

## ASSOCIATION BETWEEN ANXIETY, DEPRESSION, AND ADHERENCE TO COVID-19 PREVENTIVE MEASURES AMONG ADULTS IN KARACHI DURING THE FOURTH WAVE

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### ABSTRACT

The COVID-19 pandemic has had profound psychological and behavioral impacts on populations worldwide. Understanding the association between mental health factors—such as anxiety and depression—and adherence to preventive measures is essential for effective public health planning. To assess the relationship between socio-demographic characteristics, anxiety and depression levels, and adherence to COVID-19 preventive measures during the fourth wave of the pandemic in Karachi, Pakistan. A cross-sectional study was conducted from August to October 2021, involving 417 adults from Karachi, selected via convenience sampling. Data were collected using a structured online questionnaire that included demographic details, preventive behaviors, and the Hospital Anxiety and Depression Scale (HADS). Preventive measure adherence was categorized as low, moderate, or high based on a Likert scale. Statistical analyses, including Pearson correlation and multiple linear regression, were performed using SPSS Version 20. The prevalence of anxiety and depression was 45.8% and 38.6%, respectively. Moderate adherence to preventive measures was observed in 66.5% of participants. A statistically significant but weak positive correlation was found between anxiety and adherence to preventive measures ( $r = 0.105$ ,  $p = 0.032$ ). Females and individuals with a Master's degree or higher were significantly more likely to adhere to preventive guidelines ( $p = 0.000$  and  $p = 0.025$ , respectively). Anxiety was weakly but significantly associated with increased adherence to COVID-19 preventive measures. Gender and education level played significant roles in influencing compliance. These findings underscore the importance of incorporating psychological and socio-demographic factors into public health strategies to enhance adherence during health crises.

**Key-words:** COVID-19, Anxiety, Depression, Preventive Measures, Gender, Education, Karachi

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### INTRODUCTION

The novel coronavirus, SARS-CoV-2, which causes the disease COVID-19, was first identified in Wuhan, China, in November 2019 (Nature Editorial, 2020; Luo and Gao, 2020; Wang *et al.*, 2020). Since then, the SARS-CoV-2 virus has led to widespread disruption globally, including in Pakistan. The first case was confirmed in Pakistan in February 2020, and by April 6, 2020 there were total of 3277, confirmed cases in the country with 18 critical and 50 deaths (Waris *et al.*, 2020).

Due to the rapid escalation of the virus's spread, the government of Pakistan imposed a strict lockdown starting in March 2020 to limit public gatherings at places such as restaurants, shopping malls, educational institutes, and religious locations (Noreen *et al.*, 2020). To prevent a further significant rise in cases, the government of Pakistan implemented various preventive strategies such as social distancing, public awareness campaigns, massive vaccination drives, and most importantly the establishment of the National Command and Operation Center (NCOC) in March 2020 (Emmanuel *et al.*, 2023). Pakistan experienced the second wave of COVID-19 disease on October 28, 2020 (Amjad, 2020). The daily increase in cases continued with the third wave starting on March 21, 2021, resulting in 630,471 confirmed cases and 13,863 deaths (Ejaz and Syed, 2021).

With a total of 314,786 reported cases, Pakistan was affected by the fourth wave of COVID-19 from July to August 2021 (Umair *et al.*, 2022). Although the government successfully reduced transmission and flattened the curve, non-compliance with standard operating procedure (SOPs) remained a significant concern among the general public (Khalid and Ali, 2020).

Previous observations indicated that the spread of the disease was strongly influenced by people's perceptions of it and their willingness to follow preventive measures (Dires *et al.*, 2021). Due to the ongoing restrictions since the first wave of COVID-19 pandemic, public attitudes have shifted. Many individuals were tired and reluctant to adopt measures against COVID-19 pandemic during the fourth wave (Yazdanpanah *et al.*, 2020). Thus, the purpose

of this study is to provide insights into the population's psychological and behavioral responses and to examine the association between socio-demographic characteristics, anxiety and depression with preventive measures during the fourth wave of the COVID-19 pandemic in Karachi. With this understanding, we can develop targeted communications to encourage greater adherence to public health recommendations in similar situations in the future.

## MATERIALS AND METHODS

### Participant's Selection

A cross-sectional investigation was carried out from August to October 2021, when it was the fourth wave of the COVID-19 pandemic, using a convenient sampling technique. The study population included the people of Karachi aged 18-70 years. The sample size was calculated by web-based Open-Epi calculator (Dean *et al.*, 2013). By keeping the confidence level at 95%, the error limit at 5%, and the prevalence of anxiety at 48.9%, the sample size came out to be 384. However, a total of 500 participants were approached to ensure sufficient data collection. Out of the 500 participants, 417 filled out the survey, yielding an 83.4% response rate.

### Inclusion Criteria

Those people who were willing to give consent, had internet access, and were approachable via social media

### Exclusion Criteria

Individuals already diagnosed with anxiety or depression and receiving treatment were excluded

### Variables

The independent variables taken into account were sociodemographic characteristics, anxiety, and depression while the dependent variable was preventive measures.

### Ethical Approval

Prior to conducting the research, The Institutional Review Board of Jinnah Sindh Medical University (JSMU), provided ethical approval (Ref No. JSMU/IRB/2021/-560). The research objectives were clearly communicated to all participants, and before they were involved, their informed consent was acquired. Ethical integrity was maintained throughout the study, ensuring the avoidance of research misconduct while safeguarding the rights and well-being of all participants.

### Data Collection

A systematically designed questionnaire, organized into four distinct sections, was utilized to investigate various study variables. The first section was based on the demographic characteristics of the participant including gender, age, and education. In the next section, preventive measures were assessed using a pre-formed free-to-access questionnaire adopted from a study (Montazeri *et al.*, 2003) consisting of 11 questions regarding wearing face masks, washing hands frequently, disinfecting floors and tables with phenyl products, covering the nose and mouth when sneezing or coughing, avoiding contact with people who have fever, respiratory symptoms, or have traveled abroad within the past month, avoiding going out, staying away from crowded areas, meat shops or markets, hospitals or clinics, and workplaces. Each question consisted of a 4-point Likert scale (1=never, 2=sometimes, 3=mostly, 4=always). The cut-off values for score ranges for Adherence to Preventive Measures were based on a scale described in previous study of (Montazeri *et al.*, 2003). The resulting score on the scale ranged from 11 to 44. Scores between 36-44 were categorized as high adherence to preventive measures, scores between 22-35 as moderate adherence and scores below 21 as low adherence (Montazeri *et al.*, 2003). Cronbach's alpha coefficient was employed to assess the internal consistency reliability of the preventive measure's questionnaire. This reliability test was conducted using the Reliability Analysis function in SPSS software (IBM Corp., 2020), accessible via: Analyze → Scale → Reliability Analysis.

The calculated Cronbach's alpha value was found to be 0.846, indicating a high level of internal consistency among the items. In the next section, Participants' anxiety and depression levels were evaluated using the validated Hospital Anxiety and Depression Scale (HADS). The HADS comprises of 14 constituents, with seven of them being dedicated to measuring anxiety and seven items dedicated to measuring depression. Each item was scored on a four-point Likert scale. According to the scale's classification, scores of 7 or lower were considered normal, scores between 8 and 10 were categorized as borderline abnormal, and scores of 11 or higher were considered abnormal. Higher ratings denoted more severe depression and anxiety. The HADS anxiety sub-scale has a Cronbach's alpha coefficient of 0.78, while the HADS depression sub-scale has a coefficient of 0.86, indicating acceptable internal

consistency for both measures (Bocéréan and Dupret, 2014). Data was collected through social media platforms. The questionnaire was made on Google Forms for dissemination via the Internet. Researchers used social media networks like Facebook, WhatsApp, and Email to disseminate the questionnaire. A consent form was appended to the first section of the Questionnaire.

### Analysis of Statistics

IBM SPSS Statistics software for Windows, Version 20.0, was used to analyze the data (IBM Corp., 2020). Multiple linear regression analysis and Pearson correlation were conducted to analyze the associations between the variables. The statistical analysis was conducted with a 95% confidence interval. For all tests, the significance was determined at a p-value  $\leq 0.05$ .

### RESULTS

Out of 417 participants, 323(77.4%) were aged between 18-29 years, 40(9.5%) aged between 30-39 years, 30(7.1%) aged between 40-49 years, and 24(5.7%) aged between 50-59 years. Among the participants, 115(27.6%) were male and 302(72.4%) were female. 258(61.9%) had a Bachelor's degree, 48(11.5%) had a Master's degree or higher. 69(16.4%) participants had a household income of PKR 40,001 – PKR 60,000. The majority of participants had a normal HADS anxiety score (54.2%) and a normal HADS depression score (61.4%). The majority had moderate adherence to preventive measures (66.5%) (Table 1).

**Table 1.** Participants' demographic characteristics (n=417).

Variable	Number of participants n(%)
<b>Age</b>	
18-29 years	323 (77.4%)
30-39 years	40 (9.5%)
40-49 years	30 (7.1%)
50-59 years	24 (5.7%)
	417
<b>Gender</b>	
Male	115 (27.6%)
Female	302 (72.4%)
	417
<b>Education</b>	
Intermediate degree or Lower	111 (26.6%)
Bachelor's degree	258 (61.9%)
Master's degree or Higher	48 (11.5%)
	417
<b>Household Income in PKR</b>	
20,000 or below	44 (10.4%)
20,001 – 40,000	67 (16.0%)
40,001 – 60,000	68 (16.3%)
60,001 – 80,000	67 (16.0%)
80,001 –100,000	62 (14.8%)
100,00 –150,000	49 (11.6%)
Greater than 150,000	60 (14.3%)
	417
<b>HADS Anxiety Score</b>	

Normal (score 7 or less)	226 (54.2%)
Abnormal (score 8 or greater)	191 (45.8%)
	417
<b>HADS Depression Score</b>	
Normal (score 7 or less)	256 (61.4%)
Abnormal (score 8 or greater)	161 (38.6%)
	417
<b>Adherence to Preventive Measures</b>	
High adherence (score 36-44)	98 (23.5%)
Moderate adherence (score 22-35)	279 (66.5%)
Low adherence (score below 21)	40 (9.6%)
	417

A significant positive correlation was found between anxiety and preventive measures ( $r=0.105$ ,  $p=0.032$ ) (Table 2). Multiple linear regression analysis indicates that males had a lower preventive measures score as compared to females ( $-0.246$  [ $-4.866$  to  $-2.040$ ],  $p=0.000$ ). Similarly, participants with an education level of Intermediate or below had a lower preventive measures score compared to those with a Master's degree or higher ( $0.135$  [ $0.335$  to  $4.953$ ]  $p=0.025$ ) (Table 3).

**Table 2.** Pearson correlation of preventive measures with Anxiety and Depression levels of the study participants ( $n=417$ ).

	Total Depression		Total Anxiety		Preventive Measures	
	r	p-value	r	p-value	r	p-value
<b>Preventive Measures</b>	0.059	0.316	0.105*	0.032	1	
<b>Total Anxiety</b>	0.621*	0.000	1		0.105*	0.032
<b>Total Depression</b>	1		0.621*	0.000	0.059	0.316

\*Correlation is significant at  $p\text{-value} < 0.05$

**Table 3.** Regression analysis of Preventive measures with Sociodemographic variables of the study participants ( $n=417$ ).

Factors	Adjusted beta coefficient (95% CI)	p-value
<b>Gender of study participants</b>		
Female	<b>Ref</b>	
Male	$-0.246$ ( $-4.866$ to $-2.040$ )	0.000

<b>Age (in years)</b>		
18-29 years	<b>Ref</b>	
30-39 years	-0.048 (-3.222 to 1.124)	0.343
40-49 years	-0.064 (-4.041 to 0.905)	0.213
50-59 years	-0.052 (-4.194 to 1.343)	0.312
60-69 years	-0.037 (-6.662 to 3.013)	0.459
<b>Education</b>		
Intermediate or Below	<b>Ref</b>	
Bachelor's	0.076 (-.418 to 2.368)	0.170
Master's or Above	0.135 (0.335 to 4.953)	0.025
<b>Household Income in PKR</b>		
20,000 or below	<b>Ref</b>	
20,001 – 40,000	-0.086 (-3.822 to .873)	0.218
40,001 – 60,000	-0.014 (-2.597 to 2.136)	0.849
60,001 – 80,000	-0.023 (-2.750 to 1.950)	0.738
80,001 – 100,000	-0.053 (-3.323 to 1.474)	0.449
100,001 – 150,000	-0.035 (-3.224 to 1.835)	0.590
Greater than 150,000	-0.003 (-2.467 to 2.364)	0.967
<b>Total Anxiety</b>	0.086 (-.045 to .273)	0.158
<b>Total Depression</b>	-0.009 (-.200 to .173)	0.886

## DISCUSSION

Our study showed a high prevalence of anxiety and depression among adults in Karachi during the fourth wave of the COVID-19 outbreak, findings indicated that 45.8% of the participants experienced anxiety, whereas 38.6% reported depression (Table 1). A study conducted during the second wave of the COVID-19 pandemic in Pakistan revealed a 56.9% prevalence of (HAD) Anxiety and an 39.1% prevalence of (HAD) depression (Ullah *et al.*, 2024). This indicates that anxiety and depression persisted through the later waves of COVID-19. Fear of contacting and transmitting the virus to family and friends, limited healthcare facilities, financial constraints, restricted social connections, family issues, lack of social gatherings and a lack of mental health support are some of the key factors contributing to anxiety and depression during the ongoing waves of the COVID-19 pandemic (Inam *et al.*, 2022).

Our study found a statistically significant but weak positive correlation between anxiety and adherence to COVID-19 preventive measures ( $r = 0.105$ ,  $p = 0.032$ ) (Table 2). Some studies found that neither anxiety nor depression was associated with COVID-19 preventive behaviors (Liu *et al.*, 2020; Stickley *et al.*, 2020; Ali *et al.*, 2022). This suggests that individuals with higher anxiety levels were marginally more likely to follow recommended preventive behaviors. Although the correlation is weak in strength, it remains important, particularly from a public health perspective, where even small behavioral changes can influence disease spread on a population level. Therefore, the role of anxiety in motivating precautionary behavior should not be dismissed, but rather contextualized with its limited predictive power. Other studies have consistently associated anxiety with a higher probability of engaging in preventive behaviors (Kwok *et al.*, 2020; Bowman *et al.*, 2021; Magdy *et al.*, 2021), which aligns with our study, where the majority of participants (66.5%) (Table 1) had moderate adherence to preventive measures.

Regarding gender differences, our findings revealed that females demonstrated significantly higher adherence to preventive measures compared to males ( $p = 0.000$ ) (Table 3). This suggests that women were more likely to engage in behaviors such as mask-wearing, hand hygiene, and social distancing. These findings are consistent with previous research which showed greater compliance among women (Chang, 2020; Zaher *et al.*, 2023). One possible explanation is that females, being more likely to report anxiety and concern for health, may also be more vigilant in

adopting preventive measures (Albert, 2015; Bahrami and Yousefi, 2011). However, it is important to note that not all studies agree; for instance, Stickley et al. (2020) reported no significant gender-based differences in adherence. Such discrepancies may reflect cultural, regional, or methodological differences, underscoring the importance of contextual factors in behavioral research.

Similarly, our study demonstrated that participants with a Master's degree or higher showed significantly greater adherence to preventive measures ( $p = 0.025$ ) (Table 3) than those with intermediate education or below. This finding aligns with a meta-analysis by (Siddiquea *et al.* 2021), which showed that lower educational attainment was associated with reduced adherence to COVID-19 preventive practices. Education likely enhances health literacy and the ability to understand and act upon public health information. Nonetheless, comparisons must be made cautiously, as education-related behaviors can be influenced by access to information, socioeconomic status, and health communication strategies specific to different populations.

In situations where non-pharmaceutical interventions are essential preventive measures, community responses have proven to be key in controlling outbreaks. Health-related information regarding COVID-19 or any other disease plays a vital role in stress management and has an impact on the behaviors of people. The government should deliver psychological support via TV, radio, and social media, with guidance from mental health professionals, to tackle emotional challenges and help reduce anxiety and depression among general population.

#### **Limitations of the study:**

This research used a convenience sampling technique so it is subjected to introduce bias and limit the representativeness of the findings. The data collection method relied on self-reported data so there is a possibility of response bias. The cross-sectional design hampers our ability to ascertain whether one variable influence or causes changes in another.

#### **CONCLUSION**

This study demonstrated that anxiety is positively associated with adherence to COVID-19 preventive measures, though the correlation was weak ( $r = 0.105$ ), indicating a limited but statistically significant effect. This implies that anxiety may serve as a mild motivator for precautionary behaviors, though its practical impact should be interpreted cautiously. Furthermore, gender and education level were significantly linked to preventive behaviors. Females and individuals with a Master's degree or higher showed greater adherence to preventive measures, reflecting how both psychological state and socio-demographic characteristics can influence health-related actions. These findings highlight the importance of considering such variables when designing public health interventions aimed at improving compliance during pandemics or similar health crises.

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