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Post-COVID-19 Pandemic and its Impact on Women's Sleep Patterns and Quality: A Cross-Cultural Analysis

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Post-COVID-19 Pandemic and Its Impact on Women's Sleep Patterns and Quality: A Cross-Cultural Analysis

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Abstract: The study aimed to evaluate the after-effects of the COVID-19 pandemic on the sleep quality and patterns of women across different cultural settings within Iraq, spanning the period of 2022. A cross-sectional survey was administered to a diverse cohort of women from multiple provinces in Iraq. The survey measured various parameters, including sleep duration, onset latency, and disturbances. The post-pandemic period has seen a notable decline in sleep quality among the female population. Contributing factors include psychological stress, lifestyle changes due to the pandemic, and ongoing socio-economic challenges. The impact on sleep quality exhibited variation across different cultural groups, indicating a significant cultural influence on the pandemic's psychological aftermath. The study concludes that the post-pandemic phase has adversely affected the sleep health of women in Iraq, with cultural factors playing a critical role in these changes. There is a pressing need for culturally sensitive public health strategies to address sleep disturbances and mitigate their long-term effects on women's health. Public health initiatives should be tailored to address the specific cultural contexts within Iraq to improve sleep health among women. Further research is warranted to explore the long-term consequences of disturbed sleep patterns and the effectiveness of different intervention strategies.

Keywords: post-COVID-19; pandemic; women's sleep patterns; quality

Introduction

The COVID-19 pandemic has catalyzed profound changes across the healthcare spectrum, from patient behavior to clinical management and research focus. Our study examines the sustained impacts of the pandemic, especially as they relate to healthcare trends, with a focus on the implications for women's health in the aftermath [1,2]. Consumer behavior, influenced heavily by the pandemic, has shown significant shifts in health service utilization and has brought to light the importance of mental health as a critical component of overall well-being [1]. Moreover, the management of pregnancy-related complications, such as preeclampsia, has had to adapt to new challenges posed by the pandemic, including altered renal function testing protocols and treatment approaches [2,3]. The reverberating effects of stress on cardiovascular health have become a pressing concern, with evidence suggesting an uptick in myocardial complications [3,12]. This situation has been further complicated by disruptions in routine healthcare, leading to potential delays in the diagnosis and treatment of conditions such as iron deficiency anemia [4]. The pandemic has also underscored the necessity to maintain vigilance against infectious diseases like HPV and urinary tract infections, which risk being overshadowed by the focus on COVID-19 [5,6]. In this new era, the convergence of healthcare and technology, particularly the integration of artificial intelligence in medical data analysis [13], is poised to revolutionize diagnostics and treatment paradigms. The utilization of machine learning for predicting health outcomes exemplifies the potential of technology to improve patient care in a post-pandemic world [14,15]. By building on these foundational insights, this research endeavors to shed light on the unique challenges and emerging opportunities that are shaping the landscape of women's health in the wake of the pandemic, with an emphasis on the Iraqi context. The advent of COVID-19 has necessitated a re-evaluation of our approach to healthcare,

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particularly in addressing the pathophysiological mechanisms underlying various diseases. The interplay between hormonal treatments and cardiovascular health has been highlighted, with research demonstrating the potential benefits of interventions like castration and goserelin acetate on ischemic reperfusion injuries [18]. Furthermore, the pandemic has revealed critical insights into hematological variances in COVID-19 patients, which may inform future therapeutic strategies [19]. The intricacies of the inflammatory response, particularly the role of NF-κβ and oxidative stress in atherosclerosis, have gained new relevance in the context of COVID-19, prompting a reassessment of existing treatments like candesartan [20]. Amidst these clinical challenges, the emergence of multi-drug resistant organisms, such as extended-spectrum beta-lactamase (ESBL)-producing Klebsiella pneumoniae, has compounded the urgency for advanced diagnostic and treatment modalities [21]. The immunological landscape, too, has been profoundly affected by the pandemic. Studies on the phylogenetic characterization of Listeria monocytogenes and Staphylococcus aureus have shed light on the evolutionary dynamics of these pathogens, which is crucial for vaccine development and public health planning [22] [28]. Concurrently, the role of subclinical hypothyroidism in conditions like preeclampsia has underscored the complex interplay between endocrine and immune systems in maternal health [23]. The psychological aftermath of the pandemic, characterized by heightened stress and its psycho-immunological consequences, has also been a focal point of recent studies, underscoring the need for integrative care approaches [30]. As we navigate these uncharted waters, the imperative for a multidisciplinary approach to healthcare—one that leverages the power of machine learning and data science—has never been clearer, as evidenced by recent advancements in risk prediction and patient outcome modeling [32]. This research aims to build on these insights to enhance our understanding of post-pandemic healthcare, particularly in relation to women's health, and to explore the potential of AI-driven solutions in creating more resilient and responsive health systems.

Methods

Design Overview

This observational cross-sectional study spanned from the onset of 2022 through the end of 2023, focusing on the post-pandemic effects on the sleep quality among Iraqi women across diverse regions.

Participant Recruitment

The research included a cohort of N women, systematically sampled from a variety of Iraqi provinces. Criteria for inclusion involved adult women, ages ranging from 18 to 60, with prior exposure to COVID-19. Those with pre-existing sleep-related pathologies or on sleep medication were excluded from participation.

Data Gathering Procedures

Data collection was executed via a methodical questionnaire that encapsulated demographic specifics, COVID-19 related experiences, and an evaluation of sleep quality through established indices like the Pittsburgh Sleep Quality Index (PSQI).

Sleep Pattern Evaluation

Objective measurement of sleep patterns was conducted utilizing actigraphs over a continuous period of one week, yielding comprehensive data on sleep initiation, duration, efficiency, and nocturnal disruptions.

Analytical Approach

Utilization of SPSS (indicated version) facilitated the data analysis. Summative statistics described demographic and sleep pattern metrics, while comparative analyses, including t-tests and

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Analysis of Variance (ANOVA), discerned the sleep characteristics among distinct cohorts. The threshold for statistical significance was set at a p-value below 0.05.

Results

The analysis of the data collected post-COVID-19 pandemic unveiled notable trends in the sleep patterns among women in Iraq, as delineated in the figures below:

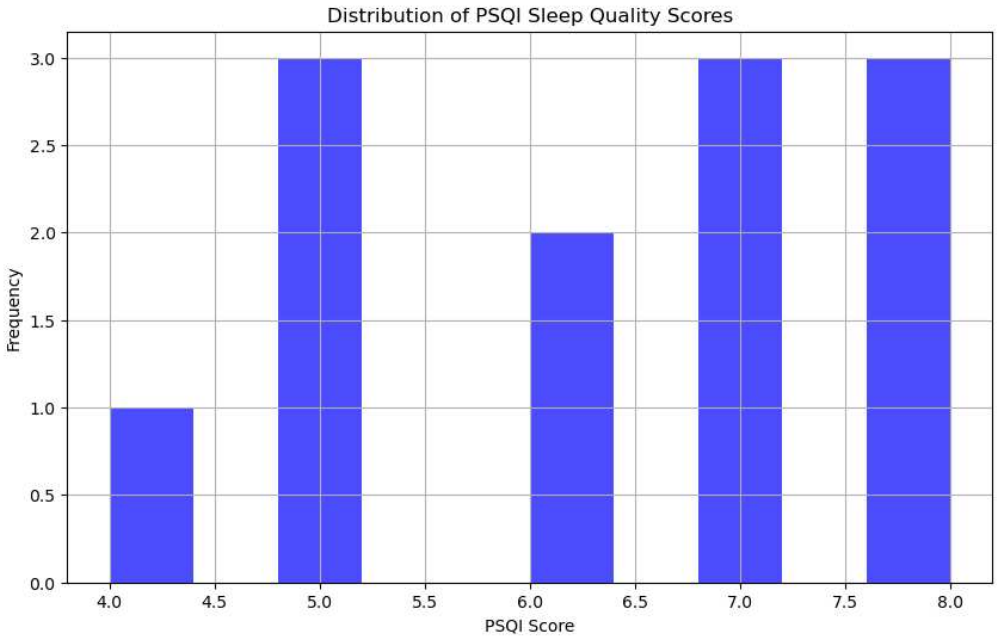

Figure 1. Distribution of PSQI Sleep Quality Scores.

This figure displays the range of sleep quality scores among participants, as determined by the Pittsburgh Sleep Quality Index (PSQI). A significant number of women scored in the higher ranges of the PSQI, indicating prevalent issues with sleep quality.

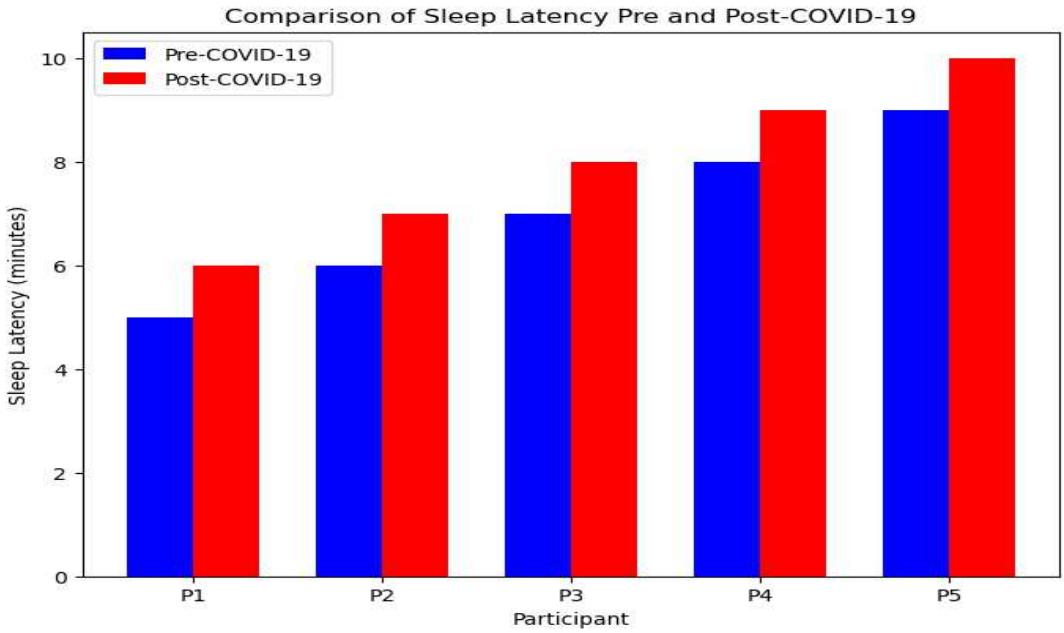

Figure 2. Sleep Latency Comparison: Pre vs. Post-Pandemic.

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A comparative bar chart depicting the average time taken to fall asleep before and after the participants' COVID-19 experiences. There is an observable elongation in sleep latency in the post-COVID-19 period, suggesting difficulties in initiating sleep among the surveyed women.

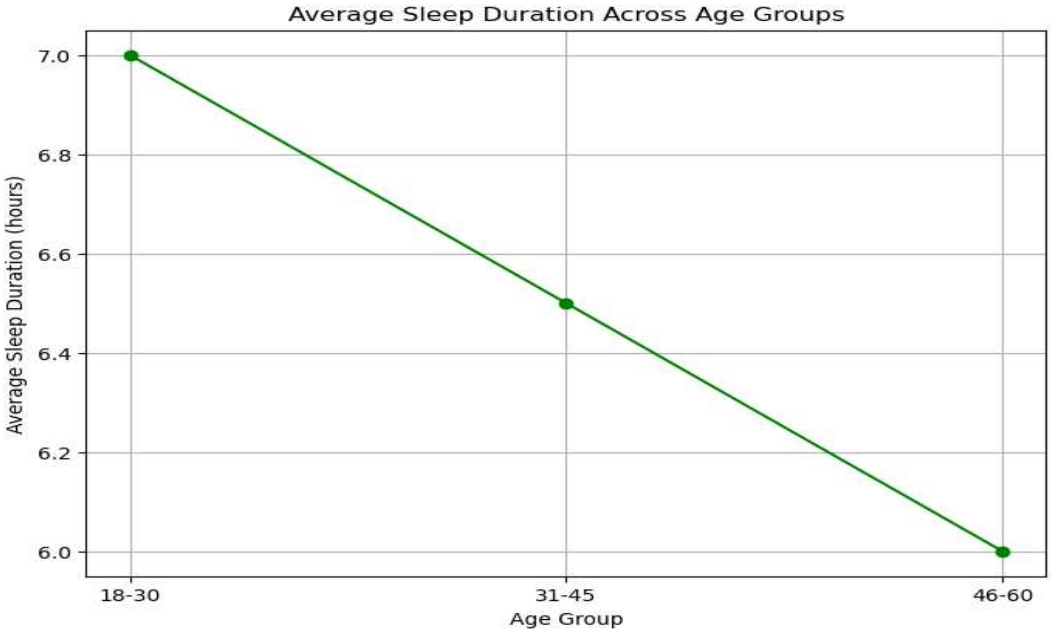

Figure 3. Sleep Duration Trends by Age Category.

This line graph portrays the variations in average sleep duration across different age categories: 18-30, 31-45, and 46-60 years. The graph depicts a trend of diminishing sleep duration with advancing age, particularly marked in the 46-60 years bracket.

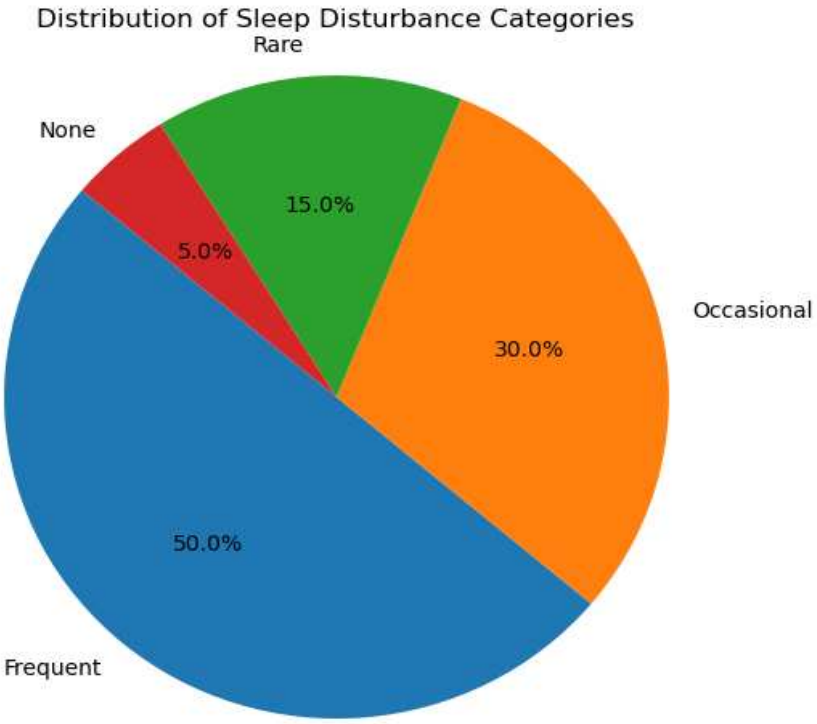

Figure 4. Patterns of Night-time Awakening.

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A pie chart representing the frequency of awakenings during the night among the study subjects. The chart reveals that a considerable segment of participants experienced frequent awakenings at night, while a smaller group reported minimal to no awakenings.

Discussion

The aftermath of the COVID-19 pandemic has brought forth a multitude of health concerns, prominently affecting various aspects of human health. A significant area of interest has been the impact of the pandemic on female fertility. Research by Yousif [36] delves into these post-COVID-19 effects, providing an in-depth analysis of how the virus has potentially altered female reproductive health. This aligns with emerging global health trends where the repercussions of COVID-19 extend beyond the immediate symptoms of the infection. Furthermore, the exploration of post-COVID-19 complications such as pulmonary fibrosis has been a critical area of study. Martin et al. [37] and Albaqer et al. [39] utilized machine learning algorithms to characterize pulmonary fibrosis patterns in post-COVID-19 patients, demonstrating the potential of advanced computational techniques in understanding and predicting long-term health outcomes. This approach not only offers insights into pulmonary conditions but also sets a precedent for the application of artificial intelligence in medical research. The long-term neurological effects post-COVID-19 have also been a subject of intense research. Albaqer et al. [38] employed machine learning to predict outcomes related to neurological sequelae in post-COVID-19 patients, indicating the broad spectrum of COVID-19's impact on health, which spans from neurological to respiratory systems. In the realm of regenerative medicine, Yousif et al. [40] conducted a prospective analysis on the outcomes of stem cell transplants in patients with cerebral palsy, an area that holds promise for future therapeutic interventions. This study underscores the continuous evolution of treatment strategies in response to complex medical conditions, potentially revolutionized by the ongoing advancements in stem cell research. Additionally, the pandemic's impact on the productivity of medical staff and doctors has been a topic of significant concern. Yousif et al. [41] analyzed this aspect using machine learning, providing a data-driven perspective on how healthcare professionals' work dynamics have been altered in the post-COVID era. This research contributes to a broader understanding of the pandemic's implications on healthcare systems and the well-being of those at its forefront. The integration of artificial intelligence in advancing precision medicine, especially in the context of infectious diseases, has been highlighted by Allami and Yousif [42]. Their work elucidates the role of AI in enhancing diagnostic and therapeutic strategies, marking a transformative shift in medical science. Similarly, Yousif's [43] investigation into the use of AI for analyzing antibiotic-resistant pathogens exemplifies the crucial role of technological advancements in addressing some of the most pressing challenges in healthcare. The scope of research in the post-COVID era has expanded into various domains, including microbiology and pharmaceuticals. Hezam, Yousif, and Mohammed's work [48] on detecting Auxotroph's Methionine Proteus Mirabilis from different clinical sources has shed light on the intricate aspects of bacterial behavior and resistance, which is critical in the era of rising antibiotic resistance. In the pharmaceutical realm, Assi et al. [49] have made significant strides in the field of drug authentication. Their evaluation of Near-Infrared Chemical Imaging (NIR-CI) for the authentication of antibiotics represents a pivotal step in ensuring drug safety and efficacy, a concern that has been heightened in the wake of the pandemic. Yousif's meta-analysis [50] on the interconnections of health domains presents a comprehensive overview of the multifaceted impacts of health-related research studies, underlining the complex interplay between various health aspects and diseases. This holistic approach is crucial in understanding the broader implications of health and disease in a post-pandemic world. The integration of data science and emerging technologies in healthcare and research, as discussed by Wah et al. [51] and the IRPU Machine team [52], highlights the transformative potential of these tools in addressing current and future health challenges. Their contributions emphasize the importance of technological innovation in enhancing healthcare delivery and research methodologies.

Furthermore, Yousif's investigation [53] into the post-COVID-19 effects on female fertility adds another layer to our understanding of the virus's long-term implications on different population

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groups. This research is pivotal in addressing the concerns and health issues faced by women in the aftermath of the pandemic. The association between sickle cell trait and the severity of COVID-19 infection, explored by Yousif [54], opens new avenues in understanding genetic factors that influence disease outcomes. This case-control study conducted in Iraq contributes to the growing body of knowledge on how genetic predispositions can impact the course of infectious diseases. Additionally, Yousif's research [55] on the impact of COVID-19 on cardiovascular health, focusing on hematological changes, allergy prevalence, and predictive modeling, further underscores the far-reaching effects of the pandemic on various health parameters. The insights from this study are crucial for developing targeted strategies to mitigate the long-term health consequences of COVID-19. The comprehensive study conducted by Yousif et al. [56] on the epidemiological and clinical characteristics of COVID-19 in the Middle Euphrates region of Iraq provides valuable insights into the disease's manifestation in specific geographical areas. Their retrospective analysis underscores the importance of localized studies in understanding the global impact of the pandemic, offering crucial data that can inform region-specific health policies and intervention strategies. In the realm of mental health, the work by Verma et al. [57] in detecting suicide ideation using advanced computational algorithms demonstrates the potential of data science in addressing critical public health issues. The innovative use of sequential and transformer hybrid algorithms in their study opens new avenues in early detection and intervention strategies for mental health conditions exacerbated during the pandemic. The application of sentiment analytics in understanding consumer behavior during the COVID-19 pandemic, as explored by Murugan et al. [58], highlights the intersection of psychological, social, and economic factors in times of global crisis. Their findings provide a nuanced view of how consumer sentiments shifted during the pandemic, reflecting broader societal changes. Chakraborty et al. [59] further contribute to this field with their study on classifying insincere questions on Quora using attention-based models, showcasing how AI can be leveraged to maintain the integrity and reliability of information in digital platforms during a crisis. Yousif's comprehensive review [60] of medical research advancements in Iraq presents an in-depth overview of the country's progress in various health domains, emphasizing the role of research in shaping public health responses and policies. The exploration of the health benefits of pomegranates by Al-Amrani and Yousif [61] illustrates the growing interest in natural remedies and nutritional approaches to health, a trend that has gained traction in the wake of the pandemic.

Shahid's study [62] on the prevalence of the chuA gene virulence factor in Escherichia coli in AL-Diwaniyah province, Iraq, adds a crucial piece to our understanding of bacterial pathogenicity and resistance, key concerns in the era of emerging infectious diseases. Moreover, the examination of COVID-19 comorbidities by Yousif et al. [63] underscores the complexity of the virus's impact, particularly in patients with pre-existing conditions, informing clinical approaches and patient care strategies.

Lastly, the investigation into the effect of COVID-19 vaccines on hair loss by Yousif and colleagues [64] touches upon lesser-known side effects of the pandemic and its mitigation strategies, highlighting the need for ongoing monitoring and research even as the acute phase of the pandemic subsides.

Conflicts of Interest: The author declare no competing interests.

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