

Research Article

A Cross-Sectional Study on Drug Utilization Pattern of Glucose Lowering Agents and Its Relationship with Glycemic Control amongst Patients with Type 2 Diabetes in a Tertiary Hospital in South West Nigeria

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Submitted: 24 September 2020

Accepted: 14 October 2020

Published: 16 October 2020

ISSN: 2333-7079

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OPEN ACCESS**Keywords**

- Diabetes mellitus
- Metformin
- Glycated haemoglobin (HbA1c)
- Drug utilization
- Nigeria

Abstract

Aim: To assess drug utilization pattern of glucose lowering agents and relationship with glycemic control amongst patients with type 2 diabetes in an outpatient clinic.

Method: A cross-sectional study was conducted amongst patients with diabetes attending the Medical Outpatient clinic of the University College Hospital, Ibadan. Demographic data, drug utilization pattern, HbA1C test and side effects related glucose lowering agents were summarized using descriptive statistics. Glucose lowering agents were classified according to the Anatomical Therapeutic Chemical (ATC), classification system.

Results: A total of 100 participants with type 2 diabetes took part in this study. 71% were females and 29% were males. The mean diabetes duration of the patients was 7.86 ± 6.53 years. When stratified according to age groups, patients within the age group of 61-70 years were the highest proportion (56%). Metformin was the most commonly prescribed medication (21%). Majority of the patients (65%), were on combination therapy. 64% of patients had good glycemic control. The most common co-morbid condition was hypertension while hypoglycemia was the most common side effects reported by the patients.

Conclusions: Metformin was the most commonly prescribed oral glucose lowering agent with most of the patients having good glycemic control.

INTRODUCTION

Diabetes Mellitus (DM) is a group of metabolic disorders characterized by hyperglycemia and disturbances of carbohydrate, fat and protein metabolism, as a result of defects in insulin secretion, insulin action or both. Diabetes mellitus is associated with acute and chronic (microvascular and macrovascular) complications [1]. It is a chronic disease reported to affect 3% of the Nigerian population [2].

The objective of this study is to assess drug utilization pattern

of glucose lowering agents in relationship with glycemic control amongst patients with type 2 diabetes in an outpatient clinic.

There are three major types of diabetes mellitus; Type I diabetes, Type II diabetes and gestational diabetes mellitus [3].

According to the World Health Organization, drug utilization is defined as the marketing, distribution, prescription and use of drugs in a society with special emphasis on the resulting medical, social and economic consequences [4].

T2DM patients usually require lifelong management with

glucose lowering drugs, leading to immense economic burden on the diabetes patient and the world economies as a whole. Healthcare costs for patients with diabetes are more than double the costs for people without diabetes [5].

The current pharmacotherapy of diabetes mellitus includes treatment with medications such as insulin injections, non-insulin injectable agents (GLP-1 agonists), and oral glucose lowering agents. Oral agents include sulfonylureas, biguanides, α -glucosidase inhibitors, thiazolidinediones, dipeptidyl peptidase-4 inhibitors, and SGLT-2 inhibitors [6,7].

MATERIALS AND METHODS

This cross-sectional study was carried out over a period of 6 months from April to July 2015 among patients attending the Medical outpatient clinic of the University College Hospital, Ibadan.

Study population

This comprised of patients with Type 2 Diabetes Mellitus (T2DM), patients attending the Medical out-patient clinic of the University College Hospital, Ibadan, Nigeria. Patients of either sex who gave informed consent were included in the study. Prescriptions of T2DM patients and treatment details were included in the study.

The exclusion criteria for the study were: patients with type 1 diabetes, patients in congestive heart failure or advanced coronary artery disease, significant gastrointestinal disease and hepatic impairment, females on oral contraceptives or hormone replacement therapy, patients with advanced nephropathy and proliferative retinopathy. Newly diagnosed and patient who are not willing to participate were excluded from the study. Patients who fulfilled the inclusion and exclusion criteria were enrolled in the study.

Study design

The endocrinology clinic runs once weekly in the mornings at the Medical Outpatient clinic of the University College Hospital (UCH), Ibadan. UCH is a major referral hospital in South Western Nigeria. All prescriptions issued to patients attending the endocrinology clinic during this period following each day's consultation were copied out from the case files and recorded in data collection forms adapted from WHO guidelines on how to investigate drug use in health facilities [8].

The data was collected from prescription, patient record book and patient interview. All necessary and relevant baseline information was collected on a standard patient data collection proforma, which contained demographic data, social history, diagnosis data, laboratory investigations, and treatment.

Drugs were classified according to Anatomical Therapeutic Chemical Classification (ATCC). ATC code A10 is for drugs used in diabetes according to WHO ATCC codes. Glycemic control was assessed using the HbA1c test. Patients with HbA1c \leq 7% were classified as having good glycemic control.

Statistical analysis

Data entry and analysis was done using SPSS16.0 and Microsoft excel 2016.

Ethical approval

Ethical approval was obtained from the Research Ethics Committee of the University of Ibadan/University College Hospital, Ibadan, Nigeria.

RESULT

100 patients with type 2 DM were recruited into the study. Of the total patient majority were female (71%), in comparison to male (29%), and thirty six percent 56% belonged to the age group 61-70 years, 35% were in the age group 41-50, few 7% were below the age of 30 years and 2% above 70 years. The mean age was 55.4 years with the ages ranging from 21 -80. The average duration of DM in the patients is 7.86 years (SD= \pm 6.53) with a minimum duration of 1 year and a maximum of 30 years. The mean BMI was 26.24Kg/m² (SD= \pm 5.05) mean HbA1c of 7.23% (SD= \pm 2.37). HbA1c ranged from 3.8% - 18.2%.

Most of the patients had their highest level of education as primary and secondary education 31.48% and 33.33% with few attending University and Postgraduate school (Table 1). Only a few were never married or separated, 1 and 2% respectively (Table 1-4, Figures 1-4).

DISCUSSION

In the present study, the most commonly used anti-diabetic medications as monotherapy were metformin (60%) followed by glimepiride (17.14%), insulin (14.12%), and glibenclamide (8.57%). This in line with a study done in same hospital (UCH), Nigeria by Amwe *et al.*, in 2017[9] where metformin was the most prescribed glucose lowering agent. Metformin primarily reduces hepatic gluconeogenesis, increases peripheral insulin sensitivity, and causes less intestinal glucose absorption. It is

Table 1: Demographic characteristics of the study population. Align the frequency.

VARIABLES	FREQUENCY (%)
Gender	
Female	71
Male	29
Age (years)	
Less than 30	3
31-40	7
41-50	14
51-60	27
61-70	36
\geq 71	13
Level of Education	
Never attended	5
Primary	29
Secondary	42
University	18
Postgraduate	6
Marital Status	
Married	85
Widowed	12
Separated	2
Never married	1

Table 2: Showing duration of type 2 DM in participants of this study.

Variables	Less than 5 years	More than 5 years	Total
Male	16	13	29
Female	52	19	71
Total	68	32	100

Table 3: Effect of occupation on glyceimic control.

OCCUPATION	Good Glyceimic Control (HbA1c ≤7)	Bad glyceimic control (HbA1c >7)	Percentage control Good/total X100
Civil servant	7	9	16
Health worker	10	2	12
Electrician	9	5	14
Engraver	2	0	2
Est. Manager	1	0	1
Goldsmith	1	0	1
Hair dresser	1	0	1
Military	0	1	1
Military worker	1	0	1
Nanny at home	1	0	1
Pensioner	1	0	1
Poultry	1	0	1
Sawmiller	1	0	1
Sewing	1	0	1
Teacher	2	2	4
Technician	1	0	1
Traders	20	15	35
Veg cult	0	1	1
Rearing livestock	0	1	1
Others	9	10	19
TOTAL	63	37	100

Table 4: ATC Codes of the various antidiabetic drugs utilized by patients in this study.

DRUGS	ATC code
Insulin	A10AB01
Insulin (bio)	A10AD01
Metformin	A10BA02
Glimepiride	A10B12
Glibenclamide	A10BB01
Gliclazide	A10BB09
Pioglitazone	A10BG03
Glipizide	A10BB07
Acarbose	A10BF01
Insulin (Lante)	A101C01
Metformin + Sulfonylureas	A10BD02

often the preferred first line oral therapy especially for obese patients unless contra-indicated. The pattern of use of metformin is probably due to its effectiveness, safety profile, role in weight loss, and low risk of hypoglycemia. The findings from this study are in agreement with established guidelines.

The age groups (61-70), years old was of the highest frequency while the least frequency age group was below 30 years old which

was a little different from findings in a research conducted in Sudan by Babiker *et al.* (April, 2020) [10], and this might be due to the influence of economy, lifestyle, and environment. However, the findings from this study is similar to a study done in Awka, Nigeria which reveals prevalence of diabetes among age group

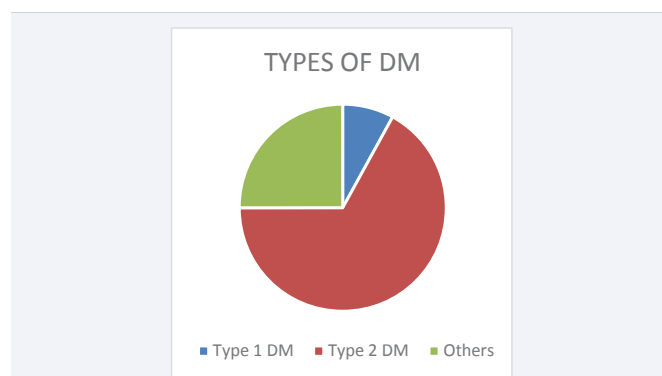


Figure 1 The types of diabetes mellitus seen at the clinic. A majority of the patients screened were type 2 DM N=100 (46.9%), followed by type 1 DM N=67(31.5%), and the rest N=46(21.6%). However, only patients with type 2 diabetes were used for this study.

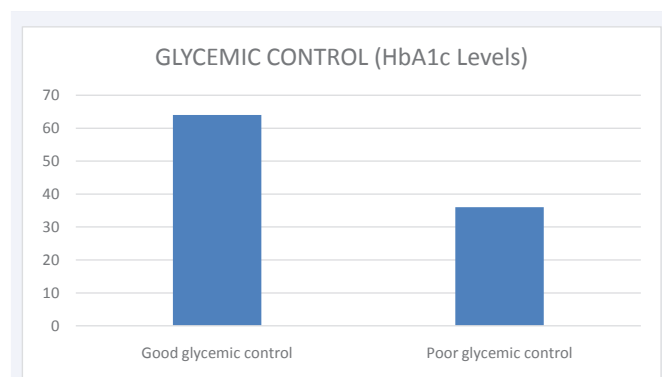


Figure 2 Frequency of glyceimic control amongst participants using HbA1C test.

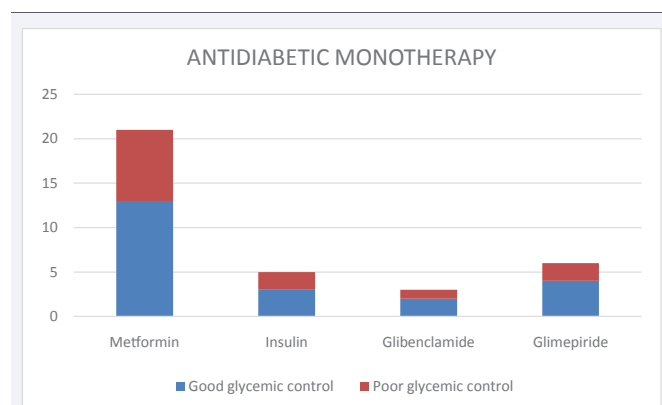
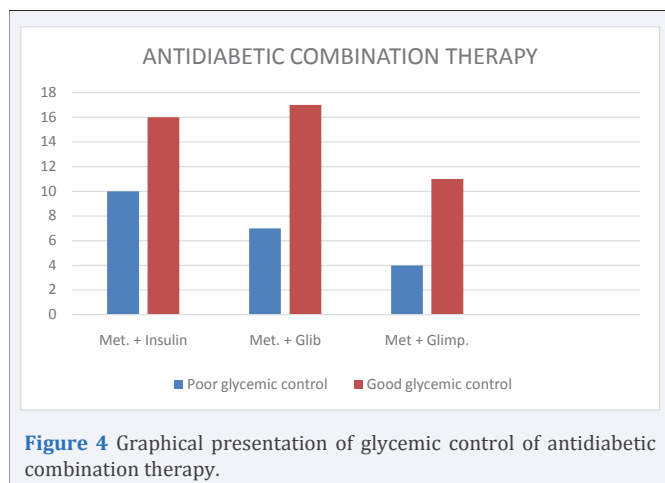


Figure 3 Graphical presentation of glyceimic control of antidiabetic monotherapy drugs. N=21(60%) of the patients on antidiabetic monotherapy are on Metformin followed by N=6(17.14%) on Glimepiride and N=5(14.12%) on insulin. The least was N=3(8.57%) who are on Glibenclamide.



71 – 80 years, Jimoh *et al.*, [11].

Among two drug combination therapy, Insulin + metformin (26%) was the most commonly prescribed followed by metformin + glibenclamide (24%) then metformin + glimepiride (15%). This finding was in contrast to a study done by Lee and Backman [12], where glimepiride + metformin was the most commonly prescribed combination and in line with the study done by Kumar *et al.* [13], where insulin + metformin (16.6%), was the most prescribed anti-diabetic combination followed by glimepiride + metformin (10%).

In our study, most of the patients had poor glycemic control as the mean HbA1c was found to be 7.23%. The findings of this study are in line with results given by Jayarama *et al.*, [14] as mean HbA1 C reported to be 8.27. The highest Hb A1 C level observed in the study population was 11.5, and the lowest observed being 6.2. Also, in this study, the female gender had good glycemic control over the males, this can be due to the fact that women seem to be most vulnerable and thus present at medical services earlier in search of cure or prevention.

Duration of diabetes has a significant role in its management. Patients who have had diabetes for <5 years could usually be managed with single drug therapy. In the present study, most of the patients n(male)=16 and n(female)=52, total N=68 (68%) had a diabetic history of <5 years with an average mean duration of illness to be 7.86(SD= ± 6.53) years, a finding similar with a study by Kannan, A. and Kumar S., 2011 [15].

Majority of the patients were on combination therapy, which is in agreement with previous studies [16]. This may be partly attributed to failure to achieve normoglycemia with one medication. Recent guidelines encouraged the use of combination therapy from the outset if HbA1c is high, and when patients fail to attain normoglycemia after a certain period.

The current guidelines of the American Association of Clinical Endocrinologist/American College of Endocrinology (AACE/ACE) advocate the use of dual therapy in patients with initial HbA1c levels > 7.5 %, and dual/triple combination therapy in patients with initial HbA1c levels > 9.0 % in addition to asymptomatic hyperglycemia [17].

Findings from a study done in Nigeria similarly reported

hypoglycemia as one of the most common side effects and common reasons for non-adherence for those patients on glibenclamide [18] which is in line with this study and the commonest side effect was hypoglycemia.

CONCLUSION

This study observes metformin as the most commonly used glucose lowering agent and there was a good glycemic control amongst the participants. The prescribing trend also appears to be moving towards combination therapy particularly two drug therapy where patients are placed on more than one glucose lowering agent. Findings from this study will better help further drug utilization studies in Nigeria.

ACKNOWLEDGMENT

This work was supported by the University of Ibadan Research Foundation (UIFR).

REFERENCES

1. Barbara GW, Joseph T, Terry L, Schwinghammer F, Cecily V. Pharmacotherapy. 7th (Edn.). 2009; 4: 210.
2. Akinkugbe OO, Akinyanju OO. Final report. national Survey on non-communicable diseases in Nigeria. Lagos: Federal Ministry of Health. 1997.
3. Velho G, Froguel P. Maturity-onset diabetes of the young (MODY), MODY genes and non-insulin-dependent diabetes mellitus. Diabetes. 2002; 23: 34-43.
4. World Health Organization. Defined Daily Dose approach to economic evaluation of drug therapy. World Health Organization Health economics and Health sector reform document (WHO/HE/HSR-2007). 2007; 1-176.
5. Hogan P, Dall T, Nikolov P. Economic costs of diabetes in the US in 2002. Diabetes Care. 2003; 26: 917-932.
6. Unger J. Current strategies for evaluating, monitoring, and treating type 2 diabetes mellitus. Am J Med. 2008; 1: 121.
7. El-Kaissi S, Sherbeeni S. Pharmacological management of type 2 diabetes mellitus: An update. Curr Diabetes Rev. 2011; 7: 392-405.
8. World Health Organization. How to investigate drug use in Health Facilities: selected drug use indicators. Geneva. WHO/DAP/93.1. 1993.
9. Amwe JV, Adedapo ADA, Adeleye JO. Diabetic Drug Utilization and Assessment of Glycemic Control Using Glycated Hemoglobin in Patients with Diabetes Mellitus Attending a Tertiary Hospital in South. Arch Bas App Med. 2017; 5: 11-16.
10. Babiker Abadi AE, Mousnad MA, Altayeb A, Mahmoud M. Pharmacoepidemiological Profiles of Oral Hypoglycemic Agents in Elbanjaded Hospital, Khartoum, Sudan. Journal of Quality in Health care & Economics. 2020; 3: 30.
11. Jimoh AO, Sabir AA, Chika A, Sani Z. Pattern of Antidiabetic drugs use in a diabetic outpatient clinic of a tertiary health institution in Sokoto, Northwestern Nigeria. J Med Sci. 2011; 11: 241-245.
12. Lee D, Bergman U. Studies of drug utilization. In: Strom BL, editor. Pharmacoepidemiology. 4th ed. New York: John Wiley & Sons. 2005; 401.
13. Kumar KS, Sreerama G, Krishna KM, Nalini K, Kiranmai N, Vasavi P. Drug use pattern study of antidiabetics in type 2 diabetes mellitus at a tertiary care hospital in Tenali, Andhra Pradesh. Int J Inv Pharm Sci.

- 2013; 1: 162-166.
14. Jayaraman, A., Lent-Schochet, D, Pike CJ. Diet-induced obesity and low testosterone increase neuroinflammation and impair neural function. *J Neuroinflammation*. 2014; 16: 162.
15. Kannan, A, Kumar S. A study on drug utilization of oral hypoglycemic agents in type-2 diabetic patients. *Asian J Pharm Clin Res*. 2012; 4: 60-64.
16. Alam MS, Aqil M, Qadry SAS, Kapur P, Pillai KK. Utilization Pattern of Oral Hypoglycemic Agents for Diabetes Mellitus Type 2 Patients Attending Out-Patient Department at a University Hospital in New Delhi. *Pharmacol Pharm*. 2014; 5: 636- 645.
17. Garber AJ, Abrahamson MJ, Barzilay JI, Blonde L, Bloomgarden ZT, Bush MA, et al. Consensus statement by the American Association of Clinical Endocrinologists and American College of Endocrinology on the comprehensive type 2 Diabetes management algorithm: 2016 Executive Summary. *Endocr Pract*. 2016; 22: 84 - 113.
18. Osuntokun O, Taylor L. Diabetes mellitus in Nigerians: a study of 832 patients. *West Afr Med J*. 1976; 28: 155-159.

Cite this article

Adeleye JO, Adedapo ADA, Amwe JV, Charles-Davies MA, Kotila TR, et al. (2020) A Cross-Sectional Study on Drug Utilization Pattern of Glucose Lowering Agents and Its Relationship with Glycemic Control amongst Patients with Type 2 Diabetes in a Tertiary Hospital in South West Nigeria. *J Pharmacol Clin Toxicol* 8(3):1147.