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Publication Date

2021

DOI

10.1016/j.jadr.2020.100071

Peer reviewed

HHS Public Access

Author manuscript

J Affect Disord Rep. Author manuscript; available in PMC 2022 January 01.

Published in final edited form as:

J Affect Disord Rep. 2021 January ; 3: . doi:10.1016/j.jadr.2020.100071.

Risk factors for severity of depression in participants with chronic medical conditions in rural primary health care settings in India

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Abstract

Background: Depression and chronic medical disorders are strongly linked. There are limited studies addressing the correlates of the severity of depression in patients with co-morbid disorders in primary care settings. This study aimed to identify the socio-demographic and disease-specific risk factors associated with the severity of depression at baseline among patients participating in a randomized controlled trial (HOPE study).

Methods: Participants were part of a randomized controlled trial in 49 primary care health centers in rural India. We included adults (≥ 30 years) with at least mild Depression or Anxiety Disorder and at least one Cardiovascular disorder or Type 2 Diabetes mellitus. They were assessed for the severity of depression using the PHQ-9, severity of anxiety, social support, number of co-morbid chronic medical illnesses, anthropometric measurements, HbA1c, and lipid profile.

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CRediT authorship contribution statement

Johnson Pradeep R: Conceptualization, Methodology, Validation, Formal analysis, Investigation, Resources, Data curation, Writing - original draft, Writing - review & editing, Visualization, Supervision. **Maria L. Ekstrand:** Conceptualization, Methodology, Validation, Formal analysis, Investigation, Resources, Data curation, Writing - original draft, Writing - review & editing, Visualization, Supervision, Project administration, Funding acquisition. **Sumithra Selvam:** Formal analysis, Investigation, Writing - original draft, Writing - review & editing, Visualization. **Elsa Heylen:** Conceptualization, Methodology, Validation, Formal analysis, Investigation, Resources, Data curation, Writing - original draft, Writing - review & editing, Visualization, Supervision, Project administration, Funding acquisition. **Prem K. Mony:** Conceptualization, Methodology, Validation, Formal analysis, Investigation, Resources, Data curation, Writing - original draft, Writing - review & editing, Visualization, Supervision, Project administration, Funding acquisition. **Krishnamachari Srinivasan:** Conceptualization, Methodology, Validation, Formal analysis, Investigation, Resources, Data curation, Writing - original draft, Writing - review & editing, Visualization, Supervision, Project administration, Funding acquisition.

Declaration of Competing Interest

All authors have declared no conflicts of interest or financial disclosures relevant to this article.

Results: Proportionately there were more women in the moderate category of depression than men. Ordinal logistic regression showed co-morbid anxiety and a lower level of education significantly increased the odds of more severe depression, while more social support was significantly negatively associated with depression severity in women. In men, anxiety was positively associated with greater depression severity; while reporting more social support was negatively associated with depression.

Limitations: This is a cross-sectional study and thus, no causal conclusions are possible

Conclusions: Anxiety and poor social support in both genders and lower educational levels in women were associated with increased severity of depression. Early identification of risk factors and appropriate treatment at a primary care setting may help in reducing the morbidity and mortality associated with depression.

Keywords

Severity of depression; Anxiety; Chronic medical illnesses; Social support; Primary health care

1. Introduction

Depression is a major global public health problem. Globally, more than 300 million people (4.4%) are estimated to have depression (WHO, 2017) and the prevalence of depression in primary care ranges from 2.3% to 48.5% (Fekadu et al., 2017; Vučurević et al., 2020) and in India the prevalence rates reported are 14.6% (Shidhaye et al., 2016) and 31.5% (Biswas et al., 2009). The World Health Organization (WHO) has predicted depression to be the second leading cause of disease burden by 2030. In India, the overall weighted percentage of depression is 2.7% for current and 5.3% for lifetime depression. Current depression percentages are higher in females (3%), the age group 40–49 years (3.6%), and urban residents (5.2%) (Gururaj et al., 2016).

There is a complex and strong link between depression and chronic medical disorders in terms of shared risk factors and pathophysiological pathways (Clarke and Currie, 2009). This co-morbidity is associated with worse physical disorder outcomes, increased mortality, greater disability, heightened functional impact, and worse quality of life than when either of the disorders is present alone (Moussavi et al., 2007). A recent systematic review and meta-analysis found that those with multimorbidity (presence of two or more chronic medical conditions) had three times greater risk of the depressive disorder compared to those without any chronic medical disorders (Egede et al., 2007; Read et al., 2017).

In India, there is a considerable increase in the prevalence of DM and HTN, and CVD. The NCD Risk Factor Collaboration (NCD-RisC) reported that age-standardized diabetes and hypertension prevalence among men in India has risen from 3.7% to 9.1% and 24.5% to 26.6%, respectively, and among women from 4.6% to 8.3% and 22.7% to 24.7%, respectively in the period from 1980 to 2014 (Zhou et al., 2016).

Some of the important risk factors for depression in diabetic patients include younger age of onset of diabetes (Wilkowska-Chmielewska et al., 2013), female gender, lower level of education, and higher BMI (Arshad, 2016), unemployment, and lower social support (Dougé

et al., 2014), shorter duration of diabetes (Arshad, 2016), the severity of diabetes symptoms (Nguyen et al., 2015) and smoking (Katon et al., 2004). Studies from India have also noted that female gender, lower education (Guruprasad et al., 2012; Nath et al., 2016) lower socioeconomic strata (Khullar et al., 2016), and increased BMI (35 to 39) are risk factors for depression among patients with diabetes. There is a reciprocal relationship between depression and cardiovascular diseases. (Alexopoulos, 2010). Several studies have reported associations between depression and an increased risk of developing cardiovascular disease in the future (Van der Kooy, 2007; Whooley and Wong, 2013) while it has also been shown that patients with cardiovascular disorders are at greater risk to develop depressive disorders compared to the general population (Bucciarelli et al., 2020).

Few studies have examined risk factors predictive of severity of depression in patients with co-morbid medical conditions. A study from the Hong Kong Jockey Club FAMILY Project cohort study (2009–2011), which included 6195 participants with self-reported chronic medical conditions, found that the mean PHQ-9 depression scores were positively associated with the number of chronic medical conditions after adjusting for age and sex (Nan et al., 2012).

Independent of chronic medical illness, the severity of depression is associated with greater disability and poorer quality of life (Noël et al., 2004; Trivedi et al., 2010). There is scarce research examining risk factors associated with the severity of depression in patients with co-morbid chronic medical conditions from low- and middle-income countries (LMIC) where the burden of non-communicable diseases and depression continues to rise rapidly (Math et al., 2007). Furthermore, in most of the studies that do exist, the diagnosis of chronic medical conditions was based on the patient's self-report (McIntyre et al., 2019; Nan et al., 2012). In the current study, we aim to contribute to the knowledge by analyzing the demographic and clinical correlates associated with the severity of depression with co-morbid chronic medical conditions that are assessed by diagnostic laboratory investigations instead of self-report. The present report is based on baseline data from an intervention study that is examining integrating care for mental health and chronic medical disease that includes diabetes mellitus, hypertension, and cardiovascular disorders among patients in primary health care settings (HOPE study) (Srinivasan et al., 2018).

2. Methods

2.1. Settings

The HOPE study was conducted in 49 primary health centers (PHC) situated in the rural district of Ramanagara situated in the state of Karnataka. We obtained the approval of the Institutional Ethical Review Board at St. John's Medical College and Hospital and Committee on Human Research, University of California, San Francisco.

Details of the study protocol have been published previously (Srinivasan et al., 2018). The screening occurred in two phases; the initial and confirmatory screening. The initial screening occurred at the PHCs and associated health fairs. Eligible participants were invited to the PHC for confirmatory screening prior to study enrolment. The eligibility criteria assessed in the initial and confirmatory screenings are listed in Table 1. Written informed

consent was taken by the research assistants for those who were interested in this study and met the eligibility criteria.

Following informed consent, participants were administered a face-to-face baseline interview at the PHCs by trained research assistants, within one week of the confirmatory screening. All questions were translated to Kannada and back-translated to English as per the WHO protocol (WHO, 2009). A study phlebotomist collected 10 ml of blood in a vacutainer and stored it in an icebox for the assessment of diabetes and lipid profile, and an electrocardiogram was done. These procedures were identical in the intervention and the control PHC.

2.2. Clinical and psychological assessments

We collected demographic details of the participants including age, gender, marital status, educational status, and household income (in Indian Rupees).

The Patient Health Questionnaire (PHQ-9) (Kroenke and Spitzer, 2002) is a 9-item scale and is it is used for depression in primary health care settings as per DSM IV criteria and for assessing the severity of depression. It assesses the presence of depressive symptoms in the past 2 weeks. The response options consist of 0 (not at all), 1 (several days), 2 (more than half of the days), and 3 (nearly all the days). Item scores are summed over all items, so the total score ranges from 0 to 27, and the severity of depression is categorized as minimal (0–4), mild (5–9), moderate (10–14), and severe (15–27). The PHQ-9 has been widely used in studies of patients with depression and co-morbid medical conditions (van Dooren et al., 2016 Dec 1; Petersen et al., 2019; Lovino et al., 2020) including investigations from India (Mathew et al., 2013; Arshad and Alvi, 2016).

The Generalized Anxiety Disorder Scale (GAD-7) (Spitzer et al., 2006) is a 7-item questionnaire used for screening and measuring the severity of generalized anxiety disorder in the past 2 weeks. A criterion standard study evaluated GAD-7 in 15 primary care clinics in the United States and found that GAD-7 was a valid and efficient tool for screening and assessing the severity of GAD (Spitzer et al., 2006). The item response options are 0 (not at all), 1 (several days), 2 (more than half of the days), and 3 (nearly all the days), the total scores range from 0 to 21. This scale has been used in multiple studies to assess the severity of anxiety in participants with co-morbid chronic medical conditions (Alkhadhari et al., 2018; Demmer et al., 2015). We have used the total scores in this study.

The Social Support Questionnaire (SSQ) (Malda, 2009) is a 12-item questionnaire. The original scale consisted of 6 items for instrumental social support and 6 items for emotional social support and was used to assess the social support of parents in a study of the home environment and cognitive performance of school-going children from urban Bangalore (Malda et al., 2009). In this study, we excluded one item from the instrumental social support subscale and one from the emotional social support subscale because the items asked about receiving support for child care and did not apply to our study population of mostly older adults. Response options range from 1 (definitely not enough) to 4 (definitely enough), and we used the total mean score of all the items.

We assessed the systolic and diastolic blood pressure twice at each visit using a standardized protocol. We defined hypertension as systolic blood pressure ≥140 mm Hg and/or diastolic blood pressure ≥ 90 mm Hg on two measurements. The participants were divided into two categories for the presence or absence of Hypertension.

We calculated the BMI based on the formula weight (kg) divided by height (m^2) (Stommel and Schoenborn, 2009).

The Rose Angina Questionnaire (RAQ) (Rose et al., 1977) has two parts, Part 1 and Part B and a positive response to either of Part A or Part B was considered positive for Ischaemic heart disease. Also, for all the participants, an electrocardiogram was done.

We assessed HbA1c as a measure of glycemic control in patients with diabetes mellitus. We used a cut off of 6.5% of HBA1c. This marker is better than blood glucose levels since it is not affected by dietary changes and has a good correlation with the disease severity (Kern, 2009).

We also assessed the lipid profile of participants. In our study, we defined the Dyslipidaemia as having LDL cholesterol levels > 190 [mg/dL] for patients without diabetes and > 70 [mg/dL] in diabetics.

2.3. Statistical analyses

Descriptive statistics were reported using mean with SD for the normally distributed continuous variables, else the median with 25th and 75th percentile (interquartile range, IQR). Categorical variables were reported as frequencies and percentages. Chi-square tests and independent *t*-test were used to compare the demographic and clinical characteristics between males and females. A multivariate logistic regression analysis, adjusted for covariates was performed to assess the socio-demographic and clinical characteristics associated with gender. Bivariate ordinal regression analysis was performed to examine the association of socio-demographic and clinical variables with the severity of depression separately in males and females because the females were overrepresented in the moderate depression category compared to men. Variables that were (marginally) significant with a p-value up to 0.10 in the bivariate analysis were retained to be included in a multivariate ordinal regression analysis to identify correlates associated with severity of depression adjusted for covariates. Adjusted odds ratio (AOR) and 95% confidence interval (CI) are reported. The assumption of proportional odds was tested using the test of parallel lines in the ordinal regression model. We used a two-tailed analysis and a p-value of less than 5% was considered statistically significant. All the analyses were performed using SPSS version 25.0. (IBM Corp., 2017)

3. Results

Socio-demographic and clinical characteristics of the study participants overall and by gender are described in Tables 2. In our study, in addition to the 2486 eligible participants who consented, only 200 who met the inclusion criteria did not consent to enroll in the study. There were no significant differences between cohort participants and those who did

not consent with respect to age (Not consented = 57.85 ± 10.42 yrs. vs participants 59.22 ± 10.01 yrs. [$p = 0.064$]) or gender (Not consented males =45 [22.5%], females = 155 [77.5%] vs. participants males = 622 [25%] and females = 1864 [75%] [$p = 0.427$]).

The mean age of the participants was 59.22 ± 10.01 years. The majority were females ($n = 1864$, 75%) and married ($n = 1591$, 64%). Over half did not have a formal education ($n = 1438$, 57.8%) and 71.2% of the participants had a monthly household income of ≤ 5000 Indian rupees. The median (IQR) score for PHQ-9 was 8 (6 – 11) and for GAD-7 it was 6 (4 – 9). The mean total social support score was 2.89 ± 0.46 on a 1 to 4 scale. About sixty percent of the participants had diabetes, 62.5% had hypertension, 60.9% had dyslipidemia, and 12.9% scored positive on the Rose Angina questionnaire. Nearly two-thirds of the participants were overweight/obese. The majority of the participants ($n = 1816$, 73%) had more than one medical condition.

PHQ-9 was used to describe the different levels of depression severity. Lower mean age, a higher proportion of widow/single, income <=5000, lower level of education, higher anxiety score, lower social support scores, and higher severity of depression was significantly associated with gender (Table 2). In both genders, half of the respondents (females $n = 939$ [50.37%], males $n = 310$ [49.83%]) were in the mild depression category, but the other half was distributed differently for male and female; the males were found significantly more in the minimal depression category, compared to females who were disproportionately represented in the moderate depression category ($n = 493$ [26.45%] $p = 0.001$). Although there were more females in the severe depression category compared to males, the difference was not statistically significant. Among the females, the increased severity of depression was higher despite adjusting for age, marital status, income, education, overweight, hypertension, social support, anxiety scores in multivariate analysis.

Given these gender differences, bivariate associations between socio-demographic and clinical variables with levels of depression severity were carried out separately for males and females and are presented in Tables 3 and 4, respectively, including unadjusted proportional OR with 95% C.I. In female participants, anxiety ($p<0.0001$) and possible ischaemic heart disease as per the Rose Angina questionnaire ($p = 0.004$) were positively associated with depression severity, while the level of education ($p = 0.001$) and social support ($p<0.0001$) had a negative association with depression severity. In male participants, anxiety (p ˂0.0001) had a positive association whereas the level of education ($p = 0.006$) and social support (p ˂0.0001) had a negative association with the depression severity.

In the multivariate analyses, a test of parallel lines was not statistically significant ($p = 0.174$), which indicates that the assumption of proportional odds was met and there was no multicollinearity. The adjusted proportional odds ratios among female participants showed that anxiety, total social support scores, and education were independently significantly associated with the severity of depression. Those with increased anxiety scores and no formal education had significantly higher odds of being in a higher category of depression severity than less anxious females and females with at least a secondary education, (AOR = 1.69, 95% CI: 1.64, 1.76; AOR = 1.49, 95% CI: 1.05, 2.13) respectively. However, total social support scores were significantly negatively associated with depression severity. The

odds of reporting more severe depression decreased with an increase in total social support scores, with an AOR of 0.78, (95% CI, 0.63, 0.95). Among male participants, anxiety scores and total social support scores were similarly independently and significantly associated with the severity of depression. Also, an increased anxiety score was significantly associated with increased odds of being in a higher category of depression severity (AOR = 1.72, 95% CI, 1.61, 1.84) and higher total social support scores decreased the odds of being in a higher category of depression severity, with an AOR of 0.56 (95% CI, 0.38, 0.82).

4. Discussion

In this rural population of patients with depression and co-morbid chronic medical conditions, we found that the proportion of participants reporting moderate depression symptoms was higher for females than for males. In both males and females, anxiety increased the odds of showing more severe depression and social support decreased these odds. Also, for females' lower level of education increased the odds of having more severe depression.

The finding that depression tends to be more severe among females compared to males is in agreement with previous studies in multiple settings, including the community (Grover et al., 2010; Assari and Dejman 2019; Weiss et al., 2016), among hospital in-patients (Barnow et al., 2002) as well as in studies of out-patient (Kornstein et al., 2000). There could be several possible reasons for increased vulnerability among females to suffer from severe depression that includes biological, psychosocial, and cultural factors (Desai, 2000; Kuehner, 2017). Among females in LMIC gender disadvantages such as poverty, lesser educational levels, fewer job opportunities, and physical abuse pose additional risk for depression (Patel, 2003).

Earlier studies have found higher rates of medication discontinuation in rural females with major depression. Reasons cited have included lack of transportation, financial difficulties, inability to take time off from work, and being dependent on other family members to travel; these could contribute to difficulties in accessing health care facilities and greater severity of depression among females compared to men (Bhat et al., 2020; Srinivasan et al., 2006). Females from rural settings often have to perform multiple tasks and responsibilities as demanded by their social-cultural milieu; that often restricts their access to resources impeding seeking help from health care settings (Fleischer et al., 2007; Sinha, 2017). Besides, perceived stigma is higher in females resulting in delayed help-seeking and poor medication adherence, and greater severity of depression (Angermeyer, 2003; Raguram et al., 1996).

The association between low educational status among females and increased severity of depression is in line with several previous studies (Arumugam et al., 2013; Kim et al., 2014; Swarnalatha, 2013). This relationship is found more often in the rural population (Pillay et al., 1999; Shidhaye et al., 2016). There are several possible reasons for this association. Low educational level among females amplifies the already existing gender disadvantages such as poverty and limited access to resources (such as nutrition, education, employment, health care). Also, a lower educational level among females is associated with decreased autonomy and lower decision-making capacity. These result in delayed help-seeking and health care

utilization resulting in greater severity of depression among females (Chandra and Satyanarayana, 2010; Gadalla, 2008; Osamor and Grady, 2016; Roy and Chaudhuri, 2008). Low educational level is also associated with poor mental health literacy and hence not seeking timely help (Uddin et al., 2019).

Across both genders, we found that co-morbid anxiety was associated with depression severity. Anxiety has been shown in several previous studies to be associated with greater depression severity and longer duration of depression (Andrade et al., 2003; Schuch et al., 2014; Weiss et al., 2016). This effect of anxiety on depression severity is also seen in patients with co-morbid medical conditions such as hypertension and type-2 diabetes (Lalwani et al., 2019). Especially in females, anxiety has been found to be a strong predictor of severe depression including thoughts of death or suicide (Weiss et al., 2016; Schofield et al., 2014) and predictive of recurrence and greater depressive symptomatology (Potvin et al., 2013).

Our findings of an inverse relationship between the availability of social support and severity of depression have previously been reported across all age groups including older adults (Shin et al., 2008; Strine et al., 2009) and especially in females (Wareham et al., 2007). Adequate social support was associated with remission of depressive symptoms while poor social support increased the risk of subsequent depression associated with a stressor, worsened depressive symptomatology, decreased life satisfaction, and significantly predicted fluctuations of depressive symptoms (Brown et al., 1986; George et al., 1989; Liu et al., 2017). Social support acts as a buffer against stressors, which can, in turn, protect people from the negative consequences of major physical illness and provide resources to facilitate adaptive coping with the illness (Cohen and Wills,1985; Cohen et al., 2001; Sherbourne, 1988). Studies have shown that participants with poor social support have higher mortality rates especially from cardiovascular diseases (Barth et al., 2010; Berkman et al., 2000), which was partially mediated by depression severity (Zhu et al., 2019).

More females tend to suffer from severe depression compared to men due to greater gender disadvantage, particularly in LMIC settings. The gender disadvantage manifests itself through life stressors linked to multiple roles and greater perceived stigma. Gender disadvantage among rural females is amplified by low education levels, low health literacy, and greater dependence on others which impedes access to health care facilities. Early identification of risk factors, and improving health literacy, and reducing stigma among rural females may help in accessing early treatment and prevent the development of severe depression.

The findings from the present study that the husbands were older and had a lower likelihood of being widowed, was probably because their wives are younger and therefore more likely to outlive their husbands (Perkins et al., 2016).

Some of the variables which we thought would be significantly associated with the severity of depression were the severity of co-morbid medical conditions and the number of chronic medical conditions. There could be several possible reasons for the lack of association between the severity of depression and chronic medical conditions in our sample. A few

studies that have noted a positive association between severity of depression and chronic medical conditions were either based on self-reported chronic medical conditions (Nan et al., 2012) or a tertiary care hospital-based study (Godil et al., 2017). In our study, the diagnosis of chronic medical conditions was based on laboratory investigations, and participants were drawn from a rural community. Earlier studies have observed that depression scores were less among those participants who were unaware of their medical conditions compared to those who are aware (Tablot et al., 2000). Our study participants comprised of both who were aware of their medical conditions as well as participants whose medical conditions were identified during eligibility screening. Some studies have also noted that depression scores tend to be higher in younger subjects with co-morbid chronic medical conditions (Grover et al., 2010; Kato, 2016). The majority of our participants were older.

4.1. Strengths

This was a large community-based study from rural India. We used laboratory measures to identify chronic medical illnesses while previous community-based studies relied on self-reports of medical conditions.

4.2. Limitations

The primary limitation in the present report is the cross-sectional nature of the analyses which prevents us from attributing a causal role to the risk factors. The findings from the present study cannot be generalized to populations in other parts of India. In addition, since we did not include other chronic medical conditions such as chronic obstructive lung disease and bronchial asthma that have been reported to be associated with an increased prevalence of depression, the findings cannot be generalized to those populations. While, the majority of our participants were females and are in agreement with community-based studies from India (Grover et al., 2010; Kallakuri et al., 2018), the underrepresentation of males in this study population could be a limitation. Future analyses of follow-up data from participants in the control arm of the trial could examine the associations longitudinally.

Conclusions

We found that anxiety and poor social support and, at least among females, lower educational levels, were associated with depression severity in patients with co-morbid medical conditions in a primary care setting. It is important to identify these correlates in patients with depression and co-morbid medical conditions as they require extended periods of treatment (Beaglehole, 2008). In addition, increasing awareness about depression and improving health literacy will promote timely help-seeking and adherence to treatment.

Acknowledgments

We would like to acknowledge the Government of Karnataka for giving us the permission to conduct the study at Ramnagara primary health care centers. In addition, PHC staff and physicians, Anil Maxim Lobo, Aishwarya G.V and all the research staff who helped in the conduct of the study.

Role of the funding source

This work was supported by the US National Institute of Mental Health (R01 MH100311).

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Table 1

Initial and Confirmatory Screening Criteria.

Initial Screening	**Age: 30 years or older**
Inclusion Criteria	• Mental competency: Modified Short Blessed Cognitive Test score ≤7 (Katzman et al., 1983) • General psychological distress: The Kessler-10 Scale (score ≥6) (Kessler et al., 2002) • Not currently taking anti-depressant medication • One or more of the following cut-off measures for diabetes, hypertension, and/or CVD: – Capillary Blood Sugar ≥160 mg/dL – Blood pressure ≥ 140/90 mmHg – Possible Ischemic heart disease: Rose angina questionnaire (Rose et al., 1977) AND/OR Self-reported physician-diagnosed history of Type 2 DM, hypertension, or ischemic heart disease
Confirmatory Screening Inclusion criteria	• Depression/anxiety: Meeting the criteria of the Mini-International Neuropsychiatric Interview (MINI) (Sheehan et al., 1998) for at least one of the following: – Major Depressive Episode – Dysthymia – Panic Disorder – Generalized Anxiety Disorder • One or more of the following clinical measures for diabetes, hypertension, and/or CVD: – Blood pressure ≥ 140/90 mmHg – Capillary blood sugar ≥160 mg/dL – Confirmation of possible rose angina via ECG AND/OR Physician-diagnosed history of DM, hypertension, or ischemic heart disease (patient must show prescription or medication)

Table 2

Baseline Clinical Variables of the Participants (n = 2486).

	Overall	Males n-622	Females n-1864	p-value
Age	59.2 ± 10.0	61.6 ± 10.9	58.4 ± 9.55	<0.0001
Marital status				
Widow/ Single	895 (36.0)	37 (5.9)	858 (46.0)	<0.0001
Married	1591 (64.0)	585 (94.1)	1006 (54.0)	
Income				
<= 5000	1770 (71.2)	387 (62.2)	1383 (74.2)	<0.0001
>5000	716 (28.8)	235 (37.8)	481 (25.8)	
Education				
No formal	1438 (57.8)	181 (29.2)	1257 (67.5)	<0.0001
Primary	726 (29.2)	262 (42.3)	464 (24.9)	
Secondary	319 (12.8)	177 (28.5)	142 (7.6)	
Depression Categories				
Minimal	380 (15.3)	123 (19.8)	257 (13.8)	0.001
Mild	1249 (50.2)	310 (49.8)	939 (50.4)	
Moderate	627 (25.2)	134 (21.5)	493 (26.4)	
Severe	230 (9.3)	55 (8.8)	175 (9.4)	
Anxiety Scores	6.75±3.73	6.35± 3.83	6.88 ± 3.68	0.002
Total Social Support	2.89 ± 0.46	2.92 ± 0.44	2.87 0.47	0.011
Diabetes (n = 2469)				
No	971 (39.1)	393 (63.5)	1104 (59.7)	0.090
Yes	1498 (60.3)	226 (36.5)	745 (40.3)	
Hypertension(n = 2474)				
Normal BP	919 (37.0)	202 (32.7)	717 (38.6)	0.008
Hypertension	1555 (62.5)	416 (67.3)	1139 (61.4)	
Dyslipidemia(n = 2469)				
No	954 (38.4)	251 (40.5)	703 (38.0)	0.276
Yes	1515 (60.9)	369 (59.5)	1146 (62.0)	
positive Rose Angina (n = 2459)				

	Overall	**Males n-622**	**Females n-1864**	**p-value**
No	2141 (86.1)	526 (85.5)	161 (87.5)	0.189
Yes	318 (12.9)	89 (14.5)	229 (12.4)	
BMI (*n* = 2473)				
Normal (18.5 – 24.9)	916 (36.8)	287 (46.3)	629 (33.9)	<0.0001
overweight/obese (>=25)	1557 (62.6)	333 (53.7)	1224 (66.1)	

Reported as number (%) except for age, anxiety scores, and total social support as mean ± SD; p-value using independent *t* -test/ Chi-square test.

Table 3

Associations of socio-demographic and clinical variables with the severity of depression among females.

	Minimal *n* = 257	Mild *n* = 939	Moderate *n* = 493	Severe *n* = 175	Unadjusted OR (95% CI)	P value	Adjusted OR (95% CI)	P Value
Age[$]	57.8 ± 9.51	58.6 ± 9.48	58.2 ± 9.48	58.9 ± 9.56	1.00 (0.99, 1.01)	0.67		
Marital status								
Married	132 (13.1)	513 (51.0)	270 (26.8)	91 (9.0)	0.97 (0.82, 1.16)	0.76		
Widow/ Single	125 (14.6)	426 (49.7)	223 (26.0)	84 (9.8)	1			
Income								
<= 5000	194 (14.0)	696 (50.3)	370 (26.8)	123 (8.9)	0.94 (0.77, 1.14)	0.51		
>5000	63 (13.1)	243 (50.5)	123 (25.6)	52 (10.8)	1			
Education								
No formal	161 (12.8)	623 (49.6)	332 (26.4)	141 (11.2)	1.76 (1.26, 2.44)	0.001	1.49 (1.05, 2.13)	0.02
Primary	67 (14.4)	242 (52.2)	125 (26.9)	30 (6.5)	1.42 (0.99, 2.03)	0.054	1.42 (0.97, 2.09)	0.07
Secondary or above	29 (20.4)	74 (52.1)	36 (25.4)	3 (2.1)	1		1	
Overweight						0.44		
Present	85 (13.5)	314 (49.9)	162 (25.9)	68 (10.8)	1.07 (0.89, 1.28)			
Absent	170 (13.9)	621 (50.7)	329 (26.9)	104 (8.5)	1			
Total Social Support[$]	3.01 ± 0.47	2.90 ± 0.42	2.84 ± 0.47	2.60 ± 0.55	0.44 (0.37, 0.54)	<0.0001	0.78 (0.63, 0.95)	0.019
Anxiety[$$]	3.0 (2.0, 5.0)	6.0 (4.0, 7.0)	9.0 (7.0, 11.0)	12.0 (10.0, 15.0)	1.71 (1.65, 1.77)	<0.0001	1.69 (1.64, 1.76)	<0.0001
No. of Co-morbid medical conditions[$]	2.09+ 0.91	2.17 ± 0.87	2.23 ± 0.86	2.18 ± 0.93	1.09 (0.99, 1.21)	0.06	1.08 (0.97, 1.22)	0.15
Diabetes status								
HbAlc <6.5	110 (14.8)	376 (50.5)	176 (23.6)	83 (11.1)	1	0.63		
HbAlC >=6.5	145 (13.1)	558 (50.5)	310 (28.1)	91 (8.2)	0.95 (0.80, 1.14)			
Hypertension						0.86		
Yes	153 (13.4)	580 (50.9)	299 (26.3)	107 (9.4)	0.98 (0.82, 1.17)			
No	104 (14.5)	355 (49.5)	191 (26.6)	67 (9.3)	1			
Dyslipidemia						0.75		

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	Minimal *n* = 257	Mild *n* = 939	Moderate *n* = 493	Severe *n* = 175	Unadjusted OR (95% CI)	P value	Adjusted OR (95% CI)	P Value
Yes	152 (13.3)	581 (50.7)	315 (27.5)	98 (8.6)	0.97 (0.82, 1.16)			
No	103 914.7)	353 (50.2)	171 (24.3)	76 (10.8)	1			
Rose angina Questionnaire								
Yes	26(11.4)	103 (45.0)	69 (30.1)	31 (13.5)	1.45 (1.13, 2.25)	0.004	1.19 (0.87, 1.61)	0.26
No	230 (14.2)	828 (51.3)	414 (25.6)	143 (8.9)	1		1	

Reported as number (%);

$ - Reported as mean (SD);

$$ - reported as median (IQR).

Table 4

Associations of socio-demographic and clinical variables with the severity of depression among males.

	Minimal *n* = 123	Mild *n* = 310	Moderate *n* = 134	Severe *n* = 55	Unadjusted OR (95% CI)	P value	adjusted OR (95% CI)	P Value
Age[$]	60.1 ±11.7	62.8 ± 10.2	61.8 ± 10.9	57.7 ± 12.0	0.99 (0.98,1.01)	0.59		
Marital status						0.24		
Married	112 (19.1)	294 (50.3)	127 (21.7)	52 (8.9)	0.68 (0.37, 1.28)			
Widow/ Single	11 (29.7)	16 (43.20	7 (18.9)	3 (8.1)	1			
Income						0.91		
<= 5000	75 (19.4)	198 (51.2)	77 (19.9)	37 (9.6)	0.98 (0.73, 1.33)			
>5000	48 (20.4)	112 (47.7)	57 (24.3)	18 (7.7)	1			
Education[a]								
No formal	24 (13.3)	92 (50.8)	49 (27.1)	16 (8.8)	1.72 (1.17, 2.54)	0.006	1.33 (0.86, 2.05)	0.198
Primary	54 (20.6)	132 (50.4)	53 (20.2)	23 (8.8)	1.22 (0.85, 1.75)	0.274	1.03 (0.69, 1.53)	0.880
Above Secondary	45 (25.4)	86 (48.6)	30 (16.9)	16 (9.0)	1		1	
Overweight								
Present	54 (18.8)	149 (51.9)	58 (20.2)	26 (9.1)	0.99 (0.73, 1.33)	0.96		
Absent	68 (20.4)	161 (48.3)	75 (22.5)	29 (8.7)	1			
Total Social Support[$]	3.05 ± 0.43	2.96 + 0.38	2.85 + 0.49	2.92 + 0.45	0.34 (0.24, 0.48)	<0.0001	0.56 (0.38, 0.82).	0.003
Anxiety[$$]	3.0 (2.0, 4.0)	5.0 (4.0, 7.0)	9.0 (7.0, 10.0)	13.0 (11.0, 16.0)	1.73 (1.63, 1.85)	<0.0001	1.72 (1.61, 1.84)	<0.001
Comorbidities[$]	2.16 ± 0.86	2.23 ± 0.88	2.18 ± 0.91	2.36 ± 0.88	1.06 (0.90, 1.26)	0.43	1.07 (0.87, 1.32)	0.50
Diabetes status						0.78		
HbAlc <6.5	53 (23.5)	99 (43.8)	53 (23.5)	21 (9.3)	1			
HbAlC >=6.5	70 (17.8)	209 (53.0)	81 (20.6)	34 (8.6)	0.95 (0.70, 1.30)			
Hypertension						0.83		
Yes	89 (21.4)	199 (47.8)	92 (22.1)	36 (8.7)	1.03 (0.75, 1.42)			
No	34 (16.8)	111 (55.0)	42 (20.8)	15 (7.4)	1			
Dyslipidemia								
Yes	67 (18.2)	194 (52.6)	74 (20.1)	34 (9.2)	0.96 (0.72, 1.30)	0.82		
No	56 (22.3)	114 (45.4)	60 (23.9)	21 (8.4)	1			

	Minimal *n* = 123	Mild *n* = 310	Moderate *n* = 134	Severe *n* = 55	Unadjusted OR (95% CI)	P value	adjusted OR (95% CI)	P Value
Rose angina Questionnaire								
Yes	16 (18.0)	39 (43.8)	19 (21.3)	15 (16.9)	1.48 (0.97, 2.25)	0.07	1.07 (0.63, 1.78)	0.84
No	105 (20.0)	268 (51.0)	113 (21.5)	40 (7.6)	1		1	

Reported as number (%);

$ - Reported as mean (SD);

$$ - reported as median (IQR);.