mmHg; p<0.001) but lower FPG, though not statistically significant (7.40 ± 3.33 VS 8.00 ± 2.80mmol/L; p=0.199).

Multiple linear regression analysis identified DBP (ß=0.484, p < .001), clinic duration (ß =-0.258, p = .008), SBP (ß =-0.275, p =0.038), as significantly associated with higher FPG.

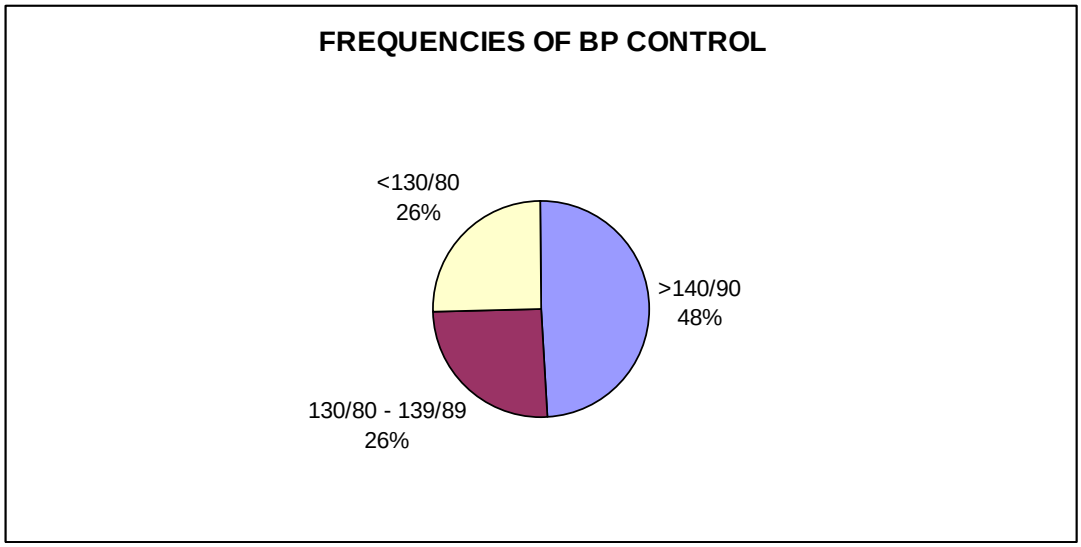

Figure 2: Frequencies of BP control

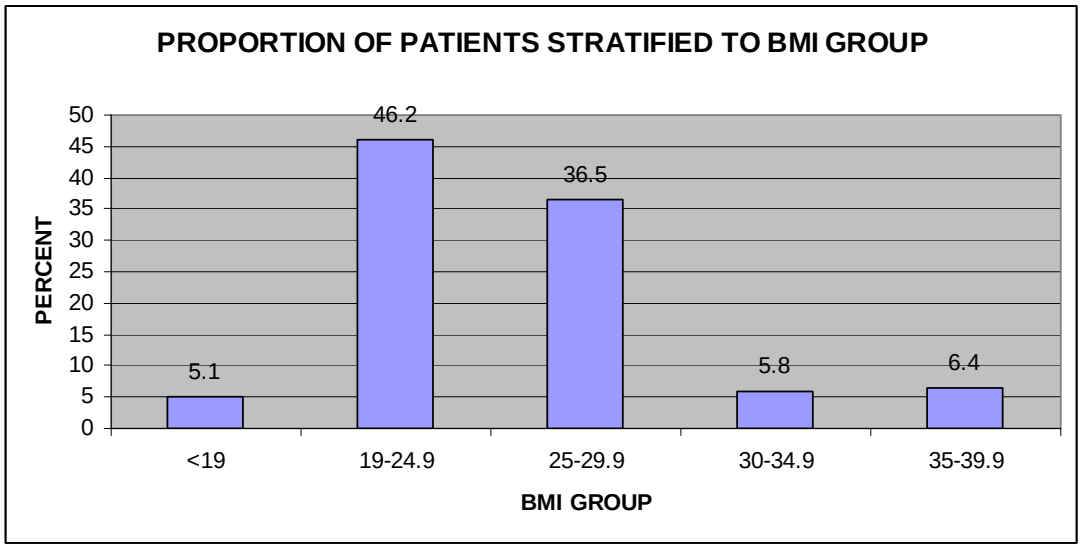

Figure 3: Proportion of patients stratified to BMI group

Table 3: Pearson's correlation coefficient (r) between various variables

	Age	BMI	FBS	SBP
BMI	0.147			
FBS	-0.176**	0.045		
SBP	0.301**	0.410**	0.046	
DBP	0.337**	0.337**	0.224**	0.694**

**Correlation is significant at the 0.01 level (2-tailed)

Pattern of prescription

Hypoglycemic agents: Majority of the patients (77.1%) were on combined oral hypoglycemic agents (OHA) while only 1.6% was on diet alone. OHA were combined with insulin in 3.3% of cases. Frequencies of insulin and OHA monotherapy were 2.0% and 16.0% respectively.

Antihypertensive agents: Antihypertensive agents were combined in 54.0% of cases while 46.0% had antihypertensive monotherapy. Out of those on combination antihypertensives, 90.3% were on two medications while 9.7% were on three medications.

Diuretics were combined with other antihypertensive agents in 66.1% of cases. Angiotensin converting enzyme inhibitor (ACEI) in combination with diuretics were most frequently used (38.7%) followed by ACEI combined with calcium channel blocker (31.5%). In 2.4% and 0.8% of cases respectively, beta-blocker was combined with calcium channel blocker and diuretic. The commonly used antihypertensive monotherapy were ACEI (85.2%) and calcium channel blocker (14.8%).

Low dose aspirin: Low dose aspirin was prescribed in 114 (37.01%) of the total 308 patients. Out of the 234 patients with coexisting hypertension, 91 (38.9%) were on low dose aspirin while 143 (61.1%) were not and 21 (30.44%) of the normotensive diabetics had low dose aspirin.

Statin: None of the patient was on statin or any other medications for dyslipidemia.

DISCUSSION

In this study, there was high prevalence of hypertension coexisting with diabetes (76.3%). These diabetic patients with coexisting hypertension were found to be older than the mean age of the study population and had significantly higher BMI than those without coexisting hypertension. They also had been attending clinic for a longer duration than those without hypertension. Their mean FPG levels were however comparable. It is likely, from the foregoing, that these hypertensive diabetics have had their diabetes for a longer duration than those without hypertension. The proportion of patients who achieved target BP control of <130/80mmHg was disappointingly low (24.5%) despite the fact that all the hypertensive patients were identified and placed on antihypertensive medications. It is noteworthy that combination antihypertensive medications were employed in just about half of the hypertensive diabetic patients. Out of these patients on combination antihypertensive drugs, 90.3% were on two antihypertensive drugs while only 9.7% were on combination of three antihypertensive drugs. To achieve satisfactory BP control in DM, multiple drugs therapy is often required[15]. It has even been suggested that a combination of at least three drugs are required in patients whose systolic BP is about 25-30 mmHg above the target goal[16].

Inadequate BP control in the majority of a group of patients with DM had been in Nigeria. In one study, only 11% of diabetic patients with hypertension had their BP controlled to levels below 140/90mmHg.[17] Similarly, Arije et al[18] in a study in an urban teaching hospital in south-western Nigeria, observed that approximately 12% of their patients achieved BP control below the currently recommended target level of 130/80 mmHg. In a different study of BP control among hypertensive patients in a tertiary health care setting in northern Nigeria, a normal blood pressure control incidence of approximately 43% was reported using a blood pressure cut-off value of 140/90 mmHg[19]. Several other studies in more economically advanced environments showed that achieving the target blood pressure goal is often difficult[20] as only a minority of the patients studied had their BP controlled below the recommended target. Considering the poor BP control rate among these patients, it becomes necessary to emphasize the need to the attending physicians of the necessity of multiple drug therapy with at least three different classes of antihypertensive drugs for hypertensive diabetic patients in order to achieve target BP. Patients' compliance with medications should also be stressed and fixed dose antihypertensive drugs combinations may be employed to enhance patients drug adherence.

Generally, the proportion of our study population who attained target glycemic level with either the IDF-Europe or ADA criteria was very low (29.3% and 32.5% respectively), though comparable with what had earlier been reported in other studies across the world. In a study on glycemic control rates among US adults with type 2 diabetes from 1999 to 2000[8], less than 36% of patients reached a HbA1c goal of less than 7%. In a subset of diabetic patients with retinopathy in Australia, only 14% (36/259) had an optimal HbA1c level[21]. In a South African township, fasting blood glucose levels were <7.0 mmol/l in only 17.6% of the patients[22]. Maintenance of tight glycemic control in patients with type 2 diabetes requires timely adjustments and changes in therapy when goals are not met. While the majority are initially treated with oral antidiabetic drugs (OHAs)[23], most patients ultimately require insulin therapy to maintain glycemic control[24] due to progressive pancreatic ß-cell dysfunction and/or failure. Insulin use is low in our patients as only 3.3% were on insulin alone and another 2.0% were on insulin combined with OHA. This may partly account for the poor glucose control in these patients. Similarly, a low insulin use has been noted by Alebiosu et al in a study from Sagamu, south western Nigeria[25]. However a higher percentage of patients (26.4%) in Ibadan were prescribed insulin compared to the Sagamu study[26], though the study population consisted of all types of DM. Oral hypoglycemic agents (OHAs), especially metformin and glibenclamide are the commonly prescribed antidiabetic agents in this Ibadan study similar to Sagamu study and our present study. In our study, increasing age and longer duration of clinic attendance appear to be associated with better blood glucose control.

About half of the patients in this study were either overweight or obese. Worse still was the high prevalence of coexisting hypertension among this

subset of patients (75.3%). Though, there was no correlation between BMI and mean FPG in this study, the high prevalence of poor glycemic, BP and weight control is worrisome. An increase in body fat is generally associated with increased risk of metabolic diseases such as type 2 diabetes mellitus, hypertension and dyslipidemia. There is an urgent need to advocate holistic approach to diabetes management in clinical practice in Nigeria.

Another important observation in this study was the low prevalence of the use of antiplatelet agents. Only 37.01% of the patients were placed on low dose aspirin. This is in spite of the fact that daily aspirin intake has been found to reduce vascular events in patients with diabetes[27]. Physicians need to be encouraged to prescribe this relatively cheap but important drug in the management of diabetes.

The lipid lowering agents, statins or any other lipid lowering drugs, were not prescribed in the patients. Evidence exists about the benefit of statins in reducing cardiovascular events in diabetic patients independent of lipid levels[28]. It has been recognized that one important factor against frequent use of statin is the high cost, especially in the resource – poor setting like ours[28].

CONCLUSION

The results from this study showed poor control of blood glucose, BP and weight in the patients. Patients' blood pressure and longer duration of clinic attendance appeared to negatively affect blood glucose control. We are of the opinion that current practices are not aggressive enough to manage a substantial proportion of type 2 diabetes patients.

As facilities for glycated hemoglobin are being increasingly available in Nigeria, it may be possible in the nearest future to employ it in monitoring glycemic control in all our DM patients.

REFERENCES

1. Davis SK, Liu Y, Gibbons GH. Disparities in trends of hospitalization for potentially preventable chronic conditions among African Americans during the 1990s: implications and benchmarks. *Am J Public Health*. 2003 Mar;93(3):447-55.
2. UK Prospective Diabetes Study (UKPDS) Group. 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* 1998 Sep;352(9131):837-53.
3. The Diabetes Control and Complications Trial Research Group. 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*. 1993 Sep;329(14):977-86.
4. Nathan DM, Cleary PA, Backlund JY, et al. Intensive diabetes treatment and cardiovascular disease in patients with type 1 diabetes. *N Engl J Med*. 2005 Dec;353(25):2643-53.
5. American Diabetes Association: Standards of medical care in diabetes-2006 (Position Statement). *Diabetes Care* 2006;29(Suppl 1):S4–S42.
6. Akalin S, Berntorp K, Ceriello A, et al. The Global Task Force on Glycaemic Control Intensive glucose therapy and clinical implications of recent data: a consensus statement from the Global Task Force on Glycaemic Control. *Int J Clin Pract*. 2009 Oct;63(10):1421-5.
7. American Diabetes Association. Standard of medical care in diabetes. *Diabetes Care* 2005 Jan;28(suppl 1):S4-S36.
8. IDF Clinical Guidelines Task Force. Global Guideline for Type 2 Diabetes: recommendations for standard, comprehensive, and minimal care. *Diabet Med.* 2006 Jan;23(6):579-93.
9. Massi-Benedetti M. Changing targets in the treatment of type 2 diabetes. *Curr Med Res Opin*. 2006;22(Suppl 2):S5–S13.
10. Ikem RT, Akinola NO, Balogun MO, et al. What does the Presence of Hypertension Portend in the Nigerian with Non-Insulin Dependent Diabetes Mellitus? *West Afr J Med* 2001 Apr-Jun;20(2):127-30.
11. Teuscher A, Egger M, Herman JB. Diabetes and hypertension. Blood pressure in clinical diabetic patients and a control population. *Arch Intern Med*. 1989 Sep; 149(9):1942-5.
12. UK Prospective Diabetes study Group. Tight blood pressure control and risk of macrovascular and microvascular complications in type 2 diabetes: UKPDS 38. *BMJ* 1998 Sep;317(7160):703-13.
13. Hansson L, Zanchetti A, Carruthers SG, et al. Effects of intensive blood pressure lowering and low-dose aspirin in patients with hypertension: principal results of the Hypertension Optimal Treatment trial. *Lancet* 1998 Jan;351(9118):1755-62.
14. Nilsson PM, Gudbjornsdottir S, Eliasson B, et al. Hypertension in diabetes: trends in clinical control in repeated national surveys from Sweden. *J Hum Hypertens*. 2003 Jan;17(1):37-44.
15. Bakris GL. Who should be treated with combination therapy as initial treatment for hypertension? *J Clin Hypertens (Greenwich).* 2003 Jul-Aug;5(4 suppl 3):21-8.
16. Weber MA, Weir MR. Management of high-risk hypertensive patients with diabetes:

potential role of angiotensin II receptor antagonists. *J Clin Hypertens (Greenwich).* 2001 Jul-Aug;3(4):225-35.
17. Okoro E, Oyejola B. Inadequate control of blood pressure in Nigerians with diabetes. *Ethn Dis*. 2004;14(1):82-6.
18. Arije A, Kuti M, Fasanmade A, et al. Control of hypertension in Nigerians with Diabetes Mellitus: A report of the Ibadan Diabetic / Kidney Disease Study Group. *Int J Diabetes & Metabolism* 2007;15:82-6.
19. Isezuo A, Njoku C. Blood pressure control among hypertensives managed in a specialised health care setting in Nigeria. *Afr J Med Med Sci*. 2003 Mar;32(1):65-70.
20. Sequeira RP, Al Khaja KA, Damanhori AH. Evaluating the treatment of hypertension in diabetes mellitus: a need for better control? *J Eval Clin Pract*. 2004 Feb;10(1):107-16.
21. Tikellis G, Wang S, Wong N, et al. Poor metabolic and blood pressure control in patients with diabetic retinopathy attending a tertiary ophthalmic hospital in Australia. *Diabetes Res Clin Pract*. 2008 May;80(2):208-12.
22. van de Sande M, Dippenaar H, Rutten GE. The relationship between patient education and glycaemic control in a South African township. *Prim Care Diabetes*. 2008 Jun;2(2):105.
23. Nathan DM. Clinical practice. Initial management of glycemia in type 2 diabetes mellitus. *N Engl J Med*. 2002 Oct;347(17):1342–9.
24. United Kingdom Prospective Diabetes Study Group. United Kingdom prospective diabetes study (UKPDS) 13: relative efficacy of randomly allocated diet, sulphonylurea, insulin, or metformin in patients with newly diagnosed non-insulin dependent diabetes followed for three years. *BMJ*. 1995 Jan;310(6972):83-8.
25. Alebiosu CO. Antidiabetic/ Antihypertensives prescription profile in OSUTH, Sagamu and Environment. *Nigerian J Clin Prac.* 2004;7(1):15-20.
26. Enwere OO, Salako BL, Falade CO. Prescription and Cost Consideration at a Diabetic Clinic in Ibadan, Nigeria: A Report. Ann Ibadan Postgraduate Med. 2006;.4(2):35-9.
27. Collaborative overview of randomised trials of antiplatelet therapy--I: Prevention of death, myocardial infarction, and stroke by prolonged antiplatelet therapy in various categories of patients. Antiplatelet Trialists' Collaboration. *BMJ* 1994 Jan;308(6921):81-106.
28. Tuomilehto J, Leiter LA. Defining the role of statins in diabetes. *Br J Diabetes Vasc Dis*. 2005;5:55-62.