

A Clinical Analysis of the Presentation of Depression in Pakistan

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Abstract:	<p>Background Major depressive disorder is a leading cause of disability worldwide, yet its clinical presentation varies substantially across cultural contexts. In many low- and middle-income settings, including Pakistan, depression is frequently expressed through somatic rather than psychological symptoms, contributing to under-recognition in general medical settings.</p> <p>Aims To estimate the prevalence of depression among patients attending a tertiary care medical clinic in Pakistan and to characterise the somatic and psychological symptom patterns associated with depression severity.</p> <p>Method We conducted a cross-sectional study of 356 adult patients recruited from a general medicine outpatient clinic in Lahore, Pakistan. Depression and anxiety were assessed using the Patient Health Questionnaire (PHQ-9) and the Generalised Anxiety Disorder scale (GAD-7). For encounters with missing PHQ-9 scores, symptom-based prediction using a random forest model was applied. Clinical notes were analysed using natural language processing to extract somatic and psychological symptoms. Logistic regression models were used to identify predictors of moderate-to-severe depression.</p> <p>Results Sixty-three per cent of participants met criteria for moderate-to-severe depression, and 42.4% had comorbid anxiety and depression. Psychological symptoms such as low mood and anhedonia were rarely documented, whereas somatic complaints predominated across all severity levels. Epigastric pain (OR 2.31–2.50) and anxiety (OR 5.87–5.95) were strong predictors of moderate-to-severe depression, while male sex was associated with lower odds (OR ≈0.54). Constipation showed a borderline association with depression severity, whereas diarrhoea did not.</p> <p>Conclusions Depression in this clinical setting is predominantly expressed through somatic symptoms, particularly gastrointestinal complaints and pain syndromes. Routine depression screening should be implemented for patients presenting with unexplained somatic symptoms in general medical clinics in Pakistan.</p>

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Title:

A Clinical Analysis of the Presentation of Depression in Pakistan

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ABSTRACT

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Background

Major depressive disorder is a leading cause of disability worldwide, yet its clinical presentation varies substantially across cultural contexts. In many low- and middle-income settings, including Pakistan, depression is frequently expressed through somatic rather than psychological symptoms, contributing to under-recognition in general medical settings.

Aims

To estimate the prevalence of depression among patients attending a tertiary care medical clinic in Pakistan and to characterise the somatic and psychological symptom patterns associated with depression severity.

Method

We conducted a cross-sectional study of 356 adult patients recruited from a general medicine outpatient clinic in Lahore, Pakistan. Depression and anxiety were assessed using the Patient Health Questionnaire (PHQ-9) and the Generalised Anxiety Disorder scale (GAD-7). For encounters with missing PHQ-9 scores, symptom-based prediction using a random forest model was applied. Clinical notes were analysed using natural language processing to extract somatic and psychological symptoms. Logistic regression models were used to identify predictors of moderate-to-severe depression.

Results

Sixty-three per cent of participants met criteria for moderate-to-severe depression, and 42.4% had comorbid anxiety and depression. Psychological symptoms such as low mood and anhedonia were rarely documented, whereas somatic complaints predominated across all severity levels. Epigastric pain (OR 2.31–2.50) and anxiety (OR 5.87–5.95) were strong predictors of moderate-to-severe depression, while male sex was associated with lower odds (OR ≈0.54). Constipation showed a borderline association with depression severity, whereas diarrhoea did not.

Conclusions

Depression in this clinical setting is predominantly expressed through somatic symptoms, particularly gastrointestinal complaints and pain syndromes. Routine depression screening should be implemented for patients presenting with unexplained somatic symptoms in general medical clinics in Pakistan.

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INTRODUCTION

Major depressive disorder (MDD) is the second most prevalent psychiatric disorder worldwide, affecting an estimated 3.8% of the global population and 5% of adults [1]. It accounts for 4.3% of the 13% global disease burden attributed to psychiatric and neurological disorders [2]. MDD is characterized by persistently low mood or anhedonia for at least two weeks, accompanied by cognitive, behavioral, and neurovegetative symptoms such as poor concentration, hopelessness, worthlessness, guilt, and, in moderate to severe cases, suicidal thoughts, intentions, plans, or attempts.[3] Despite this canonical definition, depression frequently presents in clinical practice with somatic rather than psychological complaints. Approximately two-thirds of patients with depression first report physical symptoms such as fatigue, sleep disturbance, appetite changes, generalized pain, headaches, back pain, or gastrointestinal disturbances [4]. This translation of emotional distress into recurring, multi-system bodily complaints without an identifiable organic cause is referred to as somatization. Somatization is recognized as a component of depression across many cultures, but in some settings it may be the predominant or even sole mode of presentation[5].

LITERATURE REVIEW:

A growing body of work suggests that cultural beliefs, social norms, and stigma shape how mental health conditions are experienced, expressed, and managed[6-10]. Cultural context influences not only symptom experience but also how individuals communicate distress to clinicians, including the omission of salient cognitive or emotional complaints due to shame or anticipated stigma, as described in several Asian populations [11,12]. In many Asian cultures, overt expression of emotional distress or “dwelling” on negative thoughts is discouraged, and distress is more often channeled into somatic complaints[12]. Explanatory models that attribute depression and other psychiatric syndromes to spiritual or supernatural causes, curses, spirit possession, or divine punishment can further heighten stigma, divert help-seeking toward traditional or religious healers, and delay or prevent access to biomedical care [13]. Gender norms add an additional layer: in many Asian societies, men are less likely to acknowledge emotional distress or frame their difficulties in psychological terms [14]. In contrast, although depression carries some stigma in the west [15], individuals are generally more likely to endorse biological or psychological models of illness and to report internal states such as guilt, worthlessness, and cognitive difficulties. Help-seeking patterns mirror these differences: people in Western settings are more likely to seek formal mental health or primary care services, while individuals in Eastern settings often turn first to family, friends, and traditional or religious healers and may delay formal care until symptoms become “too severe to bear” [13]. Nonetheless, stigma persists in high-income Western settings as well; mental illness may still be construed as personal weakness or failure of self-control, and individuals with psychiatric disorders—particularly those with substance use disorders—may be perceived as dangerous or morally culpable rather than ill [16].

These patterns can be understood within a broad biopsychosocial framework in which depression arises from the interplay of biological vulnerability, psychological factors, and social stressors, with the latter activating latent susceptibility into manifest illness [17]. Within this framework, culture acts as a mediating variable that shapes both the expression and perception of depressive symptoms. Core features such as low mood, anhedonia, and functional impairment appear to be broadly universal, but the language, bodily focus, and social meanings attached to these experiences vary across settings. Stigma—as a social, interpretive, cultural, and moral process—is central to this variation, influencing whether distress is primarily articulated through psychological idioms (e.g., “feeling guilty,” “can’t concentrate”) or somatic idioms (e.g., “body pain,” “weakness,” “stomach problems”) [18].

When local norms emphasize social harmony, family reputation, and “face,” as in many collectivistic societies including Pakistan, mental illness may be seen as bringing shame to the individual and family, reinforcing a preference for somatic rather than cognitive or affective complaints.

Most empirical work on the expression of depression and related help-seeking behaviors, however, has been conducted in Western, high-income settings, leaving substantial gaps in understanding the phenomenology of depression in the global south. Pakistan—the world’s fifth most populous country—has a particularly high estimated burden of depression, with approximately 19.62% of adults meeting criteria for MDD compared with about 5% in the United States[19].

Depression is a major contributor to morbidity and disability-adjusted life years (DALYs)[20], yet it remains underdiagnosed and undertreated. One likely explanation is that local presentations, shaped by cultural norms, stigma, and explanatory models, diverge from the symptom patterns emphasized in psychiatric nosology and research, which are largely grounded in Western clinical experience. This mismatch may contribute to missed or delayed recognition of depression in general medical settings, where patients frequently present with somatic complaints and where time and mental health training are limited.

RATIONALE AND AIMS

Against this backdrop, there is a clear need to examine depression simultaneously as a universal disorder and as a culturally patterned phenomenon in Pakistan, particularly in frontline medical settings where most patients first seek care. The present study addresses this gap by focusing on patients presenting to the medicine department of a tertiary care centre in urban Pakistan. Specifically, we aim to:

1. Estimate the prevalence and treatment rates of depression in this population
2. Characterise the expression of depression, including somatic and cognitive symptom reporting, and compare these patterns with those described in the global north.

METHODOLOGY:

Design: Cross-sectional screening for depression via PHQ-9 and concomitant chart review for symptoms

Setting: We recruited the patients for our study from the waiting rooms of a busy general medicine clinic in a tertiary care clinic in Lahore. Lahore is Pakistan's second largest city with a population of 14.8 million. Urdu is the lingua franca in Lahore.

Our team interviewed 356 patients of whom 279 were women and 77 were men. We administered a PHQ-9 questionnaire to 297 patients. For the remaining 59, we used a predefined list of depression related symptoms to compute a symptom count from their clinical records and applied a Random Forest model, trained on patients with observed PHQ-9 scores, to generate predicted PHQ-9 values.

Table 1

Data collection: A study team member (STM) approached all patients waiting to be seen in the medicine clinic in Services Hospital. If the patient was agreeable to participating in the study, the STM obtained informed consent verbally and explained the PHQ9 and GAD7 questionnaires to each patient in Urdu. A copy of the medical records for the visit gave us the symptoms of the patient and the treatment given. Because the clinic operated on a walk-in basis and issued new medical record numbers at every visit, we could not perform longitudinal tracking; therefore, we treated each encounter as an independent observation representing a single presentation of disease

Ethical approval: The IRB at Lahore University of Management Sciences reviewed and approved the study design for our study. All study team members received training for conducting human subject research and were trained to administer PHQ-9 and GAD-7.

ANALYSIS:

Mixed-Methods Approach

We used a mixed-methods design that integrated quantitative modeling with qualitative interpretation of unstructured clinical text to characterize depressive symptom patterns. Clinical notes were preprocessed using Python-based NLP pipelines to extract affective, behavioral, and somatic symptoms (e.g., sadness, irritability, loss of motivation, fatigue, pain, and gastrointestinal complaints). Each clinical encounter was encoded as a binary symptom vector, generating a feature matrix with encounters as rows and symptoms as columns.

Quantitative analyses included word-frequency matrices, heatmaps, and logistic regression to identify patterns and predictors of depression severity. To address class imbalance driven by an overrepresentation of minimal and mild PHQ-9 scores, analyses were restricted to moderate, moderately severe, and severe encounters.

The qualitative component consisted of visual inspection of symptom distributions, interpretation of text-derived visualizations (e.g., word clouds), and culturally informed analysis of somatic versus psychological symptom expression. Together, these approaches enabled empirical measurement of symptom patterns while contextualizing findings within cultural differences in how depression is expressed and documented in clinical encounters.

Qualitative Visualization of Symptom Patterns

To improve interpretability, we generated word clouds and normalized heatmaps across PHQ-9 categories. These visualizations highlighted frequently reported symptoms and revealed a consistent predominance of somatic complaints—particularly fatigue, headaches, and gastrointestinal pain—across all severity levels. Higher-severity encounters showed increasingly complex symptom combinations, providing qualitative context that informed variable selection for the quantitative phase.

Quantitative Modeling Using Logistic Regression

We then fit multivariable logistic regression models to identify predictors of moderate-to-severe depression, treating each encounter independently. Covariates included sex, age, anxiety, headache, fatigue/weakness, body/back pain, and gastrointestinal symptoms (modeled as composite and, separately, by subtype). Robust standard errors were used, and all models met recommended events-per-variable and diagnostic criteria, including acceptable calibration, discrimination, and low multicollinearity ($VIF < 5$).

Model Interpretation and Reliability

Male sex was associated with reduced odds of moderate-to-severe depression, whereas anxiety showed a positive association, though with wide confidence intervals. When GI symptoms were disaggregated, constipation emerged as a significant predictor while diarrhea did not. Complete-case analyses produced stable estimates, and stochastic imputation yielded similar results. Although some predictors had borderline significance, the combined visual and statistical findings strengthened confidence in overall symptom patterns identified.

RESULTS:

Our study participants ranged from 15 to 75 years in age. The median and mean ages of our patients were 33 and 34.97. Graph 1 shows the age distribution of our patients.

Graph 1

Of the 356 patients, 7.5% had no depression, 30% had mild depression, 35% had moderate, 27% had moderately severe and 1.5% had severe depression. 63% of our patients had moderate to severe depression and an equal percentage had anxiety. Most of our patients had both anxiety and depression. Only 8.4% percent had depression alone.

Table 2A.

Table 2B.

Analysis of the clinical presentation of the participants included in the study, demonstrated a predominantly somatic pattern, with several physical complaints emerging consistently across all depression severity levels.

Epigastric pain, fever, body aches/myalgia, headaches, and weakness were the most prevalent symptoms across all PHQ-9 categories (see Figures 1-6).

Epigastric pain, followed by body aches, remained the most prominent symptoms across all groups, including participants with no depression, making them less specific for predicting depression in these populations.

Constipation emerged more strongly as we went up the severity classes of depression, in contrast to the no depression category which reported this symptom less frequently.

Figures 1-6:

Table 3:

Within moderate depression, the heatmap is characterized by a concentrated pattern led by epigastric pains (0.28), followed by body aches (0.25) and fever (0.15), with additional contributions from weakness (0.07) and cough (0.07). Gastrointestinal and pain-related symptoms such as abdominal pain (0.06), shortness of breath (0.06), constipation (0.06), diarrhea (0.05), nausea (0.04) and chest pain (0.04) were present but at lower prevalence, while most other symptoms were near zero (≤ 0.03). This aligns with the overall observation that moderate

depression encounters frequently include constipation and shortness of breath in addition to prominent pain-related symptoms.

In moderately severe depression, the symptom profile broadens while remaining predominantly physical. Body aches (0.41) becomes the dominant feature, followed by epigastric pains (0.21) and headache (0.21), with fever (0.14) also prominent; abdominal pain (0.08), constipation (0.07) and chest pain (0.07) appear as meaningful mid-tier contributors. Notably, fever (0.14) remains substantially more common than cough (0.03), consistent with a “fever > cough” pattern across severity strata, and constipation remains at a higher level than in the moderate group.

In severe depression, the heatmap shows a sharper peak, with body aches (0.37) leading, followed by epigastric pains (0.23), and then weakness (0.20) and headache (0.20). A secondary cluster is visible at lower prevalence, including abdominal pain (0.10) and body swelling (0.10), and a band around 0.07 comprising dizziness (0.07), nausea (0.07), constipation (0.07), fever (0.07), fatigue (0.07) and chest pain (0.07). Compared with lower severity groups, severe encounters therefore show a more even spread of multiple co-occurring somatic symptoms, although the profile remains overwhelmingly physical.

Within patients from all PHQ-9 categories, the heatmap is characterized by a broad but still top-heavy pattern led by body aches (0.29), followed by epigastric pains (0.21) and fever (0.14), with secondary contributions from headache (0.10) and abdominal pain (0.10). A mid-tier cluster is then visible, including weakness (0.07), cough (0.05), and shortness of breath (0.05), alongside constipation (0.04) and chest pain (0.04). Lower-prevalence symptoms such as nausea (0.03), diarrhea (0.03), palpitations (0.03), body swelling (0.03), and anorexia (0.03) remain present but less dominant, while the remaining symptoms are comparatively rare (≤ 0.02).

Logistic Regression on Moderate/Severe Depression

We estimated multivariable logistic regression models of moderate/severe depression. Table 1 evaluates gastrointestinal (GI) symptom composites; Table 2 evaluates constipation and diarrhea as separate predictors. Odds ratios (ORs) above 1 indicate higher odds of depression; ORs below 1 indicate lower odds.

Table 4.

Table 5.

Consistency and Differences Across Models

Male sex is consistently protective ($\approx 64\%$ lower odds) across specifications. Anxiety is a strong positive signal in both models, though confidence intervals are exceptionally wide, suggesting sparse data or model instability. Epigastric pain is also a strong positive predictor in both models, with slightly stronger Odds when diarrhea and constipation are in the GI variable. When constipation and diarrhea are modeled separately (Table 2), constipation emerges as marginal (OR 9.07, $p=0.054$), while diarrhea remains null. Fatigue and Weakness is borderline significant in both models (Table 1 and Table 2).

DISCUSSION:

In this cohort, 63% of patients met criteria for moderate to severe depression, a prevalence consistent with prior reports from Pakistan and comparable low- and middle-income settings [21]. Women constituted 60% of the sample, reflecting known healthcare-seeking patterns among urban women in the Indo-Pak subcontinent [22]. Depression was more prevalent among women than men, and quantitative modeling demonstrated male gender to be protective against depression severity. This gender distribution aligns with regional epidemiologic studies reporting higher rates of depression among women, likely driven by a combination of social, economic, and cultural stressors [23].

Somatic dominance in clinical presentation

A striking and consistent finding was the near-complete absence of canonical psychological symptoms of depression—such as low mood, anhedonia, or cognitive complaints—in patients' presenting concerns. Instead, depressive severity was overwhelmingly associated with physical symptoms. This reinforces the notion that, in this population, depression is primarily expressed and communicated through somatic idioms rather than psychological language.

Among all symptoms, epigastric pain emerged as the most consistent and prominent correlate of depression across severity levels. Prior studies have demonstrated an association between depression and upper gastrointestinal symptoms, including epigastric discomfort [24], supporting the interpretation that epigastric pain may function as a culturally salient marker of psychological distress. In this context, its recurrence across moderate to severe depression suggests that it may represent a dominant idiom of distress rather than coincidental comorbidity.

Constipation was the second most notable gastrointestinal symptom. Emerging literature suggests that constipation may act not only as a comorbid condition but also as an independent risk factor or prodromal feature of depression, possibly mediated through gut–brain axis dysregulation [25,26]. These findings underscore the importance of bidirectional screening:

clinicians should assess mood symptoms in patients presenting with constipation, while also proactively evaluating bowel habits and medication use in patients diagnosed with depression.

Pain, fever, and myalgias as markers of severity

Body aches and myalgias were common across the cohort; however, their clinical significance varied by severity. In severe depression, body aches frequently occurred in the absence of fever, suggesting a direct association with depressive pathology rather than intercurrent infection. In contrast, patients with moderate and moderately severe depression often presented with fever alongside myalgia, likely prompting medical evaluation during which depression was subsequently identified through screening.

Exploratory overlap analyses indicated that body aches and myalgias maintained an independent association with depression, rather than representing secondary manifestations of febrile illness. This distinction is clinically important, as pain syndromes without objective inflammatory findings may serve as indicators of more advanced depressive illness in medical settings. [27]

Figure 7.

Progression of somatic burden with increasing severity

Symptom patterns showed a graded progression with increasing depression severity. Moderate depression was characterized by a limited cluster of somatic symptoms—epigastric pain, myalgia, fever, shortness of breath, and weakness—suggesting early depressive states present primarily as diffuse bodily and autonomic discomfort. With moderately severe depression, the somatic profile expanded to include headaches, abdominal pain, and constipation, indicating increasing physiological burden. Severe depression was associated with a further accumulation of symptoms, most notably epigastric pain, weakness, headache, constipation, and back pain, consistent with cumulative somatic load and neurovegetative dysregulation.

Although affective symptoms such as anhedonia, crying spells, and suicidal ideation became more evident in severe depression, physical complaints remained predominant across all severity levels, underscoring the centrality of somatization even in advanced illness.

Cultural context and somatization

This pattern is consistent with prior studies from Pakistan and neighboring regions, where psychological distress is often expressed through somatic symptoms. Cultural norms, stigma, and limited mental health literacy likely contribute to this presentation, and the persistent prominence of epigastric pain may reflect a culturally mediated idiom of distress rather than a disorder-specific symptom.

Methodological contribution

Methodologically, this study employed a mixed-methods approach integrating NLP-based feature extraction with qualitative visualization (word clouds and heatmaps) and quantitative modeling. Similar triangulated approaches have been used in prior work to contextualize symptom expression and semantic patterns in mental health research [28]. This design allowed us to quantify symptom patterns while preserving interpretive insight into how depression is expressed and documented in routine clinical encounters.

Limitations

Our study has several limitations. Although data were drawn from a large tertiary care hospital, the quality of clinical documentation was variable. PHQ-9 scores were missing for a subset of encounters and were predicted using predefined symptom mappings, which may have introduced measurement bias. Incomplete demographic or prescription data led to exclusion of some visits. The sample was gender-imbalanced, with a higher proportion of women, potentially limiting generalizability to male patients. Finally, the relatively small number of patients with severe depression reduced statistical power for comparisons across severity strata.

Implications and future directions

Pakistan has approximately 0.19 psychiatrists per 100,000 population, far below WHO recommendations [29]. Given this constraint, most uncomplicated depression must be managed in primary care settings. Our findings suggest that routine depression screening should be implemented for patients presenting with unexplained somatic complaints—particularly gastrointestinal symptoms and pain syndromes—in general medical clinics. Validated, culturally adapted Urdu versions of the PHQ-9 are available and should be incorporated into routine care [30]

With smartphone penetration exceeding 50–60% of the population, digital screening represents a feasible and scalable strategy [31]. Integration of PHQ-9 delivery at clinic check-in—potentially linked to national identity registration—could facilitate early detection. Strengthening such systems will require training primary-care clinicians in recognizing and managing depression, an approach shown to improve outcomes in low-resource settings. Ultimately, culturally informed, mind–body–oriented models of care are essential to address the substantial burden of depression in Pakistan.

DECLARATION OF INTEREST:

None

CONSENT STATEMENT

Informed verbal consent was obtained and formally recorded from all participating patients.

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REFERENCES

For Peer Review

1. Jiang Y, Zhu D, Huang X, Li Y, Chen Y, Jiang Y, et al. Associations between somatic symptoms and remission of major depressive disorder: A longitudinal study in China. *J Psychiatr Res.* 2024;172:382–390.
2. Ferrari AJ, Charlson FJ, Norman RE, Patten SB, Freedman G, Murray CJL, et al. Burden of depressive disorders by country, sex, age, and year: findings from the Global Burden of Disease Study 2010. *PLoS Med.* 2013;10(11):e1001547.
3. World Health Organization. Depression. Geneva: WHO; 2025 [cited 2025 Dec 27]. Available from: <https://www.who.int/news-room/fact-sheets/detail/depression>
4. Tylee A, Gandhi P. The importance of somatic symptoms in depression in primary care. *Prim Care Companion J Clin Psychiatry.* 2005;7(4):167–176.
5. Kapfhammer HP. Somatic symptoms in depression. *Dialogues Clin Neurosci.* 2006;8(2):227–239.
6. Ntumi S, Upoalkpajor JLN, Nimo DG. Culturally responsive assessment of help-seeking behavior among university students: mediation-moderation of cultural norms, stigma, and digital engagement. *BMC Psychol.* 2025;13:922.
7. Abdullah T, Brown TL. Mental illness stigma and ethnocultural beliefs, values, and norms: an integrative review. *Clin Psychol Rev.* 2011;31(6):934–948.
8. Daraz U, Bojnec Š, Khan Y, Hussain Z. Cultural narratives, social norms, and psychological stigma: a study of mental health help-seeking behavior in Peshawar, Pakistan. *Front Psychiatry.* 2025;16:1560460.
9. Fekih-Romdhane F, Jahrami H, Stambouli M, Alhuwailah A, Helmy M, Shuwiekh HAM, et al. Cross-cultural comparison of mental illness stigma and help-seeking attitudes: a multinational population-based study. *Soc Psychiatry Psychiatr Epidemiol.* 2023;58(4):641–656.
10. Ibrahim N, Amit N, Shahar S, et al. Depression literacy, mental illness beliefs and stigma and help-seeking attitude among Malaysian students. *BMC Public Health.* 2019;19(Suppl 4):544.
11. Bhatt A, Tomenson B, Benjamin S. Transcultural patterns of somatization in primary care: a preliminary report. *J Psychosom Res.* 1989;33(6):671–680.
12. Hussain M, Rana H, Ashraf R, Khurram S, Sindhu Z. Exploring cultural factors in perception and treatment of depression. *J Popul Ther Clin Pharmacol.* 2023;30:947–958.
13. Office of the Surgeon General (US). Mental Health: Culture, Race, and Ethnicity. Rockville (MD): SAMHSA; 2001.
14. Kim S, Kim D. Mental health help-seeking among Korean men: stigma, masculine norms, and face. *BMC Psychol.* 2025;13(1):461.
15. Birtel MD, Mitchell BL. Cross-cultural differences in depression between White British and South Asians. *Psychol Psychother.* 2023;96(1):101–116.
16. Altweck L, Marshall TC, Ferenczi N, Lefringhausen K. Mental health literacy: a cross-cultural approach. *Front Psychol.* 2015;6:1272.

17. Schotte CKW, et al. A biopsychosocial diathesis-stress model of depression. *Depress Anxiety*. Year unknown.
18. Yang LH, Kleinman A, Link BG, Phelan JC, Lee S, Good B. Culture and stigma: adding moral experience to stigma theory. *Soc Sci Med*. 2007;64(7):1524–1535.
19. Centers for Disease Control and Prevention. Depression. Atlanta: CDC; 2025 [cited 2025 Dec 27]. Available from: <https://www.cdc.gov/nchs/fastats/depression.htm>
20. Alvi MH, Ashraf T, Naz F, et al. Burden of mental disorders by gender in Pakistan: analysis of GBD 1990–2019. *BJPsych Bull*. 2024;48(6):333–340.
21. Khan MN, Akhtar P, Ijaz S, Waqas A. Prevalence of depressive symptoms among university students in Pakistan: a systematic review and meta-analysis. *Front Public Health*. 2020;8:603357.
22. Maitra S, Brault MA, Schensul SL, et al. Mental health in low and middle income countries: example from India. *Int J Ment Health*. 2015;44(3):215–230.
23. Abdullah MA, Shaikh BT, Sattar NY, et al. Social determinants and depression among married women in Pakistan. *PLOS Glob Public Health*. 2024;4(7):e0003463.
24. Jamil O, Sarwar S, Hussain Z, et al. Association between functional dyspepsia and depression severity. *J Coll Physicians Surg Pak*. 2016;26(6):513–516.
25. Wang P, Shen X, Wang Y, Jia X. Constipation and major depression: NHANES 2005–2010. *Front Psychiatry*. 2023;14:1152435.
26. Yun Q, Wang S, Chen S, et al. Constipation preceding depression: a cohort study. *EClinicalMedicine*. 2024;67:102371.
27. Garcia-Cebrian A, Gandhi P, Demyttenaere K, Peveler R. Depression and painful physical symptoms. *Eur Psychiatry*. 2006;21(6):379–388.
28. Chen S, Ngai CSB, Cheng C, Hu Y. Online news coverage of depression in Hong Kong. *J Med Internet Res*. 2025;27:e66696.
29. WHO. Mental Health Atlas 2020. Geneva: WHO; 2020.
30. Ahmad S, et al. Validation of the Urdu version of the PHQ-9. *J Affect Disord*. Year unknown.
31. Pakistan Telecommunication Authority. Annual report 2024. Islamabad: PTA; 2024.

FIGURES AND TABLES

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Table 1 : Summarises demographic composition of the study sample. The sample comprised 356 adults, including 77 men and 279 women. PHQ-9 scores were directly collected for 297 participants, while symptom-based prediction using a random forest model was applied to estimate PHQ-9 scores for the remaining 59 encounters with missing questionnaire data. All analyses were conducted on the combined dataset of observed and predicted PHQ-9 values.

	Male	Female	Total
# of Patients	77	279	356
	Clinically collected PHQ 9	PHQ 9 Predicted with Random Forest model	
# of Patients	297	59	356

Table 2A. Severity distribution (N = 356)

Condition	No disease	Mild	Moderate	Moderately severe	Severe	Missing GAD-7	Total
Depression	27 (7.6%)	102 (28.7%)	126 (35.4%)	96 (27.0%)	5 (1.4%)	0 (0.0%)	356 (100%)
Anxiety	28 (7.9%)	83 (23.3%)	101 (28.4%)	NA	85 (23.9%)	59 (16.6%)	356 (100%)

Note: Values are shown as N (% of total N = 356). NA = not available in this dataset.

Table 2B. Anxiety-depression overlap and missing GAD-7 breakdown (N = 356)

Category	Count (N/%)
Anxiety and depression	151 (42.4%)
Anxiety only	35 (9.8%)
Depression only	30 (8.4%)
No anxiety or depression	81 (22.8%)
Depression but no GAD-7 score	46 (12.9%)
No depression + no GAD-7 score	13 (3.7%)
Total	356 (100%)

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Table 3: Most common symptoms in patients grouped by the severity of their depression

All Study Participants	Body aches	Epigastric pain	Fever	Headache	abdominal pain	Weakness	cough
Patients with Depression	Body Aches	Epigastric Pain	fever	headache	weakness	Abdominal pain	Constipation
Patients without Depression	Body Aches	Fever	Abdominal Pain	epigastric pain	headache	fever	Cough
Patients with moderate depression	Body Aches	Epigastric pain	Fever	Constipation	Cough	Abdominal pain	Weakness
Patients with moderately severe depression	Body aches	Epigastric pain	Headache	Fever	Chest pain	Abdominal pain	Constipation
Patients with severe depression	Body Aches	Epigastric pain	Weakness	Headaches	Body Swelling	Abdominal pain	Constipation

Table 4. Constipation and Diarrhea in GI (Composite)Significant predictors ($p < .05$):

Predictor	OR	95% CI	p	Interpretation
Male (vs. female)	0.544	0.30 – 0.99	0.044	Lower odds of depression among males.
Epigastric pains	2.50	1.30-4.84	0.006	Higher odds of depression in patients with epigastric pains.
Anxiety	5.95	3.57-9.94	0.000	Higher odds of depression in patients with anxiety

Near-significant / notable ($p \approx .05–.10$):

Predictor	OR	95% CI	p
Fatigue + Weakness	2.27	0.93-5.53	0.071

Table 5. Constipation and Diarrhea Not in GI (Separate Indicators)

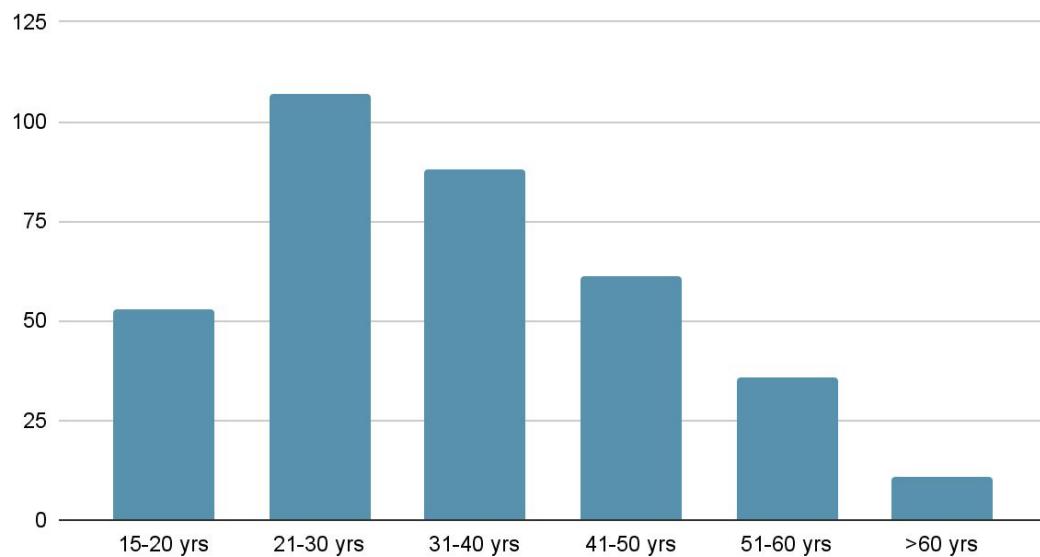
Significant predictors ($p < .05$):

Predictor	OR	95% CI	p	Interpretation
Male (vs. female)	0.54	0.30–0.99	0.046	Lower odds of depression among males.
Epigastric pains	2.31	1.18–4.53	0.015	Higher odds of depression on patients with epigastric pains.
Anxiety	5.87	3.49–9.86	0.000	Higher odds of depression on patients with anxiety.

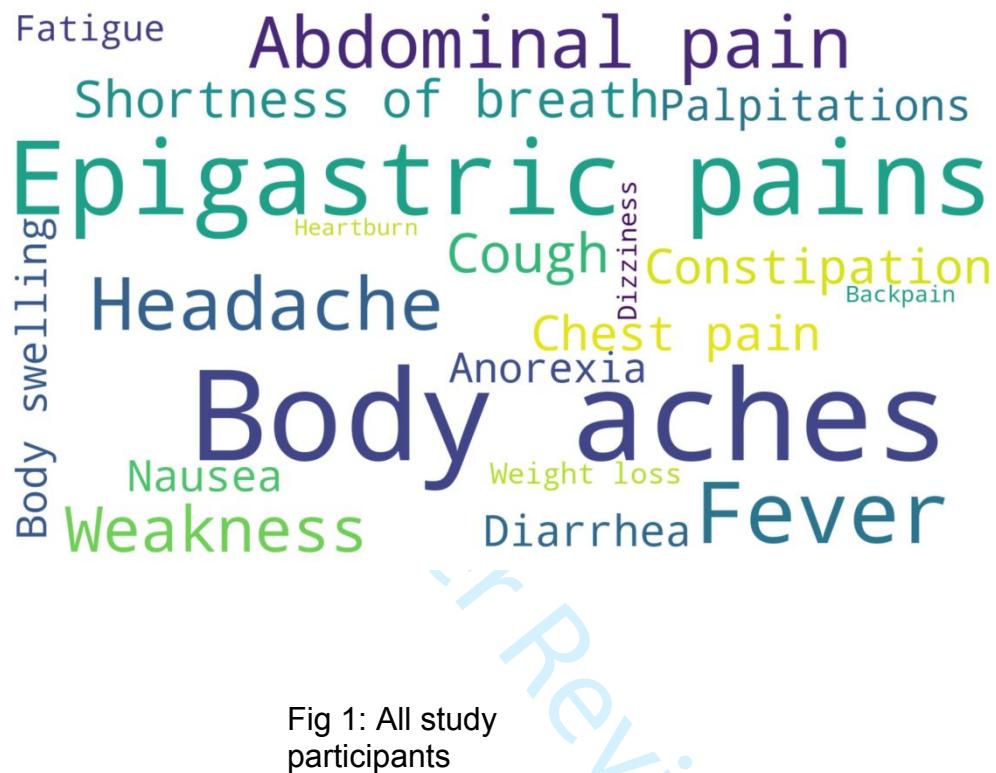
Near-significant / notable ($p \approx .05–.10$):

Predictor	OR	95% CI	p
Constipation	9.068	0.963–85.385	0.054
Fatigue + Weakness	2.27	0.93–5.58	0.074

Graph 1: Patient Age Bands (in years)



Review



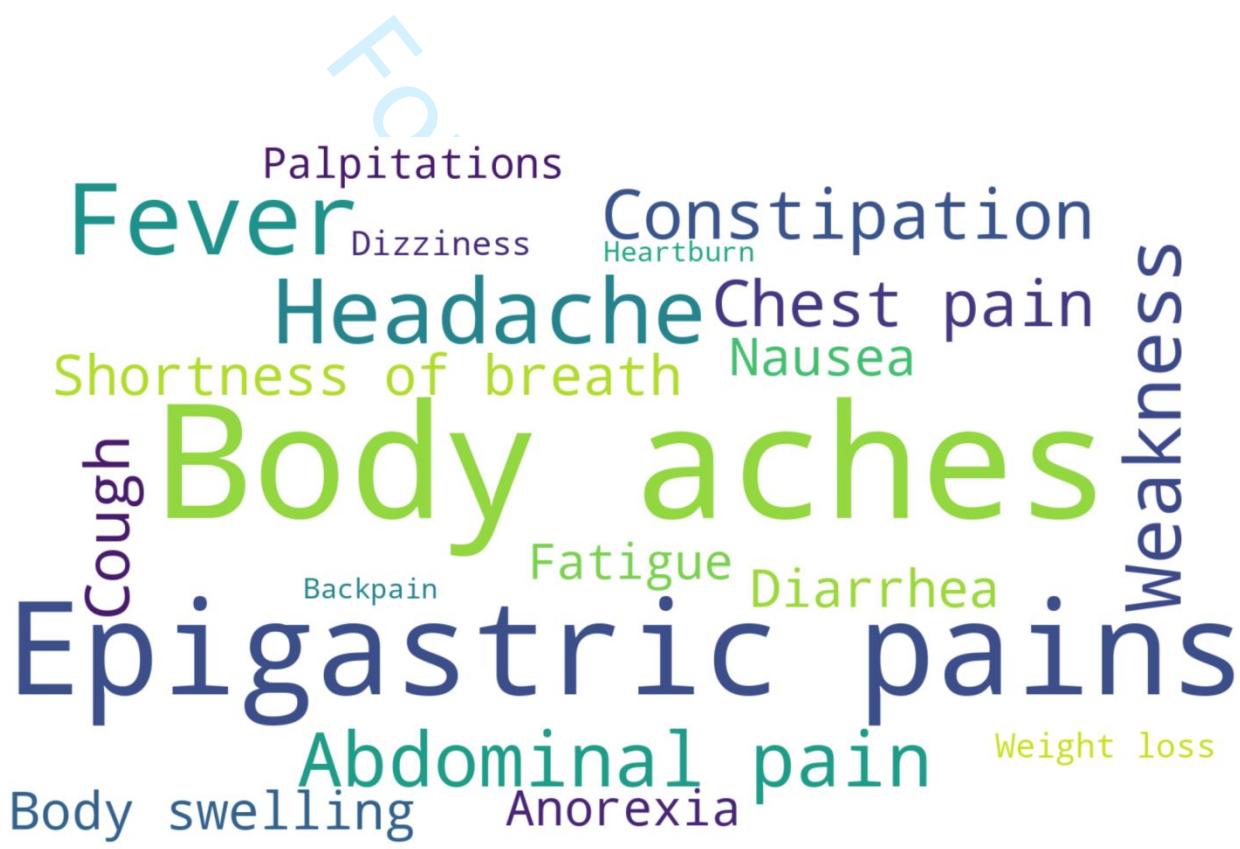


Fig 2: All Patients with Depression

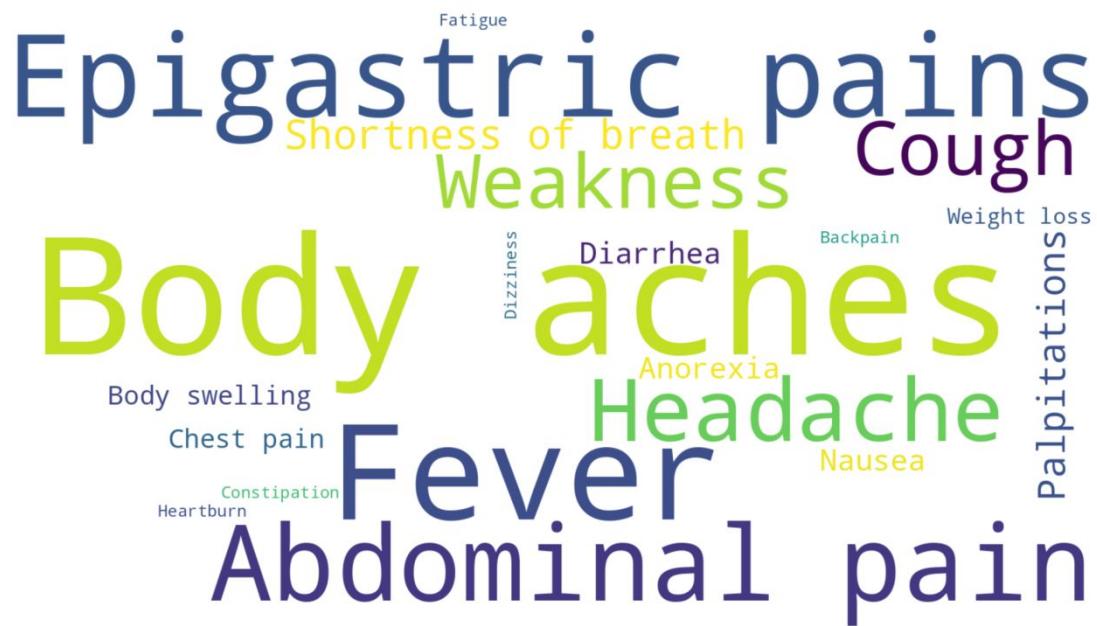


Fig 3: Patients with no Depression

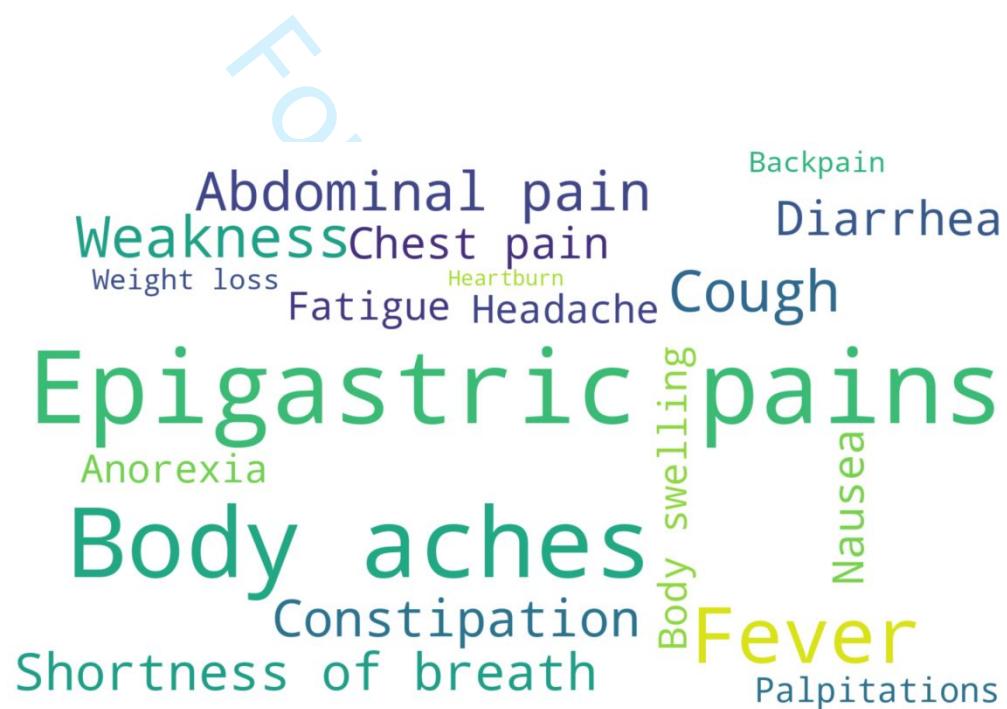


Fig 4: Moderate Depression

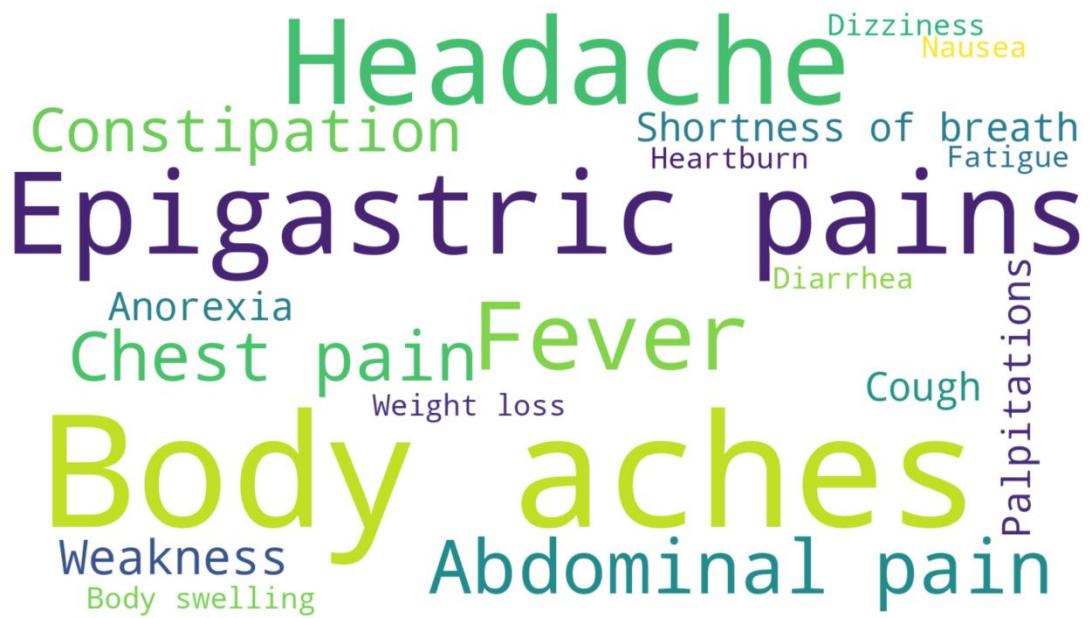


Fig 5: Moderately Severe Depression

Abdominal pain
Diarrhea
Fatigue
Headache
Body aches
Constipation
Epigastric pains
Fever
Weakness
Body swelling
Nausea
Chest pain
Anorexia
Dizziness

Fig 6: Severe Depression

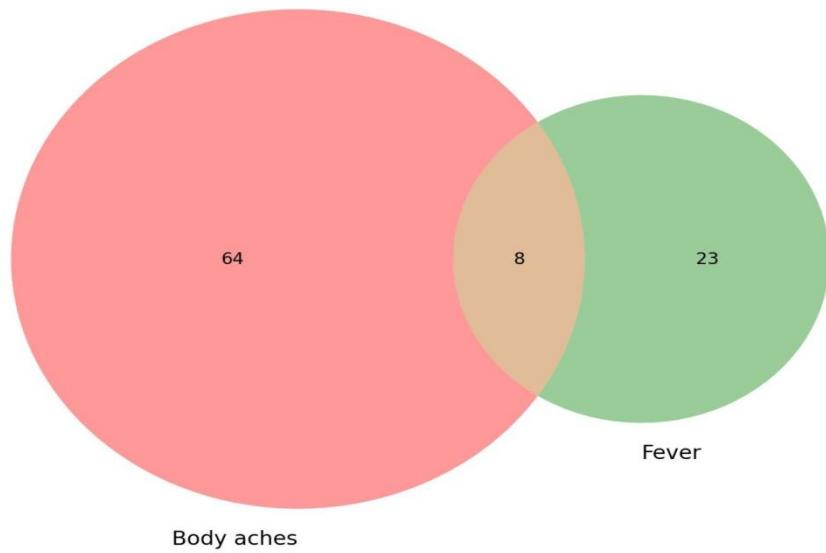


Figure 7. Patients with Body aches and fever

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For Peer Review

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