INTERNATIONAL JOURNAL OF DRUG DEVELOPMENT AND RESEARCH

INT.J.DRUG DEV & RES., SEP-DEC 2009;1(1):27-36

RESEARCH ARTICLE

OUTPATIENT UTILIZATION OF ANTI-DIABETIC DRUGS IN THE SOUTH EASTERN NIGERIA

** ADIBE M.O. (M.PHARM), PROF. AGUWA C.N. (PHARM D), UKWE C.V. (PH.D), OKONTA J.M. (PH.D), PHARM. UDEOGARANYA P.O (M.PHARM)*

Department of Clinical Pharmacy and Pharmacy Management, Faculty of Pharmaceutical Sciences, University of Nigeria, Nsukka, Enugu State, Nigeria.

ABSTRACT

Background *Recent study in the tertiary hospitals in Nigeria showed that prevalence of diabetes mellitus (DM) is on the increase. With this increase, the prescription volume of anti diabetic drugs, morbidity and ultimately mortality rates are expected to assume an upward trend especially in regions of the world like Nigeria where healthcare services are sub-optimal for the rapidly expanding populations.*

Aim *To determine the outpatient utilization of anti diabetic drugs in south-eastern Nigeria.*

Methods *This prospective cross-sectional study was undertaken for 20 weeks between July 2008 and November, 2008 in the three tertiary hospitals which were randomly selected. All prescriptions issued to patients attending endocrinology clinic during this period following each day's consultation were copied out from the case files and recorded in case record forms. Cost of the prescribed drugs was obtained from drug price list of the hospital pharmacies.*

Results *Oral hypoglycaemic agents (OHAs) ((15.21 DDDs/1000 diabetic patients) /day) were 4.5 times more utilized than insulin (3.4 DDDs/1000 diabetic patients /day). Among OHAs, Biguanide (Metformin) was the most utilized (11.3 DDDs/1000 diabetic patients /day), it was likely to be prescribed to diabetic patient daily compared to Sulphonylureas (Glibenclamide, Chlorpropamide) and Thiazolidinediones (Rosiglitazone) with 3.8 DDDs/1000 diabetic patients /day and 0.09 DDDs/1000 diabetic patients) /day respectively.*

Conclusion *Metformin was the most utilized anti-diabetic drugs and the costs of anti-diabetic drugs were high in the south-eastern Nigeria. Government should come up with appropriate policies such as free health care for diabetic patients, subsidies for anti-diabetic drugs and finally low import tariff for anti-diabetic drugs. All these measures will reduce the provocative high cost of anti-diabetic drugs in the zone.*

.

KEY WORDS: *Anti-diabetic drugs, Diabetic outpatients, Drug utilization, South-Eastern Nigeria.*

***Corresponding Author:** *e-mail: : maxolpharmacia@yahoo.com; **maxwell.ogochukwu@unn.edu.ng** ;Tel: +234 803 778 1479*

Received on: 30-10-09 ; Accepted on: 28-12-09

INTRODUCTION

The development of drug utilization research was sparked by initiatives taken in Northern Europe and the United Kingdom in the mid- 1960s.[1,2] The pioneering work of Arthur Engel in Sweden and Pieter Siderius[3] in Holland alerted many investigators to the importance of comparing drug use between different countries and regions. Their demonstration of the remarkable differences in the sales of antibiotics in six European countries between 1966 and 1967 inspired World Health Organization (WHO) to organize its first meeting on ''Drug consumption'' in Oslo in 1969.[4] This led to the constitution of the WHO European Drug Utilization Research Group (DURG).

The pioneers of this research understood that a correct interpretation of data on drug utilization requires investigations at the patient level. It became clear that we need to know the answers to the following questions: why drugs are prescribed; who the prescribers are; for whom the prescribers prescribe; whether patients take their medicines correctly; what the benefits and risks of the drugs are. Drug utilization is in the very focus of discussion from the economic, political and health care viewpoints. A comprehensive insight into drug utilization as an economic and primarily a public health issue can only be acquired in the context of overall health state of the respective population.[5]

The ultimate goal of drug utilization research must be to assess whether drug therapy is rational or not. To reach this goal, auditing drug utilization towards rationality is necessary especially in Nigeria where healthcare services and accessibility to drugs and services are poor. Additionally, scarcity of health resources, prohibitive cost of drugs or their non availability, sale of fake drugs and the easy access to the traditional and faith healers militate against the optimal management of a chronic disease like diabetes mellitus.[6]

According to Intercontinental Marketing Service (IMS) data, the leading groups of drugs utilized worldwide are cardiovascular drugs[7] which are usually co-prescribed along with anti diabetic drugs as result of co-existence of cardiovascular diseases and diabetes.

Unfortunately, in Nigeria, communicable diseases remain the priority health condition for the Ministry of Health. The importance of non communicable diseases as a significant contribution to disease burden in Nigeria is high. Diabetes Mellitus (DM) is associated with a high disease burden.[8] Diabetes is also a major risk factor for cardiovascular disease, stroke, and kidney failure.[9]

Most of the reports on morbidity and mortality rates of diabetes in Nigeria were made in the 1960s and 1970s and therefore may not reflect the current situation.[10,11,12] Nearly a decade ago, the prevalence of DM in Nigeria was 2.2%.[13] Isolated reports from some regions of Nigeria have found prevalence rates to range from 0.9–8.3%.[10,14] Recent study[15] in a tertiary hospital in Nigeria showed that DM admissions accounted for 15% of all medical admissions and 22% of all medical deaths. These facts demonstrate a worsening condition for DM-related admissions and deaths in Nigeria. An earlier study by Ogbera et al [16] reported cumulative DM admission rates and death rates of 10% and 7.6%, respectively. These figures were obtained from a 10-year survey from 1990–2000. These findings were not surprising because there had been projected worldwide increase in the prevalence of DM, especially in developing countries.[17,18]

With this projected increase in prevalence rates in DM, the prescription volume of anti diabetic drugs, morbidity and ultimately mortality rates are expected to assume an upward trend especially in regions of the world like Nigeria where healthcare services are sub-optimal for the rapidly expanding populations. The above mentioned issues stimulated us to undertake the present study which is aimed at determining the outpatient utilization of anti diabetic drugs in south-eastern Nigeria.

METHODS

***Corresponding Author:** *e-mail: : maxolpharmacia@yahoo.com; maxwell.ogochukwu@unn.edu.ng ;Tel: +234 803 778 1479*

Received on: 30-10-09 ; Accepted on: 28-12-09

Study Area

This investigation was carried out in south-eastern Nigeria (Enugu State, Anambra State, Abia State, Imo State, and Ebonyi State). South-eastern Nigeria is one of six geo-political zones in Nigeria. This zone has the same cultural, religious, social, political and economic commonality. It is the native home of the Igbos. (Igbos are people speaking Igbo language which is one of the three major languages in Nigeria) The population of the zone is 16,381,729.[19]

Sampling Technique

Multi-stage sampling was employed; the eleven (11) tertiary hospitals in the zone were divided into three groups (A, B and C). Enugu has four (4) tertiary hospitals out of 11 tertiary hospitals in the zone (A), Ebonyi and Abia states have 4 tertiary hospitals (B) and Imo and Anambra states have 3 tertiary hospitals (C). Tertiary hospital is the highest level of health care facility in Nigeria with highly trained medical personnel and it is highly equipped, it includes both states' and federal university teaching hospitals and federal medical centers.

One tertiary hospital each was randomly selected from each group given a total of three tertiary hospitals.

Study Design

This prospective cross-sectional study was undertaken for 20 weeks between July 2008 and November, 2008. The endocrinology clinic is held once a week in the morning. 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.[20]

Prescriptions obtained were sorted and classified in accordance with WHO ATC/DDD (Anatomical Therapeutic Chemical/ Defined Daily Dose) classification system.[21]

Cost of the prescribed drugs was gotten from drug price list of the hospital pharmacies.

Criteria for Prescription Inclusion

Only prescriptions of patients who were diagnosed with diabetes mellitus were included in the study. Prescriptions of patients with serious medical conditions requiring subsequent hospital admission were excluded. Intravenous fluids and blood transfusions were also not regarded as prescribed drugs for the purpose of this study. All illegible, improperly and incompletely written prescriptions were noted and excluded from the final analysis.

Ethical approval for the study was obtained from the individual hospital institutional review board. Confidentiality and anonymity of the patients' information were maintained during and after the study.

Assessment of Drug use Indicators

The following drug use indicators were assessed according to WHO guidelines on how to investigate drug use in health facilities.[20]

i. Prescribing indicators: Average number of drugs per encounter, Percentage of drugs prescribed by generic name, Percentage of encounters with an antibiotic prescribed, Percentage of encounters with an injection prescribed, Percentage of drugs prescribed from essential drug list.

ii. Patient Care Indicators: Average consultation time, Average dispensing time, Percentage of drugs actually dispensed and Patients' knowledge of correct dosage.

iii. Facility indicators: Availability of copy of Essential Drug List (EDL), Availability of key drugs.

iv. Complementary indicators: Percentage of patients treated without drugs, Average drug cost per encounter, Percentage of drug costs spent on injection.

***Corresponding Author:** *e-mail: : maxolpharmacia@yahoo.com; maxwell.ogochukwu@unn.edu.ng ;Tel: +234 803 778 1479*

Received on: 30-10-09 ; Accepted on: 28-12-09

Analysis of Data

The data were sorted, coded and entered into Statistical Package for the Social Science for Windows 14.0 (SPSS Inc., Chicago, IL) and subsequently analyzed.

Procedure for Core Indicators Calculation

i. Prescribing indicators. a) Average number of drugs per encounter was calculated by dividing the total number of different drug products prescribed by the number of encounters surveyed.

b) Percentage of drugs prescribed by generic name was determined by dividing the number of drugs prescribed by generic name by the total number of drugs prescribed, multiplied by 100.

c) Percentage of encounters with an antibiotic prescribed.

d) Percentage of encounters with an injection prescribed were calculated by dividing the number of patient encounters during which an antibiotic or an injection was prescribed by the total number of encounters surveyed, multiplied by 100.

e) Percentage of drugs prescribed from essential drug list was determined by dividing the number of products prescribed from Essential drug list of the hospital by the total number of drugs prescribed, multiplied by 100.

ii. Patient care indicators. a) Average consultation time was determined by dividing the total time for a series of consultations, by the actual number of consultations.

b) Average dispensing time was calculated by dividing the total time for dispensing drugs to a series of patients, by the number of encounters.

c) Percentage of drugs actually dispensed was worked out by dividing the number of drugs actually dispensed at the health facility by the total number of drugs prescribed, multiplied by

100.

d) Patients' knowledge of correct dosage was found by dividing the number of patients who can adequately report the dosage schedule for all drugs, by the total number of patients interviewed, multiplied by 100.

iii. Facility indicators. a) Availability of copy of EDL**:** By stating yes (or) no.

b) Availability of key drugs was calculated by dividing the number of specified products actually in stock by the total number of drugs on the check list of essential drugs multiplied by 100.

iv. Complementary indicators. a) Percentage of patients treated without drugs was calculated by dividing the number of consultations in which no drug is prescribed by the number of consultations surveyed.

b) Average drug cost per encounter was determined by dividing the total cost of all drugs prescribed by the number of encounters surveyed.

c) Percentage of drug costs spent on injection was determined by dividing the cost of injections prescribed by the total drug cost. The DU90% segment reflects the number of drugs that account for 90% of drug utilization.

DDD was calculated using ATC classification and DDD assignment (2009) as given by WHO collaborating centre for drug statistics methodology, Oslo, Norway.[21]

The formulas for other Parameters are shown below:

a. DDD/1000 Patients/Day (DTD)

$$DDD/1000\ Diabetic\ Patients/Day = \frac{Total\ amount\ of\ drug\ used\ during\ \ study\ period\ (mg,\ \ units) \times 1000}{DDD(mg, units) \times\ 140\ Days \times\ Total\ Sample\ Size}$$

b. Cost Per DDD

$$Cost\ Per\ DDD = \frac{Cost\ of\ one\ tablet\ or\ one\ vial\ of\ insulin\ (₦) \times DDD(mg, units)}{Strenghth\ of\ one\ tablet\ or\ one\ vial\ of\ insulin\ (mg, units)}$$

*Corresponding Author: e-mail: maxolpharmacia@yahoo.com; maxwell.ogochukwu@unn.edu.ng ;Tel: +234 803 778 1479

Received on: 30-10-09 ; Accepted on: 28-12-09

RESULTS

A total of 2803 prescriptions were collected during the study period, out of this, 2707 (96.6%) prescriptions met the criteria for inclusion in the study.

One thousand and forty-five (38.6%) prescriptions written did not have sexes indicated on them, while 263 prescriptions (9.7%) did not have ages written on them.

All the prescriptions had the names of the patients written on them and 1191 (44.0%) did not carry the case file number of the patients. The prescribers' names were indicated in 1993 (73.6%) prescriptions, dates were indicated in 2641 (97.6%) and signatures in 2666 (98.5%).

Two thousand four hundred and sixteen (89.3%) prescriptions were written for patients who were seen on follow-up basis while three hundred and eighty seven (14.3%) of the prescriptions were for patients with new cases.

One thousand six hundred and three (59.2%) prescriptions were written for females. The mean and median ages of the patients were 54.3 ± 13 years and 57 years (range, 19 to 83 years) respectively. The incidence of type 2 diabetes was 92.5%. The number of drugs per prescription was between 1 and 6, with mean value of 2.6. While three drugs per prescription were the commonest, one drug per prescription was the least. Key drugs were generally available.

Prescriptions for Injections and antibiotics were 7.9% and 1.7% respectively. Insulin prescription accounted for 96.3% of injections prescribed and 16.7% of all anti-diabetic drugs prescribed. This study showed that 57.3% of the patients had adequate knowledge of their dosage schedules. Prescriptions written in generic name accounted for 72.5% and non anti-diabetic drug prescriptions accounted for 8.7%. Anti-hypertensives, antimalarials, analgesics/antipyretics, multi-vitamins and antibiotics were the most frequently prescribed non anti-diabetic drugs.

Potential Drug-drug interactions were found in 9.2% of the total prescriptions and involved mostly ACE Inhitors/insulin / sulphonylureas, Beta Blockers /insulin /sulphonylureas, ciprofloxacin /sulphonylureas, and co-trimoxazole and sulphadoxine / pyrimethamine.

No instruction was given on how the drugs were to be taken in 74.7% of the total prescriptions.

All the prescribed anti-diabetic drugs were in the Nigerian National Essential Drugs List,[2] except Rosiglitazone. Four classes of anti-diabetic drugs fell within DU90% segment while 2 classes fell beyond DU90%.

Outpatient utilization of anti-diabetic drugs within DU90% and total DU90% were 17.8 and 18.69 DDDs/1000 /day respectively. Oral hypoglycaemic agents (OHAs) were 4.5 times more utilized than insulin (15.21 DDDs/1000 diabetic patients /day) versus (3.4 DDDs/1000 diabetic patients /day) respectively. Among OHAs, biguanide (Metformin) was the most utilized with 11.3 DDDs/1000 diabetic patients /day compared to sulphonylureas (Glibenclamide, Chlorpropamide) and thiazolidinediones (Rosiglitazone) with 3.8 DDDs/1000 diabetic patients /day and 0.09 DDDs/1000 diabetic patients /day respectively. Cost per DDD within DU90% segment was N202.1 (US$1.37) while the total Cost per DDD was N 461.3 (US$3.14). Cost per DDD for OHAs and insulin were N254.8 (US$1.73) (55.2%) and N206.5 (US$1.4) (44.8%) respectively. Cost per DDD of Rosiglitazone N160.7 (US$1.1) was highest among OHAs amounting 63.1% of OHAs Cost per DDD (see Table 2). The key drug use indicators are given in Table 1.

*Corresponding Author: e-mail: : maxolpharmacia@yahoo.com; maxwell.ogochukwu@unn.edu.ng ;Tel: +234 803 778 1479

Received on: 30-10-09 ; Accepted on: 28-12-09

Table 1. Drug use indicators data.

Core indicators	
Prescribing Indicators	**Data**
Average drugs prescribed (n)	2.6
Generics (%)	72.5
Antibiotics (%)	1.7
Injections (%)	7.9
National Essential Drug List (%)	98.6
Patient care indicators	
Average consulting time (min)	11.5
Average dispensing time (min)	2.8
Drugs dispensed (%)	97.4
Adequate knowledge of correct dosage (%)	57.3
Facility indicators	
Availability of EDL	Yes
Key drugs availability (%)	100
Complementary indicators	
Without drugs (%)	4.3
Average drug cost per Prescription (N) (US$1 = N147)	353
Cost of injections (%)	36.3

Table 2. Utilization of anti-diabetics (A10) expressed as Percentage, number of DDD/1000 patients/day and Cost/DDD

ATC Code	Drugs Prescribed	Percentage	DDD/1000 Diabetic Patients/Day	Cost/DDD (N)
A10BA02	Metformin	38.6	11.3	57.1
A10BB01	Glibenclamide	27.9	3.1	10.7
A10BB02	Chlorpropamide	13.4	0.8	26.3
A10AB	Fast-acting Insulin	9.9	2.6	108.0
Within DU90% Segment		89.8	17.8	202.1
A10AC	Intermediate-acting Insulin	6.8	0.8	98.5
A10BG02	Rosiglitazone	4.4	0.09	160.7
Beyond DU90% Segment		10.2	0.89	259.2
Total= within DU90% + Beyond DU90%		100.0	18.69	461.3

***Corresponding Author:** *e-mail: : maxolpharmacia@yahoo.com; maxwell.ogochukwu@unn.edu.ng ;Tel: +234 803 778 1479*

Received on: 30-10-09 ; Accepted on: 28-12-09

DISCUSSION

The average number of drugs per prescription was 2.6; it was lower than what had been previously reported (3.0–4.5) in other studies in Nigeria. [23-26] The low figure probably reflects the fact that 89.3% prescriptions were written for patients who were seen on follow-up basis and therefore the range of drugs prescribed and the number would be low. Polypharmacy has been reported as one of the causes of adverse drug reactions (ADRs).[27] Polypharmacy, unfortunately, is very common in Nigeria[23-26] and some other developing countries.[28]

The high average number of drugs prescribed to patients with diabetes is not surprising. It is recognized that patients with diabetes mellitus are generally prescribed more drugs than other patients.[29] The trend in this study showed that previous studies had positively influenced the diagnostic skills and the prescribing habits of Nigerian doctors, though there is still need for improvement.

The percentage of generics and drug use from essential drug list are higher when compared to previous drug utilization in Nigeria.[30] Though generic prescription has improved, the cost per prescription is still high (N 353 approximately US$2.4) compare to the result (N 183.5 approximately US$1.25) gotten in a similar study in the south-western Nigeria between December 2004 and February 2005.[31] This might be attributed to higher prescriptions of human insulin, rosiglitazone , ACEIs and statins in the south-east. These drugs are expensive and many of which still exist in their brand names.

The insulin cost per DDD was 44.8% of the total 'cost per DDD' showing that their inclusion in prescription leads to a higher costing which is inevitable in a diabetology clinic. Since most drug used in Nigeria are imported, the high cost of drug could also be associated to discrepancy in registration charges for domestic and imported drugs stipulated by Nigerian drugs regulatory body , National Agency for Food and Drug Administration and Control (NAFDAC) which differ in their expense and ease of use.[32] It is unlikely that most of the patients will be able to sustain their supply of drugs and therefore the adherence and compliance to therapy are sceptical. Nigeria's per capita income in 2005 was $560 (USD)[33] reflects the low spending power of the population. The high cost of medications and the large number of prescribed drugs were the common reasons given by patients in south western Nigeria for non-adherence to prescribed drugs.[31]

This further emphasizes the need to reduce the cost of medications to patients through increased 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.

Prescribing by generic name allows flexibility of stocking and dispensing various brands of a particular drug that are cheaper than and as effective as proprietary brands. This is the basis of essential drugs list use. Some prescription by the proprietary names may have resulted from the good relationships existing between the physicians and the pharmaceutical sales representatives that market the drugs to the hospital.

Key drugs were available; the shortfalls in the drugs dispensed can be attributed to transient supply shortage.

A low percentage of injection utilisation from this study contrasts with the results obtained from other studies in Nigeria.[23,24,30] The most commonly prescribed injection was insulin which is the bedrock for treatment of type 1 diabetes. This result is highly commendable and may be attributed to the low incidence of type 1 diabetic patients, better knowledge of the doctors about the risks of injections and high cost these injections.

The high frequency of prescribing antihypertensive, antimalarials, analgesics/antipyretics, multivitamins, statins and antibiotics observed in our study is similar to previous studies in Nigeria.[23,24,26,31,34]

The ACE inhibitors were the commonest antihypertensive drugs prescribed. The role of ACE inhibitors in the reduction of cardiovascular associated morbidity and mortality is established.[35] The high antihypertensive prescriptions reflect the high rate of co-morbidity of hypertension and diabetes[7] while the high antimalarial

*Corresponding Author: e-mail: : maxolpharmacia@yahoo.com; maxwell.ogochukwu@unn.edu.ng ;Tel: +234 803 778 1479

Received on: 30-10-09 ; Accepted on: 28-12-09

prescriptions reflects high rate of malaria infection in south eastern Nigeria and this can be explained by the fact that this area is holoendemic for malaria.

The prescription of vitamin B complex or multivitamin supplement along with the antimalarials as revealed by this study appears to be a routine practice in Nigeria.[23,24,25] The justification for this practice is not clear to us. However, some parents and doctors believe that both the vitamin B complex and multivitamin supplement may induce or enhance the appetite.

The lipid lowering agents (statins) were prescribed only to a small proportion of patients. Evidence now exists about the benefit of statins in reducing cardiovascular events in diabetic patients independent of lipid levels.[36,37] However, the high cost of these drugs may limit their prescription in our diabetic population where the emphasis is on adequate blood glucose control.

The low prescription of Antibiotics is contrary to what had been reported previously. This is commendable as they are involved in ADRs.[38] It was also reported that antibiotics are greatly misused and over-prescribed in Nigeria.[23,24,25,34]

There was a high utilization of Oral hypoglycaemic agents in south eastern Nigeria. Oral hypoglycaemic agents ((15.21 DDDs/1000 diabetic patients) /day) were 4.5 times more utilized than insulin (3.4 DDDs/1000 diabetic patients /day). Among OHAs, Biguanide (Metformin) was the most utilized (11.3 DDDs/1000 diabetic patients /day), it is 3 and 125.6 times most likely to be prescribed to diabetic patient daily compared to Sulphonylureas (Glibenclamide, Chlorpropamide) and Thiazolidinediones (Rosiglitazone) with 3.8 DDDs/1000 diabetic patients /day and 0.09 DDDs/1000 diabetic patients /day respectively. Rosiglitazone was the least utilized in the zone, this might be due to the fact that the drug is expensive. This is supported by this study because the cost per DDD of Rosiglitazone (N160.7) was highest among OHAs amounting to 63.1% of OHAs cost per DDD. Furthermore, it is not yet included in the essential drug list of Nigeria because it is relatively new in Nigeria market.

Metformin was the most utilized anti-diabetic drugs utilization in the zone. This result contrasts the reports of some studies done in Indian[39] and Hong Kong[40] which reported that Glibenclamide was the most commonly prescribed anti-diabetic drug. The high utilization of Oral hypoglycaemic agents in south eastern Nigeria is not surprising since the clinics cater for adults who largely have Type 2 diabetes mellitus and require oral agents for blood glucose control most times. This is congruent to other studies done in south-western Nigerian.[31,33] However a higher percentage of patients in this study are prescribed insulin compared to these South-western Nigeria studies.

Potential Drug-drug interactions were found in 9.2% of the total prescriptions and involved mostly ACE Inhitors / insulin / sulphonylureas, Beta Blockers /inulin / sulphonylureas, Ciprofloxacin / sulphonylureas, and co-trimoxazole and sulphadoxine/pyrimethamine. Hypoglycaemic effects of insulin, metformin and sulphonylureas are possibly enhanced by ACE inhibitors, effects of glibenclamide are also possibly enhanced by ciprofloxacin, and effects of sulphonylureas are rarely enhanced by sulphonamides and trimethoprim. Warning signs of hypoglycaemia (such as tremor) with anti-diabetics may be masked when given with beta-blockers; also beta-blockers enhance hypoglycaemic effect of insulin.[41]

Pharmacists could be of help in detection of these potential drug interactions and communicate it back to the prescribers to improve accuracy of prescription and avert unforeseen adverse effects which might lead to emergency and increase burden of diabetes on unsuspecting patients. Pharmacists should also outline and explain to patients on how each drug should be taken to make sure that the patient understands his/her dosage schedule. The responsibilities of the pharmacists working under treatment protocols with physicians included a variety of roles, such as patient education, and medication review.[42]

The other areas in which interventional measures are needed are patient education and knowledge. In this study, 42.7% of patients lacked adequate knowledge of dosage

*Corresponding Author: e-mail: : maxolpharmacia@yahoo.com; maxwell.ogochukwu@unn.edu.ng ;Tel: +234 803 778 1479

Received on: 30-10-09 ; Accepted on: 28-12-09

schedule, possibly due to communication gap or illiteracy. This could be attributed partly to lack of instructions on how the drugs should be taken in the prescriptions. This is confirmed by high proportion of the prescriptions (74.7%) with no instruction on how the drugs were to be taken written on them. Pharmacists can be urged to spend more time with dispensing, the dispensing time at moment ranged from 2.4 to 4.1 minutes for each encounter. More pharmacists could be recruited to ease the pressure that is always experience in hospital pharmacies. These simple measures would probably help patients understand their dosage schedule better and subsequently improve their quality of life.

The non pharmacological management (non-drug) prescriptions example education, meal plan, and physical activities should also be encouraged in the hospitals as stipulated in Nigerian standard treatment guidelines.[43]

The findings of this study could be helpful to all diabetic patients, diabetes researchers and diabetes healthcare team, especially those in developing countries like African and Asian continents which have comparable health care system and diabetes data to that of Nigeria.

LIMITATIONS

The following limitations in addition to those mentioned in the text were inherent in the study and the results were interpreted in this light.

The sample size was small but representative. Interviewer bias was another potential limitation due to differences in interviewers' attitude, though we believe that this effect should be minimal as all of them were trained before the study and they were highly experienced in this regard.

CONCLUSIONS

This study has revealed that Metformin was the most utilized anti-diabetic drugs and the costs of anti-diabetic drugs were high in the south-eastern Nigeria.

The incidence of polypharmacy was low, generic and essential drug prescriptions were high which depicted that the drug use in this zone was quite rational.

Lack of adequate knowledge of dosage schedule was high; therefore improving patients' knowledge on correct dosage would conceivably improve the present state of health care in this zone. Also, continuous medical education with focus on rational drug use and evidence based medicine should form part of the programme of the hospitals.

Government should come up with appropriate policies such as free health care for diabetic patients, subsidies for anti-diabetic drugs and low import tariff for anti-diabetic drugs. All these measures will reduce the provocative high cost of anti-diabetic drugs in the zone.

REFERENCES

1. *Wade O. Drug utilization studies - the first attempts. Plenary lecture. In: Sjoqvist F, Agenas I, eds. Drug utilization studies: implications for medical care. Acta Medica Scandinavica. 1984; Suppl. 683:7-9.*
2. *Dukes MNG. Development from Crooks to the nineties. In: Auditing drug therapy. approaches towards rationality at reasonable costs. Stockholm, Swedish Pharmaceutical Press, 1992.*
3. *Engel A, Siderius P. The consumption of drugs: report on a study 1966-1967. Copenhagen, WHO Regional Office for Europe, 1968 (EURO 3101).*
4. *Consumption of drugs. Report on a symposium in Oslo 1969. Copenhagen, WHO Regional Office for Europe, 1970 (EURO 3102).*
5. *Stimac D, Culig J. Outpatient utilization of psychopharmaceuticals in the city of Zagreb 2001-2006. Psychiatria danubina. 2009; vol. 21, No. 1: 56–64.*
6. *Famuyiwa OO. Important considerations in the care of diabetic patients in a developing country (Nigeria). Diabet Med. 1990 Dec; 7(10): 927-30.*
7. *Intercontinental Marketing Service. Available at: http://www.imshealth.com. Accessed November 16, 2007.*
8. *Ogbera A, Fasanmade O, Ohwovoriole A. High costs, low awareness and a lack of care— the diabetic foot in Nigeria. Diabetes Voice. 2006; 51:30–32.*
9. *National Diabetes Fact Sheet. American Diabetes Association Web site. Available at: http://www.diabetes.org/main/info/facts/factsnatl.jsp. Accessed December 15, 2002.*
10. *Osuntokun O, Taylor L. Diabetes mellitus in Nigerians: a study of 832 patients. West Afr Med J. 1976; 28:155–159.*
11. *Greenwood BM, Taylor J. The complications of diabetes in Nigerians. Tropical Geographic Medicine. 1968; 20:1–12.*
12. *Adetuyibi A. Diabetes in the Nigerian African. Review of long term complications. Tropical Geographic Medicine. 1976; 28:155–159.*
13. *Akinkugbe OO, Akinyanju OO. Final report – national Survey on non-communicable diseases in Nigeria. Lagos: Federal Ministry of Health; 1997.*

***Corresponding Author:** *e-mail: : maxolpharmacia@yahoo.com; maxwell.ogochukwu@unn.edu.ng ;Tel: +234 803 778 1479*

Received on: 30-10-09 ; Accepted on: 28-12-09

14. *Akanji AO, Adetunji A. The pattern of presentation of foot lesions in Nigerian diabetic patients. West Afr J Med. 1990; 9:1–4.*
15. *Ogbera AO, Chinenye S, Onyekwere A, Fasanmade O. Prognostic indices of diabetes mortality. Ethnicity & Disease. 2007; Volume 17: 721-725.*
16. *Ogbera AO, Ohwovoriole AE, Soyebi O. Case fatality among diabetic in-patients. J Clin Sci. 2002; 2:18–21.*
17. *Engelgau MM, Narayan KM, Saaddine JB, Vinicor F. Addressing the burden of diabetes in the 21st century: better care and primary prevention. J Am Soc Nephrol. 2003; 7 (Suppl 2): S88–91.*
18. *Zimmet P. The burden of type 2 diabetes: are we doing enough? Diabetes Metab. 2003; 29: 6S9–18.*
19. *National Population Commission (NPC) (2006), Population Census 2006.*
20. *World Health Organization. How to investigate drug use in Health Facilities: selected drug use indicators. WHO/DAP/93.1. Geneva 1993.*
21. *Anatomical Therapeutic Chemical (ATC) index with Defined Daily Doses (DDDs). WHO Collaborating Centre for Drug Statistics Methodology. Oslo, Norway January 2002. Available at: (www.whocc.no/atcddd/). Accessed September 1, 2009.*
22. *Federal Ministry of Health. Essential Drug List. Fourth Revision. Lagos, 2003.*
23. *Ohaju-Obodo JO, Isah AO, Mabadeje AFB. Prescribing patterns of clinicians in private health institutions in Edo and Delta States of Nigeria. Nigerian Quart J Hosp Med. 1998; 8: 91-94.*
24. *Odusanya OO, Oyediran MA. Rational drug use at the primary health care centres in Lagos, Nigeria. Nigerian Quart J Hosp Med. 2000; 10: 4-7.*
25. *Odusanya OO. The role of adjunct therapies in the treatment of uncomplicated malaria. Nigerian J Clin Pract. 2002; 5: 32-36.*
26. *Nwolisa CE, Erinaugha EU, Ofoleta SI. Prescribing practices of doctors attending to under fives in a children's outpatient clinic in Owerri, Nigeria. J Trop Pediatr. 2005; 52:197-200.*
27. *Kidon MI, See Y. Adverse drug reactions in Singaporean Children. Singapore Med J. 2004; 45:574-577.*
28. *Pavin M, Talgat N, Hafner G et al. Prescribing practices of rural primary health-care physicians in Uzbekistan. Trop Med Int Health. 2003; 8:182-190.*
29. *Good CB. Polypharmacy in elderly patients with diabetes. Diabetes Spectrum. 2002; 15 (4): 240-248.*
30. *Oshikoya KA, Chukwura HA, Ojo OI. Evaluation of outpatient paediatric drug prescriptions in a teaching hospital in Nigeria for rational prescribing. Paediatric and Perinatal Drug Therapy. 2006; 7 (4):183-188.*
31. *Enwere OO, Salako BL , Falade CO. Prescription and cost consideration at a diabetic clinic in Ibadan, Nigeria: A report. Annals of Ibadan Postgraduate Medicine. 2006; Vol.4 No2:35-39.*
32. *NAFDAC Nigeria – The National Agency for Food, Drug Administration and Control (2002-2007). Tariff Charges. Available at: http://www.nafdacnigeria.org/tariffs.html Accessed October 22, 2009.*
33. *Alebiosu CO. Antidiabetic/ Antihypertensives prescription profile in OSUTH, Sagamu and environment. Nigerian J. Clin Pract. 2004; 7(1): 15-20.*
34. *Olayemi SO, Akinyede AA, Oreagba AI. Prescription pattern at primary health care centres in Lagos State. Nigerian Postgrad Med J. 2006;13:220-224.*
35. *The Heart Outcomes Prevention Evaluation Study Investigators. Effects of an Angiotensinconverting-Enzyme Inhibitor, Ramipril, on Cardiovascular Events in high-risk patients. NEJM. 2000; 342: 145-153.*
36. *Tuomilehto J and Leiter LA. Defining the role of statins in diabetes. Br J Diabetes Vasc Dis. 2005; 5:55-62.*
37. *Di Napoli P, Taccardi AA, Oliver M and De Caterina R. Statins and stroke: evidence for cholesterol-independent effects. Eur Heart J. 2002; 23 (24): 1908-1921.*
38. *Weiss J, Krebs S, Hoffmann C et al. Survey of adverse drug reactions on a pediatric ward: A strategy for early and detailed detection. Pediatrics. 2002; 110:254-257.*
39. *Xavier D, Nagarani MA, Srishyla MV. Drug utilization study of antihypertensives and antidiabetics in an Indian referral hospital. Indian J Pharmacol. 1999; 31:241-242.*
40. *Lau GSN, Chan JCN, Chu PLM, Tse DCK, Critchley JAJH. Use of antidiabetic and antihypertensive drugs in hospital and outpatient settings in Hongkong. Ann Pharmacother. 1996; 30: 232-237.*
41. *British National Formulary 57 March 2009: 717-718.*
42. *Anaya JP, Rivera JO, Lawson K, Garcia J, Luna JJ, Ortiz M. Evaluation of pharmacist-managed diabetes mellitus under a collaborative drug therapy agreement. Am J Health-Syst Pharm. Vol 65; 2008:1841-1845.*
43. *Federal ministry of health in collaboration with WHO, EC, DFID. Standard treatment guidelines, Nigeria, 2008: 90-97.*

****

Source of Support: NIL
Conflict of Interest: NONE

***Corresponding Author:** *e-mail: maxolpharmacia@yahoo.com; maxwell.ogochukwu@unn.edu.ng ;Tel: +234 803 778 1479*

Received on: 30-10-09 ; Accepted on: 28-12-09