Research Article

A prospective study on drug utilization pattern & rationality in treatment of type II diabetes mellitus: a population based analysis

Shruti Vihang Brahmbhatt*, Bhagya Manoj Sattigeri, Ashok Kumar Nil, Devang Pravinkumar Parikh, Heena Sunilbhai Shah

Department of Pharmacology, S.B.K.S. MI & RC, Piparia, Vadodara, Gujarat, India

*Correspondence:
Dr. Shruti Vihang Brahmbhatt,
E-mail: brahmbhattshru@yahoo.in

ABSTRACT

Background: Diabetes a chronic disease is associated with significant morbidity, complications with poor glycemic control. Hence, meticulous management is necessary. Comorbid conditions increase chances of polypharmacy and irrational prescriptions in diabetic patients. This prospective non interventional study aimed to gather and study the drug utilization pattern in diabetic patients.
Methods: The study was conducted in 50 diabetic patients admitted in medicine ward. Patients were included in the study only after obtaining written informed consent form; all relevant data were collected from case record forms and were analyzed.
Results: Diabetes mellitus was observed to be highest in patients with the age group of 60-70 years, affecting 66% males and 34% females. Among the participants 42 (84%) were already on treatment for diabetes while 8 (16%) were diagnosed at the time of admission. We observed that 27 (54%) patients were treated with insulin + oral hypoglycemic agents, 13 (26%) were treated with only Insulin while 10 (20%) patients were prescribed only oral hypoglycemic agents. The most common comorbid conditions observed by us were hypertension, chronic renal disease, diabetic foot, septicemia, urinary tract infections and other susceptible infections.
Conclusion: To conclude, the study reveals that Metformin continues to be the choice of oral hypoglycemic agents with least adverse effects and insulin was used to treat uncontrolled state, where physicians have greatly considered the socio-economic status while prescribing which is obvious with least use of costly insulin preparations.

Keywords: Diabetes mellitus, Drug utilization, Insulin, Metformin, Oral hypoglycemic agents

INTRODUCTION

Diabetes Mellitus (DM) is an important public health problem in developing countries. Several anti-diabetic drug utilization studies have been published in the healthcare setting from various parts of world to facilitate rational drug use in patients with diabetes. Drug utilization studies provide useful insights into the current prescribing practices and also identify irrational prescribing that lead to consequences such as non-adherence to medications, improper dose administration that ultimately result into uncontrolled blood glucose levels and also escalate drug costs and health care costs. The results of Drug utilization studies (DUS) can suggest modifications in the existing prescribing practices to the prescribers, policy makers as well as drug and therapeutic committees in order to encourage rational use of drugs.

Diabetes Mellitus (DM), a chronic non-transmissible disease, is the most prevalent disease in the world.

According to the international diabetes federation, 6.6% of the worldwide adult population was estimated to have DM in 2010, which suggests that by 2030, approximately 7.8% of the worldwide adult population will have DM.[1] However, current estimates revealed that there are at least 150 million people who are living with diabetes worldwide of which two-third of them belong to developing countries.[2] The important demographic change observed in pertinence to the global prevalence of diabetes is that the incidence of DM is increased in the people above 65 years of age and has not spared young generation as well.[3] Diabetes can be treated pharmacologically as well as non-pharmacologically.[4] The non-pharmacological measures generally include dietary control with reduction in calorie intake, regular exercises to reduce body weight along with the exercises to relieve the stress such as yoga. The mainstay of diabetes management is aimed to obtain a good glycaemic control and reduce the chronic complications of diabetes and the comorbid diseases such as cardiovascular, cerebrovascular diseases, which are preventable and manageable with proper punctual medication, good regular follow ups and investigations.[5] The type I diabetes is usually managed with insulin whereas type II diabetes is managed with oral hypoglycaemic agents & insulin preparations or both as per the patient's need.[6] A wide range of oral hypoglycaemic agents that are available for the management of type 2 diabetes gives a way for the practitioners to choose the medications according to patient's need. However, unfortunately many a times medications are prescribed without taking into consideration the economic aspects, such a small negligence leads to poor patient compliance. Apart from that, practise of polypharmacy in the treatment of type II diabetes in order to prevent complications increase the chances of drug interaction and adverse drug reactions.

Despite the availability of various guidelines for the management of diabetes mellitus the treatment varies from physician to physician depending upon the available sources, the hospital set up & the patient related factors such as the age, sex, body mass index, tolerance, the co-morbid conditions and economic status. Therefore, the study was taken with an objective of studying demographic details and pattern of prescriptions among diabetic patients and so as to compare it with available guidelines.

METHODS

A prospective, non-interventional, observational study was conducted in 50 patients admitted with diabetes in medicine wards of Dhiraj hospital, a tertiary care teaching rural hospital affiliated to SBKS medical institute and research centre, run under Sumandeep Vidyapeeth. This study was conducted only after obtaining an approval from the institutional ethics committee. All the participants included in the study were explained clearly about the purpose and nature of the study in the language they understood and were included in the study only after obtaining a written Informed Consent (ICF).

All individuals of either sex, aged above 18 years of age, diagnosed with type II diabetes mellitus were included in the study, while those diagnosed as gestational diabetes or type I diabetes were excluded from the study.

The detailed information of the participants pertaining to age, sex, occupation, relevant medical history, past history and drug therapy administered were obtained from their case files and were recorded in the Case Record Form (CRF). Details regarding the treatment of diabetes such as the drugs used, the dose, duration and the frequency of administration, type of dosage form used etc. were also recorded. The individuals included in the study were regularly followed up during their stay in the hospital in order to observe for their management, the prognosis or any adverse drug reactions during the treatment and change in the treatment if any done, till they were discharged.

Statistical analysis

The gathered data is expressed in the percentile form.

RESULTS

Among a total of 50 participants diagnosed with type II DM, 33 (66%) of them were male and 17 (34%) were female (Figure 1). It was observed to be highest 26 (52%) in the age group 60-70 years followed by 19 (38%) in the age group 70-80 years and 5 (10%) in 50-60 years. Of the 50 participants 15 (30%) had a strong family history of diabetes. It was observed that 27 (54%) of participants were literates and 23 (46%) were illiterates. However, when we looked for the life style of the participants it was noticed that 17 (34%) had sedentary life style as compared to rest the participants 43 (56%). A total of 12 (24%) participants were found to be habituated to tobacco chewing and smoking but none of them gave the history of alcohol consumption.
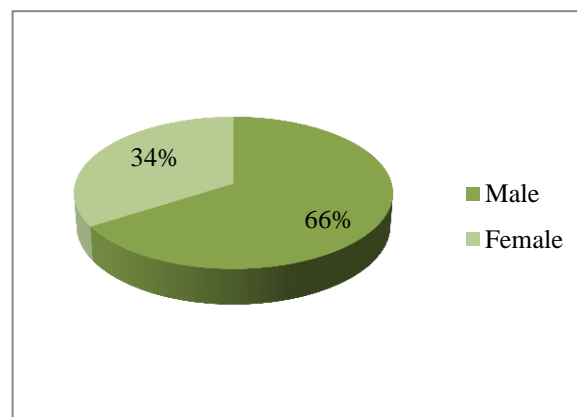

Figure 1: Occurrence of diabetes in male and female.

Of the 50 participants, 42 (84%) of them were already on treatment for diabetes of which 38 (76%) were on regular treatment for diabetes while the remaining were found to be irregular with their management for diabetes, whereas, 8 of the participants were diagnosed to be suffering with type II diabetes at the time of admission and were started with the treatment from the time of admission.

We observed that at the time of admission of the 42 participants, who were already receiving treatment 17 of them were only on metformin, (4 of them were irregular), 6 received combination of two OHA (Metformin + glimepiride = 4, metformin + pioglitazone = 1, metformin + glipizide = 1), 3 participants received the combination of 3 OHA (Metformin + glimepiride + pioglitazone), 12 of them were only on insulin preparations (Regular insulin = 9, NPH insulin = 3) whereas 4 participants received Regular insulin along with metformin. However, the 8 participants who were diagnosed as type II diabetes at the time of their admission to the hospital with different health problems were started with the treatment in following manner, 2 of them were treated with OHA (Metformin = 1, metformin + glimepiride + pioglitazone = 1), 3 of them were started with regular insulin during their hospital stay while at the time of discharge they were advised to continue with metformin. In our study only 33 patients were assessed for HbA_{1c} probably for having improper glycaemic control.

During the study, it was observed that diabetes was generally associated with hypertension (10%), atherosclerosis (4%), chronic renal disease (10%), diabetic foot (8%) and susceptible infections (68%) such as urinary tract infection, septicaemia, pleural effusion etc. It was observed that on hospitalization among the 50 participants, 13 (26%) were treated with only insulin, 27 (54%) were treated with OHA in addition to insulin while 10 (20%) were managed with only OHA (Figure 2).
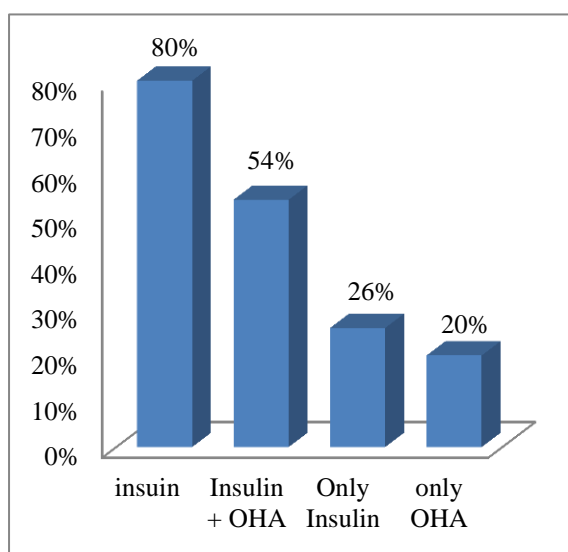

Figure 2: Treatment pattern for diabetes in hospitalized patients.

In our study, we observed that out of 40 patients, who received insulin, 21 were treated with regular insulin, 7 were treated with aspart, 4 were treated with isophane + regular insulin while 4 were treated with regular insulin + Lantus whereas only 1 patient received combination of regular + isophane + Lantus insulin. In our study, it was noticed that 37(74%) patients received OHA either alone or in combination with Insulin and Out of them 10 patients were given only OHA. Among these patients the most commonly prescribed OHA was metformin which was preferred as monotherapy as well as for combined therapy with other oral hypoglycemic agents such as pioglitazone, rapeglinide, glimepiride and glipizide respectively which fulfilled the patients' need and the physician's choice (Table 1).

Table 1: Monotherapy and combination therapy of antidiabetic agents prescribed in type-2 diabetic patients.

Drugs	Frequency
Monotherapy	18 (36%)
Combination of two OHA	14 (28%)
Combination of three OHA	5 (10%)

In order to treat the co-morbid infections the commonly used antibiotics included the combination of cefoperazone + sulbactam, piperacillin + tazobactam, amoxicillin + clavulanic acid, amoxicillin, levofloxacin, ciprofloxacin, norfloxacin and azithromycin. Apart from these, 24 patients were added with hypolipidemic agents of which atorvastatin and rosuvastatin were commonly prescribed. The treatment chart of these diabetic patients also included paracetamol, ondansetron, losartan, telmisartan, ramipril, pantoprazole, ranitidine, multivitamin, cyanocobalamin and folic acid etc.

Although polypharmacy was practised while prescribing medication in diabetic patients fortunately no adverse drug event was reported during the course of treatment during their hospital stay.

DISCUSSION

India is the diabetes capital of the world with 41 million Indians having diabetes; every fifth diabetic in the world is an Indian. It also leads in prevalence of metabolic syndrome as well as obesity. 20 million Indians are either obese or abdominally obese with children being the prime targets and by 2025, the expected number is 68 million.[7] Therefore, the prevalence of diabetes in India is increasing at an alarming rate, which needs to increase the awareness among people about causative factors for diabetes and its consequences.[8]

Diabetes being chronic debilitating disease requires lifelong management. The sedentary stressful life style, lack of exercise, irregular food habits…all these environmental factors along with the predominant genetic inheritance increase the risk of type II diabetes mellitus.[9]

Although diet and exercise along with life style modifications remains the mainstay of diabetes management, regular treatment with the drugs is essential to delay the anticipated long term complications of diabetes.[10]

The research on drug utilization studies for the antidiabetic agents conducted by Sudha V et al. (2008), Boccuzzi SJ et al. (2004), Johnson et al. (2001), Yurgin N et al. (2007) show that there occurs male preponderance in the prevalence of diabetes,[11-14] while in contrast to these studies several other studies conducted by Lisha et al. (2012), Saiyad et al. (2012), R. Ramesh et al. (2011) have reported a high proportion of diabetes in female patients.[3,15] However, our study findings are also in concurrence with the earlier studies which show male preponderance in prevalence of DM with the male:female ratio being 2:1.

As described in National Institute for Clinical Excellence (NICE) guidelines for diabetes, routine monitoring of glycemic control is an important part of diabetes management. It was observed in our study that patients were investigated and monitored for glycemic control.[16] Thus it was evident that all the physicians made a good effort to follow the NICE guidelines to achieve good glycemic control in the admitted patients. Considering this, of all the oral hypoglycemic agents, metformin was the preferred drug as it was considered to be safe in regards to the hypoglycemic episodes & it was less expensive as well, thus making it affordable to the economically weak patients in our hospital. This observation makes it clear that socio-economic status of patient was definitely taken into consideration while prescribing the antidiabetic medications.

Biguanides were found to be the preferred class of OHA in our set up, of which Metformin was commonly prescribed antidiabetic drug either alone or in combination with other antidiabetic agents. This observation in our study was in concurrence with many other similar studies.[2,10,13,14,17] Similarly, some studies have shown sulfonylurea group as a commonly prescribed antidiabetic agents, whereas several other studies show that metformin is a prescribed in combination along with glimepiride or glibenclamide or sitagliptin.[18-20] However, most commonly prescribed combination was metformin+ glimiperide.[17]

It was however found to be difficult to obtain a good glycaemic control as per NICE guidelines in the diabetic individuals who were included in our studies, probably because of either improper & irregular medications or the existing comorbid conditions. In those patients who were not achieving targeted glycaemic control insulin preparations were preferred either alone or in combination with oral hypoglycaemic agents. Regular insulin (30) was the most commonly prescribed while, Lantus (5) was least prescribed. This helped in achieving a good glycaemic control and in good prognosis.

Polypharmacy was observed to be practiced in the management of the diabetes where in selection of the individual agents was made on the basis of their glucose lowering effectiveness and other characteristics suitable to the patients' conditions.[9] However, when adding second and potentially third antihyperglycemic medications, the synergy of particular combinations and other interactions were considered. Insulin plus metformin[21] and insulin plus a thiazolidinediones (TZD)[22] are particularly effective by means of lowering hyperglycemia but the increased risk of fluid retention with the latter combination must be considered. (TZD in combination with insulin is not currently approved in the European Union.) Although both TZDs and metformin effectively increase sensitivity to insulin, they have different target organs and have been shown to have modest additive effects, with addition of TZD to metformin lowering HbA_{1C} by 0.3-0.8%.[23,24] In our study it was found that patients who were prescribed insulin in management of diabetes and had HbA_{1C} assessments available before and following therapy achieved a substantial benefit from initiation of insulin. Although few patients did not meet target blood glucose levels, however clinical improvement was noticed for which they were admitted.

CONCLUSION

To conclude with the available wide range of oral hypoglycemic agents, metformin (Biguanides) was the most preferred oral hypoglycemic agents which could achieve good glycemic control when used either alone or in combination with other oral hypoglycemic agents/insulin preparations. This study reveals a rational use of medications although the prescriptions with generic names were about 15%. However, the prescription pattern was observed to be largely in compliance with the NICE guidelines. Despite of polypharmacy practice by the physicians no adverse drug event was reported among the treated participants.

Limitations of the study

As it was a short term research project, the restricted sample size restricts the generalisation of findings therefore, similar studies can be conducted in larger number of populations to confirm our findings.

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