Sleep Disturbance During Quarantine in the Era of the SARS-CoV-2 (COVID-19) Pandemic

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Abstract

Background Quarantine has been shown to affect sleep quality in previous analyses. However, a thorough investigation of the association between sleep disturbance and COVID-19 infection during quarantine is still lacking. Aim We aim to determine the impact of quarantine on sleep quality and such impact to anxiety. We also aim to investigate the use of medication and its impact on sleep quality during quarantine.Methods A cross-sectional study conducted in the Jazan region of Saudi Arabia during September 2020. The Pittsburgh Sleep Quality Index (PSQI) and the Generalised Anxiety Disorder Assessment (GAD-7) were used. Results The number of participants was 327, with an infection rate of 53.6% (n= 175). 60.8% (n=189) were quarantined. The mean PSQI score was 5.69 (SD=3.17), those who were quarantined had a higher score (M=6.33, SD=2.99) than those who were not (M=4.57, SD=3.23). After we control for the confounding of anxiety, the PSQI score was also higher in those quarantined (M=0.59, SD=0.26) than in those who were not (M=0.48, SD=0.31); t(120)=2.08, *p*<0.05. Zinc was noted to have a significant positive effect on sleep quality and anxiety level. Conclusion This analysis provides new insight into the effect of quarantine and anxiety levels on sleep quality.

I. Introduction

Sleep disturbance has been shown to affect the immune system negatively [1], whereas sleep enhancement is associated with improved immunity, even during a period of infection [2], [3]. Several attempts have been made to explore the effect of COVID-19 infection on sleep-related disorders [4], [5]. In one study, in China, over 70% of participants reported difficulty falling asleep and waking up early at least once per week [6]. In another study, sleep quality was affected secondary to pandemic stress [7]. Fear of insufficient supply of masks, as well as isolation-related anxiety, also contributed adversely to sleep quality [6], [8].

The impact of quarantine on sleep quality needs further elucidation. Quarantine and a nationwide lockdown resulted in worry and alcohol consumption [5]. The previous pandemics of SARS, MERS-CoV, Ebola and H1N1 influenza revealed a correlation between sleep disturbance and quarantine [9], while anxiety also appears a consistent factor in the literature for sleep-related disorders [10], [11], [12]. In this analysis, we aim to determine the impact of quarantine on sleep quality, and investigate the relationship of such impact to anxiety. We also aim to investigate the use of medication and its impact on sleep quality during quarantine.

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II. Methods

This is a cross-sectional study, conducted in the Jazan region of Saudi Arabia during September 2020. The inclusion criteria were: adult patients >18 years of age. The data were collected using a validated structured questionnaire – the Pittsburgh Sleep Quality Index (PSQI). The questionnaire contains 19 self-rated questions and five questions rated by the spouse; however, only the self-rated questions were included in the scoring. The 19 self-rated items were combined to form seven component scores, each of which has a range of 0-3 points. A score of "0" indicates no difficulty in all cases, while a score of "3" indicates severe difficulty. The seven components are: subjective sleep quality, sleep latency, sleep duration, sleep efficiency, disturbance, use of sleep medication, and daytime dysfunction. The seven component scores are then added to the global score, with a range of 0-21 points, "0" indicating no difficulty and "21" indicating the worst sleep quality. We used the validated Arabic version of the questionnaire [13], which is available in the appendix.

We also used the Generalised Anxiety Disorder (GAD-7) assessment [14] to measure anxiety levels. The interpretation of the GAD-7 score is as follows: a score of 5-9 suggests mild anxiety, 10-14 suggests moderate anxiety, and sis indicated in-off

The sample size was calculated using the Raosoft® website, which estimated a sample of 385 participants. The number was based on a 5% margin of error and 95% confidence, with an expected response distribution of 50%. Data were analysed using SPSS version 21. We applied t-test, correlation coefficient, regression and chi-square χ2 tests; with a level of significance indicated by p <0.05. The study was ethically approved, and was written following the STROBE guideline [15].

III. Results

Demographics:

The total number of participants in our study was 327, with a response rate of 84.94%. The participants' demographics are illustrated in Table 1. The majority of the participants were between 18-30 years of age. 60.6% (n=198) were fe- male, and married participants comprised a similar percentage: 59% (n=191). The majority had no chronic diseases: 78.1% (n=253).

Prevalence of COVID-19 infection and quarantine:

Almost half of the participants did not acquire the infection: 53.6% (n= 175). 60.8% (n=189) were quarantined, either as a possible case, secondary to exposure with a possible case, or after travel.

Sleep quality and quarantine:

The mean PSQI score is 5.69 (SD=3.17). We noted a significant difference in scores between those who were quarantined (M=6.33, SD=2.99) and those who were not (M=4.57, SD=3.23); t(276)=4.56, $p<0.05$. Participants who were quarantined had a higher score across all components of the PSQI, $p<0.05$, as illustrated in Table 2.

Controlling for the confounder effect of anxiety, a subsequent analysis was carried out which revealed a significant difference in PSQI scores between those were quarantined (M=0.59, SD=0.26) and those who were not (M=0.48, SD=0.31); t(120)=2.08, $p<0.05$. Furthermore, those who acquired the infection were more likely to have a higher total PSQI score (M=6.18, SD=2.86) than those who did not (M=5.19, SD=3.40), irrespective of whether or not they were quarantined; t(272)=2.64, $p<0.05$.

Anxiety level and quarantine:

In our sample, mild anxiety appeared in 32.4% (n=106), moderate in 7.6% (n=25), and severe in 9.2 % (n=30) of participants. There was a significant difference in anxiety scores between those who were quarantined (M=1.78, SD=0.77) and those who were not (M=1.37, SD=0.84); t(246)=3.85, $p<0.05$. Those who were quarantined were more likely to have a higher level of mild, moderate, or even severe anxiety than those who were not; Fishers Exact Test=27.44, $p<0.05$.

An investigation into the association between anxiety and sleep disturbance revealed a moderate positive correlation between the two variables, r=0.42, $p<0.05$. Linear regression was calculated to predict sleep disturbance based on the anxiety level; a significant regression equation was found: [F(1,238)=49.78, $p<0.05$] with an R^2 of 0.17.

A subgroup analysis of sleep disturbance and anxiety level, including only quarantined participants, revealed a small but positive correlation, r=0.27, $p<0.05$. Regression analysis uncovered a significant regression equation: [F(1,78)=5.95. $p<0.05$] with an R^2 of 0.071. However, when only those who acquired the infection were included, a moderate correlation was revealed between the two variables, r=0.39, $p<0.05$. Regression analysis uncovered a significant regression equation as well: [F(1,131)=25.87, $p<0.05$] with an $R^2$of 0.165.

Medication use:

Three medications were investigated: zinc tablets, azithromycin, and paracetamol/combined paracetamol (sedative or stimulant). One-quarter of the participants used zinc tablets 25.6% (n=78), while azithromycin use was only seen in 10.8% (n=29). The use of paracetamol with caffeine was seen in 22.6% (n=74), paracetamol with codeine in 3.4% (n=11), and the majority, 74% (n=242), used paracetamol without combination.

1-Zinc supplementation:

The effect of zinc supplementation on the sleep quality components showed a tendency toward improvement, as illustrated in Table 3. We noted that the sleep latency, sleep disturbance and daytime dysfunction components were improved, $p<0.05$. However, subjective sleep quality, sleep duration and the use of sleeping medication did not reach a p-value of 0.05.

Furthermore, the use of zinc supplementation exhibited a positive effect on anxiety, irrespective of how severe the anxiety was; Linear-by-Linear Association=34.76, df(1), $p<0.05$.

2- Paracetamol use (with stimulant or sedative)

To control the possible effect on sleep quality of paracetamol with caffeine or with codeine, we restricted paracetamol use during the analysis to investigate its confounding effect. However, controlling for the use of such medications did not influence the significant of any PSQI components; $p>0.05$.

3- Azithromycin use:

The effect of azithromycin was also analysed in relation to the different sleep quality components, as illustrated in Table 4. Only the sleep disturbance component was reduced, $p<0.05$; whereas the other components did not reach a p-value of 0.05. Likewise, the effect of azithromycin on anxiety levels was not statistically significant; Linear-by Linear Association=0.26, df(1), $p>0.05$.

IV. Discussion

This article provides new insight into the association between sleep quality and quarantine. We noted that sleep quality was affected more commonly in those quarantined than in those who were not. Such an effect was evident in its influence on subjective sleep quality, latency, duration, disturbance, sleep medication, and daytime dysfunction.

Anxiety appeared to play a pivotal role in affecting sleep quality during quarantine. Its effect on sleep quality appears to be synergistic with that of quarantine. Notwithstanding, sleep quality was also affected in those without anxiety, although to a lesser extent.

Acquiring the infection appears to be an essential factor influencing sleep quality, irrespective of whether the patient was quarantined. Although our findings align with several previous notions which attributed sleep-related disorders to anxiety, quarantine and the infection itself [16], [17], nonetheless, here we provide a more in-depth understanding for the interplay between quarantine, anxiety, infection and sleep quality.

Zinc supplements are well known for their effect as a sleep modulator [18]. They appear to have had a benevolent effect on sleep quality and anxiety levels during this pandemic. The superiority of this mineral comes from its virucidal effect on several viral infections, possibly including Covid-19 [19], [20]. However, here we demonstrated a further positive effect of its use. On the other hand, sleep disturbance is a known side effect of azithromycin; nonetheless, the effect of azithromycin on sleep quality will need further studies given the small number of participants using this medication.

The limitation of this analysis lies in that we were unable to assess component number four of the PSQI, which concerned sleep efficiency. The number of hours appeared erroneous in our analysis. The reason is attributed to a lack of understanding on the part of the participants as to how precisely to record the hours, or the technical limitations of the online survey tool. However, such limitation is minimal, given the statistically significant findings on all of the other components.

V. Conclusion

This analysis reveals three paramount factors that influence sleep quality during the COVID-19 pandemic: anxiety level, quarantine, and the infection itself. We advocate measures that improve sleep quality, especially during the quarantine period, and we urge clinicians to consider zinc supplementation to achieve this.[1]

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Table 1. The demographic of the participants.

VARIABLES	PERCENTAGES % (N)
Age groups	
18-30 years	59. 3 (194)
30-40 years	29.7 (97)
40-50 years	9.5 (31)
More than 50 years	1.5 (5)
Gender	
Female	60.6 (198)
Male	39.4 (129)
Marital status	
Single	37 (120)
Married	59 (191)
Widowed	0.3 (1)
Divorced	3.7 (12)
Chronic disease	
Yes (Diabetic Mellitus, Hypertension or Hypercholesterolemia)	21.9 (67)
No	78.1 (253)

Table 2. The effect of quarantine on different components of the sleep quality

Level	**No difficulty=0 % (n)**	**Some difficulty=1 % (n)**	**Moderate difficulty=2 % (n)**	**Severe difficulty=3 % (n)**	Statistical test, *p*-level
Component 1: Subjective Sleep Quality					
Yes	47.9 (46)	76.1 (86)	65 (13)	73.9 (34)	Linear-by-Linear Association=8.86, df (1), *p*<0.05
No	52.1 (50)	23.9 (27)	35 (7)	26.1 (12)	
Component 2: Sleep Latency					
Yes	40.2 (39)	65.5 (74)	75.2 (76)	-	Linear-by-Linear Association=25.24, df (1), *p*<0.05
No	59.8 (58)	34.5 (39)	24.8 (25)	-	
Component 3: Sleep Duration					
Yes	57.5 (65)	60.9 (14)	75.4 (43)	69 (20)	Linear-by-Linear Association=4.22, df (1), *p*<0.05
No	42.5 (48)	39.1 (9)	24.6 (24.6)	31 (9)	
Component 5: Sleep Disturbance					
Yes	27.9 (17)	66.4 (85)	70.7 (70)	73.9 (17)	Linear-by-Linear Association=23.57, df (1), *p*<0.05
No	72.1 (44)	33.6 (43)	29.3 (29)	26.1 (6)	
Component 6: Use of Sleep Medication					
Yes	60.4 (139)	72.2 (13)	73.7 (14)	84.6 (11)	Linear-by-Linear Association=4.66, df (1), *p*<0.05
No	39.6 (91)	27.8 (5)	26.3 (5)	15.4 (2)	
Component 7: Daytime Dysfunction					
Yes	50.4 (71)	65.6 (61)	65.5 (36)	95.5 (21)	Linear-by-Linear Association=15.89, df (1), *p*<0.05
No	49.6 (70)	34.4 (32)	34.5 (19)	4.5 (1)	

Table 3. The effect of zinc supplementation on sleep quality.

Level	**No difficulty=0 % (n)**	**Some difficulty=1 % (n)**	**Moderate difficulty=2 % (n)**	**Severe difficulty=3 % (n)**	Statistical test, *p*-level
Component 1: Subjective Sleep Quality					
Yes	27.4 (26)	23.4 (26)	28.6 (6)	43.5 (20)	Linear-by-Linear Association=3.6, df(1), *p*>0.05
No	72.6 (69)	76.6 (85)	71.4 (15)	56.5 (26)	
Component 2: Sleep Latency					
Yes	13.2 (12)	29.8 (34)	32 (32)	-	

No	86.8 (79)	70.2 (80)	68 (68)	**-**	Linear-by-Linear Association=8.6, df(1), *p*<0.05
Component 3: Sleep Duration					
Yes	18.9 (21)	34.8 (8)	32.1 (18)	20.7 (6)	Linear-by-Linear Association=1.31, df(1), *p*>0.05
No	81.1 (90)	65.2 (15)	67.9 (38)	79.3 (23)	
Component 5: Sleep Disturbance					
Yes	5.6 (3)	23.8 (31)	36.7 (36)	34.8 (8)	Linear-by-Linear Association=16.26, df(1), *p*<0.05
No	94.4 (51)	76.2 (99)	63.3 (62)	65.2 (15)	
Component 6: Use of Sleep Medication					
Yes	25.9 (59)	33.3 (6)	36.8 (7)	46.2 (6)	Linear-by-Linear Association=3.56, df(1), *p*>0.05
No	74.1 (169)	66.7 (12)	63.2 (12)	53.8 (7)	
Component 7: Daytime Dysfunction					
Yes	14.2 (19)	28.1 (27)	39.6 (21)	50 (11)	Linear-by-Linear Association=21.67, df(1), *p*<0.05
No	85.8 (115)	71.9 (69)	60.4 (32)	50 (11)	

Table 4. The effect of azithromycin on sleep quality.

Level	**No difficulty=0 % (n)**	**Some difficulty=1 % (n)**	**Moderate difficulty=2 % (n)**	**Severe difficulty=3 % (n)**	Statistical test, *p*-level
Component 1: Subjective Sleep Quality					
Yes	12.2 (11)	7.7 (7)	10.5 (2)	22 (9)	Linear-by-Linear Association=2.03, df(1), *p*>0.05
No	87.8 (79)	92.3 (84)	89.5 (17)	78 (32)	
Component 2: Sleep Latency					
Yes	7.1 (6)	9.1 (9)	16.5 (14)	-	Linear-by-Linear Association=3.89, df(1), *p*>0.05
No	92.9 (79)	90.9 (90)	83.5 (71)	-	
Component 3: Sleep Duration					
Yes	12 (12)	23.8 (5)	10.9 (5)	11.5 (3)	Linear-by-Linear Association=0.02, df(1), *p*>0.05
No	88 (88)	76.2 (16)	89.1 (41)	88.5 (23)	
Component 5: Sleep Disturbance					
Yes	1.9 (1)	8 (9)	19.3 (16)	14.3 (3)	Linear-by-Linear Association=9.04, df(1), *p*<0.05
No	98.1 (52)	92 (103)	80.7 (67)	85.7 (18)	
Component 6: Use of Sleep Medication					
Yes	10.3 (21)	26.7 (4)	7.7 (1)	15.4 (2)	Linear-by-Linear Association=0.51, df(1), *p*>0.05
No	89.7 (183)	73.3 (11)	92.3 (12)	84.6 (11)	
Component 7: Daytime Dysfunction					
Yes	5.8 (7)	18.2 (14)	15.7 (8)	0	Linear-by-Linear Association=0.74, df(1), *p*>0.05
No	94.2 (114)	81.8 (63)	84.3 (43)	100 (20)	