

Regression Analysis of Knowledge and Perceptions of COVID-19 in Relation to Stress, Anxiety, and Depression Levels Towards Practice Modifications Among Physicians, Dentists, Medical Students, and Dental Students in the Gulf Cooperation Council (GCC) Region

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Abstract

Background: The Coronavirus (COVID-19) pandemic has led to unprecedented curfews and restrictions on daily practices and activities. Healthcare professionals, educators, and students need to face various challenges in the era of COVID-19. Our aim is to correlate the knowledge and perception level to COVID-19 among healthcare professionals and students in the Gulf Cooperation Council (GCC) region to the self-reported depression, anxiety, and stress levels. Attitude towards outreach and volunteering program was also assessed in the study.

Methods: Online survey was conducted targeting the following categories from the GCC region: dental and medical students, dentists, and medical doctors. Knowledge level to COVID-19 was assessed using a previously validated survey instrument. The Depression, Anxiety, and Stress Scale (DASS-21) was used to assess the mental health status. Univariate and multivariate logistic regression was used to evaluate the association between adequate COVID-19 knowledge scores and DASS scores for depression, anxiety, stress, and total DASS-21 score.

Results: Satisfactory knowledge regarding COVID-19 was associated with higher DASS depression and anxiety scores ($p < 0.001$ and $p = 0.001$) but not with stress scores ($p = 0.657$). The satisfactory knowledge group also scored higher in the DASS-21 when compared to unsatisfactory knowledge group ($p = 0.012$).

Conclusion: Increasing depression and anxiety scores and total DASS-21 score were associated with greater odds of having satisfactory knowledge of COVID-19. However, stress scores were not associated with satisfactory knowledge of COVID-19. Medical doctors were the least worried about participating in outreach programs, while dentists and medical students were most concerned.

Introduction

The unprecedented global outbreak of COVID-19 Coronavirus (SARS-CoV-2) in December 2019 has surpassed past viral infection episodes (such as the Severe acute respiratory syndrome Corona Virus "SARS-CoV" and Middle east respiratory syndrome Corona Virus "MERS-CoV") and has led to a tremendous impact on the social life in all countries [1-3]. In an effort to halt the spread of the infection in communities, and in order to flatten the curve of viral infection, many countries implemented curfew regulations and restrictions on public activities and travel [4]. As a consequence of this global pandemic, worldwide economies were forced into shutdown and reduction of operations, higher education institutions and schools were suspended, and routine daily practices have been dramatically changed with strict regulations and protocols imposed [5].

The effect of the pandemic is vast and yet to be assessed for its ramifications on the health care system, the educational systems, the economic structure, and the society at large. Medical and dental education and practice have also been greatly modified to cope with the healthcare situation during the pandemic, and to face the challenges in the post COVID-19 era [6-8]. As a result, numerous obstacles and arrangements need to be considered by the healthcare professionals, educators, and students in order to deal with the medical and clinical teaching curricula in the era of the pandemic. As results, many studies have been published to evaluate the mental status of the students and healthcare professionals by evaluating their anxiety and stress levels to the modifications of their clinical learning and practices [9-11]. In addition, many studies have evaluated the knowledge and awareness level of the students and healthcare professionals to COVID-19 according the WHO knowledge information [12-15]. Despite this large number of students, there is a lack in the literature that correlate awareness and knowledge level to COVID-19 to the distress and anxiety level that is reported with healthcare professionals and students.

In this study, we aimed to assess the knowledge and perception level to COVID-19 among healthcare professionals and students in Kuwait and GCC region and to correlate it with the self-reported depression, anxiety, and stress levels using previously validated instruments by logistic regression analysis. Attitude towards outreach and volunteering program was also assessed in the study.

Materials And Methods

The protocol of the study was approved by the Ethical Committee at Kuwait University, in accordance with the Helsinki Declaration. A cross-sectional survey was conducted online targeting all healthcare professionals and students from the Gulf Cooperation Council in the following categories: dental and medical students from the Gulf Region, and dentists and medical doctors from the Gulf Region. Participants were at least 18 years old and voluntarily consented to complete the questionnaire and were assured that their responses would be anonymous. A previously validated and applied questionnaire by Bhagavathula et. al. was used in the study to assess the awareness and knowledge level to COVID-19 among healthcare professionals and students [16, 17]. Permission to use the questionnaire has been obtained from the author electronically. To assess the mental health status for the participants, the widely utilized Depression, Anxiety, and Stress Scale (DASS-21) was

used as well [18]. In the period from May to June 2020, links to the online survey were sent electronically via WhatsApp, e-mail, social media platforms to various medical and dental groups in the GCC region in order to target healthcare professionals and students. Satisfactory knowledge and perception scores were considered as answering greater than 70% of the questions correctly in each group of questions. DASS scores for depression, anxiety, stress, and total DASS-21 score were obtained for the groups.

Statistical Analysis

Statistical analysis was performed using SPSS version 23 (IBM Corp. Released 2015. IBM SPSS Statistics for Macintosh, Version 23.0. Armonk, NY: IBM Corp.). Continuous data is presented as median and interquartile range (IQR) and was compared using the Mann-Whitney U test or the Kruskal-Wallis H test. Univariate and multivariate logistic regression was used to evaluate the association between adequate COVID-19 knowledge scores and DASS scores for depression, anxiety, stress, and total DASS-21 score. The variables used for multivariate analysis in each case included gender, age group, profession, country, whether they had heard of COVID-19 and whether they had attended any lectures or discussions about COVID-19. These were selected a-priori. This data is presented as odds ratio (OR) and 95% confidence intervals (CI). A p-value of <0.05 was considered statistically significant.

Results

Demographics

In total, 1,621 people responded to our questionnaire. Nineteen individuals were excluded because they were not a dentist, dental student, medical doctor or a medical student. A further twenty-three individuals were excluded because they did not provide information regarding the country they were currently living or working in. Therefore, 1,579 responses were included in our final analysis. Table 1 outlines the demographic variables of the study population. Almost two-thirds of the respondents were female (64.4%) and the majority were less than 25 years old (67.2%). Dentists accounted for 12.6% of the total population. The clinical experience of the dentists in this group ranged from 0.25 to 52 years, with a median of 3 years (IQR 1 – 10 years). Medical doctors accounted for 24.5% of responses. The clinical experience of the medical doctors ranged from 0 to 50 years, with a median of 13 years (IQR 3 – 23 years). Among the dental students, 42.3% were in pre-clinical years and 57.7% were in clinical years of study. For the medical students, 57.5% were in pre-clinical years and 42.5% were in clinical years of study. Kuwait (44.5%), the Kingdom of Saudi Arabia (23.9%) and the Kingdom of Bahrain (19.2%) were the most represented countries in this survey with smaller numbers of respondents living in the United Arab Emirates (6.6%), Oman (3.8%) and Qatar (2%). Almost everyone (96.5%) had heard about COVID-19 at the time of the survey while just 60.2% had attended a discussion or lecture about the virus. Knowledge score of the responses of dentists, dental students, medical doctors, and medical students regarding knowledge of COVID-19 divided in satisfactory and unsatisfactory responses (Table 2). Detailed responses of dentists, dental students, medical doctors, and medical students to knowledge and perceptions of COVID-19 question can be seen in the supplementary tables S1 and S2).

DASS-21 and Knowledge Scores

Table 3 and Figure 1 outline the median (IQR) scores for depression, anxiety, stress in the DASS-21 according to satisfactory knowledge scores regarding COVID-19. It was observed that satisfactory knowledge regarding COVID-19 was associated with higher DASS depression and anxiety scores ($p < 0.001$ and $p = 0.001$ respectively) but not with stress scores ($p = 0.657$). Those with satisfactory knowledge scores also scored higher in the DASS-21 questionnaire overall compared to those with unsatisfactory knowledge scores ($p = 0.012$).

Perceptions of COVID-19 did not appear to be associated with any of the DASS-21 sub-domains (Table 3). There was no difference observed between those who achieved satisfactory and unsatisfactory perception scores in the DASS depression ($p = 0.190$), anxiety ($p = 0.394$), or stress ($p = 0.143$) sub-domains. The median total DASS-21 score was greater in the satisfactory perception group, but the difference was not statistically significant ($p = 0.180$).

Logistic Regression

Satisfactory knowledge scores were examined using univariate and multivariate logistic regression. Increasing depression scores were associated with greater odds of having satisfactory knowledge of COVID-19, univariate OR 1.039 (95% CI 1.015 – 1.063, $p = 0.001$) and

multivariate 1.047 (95% CI 1.021 – 1.073, $p < 0.001$). Similarly, increasing anxiety scores were also associated with greater odds of having satisfactory knowledge of COVID-19, univariate OR 1.036 (95% CI 1.005 – 1.068, $p = 0.022$) and regression OR 1.055 (95% CI 1.019 – 1.091, $p = 0.002$).

However, stress scores were not associated with satisfactory knowledge of COVID-19 in univariate analysis (OR 1.015, 95% CI 0.994 – 1.037, $p = 0.157$) but was significantly associated with a higher odd of satisfactory knowledge in multivariate analysis (OR 1.035, 95% CI 1.010 – 1.060, $p = 0.005$). The total DASS-21 score was also associated with higher odds of satisfactory knowledge of COVID-19, univariate OR 1.011 (95% CI 1.003 – 1.020, $p = 0.012$) and multivariate OR 1.018 (95% CI 1.008 – 1.028, $p = 0.001$).

Differences between Countries

We also examined the DASS-21 scores broken down according to each country. Figure 2 displays box plots which shows the differences in DASS-depression, DASS-anxiety, DASS-stress scores for each country. In each category, the respondents from Qatar demonstrated the highest levels of depression, anxiety, and stress according to the DASS-21 ($p < 0.001$, $p < 0.001$, and $p < 0.001$ respectively). Respondents from the Kingdom of Saudi Arabia scored lowest in the anxiety and stress sub-domains while those from the United Arab Emirates scored lowest in the depression subdomain.

Attitude Towards Outreach and Volunteering

Just one quarter (25.2%) of respondents had prior experience of getting involved in medical or dental outreach/ volunteering in a foreign country (Table 4). There were no significant differences in terms of prior outreach experience between dentists, dental students, medical doctors or medical students ($p = 0.098$). Among all the groups, medical doctors were the least worried about participating in outreach programs (25.1%), while dentists (40.2%) and medical students (41.1%) were most concerned ($p < 0.001$). However, medical students indicated that they were most willing to participate in an outreach program within the next 12 months ($p = 0.002$).

Discussion

The COVID-19 pandemic is a devastating condition that associated with adverse psychological impact and mental health consequences similar to other major health crises and outbreaks [19]. Several studies have addressed the mental health impact of COVID-19 on general populations, vulnerable populations, and healthcare workers. However, to the best of our knowledge, this is the first study aimed to assess the awareness and knowledge level to COVID-19 among healthcare professionals and students in Kuwait and GCC countries in correlation to mental health issues including depression, anxiety, and stress. The psychological impact of COVID-19 pandemic among different general populations varied in levels according to geographical locations. A Chinese study showed that the rate of moderate to severe psychological impact in the general population were reported as 16.5%, 28.8%, and 8.1% for depression, anxiety, and stress levels respectively [20]. Whereas in Kingdom of Saudi Arabia's general population, severe psychological impact including depression (16.4%), anxiety (13.9%), and stress (13.7%) during COVID-19 pandemic were reported [21]. While in Kuwait, the overall prevalence of depressive symptoms was (30.13%) and the prevalence of anxiety symptoms was (25.28%), which is indicative of higher psychological impact compared to the aforementioned populations [22].

On the other hand, a systematic review and meta-analysis included 33,062 participants found that the prevalence of anxiety was 23.2% while 22.8% of depression among healthcare professionals during COVID-19 outbreak [23]. In China, 50.4% of healthcare professionals were affected with depression, 44.6% with anxiety, and 71.5% with distress [24]. Whereas in Kingdom of Saudi Arabia, psychological impact found to be prevalent among healthcare professionals including depression (55.2%) and anxiety (51.4%) [25]. Higher figures were also reported from Jordan, as healthcare professionals found to have higher prevalence of depression (78.1%) and anxiety (70.8%) levels [26]. Nonetheless, one of the current study findings showed that respondents from the Kingdom of Saudi Arabia scored lowest in the anxiety and stress sub-domains while those from the United Arab Emirates scored lowest in the depression subdomain ($p < 0.001$) among the GCC countries.

Looking into the correlation between knowledge level to COVID-19 and psychological impact, only one study found no statistical significance between the anxiety level and COVID-19 knowledge level in midwifery students [27]. However, the current study found that satisfactory knowledge regarding COVID-19 was associated with higher DASS-21 depression and anxiety scores ($p < 0.001$ and $p = 0.001$ respectively) but not with stress scores ($p = 0.657$). Those with satisfactory knowledge scores also scored higher in the DASS-21 questionnaire overall compared to those with unsatisfactory knowledge scores ($p = 0.012$). This finding is similar to a study conducted in Yemen, which showed a significant positive linear correlation between COVID-19 knowledge and anxiety in healthcare professionals [28]. This Yemeni study found that the majority of respondents (60%) had never attended COVID-19 training courses but most of them (69.8%) had acquired an adequate level of knowledge about the outbreak of the virus [28]. Unlike our study, which showed that the majority of respondents (60.2%) had attended lectures or discussions about COVID-19 that yielded a satisfactory knowledge about the disease in most of the responses (67.3%).

Understanding such psychological impact on healthcare professionals is inevitable to address its risks and tackle its consequences effectively. This can be achieved by implementing mental health interventions to help healthcare professionals during the pandemic in order to maintain their high-quality care standards [29]. Several initiatives were launched to provide mental health support during the pandemic. For example, a national counselling program for COVID-19 has been established in Kuwait, which is a platform that provides counselling sessions by a team of certified professionals specialized in mental healthcare to three main segments include frontline healthcare professionals, COVID-19 patients, and individuals in institutionalized quarantine [30]. The rest of the GCC countries are also offering various COVID-19 psychological counselling services and national campaigns for mental support [31-33]. Nevertheless, healthcare managers should proactively take the responsibility to protect mental wellbeing of staff, as they are at higher risk of moral and mental health problems during the COVID-19 pandemic [34].

Conclusions

Our findings demonstrated that increasing depression scores were associated with greater odds of having satisfactory knowledge of COVID-19. Similarly, increasing anxiety scores were also associated with greater odds of having satisfactory knowledge of COVID-19 and regression. However, stress scores were not associated with satisfactory knowledge of COVID-19 but was significantly associated with a higher odd of satisfactory knowledge. The total DASS-21 score was also associated with higher odds of satisfactory knowledge of COVID-19. Among all the groups, medical doctors were the least worried about participating in outreach programs, while dentists and medical students were most concerned.

Declarations

Funding information

No funding was used for this study.

Competing interests

The authors declare that they have no conflicts of interest and nothing to disclose.

Ethics approval

The Ethical Committee at Kuwait University approved the study, in accordance with the Helsinki Declaration.

Consent to participate

Participating healthcare professionals gave consent and filled out the questionnaire voluntarily, and their responses were kept anonymous.

Consent for publication:

Not applicable.

Availability of data and material

The datasets used and analyzed in the study are available from the corresponding author on reasonable request.

Authors' contributions

MK, MA, and YH conceived and designed the study. MK and YH collected the data work on the acquisition and analyses. MK and AA interpret the data. MK, AA and MA have drafted the work or substantively revised it. All authors read and approved the final manuscript.

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Tables

Table 1. Demographics

Variable	n = 1579
Gender	
Male	562 (35.6%)
Female	1017 (64.4%)
Age Group	
<25 years	1061 (67.2%)
25 – 44 years	356 (22.5%)
≥45 years	162 (10.3%)
Profession	
Dentist	199 (12.6%)
Dental Student	222 (14.1%)
Medical Doctor	387 (24.5%)
Medical Student	771 (48.8%)
Location	
Kuwait	702 (44.5%)
Kingdom of Saudi Arabia	378 (23.9%)
Kingdom of Bahrain	303 (19.2%)
United Arab Emirates	104 (6.6%)
Oman	60 (3.8%)
Qatar	32 (2.0%)
Heard about COVID-19	
Yes	1523 (96.5%)
No	56 (3.5%)
Attended Lectures or Discussions about COVID-19	
Yes	950 (60.2%)
No	629 (39.8%)

Table 2: Knowledge score of the responses of dentists, dental students, medical doctors, and medical students regarding knowledge of COVID-19 divided in satisfactory and unsatisfactory responses.

Knowledge						
Score	5.0 (±1.2)	4.7 (±1.2)	4.7 (±1.3)	5.06 (±1.1)	5.02 (±1.1)	<0.001
Satisfactory	1062 (67.3%)	103 (51.8%)	132 (59.5%)	272 (70.3%)	555 (72%)	<0.001
Unsatisfactory	517 (32.7%)	96 (48.2%)	90 (40.5%)	115 (29.7%)	216 (28%)	

Table 3. Satisfactory Knowledge Score and DASS Scores.

	Satisfactory Knowledge Score (n = 1062)	Unsatisfactory Knowledge Score (n = 517)	p-value
DASS depression	4 (1 – 7)	3 (1 – 7)	<0.001
DASS anxiety	2 (0 – 5)	1 (0 – 4)	0.001
DASS stress	5 (1 – 9)	5 (2 – 8)	0.657
Total DASS Score	11 (4 – 21)	9 (3 – 17.5)	0.012

Table 4. Satisfactory Perception Score and DASS Scores

	Satisfactory Perception Score (n = 1535)	Unsatisfactory Perception Score (n = 44)	p-value
DASS depression	4 (1 – 7)	3 (0 – 7)	0.190
DASS anxiety	2 (0 – 5)	0 (0 – 7)	0.394
DASS stress	5 (2 – 9)	4 (0 – 9)	0.143
Total DASS Score	11 (4 – 20)	7 (0 – 22.5)	0.180

Table 5. Experience and attitudes towards outreach programs in light of the COVID-19 pandemic

	Total (n = 1579)	Dentists (n = 199)	Dental Students (n = 222)	Medical Doctors (n = 387)	Medical Students (n = 771)	p-value
Were you ever involved in a medical outreach or volunteering program outside of your country?						
Yes	398 (25.2%)	42 (21.1%)	66 (29.7%)	107 (27.6%)	183 (23.7%)	0.098
No	1181 (74.8%)	157 (78.9%)	156 (70.3%)	280 (72.4%)	588 (76.3%)	
Are you currently worried about participating in a medical outreach or volunteering program outside of your country?						
Yes	570 (36.1%)	80 (40.2%)	76 (34.2%)	97 (25.1%)	317 (41.1%)	<0.001
No	1009 (63.9%)	119 (59.8%)	146 (65.8%)	290 (74.9%)	454 (58.9%)	
Would you participate in a medical outreach or volunteering program outside of your country in the next 12 months?						
Yes	884 (56%)	99 (49.7%)	120 (54.1%)	196 (50.6%)	469 (60.8%)	0.002
No	695 (44%)	100 (50.3%)	102 (45.9%)	191 (49.4%)	302 (39.2%)	

Figures

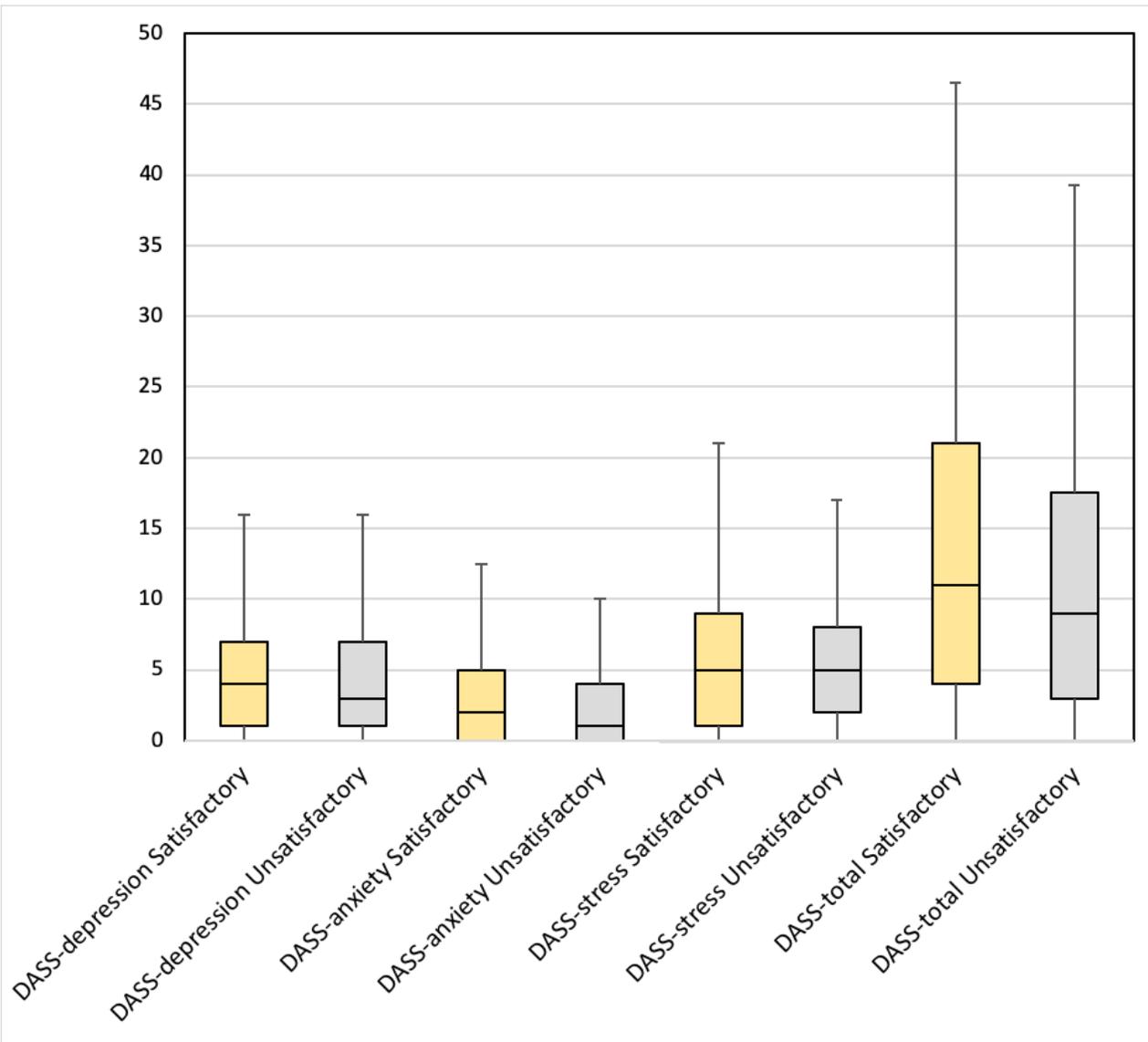


Figure 1

Satisfactory knowledge scores and DASS-subdomains and total score.

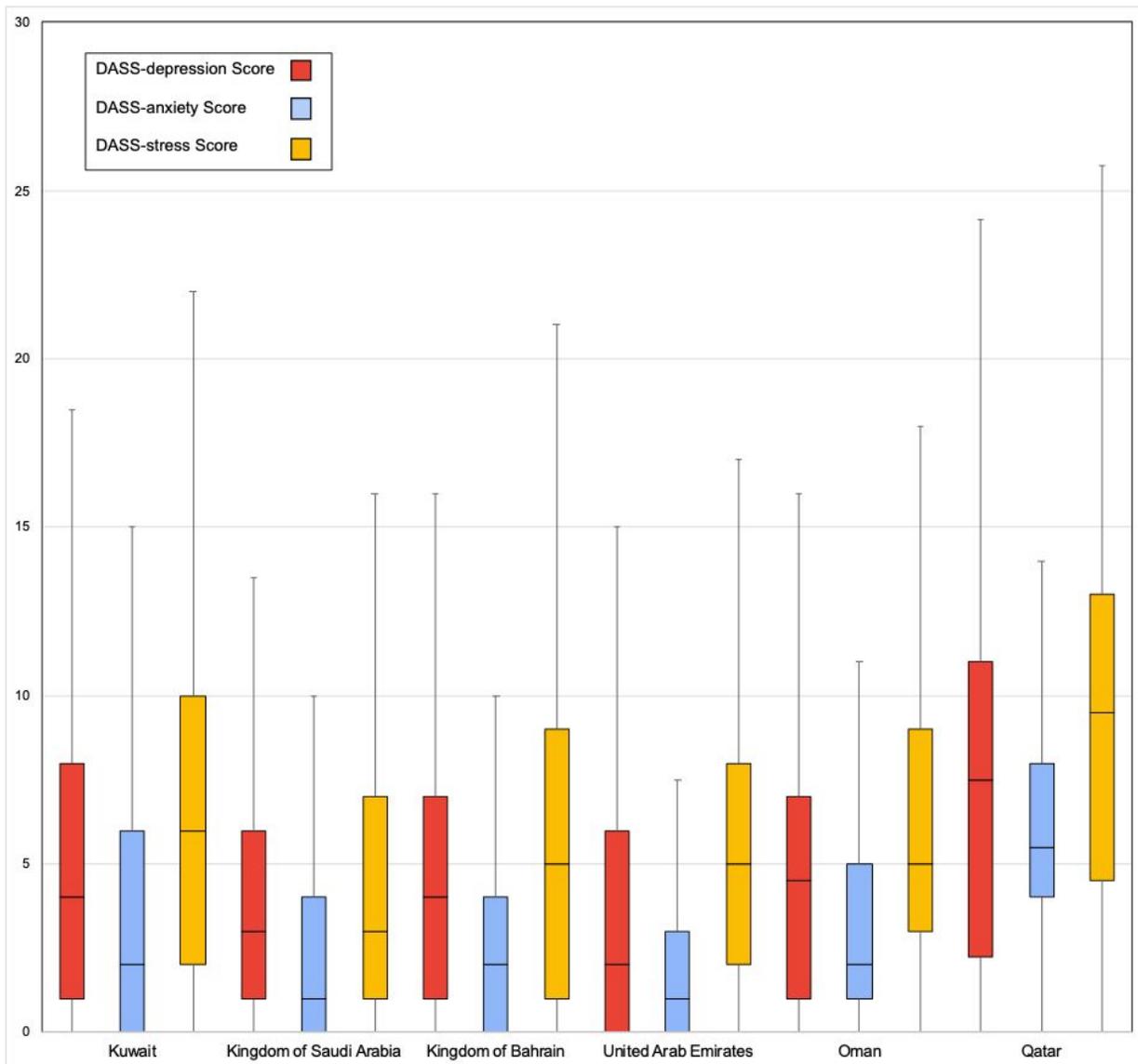


Figure 2

Differences in DASS-21 sub-domain scores by country.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [SupplementalTables.docx](#)