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Psychological and illness-related correlates of insomnia in mildly symptomatic Nigerian COVID-19 adult patients during self-isolation

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Abstract

Background: Globally, the advent of the COVID-19 pandemic has severely impacted the sleep quality of healthcare workers and healthy subjects. There is a dearth of studies on the extent and factors associated with insomnia among COVID-19 patients in Nigeria and Sub-Saharan Africa. Our aim in this study is to assess the extent and the illness-related and psychological correlates of insomnia in a cross-sectional sample of mildly symptomatic Nigerian COVID-19 adult patients.

Methods: Nigerian COVID-19 patients (n=498) aged 18 years and above completed an online survey that consisted of sociodemographic and illness-related details, the Insomnia Severity Index (ISI), the Generalized Anxiety Disorder Scale (GAD-7), the Patient Health Questionnaire (PHQ-8), suicidal ideation (item 9 of the PHQ-9) and the Brief Symptoms Rating Scale (BSRS-5).

Results: Insomnia of varying degrees was present in 22.5%. Hierarchical linear regression analysis showed that the combination of psychological distress, suicidal ideation, and duration of self-isolation were significantly associated with insomnia (accounts for 86% of the variance on ISI scores).

Conclusions: Our study revealed that insomnia is relatively common among the mildly symptomatic COVID-19 Nigerian adult patients. The associated factors may serve as a template for the development of insomnia improving interventions for mildly symptomatic Nigerian COVID-19 patients.

Keywords: COVID-19; insomnia; psychological distress; suicidal ideation

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1. Introduction

A novel coronavirus with the ability for human-to-human transmission dubbed the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) that causes coronavirus disease (COVID-19) was discovered in Wuhan, Hubei province in China in December 2019 [1,2]. This coronavirus is currently responsible for a global pandemic with soaring morbidity and mortality [3,4]. The relatively lower confirmed cases of COVID-19 reported in Nigeria and other sub-Saharan African countries have been ascribed to low testing rates and inadequate contact tracing [5]. Most COVID-19 patients experience mild symptoms, roughly 15% to 20% of patients develop severe symptoms such as severe pneumonia and organ failure which can result in death [2,6].

By the high level of human-to-human transmissibility of the virus, those diagnosed with COVID-19 are required to be quarantined from others while on treatment. In Nigeria, due to an inadequacy of treatment facilities, those with mild symptoms are usually commenced on treatment and placed on self-isolation. The self-isolating mildly symptomatic COVID-19 Nigerian patients are advised to report back to the treatment centers if they start experiencing worsening symptoms. Those patients who presented initially with more severe symptoms were admitted into the designated COVID-19 treatment centers for more intensive therapy. The treatment of COVID-19 in isolation or quarantine has been associated with the experience of psychological distress in patients [7]. Studies have also described the impact of loneliness during periods of isolation [8].

During pandemics, a variety of mental health-related problems such as psychological distress, insomnia, and suicidality has been described among infected patients [9]. An extensive electronic search of the literature showed that during this current global pandemic, insomnia and associated factors have been extensively examined among health professionals [10,11] and the general adult [12] and adolescent [13] populations. All these studies demonstrated that insomnia is relatively common within these populations. Extended periods of isolation such as quarantine due to infectious disease have been described to have adverse effects on mental health [14]. Even though insomnia is a major health issue [15], attention has not been given to insomnia and correlates specifically among mildly symptomatic COVID-19 patients who are in self-isolation.

The objective of this current study was to assess the extent of insomnia and the associated infection-related and psychological factors among mildly symptomatic Nigerian adults with COVID-19 during the periods of self-isolation.

2. Methods

2.1. Study population and design

This is a descriptive cross-sectional study to evaluate sleep problems specifically insomnia and its associated factors among Nigeria adults diagnosed with COVID-19 but who are mildly symptomatic. Data were obtained over four months. The study participants were those who on account of their symptoms profile were screened and detected to be positive for COVID-19 in Osogbo, the capital city of Osun State in Southwestern Nigeria. The respondents were commenced on treatment and advised to be on self-isolation. Participants were recruited from two COVID-19 treatment centers in Osogbo, the capital city of Osun State in Southwestern Nigeria. They were eligible for study inclusion if they volunteered on presentation at these centers, were 18 years and above, and were willing and able to participate in an online survey. We excluded those with pre-existing mental disorders, co-morbid medical disorders, those who refused consent, and those without stable access to the internet. We also excluded those with symptoms severity that made them too physically ill, those with unstable vital signs, and those who needed admission into the intensive care unit of the treatment centers. Nasopharyngeal swab samples were willingly collected from each of the eligible participants on presentation. All were found to have the COVID-19 consistent viral nucleic acid. Each participant before proceeding on self-isolation was given a code that he/she will provide in the online survey. This code was used to match each participant's online data with their viral load which was estimated using the Reverse Transcriptase-Polymerase Chain Reaction Cycle threshold (RT-PCR Ct) value that was performed on the sample that was collected at the COVID-19 treatment centers. A study-specific Google Form (Google Inc, Mountain View, CA, USA) incorporating all the research instruments was designed and sent via e-mail and WhatsApp (WhatsApp Inc, Mountain View, CA, USA) platforms to all the respondents during the self-isolation period. The ethical approval for the study was granted by the Research Ethics Committee of the Osun State Specialist Hospital. The sample size was computed using a margin of error of 5% and a confidence interval of 95%. This resulted in the need for at least 385 respondents. The study was conducted between October 2020 and January 2021. In the introductory aspect of the Google Forms, the objective of the study was explained to the participants whose anonymity was ensured.

2.2. Viral load (Cycle threshold) estimation

Nasopharyngeal swab samples were used to evaluate the Ribonucleic acid (RNA) of the COVID-19 virus. The RT-PCR test amplifies the genetic content of the coronavirus through several cycles. The number of cycles required to detect the presence of the virus is termed the cycle threshold (Ct). Elevated Ct values correlate with lower viral loads which means the number of viral RNA copies present in the positive

samples is inversely proportional to the corresponding Ct value. Thus, the Ct value is an indication of the infectivity of a patient's sample. Studies suggest that lower Ct values correlate with poorer outcomes and that the Ct values may potentially be useful in prognosticating the clinical pattern of patients with COVID-19 [16].

2.3. Instruments completed online by participants

The respondents completed a study-specific sociodemographic questionnaire which included variables such as age (years), gender, marital status, and the duration of self-isolation.

Insomnia was quantified with the Insomnia Severity Index (ISI). The ISI is a self-reported questionnaire used to diagnose insomnia and quantify its severity [15]. The total score ranges from 0 to 28. The severity of insomnia is based on the total score- as the absence of insomnia (0–7), mild insomnia (8–14), moderate insomnia (15–21), and severe insomnia (22–28). The ISI has been used as an insomnia evaluation instrument among the Nigerian adult population [17].

The Brief Symptom Rating Scale-5 (BSRS-5) consists of five subjectively completed items that assessed psychological symptoms [18]. It was derived from the original 50-item scale which measures five psychological domains specifically anxiety, depression, hostility, interpersonal sensitivity, and other psychological symptoms. The score for each item ranges from 0 to 4 (not at all-0; a little bit-1; moderately-2; quite a bit-3; and extremely-4). The BSRS-5 has been used to assess psychological symptoms among the Nigerian population [19].

The Generalized Anxiety Disorder – 7 (GAD-7) was used to quantify the severity of anxiety symptoms. Each of the 7 items is scored according to a 4-point Likert format (that is 'not at all - 0', 'several days - 1', 'more than half the days - 2', and 'nearly every day - 3'). The aggregate score on the scale ranges from 0 to 21. Anxiety symptoms severity on the GAD-7 is categorized into mild (total score ≤ 5), moderate (total score ≤ 10), and severe (total score ≤ 15) [20]. The GAD-7 has been used among the Nigerian population [21]. The Patient Health Questionnaire-8 (PHQ-8) quantifies the symptoms of depression in the preceding two weeks [22]. The total score ranges from 0 to 24, and a higher score indicates more severe symptoms of depression. Cumulative scores are used to classify the respondents into those with minimal depression (0–4), those with mild depression (5–9), moderate depression (10–14), moderately severe depression (15–19), and severe depression (20-24). The ninth item (#9) on the PHQ-9 ('Thoughts that you would be better off dead or hurting yourself in some way') was used to assess the risk of suicide among the respondents. This item has been used in assessing suicide risk in community surveys among the Nigerian population [23].

2.4. Data analyses

All analyses were performed with the 21st version of the Statistical Package for the Social Sciences (SPSS, IBM Chicago Ill) software. Descriptive statistics such as the mean (standard deviation) and frequency (percentages) were used to illustrate the socio-demographic, illness-related, and psychological-related variables (measured with the study instruments). The relationship between insomnia and the other study variables was examined using correlation analysis. Hierarchical linear regression was performed to identify which of the study variables were significantly associated with insomnia. All statistical tests were two-tailed, and the level of significance was set at p -value <0.05 .

3. Results

A total of 498 eligible Nigerian adults with COVID-19 was recruited. Table 1 shows that the mean age of our participants was 41.31 years and males constituted 52.8% of our total sample. Most were married (65.1%). A total of 112 (approximately 22.5%) suffered from insomnia (ranging from mild to severe) during the self-isolation period. The descriptive statistics regarding the viral load estimation (RT-PCR Ct values) and the mean scores on the Insomnia Severity Index (ISI) and the other study measures are also depicted in Table 1. Insomnia [Table 2] had statistically significant ($p < 0.001$) positive correlations with age, anxiety (GAD-7) and depressive (PHQ-8) symptoms, psychological distress (BSRS), and suicidal ideation (Item 9 of the PHQ-9), while negative correlations were observed with the viral load (RT-PCR Ct values) and duration of isolation. In Table 3, the hierarchical linear regression analyses showed that in the first model the respondents' mean age explained only 4.7% (Adjusted $R^2 = 0.047$) of the total variance in the ISI scores. In the second model, age and viral load (RT-PCR Ct values) cumulatively accounted for 18.5% (Adjusted $R^2 = 0.185$) of the variance in the ISI scores. In the third model, age and viral load (Ct values), in addition to the anxiety (GAD-7) and depressive symptoms (PHQ-8) lost their significance and it was the combination of psychological distress (BSRS), suicidal ideation, and duration of isolation that collectively accounted for 86% (Adjusted $R^2 = 0.860$) of the total variance on the ISI.

Table 1. Sociodemographic, illness-related and study measure characteristics of the respondents (n=498)

Variable	Frequency (%) / Mean (SD) [Range]
Gender	
Male	263 (52.8%)
Female	235 (47.2%)
Marital status	
Single	134 (26.9%)
Married	324 (65.1%)
Divorced/separated	12 (2.4%)
Widowed	28 (5.6%)
Age	41.31 (14.64) [18-80]
Ct value	31.85 (5.69) [14.71-39.60]
ISI	4.02 (5.16) [0-28]
Absent insomnia	386 (77.5%)
Mild insomnia	87 (17.5%)
Moderate insomnia	13 (2.6%)
Severe insomnia	12 (2.3%)
GAD-7	3.35 (4.45) [0-21]
PHQ-8	3.22 (4.48) [0-22]
BSRS	2.57 (3.49) [0-18]
Suicidal ideation (item 9 PHQ-9)	0.11 (0.45) [0-3]
Duration of isolation	8.79 (2.71) [1-14]

Ct: Cycle threshold; ISI: Insomnia severity index; GAD-7: Generalized anxiety disorder scale; PHQ-8: Patient health questionnaire-8; PHQ-9: Patient health questionnaire-9; BSRS: Brief symptom rating scale.

Table 2. Correlations (Spearman’s rho) between insomnia and other study variables

Variables	ISI	Age	Ct value	GAD-7	PHQ-8	BSRS	Suicidal ideation	Duration of isolation
ISI	1							
Age	0.165	1						
Ct value	-0.221	-0.055 ^{ns}	1					
GAD-7	0.814	0.154	-0.315	1				
PHQ-8	0.832	0.176	-0.293	0.940	1			
BSRS	0.857	0.178	-0.298	0.946	0.922	1		
Suicidal Ideation	0.399	0.078 ^{ns}	-0.194	0.406	0.431	0.397	1	
Duration of self-isolation	-0.146	-0.032 ^{ns}	0.130	-0.090*	-0.094*	-0.119	-0.156	1

Ct: Cycle threshold; ISI: Insomnia severity index; GAD-7: Generalized anxiety disorder scale; PHQ-8: Patient health questionnaire-8; BSRS: Brief symptom rating scale.

*Significant at p<0.05, all other correlations were significant at p<0.001; ns: not significant.

4. Discussion

This study assessed the prevalence of insomnia and its correlates in a cross-sectional sample of Nigerian adults with mild symptoms of COVID-19 while in self-isolation. Most of them presented with symptoms clusters which include fever, fatigue, and loss of smell and taste, and were commenced on treatment according to the Nigerian Centre for Disease Control (NCDC) protocol. Since the COVID-19 treatment centers in Nigeria were reserved for the management of severe COVID-19 cases, patients with mild symptoms were usually advised to be on self-isolation in their homes. We decided to use the Insomnia Severity Index (ISI) in the online survey due to its brevity and previously proven validity and reliability among the Nigerian adult population [17]. Overall, approximately 22.5% (112) of our respondents reported insomnia ranging from mild to severe according to the ISI classification [15].

Table 3. Hierarchical linear regression showing the variables that were significantly associated with insomnia

Models	Unstandardized coefficients		Standardized coefficients	t	Sig (p)	95% CI
	B	Std Error	Beta			
1. (Constant)	0.815	0.676	-	1.205	0.229	-0.514 – 2.143
Age	0.078	0.015	0.220	5.024	<0.001	0.047 – 0.108
$R^2= 0.048$ Adjusted $R^2=0.047$						
$p<0.001$						
2. (Constant)	11.935	1.359	-	8.786	<0.001	0.926-14.605
Age	0.070	0.014	0.198	4.884	<0.001	0.042 – 0.098
Ct values	-0.339	0.037	-0.374	-9.220	<0.001	-0.411 - -0.267
$R^2= 0.118$ Adjusted $R^2= 0.185$						
$p<0.001$						
3. (Constant)	2.528	0.666	-	3.797	<0.001	1.220 - 3.837
Age	0.010	0.006	0.029	1.673	0.095	-0.002 - 0.022
Ct values	-0.018	0.017	-0.020	-1.105	0.270	-0.051 – 0.014
GAD-7	0.012	0.066	0.011	0.187	0.852	-0.117 - 0.142
PHQ-8	-0.032	0.051	-0.028	-0.631	0.529	-0.134 - 0.069
BSRS	1.182	0.080	0.800	14.812	<0.001	1.026 – 1.339
Suicidal ideation	2.013	0.248	0.176	8.104	<0.001	1.525 – 2.501
Duration of isolation	-0.177	0.033	-0.092	-5.334	<0.001	-0.239 - -0.110
$R^2= 0.862$ Adjusted $R^2=0.860$						
$p<0.001$						

Ct: Cycle threshold; ISI: Insomnia severity index; GAD-7: Generalized anxiety disorder scale; PHQ-8: Patient health questionnaire-8; BSRS: Brief symptom rating scale.

A recent multiple-sited cross-sectional study in China showed that among 460 not too severely ill COVID-19 patients, 42% (171) suffered from various degrees of insomnia which was assessed with the ISI [24]. Interestingly, in our study, there was an inverse relationship between insomnia and RT-PCR Ct values, which means that the more severe insomnia the higher the viral load (i.e., the lower the RT-PCR Ct values). This observation appears to indicate that the biological marker of a disease process may exhibit a statistically significant relationship with a psychological variable. An approximate observation was a recent study in Nigeria that reported that the level of hemoglobin concentration (as a biological marker) in adults with sickle cell disease exhibited an inverse relationship with the levels of hopelessness (a psychological variable) [25]. All the patients in our study were mildly symptomatic and were not aware of their RT-PCR Ct values when they were initially tested for COVID-19 at the treatment centers. A comparison of this observation with previous studies was not feasible, and therefore we believe that more studies are needed to further explore the relationship between insomnia and other virological and biochemical markers of COVID-19. A recent study in South Korea demonstrated that there were no significant differences in the mean RT-PCR Ct values between asymptomatic and symptomatic COVID-19 patients [26].

In our study, as expected, insomnia exhibited positive correlations with anxiety and depressive symptoms in addition to psychological distress. A recent meta-analytic report demonstrated statistically significant positive correlations between insomnia and psychological factors such as anxiety and depressive symptoms among those infected during the 2016 Ebola virus disease epidemic in the West African sub-region [27]. A positive correlation between insomnia and suicidal ideation was also observed in our study. It has been suggested that suicide risk might be elevated among COVID-19 patients because of stigma [28]. Suicidal thoughts or self-mutilating ideas have been reported to be common among COVID-19 patients [24]. Previous studies have pointed out insomnia as an independent and modifiable risk factor for suicide [29]. Also, in this current study, insomnia and psychological distress positively correlated, an observation that is in keeping with a recent report of the acute psychological impact of COVID-19 on affected patients [24]. In our study higher scores on the ISI were associated with shorter durations of self-isolation. A plausible reason may be that in the initial period following being diagnosed with COVID-19 and commencing self-isolating, the patients experience more disruption to their sleep. Self-isolation attributed to COVID-19 has been reported to be associated with drastic changes in sleep patterns [30].

Following hierarchical linear regression analysis, psychological distress, suicidal ideation, and duration of isolation were the variables that cumulatively accounted for 86% of the variance in the insomnia scores among our respondents. This seems to highlight the need to identify and pay extra attention to some of the variables that may adversely influence the sleep of mildly symptomatic COVID-19 patients while on self-isolation. Therefore, screening for concomitant insomnia and related factors especially among mildly symptomatic COVID-19 Nigerian patients may reduce the impact of the disease. It is possible to provide some online knowledge and videos of sleep improving techniques such as relaxation training and cognitive behavioral therapy to ameliorate the symptoms of insomnia [31] via the mobile phones

of the mildly symptomatic self-isolating Nigerian COVID-19 patients. In this study, we excluded COVID-19 patients with severe illness since they are more prone to more severe physical and mental health-related problems.

Our study has a few limitations. First, we recruited mildly symptomatic COVID-19 patients from treatment centers in only one (Southwest) of the six geo-political zones in Nigeria, therefore we are cautious in extending our observations to mildly symptomatic patients in the other zones. Secondly, we quantified the levels of insomnia using an online subjectively completed questionnaire, the levels of reported insomnia symptoms may be inconsistent with the assessment of the mental health specialists if the patients were subjectively evaluated. Lastly, the cross-sectional nature of our current study limits the establishment of the direction of causality between our study variables. The main strength of this study is that it is the first to the best knowledge of the authors to highlight the factors associated with insomnia in mildly symptomatic COVID-19 Nigerian patients during self-isolation. The study also tentatively shows the possibility of developing sleep-improving interventions specifically targeting this population. The findings in this study demonstrated that insomnia is relatively common among Nigerian mildly symptomatic COVID-19 patients during self-isolation. Psychological distress, suicidal ideation, and duration of self-isolation were significantly associated with insomnia.

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Conflict of Interest

The authors declare no conflicts of interest.

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