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Prescribing Patterns of Antidiabetic in Patients with Type 2 Diabetes Mellitus at Levy and Chilenje Hospitals in Zambia

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ABSTRACT

Objective: To determine the prescription pattern of anti-diabetics drugs in patients with type 2 diabetes at Levy Mwanawasa General and Chilenje Level 1 Hospitals.

Methods: A cross-sectional study was conducted by reviewing the diabetic patients' prescriptions with diabetic drugs from outpatient department from January to December, 2016. Data generated from this study was analyzed using SPSS version 23. The P value < 0.05 was considered as significant. Descriptive statistics and one way analysis of variance (One way -ANOVA) statistical techniques were used to analyze data.

Results: Of the total of 384 patients' prescriptions, 63% were female and the majority of patients belonged to the age group 51-60 years indicating 28%. 51% of the prescriptions had 2 to 3 antidiabetic drugs written by generic name. Metformin/Daonil combination was highly prescribed with 57%, followed by Metformin as Monotherapy at 19%.

Conclusion: This study reported that female patients were significantly more affected with diabetes associated with cardiovascular complications than male patients reviewing 37% for male and 67% female. Most of the patients were on combination therapy of Metformin /Glibenclamide in the frequency TDS/OD. The choice of drug based on demographic data, economic status, associated conditions and complications would give additional insights into prescribing patterns in type 2 diabetes mellitus.

Keywords: Diabetes mellitus, antidiabetic drugs, prescription patterns, patients, Zambia

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INTRODUCTION

Diabetes mellitus a chronic non-communicable disease that has struck worldwide that has become an important global public health problem requiring lifelong treatment worldwide [1,2]. Each year more than 396 million people worldwide and about 231,000 in United States die from diabetes and its complications [1]. In sub-Sahara, South Africa recorded 2.6 million while Diabetes Association of Zambia reported 218,200 cases of patients aged 20 to 79 year in 2015 [3,4].

The stimulation of endogenous insulin secretion, enhancement of insulin action at the target tissues, inhibition of dietary starch and lipid degradation, and insulin replacement are currently the available therapeutic strategies for the treatment of diabetes [5,6]. These drugs work to lower abnormally high glucose levels in the blood, which are characteristic of the endocrine system disorder [7,8].

However, in the management of diabetes, selection of antidiabetic drugs is a major health concern in medical practice due to many antidiabetic drugs on the market [1]. Pharmacist and prescribers are left in a dilemma when selecting drugs for individual patients leading to ineffective treatment, unnecessary prescription and 50% wastage of antidiabetic drugs increasing the economic burden on developing countries [9,10]. Further, it is unclear whether the prescriptions by the prescribers comply with current evidence and clinical guidelines in the management of diabetes in each country [8].

The information that shall be generated in this study may be used as a reference point by health care providers in reducing morbidity and mortality, correct prescribing pattern of anti-diabetic drugs and review their management and provision of quality health towards diabetic patients. Thus, this study determined the prescription pattern of antidiabetic drugs for patients with type 2 diabetes mellitus at Levy Mwanawasa and Chilenje Hospitals in Lusaka province, Zambia.

Statement of the Problem

In the management of diabetes, selection of Antidiabetic drugs is a major health concern in medical practice due to a large number of antidiabetic drugs on the market [1]. Pharmacist and prescribers are left in a dilemma in selection of drugs for individual patients leading to ineffective treatment, unnecessary prescription and 50% wastage of antidiabetic drugs increasing economic burden on developing countries [9,10]. However, it is unclear whether prescriptions by the prescribers comply with current evidence and clinical guidelines in the management of diabetes in each country [8].

Therefore, the purpose of the study is to determine the prescription pattern of antidiabetic drugs for patients with type 2 diabetic mellitus at Levy Mwanawasa and Chilenje Hospitals, Lusaka province, Zambia.

Justification of the Study

The information that shall be generated from this study may be used as a reference point by health care providers in reducing morbidity and mortality, correct prescribing pattern of anti-diabetic drugs and review the provision of quality health towards diabetic patients at Levy Mwanawasa and Chilenje Hospitals.

The study may further help MOH in policy making prescribing pattern in patients with type 2 diabetes mellitus management at levy Mwanawasa and Chilenje hospital. Additionally, it will instill cost effectiveness in the Ministry's budgetary allocations towards Anti diabetic medicines to ensure the optimal care of diabetic patients at Levy Mwanawasa and Chilenje Hospitals. Furthermore, Lusaka Apex Medical University students may have benefited from this study as a research entity that upholds public interest regarding drug safety.

General Objective

- To determine the prescription pattern of anti-diabetics drugs in patients with type 2 diabetes at Levy Mwanawasa and Chilenje Hospitals.

Specific Objectives

1. To determine the most demographic characteristics of anti-diabetic drug user.
2. To determine class and drug combination of anti-diabetic medication commonly prescribed in Type 2 Diabetes Mellitus at Levy Mwanawasa and Chilenje Hospitals.
3. To determine the frequency, route and number of antidiabetic drugs in type 2 Diabetes mellitus at Levy Mwanawasa and Chilenje Hospitals.

Research Question

- What are the prescription patterns of anti-diabetic drugs in patients with type 2 diabetes mellitus?

MATERIALS AND METHODS

Study Design, Site, and Population

This was a cross-sectional study that reviewed male and female diabetic patient's prescriptions with type-2 diabetic drugs from the medical records of the Outpatient departments of Levy Mwanawasa General Hospital and Chilenje first level Hospital in Lusaka province, Zambia. Period under review was from January to December 2016. The patients' age ranged from 30 to 80 years.

Sample Size and Sampling Technique

A simple random sampling technique was conducted and sample size was determined using the formula *N = Z2 x P (1-P) / d2*

= 1.962 x 0.5 (1 - 0.5) / (0.05)2

= 384

Where: Z- confidence interval of 95 % (1.96), P-expected prevalence of 50% (0.5),

d - Margin of error 5 % (0.05).

Inclusion and Exclusion Criteria

Prescription with anti-diabetic drugs from the outpatient department; patients diagnosed with type 2 diabetes mellitus with hypertension as a comorbidity; both genders aged 30 to 80 years were the inclusion criteria. While in-patients; patients below the age of 30 years and above 80 years; prescriptions outside the period under analysis and patient's diagnosed with type 2 diabetes mellitus with comorbidity other than hypertension were excluded.

Variables

Independent variables

- Age
- Gender
- Anti-diabetic drugs/ anti diabetic drug combinations.
- Dosage of anti-diabetic drugs.
- Number of drugs given on a prescription for a diabetic patient.

Dependent Variables

- Prescription patterns of anti-diabetic drugs

Data Collection and Analysis

The data was collected using pre-tested data collection formats from the patient's files with the help of the research assistants from the medical records department at the hospitals that were oriented. The collected data was checked for completeness and consistency before processing. Data generated from this study was analyzed using SPSS version 22. The P value < 0.05 was considered as significant. Descriptive statistics, t-test, chi-square and one-way analysis of variance (1-ANOVA) statistical techniques were used to analyze data. Data processing steps were done which includes coding using a data coding book and then entered in SPSS version 22 and tabulated using Stata 12 software.

Ethical Consideration

Ethical approval was sort from ERES Converge IRB on code number I.R.B No. 00005948, E.W.A No. 00011697 before the commencement of the study. Confidentiality was upheld by withholding the names of the patients and all their data was kept in a data base with a password as this information was only used for academic purposes.

RESULTS

A total of 384 prescriptions for diabetic patients who were on diabetes therapy between January 2016 and December 2016 were reviewed**.** The following graphs represent the ratio of prescriptions reviewed by site; demographic data; prescription patterns (common drugs prescribed; drug dosages and number of drugs on a given prescription) among the patients.

Figure 1 shows the distribution of patients' age ranged from 30 to 80 years. The results of the percentage of patients according to age are given above. Figure shows that 22% of prescriptions were reviewed from Chilenje First Level Hospital whole 78% were reviewed at Levy Mwanawasa Hospital respectively, this was due to the number of Outpatient attendance and the difference in the catchment between the two facilities.

Table 1 shows that on average, 36.7% male had Diabetes Mellitus type 2 while there were more females suffering from diabetes because of lifestyle and use of other drugs such as oral contraceptives during their reproductive stage.

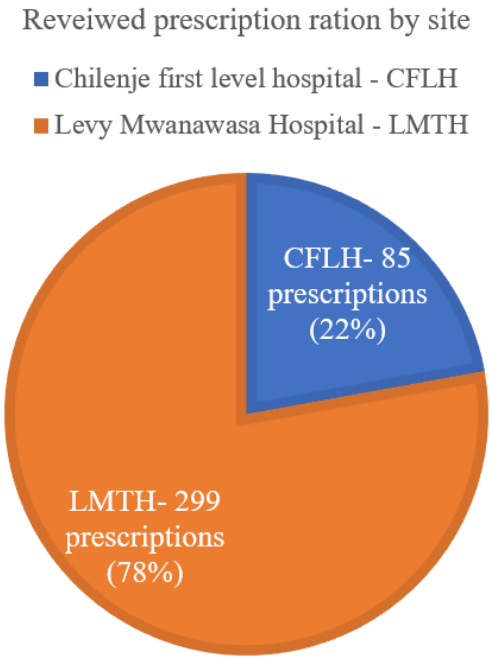

***Figure 1**. Reviewed prescription ratio by site (n =384)*

***Table 1**. Average age of participants by gender*

Gender	Total number	Percent (%)	Average Age
Male	141	36.7 %	51.12
Female	243	63.3%	51.28
Total	384	100%	51.22

***Table 2**. Age cohort distribution by gender*

Gender	Participants' Age	Frequency	Percent
Male	30-44 years	49	12.8%
	45-64years	72	18.8%
	65 years and above	20	5.2%
	Total	141	36.7%
Female	30-44 years	80	20.8%
	45-64years	130	33.9%
	65 years and above	33	8.6%
	Total	243	63.3%
Total	30-44 years	129	33.6%
	45-64years	202	52.6%
	65 years and above	53	13.8%
	Total	384	100.0%

***Table 3**. Distribution of Drug combinations prescribed according to sex*

Gender	Drug combinations used	Frequency	Percent
Male	Glibenclamide	26	6.80%
	Metformin	34	8.90%
	Metformin/Glibenclamide	69	18.00%
	Insulin and others	11	2.90%
	Glimiperide and others	1	0.30%
	Total	141	36.70%
Female	Glibenclamide	29	7.60%
	Metformin	44	11.50%
	Metformin/Glibenclamide	148	38.50%
	Insulin and others	22	5.70%
	Total	243	63.30%
Total		384	100.00%

Table 2 indicated that in both male and female aged 45 to 64 years had a higher percentage indicating 18.8% in male and 33.9% in female and in lower age ranges. The reasons could be due to the satiety lifestyle and lack of physical activities as they grow.

The trend in this study as reviewed in **Figure 2** showed that a combination of Metformin+ Glibenclamide 56.3% was the most commonly prescribed oral anti- diabetic drug. The probable reason for these findings could be that metformin is regarded as the first drug of choice for most patients with type 2 diabetes mellitus and is a drug of choice in obese patients because it does not promote weight gain.

In **Table 3**, 18% male took a combination with metformin while 38.5% in female, this I attributed to

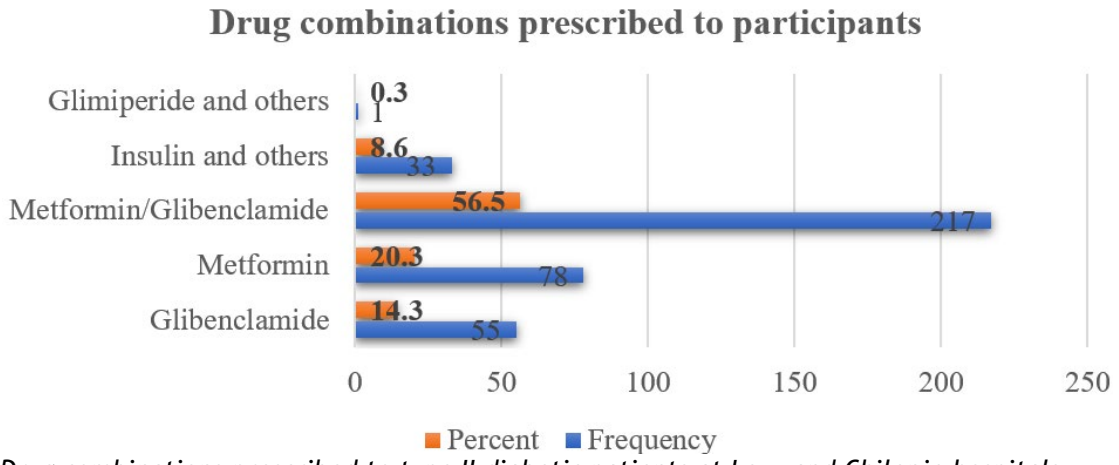

***Figure 2**. Drug combinations prescribed to type II diabetic patients at Levy and Chilenje hospitals*

***Table 4**. Drug dosage combinations prescribed to type II diabetic patients at Levy and Chilenje hospitals*

Drug dosage and combination	Frequency	Percentage
Met 500mg OD/Glibenclamide5 OD	3	0.8
Met 500 mg BD/Glibenclamide 5mg OD	**47**	**12.2**
Met 500mg TDS/Glibenclamide 5mg OD	**98**	**25.5**
Met 500mg BD/Glibenclamide 10 OD	15	3.9
Met 500mg BD/Glibenclamide 10mg BD	3	0.8
Met 500mg TDS/Glibenclamide 10mg OD	14	3.6
Met 500mg TDS/Glibenclamide 10 BD	7	1.8
Met 500mg TDS/ Glibenclamide 5 mg BD	12	3.1
Met 750mg TDS/Glibenclamide	6	1.6
Glibenclamide 2.5 mg	5	1.3
Met 250mg BD	3	0.8
Met 500mg OD	5	1.3
Met 500mg BD	19	4.9
Met 500mg TDS	**51**	**13.3**
Glibenclamide 5 mg OD	24	6.3
Glibenclamide 5mg BD	11	2.9
Glibenclamide 10mg OD	14	3.6
Glibenclamide 10mg BD	3	0.8
insulin + other drugs	**32**	**8.3**
Met 750mg	1	0.3
other- Glimiperide, etc.	1	0.3
Metformin 500mg TDS/ 15 mg OD	3	0.8
Any-other	5	1.3
Met 250 mg + other	2	0.5
Total	384	100

the fact that metformin does not cause increase in body weight which usually leads to less sensitivity to insulin.

According to **Table 4**, most of the prescription reviewed showed that many patients were managed on combined therapy between the metformin oral tablets and the insulin injectable in the frequency of TDS and OD represented with 25.5% respectively. Such a combination is used due to lack of glycemic control in diabetic patients after use of first line and second line or combination of oral therapy.

Of the 384 prescriptions reviewed, 28.4% prescriptions had 3 number of drugs prescribed, while 24.7% had 4 drugs, 18% had 5 drugs,12% had 2 drugs, 3.1% had 7 drugs, 0.8% had 8 drugs and finally 3.9% had 1 drug prescribed. Most of the prescriptions had more than 1 drug due to the coexistence of Diabetes with other diseases. **Figure 3** illustrates this data.

Out of the 384 prescriptions reviewed, when the prescribing pattern was compared with the age of the patients, on sex, the F-value of 3.281 shows that there is statistically significant difference since (sig) P=0.71. **Table 5** illustrates this data.

Out of the 384 prescriptions reviewed, when the prescribing pattern was compared with the age of the patients, on age, the F- value of 0.725 shows that there is statistically significant difference since (sig) P=0.576. **Table 6** shows this data.

DISCUSSION

According to **Figure 1**, the study obtained 78% of information at the Levy Mwanawasa Teaching hospital while only 22% of the information was from Chilenje first level hospital because of poor record availability at the latter. This distribution represented a 1:3 ratio.

Results from **Table 1** further highlighted that there were more women receiving treatment of type 2 diabetes compared to their male counterparts (243 or 63% vs 141 or 37%). These results agree with WHO country profile on Zambia that indicated that there was a higher percentage of women with diabetes type 2 compared to men [11]. Similarly, [12], reported that there were more female (64%) than male (36%) patient prescriptions in a study conducted at Shri Mahant Indiresh Hospital in India.

Further, studies have shown that an increase in the body mass index (BMI) among females in southern Africa could be the reason for an increase in the number of female patients that have type 2 diabetes and thus receiving treatment [13].

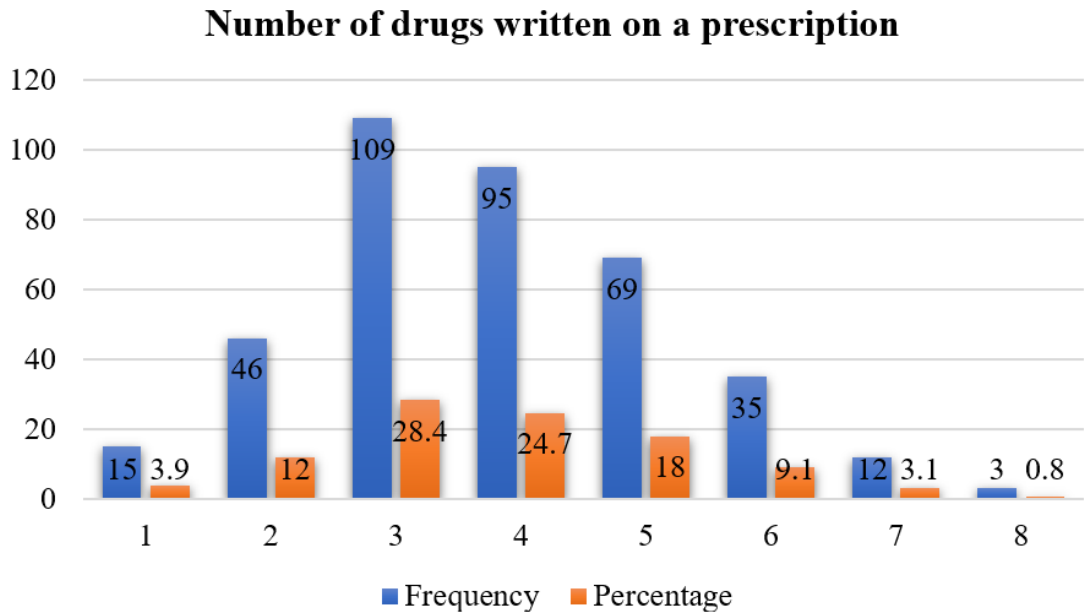

***Figure 3**. Number of drugs appearing on a prescription for type 2 diabetes patient (both anti diabetic drugs and non-antidiabetic drugs)*

***Table 5**. Relationship between the prescription pattern and the patients' sex*

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2.827[a]	1	2.827	3.281	.071
Intercept	2334.827	1	2334.827	2709.868	.000
SEX	2.827	1	2.827	3.281	.071
Error	329.132	382	.862		
Total	2874.000	384			
Corrected Total	331.958	383			

a. R Squared = .009 (Adjusted R Squared = .006)

***Table 6**. Relationship between prescription pattern and patients' age*

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2.520[a]	4	.630	.725	.576
Intercept	1937.997	1	1937.997	2229.553	.000
AGE	2.520	4	.630	.725	.576
Error	329.439	379	.869		
Total	2874.000	384			
Corrected Total	331.958	383			

a. R Squared = .008 (Adjusted R Squared = -.003)

The average age of respondents was 51.12 for males and 51.28 for females in **Table 2**, showing that there was no statistically significant difference in the age of the male and female respondents, (*P=0.902*). It was observed that the largest number of patients fell in the 45-64 years cohort (202; 52.6%) followed by the 30-44 years cohort (129; 33.6%). Mahmoud and colleagues, who conducted a study on diabetes among South African adults, reported that there was an increase in prevalence with age and had the highest prevalence amongst those that were 70 years and older [14].

However, unlike Mahmoud, Lopez and colleagues reported that the highest prevalence of diabetes was reported among patients with age ranging 18 – 64 years followed by those in the range of 65-74 years [15]. Although this study's age cohorts are slightly different, the results of this study may be like those of Lopez and colleagues' seeing that the first two cohorts of this study fall under Lopez and colleague's 18-64 years cohort.

CONCLUSION

Prescriber's efforts can be successful and satisfying only if the patient receives rational treatment for their disease. The choice of drug based on demographic data, economic status, associated conditions and complications would give additional insights into prescribing patterns in diabetes mellitus. This study reported that female patients were significantly more affected with diabetes and hypertension than male patients as stated by **Table 1** which reviewed 36.7% for male and 63.3% female.

The majority of diabetes patients were elderly and an analysis of the drug combinations in this study showed that, Metformin given concomitantly with Glibenclamide were the commonest drug combinations prescribed (25.5%; 98), while Metformin was the commonest single drug prescribed (13.3%; 51). The Prescription pattern analysis showed that most of the patients were on combination therapy of Metformin/Glibenclamide in the frequency of TDS and OD respectively.

When age and prescription pattern combination of antidiabetic drugs were compared, the results from the one-way ANOVA analysis indicated a significant difference in the prescription pattern of drugs since P = 0.576 > P = 0.05. Therefore, the prescription pattern of anti-diabetic drugs in type 2 diabetes mellitus had no statistical significant effect on the age of the patients.

This study will act as a feedback to the prescribers to create awareness about the rational use of drugs, reduce morbidity and mortality in diabetic patients, which is achieved by ensuring optimum glycemic control not only by prescribing keeping in line with guidelines, but also by ensuring patients' adherence to treatment plan.

The study will also contribute to the body of knowledge and reference to the future studies on the management of glycemic levels in diabetes mellitus. On the basis of our findings, the demographic data, economic status and associated conditions had no statistical significant effects on establishing the appropriate prescription pattern of antidiabetic drugs to meet individual patient's needs. Therefore, furthermore studies are required to review current prescribing guidelines for diabetes and to give feedback to the prescribers to create awareness about the rational use of antidiabetic drugs.

RECOMMENDATIONS

1. To increase prescription of drugs in their generic names and reduction in number of drugs per prescription to foster patients' compliance and rational drug prescription without a fall in treatment standards towards attaining optimal diabetic control.

2. To develop a system of retaining patients written data at each hospital visit at Chilenje level 1 hospital.

3. The prescribing pattern of drugs should be based on severity of disease condition, currently available evidences in order to promote the quality use of drugs.

4. There is an urgent need for review of current prescribing guidelines for diabetic patients and introduce a standard prescribing guideline for diabetes management.

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Conflict of Interest: None to Declare

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