ISSN: 2279 - 0594

Journal of Biomedical and Pharmaceutical Research

Available Online at www.jbpr.in

CODEN: - JBPRAU (Source: - American Chemical Society)

Index Copernicus Value: 63.24

PubMed (National Library of Medicine): ID: (101671502)

Volume 6, Issue 4: July-August: 2017, 60-74

Research Article

Incidence of depression in type 2 diabetes mellitus patients with or without complications

Feba Elizabeth Shaji[1], Negin Pakdaman[1], Shekin Shaji[1], Binai K Sankar, B R Shivakumar

[1]Pharm D, Department of Pharmacy Practice, Acharya and BM Reddy College of pharmacy, Bangalore-90

[2]M Pharm, Professor and Head. Department of Pharmacy Practice, Acharya and BM Reddy College of pharmacy, Bangalore-90

[3]Assistant Professor, Department of General Medicine, Dr. BRAMCH

Received 17 June 2017; Accepted 16 July 2017

ABSTRACT

Diabetes Mellitus refers to a group of common metabolic disorder associated with abnormalities in carbohydrate, fat and protein metabolism and results in chronic complications including microvascular, macrovascular and neuropathic disorders. The factors contributing to hyperglycemia include reduced insulin secretion, decrease glucose utilization, increase glucose production. Type 2 Diabetes Mellitus, is characterized by impaired insulin secretion, insulin resistance, excessive hepatic glucose production and abnormal fat metabolism. According to WHO 2012, Depression is a common mental disorder that presents with depressed mood, loss of interest or pleasure, decreased energy, feelings of guilt or low self-worth, disturbed sleep or appetite, and poor concentration. Diabetes and Depression are debilitating conditions that are associated with significant morbidity, mortality, and healthcare costs. Analysing the incidence of depression in type 2 diabetes patients using Depression rating scales are used to analyse depression in Type II Diabetes Mellitus.

Keywords: Depression and Diabetes

Introduction

Metabolic disorders are now a part of the common man's life. Changing dietary habits, lifestyle and lack of physical exercises has played a very important role in the increasing incidence of metabolic disorders. Diabetes Mellitus, which refers to a group of common metabolic disorders that share the phenotype of hyperglycemia, is among the leading lifestyle disorders. It is associated with abnormalities in carbohydrate, fat and protein metabolism and results in chronic complications including microvascular, macrovascular and neuropathic disorders[1]. The factors contributing to hyperglycemia include reduced insulin secretion, decrease glucose utilization, increase glucose production. There are four different types of diabetes that are Type 1 - insulin dependent diabetes mellitus (IDDM), Type 2 - non-insulin dependent diabetes mellitus (NIDDM), Other specific types of diabetes and Gestational diabetes mellitus (GDM)[2]

Insulin resistance and abnormal insulin secretion are central to the development of type 2 diabetes mellitus. It is characterized by impaired insulin secretion, insulin resistance, excessive hepatic glucose production and abnormal fat metabolism.1 There are some main metabolic abnormalities which leads to type 2 diabetes that are - o Abnormal muscle and fat metabolism - Insulin resistance, the decreased ability of insulin to act on target tissues especially in muscle, liver, and fat is a prominent feature of type 2 DM. Insulin resistance impairs glucose utilization by insulin-sensitive tissues and increases hepatic glucose that leads to hyperglycemia. Increased hepatic glucose increases Fasting Plasma Glucose (FPG) level and decreased peripheral glucose results in postprandial hyperglycemia.

There is a greater impairment in non-oxidative glucose usage (glycogen formation) than in oxidative glucose metabolism through glycolysis in skeletal muscle. o Impaired Insulin Secretion - Insulin secretion and sensitivity are co-related. Insulin secretion initially increases in response to

Corresponding author: Shekin Shaji | E-mail: shekin.shaji007@gmail.com

insulin resistance to maintain normal glucose tolerance in type-2 Diabetes Mellitus. The insulin secretory defect is mild initially and selectively involves glucose-stimulated insulin secretion. The response to other non-glucose secretagogues, such as arginine, is preserved. Abnormalities in pro-insulin is reflected by increased secretion of proinsulin in type 2 diabetes. The assumption is that a second genetic defect of type 2 diabetes mellitus is because of beta cell failure. Beta cell mass is decreased by approximately 50% in individuals with long-standing type 2 diabetes. Islet amyloid polypeptide or amylin is cosecreted by the beta cell and forms the amyloid fibrillar deposit found in the islets of individuals with long-standing type 2 DM. o Increased Hepatic Glucose and Lipid Production - Insulin resistance in the liver leads to failure of hyperinsulinemia to suppress gluconeogenesis, which results in fasting hyperglycemia and decreased glycogen storage by the liver in the postprandial state in type 2 diabetes. Increased hepatic glucose production initially in diabetes, though likely after the onset of insulin secretory abnormalities and insulin resistance in skeletal muscle. As a result of insulin resistance in adipose tissue, lipolysis and free fatty acid flux from adipocytes are increased, leading to increased lipid [very low density lipoprotein (VLDL) and triglyceride] synthesis in hepatocytes.[3]

Risk Factors for Type 2 Diabetes Mellitus

1. Weight - Overweight is a primary risk factor for type 2 diabetes.
2. Fat distribution - Fat in abdomen increases risk of type 2 diabetes than presence of fat in hips and thighs.
3. Inactivity - Inadequate physical activity increases development of type 2 diabetes
4. Family history - The risk of type 2 diabetes increases if your parent or sibling has type 2 diabetes.
5. Race - Studies state that Blacks, Hispanics, American Indians and Asian-Americans are more likely to develop type 2 diabetes than whites are.
6. Age - The risk of type 2 diabetes increases especially after age 45.
7. Pre-diabetes - Pre-diabetes is a condition in which your blood sugar level is higher than normal, but not high enough to be classified as diabetes. Untreated, pre diabetes leads to type 2 diabetes.
8. Gestational diabetes - Gestational diabetes is a one of the risk for type 2 diabetes
9. Polycystic ovary syndrome - Females with polycystic ovary syndrome characterized by irregular menstrual periods, excess hair growth and obesity that increases the risk of diabetes.

Signs and Symptoms for Type 2 Diabetes

Signs and symptoms of type 2 diabetes often develop slowly. The symptoms include Lethargy, polyuria, nocturia, polydipsia, Weight loss, Blurred vision, Slow-healing sores or frequent infections, Areas of darkened skin.

Complications of Type 2 Diabetes

1. Heart and blood vessel disease - Includes coronary artery disease with chest pain (angina), heart attack, stroke, narrowing of arteries (atherosclerosis) and high blood pressure.
2. Nerve damage (neuropathy).
3. Kidney damage (nephropathy).
4. Eye damage - Diabetic retinopathy such as cataracts and glaucoma.
5. Foot damage.
6. Hearing impairment.
7. Skin conditions - Includes bacterial and fungal infections.
8. Alzheimer's disease

Prevention of Type 2 Diabetes

- Prevention of Type 2 diabetes by reduction of obesity through increase of healthy diet.
- Maintaining a healthy weight by increasing physical activity
- By being aware of risk factors.[5]

Types of Depression

1. Major depressive disorder, or major depression - It is characterized by a combination of symptoms that interfere with a person's ability to work, sleep, study, eat, and enjoy oncepleasurable activities. Major depression is disabling and prevents a person from functioning normally. Some people may experience only a single episode within their lifetime, but more often a person may have multiple episodes.
2. Dysthymic disorder, or dysthymia - It is characterized by long-term (2 years or longer) symptoms that may not be severe enough to disable a person but can prevent normal functioning or feeling well. People with dysthymia may also experience one or more episodes of major depression during their lifetimes.

3. Minor depression - It is characterized by having symptoms for 2 weeks or longer that do not meet full criteria for major depression. Without treatment, people with minor depression are at high risk for developing major depressive disorder.
Signs and Symptoms of Depression Based on the Diagnostic and Statistical Manual of the American Psychiatric Association (DSMIV).
Symptoms include:

- Depressed mood for most of the day
- Decreased pleasure in normal activities
- Difficulty sleeping or significantly increased need to sleep
- Weight loss or weight gain.
- Feelings of guilt or worthlessness
- Low energy level
- Difficulty making decisions of concentrating
- Suicidal thought.[7]

Association of Diabetes and Depression

The relation between type 2 diabetes and depression are not known exactly. Diabetes and depression are closely related. As a lifelong disease, diabetes leads to depression. Most of the diabetes patients do not have depression. According to the National Institute for Health and Clinical Excellence (NICE), people who are diagnosed with a chronic physical health problem such as diabetes, heart disease and cancer are 3 times more likely to be diagnosed with depression than people without this physical health problems.8 Depression mainly forms due to stress of daily diabetes management. Patient may feel alone or set apart from your friends and family because of all this extra work. Patients with diabetes complications such as nerve damage, or are having trouble keeping blood sugar levels. Depression can get into a vicious cycle. It can block good diabetes self-care. People with diabetes suffering from depression are at greater risk of suffering from an episode of diabetic burnout, which is the term given to the state of disillusion, frustration , disregarding blood sugar levels and neglecting an individual's diet, which collectively can have adverse effects on physical health and potentially instigate more long term complications. Patient with diabetic burnout may also miss doctor appointments, forget or avoid taking insulin injections or other diabetic medication, or switch back to unhealthy eating habits. Patients with diabetes and depression shows symptoms like feeling hopeless, helpless, worthless, empty, sad, being irritable or restless, unable or unwilling to work on hobbies or outside interests that you used to enjoy, unable to perform sexually, insomnia, fatigue, or excessive sleepiness, inability to concentrate or make decisions, loss of appetite or overeating, physical symptoms like pain, cramps, and headaches, thoughts of or attempts at suicide[9]

A study by Brazilian researchers showed that among a group of people with diabetes, of those whose HbA1c levels averaged less than 9%, only 21% tested positive for depression. By comparison of those with HbA1cs over 9%, 42% tested positive for depression.10 Diabetes and Depression are debilitating conditions that are associated with significant morbidity, mortality, and healthcare costs. Co-existing depression in people with diabetes is associated with decreased adherence to treatment, poor metabolic control, higher complication rates, decreased quality of life, increased healthcare use and cost, increased disability and lost productivity, and increased risk of death. Co-morbid depression among individuals with diabetes is associated with poor diabetes outcomes such as glycemic control. Diabetes complications such as diabetic retinopathy, nephropathy, neuropathy, microvascular complications and sexual dysfunction are also increases in individuals with depression. People with depression and diabetes remain untreated, difficult to manage diabetes. Depression and diabetes has been associated with poor medication adherence, poor glycemic control and with an increased prevalence of complications in Type 2 diabetes. The adverse outcomes of untreated depression in diabetes leads an overall reduced quality of life with respect to psychological, physical, and social functioning and also report a higher diabetes-related symptom burden and lower satisfaction with diabetes treatment.[11]

Rating scales are used to diagnose depression due to the lack of lab tests to diagnose depression. A depression rating scale is a psychiatric measuring instrument having descriptive words and phrases that indicate the severity of depression for a time period. There are over 15 scales are using for rating depression. Depression rating scales can either be administered by the investigators/

clinicians or be self-administered by the patients themselves. Hamilton Depression Rating Scale Designed by psychiatrist, Max Hamilton in 1960, which includes 21 questions with between 3 and 5 possible responses which increase in severity, is a clinician administered questionnaire. On the contrary, The Beck Depression Inventory, designed by psychiatrist Aaron T. Beck in 1961, is a 21-question self-report inventory that covers symptoms such as irritability, fatigue, weight loss, lack of interest in sex, and feelings of guilt, hopelessness or fear of being punished. The scale is completed by patients to identify the presence and severity of symptoms consistent with the DSM-IV diagnostic criteria.[12]

The Charlson co-morbibity index is a method of categorizing comorbidities of patients based on the International classification of disease (ICD). Each comorbidity category has an associated weighted score. A score of zero indicates that no comorbidity was found. The higher the score, the more likely the predicted outcome will result in mortality or higher resource use. On CCI score, the severity of comorbidites were categorized into three grades - mild with CCI score 1-2; moderate with CCI score 3-4; severe score ≥5.[13] The Patient Health Questionnaire (PHQ-8) is a self-reported depression rating scales. It is a validated diagnostics and severity measure for depressive disorders in large clinical studies. Score is sum of the 8 items. If more than 1 item missing, set the value of scale to missing. A score of 10 or greater is considered major depression, 20 or more is severe major depression.[14] The Beck Depression Inventory is as a validated measure that has been instrumental in leading to numerous diagnosis of depression. It is a widely utilized 21 item self-report scale in both clinical and research studies. The scale was originally developed in 1961 as an interviewer assisted format but has undergone several revisions over the last 35 years. The BDI- 2 is a depression rating scale that can be used in individuals that are ages 13 years and older, and rates symptoms of depression in terms of severity on a scale from 0 to 3 based on the 21 specific items. Patients that endorse multiple items on the questionnaire i.e. sadness, pessimism, past failure, loss of pleasure, guilty feeling, punishment, fears, self-dislike etc., typically have higher scores with a maximum score of 63 compared to others. The sum of the BDI generally represent the severity of the depression with the test being scored differently for the general population compare to those individual with an established clinical diagnosis of depression. The BDI can be used during a patient encounter to gauge whether or not a patient endorses feeling of depression. If after multiple encounter the patient exhibit classical symptoms of depression, the inventory could be utilized to confirm or deny the suspicion through self-report. The simplicity of the questionnaire allows for its use with a wide variety of patients from adolescent to adults which can then lead to an increase of undiagnosed of unrecognized depressive symptom.[15]

METHODOLOGY:

Study Design and Human Ethical Clearance:

This was a prospective observational study. The study protocol was approved by the Institutional Ethical Committee (IEC) with ethical clearance number: EC-385

Inclusion Criteria:

a) Patients above 18 years of age.

b) Patients attended OP clinic of general medicine.

c) Patients with type 2 diabetes with or without complications and other co-morbid factors.

Exclusion Criteria:

a) Patients below 18 years of age.

b) Patients admitted in departments other than general medicine.

c) Patients with type 1 diabetes.

d) Patients with other illness or infections are ruled out.

Method

All the type 2 diabetes patients who attended outpatient clinic meeting the inclusion and exclusion criteria were enrolled by the investigators. The patients were informed the details of the study, and consent was obtained. Data was collected from the patient case sheets, treatment chart, by communicating with the physicians and nurses, and by interviewed the patients. The data collected included their demographics, medication history, reason for admission, duration of diabetes, diabetic complications, and clinical data such as laboratory reports and therapeutic data included dose, duration, frequency, route, time of administration

of medication. The data was entered into excel and analysed.

RESULT

The study included 62 patients drawn from the out-patient clinic of the department of General medicine at Dr. B.R. Ambedkar Medical College and Hospital, Bangalore. The study was conducted from February 2016 to April 2016.

Out of 62 study patients included in this study, majority of patients 20 (32.22%), belonged to age group of 55-64 years, while the least (5, 8.06%) belonged to the 75-84 years group.

Table1: Distribution of patients by age

Age Group	Distribution	
	n	%
35-44	15	24.19
45-54	14	22.58
55-64	20	32.25
65-74	8	12.90
75-84	5	8.06
Total no. of patients	62	100

Out of 62 Patients included in this study, 24(38.70%) patients were male and3 8(61.29%) Patients were female. The number of female patients was comparatively high.

Table2:Distribution of patients by Gender

Gender	Distribution	
	n	%
Male	24	38.70
Female	38	61.29
Total	62	100

The most number of males belonged to the 35-44 years age group (8, 33.33%), while the least belonged to the 65-74 and 75-84 years age groups (3, 12.5 % each). In contrast, majority of the females belonged to the 55-64 years age group (15, 39.47%), while least (2, 5.26%) were in the 75-84 years age group.

Table3: Gender distribution in age group

Age Group	Males		Females		Total	Percentage %
	n	%	N	%		
35-44	8	33.33	7	18.42	15	24.19
45-54	5	20.83	9	23.68	14	22.25
55-64	5	20.83	15	39.47	20	32.25
65-74	3	12.50	5	13.15	8	12.90
75-84	3	12.50	2	5.26	5	8.06
Total	24	100	38	100	62	100

DISTRIBUTIONOFBMISCORE

Obesity is an important component of diabetes. In the present study, ananalysis of the BMI of all the patients included in the study was performed. The over all BMI was 24.62±3.90 kg/m2. The BMI of males (25.57±3.61kg/m^2) were generally higher than that of females (24.03±4.00 kg/m^2).

Table4: Distribution of BMI			
Age Group	Average BMI(in kg/m^2)		
	Males	Females	Overall
35-44	24.99±3.41	25.27±5.05	25.13±4.09
45-54	26.99±3.26	23.19±2.68	24.55±3.36
55-64	22.90±1.47	23.13±4.01	23.08±3.51
65-74	26.75±4.08	24.64±1.68	25.43±4.10
75-84	27.95±5.64	28.60±4.39	28.22±4.24
Overall	25.57±3.61	24.03±4.00	24.62±3.90

CLASSIFICATION OF OBESITYUSINGBMI

Among the study population of 62 patients, 8 (12.09%) reported smoking, and 4 (6.45%) reported using alcohol. All the patients who reported social habits were males. Other habits like Tobacco or recreational drugs were not reported by any patient.

Table5: Classification of Obesity using BMI						
Class of Obesity	Males		Females		Total	Percentage %
	n	%	N	%		
Underweight	0	0.00	1	2.63	1	1.61
Normal Weight	12	50.00	23	60.53	35	56.45
Overweight	8	33.33	9	23.68	17	27.42
Obese	4	16.67	5	13.16	9	14.52
Total	24	100	38	100	62	100

DURATION OF DM

Among the study population of 62 patients, 8 (12.09%) reported smoking, and 4 (6.45%) reported using alcohol. All the patients who reported social habits were males. Other habits like Tobacco or recreational drugs were not reported by any patient.

Table6: Distribution of social habits		
Habits	N	Percentage %
Smoking	8	12.09
Alcohol	4	6.45

DURATION OF DM

Out of 62 patients maximum duration of diabetes found in males around the age of 55-64 (11.8±5.40 years) and 75-84 (11±7.93 years) and in females at the age group of 75-80 (10±0.00 years). Minimum duration found in males at the age group 45-54 (3.00±1.87 years) and females at the age group of 35-44 (3.42±2.81 years).

Table 7: Duration of diabetes

Age Group	Average duration of diabetes(in Years)		
	Males	Females	Overall
35-44	5.00±2.20	3.42±2.81	4.26±2.54
45-54	3.00±1.87	6.55±5.22	5.28±4.58
55-64	11.80±5.40	5.86±4.40	7.35±5.23
65-74	5.00±6.08	7.00±3.31	6.25±4.23
75-84	11.00±7.93	10.00±0.00	10.60±5.63
Overall	6.75±5.31	5.94±4.24	6.25±4.66

DISTRIBUTION OFCHARLESON COMORBIDITYINDEX

Charles on Co-morbidity index (CCI) was used to assess the contribution of other co-morbidities in the condition of the patient. The average CCI was 2.32±1.09.The CCI was nominally higher in males (2.45±1.28) as compared to females (2.23±1.08).

Table 8: Average Charles on Co-morbidity Index scores

Age Group	Average Charles on Co-morbidity Index Score		
	Males	Females	Overall
35-44	2.12±1.07	2.00±0.90	2.06±0.80
45-54	2.00±1.10	1.88±0.79	1.92±0.83
55-64	3.00±1.15	2.40±0.80	2.55±1.36
65-74	2.66±0.58	2.60±2.13	2.62±1.19
75-84	3.00±0.58	2.50±0.71	2.80±0.84
Overall	2.45±1.28	2.23±1.08	2.32±1.09

PATIENTS WITHCO-MORBIDITIES

A total of 74 co-morbidities were reported by the 62 patients included in the study. Hypertension was the most commonly reported co-morbidity (37,59.67%), followed by 13 (20.96%) patients with thyroid disorders. Diabetic foot, CKD and Anemia were the least common co-morbidities (1, 1.61% each).Other co-morbidities like GI Disturbances, Skin disorders, were reported by 7(11.29%) patients. Table 5 shows the detailed distributionnofco- morbidities.

Table 9: Patients with co-morbidities		
Co-morbidities	**Patients affected**	
	n	**%**
Hypertension	37	59.67
Thyroid disorders	13	20.96
Diabeticneuropathy	6	9.67
Diabetic foot	1	1.61
Cardiac complications	5	8.06
CKD	1	1.61
Anemia	1	1.61
Hyperlipidemia	3	4.83
Other complications	7	11.29

DISTRIBUTION OF DIAGNOSTIC PARAMETER SUSEDIN DIABETES

Blood sugar tests were performed to assess the effectiveness of present therapy for diabetes and also to ascertain the level of glycemic control in the patient. Conventional tests like Fasting Blood Glucose level (FBS) was the most commonly performed (52), while newer tests were Glycated Hemoglobin was performed rarely(17).TheaverageFBSwasfoundtobe202.71± 51.23

Table 10: Distribution ofDiagnostic Parametersusedin Diabetes						
Test	**Males**		**Females**		**Overall**	
	n	**Average**	**n**	**Average**	**n**	**Average**
FBS	19	210.22 ±61.00	33	198.4 ±45.14	52	202.72 ±51.24
PPBS	15	288.94 ±79.06	21	304.77 ±85.41	36	298.17 ±82.04
GRBS	6	269.17 ±58.43	6	232.34 ±74.71	12	250.75 ±66.77
HbA1C In(%)	4	8.13 ±1.94	13	9.84 ±1.98	17	9.44 ±2.05

PASTMEDIATION HISTORY-ANTI-DIABETIC DRUGS

Oral Hypoglycemic agents were the most preferred (55, 88.70%) in management of diabetes in the study population. Insulin, either alone or in combination with OHA, was rarely used.

Table11:*Past Mediation History-Anti-DiabeticDrugs*						
Medication	**Males**		**Females**		**Overall**	
	n	**%**	**n**	**%**	**n**	**%**
Insulin	2	8.33	1	2.63	3	4.83
OHA	20	83.33	35	95.10	55	88.70
Insulin + OHA	2	8.33	2	5.26	4	6.45
Total	24	100	38	100	62	100

DISTRIBUTION OF ORAL HYPOGLYCEMIC AGENTS (OHAS) IN PASTMEDICATION THERAPY

Out of 62 patients, a total of 22 males and 37 females were prescribed with different combination of OHA therapy. Prescription rate of Dual combination therapy (28,47.45%) of OHA's was higher than compared to mono therapy (26,44.06%) and the least prescribed rate was triple combination therapy (5, 8.47%)

Table12: Distribution of oral hypoglycaemic agents (OHAs)in past medication therapy

Type of Therapy	Males		Females		Overall	
	n	%	n	%	n	%
Mono	10	45.45	16	43.24	26	44.06
Dual	10	45.45	18	48.64	28	47.45
Triple	2	9.09	3	8.10	5	8.47
Total	22	100	37	100	59	100

PRESCRIBINGPATTERNOFANTI-DIABETIC DRUGS

Majority of the patients (37,59.67%) were prescribed Oral Hypoglycemic Agents (OHAs), while a combination of OHAs with Insulin was the second most common (19, 30.64%).The prescribing pattern for both the genders were similar, with OHAs being the most commonly prescribed.

Table 13:Prescribing pattern of anti-diabetic drugs

Drugs	Males		Females		Overall	
	n	%	n	%	n	%
Insulin	2	8.33	4	10.52	6	9.67
OHA	16	66.66	21	55.26	37	59.67
Insulin +OHA	6	25.00	13	34.21	19	30.64
Total	24	100	38	100	62	100

PRESCRIBINGPATTERN OF ORAL HYPOGLYCEMIC AGENTS (OHAS)IN PRESENT MEDICATION THERAPY

Oral Hypoglycemic Agents were generally used as combination in most of the patients (34,60.71%).The prevalence of mono therapy and triple therapy was similar (21.42%and17.85 % respectively).

Table14: *Prescribing pattern on OHAs-Presentmedication*

Type	Males		Females		Overall	
	n	%	n	%	n	%
Mono	4	18.18	8	23.52	12	21.42
Dual	15	68.18	19	55.88	34	60.71
Triple	3	13.63	7	20.58	10	17.85
Total	22	100	34	100	56	100

DRUGUSEIN MANAGEMENT OFDIABETES

Nearly all the patients (54,87.10%) received Metformin for control of blood sugar. The second most commonly used agent was Glimepiride-44(70.97%) patients. The least commonly used agents were Gliben clamide, Gliclazide and Pioglitazone (1, 1.61%patientseach).

Table 15: Distribution of Medications used

Medication used	Patients Prescribed	
	n	%
Glibenclamide	1	1.61
Gliclazide	1	1.61
Glimepiride	44	70.97
Insulin	24	38.71
Metformin	54	87.10
Pioglitazone	1	1.61
Voglibose	11	17.74

DISTRIBUTION OFBECKSCORES

Beck inventory was used to estimate the prevalence of Depression. All patients were administered Beck questionnaire. The Beck score in females was found to be higher than males in most groups, except the35-44years and 75-84years age groups.

Table16:Distribution of Average Beck Score

Age Group	Average Beck Score		
	Males	Females	Overall
35-44	17.00±10.92	16.71±9.19	16.86±9.79
45-54	12.60±2.30	17.11±7.00	15.50±6.07
55-64	18.40±10.06	19.00±10.58	18.85±9.94
65-74	19.00±17.52	27.00±11.37	24.00±13.37
75-84	22.66±8.02	17.00±8.48	20.40±7.733
Overall	17.34±9.82	19.08±9.67	18.41±9.69

DISTRIBUTION OFLEVELOFDEPRESSION

The study patients' levels of depression were classified using their beck score. Overall 13 patients were found to be normal (without depression), while 14 patients had only mild mood disturbance. Border line clinical depression was seen in 12 patients. Extreme depression was seen only in one patient

Table17:Distributionoflevel ofdepression						
Level ofDepression	Patients affected					
	Male		Female		Overall	
	n	%	n	%	n	%
Normal	5	20.83	8	21.05	13	20.96
Mild Mood Disturbance	6	25.00	8	21.05	14	22.58
BorderlineClinical Depression	5	20.83	7	18.42	12	19.35
Moderate Depression	5	20.83	10	26.31	15	24.19
SevereDepression	3	12.50	4	10.52	7	11.26
Extreme Depression	0	0.00	1	2.63	1	2.63

DISTRIBUTIONOFAVERAGE PHQ-8

In addition to the Beck Depression Inventory, the Patient Health Questionnaire-8 (PHQ-8) was also used to estimate prevalence of Depression in the study population. The questionnaire had 8 questions each scored from 0 to 3, and the total score could range from 0 to 24. Patients with scores over 10 were considered to have major depression. In the present study, out of 62 patients, 28 (45.61%) patients had PHQ-8 score above 10. The overall average score was 9.38±4.67. The scores were generally higher in Females, as compared to males.

Table 18:Distribution ofAveragePHQ-8			
AgeGroup	AveragePHQ-8		
	Males	Females	Overall
35-44	8.37±4.74	9.00±5.00	8.66±4.20
45-54	7.40±3.36	10.00±3.64	9.07±5.09
55-64	8.40±4.27	10.26±5.71	9.80±4.78
65-74	9.00±7.54	12.2±1.67	11.00±3.79
75-84	8.30±2.08	8.00±4.24	8.20±5.50
Overall	8.25±4.19	10.10±4.86	9.38±4.67

CORRELATIONBETWEENCCIANDINCIDENCEOFDEPRESSION

PearsoncorrelationwasperformedbetweenCharlsonCo-morbidityIndexandBeckDepression Inventory, which showed a statistically significant moderate positive correlation (r=0.422,p=0.0006). A similar correlation between the CCI and the corresponding PHQ-8 Scores showed a statistically significant mode rately positive correlation (r=0.4286,p=0.0005).This shows that there is a correlation between the incidence of co-morbidities and incidence of depression.

CORRELATION BETWEEN DURATION OF DIABETESAND INCIDENCEOFDEPRESSION

Pearson correlation was performed between duration of diabetes and BDI Scores showed a statistically in significant moderately positive correlation (r=0.0274, p=0.8325). A similar correlation between duration of diabetes and PHQ-8 Scores showed a statistically in significant moderately negative correlation (r=-0.0889, p=0.497). Although statistically in significant, this finding shows that there could be an decreasing risk of depression in patients who have been suffering from diabetes for along time.

CORRELATIONBETWEENBMIANDINCIDENCEOFDEPRESSION

The present study analysed if BMI played a role in the incidence of depression. A correlation was performed between BMI and BDI Scores as well as between BMI andPHQ-8Scores.Both the analyses showed statistically in significant negative correlations (r=-0.1615and-0.1491 respectively with p-values of 0.21 and 0.247 respectively).This could imply that an increasing BMI reduces the incidence of depression.

DISCUSION

This was a three month long prospective observational study conducted at the outpatient clinic of the department of general medicine at Dr BR Ambedkar Medical College. The study included a total of 62 out patients with Type 2 Diabetes mellitus, majority of whom were females (61.29%). Majority of patients enrolled with Type 2 Diabetes Mellitus belonged to the age group of 55-64 years (32.75%). In the present study, an analysis of the BMI of all the patients included in the study was performed. The overall BMI was 24.62±3.90kg/m2. The BMI of males (25.57±3.61kg/m2) were generally higher than that of females (24.03±4.00kg/m2). A similar study has done by Gonzalez (2007), the result was 31.37±6.75 out of 879 patients. 25 Among the study population , 12.09% reported smoking, and 6.45% reported using alcohol. All the patients who reported social habits were males. A similar findings was shown in the study conducted by Katon (2004), where there were 357±8.7 smokers out of 4193 patients.26 Out of 62 patients, a total of 74 complications were reported in the present study. Half of the study population were reported with hypertension, patients reported with diabetes complications such as diabetic neuropathy 8.10% and diabetic foot 1.61%, 20.96% reported with thyroid disorders, 1.61% patient were reported with CKD. A similar study conducted by Inzucchi et al (2012) showed that kidney diseases were highly prevalent in type 2 diabetes, and moderate to severe renal functional impairment occurs in approximately 20–30% of patients27 and a study conducted by Black (2003) in which 44% of subjects with both conditions had macrovascular complications, compared with only 30% who had neither condition. Similar rate differences were apparent for micro vascular complications (43% with both conditions versus 36% with only diabetes and only 3% with neither condition).28 Out of 62 patients enrolled in the study ,the maximum overall duration of Type 2 diabetes mellitus was found 6.25±4.66, males at the age of 55-64 (11.8 ±5.40) and 75-84 (11±7.93) where in females at the age group of 75-80 (10±0). Minimum duration found in males at the age group 45-54 (3±1.87) and females at the age group of 35-44(3.42±2.81).A similar study conducted by Elizabeth (2010) maximum duration diabetes found was 8.8±8.4 years out of 3723 study population.29 In our study population, blood sugar tests were performed to assess the effectiveness of present therapy for diabetes and also to ascertain the level of glycemic control in the patient. conventional tests like fasting blood sugar level 52 (202.71 ±51.23) was most commonly performed. Other tests like PPBS (36 patients, 298.16 ±82.03) , GRBS (12, 250.00 ± 66.76) and newer test like HBA1C (19, 17.00 ±.0.02) was least conducted because of cost sensitive nature. A similar study was conducted by Katon (2004) which HBA1C level was ≥8.00% in 1,526 ± 36.4 patients and of OHA's was higher than compared to monotherapy (26, 44.06%) and the least prescribed rate was triple combination therapy (5, 8.47%). On analysis of prescription pattern for diabetes, it was found that 9.67% of patients on insulin alone and 30.64% of patients on in combination with OHA, 59.67% of patients on OHA, of whom 21.42% patients were on mono therapy 60.71% patients on dual combination therapy and 17.58% of patients were on triple combination therapy. A similar study conducted by Katon (2005), insulin alone or in combination with OHA given to 27.1% patients and OHA alone

prescribed to 46.3%. Metformin (87.70%) was mostly prescribed in patients included in the study. The second most commonly used agent was Glimepiride (70.97%) patients. The least commonly used agents were Glibenclamide, Gliclazide and Pioglitazone 1.61%.30 Beck depression inventory was used to analyse the incidence of Depression. The maximum average score found from the study was in terms of gender, males at the age group of 75-84 years (22.66±8.02) and the minimum was at the age of 45-54years(12.60±2.30) and in females at the age of 65-74(27.00±11.37) and the minimum was 35-44years(71±9.19). A maximum of 24.19% patients was found with depression and the minimum of only 2.63% was found with extreme depression. A similar study conducted by Hermann (2006) out of 376 patients, the BDI score was 8.3±8.1.[31]

CONCLUSION

The study was conducted in a teaching hospital in suburban premises of Bangalore. The study included a total of 62 out patients with Type 2 Diabetes mellitus, majority of whom were females than males. Majority of the patients included in the study had normal BMI. Social habits such as smoking and alcohol consumption was found in male patients. Co morbid condition, over half of the study population was diagnosed with Hypertension while diabetic complications were reported least. Maximum duration of diabetes was higher in males as compared to females from the study population. Blood sugar tests were performed to assess the effectiveness of present therapy for diabetes and also to ascertain the level of glycemic control in the patient. Conventional tests like Fasting Blood Glucose level (FBS) was the most commonly performed, while newer tests were Glycated Hemoglobin was performed rarely. Half of the study population were reported with hypertension, patients reported with diabetes Oral Hypoglycemic agents were the most preferred in management of diabetes in the study population. Insulin, either alone or in combination with OHA, was rarely used. OHA was classified as mono therapy, dual combination therapy, and triple combination therapy. Prescription rate of dual combination therapy of OHA's was higher than compared to monotherapy and the least prescribed rate was triple combination therapy. Majority of the patients were prescribed Oral Hypoglycemic Agents (OHAs), while a combination of OHAs with Insulin was the second most common. The prescribing pattern for both the genders were similar, with OHAs being the most commonly prescribed.OHA was classified as mono therapy, dual combination therapy,and triple combination therapy.

Prescription rate of Dual combination therapy of OHA's was higher than compared to monotherapy and the least prescribed rate was triple combination therapy. Metformin was mostly prescribed drug for the control of blood sugar. The second most commonly used agent was Glimepiride and the least commonly used agents were Glibenclamide, Gliclazide and Pioglitazone to the study population. Beck inventory was used to estimate the prevalence of Depression. All patients were administered Beck questionnaire. The Beck score in females was found to be higher than males in most groups, except the 35-44 years and 75-84 years age groups. The study patients' levels of depression was classified using their beck score. Most of the patients were found to be normal, mild mood disturbance and Borderline clinical depression. Extreme depression level was found least. In addition to the Beck Depression Inventory, the Patient Health Questionnaire-8 (PHQ-8) was also used to estimate prevalence of Depression in the study population. The scores were generally higher in Females, as compared to males.

Bibliography

1. American Diabetes Association. Diagnosis and Classification of Diabetes Mellitus. Diabetes Care [Internet]. 2010 Jan [cited 2015 Jul 16];33(1):S62-9. Available from: http://care.diabetesjournals.org/content/33/Supplement_1/S62.short
2. Power CA. Diabetes Mellitus. In: Longo LD, Fauci SA, Kasper LD, Hauser LS, Jameson LJ, editor. Harrison's Principles of Internal Medicine, 18th ed. New York: McGrawHill Medical; 2012. p. 2968-3003.
3. Trplitt LC, Reasner AC, Isely LW. Diabetes Mellitus. In: Dipiro TJ, Talbert LR, Yee LG, Matzke RG, Wells GB, editor. Pharmacotherapy A Pathophysiologic Approach, 8th ed. New York: Mc Graw Hill Medical; 2008. p. 1255-1302.
4. Type 2 Diabetes Mellitus [Internet]. Arizona: Mayo Foundation For Medical Education and research; c1998-2016 [updated 2016 Jan 13;

cited 2015 Aug 2] Available from: http://www.mayoclinic.org/diseases-conditions/type-2-diabetes/symptoms-causes/dxc- 20169861

5. Type 2 Diabetes mellitus: Prevention and Identification [Internet]. Florida: Diabetes UK; c2015-16 [updated 2016; cited 2016 Jan 10] Available from: https://www.diabetes.org.uk/About_us/What-we-say/Type-2-diabetes-prevention-early-identification/
6. Depression A global Public health Concern [Internet]. Geneva: WHO Department of Mental Health and Substance Abuse. c2012 - [cited 2015 Aug 3] Available from: http://www.who.int/mental_health/management/depression/who_paper_depression_wfmh_2012.pdf
7. Diabetes and Depression [Internet]. Woodbridge (VA): World Federation for Mental health. c2013 - [cited 2015 Aug 3] Available from: http://wfmh.com/wp-content/uploads /2013/11/WFMH_GIAS_DiabetesAndDepression.pdf
8. Diabetes and Depression [Internet]. UK: Diabetes.co.uk; c2016 [updated 2016; cited 15 Mar 2016]. Available from: http://www.diabetes.co.uk/diabetes-and-depression.html
9. Type 2 Diabetes and Depression [Internet]. New York: Everyday Health Media; c2010 [updated 2012 Jan 20; cited 2015 Aug 5] Available from: http://www.everydayhealth.com/type-2-diabetes/type-2-diabetes-and-depression.aspx
10. Diabetes Stress, Anxiety and Depression [Internet]. Northampton: In Dependent Diabetes Trust. c2011 [cited 2015 Aug 8]. Available from: http://www.iddt.org/wpcontent/uploads/2011/10/Stress-Anxiety-Depression.pdf
11. Egede LE, Ellis C. Diabetes and Depression: Global perspectives. Diabetes research and clinical practice [Internet]. 2010 Mar [cited 2015 Jul 16];87(3):302-12. Available from: http://www.sciencedirect.com/science/article /pii/S0168822710000471
12. Depression rating scale [Internet]. Rating scale for depression; c2016 [updated 2016 Mar 23; cited 2016 Mar 24]. Available from: https://en.wikipedia.org/wiki/Rating_scales_for_depression
13. Charlson Comorbidity Index [Internet]. Manitoba: University of Manitoba; c2015 [updated 2016 Jan 22; cited 2016 Jan 31]. Available from: http://mchpappserv.cpe.umanitoba.ca/viewConcept.php?printer=Y&conceptID=1098
14. Kroenke Kurt, Stirine TW, Spitzer RL, Willilams JBW, Berry JT, Mokdad AH. PHQ-8 as a measure of current depression in the general population. Journals of affective disorders [Internet]. 2009 Apr [cited 2015 Aug 20]; 114(1):136-173. Available from: http:// www.jad-journal.com/article/S0165-0327(08)00282-6/abstract
15. Farinde Abimbola. The Beck Depression Inventory: The Pharma Innovation [Internet]. 2013 Feb [cited 2015 Aug 17];2(1):56-62. Available from: http://www.thepharmajournal.com/archives/2013/vol2issue1/PartA/1.pdf
16. Lustman PJ, Clouse RE, Griffith LS et al. Screening for Depression in Diabetes Using the Beck Depression Inventory. Psychosomatic Medicine [Internet]. 1997 Jan/Feb [cited 2015 Jul 17];59(1):24-31. Available from: http:// journals.lww.com /psychosomaticmedicine /Abstract/1997/01000/Screening_for_Depression_in_Diabetes_ Using_the.4.aspx
17. Knol MJ, Twisk JWR, Beekman ATF, Heine RJF, Snoek J, Pouwer F. Depression as a risk factor for the onset of type 2 diabetes mellitus:A meta-analysis. Diabetologia [Internet]. 2006 May [cited 2015 Jul 16];49(5):837-45. Available from: http://link.springer.com/article/10. 1007 /s00125-006-0159-x
18. Gonzalez JS, Safren SA, Cagliero E, Wexler DJ, Delahanthy L, WittenbE et al. Depression, Self-Care, and Medication Adherence in Type 2 Diabetes. Diabetes Care [Internet]. 2007 Sept[cited 2015 Jul 16];30(9):2222-27. Available from: http://care.diabetesjournals .org /content/30/9/2222.short
19. Katon W, Korff MV, Ciehanowski P, Russo J, Lin E, Simon G et al. Behavioral and Clinical Factors Associated With Depression Among Individuals With Diabetes. Diabetes Care [Internet]. 2004 Apr[cited 2015 Aug 26];27(4):914-20. Available from: http://care.diabetesjournals.org/content/27/4/914.full.pdf+ html

20. Nefs G, Pouwer F, Denollet J, Pop V. The course of Depressive symptom in primary care Patients with type 2 diabetes: Results from the diabetes, depression, type D personality Zuidoost-Brabant study. Diabetologia [Internet]. 2012 Mar [cited 2015 Aug 9];55(3):608- 16. Available from: http://link.springer.com/article/10.1007/s00125-011-2411-2#page-1
21. Lin EHB, Rutter CM, Katon W, Heckbert SR, Ciechanowski P, Oliver MM et al. Depression and Advanced Complications of Diabetes. Diabetes Care [Internet]. 2010 Feb [cited 2015 Aug 8];33(2):264-69. Available from: http://care.diabetesjournals.org/content/33/2/264.short
22. Nouwen A, Winkley K, Twisk J, Loyd CE, Peyrot M, Ismail K et al. Type 2 diabetes mellitus as a risk factor for the onset of depression: a systematic review. Diabetologia [Internet]. 2010 Dec [cited 2015 Aug 1];53(12):2480-86. Available from: http://link.springer.com/article/10.1007/s00125-010-1874-x#page-1
23. Fisher L, Russell E, Glasgow, Strycker AL. The relationship between Diabetes Distress and Clinical Depression with glycemic control among patient with type 2 Diabetes. Diabetes care [Internet]. 2010 May [cited 2015 Aug9];33(5):1034-36. Available from: http://care.diabetesjournals.org/content/33/5/1034.short
24. Groot de, Anderson R, Freedland KE, Clouse RE, Lustman PJ, Kenneth E et al. Association of Depression and Diabetes complications: A meta- analysis. Psychosomatic Medicine [Internet]. 2001 Jul/Aug [cited 2015 Jul 19];63(4):619-30. Available from: http://journals.lww.com/psychosomaticmedicine/Abstract/2001/07000/Association_of_Depression_and_Diabetes.15.aspx
25. Gonzalez JS, Safren SA, Cagliero E, Wexler JD, Delahanty L, WittenbergE, et al. Depression, Self-Care, and Medication Adherence in Type 2 Diabetes. Diabetes Care [Internet]. 2007 Sept [cited 2015 Nov 10]; (30):2222-7. Available from: http://www.ncbi.nlm.nih.gov/pubmed/17536067
26. Katon W, Korff MV, Ciechanowski P, Russo J, Lin E, Simon G, et al. Behavioral and Clinical Factors Associated With Depression Among Individuals With Diabetes. Diabetes Care [Internet]. 2004 Apr [cited 2015 Sept 7];27(4);914-20. Available from: http://care.diabetesjournals.org/content/27/4/914.full
27. Inzucchi SE, Bergenstal RM, Buse JB, Diamant M, Ferrannini E, Nauck M, et al. Management of Hyperglycemia in Type 2 Diabetes: A Patient-Centered Approach. Diabetes Care [Internet]. 2012 Jun [cited 2015 Sept 18];35:1364-79. Available from: http://care.diabetesjournals.org/content/35/6/1364.long
28. Black SA, Markides KS, Ray LA. Depression Predicts Increased Incidence Of Adverse Health Outcomes In Older Mexican Americans With Type 2 Diabetes. Diabetes Care [Internet]. 2003 Oct [cited 2015 Oct 15];26(10):2822–8. Available from: http://www.ncbi.nlm.nih.gov/pubmed/14514586
29. Lin EHB, Rutter CM, Katon W, Heckbert SR, Ciechanowski P, Oliver MM, et al . Depression and Advanced Complications of Diabetes. Diabetes Care [Internet]. 2010 Feb [cited 2015 Oct 19];33(2):264–9. Available from: http://care.diabetesjournals.org/content/33/2/264.short
30. Katon WJ, Rutter C, Simon G, Lin EH.B, Ludman E, Ciechanowski, et al. The Association of Comorbid Depression with Mortality in Patients With Type 2 Diabetes. Diabetes Care [Internet]. 2005 Nov [cited 2015 Oct 8];28(11):2668–72. Available from: http://www.ncbi.nlm.nih.gov/pubmed/16249537
31. Hermanns N, Kulzer B, Krichbaum M, Kubiak T,Haak T. How To Screen For Depression And Emotional Problems In Patients With Diabetes: Comparison Of Screening Characteristics Of Depression Questionnaires, Measurement Of DiabetesSpecific Emotional Problems And Standard Clinical Assessment. Diabetologia [Internet]. 2006 Jan [cited 2015 Nov 22];49:469–77. Available from: http://www.ncbi.nlm.nih.gov/pubmed/16432706