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Melatonin Mystery Key to A Sleepless Stress: A Cross-Sectional Study among Emergency Doctors of LUMHS, Sindh, Pakistan

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ABSTRACT

Objective: To find the relationship of serum melatonin with circadian rhythm disruption (insomnia) and stress-related disorder (PTSD) and to find the relationship between serum levels of melatonin with PTSD and insomnia. **Study Design:** Cross-sectional study. **Settings:** Physiology Department of LUMHS, in collaboration with clinical wards and D R (Diagnostic Research) Lab at LUMHS. **Duration:** August 2021 to March 2022. **Methods:** The participants were adult male and female doctors performing emergency duties at Liaquat University of Medical & Health Science Jamshoro and Hyderabad, using an array of methods and techniques, questionnaire, and serum samples. Data were collected for serum melatonin, PTSD score, and ISI (Insomnia severity index) score for 116 participants. Data were analysed by using SPSC 26.0 software. **Results:** A total of 116 participants, out of which 48 (41.3%) were male and 68 (58.6%) were female, The mean age was 36.65 years, and the mean BMI was 29.39. We found that strong negative correlation between serum Melatonin and PTSD (r value= -.907**) with (*P*=0.001), a negative correlation of serum melatonin with insomnia (-.585**) and we also found a relationship with all these variables which shows a strong dependency. We also found out the prevalence of PTSD (13.71%) and Insomnia (42.25%) with (*P*=0.0001) and their dependency on departmental variations and the effect of work schedule. **Conclusion:** This study concludes serum melatonin is linked directly to variables, and then it can be used as primary prevention and potential adjuvant therapy for stress & insomnia.

Keywords: *Melatonin, PTSD, Insomnia.*

INTRODUCTION

Melatonin is a key neuro-hormone secreted mostly by the pineal gland that regulates the sleep-wake cycle. Pineal melatonin is secreted mostly at night, and its production is generally connected with sleep. It is vital for biological clock control and other cyclic metabolic activities, and it allows order and temporal correlations in proper interactions of many body systems.[1] Recent research indicates that the rhythmic production of melatonin from the pineal gland is associated with the control of neurotransmitter release, particularly serotonin, and dopamine (Stress Hormones).[2] These findings are suggestive of melatonin's particular function in processes of awareness, memory, and stress, and are compatible with published research that shows variations in melatonin under stressful settings and in mental diseases.

In humans, stress may cause sleep disorders such as insomnia, as well as a lower nocturnal peak of pineal melatonin release, which is common in depressed people.[3] Sleep deprivation affects emotions: unpleasant moods such as fury, aggression, melancholy, disorientation, tension, and increased sorrow dramatically. Energy levels drop, as do vitality, wellness, and self-satisfaction. Such anxiety has been demonstrated to influence the quality of patient treatment as well as the clinician's health.[4]

Doctors and paramedics being frontline service providers in the pandemic always remained under severe stress while performing emergency duties. Because of overwork and stress, doctors and paramedics developed mental and physical health problems, in their daily routine life. PTSD is under-recognized among doctors, even though it may be more common in physicians than in the general population due to their constant exposure to such events. There is growing concern regarding the consequences of professional pressures on healthcare practitioners' well-being. Emergency physicians (EP) are expected to have high rates of occupational stress due to high patient acuity, circadian rhythm disturbance, and other workplace stresses.[1]

Doctors and paramedics may be exposed to emotional and physical dangers, including traumatic occurrences, depending on their positions. Traumatic workplace events, which are common in the healthcare sector, might result in post-traumatic stress disorder (PTSD).[5] PTSD is a mental health disorder caused by watching or experiencing death, significant injury, or violence. It is common to be influenced by these sorts of occurrences and to have certain post-event emotions. However, if the thoughts or recollections of these experiences begin to influence the individual's life long after the occurrence, that person may be suffering from PTSD.[6]

In our region, there has been no study conducted in the past to find the association of -social burden and explored the interaction of serum melatonin with PTSD and insomnia. Therefore, concerning the mental and physical health of our doctors, this study is of utmost importance.

METHODS

A cross-sectional study was conducted in the Physiology Department of LUMHS, in collaboration with clinical wards and the D R (Diagnostic Research) Lab at LUMHS from August 2021 to March 2022. The sample size was calculated by using Epi info software, and a non-probability convenience type of sample was done to collect the data, inclusion criteria include following all the basic inclusion criteria strictly.

A total of 116 participants were enrolled in the study, who fulfilled the criteria. Socio-demographic information was collected by using two structured questionnaires including The ISI (Insomnia severity index) and PTSD scale (DMS-PCLC) were filled out by all the participants. The total was compiled after completing forms and questionnaires for each participant and then was classified into no symptoms, mild, moderate, and severe symptoms according to the score mentioned in the scale. Serum melatonin was done on the Human Melatonin ELISA Kit Cat. No E1013Hu). Timing of the sample collection was of the utmost importance in this study, and all samples were collected from 07:00 am to 09:00 am. So, the range between this time window for normal value is 1.61–26.67 pg/ml, any level below this is considered as "low level" and any level above this is considered as "high level". Data collected was analysed by SPSS version 26.0 version.

RESULTS

This study was conducted on a sample size of 116 participants, out of which 48 (41.3%) were male 68 (58.6%) were female, 39 (33.6%) were medical officers, 53 (45.6%) were Postgraduates and 24 (20.6%) Assistant or Associate Professors as shown in the table 1.

Table 1: Distribution of participants

Variables	Frequency, %	MO (Medical Officer)	PG (Post Graduate)	AP (Assistant Professor)
Male	48 (41.3%)	17 (14.6%)	23 (19.8%)	09 (7.7%)
Female	68 (58.6%)	22 (18.9%)	30 (25.8%)	15 (12.9%)
Total	116	39 (33.6%)	53 (45.6%)	24 (20.6%)

Table 2 shows the Pearson correlation between serum Melatonin and PTSD (r value= -.907**) with (P=0.001), and ISI score (r=-.585**) with (P=.0001) which shows there is a strong negative correlation of both variables and shows interdependency of both variables.

Table 2: Pearson correlation between serum Melatonin and PTSD

Variables		PTSD Score	ISI Score
Serum Melatonin (pg/ml)	**r-value**	-.907**	-.585**
	***P*-value**	0.0001	.0001

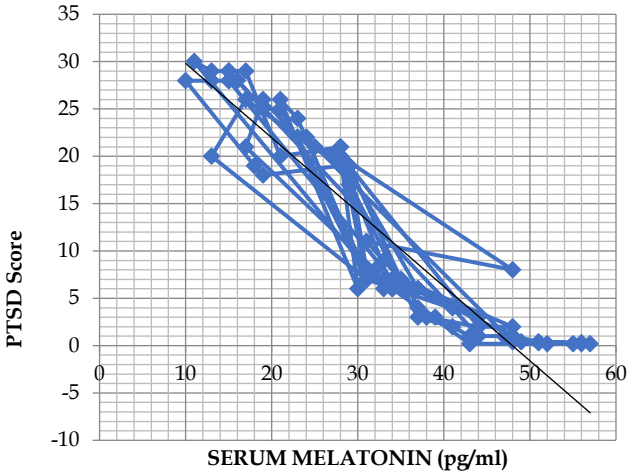
Table 3 shows One-Sample Statistics between serum Melatonin with PTSD score and ISI score with (*P*=0.001) and sample size of (n=116)

Table 3: One-Sample Statistics between serum Melatonin with PTSD score and ISI score

Variables	Mean	*P*-Value
Serum Melatonin (pg/ml)	12.946 ± 9.7903	0.001
PTSD Score	31.48 ± 11.316	
ISI Score	10.26 ± 6.789	

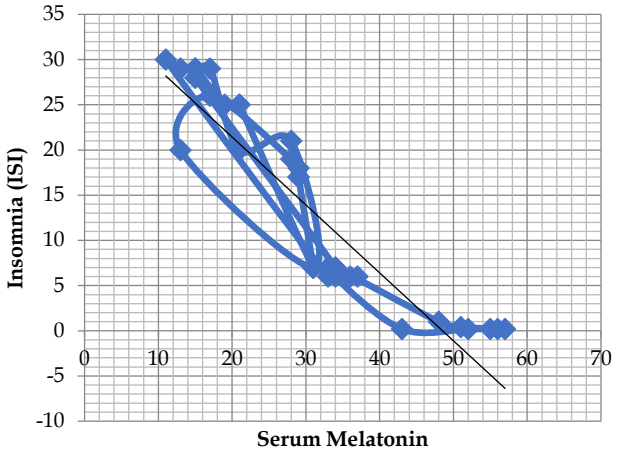
Graph: 01 shows the Scattered Plot Distribution of Correlations between serum Melatonin and PTSD (r value= -.907**) with (*P*=0.001).

Figure 1: Correlation of serum melatonin with PTSD score



Graph: 02 shows the Scattered Plot Distribution of Correlations between serum Melatonin and Insomnia (r value= -.585**) with (p=0.001), which shows there is a strong negative correlation between both variables and shows interdependency of both variables.

Figure 2: Correlation of serum melatonin with insomnia (ISI)



DISCUSSION

The findings of this research support the existence of a physiological association between serum melatonin with PTSD and insomnia, as they are interdependent with each other.

A meta-analysis published in the European Journal of Psychiatry 2016 found that the prevalence of post-traumatic stress disorder among all doctors was 14.8 percent across 9 studies that involved over 1600 participants by using a DMS5 (PCL-C) questionnaire. This data is consistent with our findings.[7] According to a study published in the Royal College of Obstetricians and Gynaecologists 2020, just two-thirds of research participants reported being exposed to stressful work-related situations. PTSD symptoms that were clinically significant were reported by 18% of consultants and trainees.[8] Mundy J *et al* demonstrated that more exposure to stress outside the job is positively linked with increasing recurrence of PTSD.[9] Because of the current COVID-19 outbreak, workplaces such as hospitals and emergency rooms are filled with fear. A similar association was established by (Abir M, *et al*, 2020).[10] However, several articles previously claimed to have calculated the incidence of post-traumatic stress disorder (PTSD) among physicians at between 12 and 18 percent. All our research uses the DMS PCL-C questionnaire to determine whether or not a patient has PTSD; there is a commonality throughout our investigations, and the results back this up.

Pakistani doctors may have had PTSD before this epidemic, but the results of enhanced high general stress and anxiety are likely to be seen in everyone, not only doctors. In this emergency circumstance, the high levels of anxiety and behavioural difficulties noted earlier are likely to have been caused by stress, which hurts the physician and patient care system as a whole.[11] Prior research has attempted to establish a relationship between Serum melatonin and PTSD, as have previous investigations. Serum Melatonin is directly connected to these factors, and this study shows that it might be an important therapeutic and preventative milestone in the future. According to a 2007 research, melatonin "may function as an agent for the treatment of PTSD by modulating fear training and fear extinction".[12] "PTSD is related with slowed nocturnal melatonin production, which is consistent with prior results demonstrating decreased melatonin following exposure to stress and indicative of severe chrono disruption," concludes one recent research.[13] Sleep deprivation due to delayed sleep phase syndrome (i.e., sleeping two or more hours later than the usual bedtime and having difficulties getting up at the appropriate time) may be eased by melatonin, and this might assist the body's sleep-wake cycle be reset more quickly as a result.[14] Melatonin and its metabolites may delay neurodegenerative processes and provide stress protection, according to recent data. According to our research, there is a considerable negative correlation between serum melatonin and posttraumatic stress disorder (PTSD). Because the two are interconnected, a decrease in serum melatonin levels due to rising PTSD symptoms or the opposite might be true, and addressing this shortfall could help alleviate PTSD symptoms.[15]

Five studies with a total of 2,123 doctors examined the incidence of sleep disorders among physicians. According to the findings, 41.6% of doctors treating COVID-19 patients reported having sleep difficulties.[16]

Short-term mental health impacts of COVID-19 are similarly high across impacted nations and genders," according to post-covid19 research undertaken by (Cénat JM *et al*. 2021).[17] However, the incidence of insomnia and PTSD among HCPs is greater than in the general population, with prevalence rates of 23.87 percent and 21.94 percent, respectively.[18,19]

Future researchers should evaluate serum melatonin levels for insomnia, PTSD, and depression symptoms on molecular levels and this could turn out to be beneficial in the long run to clinically diagnose and treat these issues, policymakers should make efforts to comfort, educate, and start awareness programs towards this psychosocial, which will benefit the quality life of a doctor and improve our health care system as whole.

CONCLUSION

Our research provides a new perspective on the incidence of Insomnia and post-traumatic stress disorder concerning serum melatonin levels in the medical community. It is our aim that this paper will raise public awareness of the subject of physicians high stress while caring for patients Participants and healthcare professionals are both harmed because of these harmful exposures to stress. To aid doctors, hospital administration and medical school committees and policymakers must design coping methods and early preventative programs for all doctors to improve the health care system.

LIMITATIONS

Limited to LUMHS Jamshoro/Hyderabad.

SUGGESTIONS / RECOMMENDATIONS

Suggested to extend the study in other hospitals.

CONFLICT OF INTEREST / DISCLOSURE

There is no conflict of interest among authors.

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