Diabetes is a metabolic disorder characterized by increased blood glucose level. Type 2 diabetes occurs most often in middle-aged and older people, being the most common type of diabetes. Our present study was to assess the various comorbid conditions associated with diabetes and their treatment approach in Qatar diabetes patients visited to primary health care centers over the year May 2019-Apr 2020. Three hundred Seventy Four (374), patients with type 2 diabetes were enrolled in this study during routine visits to the Primary health care corporation in Qatar. Most number of patients was found females compared to males. In our study it was also found that most the patients have multiple comorbidities and main are Obesity, Hypertension, Hyperlipidemia, Neuropathy, Nephropathy, Coronary Artery Disease and Retinopathy. The main reason behind the problem is unhealthy diet. Atorvastatin, Losartan, Acetaminophen, Aspirin and their combinations are highly found in prescriptions. In conclusion, it can say that it need to concern about various comorbid complications with diabetes. Not only with medication, has it required to make patient need to educate for food habits, exercise and other way to prevent diabetes.

Keywords: Type 2 diabetes, Qatar, comorbid conditions.

Saudi Arabia is a high income country with high urban population (84.3% in 2020) with annual growth rate 1.05% [3] and having That’s why there is an increase burden of diabetes in Saudi Arabia due to various factors, including a rising obesity rate and an aging population [4]. Whereas, Qatar is having 99.2% urban population [5]. According to WHO, the prevalence of diabetes mellitus among population of Qatar is approximately 17% and is in 2020, it contributes 7% of the total disease burden, and 10% of the mortality in Qatar [6].

Diabetes is a chronic disorder and due to long term rise of blood glucose level make various metabolic problems and related comorbid conditions. The most common comorbid conditions are in general hypertension, obesity, hyperlipidemia, renal disease, liver disease, Obstructive Sleep Apnea, anxiety etc.

Our present study was to assess the various comorbid conditions associated with diabetes and their
treatment approach in Qatar diabetes patients visited to primary health care centers over the year May 2019-Apr 2020.

Aim and Objectives of the study
The main aim of this study is to know the co-morbid conditions in type-2 diabetes patients in Qatar with following objectives.
- To identify co-morbid conditions in type-2 diabetes patients.
- To identify commonly used or prescribed medications to manage complications.

**Methodology**

**Study type**
Prospective cross-sectional study of patients from Qatar with type 2 diabetes

**Data Source**
The data were collected from patients profiles visited in Primary health care Corporation in Qatar having diabetes. The information was taken from the reports on diagnosis, referrals, tests and therapy records. Generals information were collected from patients counseling, patients history and treatment protocols. The presence of comorbid complications was confirmed by a qualified physician.

**Study sample**
Three hundred Seventy Four (374), patients with type 2 diabetes were enrolled in this study during routine visits to the Primary health care corporation in Qatar from May 2019 to April 2020.

**Inclusion criteria**
- Patients who have been diagnosed with type 2 diabetes both Genders.
- Patients from born Qatar national or staying in Qatar diagnosed with type 2 diabetes mellitus
- Patients who able to give consent
- Patients above 18 years of age at time of enrollment

**Exclusion criteria**
- Patients who are pregnant
- Patients who are below 18 years
- Patients who are not willing to give consent

**Complications study**
Following comorbid conditions were studied based on their clinical data.

- Obesity was calculated based on BMI if BMI ≥ 25 as taken overweight.
- Hypertension was taken if systolic blood pressure >130 mm Hg, diastolic blood pressure >80 mm Hg, or taking antihypertensive medications.
- Dyslipidemia was diagnosed as a total cholesterol >6.2 mmol/L, low-density lipoprotein (LDL)-cholesterol >3.3 mmol/L, and or triglycerides >2.2 mmol/L.
- Cardiovascular disease (CVD) was confirmed by medical records and verified by the consulting physician.
- Peripheral neuropathy was determined according to presence of (1) foot ulcers, (2) loss of sensation/numbness/burning/tingling in the feet (3) loss of toe, foot or leg due to diabetes, (4) claudication, or (5) peripheral vascular disease as determined by ultrasound [7].
- Diagnosis of Kidney disease (Nephropathy) was set by a urine albumin level >30 µg/min for microalbuminuria, and >200 µg/min for macroalbuminuria, or estimated glomerular filtration rate (eGFR) >60 mL/min/1.73 m²
- Diagnosis of retinopathy was defined as either white or red lesions (non-proliferative or proliferative retinopathy) or both present in the retina according to WHO criteria [8].

**Treatment Approach**
Drugs used for the treatment of diabetes and other complications like glucose lowering drugs, lipid lowering drugs, and blood pressure lowering drugs were and other drugs were assessed.

**Statistical analyses**
Results were expressed in percentage and graphs were plotted using Microsoft Excel 2010.

**Ethical considerations**
Permission was taken from each patient and concern physicians who agreed to take part in this study and as it is a non-invasion study where simple observations were taken.

**Result**

**Gender wise distribution of patients**
During the study period in one year from May 2019 to April 2020 all the patients were reviewed among them total 374 patients were enrolled in the study. Most number of patients was found females compared to males. The results are given in Table-1.

| Gender distribution | Number of patients | Percentage (%) |
|---------------------|--------------------|----------------|
| Males               | 156                | 41.71          |
| Females             | 218                | 58.29          |
| Total (n)           | 374                | 100            |

Table-1: Gender wise distribution of patients
Age wise distribution of patients
More number of patients was found in older age groups. Highest numbers of patients are found in the age groups in between 50 to 70 years. The details results are given in Table-2.

Table-2: Age wise distribution of patients

| Age group (years) | Total no of patients | Males | Females | Males (%)  | Females (%) |
|-------------------|----------------------|-------|---------|------------|-------------|
| 18-29             | 2                    | 2     | 0       | 0.53       | 0.00        |
| 30-39             | 12                   | 7     | 5       | 1.87       | 1.33        |
| 40-49             | 77                   | 30    | 47      | 8.02       | 12.56       |
| 50-59             | 123                  | 56    | 77      | 14.97      | 20.59       |
| 60-69             | 137                  | 51    | 76      | 13.63      | 20.32       |
| >70               | 23                   | 10    | 13      | 2.67       | 3.47        |

Diabetic patients with comorbid conditions
Percentage of diabetic patients with co-morbid conditions were presented in Table-3. Most of the patients have multiple comorbid conditions.

Table-3: Diabetic patients with co-morbid conditions

| Categories of comorbid conditions | No of patients | Percentage (%) |
|-----------------------------------|----------------|----------------|
| No complications                  | 36             | 9.62           |
| Single Complications              | 67             | 17.91          |
| Double Complications              | 108            | 28.87          |
| Three Complications               | 89             | 23.79          |
| More Than Three Complications     | 74             | 19.78          |
| **Type of comorbid conditions**   |                |                |
| Obesity                           | 136            | 36.36          |
| Hypertension                      | 115            | 30.74          |
| Hyperlipidemia                    | 102            | 27.27          |
| Neuropathy                        | 67             | 17.91          |
| Nephropathy                       | 77             | 20.58          |
| Coronary Artery Disease           | 45             | 12.03          |
| Retinopathy                       | 34             | 9.09           |
| Others                            | 13             | 3.47           |
Drug therapy of Diabetes patients for Co-morbid Conditions

The details drugs found to be used for diabetes patients for prophylaxis and treatment of various co-morbid conditions are given in table-4.

Table 4: Drug therapy of Diabetes patients for Co-morbid Conditions

| Drugs                          | Co-Morbid Conditions       | Percentage (%) |
|--------------------------------|---------------------------|----------------|
| Atorvastatin                   | Hyperlipidemia            | 67.05          |
| Aspirin+Atorvastatin           | Coronary Artery Disease   | 20.23          |
| Acetaminophen                  | Neuropathy                | 45.06          |
| Acyclopram+Clonazepam          | Neuropathy                | 2.93           |
| Amitriptyline                  | Neuropathy                | 7.7            |
| Amlodipine                     | hypertension              | 6.57           |
| Aspirin                        | Coronary Artery Disease   | 15.83          |
| Aspirin+Clopidogrel            | Coronary Artery Disease   | 8.5            |
| Atorvastatin+Fenofibrate       | Hyperlipidemia            | 6.37           |
| Clonazepam                     | Neuropathy                | 11.46          |
| Clopidogrel                    | Coronary Artery Disease   | 9.67           |
| Enalapril                      | hypertension              | 8.63           |
| Losartan                       | Hypertension, Nephropathy | 77.35          |
| Metaprolol                     | hypertension              | 6.67           |
| Olmesartan+hydrochlorothiazide | hypertension              | 30.32          |
| Pregabulin                     | Neuropathy                | 12.44          |
| Ramipril                       | Hypertension, Nephropathy | 4.53           |
| Ramipril                       | Nephropathy               | 18.75          |
| Rosuvastatin                   | Hyperlipidemia            | 21.21          |
| Rosuvastatin+Fenofibrate       | Hyperlipidemia            | 5.68           |
| Telmisartan                    | hypertension              | 17.66          |
| Telmisartan+hydrochlorothiazide| hypertension              | 5.67           |
| Torsemide                      | Nephropathy               | 6.04           |
| β-histine                      | Neuropathy                | 1.44           |

**DISCUSSION**

Type 2 diabetes is the most common type of diabetes which is 90 to 95% of the diabetic population worldwide [9]. The deficiency of the insulin actions in type 2 diabetes is main reasons which cause macrovascular and microvascular complication and other comorbidities [10]. According to Alsulaiman et al. blood glucose control is an essential to prevent the chronic metabolic complications such as hyperlipidemia, cardiovascular and kidney disease [11]. In our study, we have found that females have more diabetics cases reported than males. Most the patients are of the age group of in between 50-70 years. This may be more sedentary life style in Qatari women than men as it was reported by various studies that sedentary lifestyle is a risk factor for obesity and type 2 diabetes [12].
In our study it was also found that most the patients have multiple comorbidities and main are Obesity, Hypertension, Hyperlipidemia, Neuropathy, Nephropathy, Coronary Artery Disease and Retinopathy. The main reason behind the problem is unhealthy diet. It was observed diabetic patients were unhealthy due to high-level consumption of fats, cholesterol, sodium, and free sugar and lack of physical activities. The patients used to take medicines but they are found to neglect the life style habits. Another reason may be lack of knowledge about dietary management system. In our study it was found that most the patients used to take medications for co-morbid conditions for management. Atorvastatin, Losartan, Acetaminophen, Aspirin and their combinations are highly found in prescriptions.

CONCLUSION

In conclusion, it can say that it need to concern about various comorbid complications with diabetes. Not only with medication, has it required to make patient need to educate for food habits, exercise and other way to prevent diabetes.

REFERENCES

1. Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. Diabetes care. 2004 May 1;27(5):1047-53.
2. Saeedi P, Petersohn I, Salpea P, Malanda B, Karuranga S, Unwin N, Colagiuri S, Guariguata L, Motala AA, Ogurtsova K, Shaw JE. Global and regional diabetes prevalence estimates for 2019 and projections for 2030 and 2045: Results from the International Diabetes Federation Diabetes Atlas. Diabetes research and clinical practice. 2019 Nov 1;157:107843.
3. https://knoema.com/atlas/Saudi-Arabia/Urban-population
4. Alotaibi A, Perry L, Gholizadeh L, Al-Ganmi A. Incidence and prevalence rates of diabetes mellitus in Saudi Arabia: An overview. Journal of epidemiology and global health. 2017 Dec 1;7(4):211-8.
5. https://knoema.com/atlas/Qatar/Urban-population
6. Al Abdulla SA, Hassan DM, Mohammed AM, Bevington J. SMART Population Screening and Management in Qatar. Int J Diabetes Clin Res. 2019;6:099.
7. Pajouhi M, MR MT. Evaluation and prevention of diabetic neuropathy. Tehran University Medical Journal TUMS Publications. 2007 Jun 10;65(3):1-6.
8. McCarty CA, Taylor KI, McKay R, Keeffe JE. Diabetic retinopathy: effects of national guidelines on the referral, examination and treatment practices of ophthalmologists and optometrists. Clinical & experimental ophthalmology. 2001 Apr;29(2):52-8.
9. American Diabetes Association. Diagnosis and classification of diabetes mellitus. Diabetes care. 2010 Jan 1;33(Supplement 1):S62-9.
10. Shriram V, Mahadevan S, Anitharani M, Jagadeesh NS, Kurup SB, Vidya TA, Seshadri KG. Knowledge of hypoglycemia and its associated factors among type 2 diabetes mellitus patients in a Tertiary Care Hospital in South India. Indian journal of endocrinology and metabolism. 2015 May;19(3):378.
11. Alsalehman TA, Al-Ajmi HA, Al-Qahtani SM, Fadlallah IM, Nawar NE, Shukralah RE, Nadeem SR, Al-Weheedy NM, Al-Sulaiman KA, Hassan AA, Shahin AA. Control of type 2 diabetes in King Abdulaziz Housing City (Iskan) population, Saudi Arabia. Journal of family & community medicine. 2016 Jan;23(1):1.
12. Hu FB. Sedentary lifestyle and risk of obesity and type 2 diabetes. Lipids. 2003 Feb;38(2):103-8.