

Glycaemic Control in Patients with Type 2 Diabetes Mellitus in a Secondary and Tertiary Health Center in Oredo and Egor Local Government Areas in Benin City, South-South Nigeria

O. F. Adewolu^{1*}

¹*Department of Chemical Pathology, University of Benin Teaching Hospital Benin City, Edo State, Nigeria.*

Author's contribution

This whole work was carried out by author OFA.

Original Research Article

Received 21st November 2013
Accepted 23rd February 2014
Published 18th March 2014

ABSTRACT

Diabetes is the commonest endocrine metabolic disorder in Nigeria.

Aim: The aim was to assess the level of glycaemic control in type 2 diabetics in Oredo and Egor local government areas in Benin metropolis, with a view of planning improved diabetes care.

Study and Design: This is a cross sectional study.

Place and Duration of the Study: The study was carried out in the department of medicine Central Hospital Benin (Secondary Health center), department of Medicine University of Benin teaching Hospital (Tertiary Health center) and department of chemical pathology, University of Benin teaching hospital Benin City Nigeria between October 2012 and June 2013.

Methodology: Fasting Blood sample of 126 type 2 diabetics (38.1% males and 61.9% females from the secondary health centre and 781 type 2 diabetics (47.1% male and 58.3% females) from the tertiary health centre was assayed for plasma glucose and Glycated haemoglobin. Body mass index was calculated from measured height and weight and blood pressure measurements taken with mercury sphygmomanometer.

*Corresponding author: Email: nikemide@yahoo.com;

Results: Mean fasting plasma glucose and mean glyated haemoglobin was 142.2 ± 7.2 mg/dl, $8.3 \pm 2.1\%$ and 145.8 ± 5.4 mg/dL, $8.3 \pm 2.6\%$ for patients in the secondary and tertiary health centres respectively. 20.6% of the patients in the secondary health centre and 40.5% of those in the tertiary health centre had glyated haemoglobin values $< 7\%$ as recommended by the American Diabetes Association (ADA). 25.3% and 20.6% of the patients in the secondary and tertiary health centres respectively, met the blood pressure target recommended by ADA.

Conclusion: Most diabetics in Egor and Oredo Local Government Areas, Benin City, south-south Nigeria still have suboptimal glycaemic control, are hypertensive and have chronic complications of the disease. Improved Health care delivery, and subsidization of health care is recommended.

Keywords: Diabetes mellitus; glycemic control; American Diabetes Association (ADA) guidelines.

1. INTRODUCTION

Diabetes mellitus is a chronic disease with an increasing prevalence worldwide. It has significant health and socioeconomic burden on both patients and the health care systems. The WHO estimated a projection of 221 million people with diabetes in 2010 and 300 million in 2025 [1]. The prevalence in Nigeria varies from the 0.65% in rural mangu village, to 11.0% in urban Lagos [2]. The WHO suggested that Nigeria has the greatest number of people living with diabetes in Africa, with an estimated burden of about 1.7 million which will increase to 4.8 million by 2030 [3].

Good glycaemic control and control of other cardiovascular risks in diabetic patients lead to reduced morbidity and mortality [3]. With the incidence of diabetes in the African population on the rise, the incidence of late diabetic complications is also expected to increase correspondingly, [4,5] and this will pose a major healthcare and economic problem [3].

Several studies such as the diabetes complications and control (DCCT); the United Kingdom Prospective Diabetes Study (UKPDS) and their follow up studies, found that the adequate management of diabetes, improves the outcome in terms of morbidity, mortality, and quality of life [6,7,8]. Therefore following recommended international and national guidelines in managing diabetic patients is of utmost importance. These guidelines include glycaemic targets, systolic and diastolic blood pressure targets, body mass index (BMI) and other antropometric indices, lipid levels, self management and behavioural targets [3]. Various countries have studied the status of diabetes control in their population [9,10,11]. The reports have varied in different population groups. The diabcare study group in Nigeria carried out a study in 2008 to assess the status of diabetes care in Nigeria. They reported that only 32.4% of the patients studied achieved the American Diabetes Association glycemic control target.

This study aims to assess the level of glycaemic control in a secondary and tertiary health centre in Oredo and Egor local government areas in Benin City, South-south Nigeria, using some of the guidelines by the American diabetics association.

2. SUBJECTS, MATERIALS AND METHODS

This was a cross sectional study carried out in two health care centers, a secondary hospital and a tertiary hospital. The secondary hospital which is Central Hospital Benin, provides comprehensive health care services and specialized services. The tertiary hospital which is University of Benin Teaching Hospital, is a regional medical institution that provides comprehensive and specialized services and serves as the highest level of referrals from both primary and secondary health centers and other states in the south-south geopolitical zone in Nigeria. The study was carried out between October 2012 and June 2013. Consent for the study was obtained from the ethical committee of the hospitals and informed consent from the patients. 126 type 2 diabetic patients were recruited from the secondary health care center, they were recruited consecutively as they came to attend the out-patient diabetic clinic. 781 type 2 diabetic patients were recruited from the tertiary health care center. Every third Consenting patient was selected for the study as they came to the phlebotomy room for fasting plasma glucose and glycated haemoglobin assays, before attending the diabetic out-patient clinic. Those who were not willing to participate were not included, They were patients who were already diagnosed and being managed as type 2 diabetes mellitus patients. They have been diabetic for a mean duration of 5 years and 3 months. 69.3% of the patients have been diabetic for over a year.

Structured questionnaire was used to obtain vital information including duration of disease, type of medications they are on and other vital information including presence of complications were obtained from the medical records. General physical examination was carried out on the patients including height, which was measured with a stadiometer to the nearest 0.1cm. Weight was measured with a weighing scale with light clothes on, to the nearest 0.1kg. Blood pressure was measured using a sphygmomanometer.

2.1 Sample Collection

5ml of fasting venous blood was collected, and 2.5ml each dispensed into fluoride oxalate bottle, and ethylene diamine tetracetate (EDTA) bottle. The sample in both bottles were inverted 8 to 10 times to ensure proper mixture of blood and anticoagulant. Sample in the EDTA bottle was immediately refrigerated at 4°C, while that in the fluoride oxalate bottle was centrifuged at 3,000rpm for 5 minutes, and plasma separated into clean plain tubes and stored in an ultrafridzer at -80°C within 30minutes of collection, until time of analysis. Urine was collected in universal bottle with preservative.

2.2 Methodology

Plasma glucose was assayed by the glucose oxidase method. Glycated haemoglobin was assayed by the Boronate Affinity method using the HbA_{1c} kit (In 2it Tm system from Bio-rad). Urinalysis was done using Medi-test combi-10 dipsticks which gives both qualitative and semi quantitative analysis.

2.3 Statistical Analysis

This was done using SPSS version 13. Means of values are reported as mean±standard deviation. Differences between means of variables was determined using the student T-Test and ANOVA. A p-value < .05 was considered significant

3. RESULT

Out of the 126 patients involved in the study in the secondary health centre, 38.1% were males and 61.9% females, while 41.7% out of the 781 patients in the tertiary health centre were males and 58.3% females (Table 1).

Table 1. Demographic characteristics of the patients in the secondary and tertiary health centres

Parameter	Secondary health center	Tertiary health center	p-value
	mean±SD	mean±SD	
Male population (%)	38.1	41.7	0.64
Female population (%)	61.9	58.3	
Age (years)	58.3±1.2	56.1±1.4	0.32
BMI (Kg/m ²)	27.6±6.5	27.5±4.3	0.131
Systolic blood pressure (mmHg)	144±44	143±26	0.234
Diastolic blood pressure (mm Hg)	84±10	89±14	0.985
Fasting plasma glucose (mg/dL)	142.2±7.2	145.8±5.4	0.83
Glycated haemoglobin (%)	8.3±2.1	8.3±2.6	0.87

No statistically significant difference in the means of the parameters $p>0.05$

Age range of the subject population was 38 to 83 years and 30 to 85 years in the secondary and tertiary health care centers respectively. Median age was 56 and 57 years in the secondary and tertiary health centers respectively.

Mean age of patients in the secondary health centre was 58.3±1.2 years and 56.1±1.4 years in the tertiary health centre (Table 1).

Mean fasting plasma glucose and glycated haemoglobin values for patients in the secondary health centre was 142.2±7.2mg/dl and 8.3±2.1% respectively, while that for the patients in the tertiary hospital was 145.8 ± 5.4 mg/dl and 8.3±2.6 respectively Table 1).

Fig. 1 shows the percentage of patients with glycated haemoglobin values <7% and ≥7% in both secondary and tertiary health care centers.

Mean BMI was 27.6±6.5 kg/m² in patients in the secondary health care center and 27.5±4.3kg/m² in those in the tertiary health care centre. 31.7% and 31.5% of the patients in the secondary and tertiary health centers respectively had BMI≥30kg/m². Also 4.6% and 4.5% of the patients in the secondary and tertiary health centers respectively had BMI > 40kg/m².

Mean systolic and diastolic blood pressure was 144±24mmHg and 84±10 mmHg respectively, in patients in the secondary health center, and 143±26 mmHg and 89±14 mmHg respectively for the patients in tertiary health centre, (Table 1).

While 20.6% of the patients in the secondary health centre had glycated haemoglobin values <7%, 79.4% of them had values ≥7%. 40.5% of those in the tertiary health centre had glycated haemoglobin values <7% and 59.5% had values ≥7%. 7.1% and 13.9% of the patients in both secondary and tertiary health centers respectively had glycated haemoglobin values greater than 10%. In the secondary health center 100% of the patients below 40

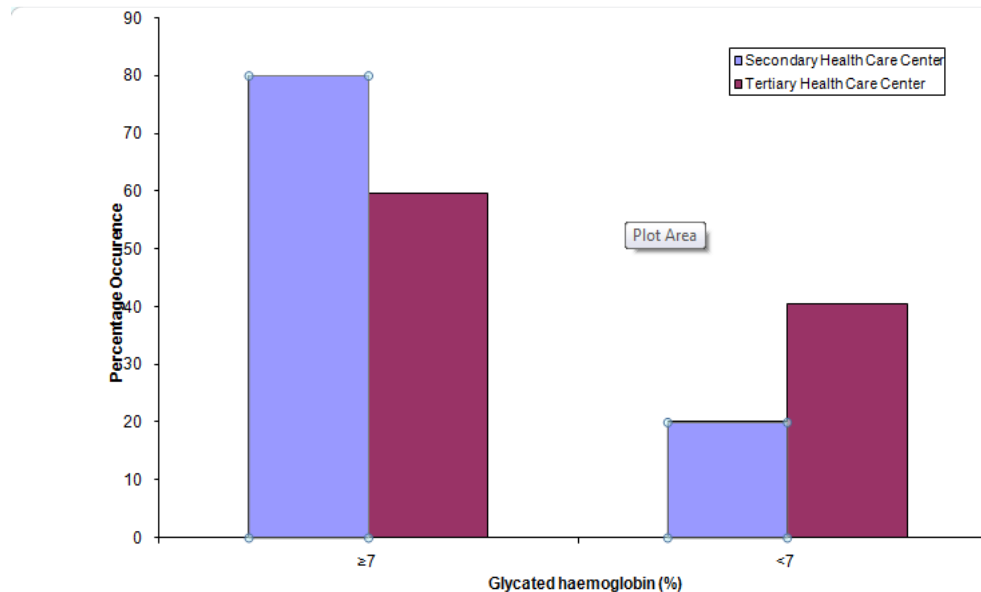


Fig. 1. Chart showing percentage of patients with glycated haemoglobin values below 7% and those equal to and above 7% in both secondary and tertiary health care centers

years and 77.8% of the patients who are 40 years and above had glycated haemoglobin values $\geq 7\%$, while 0% and 22.2% had values $< 7\%$ for below 40 years and 40 years and above category respectively. In the tertiary health center 58.8% of those below 40 years and 62.1% of those who are 40 years and above, had glycated haemoglobin values $\geq 7\%$. 41.2% and 37.9% of those below 40 years and those who are 40 years and above had glycated haemoglobin values $< 7\%$. No statistically significant difference in glycaemic control with age ($p > 0.05$) (Table 4).

14.3% of the females and 33.3% of the males in the secondary health center, while 85.7% females and 66.7% males had glycated haemoglobin values $\geq 7\%$. In the tertiary health center, 42.3% of the females and 38.3% of the males had values $< 7\%$, while 57.7% females and 61.7% males in the tertiary health center had values $\geq 7\%$. No statistically significant difference with gender. $P > 0.05$ (Table 4).

Blood pressure of 25.3% of the patients in the secondary health centre was $< 130/80\text{mmHg}$, while for 74.7% of the patients it was $\geq 130/80\text{mmHg}$. In the tertiary health centre, 20.6% of the patients had blood pressure $< 130/80\text{mmHg}$ and 79.4% $\geq 130/80\text{mmHg}$ (Table 2).

68.7% and 35.8% of the patients in the secondary and tertiary health centers respectively had blood pressure of $\geq 140/90\text{mmHg}$. (Table 3) Also 74.4% of the patients in the secondary health centre had proteinuria of varying severity, with 6.7%, 27%, 13.5% and 5.4% of them having trace, +, ++, +++, proteinuria and 23.3% glucosuria. In tertiary center 40% of the patients had proteinuria, with 25%, 50%, and 25% of them with +, ++, +++, proteinuria and 20% glucosuria (Table 3).

Table 2. American Diabetes Association (ADA) guidelines and percentage of the study population that met the guidelines in the secondary and tertiary health centers

Parameters	Recommended target value	N1 Population in secondary health center	N2 Population in tertiary health center	Percentage of patients who achieved the target values	
				N ₁	N ₂
Glycated haemoglobin (HbA _{1c})	< 7%	126	781	(26)20.6%	(316)40.5%
lucose before meals (mg/dL)	90 – 130	126	781	(88)69.9%	(361)46.2%
Blood pressure (mmHg)	≤130/80	126	781	(32)25.3%	(156)20.6%

Table 3. Percentage of patients with co-morbidities in the secondary and tertiary health centers

Parameter	Secondary health center %	Tertiary health center %
Glucosuria	23.3	20
Proteinuria	74.4	40
High blood pressure(BP≥140/90mmHg)	68.7	35.8
Diabetic foot	2.3	0

Table 4. Glycaemic control with age and gender in secondary and tertiary health centers

Parameter	Secondary Health Center		Tertiary Health Center		P Value
	Glycated Haemoglobin %	Glycated Haemoglobin %	Glycated Haemoglobin %	Glycated Haemoglobin %	
	<7	≥ 7	<7	≥ 7	
Below 40 years (%)	0	100	41.3	58.8	.316
40 years and Above (%)	22.2	77.8	37.9	62.1	
Male (%)	33.3	66.7	38.3	61.7	.643
Female (%)	14.3	85.7	42.3	57.7	

No statistically significant difference in the parameters studied. $p>0.05$

4. DISCUSSION

Achieving good glycaemic control, which in turn limits the development of complications, is the goal in management of diabetic patients all over the world. The American Diabetes Association (ADA), American Association of Clinical Endocrinologists (AACE), International Diabetes Federation have all given guidelines of target values for good glycaemic control [12].

In the present study some of the guidelines given by American Diabetes Association (ADA) were used to assess glycaemic control of diabetic patients in this environment.

In both healthcare institutions where the study was carried out, the female patients were of a higher percentage than the males. A similar observation was made in the multicenter diabcare study in Nigeria [3]. The reason for this could be multifactorial, ranging from life style, dietary habits, to health care financing, which in Nigeria is still largely "pay as you go". Women are more likely to be supported by relations and loved ones to visit the hospital compared with their male counterparts. Men may also be more preoccupied with "making ends meet" to provide for the family, and not create time to come to the hospital.

Mean age of patients in this study was similar to that reported by Chinenye et al. [3] in the multicenter diabcare study in Nigeria, but lower than reported in other developed countries like United Kingdom [13], Spain [11] United State America [14].

Mean fasting plasma glucose of patients in both institutions studied was higher than that recommended by the American diabetes Association, [12] and similar to that reported by Chinenye et al³ in their study amongst diabetics in Nigeria. While 69.9% of the patients met the fasting plasma glucose target by ADA in the secondary health center, only 46.2% met the fasting plasma glucose target in the tertiary hospital. Chinenye et al. [3] in their own study also reported 52.6% achieving fasting plasma glucose ADA guidelines. The values are comparable, and also similar reported by Adebisi et al. [15] in Nigeria.

Mean BMI was in the overweight category in the patients studied, with 53.5% and 76% of the patients in the secondary and tertiary health centers respectively having BMI $>25\text{kg/m}^2$ and 31.7% and 31.5% in the secondary and tertiary health center were obese. A similar observation was made by Eid M and associates [9] in their study amongst diabetics in Malaysia, where 66% of the patients had BMI $>25\text{kg/m}^2$. This still corroborates the association between obesity and diabetes mellitus type 2.

Mean glycated haemoglobin in the patients in both healthcare centers were higher than the recommended values by ADA. The patients in the tertiary health center had slightly higher values in achieving the targets than those attending the secondary healthcare center, though the difference was non-significant. This was the same observation reported by Chinenye et al³ in Nigeria. Mean glycated haemoglobin values reported in their own study was also higher than that set as target by ADA. Adebisi et al. [15] in Ilorin, Nigeria and Idogun ES [16] in Benin Nigeria, also made the same observation in their studies. This is an indication that achieving good glycaemic control still appears to be a challenge in Nigeria. While 79.4% of the patients in the secondary health center had glycated haemoglobin values $>7\%$, 59.5% in the tertiary health center had values $>7\%$. The percentage of those with poor glycaemic control is high in both centers. The multicenter diabcare study by Chinenye et al. [3] in Nigeria also reported a high percentage of the patients with glycated haemoglobin values $>7\%$. This has been the bane of diabetes care in the Country, poor glycaemic control is still

prevalent in the nation. So many factors may be responsible for this; ranging from education, to life style and other factors such as economic, drug compliance, availability of genuine drugs. Education still has a role to play in the control and management of diabetes mellitus. It has been reported from various studies [17,18] that patients with adequate knowledge about the disease, had good control of the disease and lower frequency of complications. Although education alone is not a cure for the disease, the type 2 diabetes patients is not able to achieve metabolic regulation, if he/she does not know the basic principles of nutrition, physical action, care of the lower extremities, as well as specific skills related to the administration of subcutaneous injection of insulin, control of blood sugar levels and other necessary parameters [18]. This may also be one of the reasons for the higher percentage of patients with glycated haemoglobin values, >7% in the secondary health center in this study, compared with those in the tertiary health center. The secondary health center serves as a referral center for the primary health centers in the rural communities and local government areas of the state, and therefore is largely patronized by more of illiterate and semi-literate people than literate people. This is unlike the tertiary health center, which caters for both the state and other states in the south-south geopolitical zones of Nigeria. It is largely patronized more by literate people than semi-literate and illiterate people.

Lifestyle and economic factors also seem to play diverse-roles in the management and control of diabetes in this environment. While lifestyle and dietary habits may lead to poor glycaemic control especially in the affluent patients, lack of funds to purchase drugs, or pay hospital bills, or pay for investigations will also affect the low income group of patients.

Therefore while the affluent patients may have poor glycaemic control because of social lifestyle and dietary habits, the low income group of patients may have poor glycaemic control because of lack of funds to procure drugs and use them consistently, irregular hospital visits for check up and monitoring, lack of adequate knowledge in self care and self-monitoring. This may be some of the reasons for the higher percentage of patients with glycated haemoglobin values >7% in the secondary health center compared with the tertiary health center. Glycaemic control varied non significantly with age. It was better in the patients below 40 years in the tertiary health center, than those who were 40 years and above, conversely control was better in the patients 40 years and above than those below 40 years in the secondary health center. Glycaemic control also varied non significantly with gender. A larger percentage of males had better glycaemic control than females in the secondary health center, while a larger percentage of females had better glycaemic control than the males in the tertiary health center. The various factors influencing glycaemic control already mentioned before, may account for this.

Achieving good glycaemic control is however not a challenge peculiar to this environment alone, as reports from other countries also show that it is still a challenge being tackled. EidM and associates [9] in Malaysia reported 73% of the patients studied with glycated haemoglobin values >7%, while Fox KM¹³ in the United Kingdom reported 76% of the patients studied with glycated haemoglobin values is >7%. Macifaac RJ et al [10] in Australia reported 53.3% of patients with values >7%, while in China [19] 43.9% were reported to have glycated haemoglobin values of >7%. However it is interesting to note that Saadine JB and associates [14] in the United State reported that only 20% of diabetic patients in their own study had poor glycaemic control. The following deductions can therefore be made;

These are:

- a) It is possible to achieve good glycaemic control than what obtains right now in various parts of the world including Nigeria, since it could be achieved in the United State. Various factors already mentioned before including environmental factors could all be contributory to the varying observations in different parts of the world.
- b) A closer look at the patient management and care in the United State vis avis. Health care programmes and policies is necessary as these may have helped them to achieve good glycaemic control in a large percentage of their patients. This is with the aim to see how we can improve on our own patients management and care.

Comorbidities were also prevalent in the patients studied in both health centers. While 74.4% of the patients in the secondary health center had proteinuria, 23.3% glucosuria, 40% of the patients in the tertiary health center had proteinuria, 20% glucosuria. While 68.7% were hypertensive in the secondary health center, 35.8% were hypertensive in the tertiary health center.

The prevalence of complications seems to be higher in patients in the secondary health center compared with those in the tertiary health center. This could have been due to the fact that those attending the tertiary health center are better educated, can afford regular monitoring, blood glucose and glycated hemoglobin assays, hospital visitations, and can afford to buy their drugs amongst other factors.

In summary the achievements so far in the management and control of diabetes mellitus in this environment still lives a lot to be desired. Poor glycaemic control is still prevalent. The percentage of patients with complications is still high, as a result of poor glycaemic control. The following recommendations may be helpful.

- 1) Emphasis on preventive medicine: Educating the public on appropriate diet, social habits, lifestyle, should be done regularly. In achieving this, the various means of media enlightenment viz television, radio, internet, seminars, public lectures can all be used. Special days like world diabetes days can be used for nationwide screening for diabetes mellitus.
- b) Also screening of population at risk, age group at risk, family members of affected individuals to detect early any, case of impaired glucose tolerance or diabetes so that early intervention can be instituted.
- 3) The scope of National Health insurance scheme which is already in operation should be expanded to incorporate provision of healthcare services to individuals with diseases like this at subsidized rates.
- 4) Provision of drugs for chronic diseases like diabetes, hypertension at subsidized rates may enhance compliance especially in the low income group category

5. CONCLUSION

Achieving good glycaemic control is still a challenge in Oredo and Egor Local Government Areas in Benin City, South-south Nigeria, as this study has revealed. Efforts have to be intensified through education, subsidized health care and regular screening exercises to detect diabetes early and also detect cases of impaired glucose tolerance, with the aim of reducing incidence of the disease prevalence of poor glycaemic control which in turn will cause a reduction in morbidity and mortality. The "health of a nation is the wealth" of the nation

CONSENT

Informed consent was given by the patients.

ETHICAL APPROVAL

Ethical approval Was given by the Ethical Committees of Central Hospital, Benin and University of Benin Teaching Hospital, Benin.

ACKNOWLEDGEMENT

I want to specially acknowledge Dr Ken Atoe of Department of Chemical Pathology, University of Benin Teaching Hospital, Benin and Dr Eboreme of Department of Medicine, Central Hospital, Benin who assisted in the sample and data collection and the assays. Dr Okonji who assisted in statistical analyses.

COMPETING INTERESTS

Author has declared that no competing interests exist.

REFERENCES

1. International Diabetics federation. 3rd ed. The improved Diabetes Atlas; 2006.
2. Akinkugbe OO. Final report of National survey on communicable diseases in Nigeria series 1. Federal ministry of Health and social services, Lagos; 1997.
3. Chineye S, Uloko AE, Ogbera AO, Ofoegbu EN, Fasanmade OA, Fasanmade AA, et al: Profile of Nigerians with diabetes mellitus- Diabcare Nigeria study group (2008): Results of multicentre study. *Indian J Endocrinol Metab.* 2012;16(6):981.
4. Nathan PM, Cleary PA, Backlund JY, Genuth SM, Lachim JM, Orchard TJ et al. Diabetes control and complications Trial/Epidemiology of Diabetes interventions and complications (DCC T/EDIC) study research group: Intensive Diabetes treatment and cardiovascular disease in patients with type 1 diabetes. *N Engl J. Med* 2005;353:2643–53.
5. Wild S, Roglic C, Green A, Sicrete R, King H. Global prevalence of diabetes: Estimates for the year 2000 and projections for 2030. *Diabetes care.* 2004;27:1047–53.
6. Zimmet P. The burden of type 2 diabetes: Are we doing enough? *Diabetes Metab.* 2003;29:659–18.
7. Diabetes control and complications trial research Group. The effect of intensive treatment of diabetes on the development of good progression of long – term complications in insulin dependent diabetes mellitus. *N Engl J Med.* 1993;329:977–85.
8. United Kingdom prospective diabetes study (UKPDS) group. Effect of intensive blood-glucose control with met formions complications in over weight patients with type 2 diabetes (UKPDS 34). *Lancet.* 1998;352:854–65.
9. Eid M, Mafauzy M, Faridah AR. Glycaemic control of type 2 Diabetes patients on follow up at Hospital Universiti Sains Malaysia. *Malays J Med Sci.* 2003(2):40–49.
10. Macisaac RJ, Jerums G, Weekes AJ, Thomas MC. Patterns of glycaemic control in Australian primary care (NEFRON 8). *Intern Med J.* 2009;39(8):512–8. doi: 10, 1111/J. 1445 – 5994.

11. De Pablos Velasco P, Franch J, Banegas JR, Fernandez S, Sicras A, Diaz S. Cross-sectional epidemiological study of clinical profiles and glycaemic control in diabetic patients in primary care in Spain. (The EPIDIAP study). *Endocrinol Nutr.* 2009;56(5):233–240. doi: 10.1016/51575 – 0922 (09) 71406 – 8.
12. American Diabetes Association. Standards of Medical care in diseases(Position Statement). *Diabetes Care.* 2005;28(Suppli):4-36.
13. Fox KM, Gerber Pharmd RA Bolinder B, Chen J, Kumar S. Prevalence of inadequate glycaemic control among patients with type 2 diabetes in the UK general practice research database. A series of retrospective analyses of data from 1998 through 2002. *Clin Ther.* 2006;28(3):388 – 395.
14. Saadine JB, Cadwell B, Cregg FW, Engelgau MM, Vinicor F, Imperatore G, et al. Improvement in Diabetes process of care and intermediate: United States, 1988 – 2002. *Ann intern Med.* 2006;144:465–74.
15. Adebisi SA Oghagbon EK Akande TM, Olarinoye JK. Glycated haemoglobin and glycaemic control of diabetics in Ilorin. *Niger J. Clin Pract.* 2009;12(1):87–91.
16. Idogun ES Olumese FE, Prevalence of poor glycaemic control in diabetics seen in a tertiary medical centre. *Niger Postgrad Med J.* 2007;14(1):34–6.
17. Afridi MA, Khan MN. Role of health education in the management of diabetes mellitus. *J Coll physicians Surg Pak.* 2003;10:558–61.
18. Polikandrioti M. The role of education in diabetes mellitus type 2 management. *Health science Journal.* 2010;4(4)201–202. E – ISSN: 1791–809 X.
19. Bi Y, Zhu D, Cheng J, Zhu Y, Xy N, Cui S, et al. The status of glycaemic control: A cross-sectional study of outpatients with type 2 diabetes mellitus across primary, secondary and tertiary hospitals in the Jiangsu province of China: *Clin Ther.* 2010;32(5):973–83. doi: 10.1016/j. Chin Thera. 2010.05.002.

APPENDIX 1

CONSENT/DATA FORM

Dear Sir/Madam,

This is a study being carried to assess how well your blood sugar is being controlled, as this has a bearing on your total wellbeing. We would take your blood sample and urine to carry out the tests.

The results would be made known to you in your subsequent clinic visits.

Please kindly sign/thumb print below, if you agree to this.

Thank you.

DR. MRS. ADEWOLU

Department of Chemical Pathology
University of Benin Teaching Hospital

.....

Signature/thumb print of patient

APPENDIX 2

PATIENT DATA

SERIAL NO:

GENDER:

AGE:

HEIGHT:

WEIGHT:

BLOOD PRESSURE:

TYPE OF DIABETES MELLITUS DIAGNOSED:

WHEN WERE YOU DIAGNOSED AS HAVING DIABETES MELLITUS?

ARE YOU ON ANY DRUGS TO CONTROL DIABETES? IF YES WHICH DRUGS?

ARE YOU ON ANY OTHER TYPE OF DRUGS E.G. ANTI HYPERTENSIVES, IF SO WHICH DRUGS?

© 2014 Adewolu; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/3.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

The peer review history for this paper can be accessed here:
<http://www.sciencedomain.org/review-history.php?iid=465&id=19&aid=4018>