

Research Article

Cost Effectiveness and Prescription Pattern of Antidiabetic Drugs in Patients with Diabetes Attending a Tertiary Health Facility in South West Nigeria

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Abstract

Diabetes Mellitus is a chronic multi-system metabolic disease associated with significant morbidity, mortality and cost to the society. The aim of this study is to evaluate the demographics, prescribing patterns, drug cost and analyze effectiveness of different antidiabetic therapies.

A prospective cross sectional study of 210 patients was conducted, out of whom 115 were used for cost study, by reviewing their case-notes and prescription pattern. A standardized data collection form was designed and used to collect data generated from prescriptions and case notes. The cost effectiveness therapy was evaluated.

Majority of the patients were aged 63.08 +/- years. 13.91% of the patients were diagnosed with type 1 diabetes and 86.09% with type 2 diabetes. Patients on sulphonylureas and its combination therapy showed a better glycaemic control. Good glycaemic control of 72.17% was observed. The biguanides, 56.45% was more prescribed than the other antidiabetics. Cost effectiveness analysis compared the value of the most prescribed drug metformin with its combination of metformin plus sulphonylureas and it shows that new anti-diabetics like the glibenclamide, glimepiride, and gliclazide. Metformin was prescribed with pioglitazones. The combination therapy with new antidiabetic drugs were cost – effective compared to older generations.

The good glycaemic control suggests good adherence to antidiabetic therapy in a large number of patients under this study.

INTRODUCTION

Diabetes mellitus (DM) is a metabolic disorder with common denominator of hyperglycemia, arising from a variety of pathogenic mechanisms. It has emerged as an epidemic both in the developing and developed countries and shows no sign of regression [1].

DM has no cure but effective and strict control of blood glucose level is beneficial. Patients must be properly educated to comply with management procedures as this is necessary to maintain a normal life and reduce complications which include retinopathy, neuropathy, nephropathy and hypertension. The approaches to the management of diabetes include diet, drugs and exercise [2].

Drug utilization research (DUR) is an eclectic collection of descriptive and analytical methods for the quantification, understanding and evaluation of the processes of prescribing, dispensing, and consumption of medicines, and for the testing of interventions to enhance the quality of this process [3]. According to the World Health Organization, drug utilization (WHO), DUR is defined as the marketing, distribution, prescription, and use of

drugs in a society, with emphasis on the resulting medical and social consequence. Although, controlling cost is the basic issue, it also affects the national budget, which is crucial in developing countries, where resources are limited. Prescribing pattern helps in evaluating local consumption/resistance pattern for optimized therapeutic effect of medications. It also helps in planning various steps to be taken to minimize adverse drug reactions and to provide cost effective medical care [4].

A major obstacle to achieving equitable access to drugs is price 13, especially in countries where drugs are paid out of pocket. Drug financing in Nigeria, for example, is generally out of pocket, with 70.20% people living below poverty line of less than 1USD per day [5]. Cost effectiveness studies will help promote proper drug utilization and more access to needed drugs at affordable rate and help policy makers regulate the high cost of drugs within the country.

In cost-effectiveness studies, different health interventions are taken into consideration with the notion that resources in the health sector should be allocated across interventions and

population groups that can generate the highest possible overall level of population health. If the calculations show that some current interventions are relatively cost-ineffective, and that some which are not undertaken fully are relatively cost-effective, resources could be reallocated across interventions to improve population health. In other words, the allocative efficiency of the health sector could be enhanced by moving resources from cost-ineffective interventions to cost-effective ones. Interest in the promise of enhancing allocative efficiency of health systems has led to analytical efforts to study the cost-effectiveness of a broad range of intervention in a number of countries [6].

MATERIALS AND METHODS

A prospective cross sectional study of 201 cases was conducted in patients with type 2 diabetes mellitus attending the endocrinology clinic of the Outpatient departments of the University College Hospital (UCH), Ibadan for a period of 4 months – between September 2015 to December 2015.

Approval of the study was obtained from the UI/UCH ethics committee. A written informed consent was used in the study to obtain consent from the subjects willing to participate in the study. A structured proforma was used to collect information from patient's prescription sheet and laboratory investigation reports after consultation.

115 prescriptions were randomly evaluated for prescribing pattern and cost effectiveness in patients with diabetes using WHO indicators like drug class, dosage form, fixed dose combinations (FDCs), and generic and branded drugs.

Cost measure

Cost per defined daily dosage (DDD) units, as recommended by World Health Organization for analysis of drug use was applied. DDD represent usual dosage of drug per day. This was applied to the branded and generic equivalents that were used in UCH [5].

Cost effectiveness analysis was done using Wilcoxon signed-rank test and this analysis was done by obtaining incremental cost-effectiveness ratio (ICER) for a period of 4 months. This ratio assesses the net incremental cost of gaining an incremental health benefit over another therapy [3].

ICER was obtained using the following formula:

$$\text{Incremental Cost-effectiveness ratio (ICER)} = \frac{\text{Cost of Drug A} - \text{Cost of Drug B}}{[\text{FBG A} - \text{FBG B}]}$$

(Where, A = Most effective therapy, B = 2nd most effective therapy).

Data were entered and analysed using the Statistical Package SPSS. Descriptive analyses of the variable were carried out and different parameters were compared.

RESULTS

During the period a total of 201 prescriptions were accessed. 66 (32.8%) were male and 135 (67.2%) were female patients. The mean age of the patients was 63.08 years. Amongst all patients, 16 (13.91%) were diagnosed with type 1 diabetes and the remainder 99 (86.09%) were diagnosed with type 2 diabetes.

The most common co-morbidities/complication seen in most of the patients were hypertension, heart disease, arthritis, glaucoma and dislipidemia in 81.5%, 10.3%, 18.0%, 18.0%, and 5.1% of the patients respectively.

A total of 186 antidiabetics were prescribed and the most commonly prescribed antidiabetic was metformin 105 (56.45%), followed by glibenclamide 33 (17.74%) then glimepiride 27 (14.52%), insulin 16 (8.60%), pioglitazone 4 (2.15%), and gliclazide 1 (0.54%). The combination therapy of biguanide and sulphonyurea showed to be most effective in glycemic control (Table 1,2).

Cost effectiveness

Cost of individual antidiabetic drug varied widely. The summed-up costs for each group of drugs towards out-of-pocket expenses are presented in (Table 3). Among the drugs prescribed, insulins accounted for maximum cost followed by biguanides

Combination therapy of metformin and sulphonylureas was a more effective pharmacological treatment regimen among the patients under study, with 54.20% achieving glycemic control compared to metformin only therapy.

Analysis for cost – effectiveness was as follows

$$\text{Incremental Cost-effectiveness ratio (ICER)} = \frac{\text{Cost of Drug A} - \text{Cost of Drug B}}{[\text{FBG A} - \text{FBG B}]}$$

(Where, A = Metformin + Sulphonylurea, B = Metformin only).

$$\text{ICER} = \frac{510 - 350}{[123.68 - 114.56]}$$

$$\text{ICER} = 160 \div 9.12; \quad \text{ICER} = 17.54$$

$$\text{ICER} = N 17.54 \text{ per mg/dl}$$

DISCUSSIONS

Drug utilization research is the marketing, distribution, prescription and use of drugs in a society with special emphasis on the resulting medical, social and economic consequences [7].

A prescription is an order that is written by the physician or a medical signature by a physician to tell the pharmacist what medication he/she wants for his/her patients at a particular time in the management of such patients' disorder. A prescription is expected to reflect some elemental components as the name, phone number and signature of prescriber, and the name of the patient [8].

Among the prescribed drugs, 536 antidiabetic drugs prescribed. There was an increased level of drug prescription from essential list using generic names (87.3%) though a short fall compared to the standard value of 100% of WHO prescribing

Characteristics	Value
Male	37 (32.17%)
Female	78 (67.83%)
Mean Age	63±0.8 years
Type of Diabetes	Type 1 Diabetes Mellitus 16 (13.91%)
	Type 2 Diabetes Mellitus 99 (86.09%)

Table 2: Drug prescription pattern.

Items	Drugs	Dose	Frequency	Cost Naira	Number Prescribed
Drug Types	Premixed Insulin	100mg	daily	2800	16 (8.60%)
	Metformin	500mg	bd	350	105 (56.45%)
	Glibenclamide	5mg	daily	160	33 (17.74%)
	Glimepiride	4mg	daily	150	27 (14.52%)
	Glicazide	80mg	bd	150	1 (0.54%)
	Pioglitazone	15mg	daily	280	4 (2.15%)
	Total				536 (100.0%)
Monthly Income	Range			Range	
	Less than 20,000			52	
	20,000 - 100,000			72	
	101,000 - 250,000			10	
	Above 250,000			1	
Glycemic Control	Class	Range	No	Percentage	
	Good	≤ 126mg/dl	83	72.17%	
	Poor	> 126 mg/dl	32	27.17%	

Table 3: Data on cost and values of FBG in patients achieving glycemic control in relation to different categories of treatment within 4 months.

Type of treatment	% of patients	Cost prices	No. Prescribed	Mean	FBG I	Cost
Effectiveness Metformin	23.38	350	105	114.56		3.06
Sulphonylurea	5.47	160	70	141		1.14
Metformin + Sulphonylurea	30.35	510	49	123.68		4.12

indices and this is in contrast with a previous study carried out by Adibe, 2009 which discovered a low prescription of drugs from essential drug list using generic names [9]. Generic substitution has long been applied in formulary system. It has benefit of discouraging the use of less than optimal drug therapy, encourages competitive bidding and reduce inventory. These benefits have in some cases been qualified as direct drug and inventory saving [10]. Generic drug programmes are today probably the most relevant economic strategy for drug supply [11]. If generic substitution does not exist, price competition will not exist either and price of drugs will swell [12]. From the study, it was discovered that 83 (72.17%) of the patient showed good glycemic control compared to 32 (27.83%) of the patient who showed a poor glycemic control in reference to the standard for glycemic control by American Diabetes Association (ADA) [13], which indicates a better improvement to drug compliance amongst the patient and Clinicians should be encouraged to keep educating patients on the importance of adhering to their treatment which is a key to a better well being.

The findings of this study is in agreement with a study done by Giwa et al., which reveals that the cost effectiveness analysis of metformin + sulphonylureas which is the most commonly prescribed combination therapy was not necessarily more cost-effective than metformin only [14].

Patients on insulin therapy showed a higher blood urea level, body mass index, haemoglobin A1c and some adverse cardiovascular outcomes which is in agreement with a study carried out by Bundhun et al., who reported a significant higher short and long term adverse cardiovascular outcomes after a percutaneous coronary intervention (PCI) compared to DM patients not treated with insulin [15]. Although another study carried out by Bundhun et al., discovered that coronary artery

bypass surgery (CABG) was associated with significantly lower long-term adverse clinical outcomes compared to PCI in patients with insulin-treated type 2 diabetes mellitus which should be a good option in insulin therapy [16]. Although it has been observed that the newer antidiabetic drug Canagliflozin which has been approved by the FDA and acts by inhibiting the Sodium-Glucose co-Transporter 2 (SGLT2) which accounts for more than 90% of renal glucose reabsorption is not readily available and used within the country, research also finds out that apart from bringing down the blood glucose levels, Canagliflozin has many other beneficial actions like reduction of the glycosylated haemoglobin levels due to better control of blood glucose levels [17]. It has also been shown not to have a significantly higher adverse events at a dose of 300mg in patients treated for type 2 diabetes mellitus [18]. Clinicians should encourage the use of this newly approved antidiabetic as it has been shown to be safe in patients with diabetes. Comparing metformin and metformin plus sulphonylurea, metformin monotherapy has a better cost effectiveness of 3.06 compared to the combination of metformin plus sulphonylurea of 4.02. this shows metformin monotherapy as a more cost effective intervention when compared to its combination but when compared to sulphonylurea monotherapy, sulphonylurea tends to be more cost effective compared to metformin only intervention.

Due to the higher cost of antidiabetic drugs like insulin, metformin, and other newer antidiabetics, the government especially in developing country like Nigeria have set up bodies like the National Health Insurance Scheme (NHIS) and also work with the WHO to make these drugs free or more affordable and accessible to the patients. Cost effectiveness studies is crucial to attaining a better health and good glycemic control amongst patients with diabetes and should be encouraged in order to make medication more affordable and accessible by the patient.

CONCLUSION

The findings in this study contributes to the growing knowledge of drug utilization studies and will help health policy makers outline newer guidelines for standard efficient therapy. The findings of this study also agrees with that of Abdulganiyu et al., which state that branded products were frequently prescribed than generic equivalent products for all antidiabetic drugs used, and also that generic products were lower cost options to branded equivalents for all antidiabetic drugs analyzed [12]. From the study, a cost effectiveness ratio of N17.54 per mg/dl was achieved comparing metformin and its combination and this shows that metformin alone intervention is more cost-effective with 3.06 naira per cost effectiveness compared to the combination of metformin and sulfonylurea of 4.02 naira per cost effectiveness. A good glycemetic control was also observed in patients under this study.

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