ORIGINAL ARTICLE

TYPE II DIABETES MELLITUS: A WARNING SIGN FOR DEPRESSION

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ABSTRACT

Background: People with type 2 diabetes compared to those without seem to have more chances of developing depressive symptoms. Diabetes leads to depression or vice versa, remains an unsolved puzzle. Diabetes and depression together leave deep psychological and physical imprints on their victims leading to functional limitation, poor quality of life and raised mortality rate. Diabetic patients should be warned by the physicians to keep a watch for the development of depressive symptoms in them. The study aimed to investigate the relationship between type 2 diabetes mellitus and depression.

Methods: The cross sectional study was conducted at Ziauddin University Hospital over a period of six months. Sample size of 100 was taken. Details of participant's demographics along with Body Mass Index were recorded. Questionnaires were filled by researchers. SRQ 20 depression scale was used to diagnose depression. Data was entered and analyzed by version 20 of SPSS.

Results: Different demographic and social variables were assessed in this study. 100 patients with HbA1c <6.5% were taken and 100 with ≥ 6.5%. 73 (36.5%) patients out of the total sample were depressed, almost from the good glycemic control group. Only a quarter of patients that had normal HbA1c levels became depressed however 48% patients with poor glycemic control suffered depression.

Conclusion: Research concludes that co-morbid diabetes and depression is not a rare finding. Risk factors must be ruled out and the chances to develop depression should be identified at an earlier stage before complications worsen the condition.

Keywords: Depression; Type 2 Diabetes Mellitus; Risk Factors.

INTRODUCTION

Diabetes and depression are chronic diseases with modifiable risk factors but if both occur together, they become unhealthy bed fellows. According to the WHO report in 2016, Diabetes is the fourth leading cause of mortality. Diabetes killed 1.6 million people in 2016, up from less than 1 million in 2000. The prevalence of diabetes is increasing every year worldwide and is predicted to touch between 438 million to 552 million by the year 2030[1]. More than two-thirds of the affected population belongs to developing countries, hence these are under threat. Diabetes has become a global epidemic particularly in south Asia[2]. The prevalence of type II diabetes is 4.8% in females and 5% in males in rural areas whereas 6.8% in females and 5.1% in males in urban areas of Pakistan[3].

Depression is one of the leading causes of disability and a major culprit in raising the global burden of disease. More than 300 million people are affected by depressive symptoms; equivalent to 4.4% of the world's population. The total number of depressed people increased by, 18.4%, from 2005 to 2015[4] Pakistan is world's fifth-most-populous country; having a population of around 200 million, one out of three is suffering from depression. Hence it is a major public health problem in this low income country. Globally it affects 20 percent of people while in Pakistan 34 percent of the population suffers from depression[5,3]. The prevalence is 57.5% in women and 25% in men. According to the Secretary General of the Pakistan Medical Association[5], around 35.7 percent citizens of Karachi are affected with mental illness, while 43 percent people in Quetta and 53.4 percent in Lahore.

Although association between Diabetes and Depression have been declared since many years but there is no definite answer to the chicken and egg dilemma, to make it less complicated a few researchers have labeled the link between the two to be bi-directional. Epidemiological transition and lifestyle modification in South Asian countries have increased the prevalence of type 2 diabetes and depression[3]. People who suffer from type II DM are twice more prone to develop co-morbid depression as compared to healthy individuals. Besides having a clear idea that the two are related, it is yet not evident whether diabetes increases the chance by two-fold for developing depression or people with depression develop type II diabetes mellitus. If type II DM patients develop depression it leads to infinite mental and physical crisis; for instance, non compliance to treatment, poor diabetic self care and less glycemic control.

All these lead to functional impairment[6] and medical complications which in turn increase mortality[1]. Majority of studies regarding relationship between diabetes and depression have been carried out in the developed world. It has generally been shown that depression is seen in one-fifth of diabetics[7]. A research done in Bahrain in 2012 showed that 33% of diabetic patients who attended diabetic clinics at primary health settings were found to have co morbid depression[8]. Another study conducted in India in 2009 reported that one-fourth of the screened patients were potential cases of depression[9]. There is insufficient data from Pakistan to accurately judge the association between diabetes and depression. A study done in 2007 gave a figure of 14.7% type 2 diabetics from a rural area to have had developed depression, whereas another study described a frequency of 43.5% in an urban population[10,2]. This study was conducted to find out the prevalence of fatal combination of depressive symptoms in patients with TII DM at a tertiary care hospital, along with identification of risk factors. Co-existence of these conditions escalates the path of morbidity and mortality creating a clinical challenge for a third world country. In spite of the huge impact of co morbidity of these two chronic conditions, depression remains unrecognized by the physicians dealing with diabetes. Initial diagnosis would improve clinical outcome.

METHODS

The study was conducted at Ziauddin University Hospital, Kemari campus that is a 100 bedded tertiary care facility located in Kemari. It caters to middle and lower socio-economic strata. Questionnaires were filled by researchers after informed consent from participants. It was a prospective cross sectional study. 200 patients were included in the study that fulfilled the inclusion criteria. It took six months; from July 2018 to December 2018, to gather a sample of 200 patients. Adult age group that is above 14 years were included and an equal number of patients with normal (<6) and deranged HbA1c (≥6) levels was consecutively taken. Sample size for each group was 100. The factors that were excluded were type 1 Diabetes Mellitus, any other co-morbids like hypertension (HTN), chronic liver disease (CLD), malignancy etc., history of psychiatric illnesses or depression, family history of depression and addictions.

Questionnaire was filled by all authors. Privacy was maintained throughout the interview. Details of participant's demographics, duration of diabetes, employment, education, marital status, number of children, religious belief, compliance to diabetic medications along with Body Mass Index, previous history of psychiatric illness or depression and family history of diabetes or depression were recorded. Socio-economic status was also inquired that was determined by income per capita. It was divided into three classes, lower class (<Rs 10000), middle (Rs10-90000) and higher ≥ Rs100, 000). Existence of Diabetes-related complications was asked from the ones who had good knowledge of their medical condition and was re checked by exploring their record file. Ophthalmic for example retinopathies and cataract development , cardiac like myocardial infarction, angina or cardiovascular diseases, renal problems such as ARF, CRF, proteinuria, micro-albuminuria, arthropathies, sores, gangrenes, limb amputation, neurological conditions like stroke, transient ischemic attack (TIA), dementia, hypertension, dyslipidemia were recorded. Compliance was evaluated using Morisky compliance scale.

SRQ-20 (self reported questionnaire) was used to assess depression among type 2 DM patients in this study. It comprises of 20 questions(symptoms), developed by the World Health Organization and a response of ' yes' or 'no' in regards to the patients experience within a time frame of last 4 weeks, has to be given. After extensive literature search, from the score of 0 to 20, 10 was taken as the cut off for depression. For this study, all SRQ-20 items were translated into Urdu language. Glycosylated Hemoglobin (HbA1c) as per ADA guidelines was used as a measure of glycemic control (≤6.5% good compliance; > 6.5% poor compliance). Data was analyzed by version 20 of SPSS. Chi square was applied and p value <0.05 was taken as significant. BMI was calculated using standard formula weight in kg/height in m^2.

RESULTS

Total number of type II diabetic patients that was included in the study was 200. Self-Reporting Questionnaire (SRQ 20) was used for assessment of depression. Score of ≥10 was taken as depressed. Different parameters, risk factors and socio-demo-

graphic characteristics were assessed in this study. 100 patients with HBA1c <6.5 were taken and 100 with ≥ 6.5. 73 (36.5%) patients out of the total sample were depressed and 127(63.5%) were not depressed. From the good glycemic control group only a quarter became depressed however almost half (N=48, 48%) patients with poor glycemic control suffered depression.

The age bracket for adults was selected that is >14 years old, to participate in the research and most patients were 40-60 years old. Age factor was divided into four categories first was 14-19 years old patients, second 20-39 years, third was 40-60 and fourth was >60. The highest number of depressed people was found among the fourth age group (22 out of 47, 47%) and the least depressed among the first (2 out of 13, 15%). 87 males and 113 females were interviewed. 11% (22) males and more than double i.e., 25.5% (51) females were depressed, p value=0.004. As far as BMI is concerned almost 40% participants fell in the normal BMI category (18.5-24.9), most of the over-weight and obese comprised of females (88%). 11 out of 22(50%) underweight, 23/52(44%) overweight, 15/49(31%) obese and 24/77(31%) possessing normal BMI were affected by depression. Obese patients (BMI>30) were found to have poor glycemic control.

75 out of 200 patients were uneducated which gave rise to the most depressed group N= 36(48%), 48 had primary education and 37.5% got depressed among them, 62 had secondary with 24% depressed and only 15 attained higher education while 27% out of them underwent depression. Un-employed type 2 DM people had two times more chance to develop depression as compared to participants who were employed. 54(27%) out of 200 patients were employed and 146(73%) were unemployed, 20% of the employed and 42% unemployed developed depression, p-value= 0.004. Majority that is 32 out of 67(48%) of the lower class was affected by depression, 39 out of 123(31 %) middle class and 2 out of 10 (20%) upper class. It was noticed that depression prevailed more among diabetic patients belonging to lower socio-economic class. Religion plays a major role on mental health.

Marital status was highly significant in causing depression, *p* value= 0.001. Out of the people depressed 67% were widows and widowers, 46% were divorced, 40% were unmarried and 28% were married while people who were engaged had no depression. Figure 1 clearly demonstrates the association of marital status with depression in diabetic patients. Out of the total married, divorced or widowed patients; 149 patients had ≤ or >5 children, 18 did not bear any children and 33 subjects lied in the unmarried or engaged category that was rendered not applicable. Depression in diabetic parents with children was 78% whereas childless patients comprised 24% of depressed ones. There was no significant association between number of children and depression. Depression in parents with ≤ 5 children was 45% whereas 33% among parents who bore more than 5 children.

Most of the participants were Muslims N=168, 29 Christians, Hindus, Sikhs, etc., and only 3 were non believers. It was concluded from this study that people who believed in Islam had least the chance for developing depression after diabetes mellitus II, only 36% (61/168), followed by 38% (11/29) people who believed in other religions and the highest number 67% (2/3), that fell a prey to depression, were atheists or the ones who did not follow any religion at all. See Table 1 and Table 2 for association between socio demographic characteristics and clinical factors with depression.

Table 1: Socio-demographic characteristics and association with depression.

Characteristics	Total	Depressed	Not Depressed
	200	**73**	**127**
Age (years)			
14-19	13	2	11
20-39	62	19	43
40-60	78	30	48
>60	47	22	25
Gender			
Male	87	22	65
Female	113	51	62

Education			
None	75	36	39
Primary	48	18	30
Secondary	62	15	47
Higher	15	4	11
Employment			
Employed	54	11	43
Unemployed	146	62	84
Socioeconomic status			
Lower	67	32	35
Middle	123	39	123
Upper	10	2	10
Religion			
Islam	168	61	107
Other religions	29	10	19
Atheists	3	2	1

Duration for which people had diabetes mellitus II was highly significant for increasing rate of depression. 80 (40%) participants had DM II for 5 or less years and 24% developed depression, whereas 120 (60%) patients had DM II for more than five years and 44% out of this group became depressed.

Table 2: Clinical factors and association with depression, N =200.

Clinical Factors	Total	Depressed	Not Depressed
	200	**73**	**127**
Body Mass Index			
Normal(18.5-24.9)	77	24	53
Underweight(<18.5)	22	11	11
Overweight(25-29.9)	52	23	29
Obese(>30)	49	15	34
HBA1c Levels			
Normal(<6)	100	25	75
Derranged (≥6)	100	48	52
Compliance			
Compliant	119	37	82
Non compliant	81	36	45

Compliance was assessed using the Morisky scale, 7 in 10 patients (70%) with normal HbA1c levels were compliant. 37 out of the total 119 (31%) compliant patients were depressed, whereas significantly more non compliant, 36 out of the 81 (44%), became depressed. Almost two fifth patients (N=74), developed certain complications and 126 out of the sample taken did not have any sort of complications. Only 27% (34 out of 126) diabetic patients developed depression in the absence of any complications and 73% remained non-depressed. Amputation of limb/limbs, was the biggest reason for depression (N=10 out of 12, 83.3%), followed by ophthalmic problems (17/28, 61%), neurological conditions like stroke, TIA, dementia, (3/5, 60%), gangrenes and sores as (7/16, 44%), renal problems e.g., chronic renal failure (CRF), acute renal failure (ARF), (2/10, 20%) and cardiovascular diseases (0/3, 0%) respectively.

Marital Status and Depression

Figure 1: Association of marital status with depression.

Refer to Figure 2 (Bar Graph) that narrates how different complications play a role in enhancing the effect of depression in such patients.
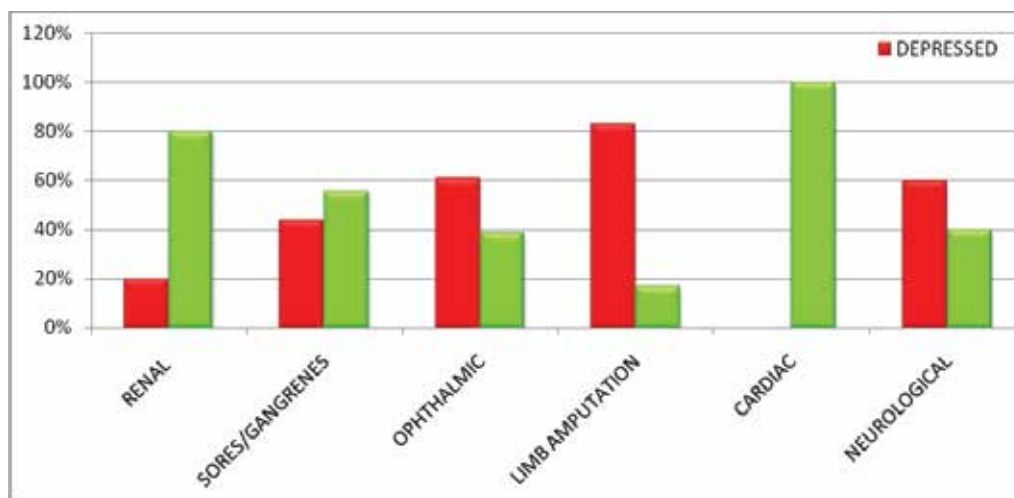

Figure 2: Complications leading to depression in Type II DM patients.

Poor glycemic control patients had double the chance to become depressed. Females were found to be more prone for depression among type 2 Diabetics. Duration of illness, unemployment, lower socioeconomic class and marital status all raised the chances of depression. On the other hand compliance and religious beliefs seemed to play a vital role in reduction of depressive symptoms.

DISCUSSION

There is enough evidence to state that depression is two times more prevalent in patients with type 2 DM as compared to general population[11]. Selecting a good depression scale is the key to accurate results and so is the most difficult task. In the current study SRQ-20 was the instrument selected for diagnosing depression. Although Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition criteria for illness (DSM-IV), is the gold standard, but SRQ-20, Patient Health Questionnaire-9 (PHQ-9), Hospital Anxiety Depression Scale (HADS) seem to be easier and quick form of interviews especially designed for an OPD (Out Patient Department) setting or Primary Health Care centers where time matters due to burden of patient flow[12].

The results from this study clearly suggest a strong relationship between type 2 DM and depression. 36.5% out of the total patients with type 2 diabetes were depressed. This is very close to the figure of 43.5% from a multi-centre study conducted in Karachi2. Multiple variables were used to assess the causes for increased frequency of depression in type 2 DM patients. 100 patients who had poor glycemic control and 100 who had good glycemic control were taken. Findings showed that hyperglycemia was a major risk factor for depression in type 2 DM patients. Patients with HbA1c levels greater than 6.5 had more chances of developing depression, as compared to those who had normal levels. This was in consistence with the general view.

Most of the participants belonged to 40-60 years of age group. Patients above 60 years were majorly affected by depression. Globally, females are more depressed in contrast to males and so are in Pakistan[13]. Similarly depression in type 2 DM patients is also more common in females[14] and the results from this study suggest that depression in females is twice as much as in males. Hence, one should be extra careful when catering to female diabetic patients. Obesity is often associated with a reduction in self-esteem, with psychological, economical and social problems[15]. This might contribute to negative affective states in these individuals. Obese patients seem to have poor glycemic control as compared to participants with lower BMIs. This is also confirmed by a recent study held in 2018 in south East Asia[1]. Surprisingly; the current study revealed that, over all, under weights had a significant chance to develop depression as compared to over-weight or obese categories, hence it would not be wrong to say that extremes of weight could cause depressive symptoms in Type 2 DM patients.

It was observed that education played a major role in prevention of depression in such cases. People who were uneducated carried depressive symptoms more than those who had attained some education. Highly educated were found to be least depressed. This could be because of awareness of side effects and better understanding of their condition. This finding is in line with the research of Farhan et al[16], that stated illiteracy to be one of the causes of depression in diabetics. In the era of inflation a good source of sustenance plays a vital role on mental well being. According to this study un-employment in type 2 DM increased the chance of depression twice as compared to employed people. Socio economic status was defined by income per capita/month. It was noticed that poor people or those belonging to lower class were more prone to be mentally compromised, contrary to the well off or upper class participants[17].

Furthermore, it was found that the participants who were in a positive marital relationship or were engaged had the least to negligible cases of depression respectively; whereas widows, divorcees and unmarried were greatly depressed. Similar were the findings of a study done in Islamabad[16]. But this was in contrast to a multicentre study carried out in 2010 that showed a comparatively less number of depressed people living without their spouses[2].

Although sub-fertility, in either males or females, can be an enormously important cause for severe depression[18] but, this study showed no such association. Similarly it could not find depression in people who bore ≥5 children that would put an additional financial burden on them. This could be due to the vast belief in Pakistan that more children bring more power cum support to the family or faith in Islam that each child brings his own sustenance[21-24]. It is a known fact that religion is a source of peace of mind. Statistics demonstrate that suicide is far less in Muslims in the whole world[19-21]. The study supports the idea by showing that Muslims had the least chances of developing depression as compared to people who believed in other religions. The participants who were non believers that is did not follow any creed were at a greater risk of getting depressed.

Duration of an illness contributes greatly on general well being of a person[13,22] DM II patients, for instance, who are victims for a prolonged time, doubles the chance that they might compromise on their mental health[17]. Clinical outcome is one of the direct measures of compliance to medications. Participants who had good glycemic control were mostly compliant and consequently less depressed. Depression activates the hypothalamic-pituitary-adrenal axis, turns on the sympathetic nervous system, increases inflammatory responses and declines insulin sensitivity hence leads to poor glycemic control, failure to take self care and increases the risk of complications resulting in poor clinical outcome[2].

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Diabetes mellitus invites a lot of complications that can prove to be extremely detrimental physically and mentally. 1 in 7 participants developed depression due to diabetic complications in the current study. Amputation of limb/limbs topped the list followed by eye related problems such as cataract or retinopathies. Third were neurological conditions like stroke and dementia then arthropathies, sores and gangrenes, fifth were renal problems for example, ARF/CRF and lastly cardiovascular diseases[6, 23].

The main findings of the study that were quite similar to the existing data were that the risk of depression development in type 2 DM patients was double in females and in patients with prolonged illness and unemployment. Hyperglycemia, extremes of BMI (obesity or under weight) and diabetic complications were major risk factors for depression in type 2 DM patients. In addition to this educational level, compliance to medicines, a healthy marital status and employment all proved beneficial for a decreased rate of depression in such patients.

This study emphasizes that presence of diabetes should not only be an alarming sign for co morbid depression but it should put enough stress on all physicians to look for depressive symptoms among diabetics, so that future prospective studies held for screening depression in diabetic patients yield good results. Unfortunately there are only 750 psychiatrists in Pakistan that is 1 for 10000 patients and one pediatric psychiatrist for 400 million children with mental disorders. It is an eye opener that Pakistan has only 4 major psychiatric hospitals[5] for the 5th most populous nation in the world, hence it becomes obligatory on general physicians dealing with diabetes, to play a major role for recognizing and treating this largely growing menace.

Although several studies have been conducted in the past nationwide but they possess certain non specific factors such as co-morbid hypertension, family or past history of depression and addictions, which may be a direct cause of depression. The current study has excluded these variables to avoid inaccuracy.

There were certain limitations in this study; firstly, participants were not evaluated by a psychiatrist, this was to avoid extra cost for the patients to bear. Secondly, there was no control group of non diabetics, for comparison of depression rates with our subjects. Hence, we cannot say whether the data for depression as analyzed by this study is higher or lower than the rest of population. It can be argued that for generalization of the above results, data from various regions of Pakistan would be required. Lastly, the type and severity of depression was not assessed. This was due to lack of time in the regular outpatient departments (OPDs).

CONCLUSION

This study supports the idea that poor glycemic control in type 2 diabetes should be dealt with cautiously since it may result in expediting the development of depression. Vulnerable groups that are those with considerable risk factors should be screened compulsorily for depression, in order to reduce mortality and improvement of quality of life. A strategy should be proposed for creating policies and a valid instrument for timely detection and management of co morbid diabetes and depression.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

ETHICS APPROVAL

Ethical approval was sought from the institute.

PATIENTS CONSENT

Verbal consent was taken.

AUTHORS CONTRIBUTION

AKJ wrote up and did the literature search, FS presented the main idea and AA did the proof read). Further, AJ did the data analysis, MVP collected the data for the research, FZ also did the literature search and SNQ contributed in the data collection as well.

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