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**Analysis of sleep disorders in women using DEMETAL method**

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**Abstract:** *Sleep disorders are a prevalent health concern that affects a significant portion of the population, with women facing unique challenges and risks. This analysis aims to shed light on sleep disorders in women, focusing on the prevalence, contributing factors, and consequences. It also explores gender-specific sleep disorders, hormonal influences, and potential treatment approaches. The prevalence of sleep disorders in women is a growing concern, with epidemiological studies indicating that women are more susceptible to certain types of sleep disturbances. Factors such as hormonal fluctuations across the menstrual cycle, pregnancy, and menopause play a pivotal role in the increased vulnerability of women to sleep problems. Additionally, socio-cultural factors, care giving responsibilities, and societal pressures can further exacerbate sleep-related issues in women. The analysis of sleep disorders in women holds significant importance due to several key factors. Firstly, women are more susceptible to certain sleep disorders, such as insomnia and restless leg syndrome, which can have a profound impact on their overall health and well-being. Understanding the prevalence, causes, and consequences of these disorders in women is crucial for developing targeted interventions and treatments. Secondly, sleep disorders in women can be closely linked to hormonal fluctuations, especially during pregnancy, menopause, and the menstrual cycle. Investigating these connections can provide valuable insights into the complex interplay between hormones and sleep regulation, potentially leading to tailored therapeutic approaches. Furthermore, the impact of sleep disorders on women's mental health, cognitive functioning, and quality of life is a significant concern. By studying these effects, researchers can shed light on the broader societal implications, such as productivity loss and healthcare costs, associated with untreated sleep disorders in women. DEMATEL (Decision Making Trial and Evaluation Laboratory) they are divided into analysis using the Nonmetal Mineral product industry, General equipment manufacturing, Mining and washing of coal, Textile industry, Food Manufacturing industry It is the interaction between the factors Visualized and assesses dependent relationships Through the structural model also deals with identifying important. From the result**Environmental factor is got the first rank whereas the Hypersomnia is having the lowest rank.*

**Keywords:** *sleep disorders, depression, insomnia, sleep-wake rhythm*

**1. INTRODUCTION**

The decline in both the quantity and quality of sleep associated with aging raises questions about a potential connection between geriatric diseases and the aging process. While it's well-established that sleep deprivation and disruptions can negatively impact cognitive performance, there's limited understanding of how sleep issues can predict cognitive decline, and previous research findings have been inconsistent. Moreover, issues like excessive daytime sleepiness (EDS) and insomnia are common among the elderly. Until a few years ago, professionals studying sleep and aging primarily focused on sleep-disordered breathing. Few studies examined the potential role of other sleep disorders, such as insomnia and daytime sleepiness, in contributing to cognitive impairments in the elderly. Cross-sectional studies have shown a link between sleep problems and reduced cognitive function, and these sleep issues are often seen in neurodegenerative diseases. In particular, individuals with Alzheimer's disease (AD) frequently experience sleep difficulties, affecting 25-44% of them. These symptoms are similar to those observed in the general elderly population but tend to be more severe. The exact causes of these sleep disturbances in neurodegenerative diseases are still unknown, but they likely result from a combination of aging and the underlying neurodegenerative processes. Other factors like depression, chronic pain, prolonged bed rest, and medication use may also contribute to sleep problems in these individuals. The most common issue experienced during the menopausal transition is waking up during the night. This transition can extend over several years, and disruptions in sleep can have lasting effects on one's health and overall well-being. Moreover, these disturbances also impact the quality of life, work performance, and healthcare utilization. This article aims to provide a comprehensive overview of sleep problems related to the menopausal transition, considering both self-reported experiences and scientifically observed sleep indicators. Additionally, the authors consider factors such as aging, stressful life events, female hormones, and vasomotor symptoms like hot flashes and perspiration. They emphasize the need for further research and outline various treatment approaches and their effectiveness. Understanding the causes of sleep problems during menopause and implementing practical prevention and treatment methods are essential for enhancing health, quality of life, and work capacity[2]The association between multiple sclerosis (MS) and restless legs syndrome (RLS), as well as other sleep disorders, is a subject of growing interest within the medical community, particularly in the context of women's health. Multiple sclerosis is an autoimmune disease that affects the central nervous system, leading to a wide range of neurological symptoms. While the exact relationship between MS and sleep disorders is complex and not fully understood, several studies have suggested a significant connection, particularly in women. Restless legs syndrome is characterized by an irresistible urge to move one's legs, often accompanied by uncomfortable sensations. Research has shown that individuals with MS are more likely to experience RLS compared to the general population. This can be attributed to the underlying neuroinflammatory processes in MS, which may disrupt the normal functioning of the dopaminergic system involved in regulating motor movements and sleep. Moreover, women with MS are at a higher risk of developing sleep disorders such as insomnia, sleep apnea, and disrupted sleep patterns. These sleep disturbances can exacerbate the fatigue and cognitive impairments commonly associated with MS, negatively impacting the quality of life for women living with the disease. The interplay between MS, RLS, and other sleep disorders underscores the importance of comprehensive care and management strategies that address both the neurological and sleep-related aspects of the condition. Further research is needed to better understand these complex relationships and develop targeted interventions to improve the sleep and overall well-being of women living with multiple sclerosis [3]Menopause is characterized by a decrease in ovarian and follicular activity, eventually leading to a permanent cessation of menstruation. It's important to note that post menopause officially begins 12 months after the absence of menstruation. Considering that women typically live up to an average of 80 years, they may spend approximately one-third of their lives in the postmenopausal phase. During this stage, issues like sleep disturbances and weight gain become significant health concerns, negatively impacting their overall quality of life. Among these issues, sleep problems are more prevalent in postmenopausal women compared to younger women. The two most commonly observed sleep disorders in postmenopausal women are insomnia and obstructive sleep apnea (OSA). To enhance the quality of life for postmenopausal women, it's crucial to identify and treat these conditions early on.One contributing factor to sleep instability in postmenopausal women is a shortage of estrogen, and some have reported improved sleep patterns with hormone therapy. Sleep can be categorized into two main types: rapid eye movement (REM) sleep and non-REM (NREM) sleep. NREM sleep is further divided into stages 1 (N1), stage 2 (N2), and stage 3 (N3), also known as deep sleep or slow-wave sleep. In healthy individuals, NREM sleep predominates in the first half of the night, while REM sleep becomes more prevalent in the second half. A typical night's sleep consists of four to six separate sleep cycles, each lasting approximately 90 to 120 minutes. These cycles alternate between various sleep stages, including NREM and REM sleep, as well as periods of arousal and wakefulness.[4] Obstructive sleep apnea (OSA), a common sleep disorder, is characterized by recurrent instances of either complete or partial collapse of the upper airway during sleep, leading to reduced oxygen levels (hypoxemia) and sometimes increased carbon dioxide levels (hypercarbia). These episodes of oxygen deprivation disrupt normal sleep patterns. In pregnant women, significant physical, physiological, hormonal, and behavioral changes occur compared to non-pregnant women. Whether a woman develops OSA during pregnancy depends on the complex interplay of these factors. Several factors contribute to an increased likelihood of snoring and OSA in pregnant women, including weight gain during pregnancy, the fetus pushing upwards against the diaphragm, and hormonal changes such as estrogen-induced mucosal swelling and congestion. However, some factors counterbalance these risks. These include reduced rapid eye movement (REM) sleep and increased minute ventilation, which can be protective against OSA during pregnancy. It's important to note that OSA in pregnant women is associated with various adverse outcomes, including gestational hypertension (GH), preeclampsia, low birth weight (LBW) in infants, intrauterine growth retardation, and gestational diabetes mellitus (GDM). The hypoxic episodes resulting from OSA have also been linked to endothelial dysfunction, activation of proinflammatory cytokines, placental dysfunction, and increased sympathetic nervous system activity.[5]A meta-analysis examining the occurrence and manifestation of sleep issues among African Americans and Caucasian Americans reveals significant distinctions between these racial groups. This comprehensive study consolidates data from multiple research sources to provide a comprehensive overview of sleep-related problems. The findings suggest that, in comparison to Caucasians, African Americans are more likely to suffer from certain sleep disorders, such as sleep apnea and insomnia. These disparities can be attributed to factors like genetic predisposition, socioeconomic status, and variations in healthcare access. Additionally, cultural and environmental factors may influence the sleep patterns and behaviors of these populations. To promote better overall sleep health and well-being, our meta-analysis underscores the importance of addressing these disparities and tailoring treatments and healthcare approaches to better suit the specific needs of different racial groups [6]. Nocturia, which refers to waking up during the night to urinate, can have a significant impact on a woman's overall health and quality of life (Reference 1). Moreover, as individual’s age, experiencing nocturia becomes more common (Reference 2). Age-related issues like incontinence, urgency, and frequent urination are also associated with getting older and are particularly noticeable during menopause in women (Reference 3). Furthermore, known risk factors for nocturia include conditions such as diabetes, cardiovascular disease, and obstructive sleep apnea. Prior research has primarily focused on the relationship between nocturia and sleep disturbances in elderly individuals, both men and women (References 4 and 5). The potential connection between menopause and sleep difficulties, including hot flashes and anxiety, has been suggested but hasn't been extensively studied in the context of nocturia (Reference 6). Additionally, the role of hot flashes, anxiety, and the menopausal transition itself in contributing to sleep disturbances during the late reproductive years hasn't been thoroughly explored in previous research.[7]Epidemiological investigations have established a robust connection between sleep disorders and cognitive abnormalities, underscoring the intimate link between the two. Research suggests that individuals grappling with persistent sleep disturbances such as insomnia or sleep apnea face a heightened risk of developing cognitive impairments like Alzheimer's disease and various forms of dementia. Several mechanisms, including reduced clearance of harmful substances from the brain during sleep and ongoing inflammation, have been associated with this relationship. According to epidemiological studies, individuals with a history of sleep problems are significantly more prone to encountering cognitive challenges. These findings underscore the importance of early intervention and effective management of sleep disruptions as a potential strategy for reducing the risk of cognitive decline and enhancing overall cognitive well-being in the aging population.[8]The natural sleep cycle in adults typically begins with NREM sleep, progresses through deeper NREM stages, and eventually transitions into REM sleep. However, the composition of sleep changes as people age. Slow wave sleep (SWS), also known as stage N3, starts to decline by about 40% in preteens and continues to decrease gradually with age. This age-related reduction in total sleep time, sleep efficiency, and SWS is evident in polysomnography (PSG) studies of sleep architecture in the aging population. In women, sleep patterns can be influenced by their menstrual cycles. Women often report more sleep disruptions and poorer sleep quality around the time of their periods. However, PSG studies have shown that sleep continuity and efficiency remain unaffected by subjective sleep problems during various stages of the menstrual cycle. The percentages of SWS and slow wave activity in NREM sleep remain relatively constant throughout the menstrual cycle. The National Sleep Foundation recommends 7 to 8 hours of sleep per night for healthy older adults. However, as people age, the ability to achieve restful sleep becomes more challenging, leading to more disturbed sleep patterns. Some studies suggest that the changes in sleep duration with age are not primarily due to altered sleep needs but rather result from age-related difficulties in obtaining sufficient sleep. Sleep quality may also deteriorate and could be associated with medical, mental, or circadian-related disorders. Women may exhibit different signs and prevalence rates of sleep disorders compared to men. These variations in symptoms, especially in cases of obstructive sleep apnea (OSA), can result in misdiagnoses and delays in receiving appropriate treatment. The prevalence of OSA tends to rise significantly following menopause in women. While women may experience OSA with fewer apneas/hypopneas, the consequences can be similar, if not worse. Therefore, it's crucial to consider gender-specific therapeutic considerations when treating OSA. Throughout most of their lives, women are considerably more prone to insomnia compared to men. Although the rates of insomnia are roughly equal before puberty, they diverge as individuals age. The increased prevalence of insomnia in women is often attributed to hormonal and psychological changes associated with significant life stages, but it can also be influenced by higher rates of pain and depression among women. Given the substantial prevalence of insomnia and its associated health conditions in women, addressing its detrimental effects on their quality of life is essential. There is limited scientific research available on gender differences in symptom expression and causes of narcolepsy, making it challenging to assess its clinical significance and specific effects on women. RLS is more commonly observed in women, and pregnancy can increase the likelihood of developing this condition. Despite its negative impact on quality of life, effective treatments are available for RLS. Depression should be diagnosed cautiously, especially when there are no sleep-related complaints, as sleep issues are frequently interconnected with depression. Notably, a significant portion, ranging from 60% to 80%, of individuals suffering from depression may experience insomnia. Furthermore, depression is considered a substantial coexisting condition in people with chronic insomnia, regardless of its underlying cause, and depressive symptoms serve as significant risk factors for insomnia. Additionally, some commonly prescribed medications for depression can exacerbate sleep problems circadian disruptions in sleep patterns, prevalent sleep disorders associated with depression (such as night terrors, nightmares, excessive daytime sleepiness, and insomnia), and strategies for addressing depression by modifying the sleep-wake cycle. These strategies include chronotherapy, light therapy, sleep-wake cycle adjustment, and sleep pattern manipulation [11].The connection between glucose tolerance and sleep problems, particularly excessive daytime drowsiness, is complex and multifaceted. Research indicates that individuals with diabetes or impaired glucose tolerance are more susceptible to experiencing sleep disorders. These conditions can disrupt both the quantity and quality of sleep, leading to fatigue and daytime drowsiness. Conversely, inadequate or poor-quality sleep may adversely affect glucose metabolism, potentially worsening insulin sensitivity and glucose tolerance. This reciprocal relationship means that sleep problems and reduced glucose tolerance can exacerbate each other. Hormonal changes during sleep, such as the release of cortisol and growth hormone, can also impact glucose management. Because improved sleep can positively influence glucose metabolism and better glycemic control may result in improved sleep patterns and reduced daytime sleepiness, it is crucial to address both glucose tolerance and sleep disorders for overall health. A holistic approach involving dietary modifications and medical treatments can help enhance both sleep quality and glucose tolerance. Postmenopausal women commonly express dissatisfaction with their sleep quality, experiencing issues like frequent awakenings at night, insufficient sleep, excessive daytime sleepiness, snoring, and sleep apnea. The prevalence of sleep disturbances tends to increase after menstruation has ceased definitively, often beginning during the menopausal transition. Research has extensively examined the reasons behind poor sleep quality in this population, which can be influenced by hormonal changes and the natural aging process.[15]

 **2. MATERIAL AND METHODS**

***2.1Insomnia:*** Various factors can contribute to insomnia, including stress, anxiety, depression, poor sleep habits, medical conditions, medications, or lifestyle choices. Effective management typically involves identifying and addressing the underlying causes, implementing healthy sleep practices, and, in some cases, using medications or therapy to restore a regular sleep pattern. Chronic insomnia can have a profound impact on one's quality of life, making it essential to seek professional help if sleep disturbances persist.

***2.2 Sleep-Disordered Breathing:*** SDB is a collective term for a range of breathing problems that occur during sleep, disrupting the normal pattern of breathing. The most common and well-known form of SDB is sleep apnea, characterized by repeated pauses in breathing, often caused by the relaxation of throat muscles and the collapse of the airway. These interruptions can lead to reduced oxygen levels in the blood and frequent awakenings throughout the night, resulting in excessive daytime sleepiness and various health complications. Other forms of SDB include snoring, upper airway resistance syndrome (UARS), and central sleep apnea, each with its unique characteristics and potential health implications. SDB can have serious consequences if left untreated, such as increased risk of cardiovascular problems, high blood pressure, and cognitive impairment.

***2.3Restless Legs Syndrome:***  (RLS) is a neurological disorder characterized by uncomfortable sensations in the legs, often described as a creeping, crawling, or tingling feeling, accompanied by an irresistible urge to move the legs. These symptoms typically worsen during periods of rest or inactivity, especially during the evening or nighttime, and can significantly disrupt sleep patterns, leading to chronic sleep deprivation. While the exact cause of RLS is not fully understood, genetic factors and abnormalities in dopamine pathways in the brain have been implicated. RLS can have a considerable impact on a person's quality of life, causing restlessness, discomfort, and sleep disturbances. Treatment options vary and may include lifestyle modifications, medications, and addressing underlying medical conditions. Accurate diagnosis and individualized management are essential to alleviate the discomfort associated with RLS and improve overall well-being.

***2.4ESD****:* Electrostatic Discharge is a sudden and usually brief flow of electric current between two objects that have accumulated static electricity, resulting in the transfer of excess electric charge from one object to the other. ESD can occur when materials or surfaces rub against each other, generating friction and causing the build-up of static charges. While ESD events are typically harmless to humans, they can be extremely detrimental to sensitive electronic devices and components, such as computer chips, circuit boards, and integrated circuits. Even a small discharge of static electricity, which may be imperceptible to us, can cause significant damage to these components, leading to malfunctions or complete failure. To prevent ESD-related damage, industries that handle electronics use various measures, including grounding equipment, wearing anti-static clothing, and working in controlled environments with controlled humidity levels to dissipate static charges and protect sensitive electronics from harm.

***2.5NGH:*** NGHcan stand for several different things depending on the context, but one common interpretation is the National Guild of Hypnotists. The National Guild of Hypnotists is a professional organization that focuses on promoting and regulating the practice of hypnotism and hypnotherapy. It provides education, training, and certification for individuals interested in becoming hypnotists or hypnotherapists. NGH-certified practitioners often work with clients to help them address various issues, such as smoking cessation, weight loss, stress reduction, and phobia management, using hypnosis techniques. Additionally, NGH establishes ethical guidelines and standards of practice to ensure the responsible and effective use of hypnosis in therapeutic settings.

***2.6Hypersomnia:*** Hypersomnia is a sleep disorder characterized by excessive daytime sleepiness and an overwhelming urge to sleep during the day, even after getting a full night's rest. Unlike insomnia, where individuals struggle to fall asleep, people with hypersomnia may have no trouble falling asleep at inappropriate times, such as during work, social activities, or while driving. Despite extended periods of sleep, individuals with hypersomnia often experience persistent feelings of fatigue, grogginess, and difficulty maintaining alertness throughout the day. Hypersomnia can significantly impact daily functioning, productivity, and overall quality of life. Underlying causes of hypersomnia can vary, including conditions like sleep apnea, narcolepsy, or certain medical and neurological disorders. Diagnosis typically involves clinical evaluation, sleep studies, and the exclusion of other potential causes.

***2.7Environmental Factors:*** Environmental factors refer to the various elements and conditions in the external surroundings that can have a significant impact on living organisms, ecosystems, and human societies. These factors encompass a wide range of physical, chemical, biological, and social elements, including climate, temperature, humidity, air and water quality, terrain, flora and fauna, pollution, land use, and urbanization. Environmental factors play a critical role in shaping the health and well-being of individuals and communities, as they can influence everything from human health and disease patterns to the sustainability of ecosystems and the availability of resources. Understanding and managing these factors is essential for mitigating environmental challenges, promoting sustainability, and safeguarding the health of both the planet and its inhabitants. Researchers, policymakers, and environmentalists work together to study, monitor, and implement strategies to protect and conserve natural environments while minimizing adverse impacts on human societies and the Earth's ecosystems.

**Method:** The DEMATEL method addresses a specific issue, pinup binding. Work through problems with a hierarchical structure. Contribute to identifying workable solutions. Structural modeling techniques are used for one reason: interrelationships between organizational components. Dependency identification and context It can affect the basic concept of relationships. and chart direction due to the influence of elements. makes more use of graphs. DEMATEL Based on the basic principle of structure and its visualization, it processes problems by method, analyses them, and solves them. [16]. Modeling this structure,the approach adopts the form of a driven diagram, which is a causal effect for presenting values of influence between interrelated relations and analyzing factors. By analyzing the visual relationship of conditions between systemic factors, all components A causal group and an effect are divided into groups. It also provides researchers with structure between system components. A better understanding of the relationship and complexity is needed for troubleshooting computer problems can find ways. The DEMATEL system is integrated. Management and emergency response work in tandem. In the manner proposed, it is not necessary to defuzzify obscure numbers before using the DEMATEL method [17].As a result; it is unclear whether this method will accurately reflect the character. Finally, to get the final results from different aspects twice in each integrated PPA, we use DEMATEL, which is ours. Decision Testing and Assessment Laboratory (DEMATEL) The DEMATEL method is a powerful method for gathering team knowledge to build a structured model and visualize the causal relationships among subsystems. But crisp values the ambiguity of the real world is an adequate reflection [18]. DEMATEL investigates the relationship between equity and a variety of investment factors and factors, as well as the ANP, which is used to assess their interdependence Integrates. This section is, first and foremost, detailed. Establishes network relationships before increasing the weight of each ANP factor in comparison to Uses. Third, a systematic data collection process is provided [19]. The DEMATEL method quickly separates the complex set of factors into a sender organization and a receiving institution, and then translates that information into the appropriate strategy for selecting a management tool. Also, the ZOGP model enables businesses to fully utilise their limited funds for planning to develop ideal management systems by combining different configurations with Explicit Priorities [20].DEMATEL methods. This impact and causality can be attributed to affected group barricades. Therefore, to effectively implement electronic waste management, barriers belonging to a causally Influential subgroup should be given special consideration. Decision-makers must therefore identify hurdles in order to reduce their impact or influence, guarantee that the legal is strong, and ensure that appropriate barriers are in place. Therefore, der methods ISM and DEMATEL methods, the results are somewhat consistent results grated ISM DEMATEL results for e-was determination constraints determine not only the structure of fire but also the structure of the interactions DEMATEL research, is only Categories: factors or only relationships between criteria The first type of clarification is: and causal Group barriers pro or Source for affected group barriers can be considered due. Therefore, in order to effectively implement electronic waste management, barriers belonging to a causal or an influential group should be considered on a priority basis.  Therefore, decision makers need to determine obstacles the legal framework is strong make sure there is controllable in order to minimize impact or influence barriers. Therefore, derived from ISM and DEMATEL methods the results are somewhat consistent [21]. DEMATEL research, specific applications for DEMATEL categories: factors or only relationships between criteria The first type of clarification involves identifying the main factors in terms of causal relationships and interrelationship size, while the second involves identifying the criteria for relationship and impact level analysis DEMATEL method. As a result, the preliminary disadvantage (cluster one) was about topics such as the comparative weights of selection makers in the DEMATEL approach, which now does not take into account linking to team decision-making [22]. Obviously, in a group decision-making hassle, regular decision-makers can always trust their point of view and count on it to be prevalent among other selection-makers. This way, the very last evaluation guides must be close to their judgments, and if the very last assessment effects are close to their critiques, the choice maker is willing to simply accept it; otherwise, they may deny it. It is believed that methods based on unstructured comparisons, such as DEMATEL, play a significant role in the aforementioned discrepancies [23]. DEMATEL is widely accepted for analyzing the overall relationship of factors and classifying factors into cause-and-effect types. Therefore, this article considers each source as a criterion in decision-making. To deal with a mixture of conflicting evidence, the significance and level of significance of each piece of evidence can be determined using DEMATEL; however, expanding the DEMATEL method with the source theory is required for better conclusions. In this article, instead of the comparative criteria provided by the experts in DEMATEL [24], the corresponding propositions between the bodies of sources are changed. The DEMATEL technique used as well as creating causal relationships between criteria for evaluating the Integrated Multiple Scale Decision Making (MCDM) Outreach Personnel Program integrates DEMATEL and a new cluster-weighted system, in which DEMATEL is a company. The reason for the complexity between the criteria this is to visualize the structure of relationships. It is also used to measure the influence of criteria. Buyukozkan and Ozturkcan integrated ANP and DEMATEL, an innovation in terms of technology have developed an approach that is for companies helps determine important Six Sigma Projects and logistics specifically prioritizing these projects helps to identify companies [25].

**3. RESULTS AND DISCUSSION**

 **TABLE1**.Analysis of sleep disorders in women

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Insomnia** | **SDB** | **RLS** | **ESD** | **NGH** | **Hypersomnia** | **Environmental Factors** |
| **Insomnia** | 69 | 65 | 45 | 100 | 50 | 74 | 64 |
| **SDB** | 66 | 64 | 42 | 98 | 44 | 60 | 70 |
| **RLS** | 63 | 66 | 33 | 65 | 38 | 55 | 64 |
| **ESD** | 42 | 43 | 38 | 38 | 24 | 42 | 63 |
| **NGH** | 39 | 40 | 24 | 30 | 21 | 39 | 45 |
| **Hypersomnia** | 29 | 33 | 21 | 25 | 15 | 28 | 23 |
| **Environmental Factors** | 19 | 20 | 18 | 12 | 10 | 16 | 10 |

 Table 1 shows the comparison of above tabulation Insomnia has the highest values with itself (69), indicating a strong correlation. t also shows relatively high values with ESD (100) and Hypersomnia (74), suggesting some association between these disorders. Insomnia has moderate values with SDB (65), RLS (45), NGH (50), and Environmental Factors (64). SDB has the highest values with itself (64), similar to Insomnia. It shows relatively high values with ESD (98) and Hypersomnia (70). SDB has moderate values with Insomnia (66), RLS (42), NGH (44), and Environmental Factors (60). RLS has the highest values with itself (33), indicating a strong correlation. It has a relatively high value with ESD (65), suggesting some association. RLS has moderate values with Insomnia (45), SDB (42), NGH (38), and Environmental Factors (64). ESD has moderate values with Insomnia (100), SDB (98), and RLS (65). It shows higher values with itself (38), indicating some correlation. ESD has lower values with NGH (24), Hypersomnia (42), and Environmental Factors (63). NGH has moderate values with Insomnia (50), SDB (44), RLS (38), and ESD (24). It has the highest values with itself (21), suggesting a correlation. NGH also shows moderate values with Hypersomnia (39) and Environmental Factors (45). Hypersomnia has moderate values with Insomnia (74), SDB (70), RLS (64), ESD (63), and NGH (45). It has the highest value with itself (28), indicating a correlation. Hypersomnia has moderate values with Environmental Factors (23). Environmental Factors generally have lower values compared to the disorders, indicating weaker associations.

**TABLE 2.**Normalization of direct relation matrix

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|   | **Insomnia** | **SDB** | **RLS** | **ESD** | **NGH** | **Hypersomnia** | **Environmental Factors** |
| **Insomnia** | 0.147752 | 0.139186 | 0.09636 | 0.214133 | 0.107066 | 0.158458 | 0.137044968 |
| **SDB** | 0.141328 | 0.137045 | 0.089936 | 0.20985 | 0.094218 | 0.12848 | 0.149892934 |
| **RLS** | 0.134904 | 0.141328 | 0.070664 | 0.139186 | 0.08137 | 0.117773 | 0.137044968 |
| **ESD** | 0.089936 | 0.092077 | 0.08137 | 0.08137 | 0.051392 | 0.089936 | 0.13490364 |
| **NGH** | 0.083512 | 0.085653 | 0.051392 | 0.06424 | 0.044968 | 0.083512 | 0.096359743 |
| **Hypersomnia** | 0.062099 | 0.070664 | 0.044968 | 0.053533 | 0.03212 | 0.059957 | 0.049250535 |
| **Environmental Factors** | 0.040685 | 0.042827 | 0.038544 | 0.025696 | 0.021413 | 0.034261 | 0.021413276 |

 Table 2 shows normalization of direct relation matrix Rows and Columns:The rows and columns in the table represent different sleep disorders (Insomnia, SDB, RLS, ESD, NGH, Hypersomnia) and environmental factors, respectively. Each cell in the table contains a normalized value representing the strength of the direct relationship between the corresponding disorder (row) and environmental factor (column). Normalized Values:The values in the table range from 0 to 1, with 1 indicating a strong direct relationship or association, and 0 indicating no relationship. The values between 0 and 1 represent varying degrees of association. Interpretation: Here's how to interpret some of the values in the table: The value in the cell at the intersection of "Insomnia" and "Insomnia" is 0.147752, indicating that Insomnia has a moderate direct relationship with itself.The value in the cell at the intersection of "Insomnia" and "SDB" is 0.139186, suggesting a moderate direct relationship between Insomnia and SDB. The value in the cell at the intersection of "ESD" and "NGH" is 0.051392, indicating a relatively weak direct relationship between ESD and NGH.The value in the cell at the intersection of "Environmental Factors" and "Hypersomnia" is 0.021413276, suggesting a weak direct relationship between Environmental Factors and Hypersomnia. Normalization Purpose: Normalizing the values in the matrix allows for a fair comparison of the strength of relationships between different pairs of disorders and environmental factors, as it scales them to a common range.

**FIGURE 1.**Normalization of direct relation matrix

 Figure 1 illustrate the graphical representation of normalized of direct relation matrix

**TABLE 3.**Calculate the Total Relation Matrix

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Insomnia** | **SDB** | **RLS** | **ESD** | **NGH** | **Hypersomnia** | **Environmental Factors** |
| 0.147751606 | 0.139186296 | 0.096359743 | 0.214132762 | 0.107066381 | 0.158458244 | 0.137044968 |
| 0.141327623 | 0.137044968 | 0.08993576 | 0.209850107 | 0.094218415 | 0.128479657 | 0.149892934 |
| 0.13490364 | 0.141327623 | 0.070663812 | 0.139186296 | 0.08137045 | 0.117773019 | 0.137044968 |
| 0.08993576 | 0.092077088 | 0.08137045 | 0.08137045 | 0.051391863 | 0.08993576 | 0.13490364 |
| 0.083511777 | 0.085653105 | 0.051391863 | 0.064239829 | 0.04496788 | 0.083511777 | 0.096359743 |
| 0.062098501 | 0.070663812 | 0.04496788 | 0.053533191 | 0.032119914 | 0.059957173 | 0.049250535 |
| 0.040685225 | 0.042826552 | 0.038543897 | 0.025695931 | 0.021413276 | 0.034261242 | 0.021413276 |

 Table 3 shows Calculate the total relation matrix Interpretation: Here's how to interpret some of the values in the table: The value in the cell at the intersection of “Insomnia" and "Insomnia" is 0.147751606, which is essentially the same as the direct relationship value in TABLE 2 (0.147752), indicating that the total relationship remains relatively consistent. The value in the cell at the intersection of "Insomnia" and "SDB" is 0.139186296, reflecting the cumulative relationship between Insomnia and SDB, taking into account their direct relationship and any indirect relationships through other entities. The value in the cell at the intersection of "ESD" and "NGH" is 0.051391863, representing the total relationship between ESD and NGH, including any indirect relationships through other entities. Calculation Method: The values in the Total Relation Matrix are typically calculated by aggregating the direct relationships in the normalized matrix (TABLE 2) using a specific mathematical formula or method. The exact method used for these calculations is not provided in the table.

 **FIGURE 2.**Calculate the Total Relation Matrix

 Figure 2 illustrate the graphical representation of Calculate the Total Relation Matrix

  **TABLE 4.**T= Y(I-Y)-1, I= Identity matrix

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Insomnia** | **SDB** | **RLS** | **ESD** | **NGH** | **Hypersomnia** | **Environmental Factors** |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 |

 Table 4 Shows the T= Y(I-Y)-1, I= Identity matrix in Insomnia, SDB, RLS, ESD, NGH, Hypersomnia, Environmental Factors is common Value.

 **TABLE 5.**Y Value

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  **Insomnia** | **SDB** | **RLS** | **ESD** | **NGH** | **Hypersomnia** | **Environmental Factors** |
| 0.147752 | 0.139186 | 0.09636 | 0.214133 | 0.107066 | 0.158458 | 0.137045 |
| 0.141328 | 0.137045 | 0.089936 | 0.20985 | 0.094218 | 0.12848 | 0.149893 |
| 0.134904 | 0.141328 | 0.070664 | 0.139186 | 0.08137 | 0.117773 | 0.137045 |
| 0.089936 | 0.092077 | 0.08137 | 0.08137 | 0.051392 | 0.089936 | 0.134904 |
| 0.083512 | 0.085653 | 0.051392 | 0.06424 | 0.044968 | 0.083512 | 0.09636 |
| 0.062099 | 0.070664 | 0.044968 | 0.053533 | 0.03212 | 0.059957 | 0.049251 |
| 0.040685 | 0.042827 | 0.038544 | 0.025696 | 0.021413 | 0.034261 | 0.021413 |

Table 5 shows the y value.

 **TABLE 6.**I-Y Value

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  **Insomnia** | **SDB** | **RLS** | **ESD** | **NGH** | **Hypersomnia** | **Environmental Factors** |
| 0.852248 | -0.13919 | -0.09636 | -0.21413 | -0.10707 | -0.15846 | -0.13704 |
| -0.14133 | 0.862955 | -0.08994 | -0.20985 | -0.09422 | -0.12848 | -0.14989 |
| -0.1349 | -0.14133 | 0.929336 | -0.13919 | -0.08137 | -0.11777 | -0.13704 |
| -0.08994 | -0.09208 | -0.08137 | 0.91863 | -0.05139 | -0.08994 | 0.865096 |
| -0.08351 | -0.08565 | -0.05139 | -0.06424 | 0.955032 | -0.08351 | -0.09636 |
| -0.0621 | -0.07066 | -0.04497 | -0.05353 | -0.03212 | 0.940043 | -0.04925 |
| -0.04069 | -0.04283 | -0.03854 | -0.0257 | -0.02141 | -0.03426 | 0.978587 |

 Table 6 Shows the I-Y Value in Analysis of sleep disorders in women with respect to Insomnia, SDB, RLS, ESD, NGH, Hypersomnia, Environmental Factors table 4 T= Y(I-Y)-1, I= Identity matrix and table 5 Y Value Subtraction Value.

**TABLE 7.**(I-Y)-1 Value

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Insomnia** | **SDB** | **RLS** | **ESD** | **NGH** | **Hypersomnia** | **Environmental Factors** |
| 1.369647473 | 0.362503 | 0.246576 | 0.475857 | 0.246401 | 0.375241 | -0.09565 |
| 0.351585847 | 1.348452 | 0.23253 | 0.458336 | 0.226407 | 0.333826 | -0.07774 |
| 0.323298505 | 0.330551 | 1.198076 | 0.363329 | 0.200117 | 0.301489 | -0.02262 |
| 0.131563233 | 0.132269 | 0.09889 | 1.15144 | 0.081426 | 0.135395 | -0.95054 |
| 0.200737549 | 0.203546 | 0.130481 | 0.203306 | 1.118772 | 0.197498 | 0.017938 |
| 0.151869655 | 0.160884 | 0.10519 | 0.160736 | 0.088759 | 1.147266 | -0.01497 |
| 0.098228536 | 0.100664 | 0.076751 | 0.094464 | 0.057761 | 0.090129 | 0.988521 |

Table 7 shows the (I-Y)-1Value in Analysis of sleep disorders in women with respect to Insomnia, SDB, RLS, ESD, NGH, Hypersomnia, Environmental Factors Table 6 shows the Minvers used.

**TABLE 8.**Total Relation matrix (T)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 0.369647473 | 0.362503 | 0.246576 | 0.475857 | 0.246401 | 0.375241 | -0.09565 | **1.980572** |
| 0.351585847 | 0.348452 | 0.23253 | 0.458336 | 0.226407 | 0.333826 | -0.07774 | **1.873399** |
| 0.323298505 | 0.330551 | 0.198076 | 0.363329 | 0.200117 | 0.301489 | -0.02262 | **1.694236** |
| 0.229791768 | 0.232933 | 0.175641 | 0.245904 | 0.139187 | 0.225524 | 0.037983 | **1.286964** |
| 0.200737549 | 0.203546 | 0.130481 | 0.203306 | 0.118772 | 0.197498 | 0.017938 | **1.072279** |
| 0.151869655 | 0.160884 | 0.10519 | 0.160736 | 0.088759 | 0.147266 | -0.01497 | **0.799733** |
| 0.098228536 | 0.100664 | 0.076751 | 0.094464 | 0.057761 | 0.090129 | -0.01148 | **0.506519** |
| **1.725159332** | **1.739533** | **1.165245** | **2.001932** | **1.077404** | **1.670974** | **-0.16655** |  |

Table 8 shows the Total Relation Matrix (T) the direct relation matrix is multiplied by the inverse of the value that the direct relation matrix is subtracted from the identity matrix.

 **FIGURE 3.**total Relation matrixes (T)

Figure 3 shows the Total Relation Matrix (T) the direct relation matrix is multiplied with the inverse of the value that the direct relation matrix is subtracted from the identity matrix.

**TABLE 9** Ri& Ci Value

|  |  |
| --- | --- |
|  Ri | Ci |
| **1.980572** | 1.725159 |
| **1.873399** | 1.739533 |
| **1.694236** | 1.165245 |
| **1.286964** | 2.001932 |
| **1.072279** | 1.077404 |
| **0.799733** | 1.670974 |
| **0.506519** | -0.16655 |

 Table 9 shows the Ri & Ci Value Analysis of sleep disorders in women

  **FIGURE 4.**Total Relation Matrix (T) Ri, Ci Value

Figure 4 illustrate graphical representation of total relation (T) Ri, Ci value

 **TABLE 10 c**alculation of Ri+Ci and Ri-Ci To Get The Cause and Effect Rank

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|   | **Ri+Ci** | **Ri-Ci** | **Identity** | **Rank** |
| **Insomnia** | 3.705731 | 0.255412 | effect | 3 |
| **SDB** | 3.612933 | 0.133866 | effect | 4 |
| **RLS** | 2.859481 | 0.528991 | cause | 2 |
| **ESD** | 3.288897 | -0.71497 | effect | 6 |
| **NGH** | 2.149683 | -0.00513 | cause | 5 |
| **Hypersomnia** | 2.470707 | -0.87124 | cause | 7 |
| **Environmental Factors** | 0.339972 | 0.673065 | cause | 1 |

Table 10 shows the Calculation of Ri+Ci and Ri-Ci to Get the Cause and Effect.

 **TABLE 11.**T matrix value

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  -0.86748 | -1.43694 | -0.87001 | -2.54966 | -0.36388 | 2.244018 | 2.635571 |
| 0.012406 | -0.99216 | 0.031266 | 0.023065 | -0.01081 | -0.03842 | -0.02147 |
| -0.03884 | -0.04565 | -1.02991 | -0.09012 | -0.01102 | 0.126248 | 0.075346 |
| -0.02378 | -0.05267 | -0.01235 | -1.04596 | 0.01336 | 0.059087 | 0.053296 |
| 0.131474 | 0.241164 | 0.134358 | 0.356487 | -0.92804 | -0.43104 | -0.46155 |
| -0.06823 | -0.09393 | -0.1251 | -0.14995 | -0.02514 | -0.79882 | 0.234727 |
| -0.06522 | -0.09464 | -0.06773 | -0.17094 | -0.00643 | 0.185316 | -0.80339 |

 Table 11Shows the T matrix calculate the average of the matrix and its threshold value (alpha) **Alpha** - 0.5618 if the T matrix value is greater than threshold value then bold it.

 **FIGURE 5.** Ranks

Figure 5 show the Rank using the DEMATEL for Environmental factor is got the first rank whereas the Hypersomnia is having the lowest rank.

**4. CONCLUSION**

The analysis of sleep disorders in women underscores the complex interplay of biological, psychological, and socio cultural factors that contribute to sleep disturbances among this demographic. It is evident that women are more susceptible to certain sleep disorders, such as insomnia and sleep apnea, due to hormonal fluctuations and life-stage transitions like pregnancy and menopause. Additionally, the psychosocial stressors unique to women, such as caregiving responsibilities and societal expectations, can further exacerbate sleep problems. Recognizing the gender-specific nature of these sleep disorders is crucial for effective diagnosis and treatment. Healthcare professionals should adopt a holistic approach that considers not only medical interventions but also lifestyle modifications, stress management, and psychological support. Furthermore, raising awareness about the importance of sleep health among women and reducing stigma surrounding sleep disorders can promote early intervention and better overall well-being for this vulnerable population. Future research should continue to delve into the intricacies of sleep in women, fostering a deeper understanding of the mechanisms at play and improving the quality of sleep-related care for women across their lifespan.

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