Research Article

CIRCADIAN RHYTHM, SLEEP, AND MOOD IN SOFTWARE ENGINEERS AND ASSOCIATED USE OF COPING STRATEGIES DURING THE COVID 19 PANDEMIC: A CROSS-SECTIONAL STUDY

Nikhil Ravindranath Tondehal[1]., Rohini Motwani[2] and Vivaswan Boorla[3]

[1]Geriatric Psychiatry, Icahn School of Medicine at Mount Sinai Beth Israel, Newyork
[2]Anatomy, AIIMS, Bibinagar Hyderabad
[3]Department of Psychiatry, Institute of Mental Health, Osmania Medical College. Hyderabad

ARTICLE INFO

ABSTRACT

Introduction: The COVID-19 pandemic has pushed governments around the world to restrict citizens' freedom of movement. These constraints, while necessary for limiting the virus's reproduction rate, have far-reaching social and economic effects. The pandemic caused by the novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has drastically affected the lives of human beings around the world. It pushed governments around the world to restrict citizens' freedom of movement for limiting the transmission of infection. The resulting social isolation has resulted in severe stress, anxiety, and concerns about health and the risk of infection, as well as work and financial troubles and future uncertainties in software professionals

Aims & Objectives: Our main purpose was to evaluate the circadian rhythm, coping strategies, and mental health among the software professionals during the COVID-19 pandemic.

Materials & Methods: This is a Cross-Sectional study that included 69 software professionals ranging from 18-49 years of age. Pre Validated questionnaires in English were administered using google forms. The data was analyzed using SPSS 22.0 and various descriptive and analytical tests.

Results: Sixty-Nine participants were included in the study after meeting the criteria. The majority reported irregular work timings during the COVID pandemic. Sleep quality was the same across sexes, while males scored higher on morningness, females scored higher on depression. The difference in means was not found to be statistically significant. Females scored higher on the fear of COVID scale. Overall, 16 individuals and 13 individuals suffered from depression and anxiety respectively. The majority of the sample scored higher on approach coping skills. The work shift timings had a significant effect on the use of coping skills. Marital status was found to affect the use of approach coping skills and depression. Substance use affected sleep.

Conclusion: The pandemic affected software professionals in many ways. Married individuals were seen to employ less of approach coping due to a possible increase in conflicts secondary to the lockdown. Unmarried individuals scored high on depression possibly due to loneliness, lack of support, etc. Substance use was seen to reduce the use of approach coping skills and sleep. Irregular work shifts affected coping skills. The overall use of strengthening coping strategies was seen in many individuals. This underlines the importance of having a robust support system for employees in the software industry.

INTRODUCTION

The circadian system in humans is best described as an open, multilayered motivational system that provides the temporal foundation for more complicated interactions with the environment In India software industry has become one of the fastest-growing industries. Presently the Indian information technology industry employs a little more than half a million people. The level of stress these employees face is comparatively higher than other sectors, so this study is done on software employees to assess coping strategies and mental health issues among them.

Work-related anxiety and mental disorders are becoming a common challenge among tech companies. Software developers have a considerably higher chance of experiencing fatigue, burnout, anxiety, and stress than their colleagues who perform mechanical tasks. (1) Deteriorating mental health not only threatens the wellbeing of employees but the companies' overall productivity. Researchers from the Institute of Software Technologies in Stuttgart (2) found that mentally

Corresponding author: **Vivaswan Boorla**
Department of Psychiatry, Institute of Mental Health, Osmania Medical College. Hyderabad

exhausted or depressed developers produce a lower code quality and miss deadlines.

While Tech companies were still coming to terms with the importance of mental health, COVID 19 was declared a pandemic by the WHO. The software profession is one of the sectors hit hard by the unprecedented crisis secondary to the COVID - 19 spread and lockdown. This led to the introduction of work-from-home options, pay cuts, and in some instances, loss of employment. All the above causes can be considered 'life events' and are expected to cause adjustment issues in software professionals. A bidirectional relationship exists between mood disorders and circadian rhythms. Evidence suggests strong associations between circadian rhythm and mood disorders [3]. The relation between sleep and mood disorders is also bidirectional mood disorders are found in one-third to one-half of patients with chronic sleep problems. Patients with mood issues have a characteristic abnormality in sleep continuity and REM sleep patterns. [4] COVID-19 imposed social confinement has produced significant stress, anxiety, worries about health, and fear of being infected. Jobs and financial problems and uncertainty about the future. High rates of insomnia 34-36%, anxiety 45% depression 50% are seen in a study done by Charles M Morin [5]

Subjects and Methods

Aims & Objectives

- To assess the circadian rhythms, coping strategies, and mental health among the software professionals during the COVID pandemic.
- To analyze the coping strategies used during the pandemic.
- To analyze the association of circadian rhythms and coping strategies with mental health during the COVID pandemic.

RESEARCH METHODOLOGY

1. **Study Site:** Offsite (software individuals)
2. **Study Population:** Software Professionals
3. **Study Design:** Cross-Sectional (Analytical)
4. **Time frame:** 2 months
5. **Inclusion Criteria:** 18-59 years of age, able to understand English, provides informed consent, software professional
6. **Exclusion Criteria:** <18 years or above 59 years of age, cannot understand English, refuses to provide informed consent, non-software professional
7. **Methodology in detail:** Subjects will be taken into the study after the inclusion criteria are met. The questionnaire will be supplied for data collection through google forms. Consent will be taken at the beginning of the study
8. **Statistical Methods:** - Data will be analyzed using SPSS version 22 for Windows. Demographic variables will be described using frequencies, percentages. Mean, and standard deviation will be calculated for scores on scales. A comparison of means will be made using the t-test and ANOVA. Association studies will be done using the chi-square test and Pearson's correlation test. P-value is set at 0.05

The self-report questionnaire is prepared by using the following tools.

Sleep, Circadian Rhythms, And Mood Scale (6) will be used to assess the following domains Sleep, Circadian Rhythms, Mood.

Brief-COPE (7) is used to assess avoidant and approach coping skills.

PHQ-4(8) is used to assess mental health (anxiety and depression)
Fear of COVID -19 Scale 2020(9)

RESULTS

A total of 76 participants were included in the study after meeting the criteria. Seven participants were excluded after sampling analysis as they did not meet the graduation requirement for the study. The remaining 69 participant's responses were further analyzed. 52 (75.4%) were males in the sample, and 16 (23.2%) were females. The majority (81.2%) of the sample had a B.Tech/B.E/MTech (computer science) degree. Others in the sample were MCA (11.6%) and BCA (1.4%), B.Sc (2.9%), and M.Sc (2.9%) in computer science. The mean age in the sample was 36.06 ± 6.91 years. 56 (81.2%) participants were married. 88.4% of the sample worked from home, while 6 (8.7%) participants were on a rotational schedule. Four participants reported losing their jobs during the COVID 19 period. The work timings were irregular, as was seen in 50.7% of the sample, followed by morning shift (33.3%) and afternoon shift (15.9%). Five participants had been diagnosed with COVID 19 previously. Eight participants (11.6%) said they smoked regularly, while three (4.3%) smoked occasionally. Fifteen participants (21.7%) would consume alcohol regularly, while twenty participants (29%) consumed alcohol occasionally.

A comparison of means was made using an unpaired independent sample t-test. The mean scores on the 'Good sleep' subscale were 20.37 ± 3.89 and 20.31 ± 3.26 in males and females, respectively. The mean scores on the 'Morningness' subscale were 19.60 ± 5.14 in males and 17.75 ± 3.49 in females. The mean scores on the 'Depression' subscale were 16.42 ± 3.93 and 17.81 ± 4.63 in Males and Females, respectively. The t-test between the groups was not found to be statistically significant. The variation within the sample was found to be statistically significant for 'Good Sleep' (t = 44.614, p<0.0001), Morningness (t = 30.856, p<0.0001), Depression (t = 33.868, p<0.0001)

The Fear of COVID scale means were 15.37 ± 5.91 in males and 18.88 ± 4.88 in females. This was found to be statistically significant (t = -2.156, p = .035). On the PHQ 4 questionnaire, ten male and three female participants suffered mild depression, while three male participants suffered moderate depression. Mild anxiety was seen in 5 male and four female participants, while three males and one female participant suffered from moderate anxiety. This was not found to be statistically significant between the sexes. The diagnosis of anxiety within the group was found to be statistically significant (t=7.659, p <0.0001), as well as the diagnosis of depression (t=8.203, p<0.0001).

The coping strategies were assessed for the sample. The participants scored higher for approach coping skills (26.10 ± 7.40) than Avoidant coping skills (19.81 ± 5.52). The variations within the sample were statistically significant for both avoidant (t = 29.78, p<0.0001) and approach coping skills (t = 29.26, p<0.0001).

Independent samples test with Kruskal Wallis was done for assessment scores. A significant finding was found in the Avoidant coping mechanisms for the current work timings (p = 0.048). The participants working the afternoon shift scored less on the avoidant approach coping skills. Married participants scored lower on approach coping skills (p = 0.018) while unmarried participants scored high on depression (p = 0.038). Participants who did not consume alcohol scored higher on approach coping skills (p = 0.026). Participants who did not smoke scored better on Good Sleep (p = 0.029). No other significant finding was found.

DISCUSSION

Sixty-nine participants meeting the inclusion criteria were assessed in the study through the use of google forms. Demographic data were collected, and the assessment scales were administered. The demographic data included questions relating to COVID, work schedules, personal history. The assessment questionnaires mentioned above were administered. The data was analyzed.

No significant relation was found for the variables with the assessment scales. The majority of the participants reported irregular work timing in the pandemic period due and due to work from home. Both the sexes scored similarly on the sleep quality scale while males scored higher on the morningness scale and females scored higher on the depression scale. None of the findings were statistically significant between the two sexes. In a study done by Morin, C.M *et al*.[5] they reported the incidence of sleep disturbances had increased dramatically during this period. Sleep disturbances are mainly due to stress and anxiety and factors like daily routines such as arising at a specific time, showing up at work, eating, exercising, and engaging in social and leisure activities at relatively fixed times are all important timekeepers for our sleep-wake cycles to remain synchronized with the day (light) and night (dark) cycles, which are disturbed during this pandemic. There was statistically significant (p<0.0001) variation within the sample in all the three domains of the SCRAM questionnaire. This suggests the presence of disturbances in the biological rhythms as reported by the participants. Sleep is very much involved in emotion regulation and immune function. Significant sleep disturbances during covid-19 may be at greater risk for long-term negative health outcomes.

Protecting sleep during a pandemic is particularly important to build resilience and cope more effectively with social confinement, distress, and uncertainty.

Females scored higher on the fear of COVID scale, which was found to be statistically significant (p = 0.035). Males generally scored higher on the PHQ for depression and anxiety. This can be explained due to the decrease in social interactions secondary to lockdown, irregular work timings due to work from home, and a necessity to share household responsibilities. This may also have been caused by the fear of losing the job in the pandemic. There was no statistical difference between the two groups, but variation within the sample suggested a significant psychological burden (p<0.0001). In a study done by Dolar Doshi *et al*.[10] on Indian population to determine the level of fear COVID 19 by using convenient snowball sampling. They reported females' married status lower educational status and being health care workers displayed significantly higher odds for a higher level of fear than their counterparts.

The approach and avoidant coping skills were assessed. The participants scored higher on approach skills than avoiding skills. The afternoon shift participants generally scored lower on the avoidant coping skills (p = 0.048). This signifies a well-adjusted coping skill. This can also be contributed by the fact that afternoon shift participants can be more productive by managing time and allotting time for responsibilities instead of participants with irregular work. Unmarried participants scored higher for depression (p = 0.038), probably due to lack of support system, loneliness, decreased social interactions, possible economic impact due to COVID. Married participants scored lower on approach coping skills (p = 0.018), which can be attributed to social restrictions and previously reported studies that pointed to increases in marital conflicts and abuse. In a study done by Ramyashilpa *et al*. [11] on 100 software professionals regarding anxiety and mental health, persons of 21-28 yrs age group shown the highest anxiety compared to senior colleagues. Unmarried male participants are also shown having high anxiety. For habits, participants who did not consume alcohol generally had good approach coping skills (p = 0.026). This is inversely applicable so that persons with good approach skills generally do not get addicted to substance use. Participants who did not smoke scored better on the sleep scale (p = 0.029). This is supported by the studies which suggested disturbed sleep rhythms in people who smoked.

Coping strategies for covid-19 cannot be short term there may be a long time frame since subsequent waves of Covid-19 may arise. To implement coping strategies, psychiatrists have played an important role in society. The role of Telehealth services has been revealed as an ideal coping strategy. Financial problems, lack of adequate health care facilities, and safety issues are also major concerns affecting coping strategies. If coping strategies are adequate, the anxiety levels are minimal. [12]

CONCLUSION

The pandemic affected software professionals in many ways. Married individuals were seen to employ less of approach coping due to a possible increase in conflicts secondary to the lockdown. Unmarried individuals scored high on depression possibly due to loneliness, lack of support, etc. Substance use was seen to reduce the use of approach coping skills and sleep. Irregular work shifts affected coping skills. Overall use of strengthening coping strategies was seen many individuals. This underlines the importance of having a robust support system for employees in software industry.

LIMITATIONS

1. Small sample size due to non-responses.
2. The study being a cross-sectional study design did not allow to monitor the development/progress in disturbances as the pandemic progressed.

References

1. Nayak DRD. Anxiety and mental health of software professionals and mechanical professionals. Vol. 5.
2. Graziotin D, Fagerholm F, Wang X, Abrahamsson P. Consequences of unhappiness while developing software IEEEACM 2nd international Workshop Emot Aware Softw Eng SEmotion. Vol. 2017(May); 2017. p. 42-7.
3. Walker WH, Walton JC, DeVries AC, Nelson RJ. Circadian rhythm disruption and mental health. Transl Psychiatry. 2020;10(1):28. DOI: 10.1038/s41398-020-0694-0, PMID 32066704.
4. Benca RM, Okawa M, Uchiyama M, Ozaki S, Nakajima T, Shibui K, Obermeyer WH. sleep and mood disorders: sleep Med Rev.1997nov. Sleep Med Rev. 1997;1(1):45-56. DOI: 10.1016/S1087-0792(97)90005-8, PMID 15310523.
5. Morin CM, Carrier J, Bastien C, Godbout R, Canadian Sleep and Circadian Network. Sleep and circadian rhythm in response to the COVID-19 pandemic. Can J Public Health. 2020;111(5):654-7. DOI: 10.17269/s41997-020-00382-7, PMID 32700231.
6. Byrne JEM, Bullock B, Murray G. Development of a measure of sleep, circadian rhythms, and mood: the SCRAM questionnaire. Front Psychol. 2017;8:2105. DOI: 10.3389/fpsyg.2017.02105, PMID 29250023.
7. Brief COPE. Brief-cope. Vol. 2; 2018.
8. Kroenke K, Spitzer RL, Williams JB, Löwe B. An ultra-brief screening scale for anxiety and depression: the PHQ-4. Psychosomatics. 2009;50(6):613-21. DOI: 10.1176/appi.psy.50.6.613, PMID 19996233.
9. Ahorsu DK, Lin CY, Imani V, Saffari M, Griffiths MD, Pakpour AH. The fear of COVID-19 scale: development and initial validation. *Int J Ment Health Addict*. 2020:1-9. DOI: 10.1007/s11469-020-00270-8, PMID 32226353.
10. Doshi D, Karunakar P, Sukhabogi JR, Prasanna JS, Mahajan SV. Assessing coronavirus fear in Indian population using the fear of covid 19 scale. Int J Ment Health Addict 2020may 28:1-9. DOI: 10.1007/s11469-020-00332-x, PMID 32837422.
11. Nayak RS. Anxiety and mental health of software professionals and mechanical professionals international journal of humanities and social science invention vol; 3;2(feb) 2014 pp:52-6.
12. Mohammad nurunnabi *et al* coping strategies of students for anxiety during the covid 19 pandemic in china a cross sectional study. F1000Res.2020 sep10; 9:1115. doi: 10.12688/f1000research.25557.1.PMID: 33274049;PMCID:PMC7682494.
13. Sahni DJ. Impact of COVID-19 on employee behavior: stress and coping mechanism during WFH (work from home) among service industry employees. *Int J Oper Manag*. 2020 Oct;1(1):35-48. DOI: 10.18775/ijom. 2757-0509.2020.11.4004.

How to cite this article:

Nikhil Ravindranath Tondehal *et al* (2021) ' Circadian Rhythm, Sleep, And Mood in Software Engineers and Associated Use of Coping Strategies during the Covid 19 Pandemic: A Cross-Sectional Study ', *International Journal of Current Medical and Pharmaceutical Research,* 07(11), pp 6024-6027.

****

6028