

A survey of prescription pattern of anti-diabetic drugs on diabetic patients with cardiovascular complications within Dhaka metropolis

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INTRODUCTION

Diabetes is a chronic disease which is globally increasing and it also considered as an epidemic. Millions of people are affected with a large negative impression by Diabetes mellitus that is considered as one of the common chronic diseases.¹ At present, approximately 4% of the global

population is suffering from Diabetes mellitus which is expected to reach 5.4% in 2025.² In 1985, 30 million people had diabetes in worldwide which was estimated by the World Health Organization (WHO, 2006) and this number increased to 135 million by 1995 and reached 217 million in 2005. WHO has predicted that by the year 2030 this number will increase to at least 366 million.³

ABSTRACT

Background: This survey study was designed to analyze the current prescription pattern of anti-diabetic drugs that used in diabetic patients with cardiovascular complications within Dhaka metropolis.

Methods: The present study has been conducted by out-patient department in a number of well-known general and specialized government and private hospitals in Dhaka, Bangladesh for 5 months. 1200 prescriptions and questionnaire were randomly evaluated for this present survey. A standard questionnaire was prepared, containing 17 different questions, to conduct the survey based on patient's demographic data such as which type of diabetes they have contained, age, gender, education and their self-assessment of health, disease history and medication.

Results: Among the patients involved in this study, there were 46% (550) male and 54% (650) female between the ages of 30 and 75 years. Between 46 and 70 years, 19% male and 31% female were found to be diabetic indicating that in this age group female are mostly affected by diabetes. About 2020 antidiabetic drugs were prescribed by the physicians in which 30.43% contained single, 54.16% contained two and 15% contained more than two anti-diabetic drugs. Amongst antidiabetic medications, metformin was the most commonly prescribed drug which was given in 30.69% patients followed by glimepride 10.9%, 5.45% had glipizide, 1% pioglitazone and other drugs. A total of 7.43% drug was prescribed by fixed dose combinations. Highest percentage of male diabetic patients with hypertension (86%), dyslipidemia (100%) and other complications (57%) was found at 75 years of age while no female patients were found under the same condition at the same age.

Conclusions: The findings can serve as a guide to choose the formulation and combination of anti-diabetic drugs in this part of the world before developing & marketing any new drug. Therefore it is necessary to create better awareness among people, focus on rational use of anti-diabetic drugs and also motivate our physicians to prescribe the generic drugs.

Keywords: CVD, Dhaka, Diabetes, Hypoglycemic agents, Prescription

Diabetes is a chronic and complex disease caused by the body's inability to produce or respond to the pancreatic hormone insulin that controls blood glucose levels. Diabetes happens when there is low or no insulin production or improper use of insulin. The prevalence of type 2 diabetes mellitus is increasing in both developing and developed country and the incidence of type 1 diabetes (T1D) is also increasing parallelly in worldwide.

People with type 2 diabetes have a greater incidence of cardiovascular disease, cerebrovascular disease, and renal disease than the general population. The clinical diagnosis of diabetes is often indicated by the presence of symptoms such as polyuria, polydipsia, and unexplained weight loss, and is confirmed by measurement of abnormal hyperglycemia. Hypertension is a highly prevalent disease worldwide and very common among patients with diabetes. Approximately from 10 to 30% of T1D and 60% of T2D patients have hypertension.⁴ Approximately 74.5 million and 23.6 million adults respectively in the United States are affected by hypertension and diabetes, and approximately 75% of patients with diabetes have concomitant hypertension.⁵ On the other hand, in diabetes mellitus dyslipidemia is one of the major risk factors for cardiovascular disease. In diabetic patients dyslipidemia are a high plasma triglyceride concentration, low HDL cholesterol concentration and increased concentration of small dense LDL-cholesterol particles. The lipid changes associated with diabetes mellitus are attributed to increased free fatty acid flux secondary to insulin resistance.⁶

The stimulation of endogenous insulin secretion, enhancement of insulin action at the target tissues, inhibition of dietary starch and lipid degradation, and treatment with oral hypoglycemic agents are currently available therapeutic strategies for the treatment of this chronic metabolic disorder.⁷ Some anti-diabetic drugs that are used to treat diabetes mellitus with the exceptions of insulin, exenatide, and liraglutide, pramlintide, all are administered orally and are thus also called oral hypoglycemic agents or oral antihyperglycemic agents.⁸ These anti-diabetic drugs are the drugs that work to lower abnormally high glucose (sugar) levels in the blood, which are characteristic of the endocrine system disorder (diabetes mellitus).

METHODS

This study was performed using prescriptions and questionnaire of around 1200 patients suffering from diabetes and some of them associated with hypertension and dyslipidemia. Various age group patients and patients with different types of diabetes have been selected for the study. This study conducted for a period of 5 months from August 2015 to January 2016.

Selection area

Selecting proper area for survey is a crucial part for getting perfect data, which represent the actual condition. We emphasized on some general and specialized governmental hospitals. Our main focus was actually out patients of endocrinology department. Prescriptions of newly registered patients were studied.

Sampling design

A sampling design is a definite plan for obtaining a sample from a given area. It refers to the technique or the procedure, the researchers would adopt in selecting items for the sample. Patient's data such as the age, name, gender and data on prescribed drugs that include name of drug, dosage form, route of administration, most prescribed drug and so on were recorded on a customized data collection sheet in an approved manner. Each drug was counted only once without considering any change in the regimen.

Questionnaire

A standard questionnaire was prepared, containing 17 different questions, to conduct the survey based on patient's age, disease history and medication. Our total patients were 1200 from those hospitals. The questionnaire has been used to collect proper information about Diabetes Mellitus and its association with cardiovascular complications in Bangladeshi population. The information that were collected from this survey by using questionnaire was related to the patient demographic data such as which type of diabetes they have contained, age, gender, education and their self assessment of health. A number of criteria were considered for analyzing questionnaire that includes, duration since they were diagnosed with diabetes, time interval to check their glucose level in a year. The most significant part of the questionnaire involved whether the patient has been diagnosed with any cardiovascular complications along with diabetes and for how long. A part of the questionnaire also helped us to determine the concurrent administration of antidiabetic drugs and other drugs for cardiovascular complications by the patients specifying the name of drugs, dose and dosage forms. Moreover, this also involved question mentioning use of insulin injection by patients in the past weeks or months.

The questionnaire has been filled up by the individuals at different hospitals who have participated to share their health issues.

Data processing and graphical representation

Finally all the collected raw data were processed and represented to various aspects through MS-Excel. The results were expressed as proportions or as percentages.

RESULTS

A total of 1200 prescriptions were assessed. The patients involved 46% (550) male and 54% (650) female between the ages of 30 and 75 years. Between 46 and 70 years, 19% male and 31% female were found to be diabetic indicating that in this age group female are mostly affected by diabetes (Figure 1).

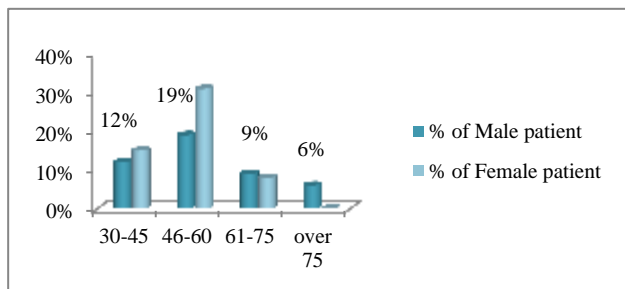


Figure 1: Percentage (%) of male and female patients affected by diabetes according to their age group.

In the patient information section about 2020 drugs were prescribed. In the present case study, 30.83% prescriptions contained single anti-diabetic drug, 54.16% contained two anti-diabetic drugs and only 15% contained more than two anti-diabetic drugs (Figure 2).

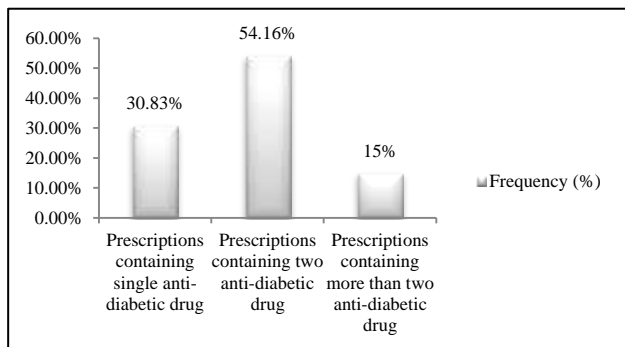


Figure 2: Proportion of prescriptions containing anti-diabetic drug.

In Figure 3, it is shown that the percentage of the prescription written with either the generic or brand name. It was found that only 8.33% anti-diabetic drugs were prescribed by their generic name while the rest (91.66%) were prescribed by brand names. Among these prescribed drugs, about 69.80% anti-diabetic drugs were solid dosage forms while 30.20% anti-diabetic drugs were injectables (Figure 4).

In these prescriptions, about 92.57% drugs were prescribed as single dose while 7.43% drugs were prescribed as fixed dose combinations where 30.3% Insulin, 30.69% Metformin, 2.48% Sitagliptin, 5% Vildagliptin, 5% Linagliptin, 2% Glipizide, 5.45% Glimperide, 10.9% Gliclazide and 1% Pioglitazone were found to be prescribed as single dose. However, it was

observed that most commonly prescribed fixed dose combinations were 5.45% Vildagliptin + Metformin, 1.49% Sitagliptin + Metformin and 0.5% Pioglitazone + Metformin (Table 1).

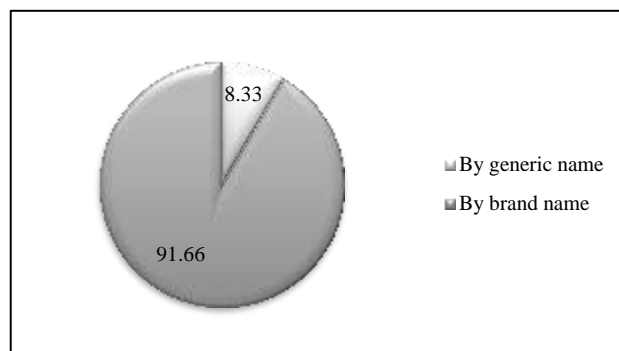


Figure 3: Percentage (%) of anti-diabetic drugs prescribed by their generic or brand name.

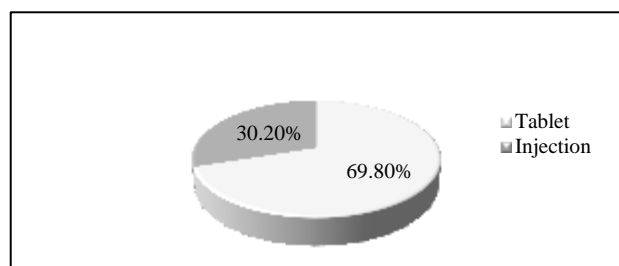


Figure 4: Percentage (%) of anti-diabetic drugs prescribed orally or parenterally.

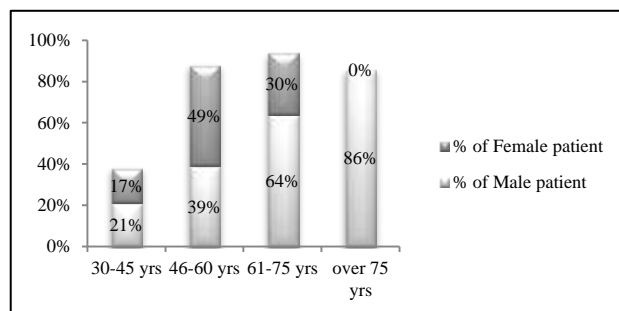


Figure 5: Percentage (%) of patient of Diabetes associated with Hypertension.

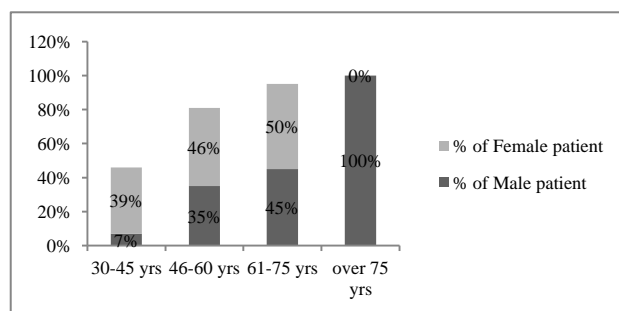


Figure 6: Percentage (%) of patient of diabetes associated with dyslipidemia.

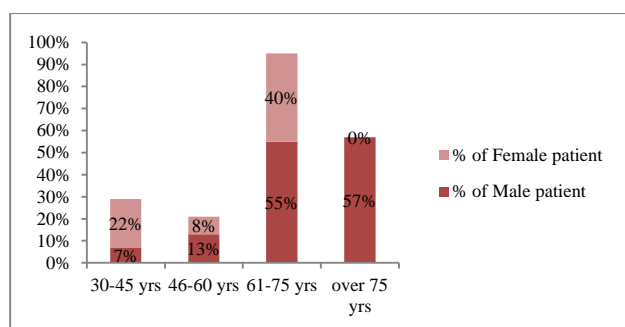


Figure 7: Percentage (%) of patient of diabetes associated with other complications.

Table 1: Type of anti-diabetic drug contained in prescriptions.

Anti-diabetic drug	Frequency	Frequency (%)
Insulin	610	30.2%
Metformin	620	30.69%
Sitagliptin	50	2.48%
Vildagliptin	100	5%
Linagliptin	100	5%
Glipizide	40	2%
Glimepiride	110	5.45%
Gliclazide	220	10.9%
Pioglitazone	20	1%
Vildagliptin + Metformin	110	5.45%
Sitagliptin + Metformin	30	1.49%
Pioglitazone + Metformin	10	0.5%

In the present study we also found that majority of the patients have diabetes associated with hypertension, dyslipidemia and other complications. To analyze the association of cardiac complications in diabetic patients the present survey was conducted by using a standard questionnaire. A significant portion of the questionnaire highlighted that whether the patients have been diagnosed with any cardiovascular complications and if they have any cardiovascular complications then for how long they have been diagnosed. According to the information of questionnaire it was found that between 30 and 45 years of age 21% male and 17% female were diabetic in association with hypertension while 39% male and 49% female between the age group of 46 and 60 years suffered from diabetes with hypertension. Moreover, it was observed that 64% male and 30% female between 61 and 75 years of age and 86% male and 0% female over 75 years of age were diabetic patients with hypertension (Figure 5).

An estimation from the current survey involved 7% male and 39% female between 30 and 45 years of age while 35% male and 46% female between 46 and 60 years of age have been suffering from diabetes along with

dyslipidemia. On the other hand, coexistence of diabetes and dyslipidemia was seen in 45% male and 50% female between 61 and 75 years of age while over the age of 75 years all male (100%) and no female (0%) patients were found to be diabetic in association with dyslipidemia (Figure 6). Furthermore, some of the diabetic patients were significantly found to be in association with other complications for example weakened immune system, oral infections, lung disease, diabetic neuropathy etc. This involved 7% male and 22% female between 30 and 45 years of age, 13% male and 8% female between 46 and 60 years of age, 55% male and 40% female between 61 and 75 years of age and 57% male over 75 years of age. However, no female (0%) diabetic patients were found to be associated with other complications (Figure 7).

DISCUSSION

A prescription is an order that is written by the 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. Prescriptions given by physician must be containing some elemental components such as name, age of the patient and signature of the prescriber.⁹ To assess and evaluate the prescribing attitude of the physicians and dispensing practice of the pharmacists' prescription based survey is considered the most effective method.¹⁰

In the present study a total of 1200 prescriptions were assessed and the incidence of Diabetes was seen in 550 (46%) male and 650 (54%) female patients. The ages of the patients were between 30 and 75 years. Most diabetic patients belong to the age 46-60 years (31% female, 19% male) followed by 30-45 years (15% female, 12% male) which indicates that in this age group females are mostly affected by diabetes. Almost similar results were found in a previous study where indicated most patients belonged to the age group of 51-70 years (54.16%) followed by 30-50 years (32.66%).¹¹ In the patient information section we found that about 2020 drugs were prescribed which belong to 12 different classes. In this case study we found that 30.83% prescriptions contained single anti-diabetic drugs, 54.16% contained two anti-diabetic drugs and only 15% contained more than two anti-diabetic drugs. This percentage shows that two anti-diabetic drugs were mostly prescribed for diabetic patient. This is known as polypharmacy and may lead to improper use of the prescribed medicines. Similar results were obtained in a previous study.^{12,13} According to Good, (Good 2002) use of multiple medications increases in a variety of ways likelihood of an unintended therapeutic outcome.¹⁴

In this study we found that most anti-diabetic drugs were prescribed by brand name (91.66%) and this percentage is quite high which reflects the strong marketing policy of the pharmaceuticals. Here showed much lower percentage of prescriptions with generic name which is

similar as previous study that was conducted by WHO within the Indian population.¹¹ Among 2020 prescribed anti-diabetic drugs oral anti-diabetic drugs were prescribed in majority of patients (69.80%), which corresponds with the previous study where 95% oral antidiabetics were prescribed.¹⁵

In these prescriptions, about 92.57% drugs were prescribed as single dose while 7.43% drugs were prescribed as fixed dose combinations which are similar as the previous study.¹⁶ Amongst antidiabetic medications, metformin was the most commonly prescribed drug which was given in 30.69% patients followed by glimepride 10.9%, 5.45% had glipizide, 1% pioglitazone and other drugs. Similar result was observed in the previous study on prescription pattern.^{11,15,17} For type 2 diabetes mellitus, metformin is reported as the first choice of drug for most patients because metformin has no dangerous effect on cardiovascular risk factors and does not promote weight gain.¹⁸ On the other hand, a total of 7.43% drug was prescribed by fixed dose combinations where 5.45% was Vildagliptin + Metformin combination, 1.49% was Sitagliptin + Metformin combination and 0.5% was Pioglitazone + Metformin combination.

From this study we also found that most of the patients have diabetes associated with cardiovascular complications. According to the American Heart Association (AHA) considers diabetes to be one of the seven major controllable risk factors for cardiovascular disease. American Diabetes Association (ADA) observe that there's a big link between diabetes, heart disease, and stroke and claim that at least 68 percent of people age 65 or older with diabetes die from some form of heart disease; and 16% die of stroke.¹⁹ Diabetes is treatable, but even when glucose levels are under control it greatly increases the risk of heart disease and stroke. ADA also considers that patients with type 2 diabetes may have hypertension, dyslipidemia, obesity that contributes to their risk for developing cardiovascular disease. To find out the correlation of diabetic patients with cardiovascular complications a questionnaire form was used.

Diabetes mellitus and hypertension are interrelated diseases that strongly predispose an individual to atherosclerotic cardiovascular disease.^{20,21} Generally most of the patients are diabetic in association with hypertension. According to the information found in the questionnaire, most of the male patients (64%) were diabetic in association with hypertension between the age group of 61 and 75 years. On the other hand, between the age group of 46 and 60 years most of the female patients (49%) were diabetic in association with. Moreover, it was observed that 0% female over 75 years of age were diabetic in association with hypertension. This result shows that after 75 years of age female patients are not vulnerable for diabetes in association with hypertension.

Another cardiovascular complication known as dyslipidemia is also a common disease for diabetic patients. Dyslipidemia, an established risk factor for CVD, is strikingly common in patients with type 2 diabetes, affecting almost 50% of this population.²² After analyzing the questionnaire we found that almost all patients had diabetes in association with dyslipidemia. It was observed that at the age between 30 and 45 years 7% male and 39% female, at the age between 46 and 60 years 35% male and 46% female and the age between 61 and 75 years 45% male and 50% female patients were found to be diabetic in association with dyslipidemia while over the age of 75 years all male (100%) and no female (0%) patients were found to be diabetic in association with dyslipidemia.

Furthermore, in this study we also found that some diabetic patients had complications other than hypertension and dyslipidemia such as weakened immune system, oral infections, lung disease, diabetic neuropathy etc. In this case after 75 years most of the male patients (57%) were found to be associated with other complications. On the other hand most of the female patients (40%) were found to be associated with other complications.

CONCLUSION

Oral anti-diabetic drugs were advised in majority, which is easier method of drug administration. From the present study based on collected data from prescriptions, we found that majority of patients were affected by type-2 diabetes with cardiovascular complications. To treat these diabetic patients anti-diabetic drugs have been prescribed irrationally where metformin (30.69%) was found to be most commonly prescribed anti-diabetic drug. Furthermore, our study reported that the female patients (54%) were significantly more affected by diabetes associated with cardiovascular complications than male patients. To reduce morbidity and mortality in diabetic patients, we must ensure optimum glycemic control not only by prescribing keeping in line with guidelines, but also by ensuring patients' adherence to treatment plan.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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