Medical Science

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The association of depression and anxiety with hypertension among adults in Riyadh, Saudi Arabia 2022

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ABSTRACT

Objectives: Depression is a mental disorder that affects the daily function of individuals. Anxiety appears to be the most prevalent among mental disorders. Increased blood pressure can be a result of various psychiatric disorders. Our aim is to determine the relationship between Psychological Disorders and Hypertension among adults in KSA in 2022. *Methods:* A cross-sectional study Targeted 304 adults. Questionnaires were distributed to eligible participants. Hospital Anxiety Depression Scale (HADS) was used. The data underwent analysis and coding process and finally that was entered through SPSS. *Results:* Of the 15 participants, who were previously diagnosed with hypertension, 2% had borderline abnormal results and 1.6% had abnormal results in the HADS anxiety. (P = 0.56), only 0.7% had borderline abnormal results and 1.3% had abnormal results in the depression. (P = 0.11). *Conclusion:* An association with abnormal and borderline abnormal in the anxiety of the HADS was found. The results collected from the depression section show no clear association between hypertension and borderline abnormal/abnormal scores. Further studies in a larger population are crucial to establish a stronger relationship between mental disorders and the etiology of chronic illnesses such as hypertension.

Keywords: Adults, Anxiety, Depression, Hypertension, Riyadh.

1. INTRODUCTION

Depression is a serious mental disorder that affects the daily function of individuals negatively, despite that, treatment of depression is usually neglected. Furthermore, anxiety disorders appear to be the most prevalent among mental disorders (Kessler et al., 1994). Chronic diseases are conditions that last for more than three months, and a major depressive episode lasts for two weeks or longer (O'connor et al., 2009). While anxiety disorders are worsened with time (National Institute of Mental Health). Given that, mental

disorders have become an major contributor to the development of chronic diseases. In addition, according to previous studies, chronic conditions such as hypertension (Shinn et al., 2001), many undistinguished cardiovascular diseases, diabetes mellitus, asthma, osteoporosis and distinct types of cancers have been linked to psychological disorders (Clarke & Currie, 2009), in particular to depression and anxiety. Moreover, the incidence of coronary heart diseases (CHD), hypertension, and other chronic illnesses have also been predicted by generalized anxiety (Barger & Sydeman, 2005; Kinley et al., 2015; Alolaiwi et al., 2021). Depression has positively predicted the onset of hypertension in young black adults (Davidson et al., 2000).

In Saudi Arabia, mental disorders are on the rise. King Salman Center for Disability Research reports that 34.2% of Saudi citizens will suffer from a mental disorder during their lifetime. 40% of Saudi adults aged 25 to 34 have been diagnosed with a mental disorder and only 13.6% of the Saudi adult population suffering from mental disorders seek help (King Salman Center for Disability Research, 2019). In a separate study of 340 Saudi adults, it was observed that 72.9% suffered from depression (Abumadini, 2019). In a study conducted in 1995-2000, the prevalence rate of hypertension among Saudi Arabian adults aged 30-70 was 26.1% (Al-Nozha et al., 2007). However, in a 2022 study, the incidence of elevated blood pressure among Saudi Arabian adults was 55%-65% (Yagoub, 2022). Furthermore, the prevalence of diabetes has increased over the past 25 years (Alotaibi, 2017). As the prevalence of mental disorders increased, so did the prevalence of hypertension and diabetes.

This study will investigate the shared and specific relationship of varied psychological disorders with long-term uncontrolled blood pressure. Furthermore, it may aid in future studies focused on early screening and prevention of psychosomatic disorders. The pathophysiology of increased sympathetic tone (Davidson et al., 2000), cortisol, and adrenocorticotropic hormone (Meng et al., 2012), in both hypertensive patients and mental disorders patients, are alike, making the early detection and treatment of hypertension plausible. Thus, treatment of depression and anxiety could prevent the likelihood of these changes escalating into a severe longstanding illness. We aim to determine the relationship between Psychological Disorders and Hypertension among adults in Saudi Arabia in 2022.

2. MATERIALS AND METHODS

It's a cross-sectional study. The target population was adults 18 years old and over, with a sample size of 304 adults. The data was collected in Riyadh, KSA between April 2022 and June 2022 in Riyadh through paper-base and online questionnaires. We used the Hospital Anxiety Depression Scale (HADS) in Arabic and English languages. The (HADS) is a reliable self-assessment scale for detecting states of depression and anxiety. The questionnaire contained three parts, the first part was the demographic data, the second part was the scale, and finally, the third part was their past diagnosis of Hypertension, to link it with their psychological state. The data was cleared, coded, and entered through the Statistical Package for the Social Sciences (SPSS).

3. RESULTS

Of the 304 participants, 172 are aged 18 to 28, 95 are aged 29 to 39, 25 are aged between 40 and 50, and 12 are aged above fifty. Moreover, 166 were females and 138 were males. Furthermore, 148 participants had higher education, 114 had high school education, 41 had middle school education, and one was uneducated. In addition, 126 participants had income of 3000 or less, 113 had income of 5000-10000, and 65 had income of 20000 or above (table 1). Out of the 304 participants, 26 were diagnosed with hypertension (8.6%), while 278 (91.4%) didn't have a previous diagnosis of hypertension (table 2).

Table 1 Personal Data (N=304)

Age		
	Frequency	Percent
18-28	172	56.6
29-39	95	31.3
40-50	25	8.2
50 and more	12	3.9
Total	304	100.0

Gender		
	Frequency	Percent
male	138	45.4
female	166	54.6
Total	304	100.0
Education Level		
	Frequency	Percent
uneducated	1	0.3
middle school	41	13.5
high school	114	37.5
higher education	148	48.7
Total	304	100.0
Monthly Income		
	Frequency	Percent
3000 or less	126	41.4
5000-10000	113	37.2
20000 or more	65	21.4
Total	304	100.0

Table 2 Prevalence of Hypertension (N=304).

	Frequency	Percent
Yes	26	8.6
No	278	91.4
Total	304	100.0

Table 3 Severity of Anxiety and Depression (N=304)

Severity of Anxiety		
	Frequency	Percent
Normal	155	51.0
borderline abnormal	64	21.1
Abnormal	85	28.0
Total	304	100.0

Severity of Depression		
	Frequency	Percent
normal	193	63.5
borderline abnormal	68	22.4
abnormal	43	14.1
Total	304	100.0

155 participants had normal results for anxiety, and 193 had the same results for depression from the 304 participants. Furthermore, 85 results were abnormal for anxiety, and 43 had abnormal results for depression. Moreover, in borderline abnormal results, 68 participants had that result in depression, and 64 in anxiety (table 3).

Table 4 Correlation between Age and Severity of Anxiety and Depression P value of Anxiety=0.14, P value of Depression=0.79.

		Anxiety			
		normal	borderline abnormal	abnormal	Total
Age	18-28	80	36	56	172
		26.3%	11.8%	18.4%	56.6%
	29-39	54	20	21	95
		17.8%	6.6%	6.9%	31.3%
	40-50	15	7	3	25
		4.9%	2.3%	1.0%	8.2%
	50 and above	6	1	5	12
		2.0%	0.3%	1.6%	3.9%
	Total	155	64	85	304
		51.0%	21.1%	28.0%	100.0%
		Depression			
		normal	borderline abnormal	abnormal	Total
Age	18-28	106	42	24	172
		34.9%	13.8%	7.9%	56.6%
	29-39	63	20	12	95
		20.7%	6.6%	3.9%	31.3%
	40-50	16	5	4	25
		5.3%	1.6%	1.3%	8.2%

	50 and above	8	1	3	12
		2.6%	0.3%	1.0%	3.9%
	Total	193	68	43	304
		63.5%	22.4%	14.1%	100.0%

This study had a sample of 304 participants; 172 were in the age group 18-28, 95 were between 29-39, 25 were in the age group 40-50 and 12 were older than 50 (table 4). In the section on anxiety from the Hospital Anxiety and Depression Scale the results of the age group 18-28 were as follows: 18.4% of the participants had abnormal results whilst 11.8% had borderline abnormal results and 26.8% had normal test results. Furthermore, 17.8% had normal results from the age group 29 to 39, and 6.9% from the same age group presented abnormal results. 4.9% of the participants aging from 40 to 50 showed normal results but 2.3% had borderline abnormal results and only 1% had abnormal results. While 1.6% of the participants that are aged 50 and above had abnormal results and 2% had normal results. The statistical significance is (P Value = 0.14). The results of the section of depression in the HADS test in this study are the following: 13.8% in the age group of 18-28 had borderline abnormal results and 7.9% showed abnormal results while 34.9% had normal results. 6.6% in the age group 29-39 had borderline abnormal results and 3.9% had abnormal results, whilst 20.7% had normal results. Moreover, 5.3% had normal results from the age group 40 to 50, and 1.3% from the same age group presented abnormal results and 1.6% had borderline abnormal results. 2.6% of the participants aging 50 and above showed normal results but 1% had abnormal results and 0.3% had borderline abnormal results. The statistical significance is (P Value = 0.79).

Table 5 Correlation between Gender and Severity of Anxiety and Depression P value of Anxiety=0.11, P value of Depression=0.98.

		Anxiety			
		normal	borderline abnormal	abnormal	Total
Gender	male	78	29	31	138
		25.7%	9.5%	10.2%	45.4%
	female	77	35	54	166
		25.3%	11.5%	17.8%	54.6%
	Total	155	64	85	304
		51.0%	21.1%	28.0%	100.0%
Gender		Depression			
		normal	borderline abnormal	abnormal	Total
	male	87	31	20	138
		28.6%	10.2%	6.6%	45.4%
	female	106	37	23	166
		34.9%	12.2%	7.6%	54.6%
	Total	193	68	43	304
		63.5%	22.4%	14.1%	100.0%

This study had 138 male participants, from those, 10.2% had abnormal results in the section of anxiety from the HADS test, while 6.6% had abnormal results in the section of depression (table 5). Moreover 9.5% had borderline abnormal results in the section

of anxiety and 10.2% had borderline abnormal results in the section of depression. Furthermore, 25.7% of male participants had normal results in the section of anxiety and 28.6% had normal results in the section of depression of the HADS test. 166 females participated, 17.8% had abnormal results in the anxiety section of the HADS test, and 11.5% had borderline abnormal results, whilst 25.3% had normal results. In the section of depression 7.6% had abnormal results, while 12.2% had borderline abnormal results and 34.9% had normal results. The statistical significance is (P Value of depression = 0.98), (P Value of anxiety = 0.11).

Table 6 Correlation between Education Level and Severity of Anxiety and Depression P value of Anxiety=0.64, P value of Depression=0.43.

		Anxiety			
		normal	borderline abnormal	abnormal	Total
Education Level	not educated	0	0	1	1
		0.0%	0.0%	0.3%	0.3%
	middle school	21	8	12	41
		6.9%	2.6%	3.9%	13.5%
	high school	58	21	35	114
		19.1%	6.9%	11.5%	37.5%
	higher education	76	35	37	148
		25.0%	11.5%	12.2%	48.7%
	Total	155	64	85	304
		51.0%	21.1%	28.0%	100.0%
		Depression			
		normal	borderline abnormal	abnormal	Total
Education Level	not educated	0	0	1	1
		0.0%	0.0%	0.3%	0.3%
	middle school	24	10	7	41
		7.9%	3.3%	2.3%	13.5%
	high school	71	29	14	114
		23.4%	9.5%	4.6%	37.5%
	higher education	98	29	21	148
		32.2%	9.5%	6.9%	48.7%
	Total	193	68	43	304
		63.5%	22.4%	14.1%	100.0%

There was diversity in the level of education that our participants have had and the correlation of their level of education to their HADS results. For instance, 12.2% of the participants had abnormal anxiety results from the higher education group, and 11.5% had borderline abnormal anxiety results in that group, while 25% had normal anxiety results. More over 6.9% had abnormal

depression results and 9.5% had borderline abnormal results, whilst 32.2% had normal depression results in the same group. Furthermore, the group of uneducated participants had 0.3% abnormal results in the HADS of both depression and anxiety. 11.5% of participants with high school education had abnormal anxiety results and 4.6% had abnormal depression results, while 19.1% had normal anxiety results and 23.4% had normal depression results. In the group of middle school level education 3.9% had abnormal anxiety results and 6.9% had normal anxiety results, while 2.3% had abnormal depression results according to HADS and 7.9% had normal depression results (table 6). The statistical significance is (P Value of depression = 0.43), (P Value of anxiety = 0.64).

Table 7 Correlation between Monthly Income and Severity of Anxiety and Depression P value of Anxiety=0.29, P value of Depression=0.94.

		Anxiety			
		normal	borderline abnormal	abnormal	Total
Monthly Income	3000 or less	57	26	43	126
		18.8%	8.6%	14.1%	41.4%
	5000-10000	64	22	27	113
		21.1%	7.2%	8.9%	37.2%
	20000 or more	34	16	15	65
		11.2%	5.3%	4.9%	21.4%
	Total	155	64	85	304
		51.0%	21.1%	28.0%	100.0%
		Depression			
		normal	borderline abnormal	abnormal	Total
Monthly Income	3000 or less	78	30	18	126
		25.7%	9.9%	5.9%	41.4%
	5000-10000	71	25	17	113
		23.4%	8.2%	5.6%	37.2%
	20000 or more	44	13	8	65
		14.5%	4.3%	2.6%	21.4%
	Total	193	68	43	304
		63.5%	22.4%	14.1%	100.0%

There were variations in the monthly income of the participants and its relationship with their anxiety and depression scores on HADS. For example, 14.1% of the participants with a monthly income of 3000 or less had abnormal anxiety results and 18.8% had normal anxiety results. Whilst 5.9% in the same group had abnormal depression results and 25.7% had normal depression results. 8.9% of participants with a monthly income of 5000-10000 had abnormal anxiety results and 21.1% had normal anxiety results, also 5.6% in the same income group had abnormal depression results and 23.4% had normal depression results. 4.9% of participants with a monthly income of 20000 and above had abnormal results for anxiety and 11.2% had normal results for anxiety, whilst in depression, 2.6% had abnormal results and 14.5% had normal results (table 7). The statistical significance is (P Value of depression = 0.94), (P Value of anxiety = 0.29).

Table 8 Correlation between Hypertension and Severity of Anxiety P value of Anxiety=0.56.

		Anxiety			
		normal	borderline abnormal	abnormal	Total
Hypertension	Yes	15	6	5	26
		4.9%	2.0%	1.6%	8.6%
	No	140	58	80	278
		46.1%	19.1%	26.3%	91.4%
	Total	155	64	85	304
		51.0%	21.1%	28.0%	100.0%
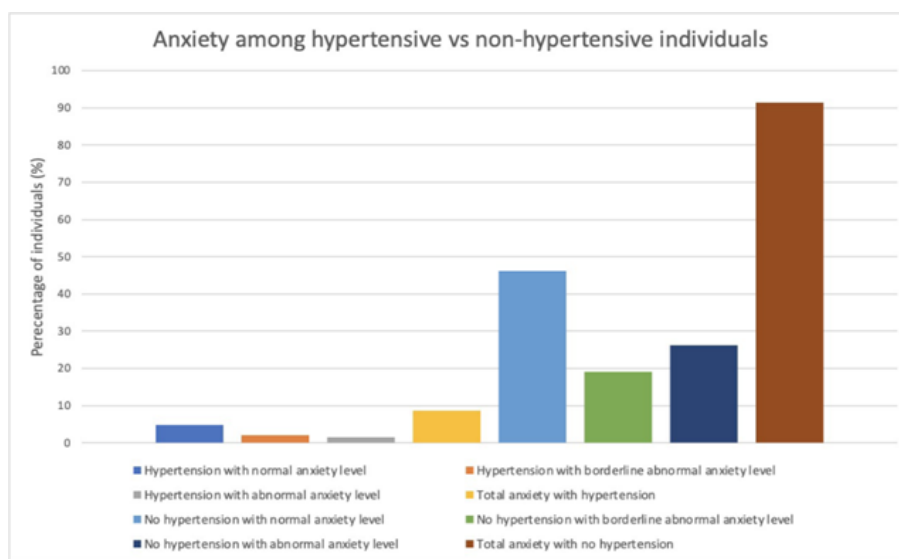
Figure 1 Anxiety among hypertensive and non-hypertensive individuals

The correlation of the diagnosis of hypertension among the participants of the study according to the anxiety section of the HADS test is as follows: 5 participants (1.6%) who had abnormal anxiety results were diagnosed with hypertension, while 6 (2%) of the participants with hypertension had borderline abnormal results, and 15 participants (4.9%) who have had been diagnosed with hypertension had normal anxiety results. Furthermore, 80 participants (26.3%) who were not previously diagnosed with hypertension had abnormal anxiety results; also 58 participants (19.1%) had borderline abnormal results and weren't diagnosed with hypertension previously, while 140 participants (46.1%) from the same group had normal anxiety results (table 8 and figure 1). The statistical significance is (P Value of anxiety = 0.56).

Table 9 Correlation between Hypertension and Severity of Depression P value of Depression=0.11.

		Depression			
		normal	borderline abnormal	abnormal	Total
Hypertension	Yes	20	2	4	26
		6.6%	0.7%	1.3%	8.6%

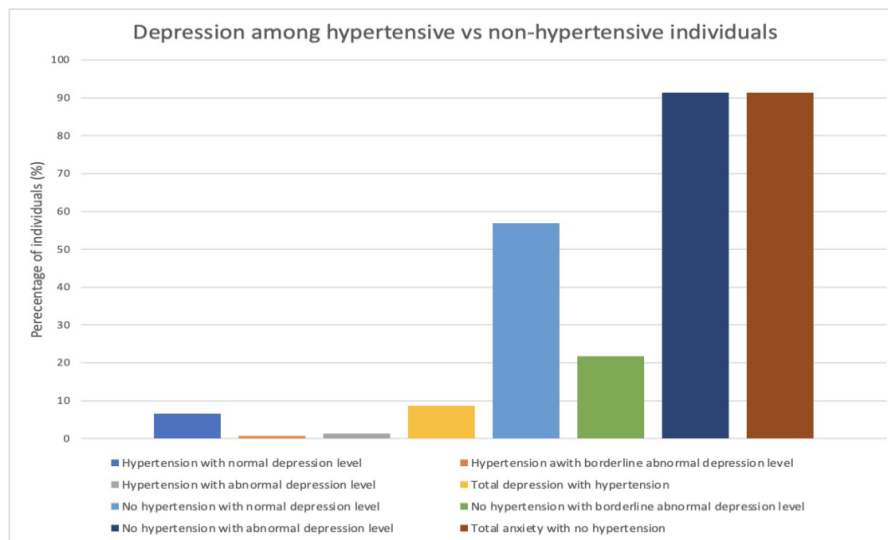|					
	No	173	66	39	278
		56.9%	21.7%	12.8%	91.4%
	Total	193	68	43	304
		63.5%	22.4%	14.1%	100.0%

Figure 2 Depression among hypertensive and non-hypertensive individuals

The association between depression and the diagnosis of hypertension among the participants of the study was as follows: In participants with a previous diagnosis of hypertension, 4 (1.3%) had abnormal depression results, and 2 participants (0.7%) had borderline abnormal results, whilst 20 (6.6%) had normal results (table 9 and figure 2). Moreover, the results of the participants without a previous diagnosis of hypertension were as follows: 39 participants (12.8%) showed abnormal depression results and 66 (21.7%) had borderline abnormal results while 173 participants (56.9%) gave normal depression results according to the HADS test. The statistical significance is (P Value of depression = 0.11).

4. DISCUSSION

Age-wise, the results of the study were not far off from our expectations, or previous papers. For instance, in the Saudi National Mental Health Survey of 2019, the majority of mental health disorders were detected in the age groups of 15-24 and 25-34 (King Salman Center for Disability Research, 2019). Similarly, our study resulted that the age group of 18-28 years had the most prevalence of anxiety and depression. In a more recent paper published in Saudi Arabia, it was stated that the age group of 18-24 had the most anxiety levels among their participants (Aljurbua et al., 2021). While a different study profiling the sociodemographic of mood disorders in Saudi Arabia, had almost matching results to ours in depression age demographics, with the highest prevalence of depression in their study in the age group 18-30 (Abumadini, 2019), and ours 18-28 and 29-39.

Contrary to our results, a tertiary care hospital study resulted that the greatest prevalence of depression was in the age group 40-59 followed by 18-39 (Abolkhair et al., 2018) this could be explained by the presence of terminal illnesses and chronic pain in their participants. Gender is a strong indicator of depression and anxiety in our study, for which female participants had a higher prevalence of those disorders than males, did thus being in line with past papers. In an article published in 2020 covering the sociodemographic characteristics of anxiety in medical students, results showed that severe anxiety was more present in females, whilst moderate anxiety was higher in males (Alateeq, 2020). In addition, a different local study specific to depression results stated that the rate of depression was higher in females than males (Al-Qadhi et al., 2014). Furthermore, general studies about the prevalence of mental disorders in Saudi Arabia matched our results (Al-Khathami & Ogbeide, 2002; Becker et al., 2002; Abdelwahid & Al-Shahrani, 2011). All uneducated participants scored abnormal results for depression and anxiety, but due to the lack of uneducated participants in our study, it's difficult to say for certain that not being educated will render you depressed or anxious.

Moreover, a study by Bjelland et al., (2008) had similar results to ours, for the majority of depressed and anxious participants had primary level education. While our results showed that with the increase in education, the borderline abnormal and abnormal results of depression and anxiety increased. An article conducted after the first outbreak of COVID-19 found that severe depression was higher in below graduate level than graduates; this could be attributed to more job possibilities for graduates at the time of COVID-19. Although in agreement with our results, severe anxiety was higher in graduates than those below graduate level (Abdul Ali et al., 2022; Ismail et al., 2022).

Our study had monthly income as a significant value in the detection of depression and anxiety. For example, more than half of participants who had 3000 or less income had abnormal or borderline abnormal results for anxiety. These results are approved by an article by Al Balawi et al., (2019) which showed that 87.5% of participants with income lower than 3000 had a degree of depression. In a different article aimed to detect the relation of income to mental disorders, results of lower income showed a higher incidence of mental disorders (Sareen et al., 2011). Whilst scores of abnormal in the depression section of HADS, are still the highest in the group with income of 3000 or less, it's not as notable as the abnormal results for anxiety. The group earning from 5000 to 10000 had almost similar results of depression to the group of income of 3000 or lower. Furthermore, when comparing the results of depression and anxiety in participants with an income of 20000 or more, we found that results of anxiety were higher than depression; we believe that the increased abnormal result of anxiety is perhaps due to job stress while the decreased depression results are explained by the security of income.

Moreover, a study on the impact of financial strain on mental health results was in line with our results, the same study stated that there is no association between the recurrence of mental disorders and financial strain (Dijkstra-Kersten et al., 2015). The vast majority of our participants were not diagnosed previously with hypertension. Despite the minority of participants with hypertension and the limitations in that, the results of the participants diagnosed with hypertension in borderline abnormal and abnormal anxiety are almost alike to the diagnosis of hypertension in participants scoring normal anxiety results. An article published in 2012 found a significant positive correlation between anxiety and hypertension (Ginty et al., 2012) this is in line with our hypothesis of increased incidence of hypertension among anxious individuals. A 2015 meta-analysis of studies about the association of anxiety with hypertension also supported our hypothesis (Yan et al., 2015). Moreover, a study by Hamer et al., (2010) found a direct correlation between patients' awareness of their hypertension diagnosis and anxiety, while this relation was not detected in patients who are not aware of their diagnosis. However, a study in 2001 found no significant correlation between the incidence of hypertension and anxiety (Shinn et al., 2001).

All these studies should be taken into consideration when treating both hypertension and anxiety, to prevent the worsening of the disease, and increase the life quality of hypertensive patients, and perhaps life expectancy. Depression is associated with bad lifestyle habits, thus elevating the prevalence of chronic diseases such as hypertension (Bonnet et al., 2005). Furthermore, given that we didn't have enough hypertensive participants, the difficulty to determine an existent relationship between the prevalence of hypertension to depression increased. Although less than half (30%) of our hypertensive participants had abnormal and borderline abnormal results. Moreover, a meta-analysis by Meng et al., (2012) found a significant relationship between the developments of hypertension in depressed individuals. Not only is depression a risk factor for hypertension, but depression was also associated with the increase of uncontrolled blood pressure in several studies.

One article stated that 21 out of 23 of their depressed patients had uncontrolled blood pressure (Rubio-Guerra et al., 2013). A different article concluded that depression was both a risk factor for hypertension and uncontrolled blood pressure (Abreu-Silva & Todeschini, 2014). In addition, moderate and high depression levels were used to predict the onset of hypertension in young adults subsequently. This relation was especially found in young black people (Davidson et al., 2000). However, an article studying the relation of depression and anxiety to chronic diseases, found that anxiety predicted and preceded chronic illnesses, while there was no clear association between depression and chronic diseases, while the association between negative outcomes of diseases and depression was significant (Kinley et al., 2015).

5. CONCLUSION

In conclusion, an association between Hospital Anxiety and Depression test scores of borderline abnormal and abnormal anxiety and hypertension was found. While the association between hypertension and abnormal scores of depression were not found. For a clear association between the role of anxiety, depression, and additional mental disorders with the aetiology of chronic illnesses such as hypertension, further investigations in a larger population should be conducted.

Ethical Considerations

The ethical approval of the IRB (IRB07-19082022-65) in Almaarefa University, College of Medicine was fulfilled before the start of the data collection. The aim of this study was clarified to the participants of this study and the data was kept confidential.

Author's contribution

All authors had substantial contribution to the paper, ESA and GNA and LAA and ABH and DHA designed the study and prepared the proposal. ABH analyzed and interpreted data. ESA wrote results and discussion. DHA checked the paper from plagiarism and did proofreading. KIM checked and revised every step of this paper. All authors critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

Conflict of interest

The authors declare that there is no conflict of interests

Data and materials availability

All data associated with this study are present in the paper.

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