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Prevalence of anxiety and depressive symptoms and its association with multimorbidity and demographic factors among adults in Karachi, Pakistan

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Prevalence of anxiety and depressive symptoms and its association with multimorbidity and demographic factors among adults in Karachi, Pakistan

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Abstract

Objectives

This study aimed to estimate the prevalence of anxiety and depressive symptoms and its association with multimorbidity and demographic characteristic of adults aged 30 years and above in Karachi, Pakistan.

Design

Analytical Cross-sectional

Study Setting and Participants

The study was carried out among a general population aged 30 years and above, residing in the Gulshan-e-Iqbal town of Karachi, Pakistan.

Main Outcome Measures

Presence of anxiety and depressive symptoms assessed via Aga Khan University Anxiety Depression Scale (AKUADS).

Results

The magnitude of anxiety and depressive symptoms was reported as 27.4%. The final multivariate logistic regression revealed that the presence of multimorbidity (AOR=1.34, 95% CI: 1.13, 1.59), the female gender (AOR= 2.41, 95% CI: 1.99, 2.91), illiteracy (AOR=1.59, 95% CI: 1.15, 2.21), the Punjabi ethnicity (AOR=1.69, 95% CI: 1.18, 2.42), and visiting a faith healer (AOR=2.34, 95% CI: 1.86, 2.95) were the significant predictors of anxiety and depressive symptoms.

Conclusion

This study found an alarmingly high burden of anxiety and depressive symptoms among adults aged 30 years and above in Karachi, Pakistan. Multimorbidity, the female gender, ethnicity, illiteracy, and visiting faith healers were predictors of anxiety and depressive symptoms in the country.

Key words

Multimorbidity, anxiety and depression, adults,

Strengths and limitations of this study

- The sample population of this study is representing all union councils of Gulshan Town, Karachi.
- A validated screening tool (AKUADS) was used to assess the presence of anxiety and depressive symptoms.
- This was a cross-sectional survey, so inferences could not be drawn related to causality.
- Our study was based on self-reported information on multimorbidity and anxiety and depression this might have either underestimated or overestimated its prevalence and hence association.

Introduction

Anxiety and depressive symptoms are major public health issues globally. Depression has been ranked the fourth leading cause of disease burden (1). It is predicted that by the year 2020, it will be the second leading cause of disability and death, after cardio vascular disorders (1-4). The magnitude of anxiety and depression are on the rise in the general population. However, individuals with chronic diseases are at even higher risk of anxiety and depressive symptoms (5-8).

Multimorbidity is the co-occurrence of two or more chronic diseases such as cancer, diabetes, hypertension, stroke, asthma, heart disease, arthritis or osteoporosis within an individual (3, 9, 10). Research found that one in four adults in developed countries have multimorbidity (11, 12). On the other hand, low and middle income countries were the home of 80% of chronic illnesses (13). Another study found that 52% of populations between the ages of 21 to 84 were suffering from multimorbidity (14). Whereas, a study conducted by Garin et al (15) in 2014 found a 67% burden of multimorbidity among elder Spanish females. Reasons for variation in prevalence could be due to the differences in multimorbidity definitions, number of chronic conditions included in studies, diagnostic criteria for medical conditions, and a study's sample size and population characteristics. Literature suggested that the prevalence of multimorbidity rises with age (10, 16) and this burden is reported most commonly in females. Additionally, individuals living in underprivileged areas are at a higher risk of developing multimorbidity (17).

Health care providers often face challenges when dealing with clients who have multimorbidity along with anxiety and depressive symptoms (18, 19) As multimorbidity conditions such as diabetes, hypertension, stroke, asthma, arthritis and osteoporosis have

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3 synergetic effect with anxiety and depression, it increases the probability of disabilities among
4 patients. (5). The magnitude of anxiety and depression with multimorbidity leads to increased
5 rates of utilizing health care facilities. This consequently leads to financial health care burdens
6 and poorer health outcomes (11, 20). Individuals with multimorbidity need to deal with multiple
7 treatment recommendations (8). Thus, anxiety and depression with multimorbidity is linked with
8 50% to 100% of the utilization of health services and cost (21)
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17 Anxiety and depression are extremely common and alarmingly underdiagnosed
18 healthcare problems, especially in low income countries. In addition, it is associated with social
19 and self-stigma, which create barrier to mental help seeking behavior of individuals who suffer
20 from mental health issues, which leads to an even greater public health concern. Furthermore,
21 anxiety and depression are specifically reported to be common in individuals with
22 multimorbidity (5, 8). However, the studies reporting these associations are mostly conducted in
23 high income countries. To the best of our knowledge, no such population based study has been
24 reported from Pakistan. In a resource limited setting like Pakistan, under diagnosis of mental
25 illnesses can cause potential delay in the initiation of treatment. Hence, it is of utmost importance
26 that anxiety and depression be screened in adults suffering from multimorbidity in order to
27 reduce the burden of complications and suboptimal adherence to the treatment of multimorbidity
28 conditions. Therefore, scarcity of literature from Pakistan requires quantification of the
29 association between anxiety and depression with multimorbidity within the Pakistani
30 population. Thus, the purpose of this study was to estimate the prevalence of anxiety and
31 depressive symptoms and determine the association with multimorbidity and demographic
32 factors among adults aged 30 years and above in Karachi, Pakistan
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Methodology

This study was a part of a larger community based research project titled “The Burden of Multimorbidity, Its Patterns and Consequences on Health and Well-Being: The IMPACT Study”. The aim of this cross-sectional study was to estimate the burden of anxiety and depressive symptoms and identify the factors associated with multimorbidity. The present study was conducted in the Gulshan-e-Iqbal town of Karachi, Pakistan. A sample of 3250 participants were recruited by using systematic random sampling. This required sample was achieved by using proportionate estimates of the number of individuals in 13 Union Councils (UCs) in the selected town. A Proportionate allocation method was used in order to allocate appropriate weightage to each UC. Within each UC, blocks of houses were selected with a random start, where every 109th (kth sampling interval) household was selected. Individuals within these households who met eligibility criteria were included in the study.

The Aga Khan University Anxiety Depression Scale (AKUADS) was used to assess anxiety and depressive symptoms of the participants. The cutoff score of the scale was 20. At cutoff score of 20, the AKUADS had a sensitivity of 66% and a specificity of 79% (22, 23). The Urdu version of the tool has been validated in the previous research (22). The value of the reliability coefficient tool in our study’s population was 0.93.

The study’s proposal was approved by The Institutional Review Board (IRB) of Dow University Health Sciences, reference number: Ref: IRB-554/DUHS/Approval/2015/04. Individuals who provided written informed consent were interviewed. A referral plan for counseling was made for participants who scored 20 and above on the AKUADS scale.

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3 The presence of disease was assessed by a combination of self-reported diagnosis,
4 medication use, and laboratory findings. Self-reported disease was determined by the question:
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6 “Have you ever been told by a doctor, nurse, or other health professional that you have
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8 hypertension, obesity, dyslipidemia, diabetes, heart diseases (Myocardial Infarction and/or
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10 chronic ischemic heart diseases), stroke, migraines, asthma and COPD, anemia, thyroid disease,
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12 diseases of bones and joints, dyspepsia/peptic ulcer, hepatitis B and C, chronic kidney diseases
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14 including stones, cancer, and/or disability?”. The following criteria were used to define chronic
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16 diseases such as hypertension, obesity, diabetes, and dyspepsia.
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22 A person was said to be hypertensive if they had a high systolic BP (>140 mm Hg) or a high
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24 diastolic BP (>90 mm Hg). A person is said to be obese if they had a calculated BMI \geq 30.0
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26 kg/m². A person was said to be diabetic if his blood glucose levels was \geq 200 mg/dl. A person
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28 was said to have dyspepsia if they had four or more symptoms of dyspepsia for at least 6 months,
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30 based on the Leeds Dyspepsia Questionnaire (LDQ).
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33 Individuals with 2 or more chronic diseases (excluding anxiety and depression) were labeled as
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35 having ‘multimorbidity’ and others who reported one or no chronic medical disease were labeled
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37 as having ‘no multimorbidity’.
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40 Variables were pre-coded and data was entered and analyzed in the SPSS version 19.0.
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42 Descriptive statistics were calculated in the form of frequencies and percentages for categorical
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44 variables. Descriptive statistics were calculated in order to estimate the prevalence of anxiety and
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46 depressive symptoms. Univariate and multivariate binary logistics regressions were used to
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48 assess the associations between anxiety and depressive symptoms and multimorbidity and odd
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50 ratios and their 95% confidence intervals were also calculated. The multivariate model was
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3 adjusted for all variables included in the univariate analysis, and we used significant cutoff as p-
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5 value ≤ 0.05 . This manuscript has followed STROBE cross sectional reporting guidelines (24).
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8 **Patient and public involvement**

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10 Patients and public were involved in the study and the findings of the research were disseminated
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12 using public health awareness programs in the union councils and through direct communication
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14 with the study participants.
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Results

A total of 3250 participants were interviewed. However, we analyzed our data using information from 2867 study participants. 383 participants were excluded due to missing information on the variables: anxiety & depression symptoms (n=06), presence of multimorbidity (n=09), respondent age (n=06), gender (n=08), education (n=48), income (n=81), occupation (n=72), marital status (n=05), number of children (n=67), ethnicity (n=09), home status (n=14), smoking status (n=66), and visiting faith healer (n=93).

Out of 2867 study participants, 27.4% (n=786) of the participants had anxiety and depressive symptoms. Whereas, 50.2 % (n=1440) of these individuals had reported multimorbidity. In our study, there was an almost equal ratio of male 51.5 % (n=1477) to female 48.5% (n=1390). Regarding education level of the participants, 14% (n=404) had no formal education, 38.3% (n=1098) had higher education, and 20.4% (n=585) had postgraduate education. Regarding monthly household income of participants, 22.3% (n=638) reported their monthly household income to be less than 16,000 rupees and 18.2% (n=523) reported their monthly income to be more than 55,000 rupees. Majority of participants (42% (n=1205)) had professional jobs, 14% (n=389) were labor, 17% (n=484) participants were unemployed. The socio-demographic and other characteristics of the participants are shown in Table 1.

Participants with multimorbidity had higher rate of anxiety and depression symptoms, as compared to participants without multimorbidity (30.7% v/s 24.1%). Females were shown to have higher symptoms of anxiety and depression, as compared to males (36.9% v/s 18.5%). Uneducated groups were more anxious & depressed (39.9%) as compared to other education leveled groups (Primary 29.3%, Secondary 28.1%, Higher/graduate 23.3%, and Post-graduate 25.3%). The participants who had 1-2 children were less anxious & depressed (23.3%), while

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3 those who had no children had higher levels of anxiety & depressive symptoms (30.7%). Among
4 the different linguistic groups, Punjabi and other ethnicities had predominantly higher symptoms
5 of anxiety and depression (32.1%), as compared to the Sindhi ethnicity (20.4%). There was a
6 negative association with smoking and anxiety & depressive symptoms, where smokers were
7 less depressed than nonsmokers (24.1% v/s 28.2%). The participants who used to visit faith
8 healers were more anxious & depressed than non-visiting participants (44.4% v/s 24.4%) (Table
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20 Participants who had multimorbidity had a 34% increased likelihood of being anxious and
21 depressed (AOR=1.34, 95% CI: 1.13, 1.59) as compared to those who reported no
22 multimorbidity. Females were 2.41 times more likely to have anxiety and depressive symptoms
23 as compared to male participants (AOR= 2.41, 95% CI: 1.99, 2.91). The odds of having anxiety
24 and depressive symptoms were 59% higher among participants who had no formal education
25 (AOR=1.59, 95% CI: 1.15, 2.21), as compared to participants who had postgraduate education.
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Participants who had 1 to 2 children were 32% less likely (AOR=0.68, 95% CI: 0.55, 0.83), and
who had 3 and above children were 25% less likely to had anxiety and depressive symptoms
(AOR=0.75, 95% CI: 0.59, 0.94) as compared to participants who had no children.

Subjects belonging to the Punjabi ethnicity (AOR=1.69, 95% CI: 1.18, 2.42), spoke Urdu
(AOR=1.36, 95% CL: 1.01, 1.81), and participants belonging to other ethnic groups (AOR=1.60,
95% CL: 1.10, 2.24) were more likely to have anxiety and depressive symptoms as compared to
Sindhi subjects. In addition, subjects who were visiting a faith healer were 2.34 times more likely
(AOR=2.34, 95% CI: 1.86, 2.95) to exhibit anxiety and depressive symptoms as compared to
participants who did not visit a faith healer (Table 3).

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Discussion

This study showed that nearly one fourth of the adult population in Karachi have symptoms of anxiety and depression. This study illustrated that presence of multimorbidity, the female gender, having no children, lower level of education, and visiting a faith healer were significantly associated with higher levels of anxiety and depressive symptoms.

In the present study, an overall prevalence of anxiety and depressive symptoms was 27.4%. The prevalence of anxiety and depression was previously reported to be around 10% and 44% in developed and developing countries, respectively (25, 26). Islam et al in their study , conducted in 2003 (27), found a 28% prevalence of depression among the Bangladesh population. In the United States, the prevalence of anxiety and depression was reported to be 16.2% (28). Papadopoulos et al. (29) reported that the prevalence of depression in Greece was 27%. Whereas, in India, the prevalence of depression was found to be 28% (30). However, in Pakistan, the prevalence of depression and anxiety found to be around 30 to 50 %. (25, 26, 31, 32). A plausible reason of the difference in prevalence of anxiety and depression could be inclusion criteria, sample sizes, recruitment methods, various screening tools, as well as different cutoff points that were employed in these diverse studies (33).

In the past decade, several research studies have established a strong relationship between anxiety & depression and multimorbidity (3, 6, 8, 34). Over all, a positive association was found between the presence of multimorbidity and anxiety and depressive symptoms in our study. Our findings were in concurrence with previous studies, showing a significant association between anxiety and depression and multimorbidity.(3, 8, 35-38). A probable reason could be that mental illness is linked with an unhealthy habits such as the use of smoking, poor self-care, lack of physical activities, and poor medication compliance (36, 39).

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3 In the present study, anxiety and depressive symptoms were found to be strongly
4 associated with females. The prevalence of anxiety and depressive symptoms were found to be
5 2.5 times higher in females, rather than males. Likewise, previous studies have also revealed a
6 positive association between anxiety, depression, and gender. A research conducted by Mirza
7 and Jenkin (31) found that the prevalence of anxiety and depressive symptoms were 29-66%
8 among females as compared to males, which was 10-33%. A feasible reason for higher
9 prevalence of anxiety and depression among women could be due to biological factors, socio-
10 economical disadvantages, deprivation of social status, maladaptive coping styles, different
11 mental help seeking behaviors, and lack of a support system for females in our country (40).
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25 The current study also found illiteracy as one of the potential risk factors among
26 participants. Similarly, previous studies found a strong association between low levels of
27 education and anxiety and depressive symptoms (41, 42). A plausible reason could be that
28 education in facilitating adaptive coping skills to deal with distress situation and improving self-
29 confidence, self-efficacy, social skills building and sense of control over environment (43).
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37 In our study, participants who had children were less likely to develop anxiety and
38 depressive symptoms. In contrast, other studies found that having more children is a risk factor
39 for anxiety and depression among women (41, 44). The plausible reason could be that parents
40 tend to positively engage and bind to their children's lives by giving continuous love, time,
41 support and commitment, which can all be coping strategies against distress.
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49 Our study also revealed that ethnicity of a participant is linked with anxiety and
50 depressive symptoms. Subjects who were Punjabi and spoke Urdu were more likely to have
51 anxiety and depressive symptoms. Consistent findings were reported by former studies that
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3 ethnicity was a significant risk factor for depression (45-47). However, another study reported
4 no association between these variables (44).
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8 A notable finding of our study was that visiting a faith healer was positively associated
9 with anxiety and depression among both genders. In our culture, distressed individuals seek help
10 from traditional healers or faith healers prior to visiting a doctor or psychiatrist for their illness.
11 The plausible reasons could be because of the stigma that is attached to utilizing mental health
12 services (44, 48). Research has shown that only one to two psychiatrists are available to serve the
13 one million population of Pakistan (49). Furthermore, shortage of mental help resources is one of
14 the hindering factors linked with anxiety and depression in this country. Our result is consistent
15 with a past study, where it was reported that sixteen percent of the Pakistani population first
16 approach to faith healer for their illness (50).
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30 **Strengths and Limitations**

31 This is the first research that determined an association of anxiety and depressive
32 symptoms with multimorbidity among the population in Karachi, Pakistan. Inferences could not
33 be determined about the causality of the relationship due to cross-sectional nature of study.
34 Potential risk factors like, family history of psychiatric disorders, marital dissatisfaction,
35 domestic violence, maladaptive coping, current life stressors, and death of a love one that could
36 not be addressed in the current study. This study was based on self-reported information on
37 multimorbidity and anxiety and depression. The reliance on self-reported information might have
38 either underestimated or overestimated its prevalence and hence association.
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Conclusion

Our research recognized that almost one quarter of the population had anxiety and depressive symptoms. Among females, anxiety and depressive symptoms are twice as common, as compared to males. Early prevention and screenings are key measures to prevent the rising burden of mental disorders when dealing with chronic physical conditions. In order for this to happen, health care professionals need to be trained in the multidisciplinary handling of physical and mental illnesses.. In addition, general physicians should be well equipped with the knowledge of signs and symptoms of anxiety and depressive symptoms.

Author Contributions

SF conceived the research question, conducted all the literature reviews, data collection, and management, and manuscript drafting and reviewing. MTK reviewed the manuscript and helped in data analysis. SZ helped in the analysis and preparation of tables. KS supervised the research project and conducted the final editing and review of the manuscript. The final version of manuscript was seen and approved by all contributors.

Conflicts of Interest

None

Data Statement

Data is available on request

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5 in this research work.
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Table 1: Socio-demographic and other characteristics of participants (n=2867)

Characteristics	n (%)
Anxiety and depressive symptoms	
No	2081 (72.6)
Yes	786 (27.4)
Presence of multimorbidity	
No	1427 (49.8)
Yes	1440 (50.2)
Age	
30-39 years	1062 (37.0)
40-49 years	816 (28.5)
50-59 years	570 (19.9)
60-69 years	293 (10.2)
≥70 years	126 (4.4)
Gender	
Male	1477 (51.5)
Female	1390 (48.5)
Education	
No education	404 (14.1)
Primary	133 (4.6)
Secondary	647 (22.6)
Higher/Graduation	1098 (38.3)
Post-graduate	585 (20.4)
Income	
<16,000	638 (22.3)
16,001-24,999	426 (14.9)
25,000-39,999	636 (22.2)
40,000-54,999	644 (22.5)
>55,000	523 (18.2)
Occupation	
Unemployed	484 (16.9)
Unskilled worker	243 (8.5)
Skilled worker	250 (8.7)
Labor work	389 (13.6)
Non-manual work	296 (10.3)
Professional office job	1205 (42)
Marital status	
Never Married	272 (9.5)
Currently Married	2437 (85.0)
Widowed/Separated/Divorced	158 (5.5)

Numbers of Children

No child	1250 (43.6)
1-2 children	974 (34.0)
3 and above children	643 (22.4)

Ethnicity

Sindhi	402 (14.0)
Punjabi	318 (11.1)
Balochi	94 (3.3)
Pashtu	176 (6.1)
Urdu	1534 (53.5)
Others	343 (12.0)

Home Status

Own	1595 (55.6)
Rent	1155 (40.3)
Other Arrangement	117 (4.1)

Smoking Status

No	2323 (81.0)
Yes	544 (19.0)

Visiting Faith Healer

No	2471 (86.2)
Yes	396 (13.8)

Table 2. Association of Baseline Characteristics of Participants with Anxiety and Depressive symptoms (N=2867)

Characteristics	Anxiety and depressive symptoms		p-value
	No (< 20 score) n (%)	Yes (>=20 score) n (%)	
Presence of multimorbidity			
No	1083 (75.9)	344 (24.1)	<0.001
Yes	998 (69.3)	442 (30.7)	
Age			0.457
30-39 years	777 (73.2)	285 (26.8)	
40-49 years	604 (74.0)	212 (26.0)	
50-59 years	401 (70.4)	169 (29.6)	
60-69 years	213 (72.7)	80 (27.3)	
≥70 years	86 (68.3)	40 (31.7)	
Gender			<0.001
Male	1204 (81.5)	273 (18.5)	
Female	877 (63.1)	513 (36.9)	
Education			<0.001
No education	243 (60.1)	161 (39.9)	
Primary	94 (70.7)	39 (29.3)	
Secondary	465 (71.9)	182 (28.1)	
Higher/Graduation	842 (76.7)	256 (23.3)	
Post-graduate	437 (74.7)	148 (25.3)	
Income			0.774
<16,000	459 (71.9)	179 (28.1)	
16,001-24,999	302 (70.9)	124 (29.1)	
25,000-39,999	462 (72.6)	174 (27.4)	
40,000-54,999	479 (74.4)	165 (25.6)	
>55,000	379 (72.5)	144 (27.5)	
Occupation			0.078
Unemployed	363 (75.0)	121 (25.0)	
Unskilled worker	169 (69.5)	74 (30.5)	
Skilled worker	175 (70.0)	75 (30.0)	
Labor work	267 (68.6)	122 (31.4)	
Non-manual work	229 (77.4)	67 (22.6)	
Professional office job	878 (72.9)	327 (27.1)	
Marital status			0.018
Never Married	210 (77.2)	62 (22.8)	
Currently Married	1769 (72.6)	668 (27.4)	
Widowed/separated/divorced	102 (64.6)	56 (35.4)	
Numbers of Children			0.001
No child	866 (69.3)	384 (30.7)	

1-2 children	747 (76.7)	227 (23.3)	
3 and above children	468 (72.8)	175 (27.2)	
Ethnicity			
Sindhi	320 (79.6)	82 (20.4)	0.003
Punjabi	216 (67.9)	102 (32.1)	
Balochi	71 (75.5)	23 (24.5)	
Pashtu	123 (69.9)	53 (30.1)	
Urdu	1118 (72.9)	416 (27.1)	
Others	233 (67.9)	110 (32.1)	
Home Status			
Own	1149 (72.0)	446 (28.0)	0.301
Rent	840 (72.7)	315 (27.3)	
Other Arrangement	92 (78.6)	25 (21.4)	
Smoking Status			
No	1668 (71.8)	655 (28.2)	0.053
Yes	413 (75.9)	131 (24.1)	
Visiting Faith Healer			
No	1861 (75.3)	610 (24.7)	<0.001
Yes	220 (55.6)	176 (44.4)	

Table 3: Univariate and multivariate analysis of factors associated with anxiety & depressive symptoms among adults (n=2867)

Anxiety and depressive symptoms						
Characteristics	COR	95% CI	P-Value	AOR	95% CI	P-Value
Presence of multimorbidity						
No	1			1		
Yes	1.39	1.18,1.64	<0.001	1.34	1.13,1.59	0.001
Age						
30-39 years	1			1		
40-49 years	0.95	0.77,1.77	0.677	0.90	0.71,1.12	0.345
50-59 years	1.14	0.92,1.40	0.227	0.98	0.76,1.26	0.898
60-69 years	1.02	0.78,1.40	0.873	0.86	0.62,1.18	0.337
≥70 years	1.26	0.85,1.88	0.243	1.26	0.81,1.97	0.309
Gender						
Male	1			1		
Female	2.58	2.17,3.05	<0.001	2.41	1.99,2.91	<0.001
Education						
Post-graduate	1			1		
Higher/Graduation	0.89	0.71,1.13	0.363	0.87	0.68,1.12	0.309
Secondary	1.15	0.89,1.48	0.263	1.09	0.81,1.47	0.542
Primary	1.22	0.81,1.85	0.341	1.21	0.75,1.94	0.429
No education	1.95	1.48,2.57	<0.001	1.59	1.15,2.21	0.005
Income						
>55,000	1			1		
40,000-54,999	0.91	0.69,1.17	0.462	0.91	0.69,1.21	0.541
25,000-39,999	0.99	0.76,1.28	0.947	0.97	0.72,1.31	0.855
16,001-24,999	1.08	0.81,1.43	0.592	0.96	0.68,1.35	0.829
<16,000	1.02	0.79,1.32	0.843	0.79	0.57,1.09	0.158
Occupation						
Professional office job	1			1		
Non-manual work	0.78	0.58,1.06	0.115	0.84	0.59,1.19	0.333
Labor work	1.22	0.95,1.57	0.108	1.41	1.03,1.95	0.034
Skilled worker	1.15	0.85,1.55	0.357	1.35	0.96,1.91	0.078
Unskilled worker	1.17	0.87,1.59	0.292	1.16	0.80,1.67	0.419
Unemployed	0.85	0.71,1.14	0.369	0.98	0.72,1.32	0.889
Marital status						
Never Married	1			1		
Currently Married	1.27	0.94,1.72	0.104	1.16	0.84,1.61	0.380
Widowed/separated/divorced	1.86	1.20,2.86	0.005	1.17	0.72,1.91	0.518
Numbers of Children						
no child	1			1		

1-2 children	0.68	0.56,0.83	<0.001	0.68	0.55,0.83	<0.001
3 and above children	0.84	0.68,1.04	1.040	0.75	0.59,0.94	0.014
Ethnicity						
Sindhi	1			1		
Punjabi	1.84	1.31,2.58	<0.001	1.69	1.18,2.42	0.004
Balochi	1.26	0.74,2.14	0.385	1.33	0.76,2.32	0.317
Pashtu	1.68	1.12,2.51	0.012	1.41	0.91,2.16	0.118
Urdu	1.45	1.11,1.89	0.006	1.36	1.01,1.81	0.037
Others	1.84	1.32,2.56	<0.001	1.60	1.10, 2.24	0.012
Home Status						
Own	1			1		
Rent	0.96	0.81,1.14	0.690	0.96	0.80,1.56	0.593
Other Arrangement	0.70	0.44,1.10	0.125	0.64	0.39,1.02	0.070
Smoking Status						
No	1			1		
Yes	0.80	0.65,1.00	0.053	0.90	0.71,1.14	0.381
Visiting Faith Healer						
No	1			1		
Yes	2.44	1.96,3.03	<0.001	2.34	1.86,2.95	<0.001

COR = unadjusted odds ratios, CI = confidence intervals.

AOR = odds ratios adjusted for all independent variables.

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Prevalence of anxiety and depressive symptoms and its association with multimorbidity and demographic factors: A community based cross sectional survey

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Abstract

Objectives

This study aimed to estimate the prevalence of anxiety and depressive symptoms and its association with multimorbidity and demographic characteristic of adults aged 30 years and above in Karachi, Pakistan.

Design

Observational cross-sectional study

Study Setting and Participants

The study was carried out among a general population aged 30 years and above, residing in Gulshan-e-Iqbal town of Karachi, Pakistan. The study participants were recruited using the systematic random sampling approach based on inclusion criteria. The data from 2867 participants was analyzed.

Main Outcome Measures

Primary outcome of the study was prevalence of anxiety and depressive symptoms measured via Aga Khan University Anxiety Depression Scale (AKUADS). And the secondary outcome of the study was the association of anxiety and depressive symptoms with multimorbidity as well as socio-demographic characteristics of the participants using binary logistic regression.

Results

Out of 2867 individuals, 27.4% participants reported to have anxiety and depressive symptoms. The multivariate logistic regression model revealed that the presence of multimorbidity

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3 (AOR=1.32, 95% CI: 1.11, 1.57), the female gender (AOR= 2.44, 95% CI: 2.04, 2.92), illiteracy
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5 (AOR=1.58, 95% CI: 1.16, 2.16), number of children (AOR=0.75, 95% CI: 0.59,0.93) , and
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7 visiting a faith healer (AOR=2.31, 95% CI: 1.84, 2.90) were the significant factors associated with
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9 anxiety and depressive symptoms.
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12 13 **Conclusion**

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16 This study revealed a moderately high prevalence of anxiety and depressive symptoms
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18 among adults aged 30 years and above in Karachi, Pakistan. The key variables associated with
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20 anxiety and depressive symptoms include; multimorbidity, female gender, lower level of
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22 education, number of children and visiting faith healers.
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29 *Key words*

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31 Multimorbidity, anxiety and depression, adults,
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Strengths and limitations of this study

- The study sample was a large, community-based, diverse ethnic and socioeconomic group of the population.
- A validated screening tool (AKUADS) assessed the presence of anxiety and depressive symptoms, which thus, enhanced the internal validity of the research.
- Inferences could not be drawn about causality of association due to the nature of the design.
- The study data was self-reported, hence, the results should be interpreted cautiously.

Introduction

Mental illness, anxiety and depressive symptoms are major public health issues. Globally 14% people suffer from mental illness (1). More than three quarter of these populations were linked with low and middle income countries (2). Moreover, depression has been ranked as the fourth leading cause of disease burden (3). Also, it is predicted that by the year 2020, it will be the second leading cause of disability and death after cardio vascular disorders (3-6). The magnitude of anxiety and depression is on the rise among general population. However, individuals with chronic diseases are at even higher risk of developing anxiety and depressive symptoms (7-10).

Multimorbidity is the co-occurrence of two or more chronic diseases such as cancer, diabetes, hypertension, stroke, asthma, heart disease, arthritis or osteoporosis within an individual (5, 11, 12). Research studies suggest that one in four adults in developed countries have multimorbidity (13, 14). On the other hand, low and middle income countries are the home of 80% of chronic illnesses (15). Another study claim that 52% of populations between the ages of 21 and 84 years are suffering from multimorbidity (16). Whereas, a study conducted by Garin et al (17) in 2014 found a 67% burden of multimorbidity among elder Spanish females. Furthermore, developing countries such as Bangladesh has the prevalence of multimorbidity as 53.8% among older adults (11). However, the reported burden of multimorbidity is 22% in India, (18). Among Pakistani population aged 18 years and older, it was previously reported as 4.9% (19). Thus, the prevalence of multimorbidity varies from 4.9% to 67% between various countries (19-21). Reasons for variation in prevalence could be due to differences in multimorbidity definitions, number of chronic conditions included in studies, diagnostic criteria for medical conditions, as well as study's sample size and population characteristics. Literature suggests that the prevalence of multimorbidity increases with age (12, 22), and this burden is reported to be more common in

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3 females. Additionally, individuals living in underprivileged areas are at a higher risk of developing
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5 multimorbidity (23).
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8 Health care providers often face challenges when dealing with clients who have
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10 multimorbidity along with anxiety and depressive symptoms (24, 25). As multimorbidity
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12 conditions such as diabetes, hypertension, stroke, asthma, arthritis and osteoporosis have
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14 synergetic effect with anxiety and depression, it increases the probability of disabilities among
15
16 patients (7). The presence of anxiety and depression with multimorbidity leads to increased rates
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18 of utilizing health care facilities. This consequently leads to financial health care burdens and
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20 poorer health outcomes (2, 13, 26, 27). Individuals with multimorbidity need to deal with multiple
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22 treatment recommendations (10). Thus, anxiety and depression with multimorbidity is linked with
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24 50% to 100% of the utilization of health services and cost (28)
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29 Anxiety and depression are extremely common and alarmingly underdiagnosed healthcare
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31 problems, especially in low and middle income countries. In addition, it is associated with social
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33 and self-stigma, which create barrier to mental help seeking behavior of individuals who suffer
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35 from mental health issues that further leads to an even greater public health concern. Furthermore,
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37 anxiety and depression are specifically reported to be common in individuals with multimorbidity
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39 (7, 10). However, the studies that report these associations are mostly conducted in high income
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41 countries. To the best of our knowledge, no such population based study has been reported from
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43 Pakistan yet. In a resource limited setting like Pakistan, under diagnosis of mental illnesses can
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45 cause potential delay in the initiation of treatment. Hence, it is of utmost importance that anxiety
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47 and depression be screened in adults suffering from multimorbidity in order to reduce the burden
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49 of complications and suboptimal adherence to the treatment of multimorbidity conditions.
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51 Therefore, scarcity of literature from Pakistan requires quantification of the association between
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3 anxiety and depression with multimorbidity within the Pakistani population. It was hypothesized
4 that there is an association between anxiety and depressive symptoms and multimorbidity among
5 Pakistani population. Therefore, the purpose of this study was to estimate the prevalence of anxiety
6 and depressive symptoms, and determine the association with multimorbidity and demographic
7 factors among adults aged 30 years and above in Karachi, Pakistan.
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For peer review only

Methodology

This study was a part of a larger community based research project titled “The Burden of Multimorbidity, Its Patterns and Consequences on Health and Well-Being: The IMPACT Study”, conducted in 2015-2016.

Study design: Cross-sectional study was conducted to estimate the burden of anxiety and depressive symptoms, and to identify their associated factors.

Study population: The study population comprised of all adults of age 30 years and above, and residents of Gulshan-e-Iqbal town, Karachi, Pakistan. This particular age group was selected for this study as chronic medical conditions are more prevalent among them.

Inclusion criteria: All Participants who were aged 30 years and above and who were the residents of Gulshan-e-Iqbal town, Karachi Pakistan and signed the consent form to take part in the study.

Sample size calculation: For the objective of this study, the sample size was calculated using an online version of Open Epi calculator. The prevalence of anxiety and depression is reported to be 30% to 50% among adults in Pakistan (29, 30). With 2% margin of error and 95% confidence level, the required sample size was 2401 participants. Similarly, for secondary objective (association of anxiety and depressive symptoms with multimorbidity), keeping the confidence interval of 95%, 90% power, 1:1 ratio of non-depressed and depressed individuals with odds ratio of 1.55, and proportion of multimorbidity among non-depressed was taken as 10% (Smith et al., 2014), the required sample size was 2148 individuals. In order to account for missing values, a higher sample size (2401) was chosen. However, we have taken 3250 individuals for data collection.

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3 **Sampling Technique:** The present study was conducted in Gulshan-e-Iqbal town of Karachi,
4 Pakistan. A sample of 3250 participants was recruited by using systematic random sampling. This
5 required sample was achieved by using proportionate estimates of the number of individuals in 13
6 Union Councils (UCs) in the selected town. A Proportionate allocation method was used in order
7 to allocate appropriate weightage to each UC. Within each UC, blocks of houses were selected
8 with a random start, where every 109th (kth sampling interval) household was selected. Individuals
9 within these households who met the eligibility criteria were included in the study.
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20 **Data Collection:** Data were collected from participants by interviewing them with the help of
21 structured questionnaire. The questionnaire was developed after thorough literature review to
22 collect data about socio demographic information (including age, gender, marital status,
23 educational status, employment status, mother tongue, number of family members and information
24 about housing, presence of any chronic disease, and living condition of each participant.
25 Participants were interviewed by trained data collectors, the anthropometric measurements as well
26 as Blood Pressure were measured by trained health professionals mainly included doctors and
27 nurses who were involved in data collection.
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42 **Dependent variable:** The Aga Khan University Anxiety Depression Scale (AKUADS) was used
43 to assess anxiety and depressive symptoms of the participants. This tool has a total of 25 questions
44 and for each of the questions the participant can choose an answer from Never (scored as 0),
45 Sometime (scored as 1), Often (scored as 2), Always (scored as 3). The cumulative cutoff score of
46 20 or greater at this scale is used to label anxiety and depression. At cutoff score of 20, the
47 AKUADS had a sensitivity of 66% and a specificity of 79% (31, 32). This study used the Urdu
48 version of the AKUADS which had been validated in a previous research (31). The value of the
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3 reliability coefficient tool in our study's population was 0.93. **Independent Variables:** The
4 presence of disease was assessed by a combination of self-reported diagnosis, medication use, and
5 laboratory findings. Self-reported disease was determined by the question: "Have you ever been
6 told by a doctor, nurse, or other health professional that you have hypertension, dyslipidemia,
7 diabetes, heart diseases (Myocardial Infarction and/or chronic ischemic heart diseases), stroke,
8 migraines, asthma and COPD, anemia, thyroid disease, diseases of bones and joints,
9 dyspepsia/peptic ulcer, hepatitis B and C, chronic kidney diseases including stones, cancer, and/or
10 disability?". The following criteria were used to define chronic diseases such as hypertension,
11 obesity, diabetes, and dyspepsia.
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24 A person was said to be hypertensive if that person had a high systolic BP (>140 mm Hg) or a high
25 diastolic BP (>90 mm Hg). A person is said to be obese if they had a calculated BMI ≥ 30.0 kg/m².
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29 A person was said to be diabetic if his blood glucose level was ≥ 200 mg/dl. A person was
30 considered having dyspepsia if they had four or more symptoms of dyspepsia for at least 6 months,
31 based on the Leeds Dyspepsia Questionnaire (LDQ).
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36 Individuals with 2 or more chronic diseases (excluding anxiety and depression) were labeled as
37 having 'multimorbidity' and others who reported one or no chronic medical disease were
38 considered as having 'no multimorbidity'.
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43 Beside disease related variables, other sociodemographic variables were also measured such as
44 household income, occupation and education. This variable was initially taken as continuous
45 variable such as what is your monthly income (in Pakistani Rupees). Then it was further classified
46 into quintiles i.e. < 16000, 16001-24999, 25000-39999, 40000-54999 and 55000 rupees and above.
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52 Occupation of all participants was also assessed as a categorical variable and had following
53 categories such as unemployed, unskilled worker, skilled worker, labor worker, non-manual
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3 worker and professional office job. Data on education were collected as total number of years of
4 full education, which was then categorized into five categories as follows:
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- 8 a. No education (0 years or those who never attended school)
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- 10 b. Primary (1-5 years)
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- 12 c. Secondary (6-10 years)
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- 15 d. Higher education (11-14 years)
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- 18 e. Postgraduate (≥ 15 years)
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26 **Ethical considerations:** The study's proposal was approved by The Institutional Review Board
27 (IRB) of Dow University Health Sciences, reference number: Ref: IRB-
28 554/DUHS/Approval/2015/04. Individuals who provided written informed consent were
29 interviewed. A referral plan for counseling was made for participants who scored 20 and above on
30 the AKUADS scale.
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40 **Statistical Analysis:** Variables were pre-coded and data was entered and analyzed in the SPSS
41 version 19.0. Descriptive statistics were calculated in the form of frequencies and percentages for
42 categorical variables. Descriptive statistics were calculated in order to estimate the prevalence of
43 anxiety and depressive symptoms. Univariate and multivariate binary logistics regressions were
44 used to assess the associations between anxiety and depressive symptoms and multimorbidity and
45 odd ratios and their 95% confidence intervals were also calculated. The multivariate model was
46 adjusted for only variables with p-values < 0.250 in univariate analysis using a step-wise logistic
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3 regression method. This manuscript has followed STROBE cross sectional reporting guidelines
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5 (33).
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8 **Patient and public involvement:** In current study patient and participants were not involved in
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10 the research question, study design, outcome measure and recruitment.
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16 **Data availability statement:** The data is available on request from the corresponding author.
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Results

A total of 3250 participants were interviewed. However, the data were analyzed using information from 2867 study participants. Of the total, 383 participants were excluded due to missing information on the variables: anxiety & depression symptoms (n=06), presence of multimorbidity (n=09), respondent age (n=06), gender (n=08), education (n=48), income (n=81), occupation (n=72), marital status (n=05), number of children (n=67), ethnicity (n=09), home status (n=14), smoking status (n=66), and visiting faith healer (n=93).

Out of 2867 study participants, the mean age was 45.5 years (SD \pm 11.7 years). In the study, there was an approximately equal ratio of male 51.5 % (n=1477) to female 48.5% (n=1390). Regarding educational level of the participants, 14% (n=404) had no formal education, 38.3% (n=1098) had higher education, and 20.4% (n=585) had postgraduate education. In addition, 22.3% (n=638) reported their monthly household income to be less than 16,000 rupees while 18.2% (n=523) claimed their monthly income to be more than 55,000 rupees. Majority of participants 42% (n=1205) had professional jobs, 14% (n=389) were labor, and 17% (n=484) participants were unemployed. In our study, participants reported anxiety and depressive symptoms and multimorbidity to be 27.4% (n=786) and 50.2% (n=1440), respectively. The socio-demographic and other characteristics of the participants are shown in Table 1.

Adjusted model revealed that, participants who had multimorbidity had a 32% increased odds of being anxious and depressed (AOR=1.32, 95% CI: 1.11, 1.57) as compared to those who reported no multimorbidity. The odds of having anxiety and depressive symptoms were 2.44 times higher among females as compared to male participants (AOR= 2.44, 95% CI:2.04, 2.92). The odds of having anxiety and depressive symptoms were 58% higher among participants who had no formal education (AOR=1.58, 95% CI: 1.16, 2.16), as compared to participants who had

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3 postgraduate education. The odds of being anxious and depressed were 1.35 times higher among
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5 participants who were labor workers as compared to participants who were doing professional
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7 office jobs (AOR=1.35, 95% CI: 1.01, 1.79). Study participants who had 1 to 2 children were 32%
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9 less likely (AOR=0.68, 95% CI: 0.56, 0.84), and who had more than two children were 25% less
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11 likely (AOR=0.75, 95% CI: 0.59, 0.93) to had anxiety and depressive symptoms as compared to
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13 participants who had no children. In addition, subjects who were visiting a faith healer were 2.31
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15 times (AOR=2.31, 95% CI: 1.84, 2.9) odds of exhibiting anxiety and depressive symptoms as
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17 compared to participants who did not visit a faith healer (Table 2).
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23 Table 3 showed the estimated association of anxiety and depressive symptoms and number
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25 of chronic diseases. The anxiety and depressive symptoms were significantly associated with
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27 increasing number of chronic diseases. The odds of anxiety and depressive symptoms were highest
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29 among individuals with four chronic diseases (AOR=1.92, 95% CI: 1.33, 2.78), and more than
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31 four chronic diseases (AOR=2.62, 95% CI: 1.66, 4.13), compared with healthy individuals when
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33 adjusted for other variables (Table 3).
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Discussion

This study showed that nearly one fourth of the adult population in Karachi have symptoms of anxiety and depression. This study illustrated that presence of multimorbidity, female gender, lower level of education, number of children and visiting a faith healer were significantly associated with anxiety and depressive symptoms.

Current study used a screening tool (AKUADS) to assess the presence of anxiety and depressive symptoms. In the present study, an overall prevalence of anxiety and depressive symptoms was 27.4%. The prevalence of anxiety and depression was previously reported to be around 10% and 44% in developed and developing countries, respectively (34, 35). Islam et al in their study conducted in 2003 (36), found a 28% prevalence of depression among the Bangladesh population. In the United States, the prevalence of anxiety and depression was reported to be 16.2% (37). Papadopoulos et al. (38) reported that the prevalence of depression in Greece was 27%. Whereas, in India, the prevalence of depression was found to be 28% (39). However, in Pakistan, the prevalence of depression and anxiety found to be around 30 to 50 %. (29, 34, 35, 40). A plausible reason of the difference in prevalence of anxiety and depression could be due to the inclusion criteria, sample sizes, recruitment methods, various screening tools, as well as different cutoff points that were employed in these diverse studies (21).

In the past decade, several research studies have established a strong relationship between anxiety and depression and multimorbidity (5, 8, 10, 41). Moving on, our findings were in concurrence with previous studies, showing a significant association between anxiety and depression and multimorbidity.(5, 10, 42-45). A probable reason could be that mental illness is linked with an unhealthy habits such as the use of smoking, poor self-care, lack of physical activities, and poor medication compliance (43, 46).

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3 In the present study, anxiety and depressive symptoms were found to be strongly associated
4 with females. The prevalence of anxiety and depressive symptoms were found to be 2.5 times
5 higher in females, rather than males. Likewise, previous studies have also revealed a positive
6 association between anxiety, depression, and gender. A research conducted by Mirza and Jenkin
7 (40) found that the prevalence of anxiety and depressive symptoms were 29-66% among females
8 as compared to males, which was 10-33%. A plausible reason for higher prevalence of anxiety
9 and depression among women could be due to biological factors, socio-economical disadvantages,
10 deprivation of social status, maladaptive coping styles, and lack of a support system for females
11 in our country (47).
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25 The current study also found illiteracy as one of the potential risk factors among
26 participants. Similarly, previous studies found a strong association between low levels of education
27 and anxiety and depressive symptoms (48, 49). Whereas, among the literate population, education
28 could be one of the reasons that facilitates their adaptive coping skills to deal with distress situation
29 and improving self-confidence, self-efficacy, social skills building and sense of control over
30 environment (50).
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39 In our study, participants who bore more children were less likely to develop anxiety and
40 depressive symptoms. The plausible reason could be that parents tend to positively engage and
41 bind to their children's lives by giving continuous love, time, support and commitment, which can
42 all be coping strategies against distress. In contrast, other studies found that having more children
43 is a risk factor for anxiety and depression among women (48, 51). This could be due to the extra
44 burden of responsibilities that woman has to fulfill in our society; whereas, as per societal norms,
45 males are not expected to take part in household chores and traditional child care.
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3 A notable finding of our study was that visiting a faith healer was positively associated
4 with anxiety and depression among both genders. In our culture, distressed individuals seek help
5 from traditional healers or faith healers prior to visiting a doctor or psychiatrist for their illness. .
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7 However, a few probable reasons for visiting faith healers could be due to easy accessibility,
8 availability and affordability , cultural beliefs and the predominant stigma attached to the notion
9 of mental illness (51, 52). Moreover, in our culture many people believe that mental illnesses are
10 due to wrongdoings, being possessed, witchcraft and spirit; hence the affected population consults
11 with these faith healers rather than doctors. Our result is consistent with a past study, where it was
12 reported that sixteen percent of the Pakistani population first approach to faith healer for their
13 illness (53). Therefore, there is a dire need to create awareness regarding identification of
14 symptoms of mental illness and to develop proper referral system for essential treatment on early
15 stage of disease to avoid delayed presentation with more advanced disease.
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35 **Strengths and Limitations**

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37 This is the first research that determined an association of anxiety and depressive
38 symptoms with multimorbidity among the population in Pakistan. Inferences could not be
39 determined about the causality of the relationship due to cross-sectional nature of study. Potential
40 risk factors such as, family history of psychiatric disorders, marital dissatisfaction, domestic
41 violence, maladaptive coping, current life stressors, and death of a loved one that could not be
42 addressed in the current study. This study was based on self-reported information on
43 multimorbidity and anxiety and depression.
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Conclusion

This study suggests that almost one quarter of the population had anxiety and depressive symptoms. Among females, anxiety and depressive symptoms are twice as common, as compared to males. Early prevention and screenings are key measures to prevent the rising burden of mental disorders when dealing with chronic physical conditions.

Author Contributions

KS, SF conceived the research question and design of this project. SF conducted all the literature reviews and manuscript drafting and reviewing as well as took part in data collection. MTK and SZ helped in the data analysis, preparation of tables, and reviewed the manuscript. KS supervised the research project and conducted the final editing and review of the manuscript. The final version of manuscript was seen and approved by all contributors.

Conflicts of Interest

None

Data Statement

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For peer review only

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Table 1: Socio-demographic and other characteristics of participants (n=2867)

Characteristics	n (%)
Anxiety and depressive symptoms	
No	2081 (72.6)
Yes	786 (27.4)
Presence of multimorbidity	
No	1427 (49.8)
Yes	1440 (50.2)
Age	
30-39 years	1062 (37.0)
40-49 years	816 (28.5)
50-59 years	570 (19.9)
60-69 years	293 (10.2)
≥70 years	126 (4.4)
Gender	
Male	1477 (51.5)
Female	1390 (48.5)
Education	
No education	404 (14.1)
Primary	133 (4.6)
Secondary	647 (22.6)
Higher/Graduation	1098 (38.3)
Post-graduate	585 (20.4)
Income	
<16,000	638 (22.3)
16,001-24,999	426 (14.9)
25,000-39,999	636 (22.2)
40,000-54,999	644 (22.5)
>55,000	523 (18.2)
Occupation	
Unemployed	484 (16.9)
Unskilled worker	243 (8.5)
Skilled worker	250 (8.7)
Labor work	389 (13.6)
Non-manual work	296 (10.3)
Professional office job	1205 (42)
Marital status	

Never Married	272 (9.5)
Currently Married	2437 (85.0)
Widowed/Separated/Divorced	158 (5.5)
Numbers of Children	
No child	1250 (43.6)
1-2 children	974 (34.0)
3 and above children	643 (22.4)
Ethnicity	
Sindhi	402 (14.0)
Punjabi	318 (11.1)
Balochi	94 (3.3)
Pashtu	176 (6.1)
Urdu	1534 (53.5)
Others	343 (12.0)
Home Status	
Own	1595 (55.6)
Rent	1155 (40.3)
Other Arrangement	117 (4.1)
Smoking Status	
No	2323 (81.0)
Yes	544 (19.0)
Visiting Faith Healer	
No	2471 (86.2)
Yes	396 (13.8)

Table 2: Univariate and multivariate analysis of factors associated with anxiety & depressive symptoms among adults (n=2867)

Characteristics	Anxiety and depressive symptoms			
	COR	95% CI	AOR	95% CI
Presence of multimorbidity				
No	1		1	
Yes	1.39	1.18,1.64	1.32	1.11,1.57
Age				
30-39 years	1		-	
40-49 years	0.95	0.77,1.77	-	
50-59 years	1.14	0.92,1.40	-	
60-69 years	1.02	0.78,1.40	-	
≥70 years	1.26	0.85,1.88	-	
Gender				
Male	1		1	
Female	2.58	2.17,3.05	2.44	2.04,2.92
Education				

1					
2					
3	Post-graduate	1		1	
4	Higher/Graduation	0.89	0.71,1.13	0.88	0.69,1.13
5	Secondary	1.15	0.89,1.48	1.08	0.81,1.44
6	Primary	1.22	0.81,1.85	1.12	0.71,1.78
7	No education	1.95	1.48,2.57	1.58	1.16,2.16
8					
9					
10	Income				
11	>55,000	1		-	
12	40,000-54,999	0.91	0.69,1.17	-	
13	25,000-39,999	0.99	0.76,1.28	-	
14	16,001-24,999	1.08	0.81,1.43	-	
15	<16,000	1.02	0.79,1.32	-	
16					
17	Occupation				
18	Professional office job	1		1	
19	Non-manual work	0.78	0.58,1.06	0.82	0.58,1.13
20	Labor work	1.22	0.95,1.57	1.35	1.01,1.79
21	Skilled worker	1.15	0.85,1.55	1.29	0.93,1.78
22	Unskilled worker	1.17	0.87,1.59	1.06	0.75,1.48
23	Unemployed	0.85	0.71,1.14	0.90	0.68,1.18
24					
25					
26	Marital status				
27	Never Married	1		-	
28	Currently Married	1.27	0.94,1.72	-	
29	Widowed/separated/divorced	1.86	1.20,2.86	-	
30					
31	Numbers of Children				
32	no child	1		1	
33	1-2 children	0.68	0.56,0.83	0.68	0.56,0.84
34	3 and above children	0.84	0.68,1.04	0.75	0.59,0.93
35					
36	Ethnicity				
37	Sindhi	1		-	
38	Punjabi	1.84	1.31,2.58	-	
39	Balochi	1.26	0.74,2.14	-	
40	Pashtu	1.68	1.12,2.51	-	
41	Urdu	1.45	1.11,1.89	-	
42	Others	1.84	1.32,2.56	-	
43					
44					
45	Home Status				
46	Own	1		-	
47	Rent	0.96	0.81,1.14	-	
48	Other Arrangement	0.70	0.44,1.10	-	
49					
50	Smoking Status				
51	No	1		-	
52	Yes	0.80	0.65,1.00	-	
53					
54	Visiting Faith Healer				
55	No	1		1	
56	Yes	2.44	1.96,3.03	2.31	1.84,2.90

COR = unadjusted odds ratios, CI = confidence intervals.
 AOR = adjusted odds ratios, only variables with p-value<0.250 in univariate analysis were entered into adjusted model using stepwise selection.

Table 3: Univariate and multivariate analysis of anxiety & depressive symptom with number of chronic diseases among adults (n=2867)

Characteristics	n (%)	Anxiety and depressive symptoms			
		COR	95% CI	AOR	95% CI
Number of chronic diseases					
None	152 (24.6)	1		1	
One	192 (23.7)	0.95	0.74,1.21	0.89	0.69,1.14
Two	181 (25.5)	1.05	0.81,1.34	0.98	0.76,1.27
Three	134 (29.8)	1.30	0.99,1.71	1.20	0.90,1.59
Four	76 (42.2)	2.24	1.58,3.17	1.92	1.33,2.78
Five +	51 (50.0)	3.06	1.99,4.70	2.62	1.66,4.13

COR = unadjusted odds ratios, CI = confidence intervals.

AOR = adjusted odds ratios, for all variables with p-value<0.250 in univariate analysis (Age, Gender, Education, Occupation, Marital status, Number of children, Ethnicity, Home status, Smoking status, Visiting faith healer).

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		Reporting Item	Page Number
Title	#1a	Indicate the study's design with a commonly used term in the title or the abstract	01
Abstract	#1b	Provide in the abstract an informative and balanced summary of what was done and what was found	02-03
Background / rationale	#2	Explain the scientific background and rationale for the investigation being reported	07
Objectives	#3	State specific objectives, including any prespecified hypotheses	07
Study design	#4	Present key elements of study design early in the paper	08-09
Setting	#5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	08-09
Eligibility criteria	#6a	Give the eligibility criteria, and the sources and methods of selection of participants.	08
	#7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	09-10
Data sources / measurement	#8	For each variable of interest give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group. Give information separately for for exposed and unexposed groups if applicable.	09-11
Bias	#9	Describe any efforts to address potential sources of bias	07

Study size	#10	Explain how the study size was arrived at	08
Quantitative variables	#11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen, and why	11-12
Statistical methods	#12a	Describe all statistical methods, including those used to control for confounding	11-12
	#12b	Describe any methods used to examine subgroups and interactions	n/a
	#12c	Explain how missing data were addressed	13
	#12d	If applicable, describe analytical methods taking account of sampling strategy	09
	#12e	Describe any sensitivity analyses	n/a
Participants	#13a	Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed. Give information separately for exposed and unexposed groups if applicable.	n/a
	#13b	Give reasons for non-participation at each stage	n/a
	#13c	Consider use of a flow diagram	n/a
Descriptive data	#14a	Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders. Give information separately for exposed and unexposed groups if applicable.	06, Table 01
	#14b	Indicate number of participants with missing data for each variable of interest	n/a

Outcome data	#15	Report numbers of outcome events or summary measures. Give information separately for exposed and unexposed groups if applicable.	06-07
Main results	#16a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Table 3
	#16b	Report category boundaries when continuous variables were categorized	10
	#16c	If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	n/a
Other analyses	#17	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses	n/a
Key results	#18	Summarise key results with reference to study objectives	13-14
Limitations	#19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias.	4 & 17
Interpretation	#20	Give a cautious overall interpretation considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence.	18
Generalisability	#21	Discuss the generalisability (external validity) of the study results	15-17
Funding	#22	Give the source of funding and the role of the funders for the present study and, if applicable,	18

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		for the original study on which the present article is based	
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BMJ Open

Prevalence of anxiety and depressive symptoms and their association with multimorbidity and demographic factors: A community-based cross sectional survey in Karachi, Pakistan

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Prevalence of anxiety and depressive symptoms and their association with multimorbidity and demographic factors: A community-based cross sectional survey in Karachi, Pakistan

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Abstract

Objectives

This study aimed to estimate the prevalence of anxiety and depressive symptoms and their association with multimorbidity and the demographic characteristics of adults, aged 30 years and above, in Karachi, Pakistan.

Design

Observational cross-sectional study

Study Setting and Participants

The study was carried out among a general population, aged 30 years and above, residing in the Gulshan-e-Iqbal town of Karachi, Pakistan. The study participants were recruited using the systematic random sampling approach, based on the inclusion criteria. The data collected from 2,867 participants was analyzed.

Main Outcome Measures

The primary outcome of the study was the prevalence of anxiety and depressive symptoms, measured with the Aga Khan University Anxiety Depression Scale (AKUADS). The secondary outcome of the study was the association of anxiety and depressive symptoms with multimorbidity, as well as with the socio-demographic characteristics of the participants, using binary logistic regression.

Results

Out of 2,867 individuals, 27.4% participants reported having anxiety and depressive symptoms. The multivariate logistic regression model revealed that the presence of multimorbidity (AOR=1.33, 95% CI: 1.11, 1.58), female gender (AOR= 2.40, 95% CI: 2.01, 2.87), illiteracy (AOR=1.51, 95% CI: 1.09, 2.07), more number of children (AOR=0.74, 95% CI: 0.59,0.93), and visiting a faith healer (AOR=2.29, 95% CI: 1.82, 2.88) were the significant factors associated with anxiety and depressive symptoms.

Conclusion

This study revealed a moderately high prevalence of anxiety and depressive symptoms among adults, aged 30 years and above, in Karachi, Pakistan. The key variables associated with anxiety and depressive symptoms were: multimorbidity, female gender, lower level of education, more number of children, and visiting faith healers.

Key words

Multimorbidity, anxiety and depression, adults

Strengths and limitations of this study

- The study sample was a large, community-based, ethnically and socio-economically diverse group of population.
- A validated screening tool (AKUADS) assessed the presence of anxiety and depressive symptoms, which enhanced the internal validity of the research.
- Inferences could not be drawn about causality of associations, due to the nature of the design.
- The study data was self-reported, hence, the results should be interpreted cautiously.

Introduction

Mental illness, anxiety, and depressive symptoms are major public health issues. Globally, 14% people suffer from mental illnesses (1). More than three quarters of these people belong to low and middle income countries(2). The magnitude of anxiety and depression is on the rise among the general population. Additionally, individuals with chronic diseases are at even higher risk of developing anxiety and depressive symptoms (3-6). In fact, depression has been ranked as the fourth leading cause of disease burden (7). Moreover, it is predicted that by the year 2020, it will be the second leading cause of disability and death, after cardio vascular disorders (7-10).

Multimorbidity is the co-occurrence of two or more chronic diseases, such as cancer, diabetes, hypertension, stroke, asthma, heart disease, arthritis, or osteoporosis within an individual (9, 11, 12). Research studies suggest that one in four adults in developed countries has multimorbidity (13, 14). (15). One study claims that 52% of people, between the ages of 21 and 84 years are suffering from multimorbidity (16), whereas, a study conducted by Garin et al., (17) in 2014 found a burden of 67% multimorbidity among elder Spanish females. Furthermore, among developing countries, in Bangladesh, the prevalence of multimorbidity is 53.8% among older adults(11),in India the burden of multimorbidity is 22% (18),while-among the Pakistani population, aged 18 years and older, it was reported as 4.9% (19). Thus, the prevalence of multimorbidity varies from 4.9% to 67% between various countries (19-21).

The reasons for variation in prevalence could be due to differences in multimorbidity definitions, number of chronic conditions included in the studies, diagnostic criteria for medical conditions, as well as the study's sample size and population characteristics. Literature suggests that the prevalence of multimorbidity increases with age (12, 22), and this burden is reported to

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3 be more common in females. Additionally, individuals living in underprivileged areas are at a
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5 higher risk of developing multimorbidity (23).
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8 Health care providers often face challenges when dealing with clients who have
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10 multimorbidity, along with anxiety and depressive symptoms (24, 25). As multimorbidity
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12 conditions such as diabetes, hypertension, stroke, asthma, arthritis, and osteoporosis have
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14 synergetic effects with anxiety and depression, they increase the probability of disabilities
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16 among patients (3). Moreover, Individuals with multimorbidity need to deal with multiple
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18 treatment recommendations (6). Added to that, the presence of anxiety and depression with
19
20 multimorbidity leads to increase of utilization of health care facilities. This consequently leads to
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22 financial health care burdens and poorer health outcomes (2, 13, 26, 27). Thus, anxiety and
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24 depression, with multimorbidity, is linked with a 50% to 100% increase in the utilization of
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26 health services and cost (28).
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31 Anxiety and depression are extremely common and alarmingly underdiagnosed
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33 healthcare problems, especially in low and middle income countries. In addition, they are
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35 associated with social and self-stigma, which act as a barrier in the mental help seeking behavior
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37 of individuals suffering from mental health issues, this leads to an even greater public health
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39 concern. Furthermore, anxiety and depression are specifically reported to be common in
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41 individuals with multimorbidity (3, 6). However, the studies that report these associations have
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43 mostly been conducted in high income countries. To the best of our knowledge, no such
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45 population based study has been reported from Pakistan as yet. In a resource limited setting like
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47 Pakistan, under diagnosis of mental illnesses can cause potential delay in the initiation of
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49 treatment. Hence, it is of utmost importance that anxiety and depression be screened in adults
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51 suffering from multimorbidity, in order to reduce the burden of complications and suboptimal
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3 adherence to the treatment of multimorbidity conditions. Moreover, due to, scarcity of literature
4 from Pakistan, requires quantification of the association between anxiety and depression with
5 multimorbidity, within the Pakistani population is an urgent need. In this study, it was
6 hypothesized that there is an association between anxiety and depressive symptoms and
7 multimorbidity among the Pakistani population. Therefore, the purpose of this study was to
8 estimate the prevalence of anxiety and depressive symptoms, and to determine their association
9 with multimorbidity and demographic factors among adults, aged 30 years and above, in
10 Karachi, Pakistan.
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Methodology

This study was a part of a larger community based research project, titled, “The Burden of Multimorbidity, Its Patterns and Consequences on Health and Well-Being: The IMPACT Study”, conducted in 2015-2016.

Study design: An observational cross-sectional study was conducted to estimate the burden of anxiety and depressive symptoms, and to identify their associated factors.

Study population: The study population comprised all adults aged 30 years and above, living in the Gulshan-e-Iqbal town, Karachi, Pakistan. This particular age group was selected for this study, as chronic medical conditions are more prevalent in this age group..

Inclusion criteria: All Persons, who were aged 30 years and above, who were the residents of the Gulshan-e-Iqbal town, Karachi, Pakistan, and who signed the consent form to take part in the study.

Sample size calculation: To meet the objective of this study, the sample size was calculated using an online version of Open Epi calculator. The prevalence of anxiety and depression is reported to be 30% to 50% among adults in Pakistan (29, 30). With a 2% margin of error and 95% confidence level, the required sample size was 2,401 participants. Similarly, for attaining the secondary objective (association of anxiety and depressive symptoms with multimorbidity), keeping the confidence interval of 95%, 90% power, 1:1 ratio of non-depressed and depressed individuals, with odds ratio of 1.55, and proportion of multimorbidity among non-depressed was taken as 10% (Smith et al., 2014), the required sample size was 2,148 individuals. In order to account for missing values, the higher sample size (2401) was chosen. Ultimately, however, 3,250 individuals were recruited for data collection.

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3 **Sampling Technique:** The present study was conducted in the Gulshan-e-Iqbal town of Karachi,
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5 Pakistan. A sample of 3,250 participants was recruited using the systematic random sampling
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7 technique. This sample was achieved by using proportionate estimates of the number of
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9 individuals in 13 Union Councils (UCs) in the selected town. The Proportionate allocation
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11 method was used in order to allocate appropriate weightage to each UC. Within each UC, blocks
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13 of houses were selected with a random start, where every 109th (kth sampling interval) household
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15 was selected. Individuals within these households, who met the eligibility criteria, were included
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17 in the study.
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22 **Data Collection:** Data were collected from participants by interviewing them, with the help of a
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24 structured questionnaire; the questionnaire was developed after a thorough literature review. The
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26 questionnaire was designed to collect data related to socio demographic information including
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28 age, gender, marital status, educational status, employment status, mother tongue, number of
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30 family members and information about housing, presence of any chronic disease, and living
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32 conditions of each participant. Participants were interviewed by trained data collectors; the
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34 anthropometric measurements, as well as Blood Pressure were measured by trained health
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36 professionals, mainly included doctors and nurses, who were involved in data collection.
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44 **Dependent variable:** The Aga Khan University Anxiety Depression Scale (AKUADS) was used
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46 to assess the anxiety and depressive symptoms of the participants. This study used the Urdu
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48 version of the AKUADS, which had been validated in a previous research (31). The value of the
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50 reliability coefficient tool in the study population was 0.93. This tool had a total of 25 questions
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52 and for each of the questions the participants could choose an answer from Never (scored as 0),
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54 Sometimes (scored as 1), Often (scored as 2), Always (scored as 3). The cumulative cutoff score
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3 of 20 or greater on this scale was used to label anxiety and depression. At a cutoff score of 20,
4 the AKUADS had a sensitivity of 66% and a specificity of 79% (31, 32).
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8 **Independent Variables:** The presence of disease was assessed by a combination of self-reported
9 diagnosis, medication use, and laboratory findings. Self-reported disease was determined by the
10 question: “Have you ever been told by a doctor, nurse, or other health professional that you have
11 hypertension, obesity, dyslipidemia, diabetes, heart diseases (Myocardial Infarction and/or
12 chronic ischemic heart diseases), stroke, migraines, asthma and COPD, anemia, thyroid disease,
13 diseases of bones and joints, dyspepsia/peptic ulcer, hepatitis B or C, chronic kidney diseases
14 including stones, cancer, and/or disability?”.
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25 Individuals with 2 or more chronic diseases (excluding anxiety and depression) were
26 labeled as having ‘multimorbidity’ and others who reported one or no chronic medical disease
27 were considered as having ‘no multimorbidity’. Set criteria were used to define chronic diseases,
28 such as hypertension, obesity, diabetes, and dyspepsia. A person was said to be hypertensive if
29 that person had a high systolic BP (>140 mm Hg) or a high diastolic BP (>90 mm Hg). A person
30 was considered obese if they had a calculated BMI ≥ 30.0 kg/m². A person was said to be
31 diabetic if their blood glucose level was ≥ 200 mg/dl. A person was considered having dyspepsia
32 if they had four or more symptoms of dyspepsia for at least 6 months, based on the Leeds
33 Dyspepsia Questionnaire (LDQ).
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47 Beside disease related variables, other socio demographic variables were also measured, such as
48 household income, occupation, and education. This variable was initially taken as continuous
49 variable, such as what is your monthly income (in Pakistani Rupees). Then it was further
50 classified into quintiles, i.e. < 16,000, 16,001-24,999, 25,000-39,999, 40,000-54,999 and 55,000
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3 rupees and above. The occupation of all the participants was also assessed as a categorical
4 variable and had categories such as unemployed, unskilled worker, skilled worker, labor worker,
5 non-manual worker and professional office job. Data on education were collected as total
6 number of years of full education, which was then categorized into five categories No education
7 (0 years or those who never attended school), Primary (1-5 years), Secondary (6-10 years),
8 Higher education (11-14 years)
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10 Postgraduate (≥ 15 years)
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23 **Ethical considerations:** The study's proposal was approved by The Institutional Review Board
24 (IRB) of the Dow University of Health Sciences, reference number: Ref: IRB-
25 554/DUHS/Approval/2015/04. Only individuals who provided written informed consent were
26 interviewed. A referral plan for counseling was made for participants who scored 20 and above
27 on the AKUADS scale.
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37 **Statistical Analysis:** Variables were pre-coded and data were entered and analyzed in the SPSS
38 version 19.0. Descriptive statistics were calculated in the form of frequencies and percentages for
39 categorical variables. Descriptive statistics were calculated in order to estimate the prevalence of
40 anxiety and depressive symptoms. Univariate and multivariate binary logistics regressions were
41 used to assess the associations between anxiety and depressive symptoms and multimorbidity
42 and odd ratios and their 95% confidence intervals were also calculated. The multivariate model
43 was adjusted only for variables with p-values < 0.250 in univariate analysis, using a step-wise
44 logistic regression method, following the Hosmer and Lemeshow protocol (33). Moreover, this
45 manuscript has followed STROBE cross sectional reporting guidelines (34).
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3 **Patient and public involvement:** In the current study, patients were not involved in the
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6 research question, study design, outcome measures, and recruitment.
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Results

A total of 3,250 participants were interviewed. However, the data were analyzed using information from 2,867 study participants. Of the total, 383 participants were excluded due to missing information on the variables: anxiety & depression symptoms (n=06), presence of multimorbidity (n=09), respondent age (n=06), gender (n=08), education (n=48), income (n=81), occupation (n=72), marital status (n=05), number of children (n=67), ethnicity (n=09), home status (n=14), smoking status (n=66), and visiting faith healer (n=93).

The mean age of the 2,867 study participants was 45.5 years (SD \pm 11.7 years). The male/female ratio was approximately equal, males 51.5 % (n=1,477), females 48.5% (n=1,390). Regarding the educational level of the participants, 14% (n=404) had no formal education, 38.3% (n=1098) had higher education, and 20.4% (n=585) had postgraduate education. In addition, 22.3% (n=638) reported their monthly household income to be less than 16,000 rupees, while 18.2% (n=523) claimed their monthly income to be more than 55,000 rupees. The majority of participants 42% (n=1205) had professional jobs, 14% (n=389) were laborers, and 17% (n=484) participants were unemployed. The study participants reported anxiety and depressive symptoms, and multimorbidity as 27.4% (n=786) and 50.2% (n=1440), respectively. The socio-demographic and other characteristics of the participants are shown in Table 1.

The adjusted model revealed that participants who had multimorbidity had 33% increased odds of being anxious and depressed (AOR=1.33, 95% CI: 1.11, 1.58), as compared to those who did not report multimorbidity. Moreover, the odds of having anxiety and depressive symptoms were 2.40 times higher among females, as compared to male participants (AOR=2.40, 95% CI: 2.01, 2.87). And the odds of having anxiety and depressive symptoms were 51% higher among participants who had no formal education (AOR=1.51, 95% CI: 1.09, 2.07), as

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3 compared to participants who had postgraduate education. Furthermore, the odds of being
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5 anxious and depressed were 1.34 times higher among participants who did labor work as
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7 compared to participants who were doing professional office jobs (AOR=1.34, 95% CI: 1.00,
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9 1.79). Also, study participants who had 1 to 2 children were at 32% reduced odds (AOR=0.68,
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11 95% CI: 0.56, 0.84), and those who had more than two children were at 26% reduced odds
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13 (AOR=0.74, 95% CI: 0.59, 0.93) of having anxiety and depressive symptoms, as compared to
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15 participants who had no children. Furthermore, Subjects belonging to the Punjabi ethnicity
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17 (AOR=1.66, 95% CI: 1.16, 2.37), had 66% increased odd of being anxious and depressed as
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19 compared to Sindhi subjects. In addition, subjects who were visiting a faith healer were 2.29
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21 times (AOR=2.29, 95% CI: 1.82, 2.88) odds of exhibiting anxiety and depressive symptoms, as
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23 compared to participants who did not visit a faith healer (Table 2).
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30 Table 3 shows the estimated association of anxiety and depressive symptoms and the
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32 number of chronic diseases. The anxiety and depressive symptoms were significantly associated
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34 with increasing number of chronic diseases. The odds of anxiety and depressive symptoms were
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36 highest among individuals with four chronic diseases (AOR=1.92, 95% CI: 1.33, 2.78), and more
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38 than four chronic diseases (AOR=2.62, 95% CI: 1.66, 4.13), as compared with healthy
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40 individuals, when adjusted for other variables (Table 3).
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Discussion

This study showed that nearly one fourth of the study participants had symptoms of anxiety and depression. Moreover, it illustrated that the presence of multimorbidity, female gender, lower level of education, more number of children, ethnicity and visiting a faith healer were significantly associated with anxiety and depressive symptoms.

The current study used a screening tool (AKUADS) to assess the presence of anxiety and depressive symptoms. According to the findings, the overall prevalence of anxiety and depressive symptoms was 27.4%. This has previously been reported to be around 10% and 44%, in developed and developing countries, respectively (35, 36). Islam et al., in their study conducted in 2003 (37), found a 28% prevalence of depression among the Bangladesh population. In the United States, the prevalence of anxiety and depression was reported to be 16.2% (38). Papadopoulos et al.,(39) reported that the prevalence of depression in Greece as 27%. Whereas in India, the prevalence of depression was found to be 28% (40). However, in Pakistan, the prevalence of depression and anxiety has been found to be around 30% to 50 % (29, 35, 36, 41). A plausible reason for the difference in the prevalence of anxiety and depression could be different inclusion criteria, sample sizes, recruitment methods, various screening tools, and cutoff points that were employed in these diverse studies (21).

In the past decade, several research studies have established a strong relationship between anxiety and depression and multimorbidity (4, 6, 9, 42). The findings of the present study were in concurrence with the previous studies, showing a significant association between anxiety and depression, and multimorbidity (6, 9, 43-46). A probable reason could be that mental illness is linked with unhealthy habits, such as smoking, poor self-care, lack of physical activities, and poor medication compliance (44, 47).

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3 In the present study, anxiety and depressive symptoms were found to be strongly
4 associated with females. The prevalence of anxiety and depressive symptoms were found to be
5 2.5 times higher in females than in males. Likewise, previous studies have also revealed a
6 positive association between anxiety, depression, and gender. A research conducted by Mirza
7 and Jenkin (41) found that the prevalence of anxiety and depressive symptoms were 29-66%
8 among females, as compared to 10-33% in males, Plausible reasons for the higher prevalence of
9 anxiety and depression among women could be biological factors, socio-economical
10 disadvantages, deprivation of social status, maladaptive coping styles, and lack of a support
11 system for females in our country (48).
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24 The current study also found illiteracy as one of the potential risk factors among
25 participants. Similarly, previous studies have found a strong association between low levels of
26 education, and anxiety and depressive symptoms (49, 50). Among the literate population,
27 education could be one of the factors that facilitates adaptive coping skills amongst them, and
28 enables them to deal with distress situations and in improving their self-confidence, self-efficacy,
29 social skills building and developing a sense of control over the environment (51).
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39 According to the findings of the current study, participants who bore more children were
40 less likely to develop anxiety and depressive symptoms. The plausible reason could be that
41 parents tend to positively engage with their children and to be bound with their lives children by
42 giving them continuous love, time, supports and commitment, which can all be coping strategies
43 against distress. More number of children can also act as a buffer, considering the cultural
44 dimension of the south Asian population where older children serve as a financial security for the
45 family (52). Moreover, they also perform the role of caretaker, and/or may contribute to family
46 house hold chores. This provides positive hope to the family that their future financial and social
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3 security is warranted and, thus, decreases anxiety and depression. In contrast, other studies have
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5 found that having more children is a risk factor for anxiety and depression among women (49,
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7 53).

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11 Our study also revealed that ethnicity of a participant is linked with anxiety and
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13 depressive symptoms. Subjects who were Punjabi were more likely to have anxiety and
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15 depressive symptoms. Consistent findings were reported by former studies that ethnicity was a
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17 significant risk factor for depression (54, 55). However, another study reported no association
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19 between these variables (53).

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23 A notable finding of the present study was that visiting a faith healer was positively
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25 associated with anxiety and depression among both genders. In the Pakistani culture, distressed
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27 individuals generally seek help from traditional healers or faith healers prior to visiting a doctor
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29 or a psychiatrist for their illness. A few probable reasons why people visit faith healers could
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31 their easy accessibility, availability, and affordability, cultural beliefs and the predominant
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33 stigma attached to the notion of mental illness (53, 56). Moreover, in Pakistan, many people
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35 believe that mental illnesses are due to wrong doings, being possessed, witchcraft, and evil
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37 spirits; hence, the affected population consults these faith healers rather than doctors. Our result
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39 is consistent with a past study, where it was reported that sixteen percent of the Pakistani
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41 population first approaches faith healers for their illness (57).

47 **Strengths and Limitations**

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51 This is probably the first research that has determined an association of anxiety and
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53 depressive symptoms with multimorbidity, among the population in Pakistan. Due to the cross-
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55 sectional nature of study inferences could not be determined about the causality of the
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3 relationship. Potential risk factors, such as, family history of psychiatric disorders, marital
4 dissatisfaction, domestic violence, maladaptive coping, current life stressors, and death of a
5 loved one, could not be addressed in the current study. Moreover, this study was based on self-
6 reported information about multimorbidity, and anxiety and depression.
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15 **Conclusion**

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18 This study suggests that almost one quarter of the study population had anxiety and depressive
19 symptoms. Among females, the anxiety and depressive symptoms are twice as common as
20 compared to males. Early prevention and screenings are the key measures for preventing the
21 rising burden of mental disorders, when dealing with chronic physical conditions. Therefore, there
22 is a dire need to create awareness regarding identification of symptoms of mental illness and to
23 develop a proper referral system for essential treatment at the early stage of the disease, to avoid
24 delayed presentation when the disease is more advanced.
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35 **Author Contributions**

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38 KS and SF conceived the research question and the design of this project. SF conducted all the
39 literature reviews and manuscript drafting and reviewing, as well as took part in data collection.
40 MTK and SZ helped in the data analysis, preparation of tables, and reviewed the manuscript. KS
41 supervised the research project and conducted the final editing and review of the manuscript. The
42 final version of this manuscript was seen and approved by all contributors.
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51 **Conflicts of Interest**

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53 None
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Data availability statement

The data is available on request from the corresponding author.

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Table 1: Socio-demographic and other characteristics of participants (n=2867)

Characteristics	n (%)
Anxiety and depressive symptoms	
No	2081 (72.6)
Yes	786 (27.4)
Presence of multimorbidity	
No	1427 (49.8)
Yes	1440 (50.2)
Age	
30-39 years	1062 (37.0)
40-49 years	816 (28.5)
50-59 years	570 (19.9)
60-69 years	293 (10.2)
≥70 years	126 (4.4)
Gender	
Male	1477 (51.5)
Female	1390 (48.5)
Education	
No education	404 (14.1)
Primary	133 (4.6)
Secondary	647 (22.6)
Higher/Graduation	1098 (38.3)
Post-graduate	585 (20.4)
Income	
<16,000	638 (22.3)
16,001-24,999	426 (14.9)
25,000-39,999	636 (22.2)
40,000-54,999	644 (22.5)
>55,000	523 (18.2)
Occupation	
Unemployed	484 (16.9)
Unskilled worker	243 (8.5)
Skilled worker	250 (8.7)
Labor work	389 (13.6)
Non-manual work	296 (10.3)
Professional office job	1205 (42)
Marital status	

Never Married	272 (9.5)
Currently Married	2437 (85.0)
Widowed/Separated/Divorced	158 (5.5)
Numbers of Children	
No child	1250 (43.6)
1-2 children	974 (34.0)
3 and above children	643 (22.4)
Ethnicity	
Sindhi	402 (14.0)
Punjabi	318 (11.1)
Balochi	94 (3.3)
Pashtu	176 (6.1)
Urdu	1534 (53.5)
Others	343 (12.0)
Home Status	
Own	1595 (55.6)
Rent	1155 (40.3)
Other Arrangement	117 (4.1)
Smoking Status	
No	2323 (81.0)
Yes	544 (19.0)
Visiting Faith Healer	
No	2471 (86.2)
Yes	396 (13.8)

Table 2: Univariate and multivariate analysis of factors associated with anxiety & depressive symptoms among adults (n=2867)

Anxiety and depressive symptoms				
Characteristics	COR	95% CI	AOR	95% CI
Presence of multimorbidity				
No	1		1	
Yes	1.39	1.18,1.64	1.33	1.11,1.58
Age				
30-39 years	1		-	
40-49 years	0.95	0.77,1.77	-	
50-59 years	1.14	0.92,1.40	-	
60-69 years	1.02	0.78,1.40	-	
≥70 years	1.26	0.85,1.88	-	
Gender				
Male	1		1	
Female	2.58	2.17,3.05	2.40	2.01,2.87
Education				
Post-graduate	1		1	
Higher/Graduation	0.89	0.71,1.13	0.86	0.67,1.09
Secondary	1.15	0.89,1.48	1.05	0.78,1.40
Primary	1.22	0.81,1.85	1.11	0.70,1.77
No education	1.95	1.48,2.57	1.51	1.094,2.07
Income				
>55,000	1		-	
40,000-54,999	0.91	0.69,1.17	-	
25,000-39,999	0.99	0.76,1.28	-	
16,001-24,999	1.08	0.81,1.43	-	
<16,000	1.02	0.79,1.32	-	
Occupation				
Professional office job	1		1	
Non-manual work	0.78	0.58,1.06	0.81	0.58,1.13
Labor work	1.22	0.95,1.57	1.34	1.00,1.79
Skilled worker	1.15	0.85,1.55	1.29	0.93,1.78
Unskilled worker	1.17	0.87,1.59	1.06	0.75,1.48
Unemployed	0.85	0.71,1.14	0.90	0.68,1.18
Marital status				
Currently Married	1		1	
Never Married	0.78	0.58,1.05	0.87	0.62,1.17
Widowed/separated/divorced	1.45	1.03,2.03	1.02	0.72,1.48
Numbers of Children				
no child	1		1	
1-2 children	0.68	0.56,0.83	0.68	0.56,0.84

3 and above children	0.84	0.68,1.04	0.74	0.59,0.93
Ethnicity				
Sindhi	1		1	
Punjabi	1.84	1.31,2.58	1.66	1.16,2.37
Balochi	1.26	0.74,2.14	1.32	0.76,2.30
Pashtu	1.68	1.12,2.51	1.39	0.90,2.13
Urdu	1.45	1.11,1.89	1.35	1.00,1.81
Others	1.84	1.32,2.56	1.52	1.07,2.17
Home Status				
Own	1		-	
Rent	0.96	0.81,1.14	-	
Other Arrangement	0.70	0.44,1.10	-	
Smoking Status				
No	1		-	
Yes	0.80	0.65,1.00	-	
Visiting Faith Healer				
No	1		1	
Yes	2.44	1.96,3.03	2.29	1.82,2.88

COR = unadjusted odds ratios, CI = confidence intervals.

AOR = adjusted odds ratios, only variables with p-value < 0.250 in univariate analysis were entered into adjusted model using stepwise selection (Presence of multimorbidity, Gender, Education, Occupation, Marital status, Number of children, Ethnicity, Visiting faith healer).

Table 3: Univariate and multivariate analysis of anxiety & depressive symptom with number of chronic diseases among adults (n=2867)

Characteristics	n (%)	Anxiety and depressive symptoms			
		COR	95% CI	AOR	95% CI
Number of chronic diseases					
None	152 (24.6)	1		1	
One	192 (23.7)	0.95	0.74,1.21	0.89	0.69,1.14
Two	181 (25.5)	1.05	0.81,1.34	0.98	0.76,1.27
Three	134 (29.8)	1.30	0.99,1.71	1.20	0.90,1.59
Four	76 (42.2)	2.24	1.58,3.17	1.92	1.33,2.78
Five +	51 (50.0)	3.06	1.99,4.70	2.62	1.66,4.13

COR = unadjusted odds ratios, CI = confidence intervals.

AOR = adjusted odds ratios, for all variables with p-value<0.250 in univariate analysis (Age, Gender, Education, Occupation, Marital status, Number of children, Ethnicity, Home status, Smoking status, Visiting faith healer).

		Reporting Item	Page Number
Title	#1a	Indicate the study's design with a commonly used term in the title or the abstract	01
Abstract	#1b	Provide in the abstract an informative and balanced summary of what was done and what was found	02-03
Background / rationale	#2	Explain the scientific background and rationale for the investigation being reported	07
Objectives	#3	State specific objectives, including any prespecified hypotheses	07
Study design	#4	Present key elements of study design early in the paper	08-09
Setting	#5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	08-09
Eligibility criteria	#6a	Give the eligibility criteria, and the sources and methods of selection of participants.	08
	#7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	09-10
Data sources / measurement	#8	For each variable of interest give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group. Give information separately for for exposed and unexposed groups if applicable.	09-11
Bias	#9	Describe any efforts to address potential sources of bias	07

Study size	#10	Explain how the study size was arrived at	08
Quantitative variables	#11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen, and why	11-12
Statistical methods	#12a	Describe all statistical methods, including those used to control for confounding	11-12
	#12b	Describe any methods used to examine subgroups and interactions	n/a
	#12c	Explain how missing data were addressed	13
	#12d	If applicable, describe analytical methods taking account of sampling strategy	09
	#12e	Describe any sensitivity analyses	n/a
Participants	#13a	Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed. Give information separately for exposed and unexposed groups if applicable.	n/a
	#13b	Give reasons for non-participation at each stage	n/a
	#13c	Consider use of a flow diagram	n/a
Descriptive data	#14a	Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders. Give information separately for exposed and unexposed groups if applicable.	06, Table 01
	#14b	Indicate number of participants with missing data for each variable of interest	n/a

Outcome data	#15	Report numbers of outcome events or summary measures. Give information separately for exposed and unexposed groups if applicable.	06-07
Main results	#16a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Table 3
	#16b	Report category boundaries when continuous variables were categorized	10
	#16c	If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	n/a
Other analyses	#17	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses	n/a
Key results	#18	Summarise key results with reference to study objectives	13-14
Limitations	#19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias.	4 & 17
Interpretation	#20	Give a cautious overall interpretation considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence.	18
Generalisability	#21	Discuss the generalisability (external validity) of the study results	15-17
Funding	#22	Give the source of funding and the role of the funders for the present study and, if applicable,	18

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		for the original study on which the present article is based	
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