Depression among TB patients and associated factors in Kathmandu Valley, Nepal

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Abstract

Introduction. When tuberculosis (TB) and depression co-occur, there is greater risk for comorbidities, disability, suffering, and health-related costs. Depression is also associated with poor treatment adherence in patients with TB. The major aim of this study was to assess the symptoms of depression and associated factors among TB patients currently receiving directly observed treatment short-course (DOTS) treatment.

Methods. A cross-sectional study was conducted among TB patients currently undergoing treatment in 27 DOTS centers in three districts of Kathmandu Valley. The study included 250 TB patients within 2 months of treatment initiation, aged 18 years and above. The previously validated Nepali Patient Health Questionnaire (PHQ-9) was used to screen for depression and semi-structured interviews were conducted to collect socio-demographic information and other factors related to TB and/or depression. Data analysis was conducted using IBM SPSS Statistics version 20.

Results. The study found the mean PHQ Score to be 2.84 (S.D. 4.92, range 0–25). Among the respondents, 10% (n = 25) had PHQ-9 scores ≥10, suggestive of probable depression. Multivariate linear regression indicated that depressive symptoms were significantly associated with being separated/widowed/divorced (p = 0.000) and having lower education (0.003). In addition, smoking (p = 0.02), alcohol use (p = 0.001), and experience of side effects from TB medications (p = 0.001) were risk factors for higher PHQ-9 scores.

Conclusions. Our findings suggest that patients on TB treatment have higher risk of depression and efforts should be made by the National Tuberculosis Program to address this issue.

Background

Depression may affect as many as half of all individuals with tuberculosis (TB) (Sweetland et al., 2014), which presents significant challenges to the management of these comorbid illnesses. Anxiety and depression are frequently co-occurring among patients with TB and are associated with poor adherence to anti-TB medications (Ige and Lasebikan, 2011; Duko et al. 2015) and higher mortality (Koyanagi et al., 2017). When TB and depression co-occur, there is a greater risk for other comorbidities, patients may suffer more, and associated cost increases (Basu et al., 2012). Depression may also pose an increased susceptibility to TB reactivation by compromising immunity or through neglected self-care (Sweetland et al., 2017). Thus, depression may be an unrecognized driver of the global TB and multidrug-resistant TB (MDR-TB) epidemics (Sweetland et al., 2014; Koyanagi et al., 2017).

A number of studies have assessed co-morbidity of depression and anxiety with TB (Amreen and Rizvi, 2016). A research study in Nigeria showed that 41.9% TB patients had depressive symptoms. Likewise, research conducted in India showed that the prevalence of depression among TB outpatients was 49%, and 54% in hospitalized TB patients (Adem et al., 2014). Similarly, evidence from cross-sectional studies in several African countries found the prevalence of comorbid depression among TB patients in a range from 10% to 52% (Ambaw et al., 2015). Two studies in Nepal have assessed the prevalence of depression among patients with drug-susceptible TB and MDR-TB, respectively. At an urban directly observed treatment short-course (DOTS) center in Kathmandu, of the 150 TB patients included in the sample, 18% had depression (Devkota et al., 2016). The frequency of mild depression was 16 (11%), for moderate depression was 6 (4%), for severe depression was 3 (2%) and that for very severe depression was 2 (1%). All cases of depression required medical attention. In a recent sample of 135 patients with MDR-TB in Nepal, the prevalence of depression and anxiety were 22.2% and 15.6%, respectively (Walker et al., 2019).

The co-occurrence of depression and TB can negatively impact quality of life, health care costs and self-care, as well as decreased immunity; all of these can affect patients’ adherence to TB treatment and TB outcomes (Duko et al., 2015; Kunal et al., 2016; Sweetland et al., 2017;
Ambaw et al., 2018). Poor treatment adherence not only increases the risk of negative TB outcomes, but also poses a public health risk given the potential for community transmission and/or development of drug resistance (Ambaw et al., 2017; Sweetland et al., 2017). Psychosocial concerns such as stigma, isolation, limited social support, helplessness, and other psychological reactions to the disclosing TB diagnosis, as well as medication side effects, all adversely impact treatment adherence (Mounika et al., 2016).

Given the limited availability of data on the prevalence of depression among TB patients in Nepal, this study was conducted with the aim of identifying the prevalence of depression among TB patients and the social factors associated with it.

Methods

Study design and population

A descriptive cross-sectional study was conducted among TB patients currently under treatment in DOTS centers in different treatment centers of Kathmandu Valley to study the prevalence of depression and associated factors. A total of 27 DOTS centers were selected from the three districts of Kathmandu Valley, including 10 from Kathmandu, 11 from Lalitpur, and 6 from Bhaktapur. Urban centers with higher caseloads were preferentially selected to achieve the desired sample size. Patients meeting the inclusion criteria (new adult patients within 2 months of initiating TB treatment) were recruited from these DOTS centers until the desired sample size was achieved. Medications and treatment protocols were identical across all DOTS sites.

Sampling and inclusion criteria

Given that depression may be highest at baseline (Yen et al., 2015; Ambaw et al., 2017; Dasa et al., 2019) and may be higher in patients with MDR-TB (Vega et al., 2004), only new TB patients (never treated before) aged 18 years and above in the first 2 months of DOTS treatment (intensive phase) through the National TB Program were considered for the study. In order to maximize comparability across the sample, individuals being re-treated for TB (possible MDR-TB) or who had received more than 60 days of treatment (continuation phase) were excluded.

The sample size was calculated using the following formula (Naing et al., 2006):

\[ N = \frac{z^2 P(1 - P)}{d^2} \]

where \( N \) = sample size, \( Z^2 = Z \) statistic for a level of confidence (95%), \( P = \) prevalence (18%) (Devkota et al., 2016), and \( d = \) precision (5%).

Based on the above mentioned values, the sample size (\( N \)) was calculated as follows:

\[ N = \frac{(1.96)^2 \times 0.18 \times 0.82}{0.0025} \]

\[ N = 227 \]

Adding 10% non-response rate,

\[ N = 250. \]

Measurement

The previously validated Nepali Patient Health Questionnaire (PHQ-9) (Kohrt et al., 2016) was used to screen for depression (dependent variable). The PHQ-9 was originally developed to be a self-administered screening tool for patients in medical settings based on the PRIME-MD (Kroenke et al., 2001), but is often administered via interview in low literacy settings (Kohrt et al., 2016). Independent variables included sociodemographic characteristics, social stigma, perceived social support, medication adherence, and TB-related side effects. To assess social stigma, patients were asked several questions based on prior studies including if they had disclosed their TB status to family and friends, had direct experiences of stigma or discrimination, felt guilty or shy about their TB status, and/or felt helplessness or loneliness due to their diagnosis. Patients were also asked to rate their perceived social support, whether they had ever forgotten to take their medications (adherence), and if they experienced any TB-related side effects.

Data collection

The health workers of the respective DOTS centers were oriented about the study as well as informed about the use of PHQ-9. Trained research assistants administered the PHQ-9 to assess the frequency and severity of depressive symptoms, followed by a semi-structured interview to obtain socio-demographic characteristics, TB-related information, and other factors.

Ethical approval was obtained from the Department of Psychology and Philosophy, Tri Chandra Multiple Campus, Kathmandu to conduct the study. Verbal informed consent was obtained from the participants prior to the study. The consent form was designed and approved before inclusion of participants in the study. The participants were informed about the purpose of the study, about their voluntary participation in the study and their right to leave the study at any time. Confidentiality was maintained at all levels of the study. The data collected were also kept confidential and used by the researcher for the study purpose only.

Data analysis

The collected data was entered into IBM SPSS Statistics version 20. Given the strong overlap in TB and depressive symptoms, and the fact that the screening scale was previously validated among a non-TB sample, we decided to analyze the PHQ-9 data in two ways including logistic (depression as binary using a cut off score of 10) and linear (depression symptoms as continuous) regressions. The age group and educational level were treated as ordinal variables, whereas other sociodemographic variables were treated categorically, including sex (male = 0, female = 1), marital status, and occupation. For marital status we used ‘married’ as the default comparison group and created two dummy variables for ‘never married’ or ‘separated/widowed/divorced.’ For occupation, we compared ‘wage labor’ and ‘student’ to everything else.
The sociodemographic characteristics of the sample are described in Table 1. The mean age the respondents was 32.69 (range 18–84, S.D. 14.86). The largest age group was between 18–24 years with 40% of the total respondents. The sex distribution was 55% male and 45% female. Approximately half (53%) were married and 44% had never married. Nearly one third (31.6%) of the respondents were current students. One quarter (26.0%) had completed their higher secondary education, and 20.8% had achieved a bachelor’s degree or higher.

Factors associated with TB

The sample included new cases of TB in the first phase of treatment (see Table 2). Of the total respondents, almost 50% (n = 124) were bacteriologically confirmed new pulmonary TB cases, 44.8% had extrapulmonary TB, and 5.6% were diagnosed by clinical pulmonary assessment. A total of 206 respondents (82.4%) were aware of their human immunodeficiency virus (HIV) status; of these, 94.6% (n = 195) were HIV negative and 4.4% (n = 11) were HIV positive. Approximately 69% respondents had disclosed their TB status to their family members, friends, and relatives and among those, 87% perceived good social support. Although only 5.6% (n = 14) of respondents reported experiences of stigma or discrimination because of TB, 13.2% (n = 33) respondents felt guilty or shy, 10.4% (n = 26) felt loneliness, and 7.2% (n = 18) respondents felt helplessness due to TB. A total of 6.8% of respondents (n = 17) self-reported having forgotten to take their TB medications at least one time during treatment so far and about 30% respondents (n = 74) had experienced some TB-related side effects at least once.

PHQ-9 score and depression

Among the respondents, 10.0% (n = 25) had scores above the cut off of 10, suggestive of probable depression. Forty-four patients (17.6%) reported that depressive symptoms negatively impacted their daily lives in their work, self-care, care for and/or relationship with others. When asked whether they perceived that people with TB had greater risk for depression, 18.0% (n = 45) agreed. Most patients (97.2%) believed that their TB would be cured (see Table 3).

Association between PHQ-9 score and socio-demographic and TB-related factors

Bivariate linear (continuous regression) analysis found that the higher PHQ score was associated with older age (p = 0.009), marital status [never married (p = 0.008) and separated/divorced (p = 0.000)], and occupation [student (p = 0.027)]. When controlling for other sociodemographic factors through multivariate linear (continuous regression) analysis, age and occupation were no longer significant, and only being separated/divorced and having lower education were significant risk factors for higher PHQ-9 scores (p = 0.000 and p = 0.003, respectively). When treating PHQ-9 score as binary variable indicating the presence or absence of probable depression (above and below 10), multivariate logistic (binary regression) analysis found the same pattern of results (Table 4). Additional risk factors for high depressive symptoms were current smoking (p = 0.02), current drinking (p = 0.001), and having experienced TB-related side effects (p = 0.001) (Table 5).

Discussion

The prevalence of depression in our study was lower than findings from two other studies conducted in Nepal. In the first study among an urban sample patient with TB or MDR-TB, 18% suffered from some levels of depression requiring medical attention (Devkota et al., 2016). In a more recent study among only MDR-TB patients, the prevalence of depression was estimated...
as 22.2%. It is unclear why the prevalence of depression was significantly lower in our sample (10%); one reason could be that we excluded MDR-TB patients, who have a greater risk for depression (Vega et al., 2004), or because we used a different depression screening tool.

In fact, estimating depression prevalence in TB patients using screening tools, in general, is inherently problematic. Given the strong overlap of symptoms between TB and depression, particularly physical symptoms (e.g. changes in appetite, sleep, or energy level), it is not clear if it is even valid to use the same cut-off score used in validation studies among non-TB patients (Castro Silva et al., 2018). Individuals with high scores on self-report measures of depressive symptoms and meet interviewer-rated psychiatric diagnostic criteria (true positives) differ in important ways from individuals who obtain similarly high scores on self-report measures of depressive symptoms but do not meet interviewer-rated criteria for a diagnosis of depression (false positives) (Gotlib et al., 1995). That said, the PHQ-9 is one of the most widely used globally to screen for depression among TB patients. Compared to other studies using the PHQ-9 among TB patients, the prevalence of depression in our sample was lower than samples from Cameroon (25%) India (42%), Ethiopia (54%), Pakistan (56%), and Brazil (62%) (Mandaknalli and Giriraj, 2015; Amreen and Rizvi, 2016; Kehbila et al., 2016; Ambaw et al., 2017; Castro Silva et al., 2018) but higher than one study in Nigeria (6.2%) (Issa et al., 2009). Other global studies using Hospital Depression & Anxiety Scale found similarly high prevalence estimates for depression including 47% (India), 46% (Pakistan), and 43% (Ethiopia) (Husain et al., 2008; Duko et al., 2015; Kunal et al., 2016). When examining depression and anxiety together, two studies found a prevalence of 72% (Pakistan) and 80% (India) (Mounika et al., 2016; Siddiqua and Aisha, 2016). In Nigerian study using the Hamilton Depression Rating Scale, the prevalence of moderate depression was 32% (Ige and Lasebikan, 2011).

In terms of sociodemographic correlates, we found that being separated/widowed/divorced and/or lower educational attainment were the only significant risk factors for depression in our sample. These findings differ from a cross-sectional, community-based dataset from 48 low and middle-income countries, in which the prevalence of depressive episodes among those with TB based on the Composite International Diagnostic Interview was 23.7%, and was significantly associated with older age, female sex, lower levels of wealth, smoking, and diabetes (Koyanagi et al., 2017). That said, low education and marital disruption are among the most common social correlates with depression across cultures based on the World Mental Health Survey (Kessler and Bromet, 2014).

Table 2. TB associated factors (n=250)

| Types of TB                           | Frequency | Percent |
|--------------------------------------|-----------|---------|
| New PBC (pulmonary bacteriologically confirmed) | 124       | 49.6    |
| New PCD (pulmonary clinically diagnosed)   | 14        | 5.6     |
| New EP (extra pulmonary)               | 112       | 44.8    |
| HIV infection                         |           |         |
| Yes                                   | 11        | 4.4     |
| No                                    | 195       | 78.0    |
| Unknown                               | 44        | 17.6    |
| Known status of TB among family, friends and relatives |           |         |
| Yes                                   | 172       | 68.8    |
| No                                    | 78        | 31.2    |
| Perceived support from family, friends and relatives |           |         |
| Yes                                   | 150       | 87.2    |
| No                                    | 22        | 12.8    |
| Feeling of stigma or discrimination due to TB |           |         |
| Yes                                   | 14        | 5.6     |
| No                                    | 236       | 94.4    |
| Feeling of guilty or shy due to TB     |           |         |
| Yes                                   | 33        | 13.2    |
| No                                    | 217       | 86.8    |
| Feeling of loneliness due to TB       |           |         |
| Yes                                   | 26        | 10.4    |
| No                                    | 224       | 89.6    |
| Feeling of helplessness due to TB     |           |         |
| Yes                                   | 18        | 7.2     |
| No                                    | 232       | 92.8    |
| Forgotten to take TB medications (at least one time during the course of treatment) | | |
| Yes                                   | 17        | 6.8     |
| No                                    | 233       | 93.2    |
| Experience of side effects from TB medications (at least one time during the course of treatment) | | |
| Yes                                   | 74        | 29.6    |
| No                                    | 176       | 70.4    |

Table 3. PHQ score and depression (n=250)

| Presence of symptoms of depression (based on PHQ score ≥10) | Frequency | Percent |
|-------------------------------------------------------------|-----------|---------|
| Presence of symptoms of depression (based on PHQ score ≥10) |           |         |
| Yes                                                          | 25        | 10.0    |
| No                                                           | 225       | 90.0    |
| How often in the past two weeks have the problems affected your work, self-care and your care for family and your relationship with others? | | |
| Never                                                        | 206       | 82.4    |
| Sometimes                                                    | 29        | 11.6    |
| Often                                                        | 15        | 6       |
| Patient’s perception on TB patients at risk of depression |           |         |
| Yes                                                          | 45        | 18.0    |
| No                                                           | 205       | 82.0    |
| Patient’s perception on curability of their TB               |           |         |
| Yes                                                          | 243       | 97.2    |
| No                                                           | 7         | 2.8     |
TB-related stigma and discrimination are still highly prevalent worldwide, and are associated with greater risk for depression (Sweetland et al., 2017). In our sample, 31% of patients did not disclose their TB status among family, and many endorsed experiencing feelings of guilt, loneliness, and helplessness due to TB. Several studies have explored TB-related stigma in Nepal. One study among 60 TB patients found that 63.3% \((n = 38)\) of the subjects had experienced stigma (Aryal et al., 2012), while another study among 89 patients revealed 64% of people were stigmatized due to TB (Priyanka and Dahal,

Table 4. Relationship of PHQ score and symptoms of depression with socio demographic variables

| TB related factors | N     | %       | B     | s.e.  | p Value |
|--------------------|-------|---------|-------|-------|---------|
| Type of TB (n = 250) |       |         |       |       |         |
| Extra pulmonary TB | 112   | 44.8%   | 0.331 | 0.626 | 0.597   |
| Pulmonary TB       | 138   | 55.2%   |       |       |         |
| HIV status (n = 206) |       |         |       |       |         |
| Positive           | 11    | 5.3%    | 1.897 | 1.468 | 0.198   |
| Negative           | 195   | 94.7%   |       |       |         |
| Experience of side effects from TB medications (n = 250) |       |         |       |       |         |
| Yes                | 74    | 29.6%   | 2.18  | 0.668 | 0.001*  |
| No                 | 176   | 70.4%   |       |       |         |
| Forgotten to take TB medications (n = 250) |       |         |       |       |         |
| Yes                | 17    | 6.8%    | 0.799 | 1.236 | 0.519   |
| No                 | 233   | 93.2%   |       |       |         |
| Disclosure of TB status to family and friends (n = 250) |       |         |       |       |         |
| Yes                | 172   | 68.8%   | −0.991| 0.626 | 0.597   |
| No                 | 78    | 31.2%   |       |       |         |
| Current smoking status (n = 250) |       |         |       |       |         |
| Yes                | 12    | 4.8%    | 1.379 | 0.591 | 0.02*   |
| No                 | 238   | 95.2%   |       |       |         |
| Current alcohol use status (n = 250) |       |         |       |       |         |
| Yes                | 21    | 8.4%    | 1.733 | 0.516 | 0.001*  |
| No                 | 229   | 91.6%   |       |       |         |

*Statistically significant.
2016). A qualitative study in Nepal that sought to identify the causes of TB-related stigma and self-discrimination found patient’s fear of transmission of disease and fear of gossip as the two main contributors (Baral et al., 2007). Causes of discrimination by the community included fear of perceived risk of infection; perceived links between TB and poverty and low caste; perceived links between TB and disreputable behavior; and perceptions that TB was a divine punishment. Of note, some patients felt they were discriminated against by health workers (Baral et al., 2007).

Conclusions

This study revealed that depression is a significant challenge for TB patients in Nepal, requiring attention by the NTP and TB providers. The WHO End TB strategy explicitly calls for integrated patient-centered care, including the treatment of mental disorders, in order to achieve TB elimination (Stop TB Partnership, 2016), and the WHO recently called for a TB and Mental Health collaborative framework to meet these needs (Sweetland et al., 2018). Furthermore, many NTP directors globally have expressed openness to integrating counseling and brief psychological interventions that have demonstrated effectiveness (Sweetland et al., 2019). Routine screening for depressive symptoms among TB patients, followed by a timely confirmatory diagnosis so such patients can receive treatment in order to improve the likelihood of positive TB outcomes (Sweetland et al., 2017). Operational research may guide programs how to best implement this across settings.

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Conflict of interest. None.

Ethical standards. The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008 and the authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional guides on the care and use of laboratory animals.

References

Adem A, Tesfaye M and Adem M (2014) The prevalence and pattern of depression in patients with tuberculosis on follow-up at Jimma University Specialized Hospital and Jimma Health Center. Medicine Science 3, 955–968. Available at https://www.researchgate.net/publication/259339714_The_Prevvalence_and_Pattern_of_Depression_in_Patients_with_Tuberculosis_on_Follow-up_at_Jimma_University_Specialized_Hospital_and_Jimma_Health_Center.

Ambw F, Mayston R, Hanlon C, Alem A (2015) Depression among patients with tuberculosis: determinants, course and impact on pathways to care and treatment outcomes in a primary care setting in southern Ethiopia—a study protocol. BMJ Open 5, e007653. doi: 10.1136/bmjopen-2015-007653.

Ambw F, Mayston R, Hanlon C and Alem A (2017) Burden and presentation of depression among newly diagnosed individuals with TB in primary care settings in Ethiopia. BMC Psychiatry 17, 57. https://bmcpsychiatry.biomedcentral.com/articles/10.1186/s12888-017-1231-4.

Ambw F, Mayston R, Hanlon C, Medhin G and Alem A (2018) Untreated depression and tuberculosis treatment outcomes, quality of life and disability, Ethiopia. Bulletin of the World Health Organization 96, 243–255.

Amreen and Rizvi N (2016) Frequency of depression and anxiety among tuberculosis patients. Journal of Tuberculosis Research 4, 183–190. http://dx.doi.org/10.4236/jtr.2016.44021. Available at https://file.scirp.org/pdf/jtr_16121514314528.pdf.

Aryal S, Badhu A, Pandey S, Bhandari A, Khatiwoda P, Khatiwada P, Giri A (2012) Stigma related to tuberculosis among patients attending DOTS clinics of Dharan Municipality. Kathmandu University Medical Journal 37, 48–52. Available at https://www.nepjol.info/index.php/KUMJ/article/viewFile/6914/5624.

Baral SC, Karaki DK and Newell JN (2007) Causes of stigma and discrimination associated with tuberculosis in Nepal: a qualitative study. BMC Public Health 7, 211. Available at https://bmcpublichealth.biomedcentral.com/articles/10.1186/1471-2458-7-211.

Basu G, Chatterjee C, Singh R and Biswas S (2012) Prevalence of depression in tuberculosis patients: an experience from a DOTS clinic. Indian Journal of Research and Reports in Medical Sciences 2. Available at 14–17. doi: https://www.researchgate.net/publication/235705055_Depression_and_its_correlates_among_Tuberculosis_patients_experience_from_aDOTS_clinic_of_a_sub_divisional_hospital_of_West_Bengal.

Castro-Silva KM, Carvalho AC, Cavalcanti MT, Martins PDS, Franca JR, Oquendo M, Kritski A and Sweetland M (2018) Depression among patients with presumptive pulmonary tuberculosis in Rio de Janeiro, Brazil. Braz J Psychiatry. 316–323. doi: 10.1590/1516-4446-2018-0076.

Dasa T, Abrahm A, Weldegebrat F, Mesfin F, Asfaw A, Mitiku H, Teklemariam Z, Gedugbol B, Naganuri M, Befikadu H and Tesfaye E (2019) Prevalence and associated factors of depression among tuberculosis patients in Eastern Ethiopia. BMC Psychiatry 19, 88–88.

Devkota J, Devkota N and Lohani SP (2016) Health related quality of life, anxiety and depression among tuberculosis patients in Kathmandu, Nepal. Janak Medical College, Journal of Medical Sciences 4, 13–18. https://www.nepjol.info/index.php/JMCSM/article/view/16380.

Duko B, Gebeyehu A and Ayano G (2015) Prevalence and correlates of depression and anxiety among patients with tuberculosis at WolaitaSodo University Hospital and Sodo Health Center, WolaitaSodo, South Ethiopia, Cross sectional study. BMC Psychiatry 15, 214. https://bmcpsychiatry.biomedcentral.com/articles/10.1186/s12888-015-0598-3.

Gotlib IH, Lewinsohn PM and Seeley JR (1995) Symptoms versus a diagnosis of depression: differences in psychosocial functioning. Journal of Consulting and Clinical Psychology 63, 90–100. Available at https://www.researchgate.net/profile/Ian_Gotlib/publication/15302227_Symptoms versus a diagnosis of depression_Differences_in_psychosocial_functioning/links/0e4150ef990d3ed8d00000/Symptoms-versus-a-diagnosis-of-depression-Differences-in-psychosocial-functioning.pdf.

Husain MO, Dearman SP, Chaudhry IB, Rizvi N and Waheed W (2008) The relationship between anxiety, depression and illness perception in tuberculosis patients in Pakistan. Clinical Practice and Epidemiology in Mental Health 4, 4, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2288599/pdf/1745-0179-4-4.pdf.

Ige OM and Lasbeken VO (2011) Prevalence of depression in tuberculosis patients in comparison with non-tuberculosis family contacts visiting the DOTS clinic in a Nigerian tertiary care hospital and its correlation with disease pattern. Mental Health in Family Medicine 8, 235–241. Available at https://www.mhfmjournal.com/pdf/prevalence-of-depression-in-tuberculosis-patients-in-comparison-with-nontuberculosis-family-contacts-visiting-the-dots-clinic-in-a.pdf.
Issa BA, Yussuf AD and Kuranga S (2009) Depression comorbidity among patients with tuberculosis in a university teaching hospital outpatient clinic in Nigeria. Mental Health in Family Medicine 6, 133–138. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2838651/pdf/1104-Stigma-Related-to-Tuberculosis-in-Patients-Taking-DOTS-Treatment-from-DOTS-Center-of-Palpa-District-Hospital.pdf.

Kehbila J, Ekabe CJ, Aminde LN, Noubiap JJN, Fon PN and Monekosso GL (2016) Prevalence and correlates of depressive symptoms in adult patients with pulmonary tuberculosis in the Southwest Region of Cameroon. Infectious Diseases of Poverty 5, 51. https://idpjournal.biomedcentral.com/articles/10.1186/s12888-016-0145-6.

Kessler RC and Bromet EJ (2014) The epidemiology of depression across cultures. Annual Review of Public Health, 34. 119–138.

Kohrt BA, Luitel NP, Acharya P and Jordans MJD (2016) Detection of depression in low resource settings: validation of the Patient Health Questionnaire (PHQ-9) and cultural concepts of distress in Nepal. BMC Psychiatry 16, 58. https://bmcpsychiatry.biomedcentral.com/articles/10.1186/s12888-016-0768-y.

Koyanagi A, Vancampfort D, Carvalho A, Devylder J, Haro J, Pizzol D, Veronese N and Stubbs B (2017) Depression comorbid with tuberculosis and its impact on health status: cross-sectional analysis of community-based data from 48 low- and middle-income countries. BMC Medicine 15, 209. https://bmcmedicine.biomedcentral.com/articles/10.1186/s12916-017-0975-5.

Kroenke K, Spitzer RL and Williams JB (2001) The PHQ-9: validity of a brief depression severity measure. Journal of General Internal Medicine 16, 606–613.

Kunal K, Kumar A, Chandra P and Kansal HM (2016) A study of prevalence of depression and anxiety in patients suffering from tuberculosis. Journal of Family Medicine and Primary Care 5, 150–153. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4943123/.

Mandaknalli R and Giriraj B (2015) Prevalence of depression in tuberculosis patients in a tertiary care hospital. Scholars Journal of Applied Medical Sciences 3, 2445–2448. Available at https://pdfs.semanticscholar.org/bdb1/8363332bedc03a3c67ef92b6f998d0760.pdf.

Mounika PS, Mohammed S, Chaitanya K, Reddy L and Babu AMSS (2016) Co-existing anxiety and depression in pulmonary tuberculosis patients under directly observed treatment short course therapy in Costal Andhra region. World Journal of Pharmacy and Pharmaceutical Sciences 5, 1092–1105. Available at https://www.wjpps.com/download/article/1467266905.pdf.

Naing L, Winn T and Rusli BN (2006) Practical issues in calculating the sample size for prevalence studies. Archives of Orofacial Sciences 1, 9–14. Available at http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.504.2129&rep=rep1&type=pdf.

Priyanka GC and Dahal P (2016) Stigma related to tuberculosis in patients taking DOTS treatment from DOTS center of Palpa District Hospital, Tansen, Palpa, Nepal Journal of Microbiology and Modern Techniques 1, 104. Available at http://www.annexpublishers.com/articles/JMC/1104-Stigma-Related-to-Tuberculosis-in-Patients-Taking-DOTS-Treatment-from-DOTS-Center-of-Palpa-District-Hospital.pdf.

Siddiqua A and Aisha (2016) Co-morbid anxiety and depression among pulmonary tuberculosis patients. Journal of the College of Physicians and Surgeons, Pakistan 20, 703–704. Available at: https://pdfs.semanticscholar.org/60c0/1f483a7b72a83a6814aa0211470225b76f8.pdf.

Stop TB Partnership, UNOPS (2016) Global Plan to End TB: The Paradigm Shift 2016–2020. Geneva: World Health Organization.

Sweetland A, Galea J, Shin SS, Driver C, Dlodlo RA, Karpati A, Wainberg ML and on behalf of The Union TB & Mental Health Working Group (2019) Integrating tuberculosis and mental health services: global receptivity of national tuberculosis program directors. The International Journal of Tuberculosis and Lung Disease 23, 600–605.

Sweetland AC, Jaramillo E, Wainberg ML, Chowdhary N, Oquendo MA, Medina-Marino A and Dua T (2018) Tuberculosis: an opportunity to integrate mental health services in primary care in low-resource settings. The Lancet. Psychiatry 5, 952–954.

Sweetland AC, Kritski A, Oquendo MA, Sublette ME, Norcini Pala A, Silva LR, Karpabi A, Silva EC, Moraes MO and Wainberg ML (2017) Addressing the tuberculosis-depression syndemic to end the tuberculosis epidemic. The International Journal of Tuberculosis and Lung Disease 21, 852–861.

Sweetland AC, Oquendo MA, Wickramaratne P, Weissman M and Wainberg ML (2014) Depression: a silent driver of the global tuberculosis epidemic. World Psychiatry 13, 325–326.

Vega P, Sweetland A, Acha J, Castillo H, Guerra D, Smith Fawzi MC and Shin S (2004) Psychiatric issues in the management of patients with multidrug-resistant tuberculosis. The International Journal of Tuberculosis and Lung Disease 8, 749–759.

Walker IF, Kanal S, Baral SC, Farragher TM, Joshi D, Elsey H and Newell JN (2019) Depression and anxiety in patients with multidrug-resistant tuberculosis in Nepal: an observational study. Public Health in Action 9, 42–48.

Yen YF, Chung MS, Hu HY, Lai YJ, Huang LY, Lin YS, ef al. (2015) Association of pulmonary tuberculosis and ethambutol with incident depressive disorder: a nationwide, population-based cohort study. Journal of Clinical Psychiatry 76, e505–e511. Available at https://www.psychiatrist.com/JCP/article/0198-1042/93/1/6520664914?ArticleId=JCP/article/Pages/2015/v76n04/v76n0416.aspx&Type=Article.