Psychological effects of, and compliance with, self-isolation among COVID-19 patients in South Batinah Governorate, Oman: a cross-sectional study

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Abstract

Background: Covid-19 pandemic has left deep psychological impacts, especially among infected patients. It is extremely important to understand the extent of those effects, while improving the compliance with isolation measures at the same time.

Objectives: To detect prevalence of stress using two psychological scales and examine the stress associated factors, also to identify self-isolation compliance rates among COVID-19 patients.

Methods: Cross-sectional research was conducted from 15 November to 22 December 2020, involving 379 patient participants selected via systematic random sampling. Kessler 10 Psychological Distress (K10) and the impact of event scale-revised (IES-R) tests were used to ascertain the levels of distress.

Results: K10 measure revealed elevated stress amongst 121 (31.9%) of participants, whereas IES_R indicated the level was 37.7%. Using the K10 indicated the multivariate analysis was significant for females (OR = 2.482, 95% CI: 1.532–4.021), patients with financial problems (OR = 2.332, 95% CI: 1.270–4.282) and patients experiencing shortages of essentials (OR = 4.920, 95% CI: 2.524–9.590). The IES-R scale indicated that only female and patients experiencing shortages scored significantly in multivariate analysis, (OR = 1.895, 95% CI: 1.1223–2.935) and (OR = 2.928, 95% CI: 1.1580–5.424), respectively. Those undergoing shorter isolation periods reported lower levels of stress on both K10, p = 0.016 and IES-R, p = 0.002. Approximately 90% of patients used their own towels during isolation. Moreover, 80.2% slept in separate rooms and 74% used masks in the presence of other family members. Essential supply shortages were reported by 14.2% of respondents.

Conclusions: Self-compliance rates were not optimal, while psychological distress was more prevalent among some groups. Intervention is imperative to minimize stress and improve self-isolation compliance.

Keywords: Oman, Stress, Psychology, Compliance, COVID-19, Prevalence, Quarantine

Introduction

The COVID-19 pandemic was unforeseen both in its occurrence and its duration. Moreover, its impacts have been multiple and wide-ranging, encompassing many areas of life, including mental health [1, 2].

By 16 July 2021, there had been over 188 million cases reported globally, with the number of deaths exceeding four million [3]. Various negative psychological outcomes have been observed during both the current and previous pandemics and epidemics. For example, during the 2003 Severe Acute Respiratory Syndrome (SARS) outbreak in Canada, the psychological distress experienced by health
care workers was significantly higher than was the case amongst the general population [4]. During the recent Middle East Respiratory Syndrome Coronavirus (MERS-CoV) outbreak in Korea in 2015, stress levels were not only higher, but also were reported to have persisted for longer, especially among medical staff [5]. As might be expected, the COVID-19 pandemic is no exception in that it has significantly impacted mental and psychological wellbeing, especially among high-risk groups, those already infected, or those subjected to quarantine [6–8].

However, it is also essential to comprehend the adherence to the quarantine measures demonstrated by the wider populace, not least those diagnosed with COVID-19. Different experiences across several countries have located variations in rates of compliance during the current pandemic [9]. Although many studies have explored the mental health aspects of pandemic-related confinement across the world, few have focused specifically on compliance rates during self-isolation amongst patients infected with COVID-19.

The current study comprises the first research based in Oman that has sought to determine self-quarantine compliance rates amongst COVID-19 patients. Moreover, this study employs the Kessler 10 Psychological Distress (K10) test and the impact of event scale-revised (IES-R) test to ascertain levels of distress and to examine related variables.

Methods
Setting
The South Batinah Governorate (SBG) is located in the north of Oman and has a population of 465,550 [10]. It is divided into six states, namely: Barka, Rustaq, Musanaa, Nakhal, Wadi Mawel and Awabi, in order of population size. This study was conducted as a cross-section between 15 November 2020 and 22 December 2020. The inclusion criteria required patient participants to belong to SBG, to have had a verified diagnosis of COVID-19 through a Polymerase Chain Reaction (PCR) test prior to 6 November 2020, to be aged 18 years or over and to be listed in the SBG disease surveillance database. Cases which failed to satisfy these criteria were excluded from the study. A small number of patients were found to belong to SBG, but were staying outside during isolation period were also included. A complete list of all patients was provided by the Department of Disease Surveillance and Control, along with their mobile contact numbers.

Sampling
The total number of confirmed COVID-19 cases in SBG was 12,108 as of 7 November 2020. However, after excluding patients under 18 years and those who belong to other governorates within Oman, the number was reduced to 11,223 patients. These patients were listed within the database in ascending order in accordance with the date of their confirmed diagnosis. Epi Info software (version 7.2.2.6, Centers for Disease Control and Prevention (CDC), Atlanta, Georgia USA) was employed to estimate the sample size. Thus, based on the assumption that 50% of participants were aware and compliant with health isolation measures and experienced moderate levels of stress, with a 95% confidence interval and a design effect of one, the ultimate sample size was 371. However, the sample size was increased to compensate for possible losses, wrong contact numbers and patients refusing to participate. Using a systematic random sampling ($k=28$) and a random start for selection of the first participant, 400 participants were selected. Whenever participants either could not be reached via their mobile numbers or they declined to participate, the next patient on the list was contacted as an alternative. In total, 379 participants completed the full questionnaire and were included in the analysis.

Instruments
A predesigned questionnaire was created using Microsoft Forms and distributed to all participants via a WhatsApp link. It was bilingual (Arabic and English), thereby allowing participants to select the language they preferred to use. In addition, the questionnaire was designed to be compatible with smart phones, laptops, desktops and tablets.

Before the questionnaire was distributed to the mobile phones of participants, they received a phone call from two trained personnel, the objective of the conversation being not only to outline the research objectives and content, but also to obtain verbal consent.

The questionnaire included four major components, the first of which was a set of sociodemographic questions designed to acquire data pertaining to nationality, gender, education, residence, work, income, medical history and social status.

The second set of questions explored the conditions of health isolation, including duration, place, conception, medical service, challenges and compliance with isolation protocols.

Thirdly, there were questions designed to elicit information about the psychological stress levels associated with health isolation, which were measured using two validated scales, to wit: K10 and IES-R, both of which were available in validated English and Arabic language versions. The K10 is an attractive and simple tool, with strong psychometric properties, wherein psychological distress can be assessed through 10 questions. These questions evaluate the frequency of different symptoms experienced in the preceding 4 weeks on a scale of 1–5,
where $1 = \text{none at all}$ and $5 = \text{all the time}$. Hence, the total results range from 10 to 50 $[11, 12]$. The IES-R is an appropriate instrument for evaluating the subjective distress resulting from a traumatic life event. This instrument assesses symptom frequency for 22 items on a five-point Likert scale, where $0 = \text{Not at all}$ and $4 = \text{extremely}$. The results range from 0 to 88. The IES-R has three sub-scale domains (avoidance, intrusion and hyperarousal) where the calculated mean provides insights into the level of distress experienced $[13, 14]$.

The fourth question set comprised three questions designed to obtain self-evaluations of medical services using a five-point Likert scale, wherein 1 denoted “very poor”, 2 signified “poor”, 3 represented “fair”, 4 equated to “good” and 5 comprised “excellent”.

The Ministry of Health (MOH) protocol required all individuals who had been in contact with confirmed cases to quarantine for 14 days. Any individual with a positive COVID test was obliged to self-isolate for a minimum of 10 days from the test result date onwards. Isolation ceased after 10 days, provided the individual had been symptom-free for the previous 2 days $[15]$.

Whilst some individuals were obliged to isolate for less than 14 days, other individuals may have been in isolation for longer periods. Such cases included those who had already been in isolation for several days prior to a positive test result and individuals who exhibited long-standing symptoms.

Participants were classified into two groups, based on the month of diagnosis, because the first few months of March through June were epidemiologically classed as cluster transmission cases in Oman, whereas cases from July to November occurred at a time when community transmission became real.

Monthly income was defined as negatively impacted when the patient or her/his spouse or any breadwinner was not paid for a number of weeks or months during the pandemic. This also included cases where individuals had lost their jobs during the pandemic or where there was a salary deduction related to the isolation period.

**Statistical analysis**

The data collected through the Microsoft Form was exported as a Microsoft Excel file before being organised, tabulated and statistically analysed using IBM SPSS 25.0 (IBM Corp., Armonk, New York USA). Subsequently, the resultant numerical data were presented as means and standard deviations, whilst the categorical data were presented as numbers and percentages.

The reliability test was calculated using the Cronbach’s alpha ($\alpha$) for both the K10 and IES-R scales: 0.893 and 0.922 respectively. Hence, the three self-evaluation questions pertaining to medical service provision and clinical, psychological and socioeconomic aspects produced a Cronbach’s alpha ($\alpha$) of 0.773.

The K10 total score was divided into four sub-categories, comprising low (10–15), moderate (16–21), high (22–29) and very high (30–35) $[16]$. A chi-squared test was used to identify differences between the sub-categories. The binary coding for K10 was used in the logistic model, with the combination of low and moderate levels indicating low distress (scores of 21 or less), while high distress comprised the combination of high and very high (scores of 22 or greater).

The total score of IES-R was further divided into high and low stress. Scores of 25 or higher were considered high stress $[17]$ and the mean and standard deviation (SD) were calculated for the subcategories of the independent variables. In addition, the normality assumption was evaluated via both the Kolmogorov–Smirnov test and visual assessment, whilst the Mann–Whitney $U$ test and the Kruskal–Wallis test were used to compare the subgroups. Odds ratios (OR) and related $95\%$ confidence intervals (95% CI) were calculated using bivariate and multivariable analyses (unconditional binary logistic regression). Only statistically significant covariates in the bivariate analyses were included in the multivariable model. The $p$ value adopted was $p \leq 0.05$.

**Ethical considerations**

Prior to the administration of the questionnaire, verbal consent was obtained from all participants through telephone conversations with two trained team members. This was supplemented with the electronic consent provided by each respondent during the questionnaire process. Participants could opt to complete English or Arabic language questionnaires. All data was collected anonymously and only used for research purposes. Confidentiality was safeguarded throughout the research process. Ethical approval was sought and obtained on 21 July 2020 from the Research and Ethical Review and Approval Committee, Directorate Planning and Studies at the South Batinah Governorate (Research Code 02072020).

**Results**

Table 1 describes the demographic characteristics of the participants. A total of 379 participants completed the questionnaires, of whom 363 (95.8%) were Omani and 231 (60.9%) were men. The age groups $\leq 30$ and 31–40 contained equal participants, comprising 149 (39.3%) each. Different chronic medical problems were reported by 81 (21.4%) participants. The two-week isolation period was completed by 201 (53%) participants, as compared to the 138 (36.4%) who experienced longer isolation periods. Monthly income decreased for 66 (17.4%) participants.
Home-based self-isolation applied to 353 (93.1%) participants. Most participants (370 or 97.6%) appreciated that isolation was necessary to protect others. However, 5% reported they principally complied with isolation due to pressure exerted by the Ministry of Health, the police and the community. With respect to isolation behaviour, 344 (90%) participants used personal towels and 319 (84.2%) slept in separate rooms. Table 2 includes other characteristics pertaining to isolation behaviour.

The K10 results indicated that 121 (31.9%) participants suffered from high levels of stress, as compared to the 143 (37.7%) in the IES_R score. The means and SDs for the avoidance, intrusion and hyperarousal sub-scales were $7.98 \pm 4.902$, $7.32 \pm 6.788$ and $5.97 \pm 4.902$, respectively.

Table 3 illustrates the relationship between the K10 categorical scores and participant characteristics. High stress was experienced by 23.6% of women and 16.5% of men, whilst 18.9% of women and 8.7% of men experienced very high stress, $p = 0.001$.

Participants who isolated for over 14 days experienced more stress (18.1%) as compared to those who spent exactly 14 days (10%), $p = 0.016$. Those whose incomes had fallen reported more stress (28.8%), $p \leq 0.001$. Those who reported supply shortages suffered more stress (33.3%) as compared to those who had no shortages (9.2%), $p \leq 0.001$. The multivariate analysis of the association with high stress using K10 was significant for women (OR = 2.482, 95% CI: 1.532–4.021), patients with financial problems (OR = 2.332, 95% CI: 1.270–4.282) and those who lacked essential supplies (OR = 4.920, 95% CI: 2.524–9.590), as indicated in Table 4.

The IER-S revealed similar results to K10 in terms of their association with gender, the duration of isolation, salary impact and supply shortages as demonstrated in Table 5. However, the multivariate analysis was significant only for females (OR = 1.895, 95% CI:}

### Table 1 Participant’s characteristics

|                                | N = 379 | %  |
|--------------------------------|---------|----|
| **Nationality**                |         |    |
| Omani                         | 363     | 95.8 |
| Non-Omani                     | 16      | 4.2  |
| **Gender**                     |         |    |
| Man                           | 231     | 60.9 |
| Woman                         | 148     | 39.1 |
| **Place**                      |         |    |
| Barka                         | 144     | 38   |
| Musanaah                      | 98      | 25.9 |
| Rustaq                        | 76      | 20.1 |
| Nakhal                        | 22      | 5.8  |
| Wadi Al Mawel                 | 14      | 3.7  |
| Awabi                         | 11      | 2.9  |
| Outside SBG                   | 14      | 3.7  |
| **Age**                        |         |    |
| ≤ 30                          | 149     | 39.3 |
| 31–40                         | 149     | 39.3 |
| > 40                          | 81      | 21.4 |
| **Social status**             |         |    |
| Married                       | 278     | 73.4 |
| Single                        | 84      | 22.2 |
| Divorced and widowed          | 17      | 4.5  |
| **Educational level**         |         |    |
| Primary school                | 71      | 18.7 |
| Secondary school              | 153     | 40.4 |
| Diploma/Bachelor/or higher    | 155     | 40.9 |
| **Place of work**             |         |    |
| Governmental                  | 162     | 42.7 |
| Private                       | 79      | 36.4 |
| I don’t have work             | 138     | 20.8 |
| **Working in the health sector** |     |    |
| Yes                           | 32      | 8.4  |
| No                            | 347     | 91.6 |
| **Number of children**        |         |    |
| 1–2 children                  | 110     | 29   |
| ≥ 3 children                  | 153     | 40.4 |
| I don’t have children         | 116     | 30.6 |
| **Number of household members** |        |    |
| 5 or less                     | 150     | 39.6 |
| 6–10                          | 162     | 42.7 |
| 11 or more                    | 66      | 17.4 |
| Missing                       | 1       | 0.3  |
| **Comorbidities**             |         |    |
| Yes                           | 81      | 21.4 |
| No                            | 298     | 78.6 |
| **Isolation period**          |         |    |
| 14 days                       | 201     | 53   |
| Less than 14 days             | 40      | 10.6 |
| More than 14 days             | 138     | 36.4 |

(continued)

|                                | N = 379 | %  |
|--------------------------------|---------|----|
| **Month of diagnosis**         |         |    |
| February–June                 | 119     | 31.4 |
| July–November                 | 260     | 68.6 |
| **Monthly income affected**   |         |    |
| Yes                           | 66      | 17.4 |
| No                            | 313     | 82.6 |
| **Health facility communication** |     |    |
| No                            | 26      | 6.9  |
| Yes, daily                    | 115     | 30.3 |
| Yes, few times                | 238     | 62.8 |

Table 1 (continued)

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1.1223–2.935) and supply shortages (OR = 2.928, 95% CI: 1.1580–5.424) (see Table 6).

Discussion
This cross-sectional study of randomly selected sample in SBG revealed that the prevalence of high stress using two different validated psychological scales K10 and IES_R were 31.9% and 37.7% respectively. Both psychological measures yielded comparable results for associated risk factors. The stress was primarily evident among women and patients with financial difficulties and shortages of essential supplies during the isolation period. Patients experiencing comorbidities and extended isolation periods also had higher stress levels.
| Table 3 | Relationship between Kessler categorical scales and patients’ characteristics |
|---------|--------------------------------------------------------------------------------|
|         | Low (10–15) | Moderate (16–21) | High (22–29) | Very high (30–50) | Total (%) | \(X^2\) | \(p\) value |
| Nationality |           |                  |              |                   |           |        |
| Omani    | 41.0      | 27.0             | 19.3        | 12.7              | 100       | 0.981  | 0.806   |
| Non-Omani| 31.3      | 37.5             | 18.8        | 12.5              | 100       |        |         |
| Gender   |           |                  |              |                   |           |        |
| Man      | 47.2      | 27.7             | 16.5        | 8.7               | 100       | 16.192 | 0.001*  |
| Woman    | 30.4      | 27.0             | 23.6        | 18.9              | 100       |        |         |
| Place    |           |                  |              |                   |           |        |
| Awabi    | 54.5      | 27.3             | 18.2        | -                 | 100       | 9.239  | 0.954   |
| Barka    | 38.9      | 27.8             | 18.8        | 14.6              | 100       |        |         |
| Musanaa  | 39.8      | 26.5             | 22.4        | 11.2              | 100       |        |         |
| Nakhal   | 36.4      | 22.7             | 27.3        | 13.6              | 100       |        |         |
| Rustaq   | 42.1      | 28.9             | 18.4        | 10.5              | 100       |        |         |
| Wadi Mawel | 42.9   | 21.4             | 14.3        | 21.4              | 100       |        |         |
| Outside SBG | 50.0 | 35.7             |             | 14.3              | 100       |        |         |
| Age      |           |                  |              |                   |           |        |
| Less than 30 | 40.3 | 26.2             | 21.5        | 12.1              | 100       | 3.245  | 0.778   |
| 31–40    | 42.3      | 25.5             | 17.4        | 14.8              | 100       |        |         |
| More than 40 | 38.3 | 33.3             | 18.5        | 9.9               | 100       |        |         |
| Social status |        |                  |              |                   |           |        |
| Married  | 41.0      | 27.7             | 19.4        | 11.9              | 100       | 1.804  | 0.937   |
| Single   | 41.7      | 25.0             | 19.0        | 14.3              | 100       |        |         |
| Divorced and widowed | 29.4 | 35.3             | 17.6        | 17.6              | 100       |        |         |
| Education |           |                  |              |                   |           |        |
| Primary  | 45.1      | 23.9             | 16.9        | 14.1              | 100       | 2.604  | 0.857   |
| Secondary | 40.5      | 25.5             | 20.3        | 13.7              | 100       |        |         |
| Diploma/Bachelor/higher | 38.7 | 31.0             | 19.4        | 11.0              | 100       |        |         |
| Work     |           |                  |              |                   |           |        |
| Governmental work | 40.7 | 30.9             | 18.5        | 9.9               | 100       | 12.280 | 0.056   |
| Private  | 35.5      | 29.0             | 17.4        | 18.1              | 100       |        |         |
| I don’t work | 49.4 | 17.7             | 24.1        | 8.9               | 100       |        |         |
| No of children |        |                  |              |                   |           |        |
| 1–2 Children | 35.5 | 32.7             | 19.1        | 12.7              | 100       | 3.197  | 0.784   |
| ≥ children | 41.2      | 26.8             | 19.0        | 13.1              | 100       |        |         |
| I don’t have children | 44.8 | 23.3             | 19.8        | 12.1              | 100       |        |         |
| No of household members |        |                  |              |                   |           |        |
| 5 or less | 41.3      | 24.0             | 24.0        | 10.7              | 100       | 5.680  | 0.460   |
| 6–10     | 38.9      | 31.5             | 16.7        | 13.0              | 100       |        |         |
| 11 or more | 43.9 | 25.8             | 15.2        | 15.2              | 100       |        |         |
| Comorbidities |        |                  |              |                   |           |        |
| No       | 41.9      | 29.2             | 18.1        | 10.7              | 100       | 7.183  | 0.066   |
| Yes      | 35.8      | 21.0             | 23.5        | 19.8              | 100       |        |         |
| Duration of isolation |        |                  |              |                   |           |        |
| 14 days  | 38.3      | 30.8             | 20.9        | 10.0              | 100       | 15.578 | 0.016*  |
| Less than 14 days | 62.5 | 22.5             | 7.5         | 7.5               | 100       |        |         |
| More than 14 days | 37.7 | 23.9             | 20.3        | 18.1              | 100       |        |         |
| Communication by the health facility |        |                  |              |                   |           |        |
| No       | 23.1      | 34.6             | 23.1        | 19.2              | 100       | 4.505  | 0.609   |
| Yes, daily | 44.3      | 27.0             | 18.3        | 10.4              | 100       |        |         |
| Few times | 40.8      | 26.9             | 19.3        | 13.0              | 100       |        |         |
Protecting vulnerable patients from stress is imperative. Most participants indicated a willingness to comply with isolation conditions, indicating satisfactory self-awareness. However, a significant minority failed to comply. This failure may have been related to factors such as supply shortages and insufficient awareness.

The Cronbach’s alpha values for K10 and IES-R indicated very good internal consistency. There have been many papers which have suggested different cutoff values for K10’s ability to predict high stress levels. However, we have adopted the less sensitive cutoff value suggested by Andrews and Slade in order to achieve the best estimated prevalence [16]. Conversely, the established cutoff values for the IES-R varied significantly from 22 to 44, which renders its use as a screening tool questionable. Nevertheless, the cutoff value of 24/25 with the specificity (0.75) and sensitivity (0.71) suggested by Nozomu Asukai et al. is a useful instrument with which to detect survivors of post traumatic distress syndrome (PTDS) [17]. As both measures yielded almost identical results and detected a prevalence rate difference of only 5.8%, this indicates a good reliability and accepted cutoff values.

The isolation protocol requires comprehensive compliance, including separate rooms, masks, remaining inside unless there is a medical emergency and fastidious waste management. However, there were obvious gaps in relation to all variables. This compliance rate, though it appears high, does not eliminate further spread of the disease in the community.

Research from India identified low compliance among children and adolescents [18], while another revealed high compliance (94%) when people were financially compensated, but lower compliance (<57%) when compensation was removed [9].

In this study, almost 15% of respondents reported supply shortages, which might explain why some patients temporarily broke their confinement.

Table 3 (continued)

|                          | Low (10–15) | Moderate (16–21) | High (22–29) | Very high (30–50) | Total (%) | X^2  | p value |
|--------------------------|------------|------------------|-------------|------------------|-----------|-----|--------|
| Salary affected          |            |                  |             |                  |           |     |        |
| Yes                      | 33.3       | 15.2             | 22.7        | 28.8             | 100       | 22.348 | <0.001* |
| No                       | 42.2       | 30.0             | 18.5        | 9.3              | 100       | 1.073  | 0.783  |
| Month of diagnosis       |            |                  |             |                  |           |     |        |
| February–June            | 42.0       | 27.7             | 20.2        | 10.1             | 100       | 1.073  | 0.783  |
| July–November            | 40.0       | 27.3             | 18.8        | 13.8             | 100       | 0.099  | 0.753  |
| Shortage of essential items |          |                  |             |                  |           |     |        |
| No                       | 45.5       | 28               | 17.2        | 9.2              | 100       | 39.89  | <0.001* |
| Yes                      | 11.1       | 24.1             | 31.5        | 33.3             | 100       |       |        |

*Significant result \( p \leq 0.05 \)

Previous Canadian research using IES-R revealed 28.9% and 14.6% of respondents experienced stress while quarantined during the 2003 SARS epidemic [4, 19]. Levels reported in the current study were significantly higher. Another study explored the psychological distress experienced by hospital practitioners during the 2015 MERS-CoV outbreak in Korea, where there was a higher mean IES-R (30+19.55) among staff who performed MERS tasks, as compared to those in unrelated work (22+17.7) [5]. However, the current findings are lower than both these results (19.47+7.996). A recently published paper from Australia found a lower prevalence rate of 7.1% for people experiencing quarantine during the COVID-19 pandemic using K10 while the mean score was 13.6 [20].

The current findings accord with research in Turkey that reported that females had OR = 2.478, 95% CI = (1.439, 4.267) for developing anxiety and depression, as compared to men [21]. Previous studies in Oman demonstrated higher levels of stress, anxiety and depression and lower coping scores among females [22, 23]. However, few other studies found gender had no significant impact on psychological distress [24].

The current analysis has revealed that the likelihood of developing high levels of stress was significantly higher among COVID-19 patients when their family income was impacted. In parallel to our findings, a previous study in Oman found income instability to be an independent predictor of psychological distress (OR = 2.05, 95%, CI = 1.54–2.74). In a similar vein, a Chinese study found that family income stability comprises a protective factor against anxiety (OR = 0.726, 95% CI = 0.645–0.817) [22, 25]. Another study in India found that people who had insufficient supplies during lockdown were far more afflicted by anxiety, depression and stress as compared to those who did not experience shortages [26].

The current bivariate analysis with K10 accords with previous research into the psychological impact of the
Table 4  The factors associated with high stress (Kessler score): binary logistic regression

|                       | Unadjusted OR |                    | p value | Adjusted OR |                    | p value |
|-----------------------|---------------|--------------------|---------|-------------|--------------------|---------|
|                       | OR  | 95% CI |          | OR  | 95% CI |          |
| Nationality           |     |        |          |     |        |          |
| Omani                 | 1.00|        | –       | –   | –      | –       |
| Non-Omani             | 0.968| 0.329 | 2.850   | 0.953  |
| Gender                |     |        |          |     |        |          |
| Man                   | 1.00|        | –       | –   | –      | –       |
| Woman                 | 2.211| 1.422 | 3.437   | < 0.001 | 2.482| 1.532 | 4.021   | < 0.001 |
| Place                 |     |        |          |     |        |          |
| Rustaq                | 2.444| 0.505 | 11.831  | 0.267  |
| Musanaah              | 3.046| 0.644 | 14.416  | 0.160  |
| Barka                 | 3.000| 0.645 | 13.945  | 0.161  |
| Awabi                 | 1.333| 0.157 | 11.356  | 0.792  |
| Wadi Mawel            | 3.333| 0.522 | 21.277  | 0.203  |
| Nakhal                | 4.15 | 0.743 | 23.229  | 0.105  |
| Outside SBG           | 1.00|        | –       | –   | –      | –       |
| Age                   |     |        |          |     |        |          |
| Less than 30          | 1.00|        | –       | –   | –      | –       |
| 31–40                 | 0.941| 0.580 | 1.526   | 0.805  |
| More than 40          | 0.785| 0.435 | 1.417   | 0.422  |
| Social status         |     |        |          |     |        |          |
| Married               | 0.835| 0.299 | 2.331   | 0.731  |
| Single                | 0.917| 0.307 | 2.735   | 0.876  |
| Divorced and widowed  | 1.00|        | –       | –   | –      | –       |
| Education             |     |        |          |     |        |          |
| Primary school        | 1.00|        | –       | –   | –      | –       |
| Secondary school      | 1.147| 0.627 | 2.098   | 0.657  |
| Diploma/bachelor or higher | 0.969| 0.527 | 1.781   | 0.920  |
| Work                  |     |        |          |     |        |          |
| Government            | 0.808| 0.452 | 1.444   | 0.472  |
| Private               | 1.122| 0.625 | 2.014   | 0.699  |
| I don't work          | 1.00|        | –       | –   | –      | –       |
| No of children        |     |        |          |     |        |          |
| 1–2 children          | 0.996| 0.569 | 1.744   | 0.990  |
| More than 3           | 1.006| 0.600 | 1.688   | 1.006  |
| No children           | 1.00|        | –       | –   | –      | –       |
| No of household members |    |        |          |     |        |          |
| 5 or less             | 1.220| 0.654 | 2.276   | 0.531  |
| 6–10                  | 0.968| 0.519 | 1.807   | 0.968  |
| 11 or more            | 1.00|        | –       | –   | –      | –       |
| Comorbidities         |     |        |          |     |        |          |
| No                    | 1.00|        | –       | –   | –      | –       |
| Yes                   | 1.896| 1.131 | 3.111   | 0.015  | 1.603| 0.918 | 2.797   | 0.097  |
| Duration of isolation |     |        |          |     |        |          |
| 14 days               | 1.00|        | –       | –   | –      | –       |
| Less than 14          | 0.396| 0.158 | 0.991   | 0.048  | 0.88 | 0.145 | 1.034   | 0.058  |
| More than 14          | 1.398| 0.887 | 2.204   | 0.149  | 1.208| 0.735 | 0.985   | 0.456  |
| Regular communication |     |        |          |     |        |          |
| No                    | 1.533| 0.673 | 3.496   | 0.309  |
| Daily                 | 0.841| 0.517 | 1.369   | 0.487  |
Table 4 (continued)

|                                | Unadjusted OR | Adjusted OR |
|--------------------------------|---------------|-------------|
|                                | OR 95% CI     | p value     | OR 95% CI     | p value     |
| Few times Salary affected      |               |             |               |             |
| No                             | 1.00          | –           | –             | 1.00        | –           | –         |
| Yes                            | 2.760         | 1.605       | 4.748         | <0.001      | 2.332       | 1.270      | 4.282     | 0.006     |
| Month of diagnosis             |               |             |               |             |
| February–June                  | 1.00          | –           | –             | 1.00        | –           | –         |
| July–November                  | 1.120         | 0.700       | 1.790         | 0.636       |             |           |
| Shortage essential items       |               |             |               |             |
| No                             | 1.00          | –           | –             | 1.00        | –           | –         |
| Yes                            | 5.119         | 2.78        | 9.426         | <0.001      | 4.920       | 2.524      | 9.590     | <0.001     |

Table 5 Relationship between IES-R means and patients' characteristics

|                                | Mean | SD    | p value |
|--------------------------------|------|-------|---------|
| Nationality†                  |      |       |         |
| Omani                         | 21.53| 17.59 | 0.229   |
| Non-Omani                     | 15.44| 11.90 |         |
| Gender‡                       |      |       |         |
| Man                            | 19.06| 16.50 | 0.003*  |
| Woman                         | 24.73| 18.28 |         |
| Place‡                        |      |       |         |
| Awabi                         | 22.09| 22.59 | 0.957   |
| Barka                         | 21.56| 18.05 |         |
| Musanah                       | 20.57| 16.85 |         |
| Nakhal                        | 24.05| 18.08 |         |
| Rustaq                        | 21.11| 15.68 |         |
| Wadi Mawel                    | 21.14| 21.59 |         |
| Outside SBG                   | 19.36| 16.94 |         |
| Age‡                          |      |       |         |
| Less than 30                  | 21.01| 17.80 | 0.141   |
| 31–40                         | 20.66| 17.01 |         |
| More than 40                  | 22.90| 17.56 |         |
| Social status†                |      |       |         |
| Married                       | 20.85| 16.77 | 0.671   |
| Single                        | 21.56| 18.28 |         |
| Divorced and widowed          | 26.88| 22.90 |         |
| Education‡                    |      |       |         |
| Primary                       | 22.72| 19.02 | 0.782   |
| Secondary                     | 21.16| 16.92 |         |
| Diploma/Bachelor/ or higher   | 20.73| 17.21 |         |
| Work‡                         |      |       |         |
| Governmental work             | 20.16| 16.63 | 0.525   |
| Private                       | 22.96| 18.58 |         |
| I don't work                  | 20.62| 16.86 |         |

Table 5 (continued)

|                                | Mean | SD  | p value |
|--------------------------------|------|-----|---------|
| No of children†                |      |     |         |
| 1–2 Children                   | 20.64| 16.79| 0.653   |
| ≥ 3 children                   | 22.22| 17.70|         |
| I don't have children          | 20.64| 17.71|         |
| No of household members†       |      |     |         |
| 5 or less                      | 20.81| 17.84| 0.788   |
| 6–10                           | 21.49| 17.84|         |
| 11 or more                     | 21.23| 17.14|         |
| Comorbidities†                 |      |     |         |
| No                             | 20.55| 16.68| 0.328   |
| Yes                            | 23.95| 19.78|         |
| Duration of isolation‡         |      |     |         |
| 14 days                        | 20.63| 16.60| 0.002*  |
| Less than 14 days              | 13.37| 10.34|         |
| More than 14 days              | 24.50| 19.36|         |
| Communication by the health facility† |       |     |         |
| No                             | 26.12| 20.57| 0.498   |
| Yes, daily                     | 20.01| 16.90|         |
| Few times                      | 21.36| 17.27|         |
| Salary affected†               |      |     |         |
| Yes                            | 27.79| 19.91| 0.003*  |
| No                             | 19.90| 16.55|         |
| Month of diagnosis‡            |      |     |         |
| February–June                  | 20.63| 16.60| 0.876   |
| July–November                  | 21.57| 17.80|         |
| Shortage of essential items‡   |      |     |         |
| No                             | 19.35| 16.04| <0.001* |
| Yes                            | 32.87| 20.77|         |

† Mann–Whitney, *Kruskal–Wallis tests *Significant result p ≤ 0.05
Table 6  The factors associated with high stress (IER-S score): binary logistic regression

|                     | Unadjusted OR | Adjusted OR |
|---------------------|---------------|-------------|
|                     | OR            | 95% CI      | p value | OR    | 95% CI    | p value |
| Nationality         |               |             |         |       |           |         |
| Omani               | 1.00          | –           | –       | –     | –         | –       |
| Non-Omani           | 0.741         | 0.252       | 2.178   | 0.586 |
| Gender              |               |             |         |       |           |         |
| Man                 | 1.00          | –           | –       | –     | –         | –       |
| Woman               | 1.768         | 1.156       | 2.703   | 0.009 |
| Place               |               |             |         |       |           |         |
| Rustaq              | 1.111         | 0.339       | 3.640   | 0.862 |
| Musanaah            | 1.241         | 0.387       | 3.980   | 0.716 |
| Barka               | 1.017         | 0.324       | 3.197   | 0.976 |
| Awabi               | 0.675         | 0.121       | 3.767   | 0.654 |
| Wadi Mawel          | 1.000         | 0.213       | 4.693   | 1.000 |
| Nakhal              | 1.246         | 0.312       | 4.977   | 1.246 |
| Outside SBG         | 1.00          | –           | –       | –     | –         | –       |
| Age                 |               |             |         |       |           |         |
| Less than 30        | 1.00          | –           | –       | –     | –         | –       |
| 31–40               | 1.124         | 0.699       | 1.807   | 0.628 |
| More than 40        | 1.616         | 0.930       | 2.809   | 0.089 |
| Social status       |               |             |         |       |           |         |
| Married             | 0.880         | 0.325       | 2.383   | 0.802 |
| Single              | 0.794         | 0.274       | 2.300   | 0.670 |
| Divorced and widowed| 1.00          | –           | –       | –     | –         | –       |
| Education           |               |             |         |       |           |         |
| Primary school      | 1.00          | –           | –       | –     | –         | –       |
| Secondary school    | 1.310         | 0.723       | 2.373   | 0.373 |
| Diploma/bachelor or higher | 1.354 | 0.749 | 2.449 | 0.316 |
| Work                |               |             |         |       |           |         |
| Government          | 1.071         | 0.612       | 1.877   | 0.809 |
| I don't work        | 1.207         | 0.680       | 2.141   | 0.520 |
| Private             | 1.00          | –           | –       | –     | –         | –       |
| No of children      |               |             |         |       |           |         |
| 1–2 children        | 1.086         | 0.629       | 1.873   | 0.768 |
| More than 3         | 1.330         | 0.806       | 2.193   | 0.264 |
| No children         | 1.00          | –           | –       | –     | –         | –       |
| No of household members |         |             |         |       |           |         |
| 5 or less           | 1.00          | –           | –       | –     | –         | –       |
| 6–10                | 1.096         | 0.694       | 1.731   | 0.693 |
| 11 or more          | 0.839         | 0.456       | 1.544   | 0.573 |
| Comorbidities       |               |             |         |       |           |         |
| No                  | 1.00          | –           | –       | –     | –         | –       |
| Yes                 | 1.523         | 0.926       | 2.505   | 0.097 |
| Duration of isolation|             |             |         |       |           |         |
| 14 days             | 1.00          | –           | –       | –     | –         | –       |
| Less than 14        | 0.448         | 0.196       | 1.024   | 0.057 |
| More than 14        | 1.505         | 0.967       | 2.341   | 0.070 |
| Regular communication|             |             |         |       |           |         |
| No                  | 1.410         | 0.624       | 3.182   | 0.409 |
| Daily               | 0.911         | 0.574       | 1.447   | 0.693 |
SARS quarantine that found longer durations of quarantine were associated with an increased prevalence of PTSD symptoms [19]. Indeed, coexisting chronic disease and previous psychiatric history were identified as risk factors for health anxiety in a study in Turkey [21].

Stress and other psychiatric problems may continue in the post-pandemic period [27]. Furthermore, psychological disorders also influence the immune system which influences the prognosis for patients with infectious disease [28]. Therefore, policy makers should seek ways to alleviate the stress within the community, not least amongst impacted patients. First, it is necessary to secure all essential supplies required during the isolation period, including food, water, electricity, communication and medical support. Secondly, individuals living under quarantine conditions should receive health exemption in respect of their employment, which should be supported by governmental authority to ensure that it is done properly.

Third, psychiatric counselling and support can be provided through primary health facilities. Fourth, general practitioners must always diagnose or screen for different psychological disorders to identify patients requiring clinical support. Fifth, paramedics and other specialists can use their knowledge and expertise to provide support. The accumulated experience of trained community nurses, for example, could help manage the stress experienced by self-isolating patients through regular visits and follow ups. Sixth, the psychological first aid is often invaluable during stressful situations. Hence, it would be worth training medical and paramedical staff to deliver it. Seventh, implement telemedicine in a health care context could facilitate psychological support. These initiatives can both reduce stress and increase self-isolation compliance. However, additional research is required to determine their precise benefits.

The current study has several limitations. First, in some cases, it was conducted long after the isolation period had been completed. Hence, recall bias is a potential issue. However, the author contends that this effect was reduced by the strong emotions associated with the isolation experience. Moreover, the findings indicate the existence of long-term consequences of self-isolation. Secondly, the study failed to objectively evaluate compliance levels. In addition, it overlooked different risk factors. However, the subjective assessment of compliance levels was persuasive and comparable to the psychological impact. Third, the questionnaire did not undergo advanced validity testing apart from the face and content validity by the expert colleagues. However, the scales used in the study have already been tested in other researches and we also got high reliability score. Therefore, we assume the scales carried high reliability and validity at the same time. Fourth, the interviews were conducted through introductory phone calls and electronic forms via WhatsApp links, where only we could have verbal consent. Therefore, besides the confidentiality, we ensured participants’ full understanding to the questions in order to avoid any kind of response bias.

Conclusions
The self-compliance rate is high but not optimal. Moreover, the transmission of infection is possible, especially through the less compliant group. Psychological distress was principally evident among females, participants with reduced income levels and those experiencing supply shortages. In addition, patients with comorbidities and those undergoing extended isolation periods experience more stress, although these factors were not the primary determinants. Interventions are critical to limit stress and enhance compliance with self-isolation restrictions.

### Table 6 (continued)

|                                | Unadjusted OR | Adjusted OR |
|--------------------------------|---------------|-------------|
|                                | OR  95% CI    | p value     | OR  95% CI | p value |
| Few times                      | 1.00          | –           | –          | –       |
| Salary affected                |               |             |           |         |
| No                             | 1.00          | –           | –          | –       |
| Yes                            | 1.845         | 1.080       | 3.152      | 0.025   |
| Month of diagnosis             |               |             |           |         |
| February–June                  | 1.00          | –           | –          | –       |
| July–November                  | 1.105         | 0.705       | 1.732      | 0.665   |
| Shortage of essential items    |               |             |           |         |
| No                             | 1.00          | –           | –          | –       |
| Yes                            | 3.071         | 1.697       | 5.560      | <0.001  |
|                                | 2.928         | 1.580       | 5.424      | 0.001   |
Abbreviations
SARS: Severe Acute Respiratory Syndrome; MERS-CoV: Middle East Respiratory Syndrome Coronavirus; K10: Kessler 10 psychological distress; IES-R: The impact of event scale-revised; SBS: South Batinah Governorate; PCR: Polymerase chain reaction; PTDS: Post traumatic distress syndrome; MOH: Ministry of Health.

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Author contributions
ZA: conception, design, questionnaire development, statistical analysis, interpretation of data, drafted, reviewed, approved the manuscript and supervised all study stages. NA: reviewed the questionnaire, collected data and approved the manuscript. Both authors have read and approved the final manuscript.

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References
1. Talevi D, Socci V, Carai M, Carnaghi G, Faleri S, Trebbi E, et al. Mental health outcomes of the COVID-19 pandemic. Riv Psichiatr. 2020;55(3):137–44. https://doi.org/10.1708/3382.33569.
2. Liu X, Zhu M, Zhang R, Zhang J, Zhang C, Liu P, Feng Z, Chen Z. Public mental health problems during COVID-19 pandemic: a large-scale meta-analysis of the evidence. Transl Psychiatry. 2021;11(1):384.
3. World Health Organization. Weekly epidemiological update—19 July 2021. Available from: https://www.who.int/publications/m/item/weekly-epidemiological-update. Accessed 19 July 2021.
4. Reynolds DL, Garay JR, Deamond SL, Moran MK, Gold W, Styra R. Understanding, compliance and psychological impact of the SARS quarantine experience. Epidemiol Infect. 2008;136(7):997–1007. https://doi.org/10.1017/S095026880800242X.
5. Lee SM, Kang WS, Cho A-R, Kim T, Park JK. Psychological impact of the 2015 MERS outbreak on hospital workers and quarantined hemodialysis patients. Compr Psychiatry. 2018;87:123–7.
6. Ahmad M, Vismara L. The psychological impact of COVID-19 pandemic on women's mental health during pregnancy: a rapid evidence review. Int J Environ Res Public Health. 2021;18(13):7112.
7. Mahmoud S, Hossain S, Muyeed A, Islam MM, Mohsin M. The global prevalence of depression, anxiety, stress, and, insomnia and its changes among health professionals during COVID-19 pandemic: a rapid systematic review and meta-analysis. Helikon [Internet]. 2021;7(7). Available from: https://www.cell.com/helikon/abstract/S2405-8440(21)01046-1.
8. Pashazadeh Kani F, Raoufi S, Rafiei S, Khani S, Hosseiniard F, Tajik F, et al. A systematic review of the prevalence of anxiety among the general population during the COVID-19 pandemic. J Affect Disord. 2021;293:391–8. https://doi.org/10.1016/j.jad.2021.06.073.
9. Bodas M, Peleg K. Self-isolation compliance in the COVID-19 era influenced by compensation: findings from a recent survey in Israel. Health Aff. 2020;39(8):936–41.
10. National Centre For Statistics and Information. Sultanate of Oman. eCensus Portal. https://portal.ecensus.gov.om/ecen-portal/ Accessed February 20, 2021.
11. Kessler RC, Andrews G, Colpe LJ, Hiripi E, Mroczek D, Normand SLT, et al. Short screening scales to monitor population prevalences and trends in non-specific psychological distress. Psychol Med. 2002;32(6):959–76. https://doi.org/10.1017/S0033291702000674.
12. Easton SD, Safadi NS, Wang Y, Hanson RG. The Kessler psychological distress scale translation and validation of an Arabic version. Health Qual Life Outcomes. 2017;15(1):215.
13. Weiss DS, Marmar CR. The impact of event scale-revised. In: Wilson JP, Keane TM, editors. Assessing psychological trauma and PTSD. New York: Guilford Press; 1997. p. 399–411.
14. Davy C, Heard R, Lennings C. Development of the Arabic versions of the impact of events scale-revised and the posttraumatic growth inventory to assess trauma and growth in middle eastern refugees in Australia. Clin Psychol. 2015;19(3):131–9.
15. Ministry of Health. Infection Prevention and Control Guidelines. General Directorate For Disease Surveillance and Control. MOH. Oman. Accessed: July 2021.
16. Andrews G, Slade T. Interpreting scores on the Kessler psychological distress scale (K10). Aust N Z J Public Health. 2001;25(6):494–7.
17. Asukai N, Kato H, Kawamura N, Kim Y, Yamamoto K, Kishimoto J, et al. Reliability and validity of the Japanese-language version of the impact of event scale-revised (IES-R-J): four studies of different traumatic events. J Nerv Ment Dis. 2002;190(3):175–82. https://doi.org/10.1097/00005053-200203000-00006.
18. Saurabh K, Ranjan S. Compliance and psychological impact of quarantine in children and adolescents due to COVID-19 pandemic. Indian J Pediatr. 2020;87(7):532–6.
19. Hawryluck L, Gold WL, Robinson S, Pogorski S, Galea S, Styra R. SARS control and psychological effects of Quarantine, Toronto, Canada. Emerg Infect Dis. 2004;10(7):1206–12.
20. D’Onise K, Meena S, Venugopal K, Currie M, Kirkpatrick E, Hurley J, et al. Holistic approach supporting mental wellbeing of people in enforced quarantine in South Australia during the COVID-19 pandemic. Aust N Z J Public Health. 2021. https://doi.org/10.1111/1753-6405.13106.
21. Özdin S, Baynak ÖS. Levels and predictors of anxiety, depression and health anxiety during COVID-19 pandemic in Turkish society: the importance of gender. Int J Soc Psychiatry. 2020;66(5):504–11.
22. Sinawi HA, Al Balushi M, Al-Mahrouqi T, Al Ghailani A, McClay RK, Sultan A, et al. Predictors of psychological distress among the public in Oman amid coronavirus disease 2019 pandemic: a cross-sectional analytical study. Psychol Health Med. 2021;26(1):131–41. https://doi.org/10.1080/13548506.2020.18042473.
23. Badahdah A, Khamis F, Al Mahyijari N, Al Balushi M, Al Hatmi H, Al Salmi I, et al. The mental health of health care workers in Oman during the COVID-19 pandemic. Int J Soc Psychiatry. 2020. https://doi.org/10.1177/002071932093596.
24. Fawaz M, Samaha A. COVID-19 quarantine: post-traumatic stress symptoms among Lebanese citizens. Int J Soc Psychiatry [Internet]. 2020. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7270572/.
25. Cao W, Fang Z, Hou G, Han M, Xu X, Dong J, et al. The psychological impact of the COVID-19 epidemic on college students in China. Psychiatry Res. 2020;287: 112934. https://doi.org/10.1016/j.psychres.2020.112934.
26. Rehman U, Shahnavaz MK, Khan NH, Kharsheid KD, Khursheed M, Gupta K, et al. Depression, anxiety and stress among Indians in times of Covid-19 Lockdown. Community Ment Health J. 2021;57(1):42–8. https://doi.org/10.1007/s10597-020-00664-z.
27. Jalilh MF, Li W, Burnell RE, O’Leary A, Hageman KM, Senghel P, et al. Impact of Ebola experiences and risk perceptions on mental health in Sierra Leone,
July 2015. BMJ Glob Health. 2018;3(2): e000471. https://doi.org/10.1136/bmjgh-2017-000471.

28. Glaser R, Kiecolt-Glaser JK. Stress-induced immune dysfunction: implications for health. Nat Rev Immunol. 2005;5(3):243–51.

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