

Original Research

To Study Prevalence Of Depression Among Male Prediabetic Patients- A Hospital Based Cross Sectional Study

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Abstract:

Introduction: Depression is associated with poor health behaviors (i.e., smoking, physical inactivity, caloric intake) that increase risk of type 2 diabetes. It is also related to central obesity and potentially to impaired glucose tolerance. However, it should be made very clear that clinical depression is an illness like any other medical illness that cannot be willed away. Hence, the present study was undertaken to study prevalence of depression in male prediabetic patients.

Materials and Method: The present study was conducted among all patients who visited the department and among them 139 was categorised as prediabetic who were enrolled for the present study. The clinical profile of patients was evaluated as per the proforma and laboratory investigations. For the evaluation of depression, the Hamilton Depression Rating Scale (HDRS) was used. Appropriate tests of significance were applied. Results: In the present study, mean HDRS score was 9.63 which revealed presence of depression among enrolled study subjects. On distribution of subjects according to HDRS grades it was revealed that there were 51 mild, 14 moderate, and 1 case had moderate to severe grade of depression i.e., on evaluating pre-diabetic patients according to HDRS grades in the present study, it was revealed that there were 36.70% patients who were categorised as mild, 10.1% mild to moderate, and 0.72% (1 case) had moderate to severe grade of depression. The comparison of mean blood sugar and related parameters among various grades of HDRS scores results revealed that there were non significant association found in mean RBS (P=0.141), FBS (P=0.421), PPBS (P=0.392) and HbA1C (P=0.163) with various grade of HDRS score.

Conclusion: The present study has addressed the relation of depression in prediabetic males. Depression is found to be directly correlated, but there independent existence in prediabetic males can occur as found in our study. So, screening for these entities should be carried out. To validate the strength of association of depression and prediabetes larger studies with improved design need to be conducted. Life style changes through improved nutrition and physical activity are the first line therapy for prevention of transition from prediabetes to diabetes. Since this area has a potential to improve quality of life of prediabetic males, life style measures which can improve the outcome may be reinforced.

Keywords: Diabetes; Depression; Prediabetes; Hamilton Depression Rating Scale (HDRS)

Introduction

Prediabetes is a precursor before the diagnosis of diabetes mellitus (DM). Adults with prediabetes often may show no signs or symptoms of diabetes but will have blood sugar levels higher than normal. The normal blood glucose level is between 70 mg/dL to 99 mg/dL. In patients with prediabetes, blood glucose levels are elevated between 100 mg/dL to - 125 mg/dL.¹ The term “pre-diabetes” was introduced in 1997, indicating a condition in which glucose serum levels do not meet diagnostic criteria for T2DM but are too high to be considered normal. Currently, pre-diabetes indicates a clinical condition characterized by: (1) impaired fasting glucose (IFG) (defined by a fasting glucose level between 100 and 125 mg/dL); (2) impaired glucose tolerance (IGT) [defined by a glucose level between 140 and 199 mg/dL 2 h after receiving a 75 g oral glucose tolerance test (OGTT)]; or (3) glycated hemoglobin (HbA1c) level between 39 and 47 mmol/mol.² Therefore, it refers to a condition where impaired fasting glucose and/or impaired glucose tolerance is present which is known as abnormal glucose homeostasis.³ Both impaired fasting glucose and impaired glucose tolerance are the intermediate metabolic states between normal and diabetic glucose homeostasis. These conditions are thought to be the precursors of DM, but the progression to overt disease is not straight-forward. The risk for both macrovascular and microvascular complications increase across the distribution of blood glucose concentrations well below the evident DM, and the risk is more strongly associated with post-challenge hyperglycemia than fasting glucose levels.⁴

Depression is a common mental disorder that presents with depressed mood, loss of interest or pleasure, feelings of guilt or low self-worth, disturbed sleep or appetite, low energy, and poor concentration.⁵ The American Psychiatric

Association's Diagnostic Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) classifies the depressive disorders into disruptive mood dysregulation disorder, major depressive disorder, persistent depressive disorder (dysthymia), premenstrual dysphoric disorder and depressive disorder due to another medical.⁶ Depression is associated with poor health behaviors (i.e., smoking, physical inactivity, caloric intake) that increase risk of type 2 diabetes. It is also related to central obesity and potentially to impaired glucose tolerance. Moreover, it is associated with physiological abnormalities, including activation of the hypothalamic-pituitary-adrenal axis, sympathoadrenal system, and pro-inflammatory cytokines, which can induce insulin resistance and contribute to diabetes risk.⁷ Moreover, it is of utmost importance for people to understand that depression is not a weakness but an illness. It is generally thought that depression is something that one can just 'get over' on your own. These fallacies persist because depression is often stigmatized. It is often believed that a person can regulate his/her mood on his/her own, and if he/she is unable to, they are considered to be weak. However, it should be made very clear that clinical depression is an illness like any other medical illness that cannot be willed away.⁸

Materials and Method

The present hospital based cross sectional observational study was conducted at L.N. medical college and research centre and associated J.K. hospital, Bhopal, Madhya Pradesh among the pre-diabetic male patients attending the department of medicine over a time span of 1.5 year. Ethical permission was obtained from the ethical committee of our institute and an informed consent was taken from all the patients. Patients were enrolled using non probability sampling/ convenient sampling technique. Inclusion criteria comprised of adult male, aged 18-50 years, prediabetics, willing to share detailed private information after counselling and apparently healthy men. Exclusion criteria comprised of patient aged- less than 18 years, consent not given, having known vascular disease, diabetes, hypertension, coronary artery disease, hypothyroidism, organ failure etc, on treatment of depression or any psychiatric illness, on treatment of any known drug or illness contributing to depression or erectile dysfunction.

All patients who visited the department during the study duration and met the inclusion criteria were enrolled for the present study. Relevant clinical data was recorded on the proforma. Patients were asked questionnaire-based history of their present condition after their informed consent. Relevant clinical history including age, education, occupation, diseases was taken and entered in the proforma. The clinical profile of patients was evaluated as per the proforma. For diagnosing prediabetes, the range of glucose and HbA1c is as given below:

- a. FPG- 100-125 mg/dl (5.6-6.9 mmol/L)
- b. 2-h PG- 140-199 mg/dl (7.8-11 mmol/L).
- c. HbA1c – 5.7 - 6.4%

For the evaluation of depression, the Hamilton Depression Rating Scale (HDRS)⁹ was used. HDRS is a set of 17 questions with score more than 17 indicates severe depression. The total Hamilton Depression (HAM-D) Rating Scale provides an indication of depression and, over time, provides a valuable guide to progress.

- Classification of symptoms which may be difficult to obtain can be scored as:
0 - absent; 1 - doubtful or trivial; 2 - present.
- Classification of symptoms where more detail can be obtained can be expanded to:
0 - absent; 1 - mild; 2 - moderate; 3 - severe; 4 - incapacitating.
- In general, the higher the total score the more severe the depression.
- HAM-D score level of depression: 10 - 13 mild; 14-17 mild to moderate; >17 moderate to severe.

Data was entered in Microsoft excel and was managed in SPSS/EPI/ EXCEL 20 version . Analysis was done in the form of percentages and proportions and represented as tables wherever necessary. Appropriate tests of significance were applied.

Results

Table 1: Distribution of subjects according to HRDS grades

	Frequency	%
No depression	73	52.52
Mild	51	36.70
Mild to moderate	14	10.1
Moderate to severe	1	0.72
Total	139	100

In the present study, mean HDRS score was 9.63 which revealed presence of depression among enrolled study subjects. On distribution of subjects according to HRDS grades it was revealed that there were 51 mild, 14 moderate, and 1 case had moderate to severe grade of depression (table 1), i.e., on evaluating pre-diabetic patients according to HRDS grades in the present study, it was revealed that there were 36.70% patients who were categorised as mild, 10.1% mild to moderate, and 0.72 % (1 case) had moderate to severe grade of depression. On comparison of distribution of subjects according to HRDS grades in relation to marital status results revealed that there was no depression among 62 married and 11 unmarried study subjects, mild depression in 46 married and 5 unmarried, mild to moderate depression among 14 married study subjects and moderate to severe depression noticed in 1 married subject which showing non significant (P=0.3) HRDS grading among married and unmarried subjects (table 2). Table 3 shows comparison of distribution of subjects according to HRDS grades in relation to prehypertension status results revealed that 37 normal and 36 prehypertensive subjects had no depression, 31 normal and 20 prehypertensive subjects had mild depression, 7 normal and 7 prehypertensive subjects had mild to moderate depression, and one normal subject had moderate to severe depression it was showing statically non significant (P=0.53) association of HDRS grades in relation to prehypertension status.

Table 2: Comparison of distribution of subjects according to HRDS grades in relation to marital status

HRDS grades	Married	Unmarried
No depression	62	11
Mild	46	5
Mild to moderate	14	0
Moderate to severe	1	0
Total	123	16
Chi square value	3.00	
p value	0.3	

Table 3: Comparison of distribution of subjects according to HRDS grades in relation to hypertension status

	Normal	Prehypertensive
No depression	37	36
Mild	31	20
Mild to moderate	7	7
Moderate to severe	1	0
Total	76	63
Chi square value	2.18	
p value	0.53	

Table 4: Comparison of mean age and BMI among various grades of HRDS scores

Parameter	Grade	Mean	Std. Deviation	F value	p value
Age	No depression	39.75	8.403	1.811	0.148
	Mild	40.04	8.572		
	Mild to moderate	44.50	4.832		
	Moderate to severe	50.00			
BMI	No depression	23.13	3.17	14.138	<0.01*
	Mild	25.37	4.53		
	Mild to moderate	29.37	4.58		
	Moderate to severe	36.00			

*Statistically significant

Table 5: Comparison of mean blood pressure and related parameters among various grades of HRDS scores

Parameter	Grade	Mean	Std. Deviation	F value	p value
Pulse	No depression	82.38	9.426	2.863	0.039*
	Mild	79.96	7.283		
	Mild to moderate	76.43	9.866		
	Moderate to severe	94.00			
Systolic BP	No depression	121.26	8.715	0.051	0.985
	Mild	121.18	6.440		
	Mild to moderate	120.43	7.968		
	Moderate to severe	120.00			
Diastolic BP	No depression	78.25	7.340	0.787	0.503
	Mild	79.10	6.839		
	Mild to moderate	77.86	6.298		
	Moderate to severe	88.00			

*Statistically significant

Table 4 shows comparison of mean age and BMI among various grades of HDRS scores results revealed that mean age 39.75 found the subjects those who did not had any depression, mean age 40.04 was noticed among patient with mild depression, moderate to severe depression found among mean 50 years of age study subjects. Table 5 shows comparison of mean blood pressure and related parameters among various grades of HDRS scores results revealed that mean pulse and various grade of depression showing significant (P=0.0390 results, where as mean SBP P=0.985) and mean DSB (P=0.503) showing non signification association with various grades of depression. Table 6 shows comparison of mean blood sugar and related parameters among various grades of HDRS scores results revealed that there were non significant association found in mean RBS (P=0.141), FBS(P=0.421), PPBS (P=0.392) and HBA1C (P=0.163) with various grade of HDRS score.

Table 6: Comparison of mean blood sugar and related parameters among various grades of HRDS scores

Parameter	Grade	Mean	Std. Deviation	F value	p value
RBS	No depression	149.03	21.53	1.854	0.141
	Mild	150.86	21.94		
	Mild to moderate	160.79	13.48		
	Moderate to severe	180.00			
FBS	No depression	108.38	5.3	0.945	0.421
	Mild	110.20	9.24		
	Mild to moderate	111.07	6.9		
	Moderate to severe	110.00			
PPBS	No depression	179.18	15.59	1.007	0.392
	Mild	176.81	11.7		
	Mild to moderate	175.14	13.88		
	Moderate to severe	196.00			
HBA1C	No depression	5.94	.2	1.732	0.163
	Mild	5.94	.2		
	Mild to moderate	5.90	.18		
	Moderate to severe	6.40			

Table 7: Comparison of mean lipid profile related parameters among various grades of HRDS scores

Parameter	Grade	Mean	Std. Deviation	F value	p value
TC	No depression	174.14	36.01	5.397	0.002*
	Mild	179.10	34.09		
	Mild to moderate	216.07	42.29		
	Moderate to severe	198.00			
TG	No depression	128.33	41.73	1.305	0.275
	Mild	135.24	35.59		

	Mild to moderate	149.07	23.04		
	Moderate to severe	149.00			
HDL	No depression	43.96	19.31	0.791	0.501
	Mild	41.53	7.64		
	Mild to moderate	37.63	8.70		
	Moderate to severe	40.20			
LDL	No depression	97.34	30.70	1.569	0.200
	Mild	106.23	21.35		
	Mild to moderate	109.07	20.56		
	Moderate to severe	116.00			

*Statistically significant

Table 7 shows comparison of mean lipid profile related parameters among various grades of HDRS scores results revealed that mean TC was significant (P=0.002*) with HDRS score. TG was non significant (P=0.275), HDL was nonsignificant (P=0.501) and LDL was non significant (P=0.200) with HDRS score. Table 8 shows distribution of subjects according to their response to HRDS questionnaire

Table 8: Distribution of subjects according to their response to HRDS questionnaire

	Frequency	Percent
Depressed Mood (Sadness, hopeless, helpless, worthless)		
Absent	8	5.8
These feeling states indicated only on questioning	57	41.0
These feeling states spontaneously reported verbally	70	50.4
Communicates feeling states nonverbally—ie, through facial	4	2.9
Feeling of guilt		
Absent	49	35.3
Self-reproach, feels he/she has let people down	83	59.7
Ideas of guilt or rumination over past errors or sinful deeds	7	5.0
Suicide		
Absent	119	85.6
Feels life is not worth living	20	14.4
Insomnia, Early		
No difficulty falling asleep	46	33.1
Complains of occasional difficulty falling asleep—i.e., more than 1/2 hour	68	48.9
Complains of nightly difficulty falling asleep	25	17.9
Insomnia, Middle		
No difficulty	101	72.7
Patient complains of being restless and disturbed during the night	38	27.3
Insomnia, Late		
No difficulty	103	74.1
Waking in early hours of the morning but goes back to sleep	30	21.6
Unable to fall asleep again if he/she gets out of bed	6	4.3
Work and Activities		
No difficulty	46	33.1
Thoughts and feelings of incapacity, fatigue or weakness related to activities, work, or hobbies	72	51.8
Loss of interest in activity, hobbies, or work—either directly reported by patient, or indirect in listlessness, indecision, and vacillation (feels he/she has to push self to work or activities)	21	15.1
Retardation (Slowness of thought and speech, impaired)		
Normal speech and thought	134	96.4
Slight retardation at interview	1	.7

Obvious retardation at interview	2	1.4
Interview difficult	2	1.4
Agitation		
None	25	18.0
Playing with hands, hair, etc.	28	20.1
Hand-wringing, nail-biting, hair-pulling, biting of lips	86	61.9
Anxiety Psychic		
No difficulty	52	37.4
Subjective tension and irritability	68	48.9
Worrying about minor matters	17	12.2
Apprehensive attitude apparent in face or speech	2	1.4
Anxiety Somatic		
Absent	112	80.6
Mild	23	16.5
Moderate	4	2.9
Somatic Symptoms, Gastrointestinal		
None	122	87.8
Loss of appetite but eating without staff encouragement; heavy fillings in abdomen	17	12.2
Somatic Symptoms, General		
None	134	96.4
Heaviness in limbs, back, or head; backaches, headache, muscle	5	3.6
Genital Symptoms		
Absent	139	10.0
Hypochondriasis		
Not present	137	98.6
Self-absorption (bodily)	2	1.4
Loss of Weight		
No weight loss	131	94.2
Probable weight loss associated with present illness	6	4.3
Definite (according to patient) weight loss	2	1.4
Insight		
Acknowledges being depressed and ill	2	1.4
Acknowledges illness but attributes cause to bad food, climate, overwork, virus, need for rest, etc.	3	2.2
Denies being ill at all	134	96.4

Discussion

The Hamilton Depression Rating Scale (HDRS) is the most widely used clinician-administered depression assessment scale. For the HDRS17, a score of 0–7 is generally accepted to be within the normal range (or in clinical remission), while a score of 20 or higher (indicating at least moderate severity) is usually required for entry into a clinical trial.⁹As in the present study, mean HDRS score was 9.63 which revealed presence of depression among enrolled study subjects. On distribution of subjects according to HRDS grades it was revealed that there were 51 mild, 14 moderate, and 1 case had moderate to severe grade of depression, i.e., on evaluating pre-diabetic patients according to HRDS grades in the present study, it was revealed that there were 36.70% patients who were categorised as mild, 10.1% mild to moderate, and 0.72 % (1 case) had moderate to severe grade of depression. Kawakami N et al¹⁰reported that depressive symptoms may be associated with the onset of type 2 diabetes. So depressive symptoms of patients should be addressed when they encountered during health evaluation of especially prediabetic patients. The comparison of mean age and BMI among various grades of HDRS scores results revealed that mean age 39.75 found the subjects those who did not had any depression, mean age 40.04 was noticed among patient with mild depression, moderate to severe depression found among mean 50 years of age study subjects. It was not significant (P=0.148) association of subjects with depression to mean age. Mean BMI was 23.13 in no depression, 25.37 among mild, 29.37 in mild to moderate and 36.00 was noticed among with moderate to severe grade of depression study subjects here significant (P<0.01*) association found in BMI and various grade of study subjects. Therefore, comparison of mean age was not significant whereas it was found to be significant among BMI

and among various grades of HDRS scores, regarding clinical parameters, mean blood pressure, mean pulse reported significant correlation to various grade of depression. Dolatian A et al¹¹ also reported a significant correlation between waist circumference, BMI and depression among the overweight and obese group, highlighting the concept of a significant relationship between obesity and depression. Both depression and obesity impose great economic costs and disease burden worldwide, and the high prevalence of both is an indicator of a relationship between them. Another comparable study by Feizi I et al¹² also revealed a positive significant relationship between BMI and depression. The comparison of mean blood pressure and related parameters among various grades of HDRS scores results revealed that mean pulse and various grade of depression showing significant ($P=0.0390$) results, whereas mean SBP ($P=0.985$) and mean DSB ($P=0.503$) showing non-significant association with various grades of depression. In a study by Rubio-Guerra AF et al¹³ found a high prevalence of depression in hypertensive patients; this prevalence was approximately nine times greater than what is observed in the general population. Thus, the presence of depression in hypertensive patients appears to be a risk factor for poorly controlled blood pressure. Monitoring blood glucose levels could affect the mental health of patients with diabetes. At least two conflicting hypotheses exist for the potential directionality of the association between HbA1c and depression. One possibility is that higher HbA1c levels increase the risk for depression. The mechanism could be that higher HbA1c levels due to prolonged hyperglycemia indicate a high risk of diabetic complications, and thus those complications have been previously associated with poor mental health and depression. Alternatively, there is a possibility that the risk of depression may be lower in those with higher levels of HbA1c. The mechanism for that would be that lowered HbA1c levels could be associated with more episodes of severe hypoglycemia. Because there is an association between hypoglycemic events and poorer mental health and depression, our second hypothesis proposes that there is a connection between a lower HbA1c and a higher risk for depression.¹⁴ The comparison of mean lipid profile related parameters among various grades of HDRS scores results revealed that mean TC was significant ($P=0.002^*$) with HDRS score. TG was non-significant ($P=0.275$), HDL was non-significant ($P=0.501$) and LDL was non-significant ($P=0.200$) with HDRS score. Thus, in case of comparison of mean blood sugar and related parameters among various grades of HDRS scores results revealed that there were non-significant association found in mean RBS, FBS, PPBS ($P=0.392$) and HbA1C ($P=0.163$) with various grade of HDRS score whereas comparison of mean lipid profile related parameters among various grades of HDRS scores revealed that mean TC was significant ($P=0.002^*$) whereas TG was non-significant ($P=0.275$), HDL was non-significant ($P=0.501$) and LDL was non-significant ($P=0.200$) with HDRS score. Various pathological mechanisms have been suggested for the increased risk of cardiovascular diseases in depressed patients, including altered cholesterol metabolism. Many forms of CVD are due to atherosclerosis, which is initiated by the accumulation of atherogenic lipids, such as the cholesterol-carrying low-density lipoproteins (LDL), in the blood vessel wall. In addition to the role of LDL, a deficit of high-density lipoproteins (HDL) contributes to atherosclerosis. HDL has anti-inflammatory properties, inhibits oxidation of LDL and can remove cholesterol from foam cells. In addition to CVD, levels of cholesterol and cholesterol-containing molecules have been linked to MDD. Decreased total serum cholesterol is commonly observed in depressed patients suffering from MDD when compared to healthy controls. Interestingly, lack of remission from depressive symptoms is also associated with low levels of both total serum cholesterol and LDL cholesterol. In addition to the observed association with differing HDL and LDL levels, the levels of constituent of lipoproteins have been associated with MDD.¹⁵ In the present study distribution of subjects according to their response to HDRS questionnaire results revealed that maximum depressed were 70 subjects who had depressed mood (sadness, hopeless, helpless, worthless) feeling states spontaneously reported verbally, 83 subjects feel guilt, 20 of them feel life is not worth living, 68 of them presented complaints of occasional difficulty falling asleep, 72 subjects had thoughts and feelings of incapacity, fatigue or weakness related to activities, work, or hobbies, 17 study subjects had loss of appetite but eating without staff encouragement; heavy feelings in abdomen and weight loss was present in 8 study subjects rest 131 did given any history of weight loss. However, a limitation of the HDRS is that atypical symptoms of depression (e.g., hypersomnia, hyperphagia) are not assessed.⁹ Individuals who have elevated random blood glucose levels, regardless of whether they have the classic symptoms of diabetes or are asymptomatic, need to undergo repeat testing for a diagnosis. Therefore, this aspect of the study design may have led to an overestimation of the prevalence of diabetes. India faces several challenges to tackle the diabetes epidemic. The increasing population of India is placing more pressure on the limited supply of healthcare professionals. Innovative healthcare solutions such as telemedicine, group visit models, and the use of allied healthcare professionals are urgently warranted in India to identify undiagnosed cases and to facilitate the early detection of diabetes.¹⁶

Conclusion

The present study has addressed the relation of depression in prediabetic males. Depression is found to be directly correlated, but there independent existence in prediabetic males can occur as found in our study. So, screening for these entities should be carried out. To validate the strength of association of depression and prediabetes larger studies with improved design need to be conducted. Life style changes through improved nutrition and physical activity are the first line therapy for prevention of transition from prediabetes to diabetes. Since this area has a potential to improve quality of life of prediabetic males, life style measures which can improve the outcome may be reinforced.

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