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# Changes in Depression, Anxiety, and Stress Levels during a Religious Period: A Prospective Cohort Study

Ibrahim M. Gosadi\*

Family and Community Medicine Department, Faculty of Medicine, Jazan University, Jazan City, 45142, Saudi Arabia

\*Corresponding Author: Ibrahim M. Gosadi. Email: gossady@hotmail.com

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## ABSTRACT

**Objective:** There is conflicting evidence suggesting an association between Ramadan and mental health. **Aim:** This study aims to assess changes in depression, anxiety, and stress levels during Ramadan among university students from Saudi Arabia and to measure the magnitude of change in these levels according to gender. **Methods:** This study is a prospective cohort study. Data was collected using a structured questionnaire that measured demographic data of the students, and levels of depression, anxiety, and stress utilizing the short form of the Depression Anxiety Stress Scales questionnaire (DASS 21). The assessments were performed starting from the month of Shaban (the month that precedes Ramadan), and the second wave of data collection was initiated beginning the second week of Ramadan until the end of the month. Differences in the proportion of students who are categorized as normal or having abnormal degrees of depression and anxiety between Shaban and Ramadan were tested using either the Chi-square test or Fisher's exact test. **Results:** A total of 321 students completed the assessment during Shaban and Ramadan. More than half of the students were male (54.2%), with a mean age of 22. A statistically significant difference in levels of anxiety, depression, and stress between the assessment periods was detected ( $p < 0.001$ ). The proportion of students classified as normal increased during Ramadan across all measured conditions in comparison to during Shaban. The reduction in the number of students classified as having anxiety, depression, and stress between the assessment periods remained statistically significant across both genders. Nonetheless, degrees of change appear to be higher among male students than among female students. **Conclusion:** This study identified a reduction in levels of depression, anxiety, and stress among students during the month of Ramadan, as well as gender variation concerning levels of change. The results support the significance of considering social, religious, and spiritual aspects when designing interventions to address individuals' mental health.

## KEYWORDS

Depression; anxiety; stress; religion; Ramadan

## Introduction

Mental well-being is an essential element of the health of individuals [1]. Mental disturbance can have an impact on emotions and behaviors. According to the World Health Organization, in 2019, one in every eight individuals in the world was affected by a mental disorder [2]. Furthermore, the prevalence of mental disorders was reported to have

increased due to the impact of the COVID-19 pandemic, calling for more efforts to promote mental well-being [3].

A study that assessed the global and regional prevalence of anxiety disorders during the last three decades showed that 4% of individuals in the world suffer from an anxiety disorder. The overall prevalence of the disorder increased by 55% between 1990 and 2019. The study also identified variations in the prevalence of anxiety disorders between countries,



indicating the importance of considering cross-cultural assessments to understand trends of anxiety [4]. A similar systematic review and meta-analysis assessed the periodic change in the prevalence of depression, anxiety, stress, and insomnia during the Coronavirus disease (COVID-19) pandemic, concluding that there was a high prevalence of these conditions during the pandemic compared with the pre-pandemic period [5].

Determinants of mental health can be related to individual characteristics and exposure to social and environmental factors. Individual characteristics can be related to emotional skills, gender, age, occupation, substance use, and genetic propensity; these characteristics may render an individual at a higher risk of mental health disorders. Furthermore, individuals can also be affected by exposure to risk factors such as social, economic, political, and environmental at the community level [6]. Assessment of variations in mental health according to individual and social determinants is vital to understanding the factors associated with the mental health of individuals.

Mental health has been reported to be influenced by various periods during the year. For example, seasonal affective disorder can lead to mood changes or behavior according to the season; some may experience depression and anxiety symptoms during the winter or the summer [7]. The influence of seasonal variation on mental well-being was reported to be associated with changes in circadian rhythms, leading to modified brain functions [8]. Additionally, the rise of temperature during hot seasons was reported to influence mental well-being. And variation of temperature during the seasons [9].

In addition to the influence of environmental variations associated with the change of seasons, there is some evidence suggesting that mental health can also be affected by festive and religious seasons. For example, some individuals might experience joy during the Christmas period, and some might be at risk of increased stress, depression, and anxiety [10]. The rise in the risk of developing these conditions during festive seasons might be associated with ruminating about past times, experiencing grief when remembering those lost, feeling pressure in social gatherings, or loneliness during festive periods [11]. However, these notions are mainly based on expert opinion, and there is a scarcity of evidence-based, prospective assessments of the influence of Christmas on mental well-being.

Although studies that assessed the influence of festive seasons on mental health are limited, there is conflicting evidence regarding the association between the season of Ramadan and mental health. In a prospective study that assessed changes in lifestyle, academic achievement, and perceived stress among medical students in Saudi Arabia before and during the month of Ramadan, results showed increased stress levels during Ramadan ( $p < 0.01$ ) [12]. In contrast, a Tunisian study involving a sample of 14 physically active men assessed their dietary intake, fatigue, and mental stress during three periods: before, during, and after Ramadan. The results indicated no statistically significant changes in stress levels [13]. However, a more extensive Nigerian prospective study involving a sample of

770 adults assessed mental well-being before and during Ramadan and concluded that the proportion of depressed individuals decreased from 61.3% before Ramadan to 56.5% during Ramadan ( $p < 0.001$ ) [14]. Finally, in a Pakistani study including a sample of 62 patients diagnosed with bipolar disorder, it was noted that the Hamilton Depression Rating Scale scores showed a statistically significant reduction among the patients during Ramadan ( $p < 0.001$ ) compared with the pre-Ramadan period [15].

In addition to the potential effect of religious and festive periods on mental well-being, some individuals can be exposed to certain social or occupational determinants that can increase the risk of anxiety, depression, and stress. Several cross-sectional studies have indicated that university students can be exposed to risk factors such as bullying, improper lifestyle factors, negative academic environment [16–19]. Furthermore, investigations with a longitudinal nature that assessed mental well-being among university students indicated that university students can experience variations in depression, stress, and anxiety during their studies. According to a study that included a sample of 2473 university students who were followed up for four years to assess changes in mental health, it was concluded that body mass index and sleep hours were related to increased levels of depression, gender and sleep hours were associated with increased levels of anxiety, and hometown location was related to increased levels of stress [20]. Furthermore, in a similar study that recruited a sample of 7967 students from 112 schools in China who were followed up for two academic years to assess the association between personality traits and self-rated health, it was concluded that the association between the Big Five personality traits and self-rated health among the students can be bidirectional, indicating the importance of enhancing students' well-being while facilitating the development of their personalities [21].

The current literature presents conflicting findings concerning the impact of Ramadan on the mental well-being of individuals. Additionally, the direction and variation of the influence of Ramadan on mental well-being is not clear. This study aims to assess changes in depression, anxiety, and stress levels during Ramadan among university students from Saudi Arabia. Additionally, the study aims to assess the magnitude of change in depression, anxiety, and stress among the students according to gender.

## Materials and Methods

### *Study context*

This study represents a phase of a prospective cohort investigation conducted between February and April 2023, recruiting students from Jazan University (Saudi Arabia). The project aimed to measure characteristics of chronotype, sleep quality, and mental well-being among the students before and during Ramadan. The paper presents the findings related to changes in mental well-being during Ramadan.

Data collection was conducted via an online platform to reach students affiliated with the university. The study was conducted in accordance with the Declaration of Helsinki and the ethical guidelines of Saudi Arabia. Ethical approval

for performing the investigation was obtained from the Standing Committee of Scientific Research at Jazan University (approval number REC-44/04/365, dated 14 November 2022). Involvement in the study was voluntary, and the participants had the right to accept, refuse, or withdraw at any phase of the investigation. To allow the sending of follow-up reminders, participants who consented to be recruited were asked to provide their contact details to ensure their future participation. To ensure the security of the information provided by the students, their contact details were removed after the conclusion of the study, and cases were connected using a unique code for each participant.

#### *Description of the assessment period*

The months of Shaban and Ramadan represent the eighth and ninth lunar months of the Islamic (Hijri) year. Ramadan can be presumed to represent a festive period in Saudi Arabia that can have implications on mental well-being from several perspectives. First, Ramadan is a month where Muslims are obligated to spend more time worshipping, either by fasting during the day, performing prayers and supplications at night, or giving charity to the poor, thus enhancing the spiritual aspects of the worshippers. Second, working and studying hours during Ramadan are reduced from eight to five hours, with a start at 10 am instead of 8 am during average days. Third, almost one-third of the month is a national holiday for the students. Finally, Ramadan is followed by Eid Al-Fitr (the first day of the month of Shawal). On this day, Muslims are encouraged to engage in social gatherings and visit relatives and neighbors to celebrate the end of the fasting period during the month of Ramadan. Therefore, Ramadan is associated with a change in eating and sleeping habits and increased spiritual impact and is likely to affect the overall lifestyle of students in Saudi Arabia and their mental well-being. To ensure that the evaluation of the potential impact of the Ramadan period was complete, the assessments began at the start of the month of Shaban (the month that proceeds Ramadan), and the second wave of data collection began at the start of the second week of Ramadan until the end of the month.

#### *Data collection tool*

Data was collected using a structured questionnaire consisting of two main components. First, the questionnaire collected demographic data of the participants, including gender, age, social status, the presence of any chronic disease, smoking, college affiliation, year of study, and grade point average at the time of recruitment. The second section was an assessment of the respondent's level of depression, anxiety, and stress utilizing the short form of the DASS questionnaire (DASS 21). Development, validity, reliability, and scoring of the DASS 21 were conducted by Antony et al. [22]. Their findings indicated that the internal consistency assessment via Cronbach's Alpha test was 0.94 for depression, 0.87 for anxiety, and 0.91 for stress. The validity of the DASS 21 questionnaire was performed via assessing the concurrent validity by comparing the DASS 21 questionnaire to the Beck Depression Inventory, Beck Anxiety Inventory, and State-Trait Anxiety Inventory where the correlations between the scales varied between 0.51 and

0.85. Finally, the Arabic version of the DASS 21 questionnaire which was translated by Ali et al., was utilized since it was suitable for the current targeted population [23]. The Cronbach's alpha test of the current investigation using the Arabic language reached a value of 0.95 indicating a high-reliability value.

The questionnaire was tested on 10 male and 10 female students to assess the clarity of the questions and the time needed to complete it.

#### *Data collection process*

To enable the distribution of the questionnaire, Google Forms was utilized to produce an online version of the questionnaire, and a web link was generated to allow access to the questionnaire. The identification and approaching phases of the study were completed by advertising the projects through WhatsApp groups linked to university students. The generated web link involved an information sheet explaining the aim of the study, the content of the data collection tool, and the inclusion and exclusion criteria. The recruitment phase of the data collection process was finalized by accessing and completing the questionnaire by the students who met the inclusion criteria.

#### *Sampling, inclusion, and exclusion criteria*

Only current students of Jazan University were included, with alumni and non-affiliated individuals excluded. Participants who agreed and consented to take part in the investigation were granted access to the questionnaire, while those who did not consent were directed elsewhere and excluded from the study. Additionally, students who did not complete the second wave of the data collection process were excluded. Fig. 1 presents a flow chart describing the steps for performing the prospective assessment, the number of students who were excluded at each step, and the final included sample size.

Convenience sampling was utilized to facilitate recruitment of the targeted university students. Several estimations were performed to enable the assessment of chronotype, changes in sleeping habits, and levels of depression, stress, and anxiety throughout the assessment period. However, using G\*Power software (Version 3.1.9.4), one group difference of proportion test revealed a required sample of 263 students to detect an effect size of 1% with an alpha error of 0.05 and a power of 90%. A difference of 1% was presumed to be sufficient to test for the differences in chronotype, changes in sleeping habits, and levels of depression, stress, and anxiety. Furthermore, a 50% larger sample was targeted to account for the potential loss of follow-up. The total number of samples collected and the total number of valid samples are illustrated in Fig. 1.

#### *Statistical analysis*

Data analysis was performed using Statistical Package for the Social Sciences software (version 25). Binary and categorical variables were described using frequencies and proportions. Mean and standard deviation (SD) were used to summarize continuous data. Assessment of levels of depression, anxiety, and stress was performed by the scoring system described elsewhere [24]. However, due to the limited sample size of

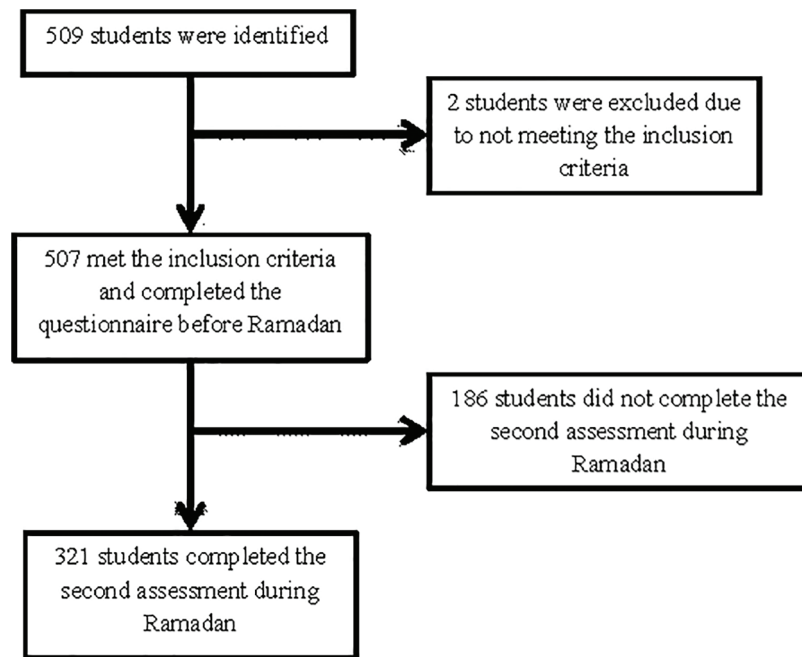


FIGURE 1. Participation flow in the current study.

the current investigation, the levels of depression, anxiety, and stress were grouped into three categories: (a) normal, mild or moderate, (b) severe, or (c) extremely severe. Differences in the proportion of students categorized as normal or having abnormal degrees of depression or anxiety between Shaban and Ramadan were tested using either the Chi-square test or Fisher's exact test. Additionally, to test for the variation in degrees of differences in levels of depression, anxiety, and stress according to gender during the assessment period, the same inferential analysis was repeated while splitting the sample into male and female groups. A *p*-value of 0.05 was presumed to be a statistically significant value for the applied test.

## Results

A total of 321 students completed the assessment during Shaban and Ramadan. Table 1 displays the demographic characteristics of the students. More than half of the participants were male (54.2%), and the mean age of the students was 22.0 (SD:2.3). A majority of the students were related to a health specialty (72.0%), while slightly more than half (51.0%) of the students were in their fourth year of study or beyond. The majority of the students were single (93.1%), while 21 students were married. At the time of recruitment, only 31 students (9.9%) were current smokers, and only 42 (13.3%) reported being diagnosed with a chronic disease.

Levels of anxiety, depression, and stress among the university students and their distribution according to the month of recruitment are displayed in Table 2 and Fig. 2. The applied statistical tests indicate the presence of statistically significant differences in levels of anxiety, depression, and stress between the assessment periods ( $p < 0.001$ ). As shown in Fig. 2, the proportion of students

TABLE 1

Demographic characteristics of the 321 university students from Jazan, Saudi Arabia

Variables*	Frequency [proportion]
<b>Age</b>	
Less than 22 years	150 [46.9%]
22 years or more	170 [53.1%]
<b>Gender</b>	
Male	174 [54.2%]
Female	147 [45.8%]
<b>Specialty</b>	
Health specialty	230 [71.9%]
Non-health specialty	90 [28.1%]
<b>Year of Study</b>	
Less than 4th year	152 [48.7%]
4th year or more	160 [51.3%]
<b>Social status</b>	
Single	299 [93.1%]
Married	21 [6.5%]
Divorced	1 [0.3%]
<b>Smoking</b>	
Never	259 [83.0%]
Current	31 [9.9%]
Previous	22 [7.1%]
<b>Diagnosis with a chronic disease</b>	
Yes	42 [13.3%]
No	274 [86.7%]

Note: \*One missing for age, seven missing for specialty, nine missing for year of study, smoking, and khat chewing, and five missing for diagnosis with a chronic disease.

TABLE 2

Levels of anxiety, depression, and stress among 321 university students from Jazan University measured during months of Shaban and Ramadan of the year 2023

Symptoms levels	Anxiety*		Depression*		Stress*	
Frequency [proportion]	Shaban	Ramadan	Shaban	Ramadan	Shaban	Ramadan
Normal	147 [45.8%]	171 [53.3%]	129 [40.2%]	173 [53.9%]	201 [62.6%]	213 [66.4%]
Mild/moderate	82 [25.5%]	74 [23.1%]	110 [34.3%]	83 [25.9%]	55 [17.1%]	56 [17.4%]
Severe/extremely severe	92 [28.7%]	76 [23.7%]	82 [25.5%]	65 [20.2%]	65 [20.2%]	52 [16.2%]

Note: \*Chi-square  $p$ -value of <0.001 for differences in symptom levels between Shaban and Ramadan.

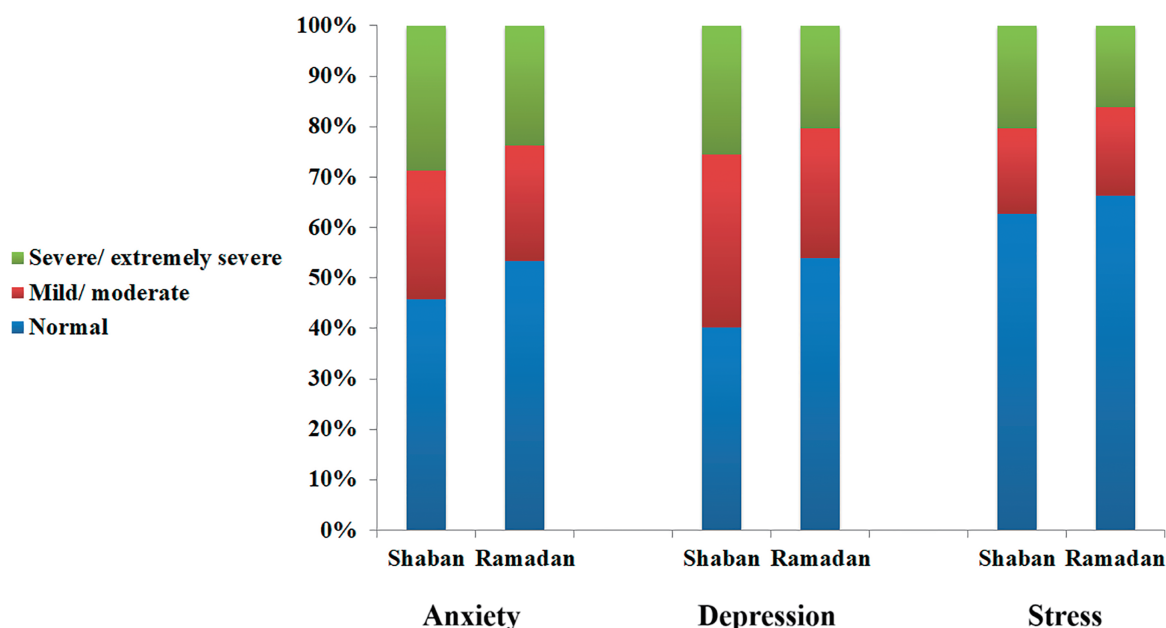


FIGURE 2. Levels of anxiety, depression, and stress among 321 university students from Jazan University measured during the months of Shaban and Ramadan in 2023.

classified as normal increased during Ramadan across all measured conditions.

Fig. 3 displays the change in the number of students experiencing anxiety, depression, and stress between Shaban and Ramadan. It can be noted that there was a greater reduction in the number of individuals classified as having depression compared with the number classified as having anxiety and stress. This suggests that the Ramadan period might be associated with a greater reduction in depression compared with anxiety, whereas stress level reduction is smaller in comparison to other conditions.

The split analysis results according to gender are shown in Table 3 and Fig. 4. The reduction in the number of students labeled as having anxiety, depression, and stress between the assessment periods remained statistically significant across both genders. Nonetheless, the degree of change appeared to be higher among male students than among female students. Fig. 5 shows the degree of change in levels of anxiety, depression, and stress according to gender. It can be noted that male students exhibited a larger reduction in anxiety, depression, and stress during the assessment period than female students. Additionally, there was very minimal change in stress levels and anxiety among females. However,

the reduction in depression among females was significant in comparison to the change in anxiety and stress levels among females throughout the assessment period. This finding suggests that the period of Ramadan might be associated with a reduction in anxiety, depression, and stress among male students, whereas among females, only a change in depression levels is apparent.

### Discussion

This investigation is a prospective cohort study that performed two assessments during Shaban and Ramadan among university students from Saudi Arabia to test for changes in levels of depression, anxiety, and stress. The overall comparison indicates the presence of a reduction in the levels of depression, anxiety, and stress. The split analysis results according to gender suggest that the magnitude of change is higher among males than females. Additionally, depression appears to have an increased change in magnitude compared with anxiety and stress. These findings suggest that the month of Ramadan, which can be presumed to be a spiritual and festive period for Muslims, may have an impact on improving mental well-being.



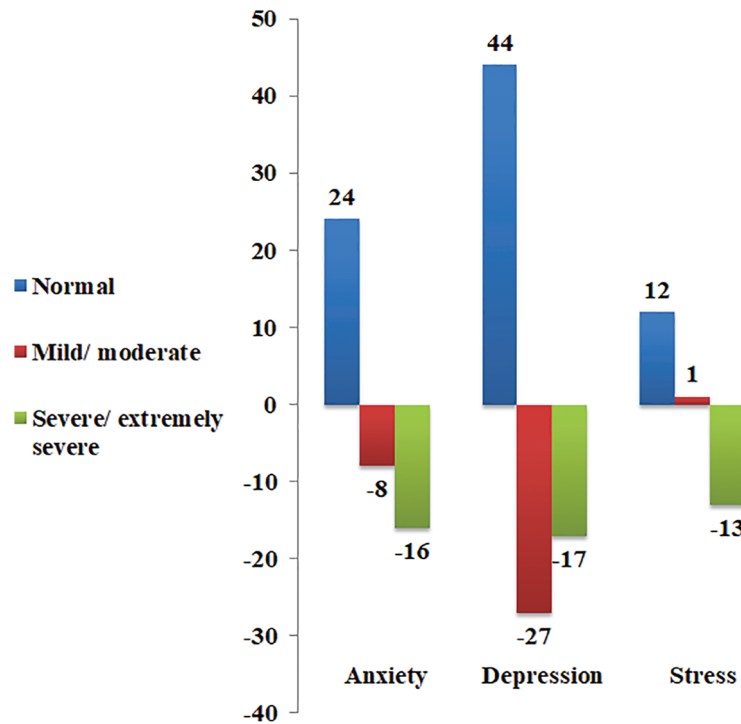


FIGURE 3. Change in the levels of anxiety, depression, and stress among 321 university students from Jazan University between Shaban and Ramadan in 2023.

TABLE 3

Levels of anxiety, depression, and stress stratified according to gender among 321 university students from Jazan University measured during months of Shaban and Ramadan of the year 2023

Symptoms levels: Frequency [proportion]	Anxiety*		Depression**		Stress**	
	Shaban	Ramadan	Shaban	Ramadan	Shaban	Ramadan
Males						
Normal	95 [54.6%]	112 [64.4%]	82 [47.1%]	109 [62.6%]	119 [68.4%]	132 [75.9%]
Mild/moderate	40 [23.0%]	34 [19.5%]	56 [32.2%]	44 [25.3%]	27 [15.5%]	26 [14.9%]
Severe/Extremely severe	39 [22.4%]	28 [16.1%]	36 [20.7%]	21 [12.1%]	28 [16.1%]	16 [9.2%]
Females						
Normal	52 [35.4%]	59 [40.1%]	47 [32.0%]	64 [43.5%]	82 [55.8%]	81 [55.1%]
Mild/moderate	42 [28.6%]	40 [27.2%]	54 [36.7%]	39 [26.5%]	28 [19.0%]	30 [20.4%]
Severe/extremely severe	53 [36.1%]	48 [32.7%]	46 [31.3%]	44 [29.9%]	37 [25.2%]	36 [24.5%]

Note: \*Chi-square *p*-value of <0.001 for differences in symptom levels between Shaban and Ramadan among both genders. \*\*Fisher's Exact test of <0.001 for the difference of symptoms I between Shaban and Ramadan among males, and Chi-square *p*-value of <0.001 for differences of symptom levels between Shaban and Ramadan among females.

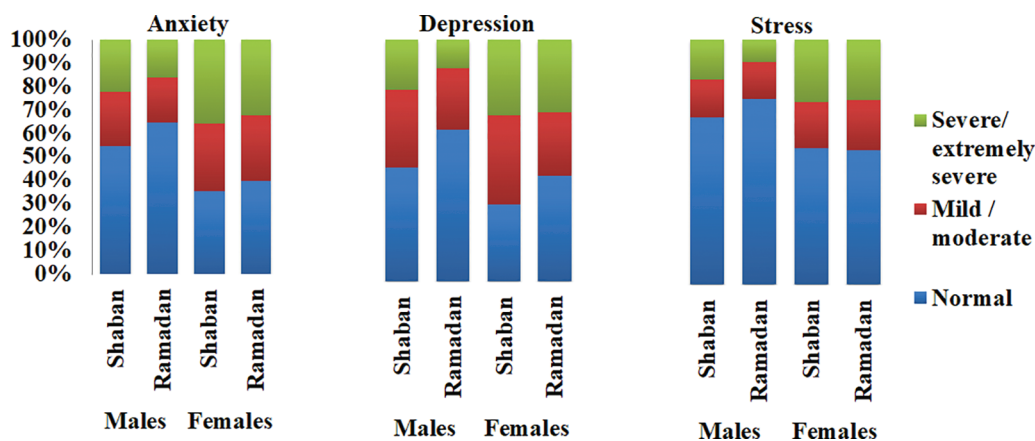


FIGURE 4. Levels of anxiety, depression, and stress among 321 university students from Jazan University measured during the months of Shaban and Ramadan in 2023 and stratified according to gender.

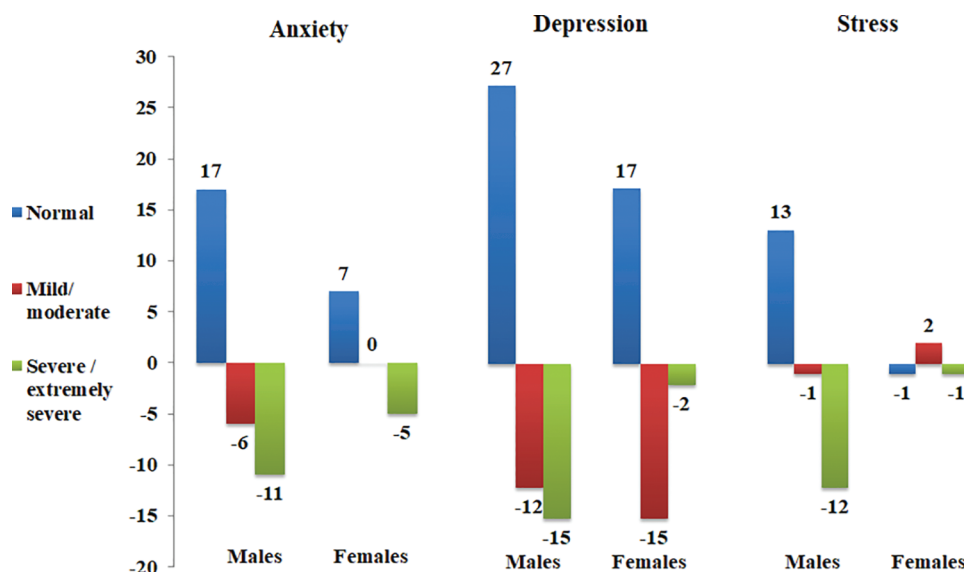


FIGURE 5. Change in the levels of anxiety, depression, and stress among 321 university students from Jazan University between Shaban and Ramadan in 2023 and stratified according to gender.

The findings of the current investigation can be compared to multiple local, regional, and international studies. In a study by Alotaibi et al. conducted in Taif City, Saudi Arabia, a sample of 220 medical students was recruited to measure the changes in their dietary and lifestyle behavior and its association with stress [12]. The results showed that medical students exhibited improved dietary and lifestyle behaviors during Ramadan, but that stress levels were higher among male students. These findings conflict with the results of the current study, which identified an overall reduction in stress levels during Ramadan, especially among male students. The variation between the findings of the current study and the study by Alotaibi et al. could be related to the differences in tools used to assess stress. The study by Alotaibi et al. utilized the Perceived Stress Scale, whereas the current investigation utilized the DASS 21 questionnaire. Additionally, while the study by Alotaibi et al. targeted medical students, in the current investigation, students from all specialties were approached.

The current findings suggest a reduction in depression and anxiety levels during Ramadan. This is similar to the findings of a Nigerian study by Sulaiman et al., who recruited a sample of 639 Nigerian adults in 2021 to assess changes in anxiety and depression levels [14]. The study concluded that Nigerian adults are more likely to exhibit a reduction in depression levels and are more likely to feel less anxious ( $p < 0.001$ ). Sulaiman et al. examined the odds of feeling depressed during Ramadan according to the characteristics of their sample demographic and concluded that married individuals and those with lower education levels are less likely to feel depressed during Ramadan than single individuals and those with higher education levels. These findings suggest that social status and education levels might impact how a festive period influences mental well-being in a general population. However, these notions could not be tested in the current investigation since the sample was limited to a cohort of primarily single university students with similar educational levels and social status. Furthermore, the study by Sulaiman et al. did not detect the

effects of gender on changes in mental well-being during Ramadan among their sample.

Although the current evidence indicates that the Ramadan period would appear to have an impact on mental well-being among Muslims, it is unclear how a festive period with spiritual characteristics, such as Ramadan, might be associated with mental well-being. Several studies examining this notion correlated a change in mental well-being during Ramadan with several factors, including but not limited to, lifestyle changes, enhanced social ties, and associated changes in spirituality [25–27].

Recent reports investigating the impact of the Ramadan period on mental well-being indicated the importance of considering cultural events when developing health interventions relevant to specific communities with a religious context. A small-scale randomized controlled trial involving a sample of 114 Muslims living in Germany gave a group of adults pre-Ramadan educational materials promoting healthy lifestyle modifications during Ramadan and compared them to a control group that was not exposed to educational materials. It was noted that the exposure group had a higher quality of life following Ramadan compared with the control group, suggesting that designing culturally relevant interventions is associated with short-term improvements [25].

In addition to improving mental well-being among healthy individuals during Ramadan, recent evidence similarly stressed the significance of addressing lifestyle changes and their impact on mental well-being among patients diagnosed with chronic diseases. In a Kuwaiti study by Al-Ozairi et al. involving a sample of 463 patients diagnosed with diabetes and assessing depression levels before and after Ramadan, it was concluded that depression levels were reduced following Ramadan. Al-Ozairi et al. emphasized the importance of addressing the emotional needs of the patients by considering their spiritual aspects, resulting in a reduction in depression levels. Al-Ozairi et al. also stressed the importance of reducing depression among patients with diabetes to ensure optimum control of the disease [26].

The impact of Ramadan on enhancing spirituality and its associated influence on mental well-being can be compared to similar non-pharmacological approaches promoting mental well-being. For example, yoga was studied as a method of reducing depression among women, and it was noted that women who underwent an 8-week yoga intervention exhibited higher levels of self-care and reduced levels of ruminations, resulting in a reduction of depression levels [28–30]. It is possible to argue that Ramadan's spiritual effects might be due to religious mediation and mindfulness practiced during the month, increasing the importance of considering individuals' religious behavior when designing mental health promotion interventions [31].

The current findings indicate that the impact of Ramadan on the improvement of mental well-being is higher among males than females. Although similar investigations assessing the impact of Ramadan on mental well-being according to gender are lacking, similar reports assessing variations in mental health according to gender can provide similar conclusions. Ramadan might increase mental well-being via increasing social ties. In a review assessing how social ties can impact psychological well-being, it was suggested that their impact on psychological well-being varies according to gender. Women might feel more distressed than men, indicating that women might be at a higher risk of mental illness symptoms due to their associated increased obligations to provide social support to others [27]. This might partially explain why female students in the current study exhibited a lower reduction in depression, anxiety, and stress levels than male students, especially during Ramadan.

These findings highlight another cultural aspect: females in Saudi Arabia might be subjected to cultural constraints and obligations more than Saudi males. For example, in a study that assessed the impact of walking on levels of depression, anxiety, and stress among university students, it was concluded that walking as a form of exercise was associated with a reduction in depression, anxiety, and stress among male students but not among female students [32]. These results strengthen the need for addressing cultural and social aspects when assessing the mental health of individuals.

The current study has several strengths and limitations. The primary strength of the current study is related to its design: a prospective cohort design was utilized on the same students on two different occasions to test changes in levels of depression, stress, and anxiety to examine the potential impact of the Ramadan period. The division of the sample according to gender also enabled the assessment of variations in levels of change, providing more insight into possible gender rules, which is consistent with similar studies assessing the impact of gender on mental health. The primary limitation of the current investigation is related to its reliance on self-assessments of levels of depression, anxiety, and stress rather than performing clinical assessments. Nonetheless, utilization of the translated, tested, and validated questionnaires might underscore the validity of the current findings. Additionally, the results are limited by the effect of other factors that were not studied in the current investigation, such as social support, sleep quality, and other academic and lifestyle factors which might require

a subsequent investigation to incorporate other factors with the variation of mental well-being among university students during festive and religious periods. Finally, the current sample was limited to university students, where the proportion of male students was relatively higher than female students, which might limit the generalizability of the current investigation to the general community.

## Conclusion

This study detected a reduction in levels of depression, anxiety, and stress among university students from Saudi Arabia during the month of Ramadan compared with the pre-Ramadan period. The study also detected gender variations concerning the levels of change in depression, anxiety, and stress; the magnitude of change was greater among males than females. These findings call for future research to identify social and spiritual characteristics associated with the reduced change among females compared with males. Future research is also necessary to understand the mechanism of the impact of a festive and religious period such as Ramadan on individuals' mental well-being. Finally, the findings of the current study and the supporting evidence from relevant literature strengthen the importance of considering social, religious, and spiritual aspects when designing interventions to address the mental health of individuals. This consideration should also emphasize incorporating social, religious, and spiritual aspects when developing artificial intelligence-based applications for early detection of mental health issues, and application of personalized therapy.

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**Availability of Data and Materials:** The datasets generated and/or analyzed during the current study are not publicly available due to privacy and ethical restrictions. However, they are available from the corresponding author upon reasonable request.

**Ethics Approval:** The study was conducted in accordance with the Declaration of Helsinki and the ethical guide-lines of Saudi Arabia. Ethical approval for performing the investigation was obtained from the Standing Committee of Scientific Research at Jazan University (approval number REC-44/04/365, dated 14 November 2022). Informed consent was obtained from the participants prior to their participation.

**Conflicts of Interest:** The author declares no conflicts of interest to report regarding the present study.

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