Epidemiology of Depression and its Relationship to Diabetes in India

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Abstract
Depression is one of the most common chronic mental illnesses globally and in India. It has been reported that depression is twice as common in individuals with type 2 diabetes. The prevalence of both depression and type 2 diabetes are rapidly increasing. This article reviews the prevalence of depression in the general population as well as in patients with type 2 diabetes and its complications with special reference to recent data from India. It also makes a case for screening for depression in diabetes clinics and integrating depression treatment with diabetes care in order to make the treatment more wholistic.

Introduction

The World Health Organization (WHO) ranked depression as the fourth most common disease in 1990, after lower respiratory tract infections, diarrheal diseases and perinatal infections.¹ Depression is expected to be the second most common disease by 2020 and to account for 15 percent of the disease burden in the world. Depression is currently estimated to affect 340 million people globally.¹ Depression is also a leading cause of disability, workplace absenteeism, decreased productivity and high suicide rates.²

The rising burden of non-communicable diseases (NCDs) like diabetes, hypertension, obesity, cardiovascular disease, cancer and mental illness, especially depression have been amongst the major health transitions that has been witnessed in the second half of the twentieth century. Depression is a mood disorder diagnosed by depressed mood, guilt feeling, decrease in appetite, thinking about death and suicide, insomnia, fatigue and loss of energy, considerable weight loss and loss of function.³

India is home to the second largest number of adults with diabetes worldwide, after China.⁴ It also has a large number of people with depression. In this article, we try to look at the prevalence of depression in the general population and in people with type 2 diabetes with and without diabetes related complications. Finally we make a case for integrating depression with diabetes care in specialized diabetes centers in India.

Prevalence of Depression

International studies

The occurrence of depression is associated with factors such as age, marital status, social class, and social conditions.⁵ Depression is one of the most prevalent psychiatric conditions in later life.⁶ In the Mini Finland Health Survey⁷ the association between the prevalence of depression and age was clearly more significant in women than in men. In this study, marital status was associated with the occurrence of depression; the prevalence of depression was higher among widowed and divorced persons and the prevalence of depression increased with decreasing social class. The prevalence of depression was higher among women and this may be attributed to a type of depression associated with somatic symptoms such as changes in appetite, sleep disturbances and fatigue accompanied by pain and anxiety.⁸ In the developed countries, depression is the most common psychiatric disorder, ranging from 10 to 37.7% as reported in various studies. Table 1 compares the prevalence of depression globally. In developing countries, 10–44% are reported to suffer from depression and anxiety disorders and an
estimated 50.8 million people suffer from major depression. The prevalence of depression is steadily increasing and is expected to move to the 1st place with reference to global burden of disease by 2030 as predicted by World Health Organization.9

**Indian studies**

The prevalence of depression is high, both in urban and rural India.10 In a cross-cultural study conducted by WHO at 14 sites, the most common diagnosis in primary care settings was depression.11 Earlier Indian studies have reported prevalence of depression varying from 21-83% in primary care settings.12 However as these are all clinic based studies, they are subject to various degrees of referral bias.

A study conducted in Goa on postnatal depression in India has shown that the prevalence of depression was 23%, economic deprivation and poor marital relationships were the important risk factors for the occurrence and chronic nature of depression.13 The prevalence of depression in Dharwad district, Karnataka was reported to be high at 29.3%,14 while in a rural population of Ahmednagar, Maharashtra, it was even higher - 31.4%.15 The prevalence of depression was high (39.0%) among the elderly in Surat city and it was observed that several important socio-demographic variables had shown a significant association with depression in the elderly.16 A large population-based study which involved 26,001 subjects in urban South Indians called the “Chennai Urban Rural Epidemiology Study (CURES) "also looked at the prevalence of depression in Chennai city in South India. The study showed that the overall prevalence of depression in Chennai was 15.1%.17 Female gender, age, low socio-economic status, lack of education and marital factors were associated with depression in this population. Studies done in an elderly community in Vellore, South India reported that the prevalence of depression was 12.7%.18 Such wide variations in prevalence of depression could be attributed to the different methods of assessing depression and the different populations studied.

There are many studies which have looked at the association of depression with the socio-economic status. A study by Shidhaye19 done on 5703 women with mental disorders showed that socio-economic factors were independently associated with common mental disorders. Nair et al20 studied the prevalence of depression aiming geriatric subjects in Raichur and found that prevalence of depression was very high. Moreover it was associated with substance abuse, unemployment, disrupted mental status, illiteracy and lower

<table>
<thead>
<tr>
<th>Author / Year</th>
<th>Place</th>
<th>Total subjects</th>
<th>Age (years)</th>
<th>Diagnostic criteria</th>
<th>Population</th>
<th>Method of survey</th>
<th>Prevalence of depression (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ovuga et al, 2005</td>
<td>Adjumani and Bugiri [Uganda]</td>
<td>939</td>
<td>18</td>
<td>13 item Beck Depression Inventory (BDI)</td>
<td>Rural population</td>
<td>Structured interview</td>
<td>17.4</td>
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<tr>
<td>Vasiliadis et al, 2007</td>
<td>Canada and USA</td>
<td>3,505</td>
<td>&gt;18</td>
<td>Diagnostic and Statistical Manual of Mental Disorders (DSM-IV)</td>
<td>Diagnostic and statistical Manual of Mental Disorders (DSM-IV)</td>
<td>Telephone survey</td>
<td>8.2</td>
</tr>
<tr>
<td>DM Ndetri et al, 2009</td>
<td>Kenya</td>
<td>2770</td>
<td>&gt;18</td>
<td>BDI</td>
<td>In and out patient population</td>
<td>Interviews</td>
<td>41%</td>
</tr>
<tr>
<td>Pouwer et al, 2010</td>
<td>Netherlands</td>
<td>772</td>
<td>29-74</td>
<td>CIDI and CESD-16</td>
<td>Out patient population</td>
<td>Self-report measures of depression and a diagnostic interview</td>
<td>32.9%</td>
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<tr>
<td>Dirmayer et al, 2010</td>
<td>Germany</td>
<td>866</td>
<td>57-77</td>
<td>DSQ score</td>
<td>Primary care center</td>
<td>Standardized assessment, including questionnaires for patients and the physician and diagnostic screening measures</td>
<td>MDE-11.8%, Minor-20.7%</td>
</tr>
<tr>
<td>Agbir et al, 2010</td>
<td>Nigeria</td>
<td>160</td>
<td>20-99</td>
<td>Structured Clinical Interview for DSM-IV axis I disorder (SCID) Hamilton Rating Scale for Depression (HDRS)</td>
<td>Out patient population</td>
<td>Interview by psychiatrist</td>
<td>19.4%</td>
</tr>
<tr>
<td>Yu et al, 2010</td>
<td>China</td>
<td>100</td>
<td>49±11</td>
<td>Self-Rating Depression Scale (SDS)</td>
<td>Out patient population</td>
<td>Self-reported</td>
<td>28%</td>
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<tr>
<td>Trento et al, 2011</td>
<td>Italy</td>
<td>459</td>
<td>40-80</td>
<td>Zung self-rating depression scale</td>
<td>Out patient population</td>
<td>Self-reported Questionnaire</td>
<td>14.1%</td>
</tr>
<tr>
<td>Tovilla – Zarate et al, 2012</td>
<td>Mexico</td>
<td>458</td>
<td>18-80</td>
<td>Hamilton Rating Scale of depression (HAM-D)</td>
<td>Out patient population</td>
<td>Interview by psychologist/ nurse</td>
<td>48.3%</td>
</tr>
</tbody>
</table>
economic status.

A study done in Kolkata by Neelanjana Paul found the depressed subjects were significantly older, had less education, belonged to lower socioeconomic status, and had greater cognitive impairment and disability. Education was found to have a protective role.

Table 2 compares the prevalence of depression obtained from India. It can be seen that the estimates on prevalence of depression vary widely in different populations. This could be attributed to different ethnicity and demography of the study populations and/or different diagnostic criteria and study instruments employed.

Table 3 shows the prevalence of depression in special populations. Patients with depression seem to have a higher prevalence of undiagnosed diabetes and pre-diabetes where the depression was clearly not produced by their glucose intolerance status as they are totally asymptomatic. 65% of the increased risk of diabetes mellitus is attributed to be due to depression in some studies.

Conversely, even during routine screening, those with depression seem to have a higher prevalence of undiagnosed diabetes and pre-diabetes where the depression was clearly not produced by their glucose intolerance status as they are totally asymptomatic. 65% of the increased risk of diabetes mellitus is attributed to be due to depression in some studies.

It is found that only less than one third of the patients received depression screening to assess the depressive symptoms in a case control study. People with depression and diabetes should be adequately treated counseled as this can potentially result in improvement of psychological and medical outcomes. This would be the first step towards improved treatment of depression in people with diabetes.

Prevalence of Depression and Diabetes

The connection between depression and type 2 diabetes was recognized as early as in the 17th century. Today, depression and type 2 diabetes have become a great global challenge. Several studies have shown that depression is associated with type 2 diabetes; however, the direction of the relationship is unclear. In addition to depression being a consequence of type 2 diabetes, depression may also be a risk factor, or a triggering factor, for the onset of type 2 diabetes. Thus there appears to be a bidirectional relationship between type 2 diabetes and depression. This was confirmed by a recent study by Golden and colleagues, in which they found that diabetic individuals without depressive symptoms at baseline had higher odds of developing depressive symptoms during the follow-up period.

People with diabetes and depression are at greater risk of disability, reduced work productivity and lower quality of life. They are also at greater risk of death, as shown in a study that found the coexistence of diabetes and depression is associated with significantly higher risk of death, beyond that due to having either diabetes or depression alone.

International studies

An Ethiopian study demonstrated that depression is a common health problem in type 2 diabetic
outpatients with a prevalence rate of 13%. In Jamaica, Wilks et al found that diabetes mellitus was more prevalent among those with symptoms of depression. A Trinidad study reported a prevalence of 17.9% among subjects with type 2 diabetes. In a study done in Nigeria, the prevalence of depression among T2DM was 30% while in Bangladesh, a prevalence of 34% was reported. 

It was reported by the World Health Study, the prevalence of depression in diabetes was 2% in adults aged 18 years and above, in 60 different countries over the period of one year. Studies by de Groot et al showed that depression was significantly associated with a wide range of diabetes complications. The overall prevalence of depression in diabetes was reported to vary from 8.5% to 27.3%. 

Indian studies

Madhu et al reported the prevalence of depression to be 49% amongst subjects with diabetes in Trivandrum, India. The predictors of depression were found to be female gender, elevated fasting blood sugar level, physical disability and lack of physician’s advice regarding lifestyle modifications.

Ranjan Das et al showed that in West Bengal, the prevalence of depression was 46.2% and reported that the presence of depression in type 2 diabetes further deteriorates the quality of life of the patients. Therefore, it is reasonable to assume that treating depression would have a beneficial effect on the quality of life. Naseer Ali et al found the prevalence of depression was 27.0% amongst diabetic subjects and 11.1% amongst healthy controls, in New Delhi.

Siddiqui et al found that there is a higher prevalence of depression in patients with type 2 diabetes was almost twice as high compared to those without diabetes (35.4% vs 20%; p=0.006) in Delhi and suggested that assessment of depression should be performed as part of the routine practice in India as persons with type 2 diabetes are at higher risk of developing depression.

In the CURES study, 25,286 subjects in whom fasting capillary glucose estimation was available were assessed for depression, using a self-reported and previously validated instrument. Depression was studied in relation to the different stages of glucose intolerance. It can be seen that the prevalence of depression was highest among known diabetic subjects (30.2%) followed by the newly diagnosed diabetes (19.7%), impaired fasting glucose (15.5%) and lowest among normal fasting glucose subjects (13.8%) and the trend was significant (p<0.001) (Figure 1). Thus it is clear that the prevalence of depression increases with greater degrees of glucose intolerance.

According to the National Institute of Mental Health, depression has a more serious progression in persons with diabetes, is linked to a higher rate of depression relapse, is associated with more diabetes-related medical complications, and engenders higher healthcare costs than depression in persons without diabetes.

**Prevalence of Depression in Diabetic complications**

Earlier studies have examined the association of depression with micro- and macro vascular complications of diabetes and there is evidence to suggest that the long-term complications of diabetes are associated with depressive symptoms.

The majority of studies on the association between depression and diabetic complications have been cross sectional. However, prospective studies have shown that depression is associated with a higher and more rapid incidence of diabetic complications.

The prevalence of depression was significantly higher among diabetic subjects with DR (35.0% vs 21.1%, p<0.001), neuropathy (28.4% vs 15.9%, p=0.023), nephropathy (35.6% vs 24.5%, p=0.04) and PVD (48.0% vs 27.4%, p<0.001) as compared to subjects without these complications. The CURES study demonstrated that all the microvascular complications and macrovascular complications are associated with the depression even after adjusting for confounding factors.

The CURES study also found that the risk of depression was significantly higher in those on insulin (OR: 1.9, p=0.037) compared to diet only group while the odds
The ratio for depression in subjects treated with OHA was 1.3 (p=0.210) compared to those who were on diet only regimen (Figure 2). This is understandable as taking insulin is associated with depression in some people. Alternatively, those treated with insulin or OHA may be more symptomatic because of more severe disease or may have one or more complications because of which, many physicians put them on insulin in the first place.

Studies have shown a significant relationship between depression and poor adherence to self-management guidelines, which is confirmed by the higher rate of diabetes complications among those who have depression. People with diabetes therefore need to successfully manage their disease to avoid complications.

Epidemiologic evidence of an association between atherosclerosis and depression in the general population is lacking and most earlier studies have been performed in patients with preexisting vascular. These studies show high risk of comorbid depression on survival after a cardiovascular event. There are only few studies which have looked at the association of depressive disorders and atherosclerosis. The CURES Study looked at the relationship between two measures of atherosclerosis, structural (intima-media thickness) and functional (augmentation index) and depressive disorders in an urban south Indian population. The prevalence of depression in subjects with normal IMT (<1.0 mm) was 16.2% compared to 30.4% in subjects with increased IMT (≥ 1.0 mm, p=0.013). This study shows that depression is associated with IMT, an early atherosclerotic marker in Asian Indians, a population with a high prevalence of premature CAD.

Figure 3 shows the association of depression and type 2 diabetes. Depression and diabetes are both chronic and complex disorders. Hence there is a need to find solutions step towards clinical- and self-care for these conditions. Both behavioral activation and motivation are critical for adherence to management plans in both conditions. Unfortunately this is hampered by major barriers like stigma at the patient level, as well as clinical inertia to intensify treatment by the provider. Patients and care providers should interact with each other to address the co-existing depression and diabetes, which is the need of the hour.

**Integrating Depression with Diabetes Care**

As diabetes and depression are both common conditions, it is important to assess depression in patients with diabetes and associated complications because they are particularly vulnerable to further deterioration.

Vikram Patel et al suggested evidence-based treatments such as antidepressants along with psychotherapy are effective in managing depression. The delivery of these treatments should ideally be carried out through an...
integration of depression programs into existing health services or community settings with task-shifting to non-specialist health workers to deliver front-line care and a supervisory framework of appropriately skilled mental health workers. This was well demonstrated by the chronic care model developed by Katon et al.\textsuperscript{50} called as TEAM care. Significant improvement in depression and glycemic control was observed in the group where intervention was provided by non-specialists compared to the usual care. There is currently a study ongoing in India at 4 centres called as the “INDEPENDENT Study” which is looking at intervention in subjects with depressive symptoms, seen at 4 diabetes centers in India.\textsuperscript{51} A study by Lydia et al.\textsuperscript{52} demonstrated the feasibility of implementing a collaborative care program for poorly-controlled type 2 diabetes and complex behavioral health disorders in an urban primary care clinic. They showed that integration of behavioral healthcare into chronic care management of patients with diabetes is a promising strategy to improve outcomes among the high risk population. The study showed that there was a mean decrease in HbA1c of 0.9 (10.6 to 9.4) among those referred to the collaborative care team, compared to a mean decrease of 0.2 (9.4 to 9.2) among those not referred. This was a significantly greater percent change in HbA1c (p=0.008).

The demand for chronic care for both diabetes and depression is high as their interactions produce biological, social, and economic confluence among populations. Adopting syndemic framework in recognizing, evaluating and implementing integrated health programmes appears to be the way forward as emphasized in a recent Lancet review.\textsuperscript{53}

The rationale for integrating treatment for depression and diabetes is that people with diabetes will comply with their treatment plan better if the depressive symptoms are treated. Treatment of depression could be a pre-requisite for good diabetes self management.\textsuperscript{51} Hence it is important that physicians dealing with diabetes are also trained for recognition and treatment of depressive disorders.\textsuperscript{54}

References
Patients With Type 2 Diabetes. J Psychosoc Nurs Ment Health Serv 2016; 54:56-63.