

## REVIEW ARTICLE

# Epidemiology of Depression and its Relationship to Diabetes in India

Subramani Poongothai<sup>1</sup>, Ranjit Mohan Anjana<sup>2</sup>, Shankar Radha<sup>3</sup>,  
Balasundaram Bhavani Sundari<sup>4</sup>, Coimbatore Subramanyam Shanthi Rani<sup>5</sup>,  
Viswanathan Mohan<sup>6</sup>

## 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 holistic.

## 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.<sup>1</sup> 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.<sup>1</sup> Depression is also a leading cause of disability, workplace absenteeism, decreased productivity and high suicide rates.<sup>2</sup>

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.<sup>3</sup>

India is home to the second largest number of adults with diabetes worldwide, after China.<sup>4</sup> 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.<sup>5</sup> Depression is one of the most prevalent psychiatric conditions in later life.<sup>6</sup> In the Mini Finland Health Survey<sup>7</sup> 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.<sup>8</sup> 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

<sup>1</sup>Senior Scientist and Head-Clinical Trials Operations, Department of Clinical Trials, <sup>2</sup>Vice President and Managing Director, Madras Diabetes Research Foundation and Dr. Mohan's Diabetes Specialities Centre, Chennai, Tamil Nadu; <sup>3</sup>Psychiatrist, Fortis Malar Hospital, Chennai, Tamil Nadu; <sup>4</sup>Research Fellow, <sup>5</sup>Senior Scientist and Head, Department of Clinical Epidemiology, <sup>6</sup>President, Madras Diabetes Research Foundation and Chairman, Dr. Mohan's Diabetes Specialities Centre, Chennai, Tamil Nadu  
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**Table 1: Studies on prevalence of depression in population based studies – International studies**

Author / Year	Place	Total subjects	Age (years)	Diagnostic criteria	Population	Method of survey	Prevalence of depression (%)
Ovuga et al, 2005	Adjumani and Bugiri [Uganda]	939	18	13 item Beck Depression Inventory (BDI)	Rural population	Structured interview	17.4
Vasiliadis et al, 2007	Canada and USA	3,505 5,183	>18	Diagnostic and Statistical Manual of Mental Disorders (DSM-IV)	Diagnostic and statistical Manual of Mental Disorders (DSM-IV)	Telephone survey	8.2 8.7
DM Ndetri, et al, 2009	Kenya	2770	>18	BDI	In and out patient population	Interviews	41%
Pouwer et al, 2010	Netherlands	772	29-74	CIDI and CESD-16	Out patient population	Self-report measures of depression and a diagnostic interview	32.9%
Dirmaier et al, 2010	Germany	866	57-77	DSQ score	Primary care center	Standardized assessment, including questionnaires for patients and the physician and diagnostic screening measures	MDE-11,8% Minor-20,7%
Agbir et al, 2010	Nigeria	160	20-99	Structured Clinical Interview for DSM-IV axis I disorder (SCID) Hamilton Rating Scale for Depression (HDRS)	Out patient population	Interview by psychiatrist	19.4%
Yu et al, 2010	China	100	49±11	Self-Rating Depression Scale (SDS)	Out patient population	Self-reported	28%
Trento et al, 2011	Italy	459	40-80	Zung self-rating depression scale	Out patient population	Self-reported Questionnaire	14.1%
Tovilla – Zarate et al, 2012	Mexico	458	18-80	Hamilton Rating Scale of depression (HAM-D)	Out patient population	Interview by psychologist / nurse	48.3%

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.<sup>9</sup>

#### Indian studies

The prevalence of depression is high, both in urban and rural India.<sup>10</sup> In a cross-cultural study conducted by WHO at 14 sites, the most common diagnosis in primary care settings was depression.<sup>11</sup> Earlier Indian studies have reported prevalence of depression varying from 21-83% in primary care settings.<sup>12</sup> 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.<sup>13</sup> The prevalence of depression in Dharwad district, Karnataka was reported to be high at 29.3%<sup>14</sup> while in a rural population of Ahmednagar, Maharashtra, it was even higher - 31.4%.<sup>15</sup> 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.<sup>16</sup> 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%.<sup>17</sup> 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%.<sup>18</sup> 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 Shidhaye<sup>19</sup> done on 5703 women with mental disorders showed that socio-economic factors were independently associated with common mental disorders.

Nair et al<sup>20</sup> 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 2 : Studies on prevalence of depression in population based studies – National studies**

Author / Year	Place	Total subjects	Age (yrs)	Diagnostic Criteria	Population	Method of Survey	Prevalence of depression (%)
Biswas et al, 2009	Vellore	204	> 60	(CIS-R),a Revised Clinical Interview Schedule	Elderly population	Door to door survey	31.5
Poongothai et al, 2009	Chennai	25,455	> 20	Modified Patient Health Questionnaire (PHQ-12 item)	Representative sample of chennai city	Interview – Door to Door survey	15.1
Joseph et al, 2013	Karnataka	230		PHQ – 9	Clinic population	Interview based	45.2
Jain et al, 2015	Jaipur	100/100	18-70	PHQ – 9	Clinic population	Self-reported	53
Kulkarni et al, 2014	Karnataka	100	25-65	PHQ – 9	Clinic population	Interview based	29.1
Sengupta et al, 2015	Punjab	290	60->80	Geriatric Depression Scale (GDS short version)	Cross sectional study	Interview method - semi-structured questionnaire	Urban –10.1 Rural – 7.3

**Table 3 : Studies on prevalence of depression in special population in India**

Author	Population	Set up	Location	Prevalence of depression (%)	Year
Patel et al	Women	Clinic population	Goa	23	2002
Pillai et al	Adolescents	Rural population (school children)	Goa	0.5	2008
Nair et al	Adolescents	Rural population (school children)	Kerala	11.2 (school dropouts) 3 (school going)	2009
Barua et al	Elderly	Rural population	Karnataka	21.7	2010
David et al	Adolescents	Clinic population (medical students)	Hyderabad	11.7	2012
Balaji et al	Elderly	Urban and rural slum	Chennai	Urban – 41 Rural – 46	2013
Sengupta et al	elderly	Urban and rural	Punjab	Urban –10.1 Rural – 7.3	2015

economic status.

A study done in Kolkata by Neelanjana Paul<sup>21</sup> 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 i.e. elderly, adolescence and women in India. It is interesting to note that the prevalence of depression in elderly in Chennai is higher in both urban and rural compared to Kerala and Punjab. Also it is found that the prevalence is higher in rural

areas compared to urban areas of Tamil Nadu.

### Prevalence of Depression and Diabetes

The connection between depression and type 2 diabetes was recognized as early as in the 17<sup>th</sup> century.<sup>22</sup> Today, depression and type 2 diabetes have become a great global challenge.<sup>23</sup> 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,<sup>24</sup> in which they found that diabetic individuals without depressive symptoms at baseline had higher odds of developing depressive symptoms during the follow-up period.

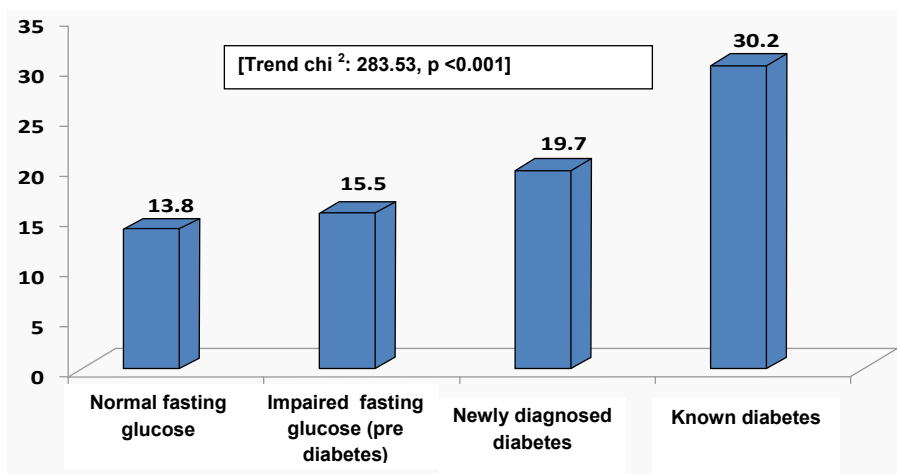
Conversely, even during routine screening, those with depression seem to have a higher prevalence of undiagnosed diabetes and pre diabetes where the depression was clearly not produced by their glucose intolerance status as they are totally asymptomatic. 65% of the increased risk of diabetes mellitus is attributed to be due to depression in some studies.<sup>25</sup>

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.<sup>26</sup> It is therefore heartening that recent diabetes guidelines recommended routine screening for depression in people with diabetes.<sup>27</sup>

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.<sup>28</sup>

#### International studies

An Ethiopian study demonstrated that depression is a common health problem in type 2 diabetic



**Fig. 1: Prevalence of depression in the different grades of diabetes status**

outpatients with a prevalence rate of 13%.<sup>29</sup> In Jamaica, Wilks et al found that diabetes mellitus was more prevalent among those with symptoms of depression.<sup>30</sup> A Trinidad study reported a prevalence of 17.9% among subjects with type 2 diabetes.<sup>31</sup> In a study done in Nigeria, the prevalence of depression among T2DM was 30% while in Bangladesh, a prevalence of 34% was reported.<sup>32,33</sup>

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.<sup>34</sup> Studies by de Groot et al<sup>35</sup> 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%.<sup>36</sup>

#### Indian studies

Madhu et al<sup>37</sup> 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<sup>38</sup> 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<sup>39</sup> found the prevalence of depression was 27.0% amongst diabetic subjects and 11.1% amongst healthy controls, in New Delhi.

Siddiqui et al<sup>40</sup> 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.<sup>41</sup>

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.<sup>42</sup>

### 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.<sup>43</sup>

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.<sup>44,45</sup>

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.<sup>46</sup> 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



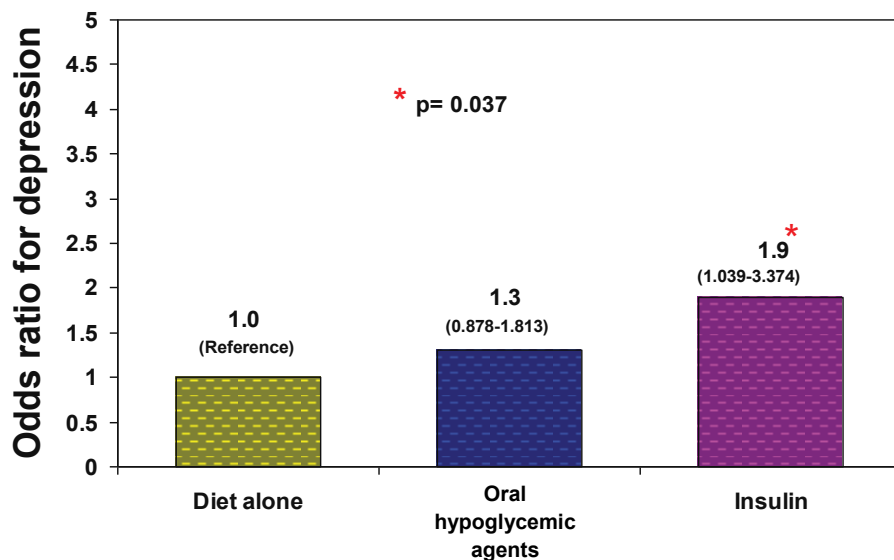


Fig. 2: Odds ratio for depression in relation to diabetes management

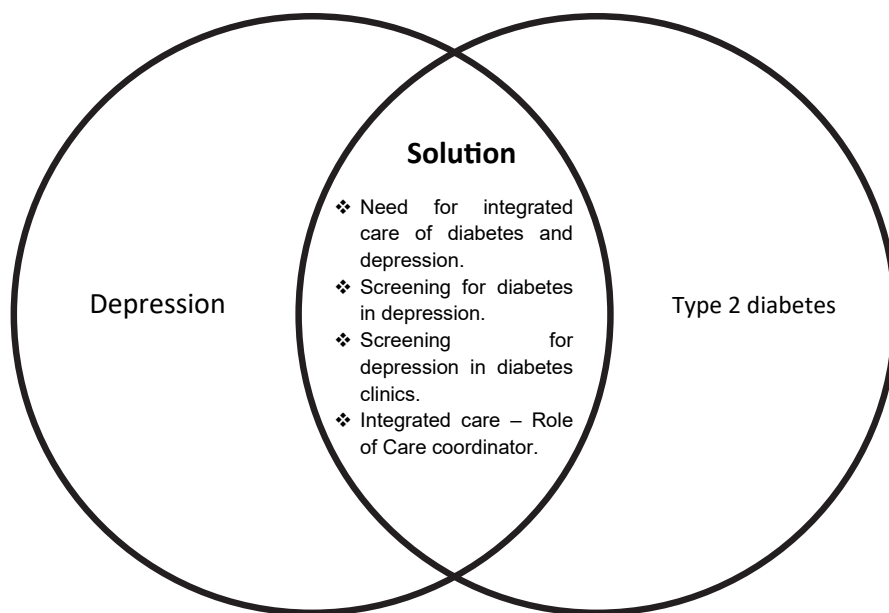


Fig. 3: Association of depression and type 2 diabetes – Need for integrated care

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.<sup>47</sup> 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.<sup>48</sup> The prevalence of depression in subjects with normal IMT ( $<1.0$  mm) was 16.2% compared to 30.4% in subjects with increased IMT ( $\geq 1.0$  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.<sup>48</sup>

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<sup>49</sup> 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<sup>50</sup> 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.<sup>51</sup> A study by Lydia et al<sup>52</sup> 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.<sup>53</sup>

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.<sup>51</sup> Hence it is important that physicians dealing with diabetes are also trained for recognition and treatment of depressive disorders.<sup>54</sup>

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