

Sleep Disorder During the Third Wave of COVID-19 Pandemic among Malaysian Adults

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Abstract

Background: The outbreak of coronavirus posits deleterious consequences on global healthcare system while affecting human life in every aspect. Despite various measures undertaken to limit the socio-economic effect of coronavirus, various challenges remain pervasive, and one such challenge is mental health, particularly sleep disorders. Therefore, this study examines the prevalence and determinants of sleep disorders among Malaysian adults.

Methods: An online survey was conducted from 11 January to May 2021. Structured questionnaire link using Google form was sent to the adults through E-mail in Malaysia. The study utilized Holland Sleep Disorder Questionnaire (HSDQ) to screen out the various sleep disorders, namely; Insomnia, Parasomnia, Circadian Rhythm Sleep Disorder (CRSD), Hypersomnia, Restless Legs Syndrome (RLS/PLMD), and Sleep-disordered Breathing (SDB). Percentage distribution and logistic regression analysis were used as study tools.

Results: Around 70% of the surveyed population had one or another sleep disorder. One-third reported RLS/PLMD (34.8%) and CRSD (33.9%). More than one-fourth of the adults reported Insomnia (29.7%) and Hypersomnia (25.8%). Increased risk of sleep disorders was found to be associated with being unemployed (OR=2.4, C.I.=1.17-4.89). The risk of insomnia and hypersomnia was higher among female adults (OR=1.6, C.I.=1.11-2.3) and unemployed adults (OR=2.4, C.I.=1.23-5.04), respectively.

Conclusion: Immediate interventions to prevent aggravation of sleep disorders should be promoted. It is recommended to bring forth psychiatric and psychological support to those suffering from various sleep disorders in the ongoing coronavirus pandemic. Government shall impart counselling through various online channels consisting of psychologists and sleep experts to improve the quality of sleep.

Background

With the first reported case of COVID-19 on January 25th, 2020, in Malaysia [1], it is currently on the third wave in such a short duration started from September 8th 2020 [2]. As dated May 2nd, 2021, the status reported a total of 411,594 cases [3], and it is going through the community transmission phase of a pandemic. The contributing factor for the third wave is attributed chiefly to the state election gathering held in the Sabah state of Malaysia in September 2020 [4].

The outbreak of coronavirus posits deleterious consequences on the global healthcare system while affecting humanlife in every aspect [5]. The aspects particularly affected by COVID-19 includes socio-economy [5], [6], mental health [7], psychological health [8], [9]. Although several practices such as isolation and social distancing are suggested to curb down the pandemic, the prolonged can be exceedingly stressful for individuals. Despite various measures undertaken to limit the socio-economic effect of coronavirus, various challenges remain pervasive, and one such challenge is mental health, particularly sleep disorders [10].

Previous studies have documented the mental-health outcomes of the coronavirus, specifically reporting an increase in distress among the study population [11]–[15], PTSD symptoms [16], [17], anxiety and depression [18], [19], and quality of sleep and sleep disorders [20], [21]. One of the facets highly affected by the coronavirus pandemic was sleep [22] and studies noted that adversities and worries during coronavirus were associated with poor sleep quality [23] and have also identified several risk factors for poor sleep quality during the coronavirus pandemic [24]. Some of the essential factors affecting the quality of sleep were the number of days at home in confinement [10], losing job during the epidemic period [25], working in the health sector [25], and people’s perception of the death toll during coronavirus pandemic [26]. Majority of the studies have examined the prevalence of sleep disorders by self-reporting questionnaires, which may not provide accurate estimation [27], with some studies confirming that examining sleep disorders by utilizing information from pre-designed validated questionnaires gives reliable estimates [28]–[30]. One of the questionnaires examining the sleep disorder is the Holland Sleep Disorder Questionnaire (HSDQ) that could examine the prevalence and predictors of sleep disorders among adults in Malaysia. HSDQ is based on the International classification of sleep disorders [31] and is utilized in several previous studies [32], [33]. After evaluating several sleep disorders screening questionnaires for their comprehensiveness, screen for multiple sleep disorders, a study evaluated HSDQ as comprehensive [34].

Several studies have examined the impact of coronavirus on sleep disorders [10], [26], [35]. However, studies related to sleep disorders among adults are minimal [25], [36]. To put the issue of sleep disorder among adults in perspective, studies examining the sleep disorders in adults in Malaysia are hard to find. A multi-country study involving Malaysia examined higher dietary risk among higher education students utilizing the quality of sleep pathway [37]. To date, authors could not find a single study examining sleep disorders involving adults in Malaysia. Considering the continued coronavirus outbreak around the world and in Malaysia that affects people socially, psychologically, and economically, it is imperious to appraise and develop strategies to address psychological health, specifically the sleep disorders among the Malaysian population. Therefore, this study examined the prevalence and determinants of sleep disorders among Malaysian adults. The findings from this study are expected to provide insights for the formulation of mitigation measures to help the adults cope with their problems about sleep disorders.

Methods

Data source

This survey is conducted online using Google Form from January 11th 2021, until May 4th 2021. The instrument used in this survey is a questionnaire which consists of 2 sections. Section A consists of questions to obtain socio-demographic details of the respondents (used as independent variables in the study), and section B consists of Holland Sleep Disorder Questionnaire (HSDQ) [for details, see supplementary file 1].

Ethical Concerns

The ethical review committee of Asia Metropolitan University approved the study protocols. All the included participants were informed about the purpose of the study before data collection, and their identity was kept

confidential.

Classification of sleep disorder

HSDQ is a sleep disorders questionnaire based on the International Classification of Sleep Disorders-2. Cronbach alpha is 0.9. There are 32 sleep-related statements in this questionnaire.

The five response options are as shown below:

- 1 = not at all applicable
- 2 = usually not applicable
- 3 = applicable at times
- 4 = usually applicable
- 5 = applicable

Two scores are calculated as depicted in Table A. The first score screens for any sleep disorder, whereas the second score helps identify which of the six different sleep disorder categories a subject fit into depending on the different cut-off scores on the scale. The scoring is shown in the table below.

		Cut-off
1. Sleep disorder	Add all item scores and divide the sum by 32	2.02
2. Scale*	Items	
Insomnia	1 7 10 12 13 14 15 21	3.68
Parasomnia	4 16 20 22 24 31	2.42
CRSD	5 10 13 26 27 30	3.41
Hypersomnia	23 25 28 29 32	2.9
RLS/PLMD	2 6 8 9 11	2.7
SDB	3 17 18 19	2.87
*Add up the item scores per scale and divide the sum by the total number of items on that scale		

Statistical analysis

The data were entered in a Microsoft spreadsheet [MS Office 2013, Microsoft Corp]. After excluding questionnaires with incomplete responses and those who did not consent to be a part of the study, a total of 1046 responses were analyzed using Statistical Package for Social Sciences [SPSS version 17.0, SPSS Inc. IL, Chicago, USA]. Descriptive statistics were used to describe the demographic variables. Age was

categorized into three sub-groups. The prevalence of sleep disorder, insomnia, parasomnia, CRSD, Hypersomnia, Restless leg syndrome/PMLD, and Sleep-disordered breathing was reported. All the independent variables were included in logistic regression analysis to calculate the Odds Ratio (OR) and 95% Confidence Intervals (CI). The level of significance was set at $P \leq 0.05$. The results were presented in an odds ratio (OR) with a 95% confidence interval (CI).

The model is usually put into a more compact form as follows:

$$\ln\left(\frac{P_i}{1 - P_i}\right) = \beta_0 + \beta_1 x_1 + \dots + \beta_M x_{m-1},$$

where β_0, \dots, β_M are the regression coefficient indicating the relative effect of a particular explanatory variable on the outcome. These coefficients change as per the context in the analysis in the study.

Results

Table 1 summarizes the distribution of respondents according to socio-demographic variables. It was observed that about 92 % of the respondents were young adults, about 71% were females, and about 78%resided in urban areas. Most of the respondents were of Malay race, and more than 65% had tertiary education. Seventy-two percent % were students, and the majority of respondents were single. About 44% had an income level below RM 4,849.

Table 1
Distribution of surveyed population by their socio-demographic characteristics

Characteristics	Number (%)
Age (mean \pm SD)	24.62 \pm 7.7
Young adult (18–35 years)	964 (92.2)
Middle age (36–55 years)	68 (6.5)
Old adult (56 years and above)	14 (1.3)
Gender	
Male	228 (21.8)
Female	818 (71.2)
Place of residence	
Rural	226 (21.6)
Urban	820 (78.4)
Race	
Malay	945 (90.3)
Chinese	13 (1.2)
Indian	62 (5.9)
Others	26 (2.5)
Education level	
No formal education	1 (0.1)
Primary school	1 (0.1)
Secondary school	22 (2.1)
Post-secondary	333 (31.8)
Tertiary education	689 (65.9)
Occupational status	
Full-time	190 (18.2)
Part-time	33 (3.2)
Unemployed	70 (6.5)
Student	753 (72)
Marital status	

Characteristics	Number (%)
Single	903 (86.3)
Married	132 (12.6)
Divorced	4 (0.4)
Widowed	1 (0.1)
Others	6 (0.6)
Family Income	
≤ RM4,849	467 (44.6)
RM4,850 - RM10,959	377 (36)
≥ RM10,960	202 (19.3)
SD – Standard Deviation; % - Percentage	

Table 2 depicts the prevalence of sleep disorders among surveyed population. The results revealed a high prevalence (70.5%) of sleep disorders in the study population.

Table 2
Prevalence of sleep disorder among surveyed population

Prevalence of sleep disorder	Number (%)
No sleep disorder	309 (29.5)
Sleep disorder	737 (70.5)
% - Percentage	

Table 3 depicts the prevalence of various types of sleep disorders in the study population. Around 30% of the respondents reported insomnia. PLMD was observed in 34.8% of the respondents, CRSD was observed in 33.9% of the respondent, and hypersomnia was present in 25.8% of patients.

Table 3
Prevalence of various types of sleep disorder
among surveyed population

Type of sleep disorder	Number (%)
Insomnia	311 (29.7)
Parasomnia	141 (13.5)
Circadian rhythm sleep disorders	355 (33.9)
Hypersomnia	270 (25.8)
Restless legs syndrome /PLMD	364 (34.8)
Sleep-disordered breathing	78 (7.5)
% - Percentage	

Table 4 depicts the odds ratio of various types of sleep disorders among the surveyed population by their various background characteristics. The analyses revealed that sleep disorders were significantly predicted by occupation. It was found that the odds of having sleep disorders were more among those who were employed part-time [OR: 2.9 (1.1–7.7)] and who were unemployed [OR: 2.4 (1.1–4.8)] in comparison to one who is employed. In addition, respondents who were married, having post-secondary education, Indian by ethnicity, and older adults were less likely to have sleep disorders than single, having tertiary education, Malay by ethnicity, and young respondents, respectively.

Insomnia

The prevalence of insomnia was 29.7% among study participants. It was found that the odds of having insomnia were more among females than males [OR: 1.6 (1.1–2.3)]. In addition, the odds of having insomnia were less likely among Indians, those with post-secondary education, and married respondents than their respective counterparts.

Parasomnia

Parasomnia was observed among 13.5% of respondents, and it was found that those with secondary education [OR: 4.0 (1.3–12.0)] were four times more likely to have parasomnia than those with tertiary education.

Circadian Rhythm Sleep Disorder [CRSD]

CRSD was observed among 33.9% of respondents, and it was found that the odds of having CRSD was more in females than males [OR: 1.52 (1.07–2.15)]. In addition, respondents who are married and with post-secondary education were less likely to have CRSD than single respondents and those with tertiary education.

Table 4

Binary logistic regression for sleep disorder, insomnia, parasomnia, CRSD, hypersomnia, RLS/PMLD and SDB

	Sleep Disorder	Insomnia	Parasomnia	CRSD	Hypersomnia	RLS/PMLD	SDB
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Age							
Young adult (18–35 years)	1	1	1	1	1	1	1
Middle age (36–55 years)	0.68 (0.32–1.475)	0.62 (0.24–1.59)	0.99 (0)	0.4 (0.15–1.2)	-	0.73 (0.3–1.6)	1.07 (0.3–3.3)
Old adult (55 years and above)	0.193 (0.042–0.9)*	0.16 (0.01–1.55)	0.99 (0)	0.14 (0.01–1.4)	-	0.3 (0.05–1.77)	0.64 (0.09–4.5)
Gender							
Males	1	1	1	1	1	1	1
Females	1.23 (0.875–1.745)	1.6 (1.11–2.3)*	1.26 (.7–2.03)	1.52 (1.07–2.15)*	1.19 (0.82–1.73)	1.05 (0.7–1.4)	0.753 (0.43–1.3)
Residence							
Rural	1	1	1	1	1	1	1
Urban	1.392 (0.98–1.96)	1.31 (0.93–1.85)	1.26(0.79–2.01)	1.1 (0.8–1.6)	1.1 (0.7–1.5)	1.3 (0.9–1.8)	0.97 (0.5–1.7)
Ethnicity							
Malay	1	1	1	1	1	1	1
Chinese	2.3 (0.48–11.25)	0.75 (0.201–2.8)	1.9 (0.5–7.3)	0.9 (0.27–3.14)	1.6 (0.5–5.13)	0.3 (0.06–1.4)	3.6 (0.9–13.7)
Indian	0.33 (0.19–0.57)*	0.5 (0.26–0.96)*	0.5 (0.23–1.3)	0.66 (0.3–1.1)	0.4 (0.2–0.8)*	0.4 (0.2–0.7)*	0.84 (0.2–2.4)
Others	3.09 (0.96–9.99)	0.83 (0.33–2.06)	1.1 (0.37–3.4)	2.1 (0.9–4.8)	1.4 (0.6–1.1)	1.6 (0.7–3.6)	1.03 (0.23–4.5)
Education							

	Sleep Disorder	Insomnia	Parasomnia	CRSD	Hypersomnia	RLS/PMLD	SDB
No formal Education	5.3 (0)	-	-	3.4 (0)	-	-	-
Primary Education	-	-	-	-	-	-	-
Secondary Education	0.98 (0.3–2.8)	1.4 (0.5–1.4)	4 (1.3–12)*	2.2 (0.8–6.1)	1.03 (0.3–3.3)	2.04 (0.79–5.3)	2.5 (0.7–8.6)
Post-Secondary Education	0.55 (0.4–0.7)*	0.67 (0.49–0.9)*	1.03 (0.7–1.5)	0.71 (0.5–0.9)*	0.86 (0.6–1.1)	0.85 (0.6–1.1)	0.8 (0.4–1.4)
Tertiary Education	1	1	1	1	1	1	1
Occupation							
Full time	1	1	1	1	1	1	1
Part time	2.9 (1.1–7.7)*	1.98 (0.8–4.47)	0.9 (0.3–2.7)	1.9 (0.8–4.5)	1.3 (0.5–3.4)	1.03 (0.46–2.3)	3.05 (0.9–9.6)
Unemployed	2.4 (1.17–4.89)*	1.5 (0.82–3)	0.64 (0.25–1.6)	1.9 (0.9–3.6)	2.4 (1.23–5.04)*	0.76 (0.4–1.4)	1.4 (0.5–4.1)
Student	1.3 (0.8–2.03)	0.91 (0.5–1.41)	0.6 (0.34–1.01)	1.3 (0.8–2.1)	1.22 (0.75–1.9)	0.8 (0.5–1.3)	1.4 (0.6–3.1)
Marital Status							
Single	1	1	1	1	1	1	1
Married	0.23 (0.12–0.43)*	0.5 (0.24–0.97)*	0.36(0.13–1.1)	0.45 (0.2–0.9)*	0.6 (0.2–1.2)	0.7 (0.3–1.3)	2.2 (0.8–6.05)
Divorced	0.32 (0.04–3.13)	3 (0.35–26.1)	1.2 (0)	3.3 (0.3–30.6)	5.05 (0)	-	-
Widowed	9.1 (0)	1 (0)	3883 (0)	1 (0)	0.7 (0)	3.8 (0)	-
Others (Engaged etc.)	0.4 (0.07–2.2)	1.6 (0.3–8.6)	-	1.44 (0.2–7.3)	-	0.8 (0.14–4.4)	-
Income							
< RM 4,849	1	1	1	1	1	1	1

	Sleep Disorder	Insomnia	Parasomnia	CRSD	Hypersomnia	RLS/PMLD	SDB
RM 4,850 – 10,959	0.99 (0.7–1.3)	0.9 (0.65–1.21)	1.24 (0.8–1.8)	0.9 (0.7–1.3)	1.05 (0.76–1.4)	0.89 (0.6–1.1)	0.9 (0.5–1.5)
> RM 10,960	0.87 (0.5–1.31)	0.97 (0.66–1.4)	0.7 (0.3–1.2)	0.9 (0.67–1.4)	0.8 (0.5–1.2)	0.6 (0.4–0.9)*	0.7 (0.3–1.4)
CRSD – Circadian Rhythm Sleep Disorder, RLS/PMLD – Restless Legs Syndrome; SDB – Sleep Disordered Breathing							

Hypersomnia

Around one-fourth (25.8%) of respondents had hypersomnia and the odds of hypersomnia was more among unemployed than those who were employed full-time [OR: 2.4 (1.23–5.04)]. In addition, Indians were less likely to have hypersomnia than Malay [OR: 0.4 (0.2–0.8)].

Restless leg Syndrome/PMLD

About 34 % of the respondents were found to have RLS/PMLD, and it was found that odds of RLS/PMLD was less likely among Indians [OR: 0.4 (0.2–0.7)] and those with higher income [OR: 0.6 (0.4–0.9)].

Sleep Disordered Breathing (SDB)

About 7.5 % of respondents had SDB and was not predicted significantly by any of the independent variables included in the present study.

Discussion

The present study was designed to identify the prevalence of several sleep disorders and their factors during the COVID-19 pandemic in the Malaysian population. Our study showed that restless legs syndrome/PLMD was more prevalent (34.8%) among the sleep disorders with the least prevalence (7.5%) for sleep-disordered breathing. We also identified that age, gender, ethnicity, education, occupation, marital status and income were associated with at least one of the sleep disorders in the COVID-19 pandemic among Malaysian adults. Our findings suggest the need of focusing on mitigation measures related to sleep disorders.

The sleeping disorders during the coronavirus crisis became so turbulent that sleep neurologists started calling it “COVID-somnia” [38]. The current study found that almost 70% of the surveyed population had one or another form of sleeping disorder. Such a high prevalence of sleeping disorders was highlighted among physicians in Saudi Arabia [39]. However, previous studies conducted in other settings have stated a lower prevalence of sleep disorder or quality of sleep [25]. Studies examining the prevalence of sleep disorders during COVID-19, conducted in other settings, have reported lower prevalence than the present study, probably because those study examined only one aspect of sleep disorder, such as; Insomnia [40]–[42],

hypersomnia [38], parasomnia [43], and sleep-disordered breathing with seven other indicators of sleep quality [44]. The high prevalence of sleep disorder could be attributed to a more extended quarantine period, infection fears, boredom, inadequate information, financial loss, frustration, and excess information from the mass-media [45]–[47].

The odds of sleep disorders were higher among urban residents than their rural counterparts; however, the finding was not statistically significant. People living in urban areas tend to spend more time following related news, which could be attributed to the higher risk of sleep disorders [48]. Furthermore, a higher caseload of coronavirus in urban areas than in rural areas could also be attributed to the higher risk of sleep disorders among urban adults than in rural adults. Since rural areas are farther away from the centre of the epidemic, rural residents show fewer symptoms of anxiety and depression due to coronavirus, which further leads to improved quality of sleep than their urban counterparts [40]. Also, lower population density means a lower infection rate in rural areas might have inhibited the anxiety among rural residents due to coronavirus, which could also be another reason for better quality sleep [40].

The study reported that almost 30% of the study participant had insomnia. Previous study has reported a higher prevalence of insomnia [48]. A study in an urban setting in China reported an almost similar prevalence of insomnia among adults as in our present study [42]. Another study conducted in the Wuhan province of China reported a similar prevalence of insomnia [40]. This study found higher odds of insomnia among females than in males. Previous studies also reported similar findings where the risk of insomnia was higher among females than in males [40], [48]. Females are socialized to experience their emotions more intensely and tend to have negative views of their health than their male counterparts, making them more anxious and subsequently developing mental health problems [40]. Also, specific biological contexts could be attributed to poor quality of sleep among females than in males; for example, a decline in estrogen among females is linked to anxiety, which could further impact their mental health and therefore impact the quality of sleep among them [40].

Furthermore, the study results found that married people tend to have lower odds of sleeping disorders, specifically insomnia, than single. A previous study also noted a higher odd of sleeping disorder among the unmarried population than their married counterparts [49]. The higher odds of sleeping disorders among single could be because of the sample selection bias as around three-fourths of the sample population was of female gender and belonged to urban societies. Previously it was explained that female gender and urban residents were more likely to report sleeping disorder. Furthermore, co-sleeping with the spouse might directly influence the quality of sleep among the married population [49].

The odds of sleep disorders, specifically hypersomnia, were higher among the unemployed than those working full time. Several previous studies also noticed a higher risk of hypersomnia among unemployed than their employed counterparts [50]. It is quite possible that adults reporting work status as unemployed might be working before the COVID-19 period and might have lost their job due to the ongoing pandemic. Losing a job might have prompted panic or alcoholism among unemployed adults, leading to a higher risk of hypersomnia. A previous study also noted the same pathway as accurate where alcoholism led to high hypersomnia among adults [51]. Furthermore, unemployed adults might have found it tough to sustain their

lifestyle during the pandemic leading to anxiety and depression, which could further be attributed to a higher risk of hypersomnia [52].

Strengths And Limitations Of The Study

The study has several potential limitations. Firstly, the data on sleep disorders was self-reported, leading to under or overestimation of the prevalence of sleep disorders. Secondly, the information on HSDQ was sought for the last three months, which could lead to recall biases among respondents. The information collected is cross-sectional, and therefore causality could not be established. Despite the above limitations, the study has various potential strengths too. The study collected data from a large sample size for a longer duration which could have negated the specific-period effect of coronavirus on sleep disorders. By specific-period effect, we mean that the situation in January 2021 might have been different from February, March, and April 2021. This could help minimize the multicollinearity of the data related to sleep disorders.

Furthermore, the study used the HSDQ screening tool to measure sleep disorders known to provide reliable estimates [53]. Almost all the research relating to sleep disorder is attributed to insomnia and quality of sleep only; therefore, previous studies have raised a need to undertake the study examining hypersomnia and other related sleeping disorder [54]. This study examined six types of sleeping disorders and therefore was the first of its kind study undertaken in Malaysia or elsewhere.

Conclusion

Quality of sleep is responsive to psychological status and the outbreak of coronavirus has enormously disturbed the psychological status of the people in Malaysia. The prevalence of sleep disorder was higher (70%) in Malaysian adults and this could be attributed to the nature of HSDQ questionnaire. Furthermore, sleeping disorders were higher among older adults, unemployed, and were lower among married adults. Additionally, other risk factors for various types of sleeping disorders, as mentioned in the study, include female gender and urban residence (although not significant). Immediate interventions to prevent aggravation of sleep disorders should be promoted. It is recommended to bring forth psychiatric and psychological support to those suffering from various sleep disorders in the ongoing coronavirus pandemic. Government shall impart counselling through various online channels consisting of psychologists and sleep experts to improve the quality of sleep.

Abbreviations

CI

Confidence Interval

CRSD

Circadian Rhythm Sleep Disorder

HSDQ

Holland Sleep Disorder Questionnaire

OR

Odds Ratio

PTSD

Post Traumatic Stress Disorder

RLS

Restless Legs Syndrome

SD

Standard Deviation

SDB

Sleep-disordered Breathing

Declarations

Ethics approval and consent to participate: The study questionnaire was presented before the ethical review committee of Asia Metropolitan University, Malaysia and proper ethical approval was provided by the ethical review committee of Asia Metropolitan University, Malaysia. A written consent was approved from each of the participants. The participants were from age 18 years and above and therefore they were eligible to provide the consent by themselves. Furthermore, this work, including methods was carried out in accordance with the relevant guidelines and regulations as laid down by the Declaration of Helsinki.

Consent for publication: All the included participants were informed about the purpose of the study before data collection, and their identity was kept confidential. Furthermore, before starting the interview, a consent was received from participants for publication.

Competing Interest: The authors declare that they have no competing interests.

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Author's Contribution: The concept was drafted by RRM. RRM & KSS contributed to the analysis design. RRM, and KKS advised on the paper and assisted in paper conceptualization. SC, RP, SA, & SS contributed in the comprehensive writing of the article. TMK, BBA, MIBM, VAPR, MABMR helped in data collection, data cleaning, and data entry. All authors read and approved the final manuscript.

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