Original Research Article

COMPARATIVE STUDY OF CLINICAL RESPONSES TO ORAL HYPOGLYCEMIC AGENTS IN A PRIMARY HEALTHCARE FACILITY

ABSTRACT

Background: There were 1.5 million deaths caused by diabetes in 2012, of which more than 80% of diabetes deaths occurred in developing countries. WHO estimated diabetes would be the 7th leading cause of death by 2030.

AIM: The study aimed at evaluating type 2 diabetes mellitus patients' clinical responses after use of oral hypoglycaemic agents.

Study design: The study was a retrospective observational study.

Place and duration of study: The study was undertaken at Primary healthcare facility, University Health Centre. The study monitored type 2 diabetes mellitus patients who attended the endocrinology clinic within the ten years of review.

METHOD: After ethical approval was given, a retrospective evaluation of type 2 diabetes mellitus patients' folders was done for one hundred and nineteen patients who attended the endocrinology clinic. Relevant information obtained from patients' folders were collated and analysed.

RESULTS: Out of one hundred and nineteen participants who received oral hypoglycaemic agents, seventy-six (63.8%) participants were in the age range 45-55 years, followed by twenty-four (20.2%) participants with age range greater than 55 years. Sixty-eight (57.1%) participants were females while fifty-one (42.9%) were males. Forty two (35.3%) participants had a controlled plasma glucose level of <110mg/dl while seventy-even (64.7%) participants had plasma glucose level of >110mg/dl. Efficacy index was highest for Daonil+Glycomet followed by Diabinese+Glucophage and Glucovance respectively.

CONCLUSION: The study indicated that fewer type 2 diabetes mellitus patients' plasma glucose levels were controlled by two drugs combination therapy involving metformin.

Keywords: Diabetes mellitus, oral hypoglycaemic agents, efficacy index, plasma glucose

INTRODUCTION

The human, social and economic consequences of non-communicable diseases are felt by all countries but are particularly devastating in developing countries of the world. Reducing the global burden of non- communicable diseases is an overwhelming priority and an unavoidable condition for sustainable development. Non-communicable diseases is the leading cause of death globally responsible for 38 million (68%) of world's 56 million deaths in 2012. Sixteen million were premature deaths under age 70 years. 28 million deaths associated with non-communicable diseases occurred in developing countries and mostly (82%) premature deaths [1].

The leading causes of deaths associated with non-communicable diseases in 2012 were reported as cardiovascular diseases (17.5 million deaths), cancers (8.2 million deaths), respiratory diseases (4 million deaths) and diabetes (1.5 million deaths). These four major non-communicable diseases were responsible for 82% of death associated with non-communicable diseases [2].

Diabetes is a chronic disease that occurs when the pancreas does not produce enough insulin or when the body cannot effectively use the insulin it produces. Insulin is a hormone that regulates blood sugar [3]. Hyperglycaemia, or raised blood sugar, is a common effect of uncontrolled diabetes and over time leads to serious damage to many of the body's systems, especially the nerves and blood vessels. The global prevalence of diabetes in 2014 was estimated to be 9% among adults aged 18 years and above [4]. There were 1.5 million deaths caused by diabetes in 2012. More than 80% of diabetes deaths occurred in developing countries [3]. WHO estimated diabetes would be the 7th leading cause of death by 2030 [4]. Africa is experiencing an increasing prevalence of diabetes [5]. In 2010, 12.1 million people were assumed to be living with diabetes in Africa and it is expected to increase to 23.9 million by 2030 [6]. Diabetes is assumed to cause other diseases such as cardiovascular disease, renal disease, pneumonia, bacteraemia and tuberculosis [7-12]. Consequently, it increased morbidity and mortality in the region [13-18]. Therefore attention should be given to the management of diabetes mellitus.

The total economic cost of diabetes in the Africa region in 2000 was US$67.03 billion, or US$8836 per person with diabetes per year [19]. The prevalence of T2DM appears to have increased considerably from that recorded in earlier surveys conducted in the region, which found the prevalence in Sub-Saharan Africa was typically below 1%, with the exception of studies in South Africa (3.6%) and the Ivory Coast (5.7%) [20-21].

The main goal of treatment of diabetes mellitus is to recreate normal or nearly normal blood sugar levels without causing low blood sugar while preventing tissue damage due to hyperglycemia. The main goal of treatment is to obtain an HbA1c of 6.5% or fasting glucose of less than 6.1mmol/L (less than 110mg/dL) [22]. There are many brands of oral hypoglycaemic agents used in Nigeria to treat diabetes mellitus. This study aimed at evaluating clinical responses to different oral hypoglycaemic agents used in the University Health Center, Uyo.

METHOD

Study design: It was a retrospective observational study. A survey of records of patients on hypoglycaemic agents were observed, collated and compared.

Study setting: This study was undertaken in a secondary healthcare facility located in Uyo. Records of patients attending endocrinology clinic were used for the study.

Study location: The study took place in Endocrinology clinic, University Health Centre, University of Uyo, Akwa-Ibom state, Nigeria. The Health Centre was a primary healthcare facility with about 50 bed spaces. The Health Centre had nine medical practitioners, five Pharmacists, twenty nurses, five medical laboratory scientists and a radiographer.

Study population: Folders of one hundred and nineteen type 2 diabetic mellitus patients who attended the Endocrinology Clinic at the University Health Centre for the management of their disease condition were used for the collation of data.

Sample size: All the available folders of type 2 diabetes mellitus patients attending endocrinology clinic in the Health Centre were used for the survey. One hundred and nineteen folders were used.

Data collection: After the study gained approval from the Health Centre Research Committee, the Health Centre record book was used to select folders of patients that were currently attending the Centre for the management of type 2 diabetes mellitus. The medical information of the participants that were extracted from the record book included age, weight, gender, patients' complaints, diagnostic test report, physicians' diagnostics, prescribed medication and serum glucose level. The reported serum glucose levels were taken after participants had taken oral hypoglycaemic medications for three months. Data were collated from one hundred and nineteen folders of type 2 diabetes mellitus patients who attended the Center from December 2013 to November 2014.

Inclusion criteria: These included patients diagnosed of type 2 diabetes mellitus and patients were receiving oral hypoglycaemic agents.

Exclusion criteria: The study excluded patients that were not having type 2 diabetes mellitus and patients that were receiving non-oral hypoglycaemic agents such as injectables and insulin.

Data analysis plan: Descriptive statistical tools were used to analyse serum glucose levels of participants. SPSS version 21 software package was used for the statistical analysis.

A format of data obtained from patient's folder was shown below:

S/N	PATIENT INFORMATION			DIAGNOSTIC REPORT	PHYSICIAN DIAGNOSTIC	PRESCRIPTION ON CLINIC VISIT				PHARMACIST' S INTERVENTION	DRUG RELATED PROBLEM	DIET CONTROL REPORT	EXERCISE	CLINICAL RESPONSE
	COMPLAINT	WEIGHT	AGE			V1	V2	V3	V4					

Data analysis:

Data were stored in Microsoft word and analyse by using descriptive analysis and chi test. SPSS version 21 software package was used while significance was considered at p=0.05.

RESULTS

One hundred and nineteen patients' folders were assessed for clinical response after use of oral hypoglycaemic agents. Among the study participants, diabetes mellitus was most prevalent (63.86%) in age 45-55 years old, followed by ages 55 years (20.17%). Among diabetic patients below 45 years of age, 13 (68.4%) patients had blood glucose level above 110mg/dL. Among diabetic patients between 45-55 years old, 57 (75%) patients had blood glucose above 110mg/dL. Among diabetic patients above 55 years old, 14 (58.3%) patients had blood glucose above 110mg/dL (Table 1). Oral hypoglycaemic agents could not reduce blood glucose to 110mg /dL in 28 (54.9%) male diabetic patients and 29 (42.6%) female diabetic patients (Table 2).

Clinical responses of diabetic patients showed that combination of Daonil+Glucomet controlled plasma glucose below 110mg/dl in 50% of users while Diabinese+Glucophage controlled plasma glucose below 110mg/dl in 45.5% of users. Glucovance controlled plasma glucose below 110mg/dl in 42.9% of users (Table 3).

Efficacy index was highest among users of oral hypoglycaemic agents who received Daonil + Glucomet combination followed by those who received Diabinese +Glucophage and Glucovance only (Table 4).

Table 1: Comparison of age with clinical response to oral hypoglycaemic agents

AGE	Clinical response			No of participants
	<90mg/dL	90-110mg/dL	>110mg/dL	
<45 years	1 (5.26%)	5 (26.3%)	13 (68.4%)	19 (16.0%)
45-55 years	5 (6.6%)	14 (18.4%)	57 (75%)	76 (63.8%)
>55 years	1 (4.2%)	9 (37.5%)	14 (58.3%)	24 (20.2%)
Total	7	28	84	119

Table 2: Comparison of sex with clinical response to oral hypoglycaemic agents

Sex	Clinical response			No of participants
	<90mg/dL	90-110mg/dL	>110mg/dL	
Male	10 (19.6%)	13 (25.5%)	28 (54.9%)	51 (42.9%)
Female	13 (19.1%)	26 (38.2%)	29 (42.6%)	68 (57.1%)
Total				119

Table 3: Clinical responses of oral hypoglycaemic agents

Drug therapy	Clinical response		Frequency
	<110mg/dL	≥110mg/dL	
Daonil + Glucophage	30 (37.0%)	51 (62.9%)	81 (68.1%)
Diabinese + Glucophage	5 (45.5%)	6 (54.5%)	11 (9.2%)
Daonil + Glycomet	1 (50.0%)	1 (50.0%)	2 (1.7%)
Daonil	3 (16.7%)	15 (83.3%)	18 (15.1%)
Glucovance	3 (42.9%)	4 (57.1%)	7 (5.9%)
Total	42	77	119

Glucophage: Metformin, Daonil: Glibenclamide, Diabinee: Chlorpropamide, Glycomet: Metformin, Glucovance: Metformin + Glibenclamide

Table 4: Efficacy index

Drug therapy	Clinical response		Efficacy index
	% Benefit	% No benefit	
Daonil + Glucophage	37.0%	63.0%	0.37
Diabinese + Glucophage	45.5%	54.5%	0.46
Daonil + Glycomet	50.0%	50.0%	0.5
Daonil	16.7%	83.3%	0.17
Glucovance	42.9%	57.1%	0.43

Glucophage: Metformin, Daonil: Glibenclamide, Diabinese: Chlorpropamide, Glycomet: Metformin, Glucovance: Metformin + Glibenclamide

Discussion

Africa is profoundly increasing in prevalence of non-communicable diseases such as diabetes mellitus from 12.1 million people living with diabetes in 2010 to 23.9 million people living with diabetes in 2030 [22]. Diabetes was most prevalent in the 45-55 years age group. Similar age group, 45-64 years was reported in a study in Asia as most prevalent [23]. Another study which determined the global prevalence of diabetes concluded that most prevalent age group in developing countries of the world was 45-64 years [24]. Their report supported this study outcome. Another study in Nigeria on prevalence of diabetes indicated an increasing prevalence of diabetes with increasing age [25]. The age range >55 years were few probably due to limited resources to maintain the health challenges of the elderly and to ameliorate the complications of uncontrolled type 2 diabetes mellitus [9].

In the study, more than half of the study participants in the three age groups could not have their plasma glucose lower to 110mg/dl suggesting difficulty of managing diabetes in developing countries with limited resources and a predisposition to risks associated with uncontrolled diabetes such as cardiovascular risk. Previous study had documented that majority of diabetes mellitus patients on oral hypoglycaemic agents did not have controlled plasma glucose level. Previous study had indicated cardiovascular risk as one of the consequencies of uncontrolled plasma glucose [26].

In this study more than half of the study male participants could not have their plasma glucose lower to 110mg/dl while less than half of the study female participants could not have their plasma glucose lower to 110mg/dl suggesting improved clinical responses in female participants. This report was in contrast to an earlier study which indicated that it was difficult to achieve glucose control in female diabetic participants [27]. The difference in our reports may be due to the fact that their study involved the use of both insulin and oral hypoglycaemic agents while this study involved the use of oral hypoglycaemic agents only. Other study indicated that combination of hypoglycaemic agent and insulin glardine could control plasma glucose [28].

Nearly 20% of both male and female participants had lowered plasma glucose below 90mg/dl suggesting. No study has suggested that there was a lowering of plasma glucose to 90mg/dl by oral hypoglycaemic agents. However, drug adherence, lifestyle modification and diet control could make glycemic goal achievable [29].

Daonil+Glycomet, Diabinese+Glucophage and Glucovance produced nearly 50% users with lowered plasma glucose at <110mg/dl suggesting efficacy at reducing plasma glucose. This combination therapies involved metformin which justified the reason for its inclusion in first line therapy. Metformin had been recommended as first line therapy in the management of type 2 diabetes mellitus [30].

The two drugs combinations including different brands of metformin with Daonil did not indicate similar efficacy which probably suggested the effect of patients' factors such as drug adherence, body mass index or drug formulation effect. Previous study explained different pattern of adherence among type 2 diabetes mellitus participants [31].

Most participants did not have plasma glucose control with the use of two combination therapies. Thus three drugs combination therapy and life style modification might be adequate to control plasma glucose in those patients whose plasma glucose levels were uncontrolled.

In conclusion, this study indicated that fewer participants had plasma glucose controlled with two drugs combinations that included metformin.

Recommendation: Type 2 diabetes mellitus patients whose plasma glucose levels were uncontrolled with two drugs combination should be given education on lifestyle modification and encouraged to commence three drugs combination therapy.

Competing interest: The authors declared no competing interest.

Ethical approval: The ethical approval was granted by the Research Ethics Committee of the University Health Centre, University of Uyo.

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