



Assessment of Diabetic Complications and Its Management in a Tertiary Care Hospital

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ABSTRACT

Aim: The aim of the study is to assess the diabetic complications and its management in a tertiary care hospital.

Materials and Methods: A prospective observational study of sixmonth duration was conducted. All the data were documented and analysed based on a standard protocol. Data collected were entered into Microsoft Excel. Statistical analysis was done by using Microsoft Excel. **Results:** A total of 120 patients were included in the study. 57.5% were male and 42.5% were female in which majority were age above 64. The major type of complication identified was nephropathy (37.7%) and the risk factor identified was hypertension (76%). The treatment of various types of complications included mainly the focus to control the blood glucose level. The treatment approach mainly followed is by the use of oral hypoglycaemics and insulin therapy. The results even suggest that any efforts made, both pre- and in- hospital, are worthwhile investments in securing the best outcomes for the patient population. **Conclusion:** This study identified various types of complications associated with long term diabetes and its management. This study strongly highlights that treatment approaches for various complications and risk factors.

Key words: Diabetes Mellitus, Glycosylated Haemoglobin, Complications, Management.

INTRODUCTION

Diabetes is a chronic condition caused by an absolute lack of insulin or relative lack of insulin as a result of impaired insulin secretion and action. Its hallmark clinical characteristics are symptomatic glucose intolerance resulting in hyperglycaemia and alterations in lipid and protein metabolism. In the long term, these metabolic abnormalities contribute to the development of complications such as cardiovascular disease (CVD), retinopathy, nephropathy, neuropathy, diabetic foot ulcer, ketoacidosis and a higher risk of cancer.

Genetically, etiologically, and clinically, diabetes is a heterogeneous group of disorders.

Nevertheless, most cases of diabetes mellitus can be assigned to type 1 or type 2 diabetes. A glycosylated haemoglobin (A1C) level can be used to diagnose diabetes, in addition to a fasting plasma glucose or oral glucose tolerance test.

The glycosylated haemoglobin, or HbA1C, has become the gold standard for measuring chronic glycemia and is the clinical marker for predicting long-term complications, particularly microvascular complications.^[1]

Various risk factors are associated with diabetes which can be broadly classified in to modifiable or non-modifiable risk factors.^[2]

Diabetic complication is divided into microvascular and macrovascular complications. Macro vascular complications arise from damage to large blood by cells and microvascular complications occurs from damage to smaller vessels.^[3]

MATERIALS AND METHODS

Study site: Study was conducted at inpatient and outpatient Department of general medicine and diabetology in a Tertiary Care Hospital, Kannur.

Study design: Prospective, observational study.

Study material: Case sheet of diabetic patients which included patient demographic details, diagnosis. Significant complications. Risk factors. Patient history, family history.

Study procedure: Detailed information regarding the study was explained to the patients with diabetes. Informed consent is obtained from the participants who are willing to participate in the study. A data collection form was designed to collect patient information. The information based on patient demography, diagnosis, past medical history, family history, social habits, medication history, and treatment chart were collected and documented.

Ethics and consent: The study was approved by the institutional Human Ethical Committee of Crescent College of Pharmaceutical Sciences filed under 002/2021/CCOPS/IEC22/12/2021. Permission to conduct the study was obtained from the chairperson of the Institutional Human Ethics Committee.

RESULTS

The study was done for a duration of 6 months in the Diabetology and General medicine department of a tertiary care hospital. Based on the inclusion and exclusion criteria 120 patients were included in our study.

BASELINE CHARACTERISTICS OF PATIENTS

A total of 120 patients were included in the study, 69 (57.5%) were male and 51 (42.5%) were female (Table 1). The occurrence of various types of complications associated with diabetes was more in case of males than females. Diabetic complications were analysed in patients above 18 years of age. Gestational diabetic patients were excluded from the study. Among 120 patients included in the study, 53 (44.17%) belongs to age group above 64, 26 (21.67%) belongs to age group 55-64, 24 (20.00%) belongs to age group 45-54, 15 (12.50%) belongs to age group 35-44, 2 (1.67%) belongs to age group 18-24 and no patients were found in the age group which belongs to age group 25-34 included in our study. The complication was identified more in patients belonging to age group above 64 (Table 2).

The type of risk factors commonly identified was Hypertension 95 (76.0%), next type identified was Hyperlipidaemia 21 (16.8%), Family history occurred among 7 (5.60%) and least contributed to obesity (1.60%) which accounts 2 (Table 3).

The major type of complication identified was nephropathy (37.7%) and the risk factor identified was hypertension (76%). Majority of the patients had HbA1c level above 6.5% (98.3%).

GENDER WISE DISTRIBUTION

Table 1: gender wise distribution

GENDER	NUMBER	PERCENTAGE
Male	69	57.50
Female	51	42.50

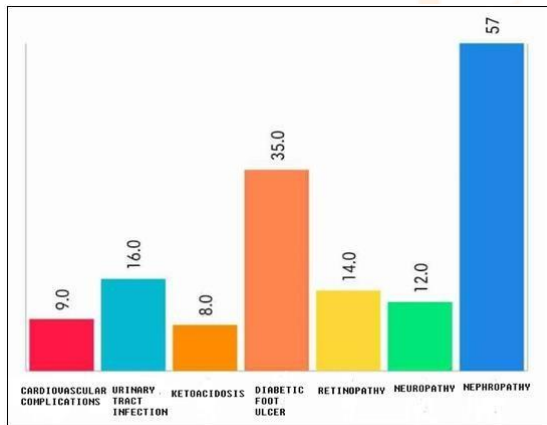
AGE WISE DISTRIBUTION

Table 2: age wise distribution

AGE	NUMBER	PERCENTAGE
18-24	2	1.67
25-34	0	0.00
35-44	15	12.50
45-54	24	20.00
55-64	26	21.67
Above 64	53	44.17

RISK FACTORS IDENTIFIED**Table 3: Risk factors identified**

RISK FACTORS	NUMBER	PERCENTAGE
High Blood Pressure	95	76
Hyperlipidaemia	21	16.80
Obesity	2	1.60
Family history	7	5.60

TYPES OF COMPLICATION AND THEIR RESPECTIVE MANAGEMENT**Types of complications identified****Figure 1: Types of complications identified**

Out of 120 patients enrolled in the study, the main type of complications identified was Nephropathy 57 (37.7%), next type of complication identified in majority of the patients was Diabetic foot ulcer 35 (23.18%), Urinary Tract Infection 16 (10.60%), Diabetic Retinopathy 14 (9.27%), Diabetic Neuropathy 12 (7.95%), Cardiovascular Complications 9 (5.96%), and finally the least number accounts for Diabetic Ketoacidosis 8 (5.30%). (Figure 1)

Risk factors identified

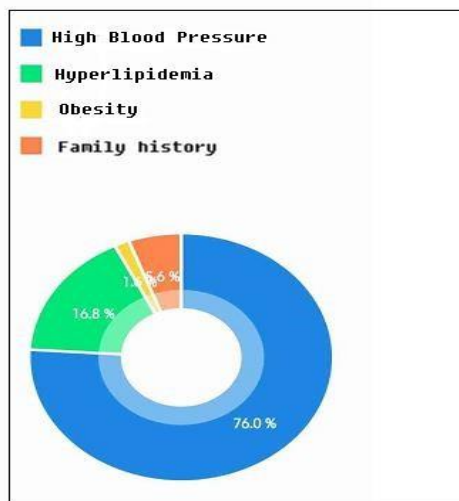


Figure 2: Risk factors identified

The type of risk factors commonly identified was Hypertension 95(76.0%), next type identified was Hyperlipidaemia 21 (16.8%), Family history occurred among 7 (5.60%) and least contributed to obesity 2 (1.60%). (Figure 2)

HbA1C level

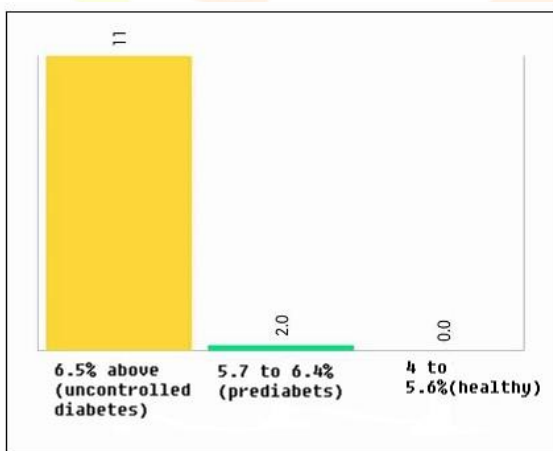


Figure 3: HbA1C level

Out of 120 patient’s majority of the patients had HbA1C level above 6.5% (uncontrolled diabetes) which were 118 (98.3%), and 5.7 to 6.4% (prediabetes) which were 2 (1.75%) and none of the patients were among 4 to 5.6% (healthy) category. (Figure 3)

MANAGEMENT OPTIONS FOR VARIOUS COMPLICATIONS

Management of Nephropathy

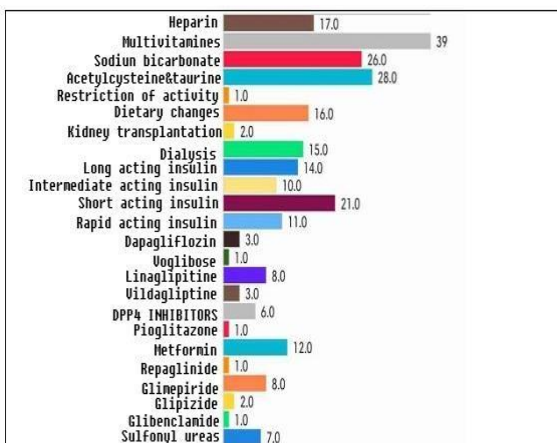


Figure 4: Management of nephropathy

In the management of nephropathy the most commonly used drugs are multivitamins 39 (15.42%), Acetyl cysteine and taurine 28 (11.07%), sodium bicarbonate 26(10.28%), shortacting insulin 21(83.0), heparin 1 (6.72), dietary changes 16(6.32), dialysis 15 (5.93%), long acting insulin 14 (95.53 %), metformin 12(4.74%), rapid acting insulin 11(4.35%), intermediate acting insulin 10(3.95%), glimepiride 8(3.16%),linagliptin 8(3.16%), sulphonylureas7 (2.77%), DPP4 inhibitors 6 (2.37%) vildagliptin 3 (1.19%), dapagliflozin 3(1.19%), glipizide 2 (0.79%), kidney transplantation 2 (0.79 %), glibenclamide 1 (0.40%), repaglinide 1 (0.40%), Pioglitazone 1 (0.40%),voglibose 1 (0.40%), restriction of activity 1 (0.40%). (Figure 4)

Management of Hypertension

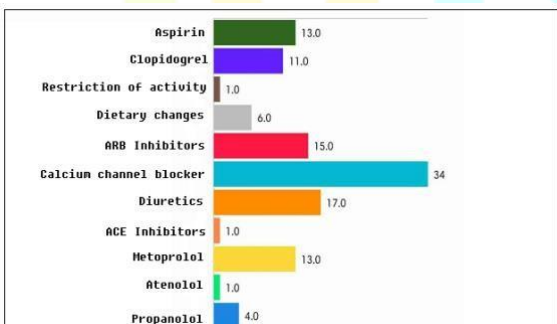


Figure5: Management of hypertension

In the management of hypertension the most commonly used drugs are calcium channel blockers 34 (29.31 %)diuretics17(14.66%), ARB inhibitors 15(12.93), aspirin13(11.21%), metoprolol 13 (11.21%), clopidogrel

11(9.48%), dietary changes 6(5.17%) propranolol 4 (3.45%), atenolol1(0.86%), angiotensin converting enzyme inhibitor 1 (0.86%), restriction of activity 1 (0.86%). (Figure 5)

Management of Neuropathy

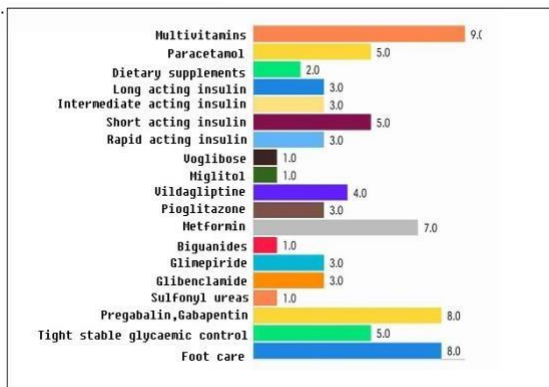


Figure 6: Management of neuropathy

The most commonly used drug in the management of neuropathy is multivitamins which include 9 (12%). The next commonly used managements are foot care 8 (10.67%), pregabalin and gabapentin 8 (10.67%), metformin 7 (9.33%), tight stable glycaemic control 5 (6.67%), short acting (regular insulin) 5 (6.67%), paracetamol 5 (6.67%), vildagliptin 4 (5.33%), glipalamide 3 (4.00%), glimepiride 3 (4.00%), thiazolidine dions (pioglitazone) 3 (4.00%), rapid acting insulin (aspart,lispro) 3 (4.00%), intermediate acting (Lente insulin, NPH) 3 (4.00%), long acting insulin (glargine, detemir) 3 (4.00%), dietary supplements 2 (2.67%), the least commonly used drugs are sulphonyl ureas 1 (1.33%), biguanide 1 (1.33%), miglitol 1 (1.33%), voglibose 1 (1.33%). (Figure 6)

Management of Retinopathy

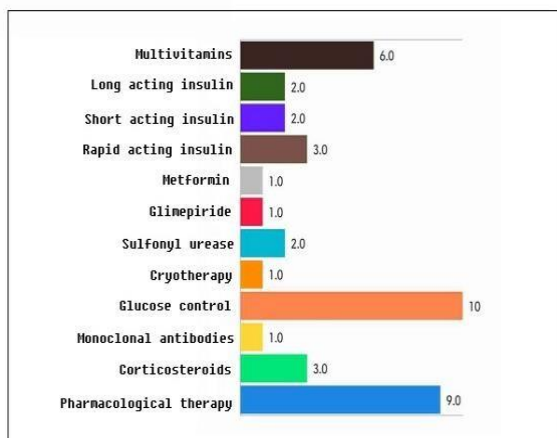


Figure 7: Management of retinopathy

Management of retinopathy mostly involves glucose control 10 (24.39%). The next commonly used management is pharmacological therapy 9 (21.95%), multivitamin 6 (14.63%), triamcinolone, corticosteroid 3 (7.32%), rapid acting insulin 3 (7.32%), sulphonyl ureas 2 (4.88%), short acting (regular insulin) 2 (4.88%), long acting insulin (glargine) 2 (4.88%), least commonly used drugs are bevacizumab, monoclonal antibody 1 (2.44%), cryotherapy

(2.44%), glimepiride 1 (2.44%), biguanide (metformin) 1 (2.44%). (Figure 7)

Management of Diabetic Foot Ulcer

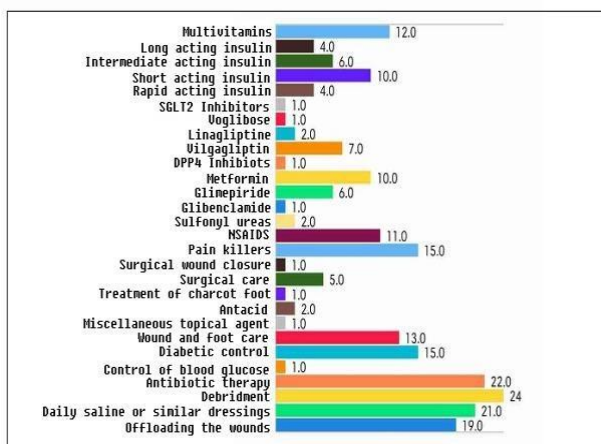


Figure 8: Management of diabetic foot ulcer

In the management of diabetic foot ulcers the most commonly followed therapy is Debridement 24 (10.96%),Antibiotic Therapy 22(10.05%),Daily saline 21(9.59%),Offloading the wound 19(8.68%),Diabetic control 15(6.85),Pain killers 15(6.85),wound and foot care 13(5.94),Multivitamins 12(5.48),NSAID 11(5.02),Metformin 10(4.51%),Short acting insulin 10(4.57%),Vildagliptin 7(3.20%),Intermediate acting insulin 6(2.74%),Rapid acting insulin 4(1.83%),Antacid 2(0.91%),Sulfonyl urea 2(0.91%),Linagliptin2(0.91%),Insulin1(0.46%),SGLT2 Inhibitors 1(0.46%),Voglibose 1(0.46), DPP4 inhibitors 1(0.46%),Control blood glucose 1(0.46%),Miscellaneous topical agent 1(0.46%),Treatment of charcot foot 1(0.46%),Surgical wound closure 1(0.46%),Glibenclamide 1(0.46%). (Figure 8)

Management of Diabetic Ketoacidosis

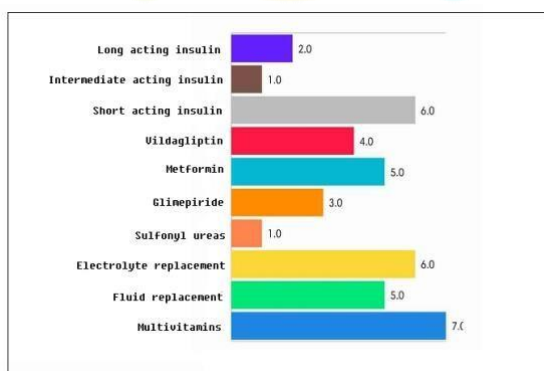


Figure 9: Management of diabetic ketoacidosis

In the management of diabetic ketoacidosis the most commonly used drug is Multivitamins

7(17.50%),Electrolyte balance 6(15%),Short acting insulin 6(15%),fluid replacement 5(12.50),Metformin 5(12.50),Vildagliptin 4(10%),Glimepiride 3(7.50%),long acting insulin 2(5%),Sulfonyl urease 1(2.50%),Intermediate acting insulin 1(2.50%). (Figure 9)

Management of Urinary Tract Infection

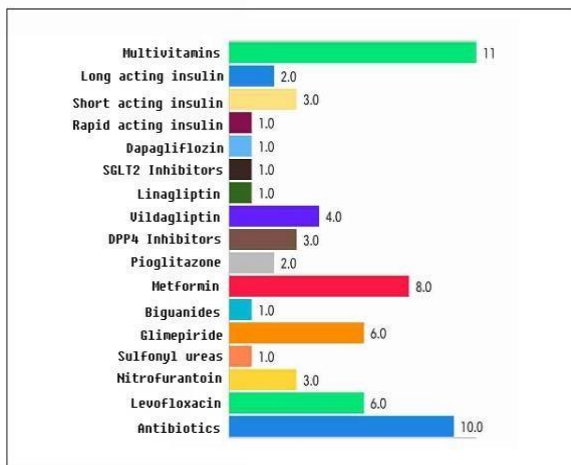


Figure10: Management of Urinary Tract Infection

In the management of UTI most commonly used is multivitamins 11 (17.19%), the next commonly used is antibiotics 10 (15.63%), metformin 8 (12.5%), levofloxacin 6 (9.38%), glimepiride 6 (9.38%), vildagliptins 4 (6.25%), nitrofurantoin 3 (4.69%), DPP4 inhibitor 3 (4.69%), short acting (regular insulin) 3 (4.69%), thiazolidine diones (pioglitazone) 2 (3.13%), long acting insulin (glargine, detemir) 2 (3.13%), the least commonly used drugs are sulphonyl ureas 1 (1.56%), biguanides 1 (1.56%), linagliptin 1 (1.56%), SGL2 inhibitors 1 (1.56%), dapagliflozin 1 (1.56%), rapid acting insulin (apart, lispro) 1 (1.56%). (Figure 10)

Management of Cardiovascular Complications

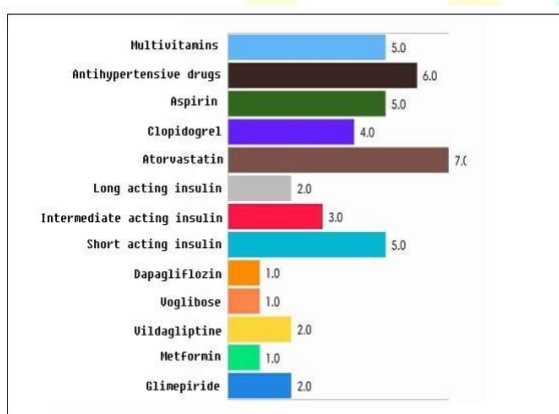


Figure 11: Management of Cardiovascular complications

In the management of cardiovascular complications most commonly used drug is atorvastatin 7 (15.91%), the next commonly used is antihypertensive drugs (13.64%),short acting insulin 5(11.36%), aspirin 5(11.36%),multivitamins 5(11.36%),clopidogrel 4 (9.09%),intermediate

acting insulin (lente, insulin, NPH), 3 (6.82%), glimepiride 2 (4.55%), vildagliptin 2 (4.55%), long acting insulin (glargine, detemir) 2 (4.55%), the least commonly used drug is metformin 1 (2.27%), voglibose 1 (2.27%), dapagliflozin 1 (2.27%). (Figure 11)

DISCUSSION

The study was conducted in a tertiary care hospital, Kannur to assess the diabetic complications and its management. A total of 120 patients were included in the study. In our study population of 120 patients, 69 were males and 51 were females. Most people admitted with diabetes were in age group above 64 (44.17%) years. In the long term, diabetes contributes to development of complications such as CVD 9 (5.96%), retinopathy 14 (9.27%), nephropathy 57 (37.7%), diabetic foot ulcer 35 (23.18%) and ketoacidosis 8 (5.30%). In our study, the most common complication was found to be diabetic nephropathy 37.7%. In Jeppe skov's study, which was conducted to investigate about diabetic nephropathy and it was observed that nephropathy is the most frequent and severe complication in diabetes mellitus.^[4]

In our study, out of 120 patients the major risk factor associated with diabetic patients was found to be hypertension 95 (76%). This result is similar to the study conducted by Guanghong jia^[5], next is hyperlipidaemia 21 (16.80%) and then family history 7 (5.60%) and least contributed to obesity 2 (1.60%).

HbA1C, FBS, RBS, GRBS and PPBS can be used to diagnose diabetes. HbA1c test helps to measure average blood sugar levels for the past 3 months.. This test is essential for every person who has diabetes. out of 120 patients, majority of the patients had HbA1C level above 6.5%

(uncontrolled diabetes) which were 118 (98.3%) and 5.7 to 6.4% (prediabetes) which were 2 (1.75%) and none of the patients were among 4 to 5.6% (healthy).

The primary goal of diabetes treatment is strict and stable glycaemic control. in our study, in the management of nephropathy the most commonly used drugs are multivitamins 39 (15.42%), Acetyl cysteine and taurine 28 (11.07%), Sodium bicarbonate 26 (10.28%) and other hypoglycaemics agents^[6].

In the management of neuropathy, the most commonly used drug is multivitamins which include 9 (12%), foot care 8 (10.67%), pregabalin and gabapentin 8 (10.67%) and other hypoglycaemic agents.

In case of retinopathy, the management is done with glucose control 10 (24.39%), pharmacological therapy 9 (21.95%), multivitamin 6 (14.63%) and other hypoglycaemic agents. In the management of diabetic foot ulcers, the most commonly followed therapy include Debridement 24 (10.96%), Antibiotic Therapy 22 (10.05%), Daily saline 21 (9.59%), Off-loading the wound 19 (8.68%), Diabetic control 15 (6.85%), Pain killers 15 (6.85%), wound and foot care 13 (5.94%), Multivitamins 12 (5.48%), NSAIDS 11 (5.02%) and other hypoglycaemic agents^[7].

In the management of diabetic ketoacidosis, the most commonly used drugs are Multivitamins 7 (17.50%), Electrolyte balance 6 (15%), Short acting insulin 6 (15%), fluid replacement 5 (12.50%), Metformin 5 (12.50%) and other hypoglycaemic agents^[8].

In the management of UTI, the most commonly used treatment methods are using multivitamins 11 (17.19%), the next commonly used are antibiotics 10 (15.63%), metformin 8 (12.5%), levofloxacin 6 (9.38%), glimepiride 6 (9.38%), vildagliptin 4 (6.25%), nitrofurantoin 3 (4.69%) and other hypoglycaemic agents.

The most commonly used management of cardiovascular complication is using atorvastatin 7 (15.91%), the next commonly used is antihypertensive drugs 6 (13.64%), short acting insulin 5 (11.36%), aspirin 5 (11.36%), multivitamins 5 (11.36%), clopidogrel 4 (9.09%) and other hypoglycaemic agents.

CONCLUSION

Out of 120 patients taken in to study maximum number of patients was in age group above 64. The occurrence of diabetic complication was more case of males than female. Hypertension is a common risk factor for diabetic complication. The HbA1c level is commonly used as screening method to find the blood glucose measure and the HbA1c level in majority of the patients was above 6.5% (uncontrolled diabetes). The most seen complication associated with diabetes was found to be nephropathy followed by diabetic foot ulcer, UTI, retinopathy, neuropathy, cardiovascular complications and ketoacidosis. In the management of nephropathy, the most commonly used drugs are multivitamins followed by acetyl cysteine and taurine and other hypoglycemic agents. The most commonly used drugs in the management of neuropathy are multivitamins, pregabalin, gabapentin and other hypoglycemic agents. In the management of retinopathy, the most commonly used treatment methods are glucose control, pharmacological therapy, multivitamins and other hypoglycemic agents. In the management of diabetic foot ulcers, the most commonly used therapy is debridement followed by antibiotic therapy, daily saline or similar dressings and other hypoglycemic agents. In the management of diabetic ketoacidosis, the most commonly used drug is multivitamins followed by electrolyte balance. The most commonly used method for UTI is multivitamins followed by antibiotics. In the management of cardiovascular complications most commonly used drugs are atorvastatin followed by antihypertensive drugs.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ABBREVIATIONS

ADA: American Diabetes Association, DM: Diabetes Mellitus, AH: Antihypertensive, CKD: Chronic Kidney Disease, HTN: Hypertension, BG: Blood glucose, GDM: Gestational Diabetes Mellitus

IFG: Impaired Fasting Glucose

IGT: Impaired Glucose Tolerance

NDDG: National Diabetes Data group

IDDM: Insulin Dependent Diabetes Mellitus

NIDDM: Non-Insulin Dependent Diabetes Mellitus

MI: Myocardial Infarction, CVD: Cardiovascular Disease, CAD: Coronary Artery Disease

SUMMARY

A Prospective observational study was performed to assess the diabetic complication and its management in Inpatient and outpatients. Significant complications and their various treatment options were evaluated. Various treatment options suggested that better control of the complications was possible.

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