

Investigating Sleep Preparation, Sleep Participation, and Sleep Performance among Individuals with Spinal Cord Injuries: A Cross-sectional Study



By
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Statement of Authorship

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Dedication

Dedicated to my honorable and beloved parents, my research supervisors and respected all teachers at Bangladesh Health Professions Institute.

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List of Abbreviations

BHPI	Bangladesh Health Professions Institute
CBR	Community Based Rehabilitation
CRP	Centre for the Rehabilitation of the Paralyzed
IOC	Item-Objective Congruence
IRB	The Institutional Review Board
PSQI	Pittsburgh Sleep Quality Index
SCI	Spinal Cord Injury
SPPQ	Sleep Preparation, Participation, and Quality Questionnaires
SPSS	Statistical Package for the Social Sciences
SRRF-SCI	Sleep-related Risk Factor for Spinal Cord Injury

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Abstract

Background: It is essential to explore sleep patterns and factors affecting sleep quality in individuals with spinal cord injury, as they are more prone to sleep disturbances, yet there is a lack of research on this topic in Bangladesh, highlighting the need for studies to address this gap and provide insights for improving sleep outcomes in this population.

Aim: The study aims to compare sleep preparation, sleep participation, and sleep performance and related factors among individuals with spinal cord injuries in hospital and community settings.

Methods: The study employed a cross-sectional design, recruiting participants from both hospital and community settings, utilizing self-reported measures to assess the domain of sleep and related factors. Statistical analysis, including Spearman's correlation coefficient, was conducted to examine the relationships between these variables and identify any significant correlations.

Result: The overall sleep preparation practices among individuals with spinal cord injury were slightly higher in hospital settings ($M = 3.56$, $SD = 0.648$) compared to community settings ($M = 3.42$, $SD = 0.479$). Overall, sleep participation was higher among community participants ($M = 3.53$, $SD = 0.485$) compared to hospital participants ($M = 3.23$, $SD = 0.794$). Community participants ($M = 3.74$, $SD = 0.577$) demonstrated higher overall sleep quality compared to hospital participants ($M = 3.41$, $SD = 0.947$). The study highlights significant associations between sleep participation, sleep quality, and sleep preparation in hospital settings with more positive ratings in physical and psychological factors, while no significant correlations were found with environmental factors. Conversely, in a community setting, positive correlations were

observed between sleep participation and sleep preparation, as well as between physical and psychological factors, with environmental factors showing a moderate negative correlation.

Conclusion: The findings highlight the significance of addressing sleep-related challenges and considering the multifaceted impact of physical, psychological, and environmental factors on sleep quality for individuals with spinal cord injuries.

Keywords: Sleep quality, spinal cord injury, physical factors, psychological factors, environmental factors, sleep preparation, sleep participation.

CHAPTER I: INTRODUCTION

1.1: Background

Sleep is a fundamental aspect of human life, essential for maintaining physical health, cognitive function, and emotional well-being (Akbarfahimi et al., 2020). Adequate rest allows the body to repair tissues, strengthen the immune system, and support cognitive processes such as memory consolidation and problem-solving (Akbarfahimi et al., 2020). However, for individuals living with neurological conditions, such as spinal cord injuries (SCIs), achieving restorative sleep can be particularly challenging due to the unique circumstances associated with their condition.

Neurological conditions often disrupt the delicate balance of brain functions, underscoring the importance of sleep as a therapeutic mechanism (Bishir et al., 2020). Sleep is crucial for neural plasticity, supporting the brain's ability to adapt and reorganize in response to injury or disease (Bishir et al., 2020). Moreover, it plays a pivotal role in managing symptoms commonly associated with neurological disorders, including pain, spasticity, and fatigue (Bishir et al., 2020). Thus, understanding and addressing sleep-related challenges are paramount for enhancing the overall well-being and quality of life for individuals with SCIs. The impact of SCIs on sleep is multifaceted, influenced by both physical and psychological factors.

Active participation in sleep routines is equally vital for individuals with SCIs. Addressing bladder and bowel control issues, hydration, and pressure ulcer prevention are essential considerations to prevent nighttime disturbances and promote uninterrupted sleep (Kryger & Chehata, 2021). Assistive technology, such as adjustable beds and patient lifts, may also facilitate comfortable sleep positions and reduce the risk of pressure ulcers (Kryger & Chehata, 2021).

Moreover, the quality of sleep experienced by individuals with SCIs significantly impacts their overall health and well-being. Sleep disturbances, including pain, spasticity, and environmental factors, can disrupt sleep continuity and lead to adverse health outcomes (Genin et al., 2018). Psychological factors, such as stress, anxiety, and depression, further contribute to sleep disturbances among this population, highlighting the need for holistic interventions that address both physical and psychological aspects of sleep (Genin et al., 2018).

Occupational therapists play a crucial role in addressing sleep-related challenges and promoting overall well-being for individuals with SCIs (Ludwig et al., 2022). By understanding the intricate relationship between sleep and occupational performance, therapists can develop tailored interventions to improve sleep outcomes and enhance independence in daily activities (Ludwig et al., 2022). This study aims to investigate the sleep experiences of individuals with SCIs, contributing to evidence-based practices that ultimately improve health outcomes and quality of life for this population.

1.2: Justification of the study

Research on sleep in the context of spinal cord injuries is crucial for improving the daily lives of affected individuals. Adequate sleep is fundamental for managing challenges like mobility issues and pain, crucial for engagement in daily activities. By offering tailored interventions, this research can enhance sleep outcomes, leading to greater independence and well-being. It also benefits caregivers by alleviating their burden and contributes to more effective healthcare practices. In resource-constrained settings like Bangladesh, integrating sleep-focused interventions can lead to cost-effective care, ultimately improving healthcare efficiency and patient outcomes.

1.3: Operational Definition

Sleep Preparation: Sleep Preparation involves establishing conducive sleep patterns and routines, such as selecting preferred bedtime and wake-up times, and engaging in relaxing activities like grooming or meditation before sleep (A. Conti et al., 2021).

Sleep Participation: Sleep Participation entails meeting one's sleep needs through maintaining a consistent sleep schedule, addressing hydration and bathroom needs at night, and ensuring the comfort and safety of oneself and others in the sleeping environment (Tester & Foss, 2018b).

Sleep Performance: Sleep Performance refers to the quality and effectiveness of sleep, including factors like duration, depth, continuity, and the individual's level of alertness and refreshment upon waking up (Tester & Foss, 2018b).

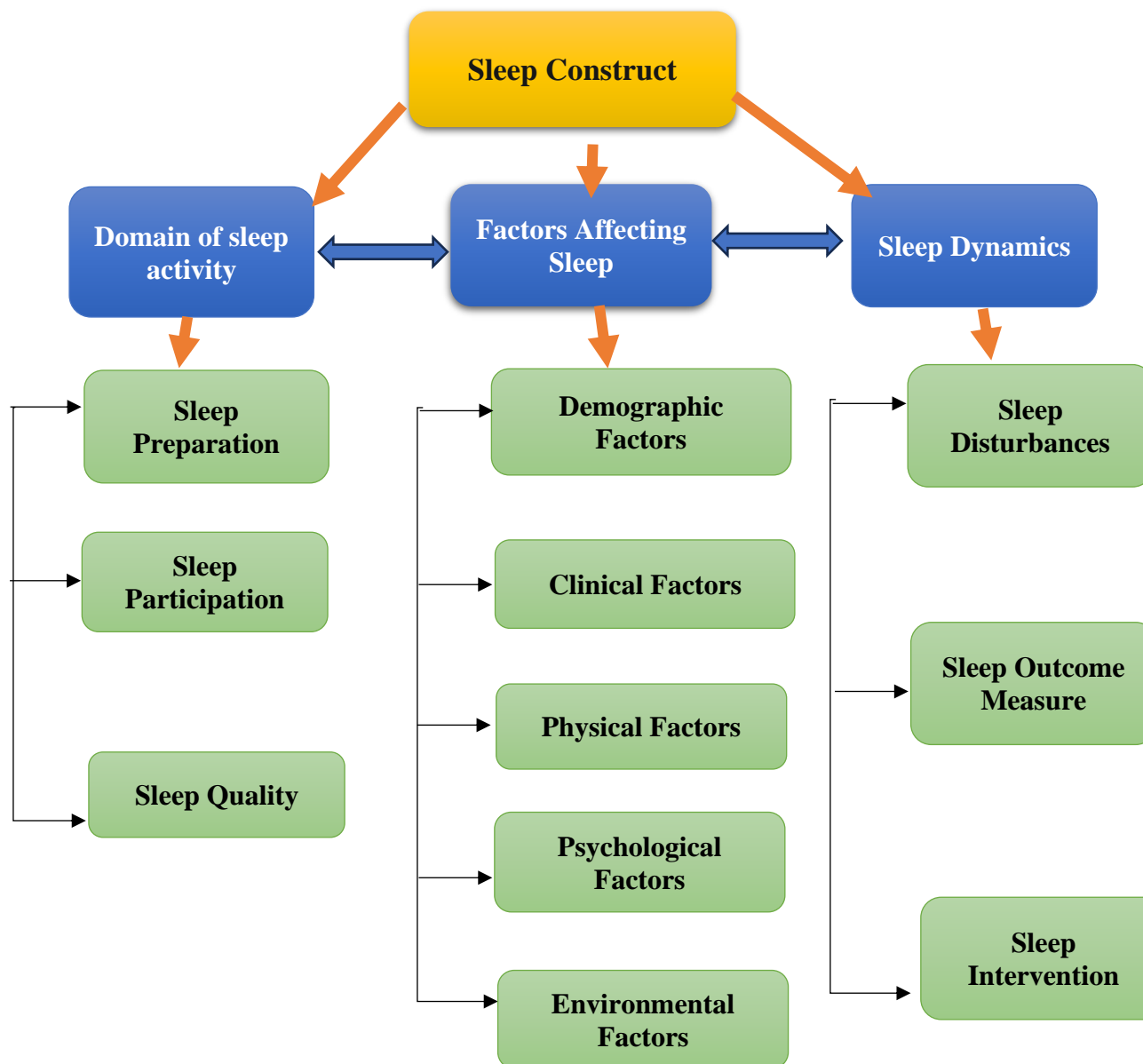
1.4: Aim of the study

The study aims to compare sleep preparation, sleep participation, and sleep performance and related factors among individuals with spinal cord injuries in hospital and community settings.

CHAPTER II: LITERATURE REVIEW

Figure 2.1

Overview of Literature Findings



2.1 Sleep

Sleep is a fundamental aspect of human physiology, characterized by altered consciousness, reduced sensory activity, and decreased interaction with the surrounding environment (Harding & Feldman, 2008). Physiological changes during sleep, such as

reduced muscle activity and altered brainwave patterns, facilitate rest, repair, and restoration of the body both physically and mentally (Koo & Kim, 2013; Harding & Feldman, 2008). Sleep serves various bodily functions, including memory consolidation, immune function, and emotional regulation, occurring in cycles encompassing different stages like rapid eye movement (REM) sleep and non-REM sleep (Giannoccaro et al., 2013; Harding & Feldman, 2008).

2.2 Domains of Sleep as Occupational Area

According to the American Occupational Therapy Association, sleep is a core occupational area, encompassing preparation, participation, and quality (Tester & Foss, 2018b). Sleep preparation involves establishing bedtime routines and creating a conducive sleep environment, signaling the body to transition from wakefulness to sleep (Tester & Foss, 2018b). Sleep participation entails actively engaging in sleep-related activities throughout the night, managing tasks independently (Tester & Foss, 2018b). Sleep quality reflects individuals' perceptions of sleep duration, continuity, and restfulness, influenced by various physiological, psychological, environmental, and behavioral factors (Tester & Foss, 2018b).

2.3 Factors Affecting Sleep

Demographic characteristics like age, gender, socioeconomic status, and cultural background significantly influence sleep patterns and quality (Tester & Foss, 2018b). Clinical factors, including spinal cord injury characteristics such as level and completeness, neurological level, and SCIM score, impact sleep through various mechanisms, including respiratory function and nighttime routines (Giannoccaro et al., 2013; Tester & Foss, 2018b). Physiological factors like chronic pain and medical conditions such as sleep apnea directly affect sleep patterns (Tester & Foss, 2018b). Psychological well-being, environmental influences, and lifestyle factors also play

crucial roles in shaping sleep quality (Tester & Foss, 2018b; Giannoccaro et al., 2013; Koo & Kim, 2013; Singh et al., 2014; Dzierzewski et al., 2021).

2.4 Sleep Disturbance in Spinal Cord Injury

Individuals with SCI face challenges in achieving restorative sleep due to factors like respiratory dysfunction, pain, and disruptions in circadian rhythms, leading to fragmented sleep and diminished quality of life (Giannoccaro et al., 2013; A. Conti et al., 2023). Untreated sleep disorders in SCI patients can result in serious health consequences like cardiovascular diseases and compromised immune function (Widerstrom-Noga et al., 2020).

2.5 Evidence-based Interventions Related to Sleep Quality

Interventions for improving sleep quality in individuals with SCI include assistive devices like the Dreampad pillow and traditional sleep aids, which have shown promise in reducing sleep disturbances (Tester & Foss, 2018b; Ho & Siu, 2018a). Mind-body activities such as meditation and yoga offer holistic approaches to enhancing sleep quality and alleviating depressive symptoms (A. Conti et al., 2023; Ho & Siu, 2018a).

2.6 Key Gaps

Key research gaps include the need for comprehensive studies exploring the relationship between sleep disturbances and SCI-related factors, as well as the scarcity of research examining the impact of physical, psychological, and environmental factors on sleep in individuals with SCI (Giannoccaro et al., 2013). Additionally, longitudinal studies assessing the long-term trajectory of sleep disturbances in SCI and research on effective interventions tailored to address sleep issues in this population are lacking (A. Conti et al., 2023). Moreover, there is a need for novel assessment tools for measuring sleep preparation, participation, and performance consistently across diverse populations (Tester & Foss, 2018b).

CHAPTER III: METHOD

3.1 Study Question, Aim, Objectives

3.1.1 Study question

How do sleep preparation, sleep participation, and sleep performance, including associated physical, psychological, and environmental factors, differ between individuals with spinal cord injuries in hospital versus community settings?

3.1.2 Aim

The study aims to compare sleep preparation, sleep participation, and sleep performance and related factors among individuals with spinal cord injuries in hospital and community settings.

3.1.3 Objectives

1. To examine and compare the socio-demographic, clinical, and sleep-related characteristics of participants in hospital and community settings.
2. To determine and compare the sleep preparation, sleep participation and sleep quality among individuals with spinal cord injuries in hospital and community settings.
3. To determine the extent of perceived physical, psychological, and environmental factors in hospital and community settings
4. To determine the correlations of physical, psychological, and environmental factors with various dimensions of sleep preparation, sleep participation, and sleep quality in hospital and community settings

3.2 Study Design

3.2.1 Study Methods

The quantitative approach was chosen for its ability to provide precise, measurable data

on sleep preparation, participation, and performance among individuals with spinal cord injuries, allowing for objective analysis and generalized conclusions. This methodological choice ensures statistical rigor, enabling evidence-based decision-making for tailored interventions and support strategies to enhance sleep quality and overall well-being in this population (Castillo-Escario et al., 2021).

3.2.2 Study Approach

A cross-sectional study design was well-suited for investigating sleep preparation, sleep participation, and sleep quality among individuals with spinal cord injuries due to its efficiency in providing a snapshot of the population's sleep-related factors at a specific point in time. Furthermore, cross-sectional studies can efficiently generate hypotheses and inform the development of targeted interventions and policies to address sleep-related challenges in this population (Setia, 2016).

3.3 Study Setting and Study Period

3.3.1 Study Setting

This study was conducted in two distinct settings to comprehensively examine the sleep experiences of individuals with spinal cord injuries. The primary clinical setting for data collection was the Center for the Rehabilitation of the Paralyzed (CRP), located in the Dhaka region, Bangladesh. CRP is a renowned healthcare institution specializing in the care and rehabilitation of individuals with SCIs.

The community setting for data collection was Savar Upozilla, a district located in the Dhaka Division of Bangladesh. Savar Upozilla encompasses a diverse community, including individuals with SCIs residing in various areas.

By conducting research in both the clinical setting of CRP Hospital and the community setting of Savar Upozilla, this study provided a comprehensive understanding of the sleep-related challenges and experiences of individuals with SCIs,

taking into account the unique dynamics of each setting.

3.3.2 Study Period

The total study period was between May 2023 to February 2024 and data collection period was 1st December 2023 to 20 February,2024.

3.4 Study Participants

3.4.1 Study Population

The study population includes all individuals with spinal cord injuries, regardless of their demographics. These individuals are the focus of the research on sleep experiences and quality in both hospital and community settings.

3.4.2 Sampling technique

The sampling method employed for this study was purposive sampling. Participants were selected from a large rehabilitation center specializing in the care of individuals with spinal cord injuries. This method was chosen because it allowed researchers to intentionally select participants who met specific criteria relevant to the study objectives, such as age, type of injury, and current residence.

The sampling method utilized for selecting participants from the community near the rehabilitation center was convenient sampling. This approach was chosen due to its ease of access to potential participants residing in the area of the rehabilitation center and who are members of a spinal cord injury association (Campbell et al., 2020; Carlson & Tyce, 2017).

3.4.3 Inclusion Criteria & Exclusion Criteria

3.4.4.1 Inclusion criteria

- Individuals with a confirmed diagnosis of spinal cord injury were included.
- Participants with varying levels of injury severity, including paraplegia and tetraplegia, were eligible.

- In the hospital setting, participants who were currently receiving medical care and rehabilitation services in a hospital or clinical facility were included.
- In the community setting, participants who resided in the community, including those who had completed their hospital-based rehabilitation and were living independently or with family and caregivers, were included.

3.4.4.2 Exclusion Criteria

- Individuals with severe cognitive impairments or neurological conditions that could significantly affect their ability to understand and respond to study questions were excluded.
- Participants who had communication barriers that prevented effective data collection, such as severe speech or language impairments, were excluded.
- Participants with severe comorbid medical conditions reported in medical notes that could independently affect sleep quality (e.g., severe untreated sleep disorders, advanced cancer, or end-stage organ failure) were excluded.
- Pregnant individuals were excluded from certain aspects of the study, such as sleep quality assessments that may have been influenced by pregnancy-related factors.
- Individuals with active substance abuse disorders (e.g., drug or alcohol addiction) that could significantly impact sleep patterns were excluded.

3.4.4: Sample Size

The sample size of the study is 153; 90 from hospital and 63 from community.

3.4.5 Participants overview

The target population of this study consisted of individuals aged 18 or older with spinal cord injuries residing either in hospitals or communities. When the study population is too vast or challenging to investigate thoroughly, researchers often define a target

population—a subset that is the focus.

3.5 Ethical Consideration

The research upheld strict principles of informed consent, ensuring participants fully understood and voluntarily agreed to participate. Privacy and confidentiality were safeguarded through anonymization and secure data storage. Beneficence prioritized participant well-being, minimizing harm and discomfort. Research integrity was maintained with accurate reporting and IRB approval. Cultural sensitivity was incorporated through language, validation, and training. Continuous monitoring ensured participant well-being, with prompt actions taken for adverse events. Findings were disseminated transparently to stakeholders, contributing to improved care for individuals with SCIs while respecting participants' rights and well-being.

3.5 Data Collection Process

3.5.1 Participant recruitment strategy

Participants were recruited from both the hospital and community using distinct approaches. For hospital recruitment, the process commenced by identifying patients' names and ward numbers from the hospital registry book with the assistance of staff. Subsequently, patients were invited to participate in the study, receiving an information sheet detailing the research. The information provided in the sheet was thoroughly explained to the patients, affording them the opportunity to decide whether they wished to participate or not.

For community recruitment, the process began with the identification of patients' names, addresses, and telephone numbers from the registry of former CRP patients, facilitated by the staff of the Community-Based Rehabilitation Department. Patients were then contacted via mobile phone and invited to participate in the study. Subsequently, the investigator met with potential participants during a conference

hosted by the Spinal Cord Injury Association. Following this interaction, the investigator provided them with an information sheet, and its contents were meticulously explained to the patients, allowing them to make an informed decision regarding participation. Individuals who expressed interest were finally recruited into the study.

3.6.2 Data Collections method

Data collection in the hospital setting involved face-to-face surveys administered using a self-developed linguistically validate questionnaire with socio-demographic information. To maintain participant privacy, interviews took place in a designated room within the hospital premises. The surveys were personally conducted by the student researcher, who explained the questionnaire to participants and collected responses in person. Similarly, for participants residing in the community, face-to-face interviews utilizing similar questionnaire were conducted in separate rooms to ensure privacy.

In both settings, participants were required to provide their signature on the consent form before the interview commenced, indicating their voluntary participation in the study. The questionnaire was then explained to the participants by the investigator, ensuring clarity and understanding. Subsequently, participants independently filled out the questionnaire, providing their responses to the survey items.

3.6.3 Data Collection Instruments

The Sleep Preparation, Participation, and Quality Questionnaire (SPPQ) and Sleep-related Risk Factor for Spinal Cord Injury (SRRF-SCI) was developed prior to data collection. This scale was constructed in line with the study objectives, drawing on insights from literature reviews and consultations with individuals with spinal cord

injuries. Subsequently, the SPPQ and SRRF-SCI underwent a rigorous process of translation and linguistic validation, following the methodology outlined by (Baten et al. (2013).

Table 3.6.1 Data Collection Instrument

Data Collection tools	Type of tools	Subscale	Items	Scoring	Interpretation
Sleep Preparation, participation, quality scale	Clinical Tool	Sleep preparation (15) Sleep participation (5) Sleep Quality (5)	25 items	1 to 5	Higher mean score indicates higher preparation, participation and high quality of sleep.
Sleep-related Risk Factor for spinal cord injury		Physical Risk Factors (08) Psychological Risk Factors (10) Environmental Risk Factors (7)	25 items	1 to 4	Higher mean indicates lower extent of risk factors

3.6.4: Field-test

The field test of the Sleep Preparation, Participation, and Quality Questionnaire for Spinal Cord Injury and Sleep-related Risk Factor for spinal cord injury involved administering the questionnaire to three participants selected from both hospital and

community settings based on study inclusion criteria. Participants completed the questionnaire independently, with researchers available for assistance. Throughout the field test, participants were asked about any difficulties they encountered in understanding the questionnaire, and researchers sought feedback on the clarity and comprehensibility of the wording and meaning of the questions.

3.7 Data Management and Analysis

3.7.1: Data Management

Data management encompassed several key steps to ensure the integrity, security, and accessibility of the collected data throughout the research process. Initially, data collection forms and instruments were designed and validated to gather pertinent information in a standardized manner. Once data collection commenced, all collected data were carefully recorded, organized, and stored in secure electronic databases, with appropriate backups implemented to prevent data loss.

Access to the data was restricted to authorized personnel only, and measures were in place to anonymize and de-identify participant information to maintain confidentiality and privacy. Additionally, data masking techniques were employed to safeguard sensitive data from unauthorized access or disclosure.

Regular data quality checks were conducted to identify and address any discrepancies, errors, or missing information promptly. Data cleaning procedures involved reviewing, validating, and correcting inconsistencies or inaccuracies in the dataset to ensure its accuracy and reliability. Finally, upon completion of the study, the data were securely archived for future reference and potential replication of the research findings.

3.7.2: Data Analysis

The data analysis involved both descriptive and inferential techniques. Descriptive

analysis aimed to summarize and characterize the dataset, including measures of central tendency (mean) and dispersion (standard deviation). Inferential analysis such as correlational analysis was employed to explore the strength and direction of relationships between variables. These analyses were conducted using Statistical Package for Social Science (SPSS) software, with the results interpreted to draw meaningful conclusions and insights related to the research objectives.

3.8 Quality Control and Assurance

3.8.1 Quality Control

- Reviewing, validating, and correcting inconsistencies or inaccuracies in the dataset is a quality control measure aimed at maintaining the accuracy and reliability of the data.
- Ensuring adherence to established research protocols and procedures throughout the data collection and analysis process is a quality control measure to maintain consistency and reliability.
- Employing data security measures, such as data masking techniques, to protect sensitive information from unauthorized access or disclosure, is part of quality control as it safeguards the integrity of the data.

3.8.2 Quality Assurance

- Ensuring participant information is anonymized and de-identified to maintain confidentiality and privacy falls under quality assurance, as it ensures adherence to ethical standards and participant confidentiality.
- Restricting access to data to authorized personnel only is a quality assurance measure to prevent unauthorized access and maintain data integrity and confidentiality.
- Adhering strictly to ethical guidelines and principles to safeguard participant

rights and welfare is a quality assurance measure to ensure ethical conduct throughout the research process.

- Maintaining transparency in data management processes and documenting all steps taken to ensure data integrity and reliability is a quality assurance measure to ensure accountability and transparency in the research process.

CHAPTER IV: RESULT

4.1 Demographic and clinical characteristics of the participants

Table 4.1.1 Demographic characteristics of the participants in hospital (n=90) and in community (n=63)

Variables		Hospital		Community	
		Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
Age (Years)	18-35	59	65.6	7	11.1
	36-74 years	31	34.4	44	69.8
		Mean±SD= 32.08±11.320		Mean±SD= 32.08±11.320	
Gender	Male	78	86.7	54	85.7
	Female	12	13.3	9	14.3
Number of family members	≥5 person	61	67.8	40	44.4
	<5 person	25	27.8	20	22.2
	11 to 15 persons	4	4.4	3	3.3
Educational status	Signature	15	16.7	3	4.8
	Primary level	35	38.9	21	33.3
	Secondary level	20	22.2	23	36.5
	Higher level	12	13.3	6	9.5
	Graduate	8	8.9	10	15.9
Marital status	Married	59	65.6	43	68.3
	Unmarried	31	34.4	20	31.7

Table 4.1.1 provides demographic information for two groups: patients in a hospital setting and individuals from the community. The demographic characteristics of

participants in the hospital and community groups exhibit notable differences across various parameters. In terms of age distribution, the hospital group primarily comprises individuals between 18-35 years old, whereas the community group has a higher proportion of participants aged 36-74 years. Despite this contrast, both groups share a similar mean age of approximately 32.08 years. Gender distribution shows a predominance of males in both settings, with little variation between the hospital and community groups. Family size varies more distinctly between the groups, with a majority of hospital participants having five or more family members, while the community group presents a more diverse distribution. Educationally, a significant portion of both groups has education up to the secondary level, although the distribution across educational levels differs. Marital status shows a similar pattern between the hospital and community groups, with a majority being married, albeit with a slightly higher percentage of unmarried individuals in the hospital setting. These demographic distinctions provide valuable insights into the composition of the studied populations and underscore the need for tailored approaches in addressing their specific needs and characteristics.

Table 4.1.2 *Clinical characteristics of the participants in hospital (n=90) and in community (n=63)*

Variables		Hospital	Community
		n (%)	n (%)
Level of Neurological Injury	<i>C2-C7</i>	41 (45.6)	31 (49.2)
	<i>T1-T12</i>	36 (40.0)	29 (46.0)
	<i>L1-L5</i>	13 (14.4)	3 (4.8)
Type of SCI	<i>Paraplegia</i>	49 (54.4)	49 (77.8)
	<i>Tetraplegia</i>	41 (45.6)	14 (22.2)
Presence of Secondary Complication	<i>Absence</i>	66 (73.3)	55 (87.3)
	<i>Pressure sore</i>	24 (26.7)	8 (12.7)
SCIM Scores	<i>0 -30 scores</i>	90 (100)	14 (22.2)
	<i>31 -60 scores</i>	0 (0)	49 (77.8)
Bed transferring	<i>Able</i>	38 (42.2)	45 (71.4)
	<i>Unable</i>	52 (57.8)	18 (28.6)
Adaptive Equipment Use	<i>No</i>	29 (32.2)	5 (7.9)
	<i>Wheelchair</i>	58 (64.4)	56 (88.9)
	<i>crutch</i>	3 (3.3)	2 (3.2)

Table 4.1.2 shows that, the majority of injuries were at the cervical and thoracic levels. Paraplegia was more common in the community group 77.8% and in hospital 54.4%, while tetraplegia was more evenly distributed between hospital and community groups. 26.7% participants in hospital setting were present pressure sore and 12.7% participants in the community were present pressure sore. In hospital setting participants SCIM score were 0 to 30 for all but in community participants 77.8% SCIM score were 31 to 60.

4.2 Sleep Preparation, Sleep Participation, Sleep Quality of Individual with Spinal Cord Injury

Table 4.2.1 *Sleep preparation practices of individual with spinal cord injury in hospital (n=90) and community (n=63).*

Sleep Preparation practices	Mean±SD	
	Hospital	Community
I have a preferred bedtime and wake-up time.	4.08±1.09	4.03±1.01
I incorporate sleep hygiene activities in my sleep routine	2.81±1.57	2.97±1.28
Before going to bed, using catheter is mandatory.	3.91±1.14	4.14±.840
I wear loose-fitting clothing before going to sleep.	3.14±1.59	2.87±1.25
I make sure my mattress is in good condition for restful night sleep.	3.50±1.23	3.22±.924
I prefer my bed clean and tidy.	3.53±1.24	3.32±1.11
Preparing a bed net to avoid mosquito bites is imperative for me.	4.14±1.41	4.33±1.16
Safety precaution is a part of my regular routine before sleeping.	3.18±1.49	3.27±1.29
Medication for general health well-being is a part of my routine.	3.81±1.49	3.05±1.75
I engage in e.g., mindful exercise, yoga, and reading before going to sleep.	2.54±1.58	2.02±1.46
Dark bedroom and quite environment is imperative before I sleep.	3.73±1.21	3.95±1.22
I finish having heavy meal at least 2 hours before to bedtime.	4.31±1.09	4.46±.820
I avoid caffeine, nicotine, betel leaf.	3.71±1.70	3.97±1.39
I stay adequately hydrated throughout the day, but I limit intake before bedtime.	3.52±1.32	3.19±1.21
Avoid using electronic devices at least 30 minutes before to bedtime.	3.53±1.52	2.56±1.36
Overall sleep preparation practices	3.56±.648	3.42±.479

The table 4.2.1 provides insight into the sleep preparation practices of individuals with spinal cord injuries in both hospital and community settings. Mean scores (\pm standard deviation) are used to indicate the extent to which various practices are incorporated into their sleep routines.

Firstly, it's evident that both hospital and community participants prioritize certain fundamental aspects of sleep hygiene. They emphasize the importance of setting preferred bedtime and wake-up times, indicating a commitment to maintaining a consistent sleep schedule, which is crucial for regulating sleep-wake cycles and promoting restful sleep. Additionally, participants in both settings show a moderate commitment to incorporating sleep hygiene activities into their routines. While these activities might vary, the overall trend suggests an awareness of the importance of practices like maintaining a clean and tidy bed, ensuring mattress quality, and taking safety precautions before sleep.

Certain differences emerge between hospital and community participants in specific sleep preparation practices. For example, hospital participants report a higher emphasis on wearing loose-fitting clothing before sleep. On the other hand, community participants appear to prioritize preparing a bed net to avoid mosquito bites and for preferring a dark and quiet sleep environment.

Hospital participants report a higher mean score for incorporating medication for general health well-being into their routine, suggesting a stronger emphasis on medical management within clinical settings. Community participants, however, show a higher commitment to certain lifestyle factors. They report higher mean scores for avoiding stimulants like caffeine and nicotine before bedtime, as well as for limiting electronic device use in the period leading up to sleep.

Table 4.2.2 *Sleep participation among hospital (n=90) and community (n=63) participants*

Sleep participations	Mean±SD	
	Hospital	Community
I maintain a regular sleep schedule.	3.34±1.32	3.60±.834
I find it easy to fall asleep and stay asleep throughout the night without any sleep medication.	3.67±1.16	3.75±.915
I attend to toilet needs and hydration needs at night	3.19±.993	3.54±.800
I negotiate bedtime routines that work for everyone in my household.	2.93±.872	3.35±.722
I ensure the comfort and safety of fellow sleepers in my household	3.04±.993	3.43±.734
Overall sleep participation	3.23±.794	3.53±.485

The table 4.2.2 presents data on sleep participation among hospital and community participants with spinal cord injuries, showing mean scores (\pm standard deviation) for various aspects of their sleep behaviors. Analyzing these findings provides insights into the differences and similarities in sleep participation between the two groups.

Firstly, both hospital and community participants express a commitment to maintaining a regular sleep schedule, with community participants reporting a slightly higher mean score. This suggests that individuals with SCI in both settings recognize the importance of consistency in sleep patterns for overall sleep quality and well-being.

Secondly, participants from both groups indicate a similar level of ease in falling asleep and staying asleep throughout the night without the need for sleep medication. This finding highlights a degree of self-regulation in sleep among individuals with SCI,

regardless of their living environment. When it comes to attending to toilet needs and hydration at night, community participants report a higher mean score compared to hospital participants. This could indicate a greater sense of independence and autonomy in managing nocturnal needs among individuals living outside clinical settings.

Furthermore, community participants are more likely to negotiate bedtime routines that work for everyone in their household, as indicated by the higher mean score compared to hospital participants. This suggests that individuals with SCI in community settings may have a more active role in coordinating sleep schedules within their households, potentially reflecting greater involvement in familial or social dynamics. Similarly, community participants prioritize ensuring the comfort and safety of fellow sleepers in their household to a greater extent than hospital participants. This emphasis on consideration for others' sleep experiences may be influenced by the communal nature of living arrangements in community settings.

Table 4.2.3 *Sleep performance among hospital (n=90) and community (n=63) participants*

Sleep Quality	Mean±SD	
	Hospital	Community
I get an adequate amount of sleep per night for example 6-8hours.	3.52±1.35	3.83±.890
I attend to toilet and hydration needs without excessive disruption to my sleep	3.20±1.15	3.52±.913
I am satisfied with my total sleep time on an average night.	3.47±1.18	3.68±.913
I wake up feeling highly refreshed and well-rested.	3.50±1.16	3.67±.880
I have a positive impact of sleep on my daily life and well-being.	3.37±.917	4.03±.861
Overall sleep quality	3.41±.947	3.74±.577

The table 4.2.3 provides insights into the sleep performance of individuals with spinal cord injuries in both hospital and community settings, with mean scores (\pm standard deviation) indicating various aspects of their sleep quality. Analyzing these findings sheds light on the differences and similarities in sleep performance between the two groups.

Firstly, community participants report higher mean scores across all aspects of sleep quality compared to hospital participants. This suggests that individuals with SCI living in community settings perceive their sleep performance more positively overall. For example, community participants report getting an adequate amount of sleep per night more frequently than hospital participants, indicating a greater sense of

satisfaction with their sleep duration. Similarly, community participants also report attending to toilet and hydration needs without excessive disruption to their sleep to a greater extent than hospital participants. This suggests that individuals living in community settings may have more control over their sleep environment and routines, allowing them to manage nocturnal needs more effectively.

Moreover, community participants express greater satisfaction with their total sleep time on an average night and report feeling more refreshed and well-rested upon waking compared to hospital participants. Overall, the data indicates that individuals with SCI in community settings tend to perceive their sleep quality more positively and experience greater benefits from sleep compared to those in hospital settings.

4.3 Perceived Physical, Psychological and Environmental Factors by the Individuals with Spinal Cord Injury of Hospital and Community

Table 4.3.1 Comparison of physical factors among the participants residing in hospital (n=90) and community (n=63)

Variables	Mean±SD	
	Hospital	Community
How significantly does chronic pain related to your spinal cord injury affect your ability to sleep well?	2.78±1.05	3.03±.803
To what extent do muscle spasm and stiffness, disrupt your sleep?	2.96±.947	3.30±.816
How much do bladder and bowel issues contribute to sleep interruptions?	2.98±.749	3.21±.786
How significantly does respiratory dysfunction affect the quality of your sleep?	3.44±.795	3.62±.633
How much do pressure sores issues influence your sleep quality?	3.20±.796	3.30±.944
To what extent do autonomic dysreflexia contribute to sleep disturbances?	3.14±.842	3.38±.607
To what extent does the use of medications to manage SCI-related symptoms affect your sleep quality?	3.16±.833	3.41±.687
How much do sensory changes related to your SCI, such as loss of sensation, affect your sleep?	3.01±1.00	2.98±.609
Overall score	3.08±.184	3.15±.230

The table 4.3.1 presents the mean scores (\pm standard deviation) for several physical factors affecting sleep quality among two distinct groups: participants from hospitals and participants from the community, all living with spinal cord injuries. Each factor is assessed on a scale, with higher scores indicating a greater impact on sleep quality.

Chronic pain related to SCI emerges as a significant contributor to sleep disturbances for both groups. Participants from the community reported slightly higher mean scores (3.03 ± 0.803) compared to those from hospitals (2.78 ± 1.05), indicating that chronic pain may have a more pronounced effect on the sleep of individuals outside clinical settings.

Muscle spasm and stiffness were also found to disrupt sleep significantly, with the community group reporting a notably higher impact (3.30 ± 0.816) compared to the hospital group (2.96 ± 0.947). This suggests that the environment and support available in community settings might influence the management and perception of these symptoms.

Bladder and bowel issues, common complications of SCI, were reported to contribute to sleep interruptions by both groups. While the impact was slightly higher among community participants (3.21 ± 0.786) compared to hospital participants (2.98 ± 0.749), the difference was not as pronounced as with other factors.

Respiratory dysfunction emerged as a significant factor affecting sleep quality, with both groups reporting high mean scores. Community participants (3.62 ± 0.633) reported a slightly higher impact compared to hospital participants (3.44 ± 0.795), indicating the importance of respiratory management in improving sleep outcomes for individuals with SCI.

Pressure sore issues were identified as another contributor to sleep disturbances, with both groups reporting moderate impacts. Interestingly, the hospital group ($3.20 \pm$

0.796) reported slightly lower scores compared to the community group (3.30 ± 0.944), suggesting potential differences in preventive measures or treatment approaches between the two settings.

Autonomic dysreflexia and the use of medications to manage SCI-related symptoms were also found to influence sleep quality, with slightly higher impacts reported by the community participants compared to their hospital counterparts. However, sensory changes related to SCI, such as loss of sensation, appeared to affect sleep similarly across both groups, with no significant difference observed in mean scores.

Table 4.3.2 *Comparison of psychological factors among the participants residing in hospital (n=90) and community (n=63)*

Variables	Mean±SD	
	Hospital	Community
To what extent does depression impact your ability to sleep well?	2.79±1.00	2.98±.813
How significantly does anxiety affect the quality of your sleep?	2.91±.944	3.11±.764
To what extent does social isolation influence your sleep patterns?	2.84±.970	2.84±.787
How much do relationship challenges affect your sleep quality?	2.88±.958	2.90±.893
To what extent do body image issues impact your ability to sleep well?	2.89±1.04	3.00±.718
How significantly does traumatic stress influence your sleep patterns?	3.06±.987	3.19±.859
To what extent does chronic stress affect the quality of your sleep?	3.13±.974	3.17±.908
How much does grief and a sense of loss due to SCI affect your sleep quality?	3.11±.892	3.21±.786
To what extent do your coping strategies influence your sleep patterns?	3.03±.942	3.16±.865
How significantly does limited access to mental health services impact your sleep and emotional well-being?	2.98±.930	2.90±.979
Overall	2.94±.119	3.03±.126

The table provides insight into the psychological factors influencing sleep quality among two groups: participants from hospitals and participants from the community, all dealing with spinal cord injuries. Each variable is assessed through mean scores (\pm standard deviation), offering a comparative view of the psychological challenges impacting sleep within these populations.

Depression emerges as a notable factor affecting sleep quality for both hospital and community participants. While the impact is slightly higher among community participants (2.98 ± 0.813) compared to hospital participants (2.79 ± 1.00), both groups indicate a significant influence of depression on their ability to sleep well. This underscores the importance of addressing mental health concerns in managing sleep disturbances among individuals with SCI.

Anxiety is also identified as a significant contributor to sleep disturbances, with both groups reporting moderate impacts. Community participants (3.11 ± 0.764) again indicate slightly higher scores compared to hospital participants (2.91 ± 0.944), highlighting the pervasive nature of anxiety in affecting sleep quality among individuals with SCI.

Interestingly, social isolation appears to have a similar impact on sleep patterns for both hospital and community participants, as evidenced by the comparable mean scores (2.84 ± 0.970 for hospital participants and 2.84 ± 0.787 for community participants). This suggests that regardless of the setting, feelings of social isolation can adversely affect sleep among individuals with SCI.

Relationship challenges and body image issues are also identified as factors influencing sleep quality, with both groups reporting moderate impacts. The similarity in mean scores between hospital and community participants suggests that these psychological factors affect sleep patterns regardless of the setting.

Traumatic stress and chronic stress are identified as significant contributors to sleep disturbances, with both groups reporting moderate impacts. Community participants again report slightly higher mean scores for traumatic stress (3.19 ± 0.859) compared to hospital participants (3.06 ± 0.987), indicating a greater perceived influence of traumatic stress on sleep quality within the community setting.

Grief and a sense of loss due to SCI are also found to affect sleep quality, with both groups reporting moderate impacts. While hospital participants (3.11 ± 0.892) and community participants (3.21 ± 0.786) report similar mean scores, the presence of grief and loss-related concerns highlights the emotional toll of SCI on sleep patterns.

Coping strategies and access to mental health services emerge as additional factors influencing sleep quality. Both hospital and community participants report moderate impacts of coping strategies on sleep patterns, suggesting the importance of effective coping mechanisms in managing sleep disturbances. Limited access to mental health services also appears to affect sleep and emotional well-being, with hospital participants reporting slightly higher mean scores compared to community participants.

Table 4.3.3 *Comparison of environmental factors among the participants residing in hospital (n=90) and community (n=63)*

Variables	Mean±SD	
	Hospital	Community
To what extent does noise in your environment (e.g., traffic, neighbors) affect your ability to sleep well?	2.16±1.07	1.87±1.01
How significantly does light pollution (e.g., streetlights, electronic devices) influence the quality of your sleep?	2.34±1.03	1.98±1.03
To what extent does the temperature of your sleep environment (too hot or too cold) affect your sleep comfort?	2.74±.919	2.86±.913
To what extent does air quality (allergies, irritants) in your sleeping area impact your sleep comfort?	3.00±.887	3.25±.915
How much does discomfort related to your sleeping surface (e.g., mattress) impact your ability to sleep well?	3.00±.983	3.37±.921
How much co-sleeping affects your sleep quality?	3.08±.902	3.44±.838
To what extent do technological devices (e.g., electronic screens, notifications) in your room affect your sleep patterns?	2.96±.898	2.76±.856
Overall	2.75±.280	2.79±.590

The table illustrates the impact of various environmental factors on sleep quality among hospital and community participants with spinal cord injuries, providing mean scores (\pm standard deviation) for each variable. Analyzing these factors offers insights into

how environmental conditions affect sleep comfort and patterns within these populations.

Noise emerges as a significant environmental factor influencing sleep quality, with both hospital and community participants reporting its impact. Hospital participants indicate a mean score of 2.16 (± 1.07), while community participants report a slightly lower mean score of 1.87 (± 1.01), suggesting that noise disturbances, such as traffic or noisy neighbors, affect sleep to a similar extent in both settings, albeit slightly less so in the community.

Light pollution, including sources like streetlights and electronic devices, also affects sleep quality, with hospital participants reporting a mean score of 2.34 (± 1.03) and community participants reporting a slightly lower mean score of 1.98 (± 1.03). This indicates that exposure to excessive light during sleep may have a somewhat lesser impact on community participants compared to those in hospital settings.

Temperature regulation in the sleep environment emerges as another important factor influencing sleep comfort. Both hospital and community participants report moderate impacts, with mean scores of 2.74 (± 0.919) and 2.86 (± 0.913) respectively. This suggests that maintaining an optimal temperature for sleep is a common challenge for individuals with SCI, regardless of their living arrangements.

Air quality in the sleeping area, including factors like allergies and irritants, also affects sleep comfort. Community participants report a slightly higher mean score of 3.25 (± 0.915) compared to hospital participants' mean score of 3.00 (± 0.887), indicating that air quality may have a more pronounced impact on sleep comfort within community settings.

Discomfort related to the sleeping surface, such as mattress quality, significantly affects sleep quality for both groups, with community participants reporting a notably higher mean score of 3.37 (\pm 0.921) compared to hospital participants' mean score of 3.00 (\pm 0.983). This suggests that ensuring a comfortable sleeping surface is particularly crucial for individuals with SCI in community settings.

Co-sleeping arrangements also influence sleep quality, with both hospital and community participants reporting moderate impacts. Community participants report a slightly higher mean score of 3.44 (\pm 0.838) compared to hospital participants' mean score of 3.08 (\pm 0.902), indicating that co-sleeping may have a more significant impact on sleep quality within community settings.

Technological devices in the bedroom, such as electronic screens and notifications, affect sleep patterns for both groups, albeit to varying extents. Hospital participants report a mean score of 2.96 (\pm 0.898), while community participants report a slightly lower mean score of 2.76 (\pm 0.856), suggesting that the presence of technological distractions may have a slightly lesser impact on sleep patterns in community settings.

4.4 Correlations of Perceived Physical, Psychological and Environmental Factors with the Sleep Domains

Table 4.4.1 *Correlation of physical factors with sleep preparation, sleep participation and sleep quality of individuals with spinal cord injury in hospital settings (n= 90)*

Variables	Sleep quality	Sleep participation	Sleep preparation
Chronic Pain	.327**	.360**	.285**
Muscle Spasm & Stiffness	.222*	.230*	.147
Bladder & Bowel Issues	.431**	.466**	.206
Respiratory Dysfunction	.386**	.345**	.148
Pressure Sores	.209*	.293**	.314**
Autonomic Dysreflexia	.343**	.255*	.232*
Medication Usage	.428**	.443**	.313**
Sensory Changes	.256*	.360**	.339**

When examining the relationship between sleep preparation and various factors related to spinal cord injury, it becomes evident that chronic pain plays a significant role. The correlation analysis reveals a moderate positive association between chronic pain and sleep preparation ($\rho = 0.285$, $p < 0.01$), indicating that individuals experiencing higher levels of chronic pain tend to engage slightly more in sleep preparation activities. This suggests that managing chronic pain may motivate individuals to be more attentive to

their sleep environment and routines. Additionally, pressure sores exhibit the strongest positive correlation ($\rho = 0.314$, $p < 0.01$) with sleep preparation, suggesting that individuals with more pressure sore issues tend to focus more on preparing for sleep, possibly to alleviate discomfort or prevent exacerbation of sores during sleep.

Moving on to sleep participation, the correlation coefficients are generally higher compared to sleep preparation, indicating potentially stronger relationships between these factors and sleep participation behaviors. Notably, bladder and bowel issues display the highest positive correlation ($\rho = 0.466$, $p < 0.01$) with sleep participation, suggesting that managing these issues significantly influences an individual's engagement in sleep-related activities. Furthermore, chronic pain and medication usage also show significant positive correlations with sleep participation, implying that individuals experiencing more pain and relying more on medications for symptom management tend to have higher levels of sleep participation.

Contrastingly, when considering sleep quality, different associations with the variables emerge. While chronic pain, bladder and bowel issues, and medication usage demonstrate significant positive correlations with sleep quality, suggesting that individuals experiencing more chronic pain, bladder and bowel issues, and relying more on medications tend to have poorer sleep quality, other factors such as muscle spasm & stiffness, respiratory dysfunction, and pressure sores also show positive correlations, albeit weaker compared to chronic pain and bladder & bowel issues.

Table 4.4.2 *Correlation of psychological factors with sleep preparation, sleep participation and sleep quality of individuals with spinal cord injury in hospital settings (n= 90)*

Variables	Sleep Preparation	Sleep Participation	Sleep Quality
Depression	0.263*	0.388**	0.304**
Anxiety	0.227*	0.366**	0.330**
Social Isolation	0.285**	0.282**	0.230*
Relationship Challenges	0.172	0.141	0.155
Body Image Issues	0.185	0.325**	0.247*
Traumatic Stress	0.211*	0.398**	0.258*
Chronic Stress	0.165	0.329**	0.320**
Grief & Loss	0.068	0.403**	0.355**
Coping Strategies	0.194	0.355**	0.305**
Access to Mental Health	0.162	0.235*	0.253*

The correlation analysis reveals several significant associations between psychological factors and various aspects of sleep among participants. The correlation analysis conducted on individuals with spinal cord injury in hospital settings reveals insightful associations between psychological factors and various dimensions of sleep.

Firstly, depression exhibits significant positive correlations with all aspects of sleep: preparation ($\rho = 0.263, p < 0.05$), participation ($\rho = 0.388, p < 0.01$), and quality ($\rho = 0.304, p < 0.01$). This suggests that higher levels of depression are associated with poorer sleep preparation habits, lower engagement in sleep-related activities, and diminished overall sleep quality. Similarly, anxiety displays positive correlations with all three sleep variables (preparation: $\rho = 0.227, p < 0.05$; participation: $\rho = 0.366, p < 0.01$; quality: $\rho = 0.330, p < 0.01$), indicating that heightened anxiety levels coincide with difficulties in preparing for sleep, participating in sleep-related activities, and experiencing restful sleep. These findings underscore the detrimental impact of depression and anxiety on sleep outcomes among individuals with spinal cord injury.

Moreover, social isolation demonstrates a positive correlation with sleep preparation ($\rho = 0.285, p < 0.01$) and participation ($\rho = 0.282, p < 0.01$), implying that individuals experiencing feelings of social isolation may encounter challenges in preparing for sleep and actively engaging in sleep-related behaviors. However, the correlation with sleep quality ($\rho = 0.230, p < 0.05$) is weaker, suggesting that while social isolation may influence the initiation and maintenance of sleep routines, its effect on the overall sleep quality may be less pronounced. This highlights the importance of addressing social connectedness and support systems in interventions aimed at improving sleep among individuals with spinal cord injury.

In contrast, relationship challenges and chronic stress show weaker positive correlations with sleep participation (relationship challenges: $\rho = 0.141, p > 0.05$; chronic stress: $\rho = 0.329, p < 0.01$), indicating that individuals facing difficulties in their relationships or experiencing ongoing stressors may find it slightly harder to engage in sleep-related activities. Similarly, grief and loss demonstrate a weak positive

correlation with sleep preparation ($\rho = 0.068$, $p > 0.05$), suggesting that individuals grappling with grief and a sense of loss may exhibit slightly poorer sleep preparation habits. However, these correlations are not as strong as those observed for depression and anxiety, suggesting that other factors may also contribute to sleep outcomes in this population.

Interestingly, coping strategies exhibit positive correlations with all three sleep variables (preparation: $\rho = 0.194$, $p < 0.05$; participation: $\rho = 0.355$, $p < 0.01$; quality: $\rho = 0.305$, $p < 0.01$), implying that individuals employing effective coping mechanisms may experience better sleep preparation, participation, and quality.

Table 4.4.3 *Correlation of environmental factors with sleep preparation, sleep participation and sleep quality of individuals with spinal cord injury in hospital settings (n= 90)*

Variables	Overall	Sleep	Sleep
	Overall	Participa	Quality
Noise Impact	-0.085	0.111	0.162
Light Pollution	-0.083	0.194	0.236*
Impact	0.001	0.265*	0.231*
Temperature Impact	-0.136	0.239*	0.200
Air Quality Impact	-0.070	0.242*	0.286**
Sleeping Surface	-0.050	0.221*	0.159
Discomfort Impact	-0.012	0.184	0.197
Co-sleeping Impact			
Technological Device			
Impact			

The correlation analysis conducted on individuals with spinal cord injury in hospital settings unveils significant associations between environmental factors and various aspects of sleep.

Firstly, noise impact and light pollution impact both exhibit negative correlations with sleep preparation, although these correlations are weak and statistically insignificant (noise: $\rho = -0.085$, $p > 0.05$; light pollution: $\rho = -0.083$, $p > 0.05$).

Similarly, temperature impact and air quality impact also show weak correlations with sleep preparation, with temperature impact having a negligible

positive correlation ($\rho = 0.001$, $p > 0.05$) and air quality impact having a slightly stronger negative correlation ($\rho = -0.136$, $p > 0.05$). These findings suggest that while environmental factors may have some influence, they are not strong predictors of sleep preparation among individuals with spinal cord injury.

Moving on to sleep participation, the analysis reveals more notable correlations with environmental factors. Both temperature impact ($\rho = 0.265$, $p < 0.05$) and air quality impact ($\rho = 0.239$, $p < 0.05$) demonstrate positive correlations with sleep participation, indicating that individuals may be more likely to engage in sleep-related activities when the temperature is more favorable and the air quality is better.

Additionally, light pollution impact ($\rho = 0.194$, $p < 0.05$) and sleeping surface discomfort impact ($\rho = 0.242$, $p < 0.05$) also show positive correlations with sleep participation, albeit weaker ones. These findings suggest that environmental factors such as temperature, air quality, light pollution, and sleeping surface comfort may play a role in influencing individuals' engagement in sleep-related activities.

Furthermore, the analysis of sleep quality reveals positive correlations between light pollution impact and sleep quality ($\rho = 0.236$, $p < 0.05$), as well as between temperature impact and sleep quality ($\rho = 0.231$, $p < 0.05$). These findings suggest that individuals may experience better sleep quality in environments with lower levels of light pollution and more favorable temperatures. However, it's worth noting that while these correlations are statistically significant, they are relatively weak. Other environmental factors such as noise impact, air quality impact, sleeping surface discomfort impact, co-sleeping impact, and technological device impact show weaker correlations with sleep quality, indicating that their influence may be less pronounced.

Table 4.4.4 *Correlation of physical factors with sleep preparation, sleep participation and sleep quality of individuals with spinal cord injury in community settings (n= 63)*

Variables	Chronic Pain	Muscle Spasm & Stiffness	Bladder & Bowel Issues	Respiratory Dysfunction	Pressure Sores	Autonomic Dysreflexia	Medication Usage	Sensory Changes
Sleep preparation	0.131	-0.172	-0.059	-0.036	-0.230	-0.112	-0.099	-0.075
Sleep participation	0.204	0.135	0.313	0.022*	-0.124	-0.030	-0.017	0.014
Sleep quality	0.206	0.111	0.136	0.284*	0.111	-0.124	0.167	0.055

The analysis of correlations between physical factors and sleep outcomes among community participants reveals interesting insights into the relationship between these variables.

Chronic pain exhibits a weak positive correlation with sleep preparation ($r = 0.131$, $p > 0.05$), suggesting that higher levels of chronic pain may slightly contribute to poorer sleep preparation. However, this correlation is not statistically significant, indicating that other factors may have a more pronounced influence on sleep preparation among the participants.

Muscle spasm and stiffness demonstrate a weak negative correlation with sleep preparation ($r = -0.172$, $p > 0.05$), implying that higher levels of these issues might be associated with slightly poorer sleep preparation.

Bladder and bowel issues, as well as respiratory dysfunction, exhibit weak negative correlations with sleep preparation, with respective p-values of $p > 0.05$ and $p > 0.05$, indicating no statistically significant relationship. These correlations suggest potential associations, but their lack of statistical significance suggests their influence on sleep preparation may be minimal.

In contrast, pressure sores demonstrate a moderate negative correlation with sleep preparation ($r = -0.230$, $p < 0.05$), signifying that higher levels of pressure sores are associated with poorer sleep preparation among the community participants. This correlation is statistically significant, suggesting that addressing pressure sore issues could potentially improve sleep preparation outcomes.

Autonomic dysreflexia, medication usage, and sensory changes show weak negative correlations with sleep preparation, although these correlations are not significant, with respective p-values of $p > 0.05$, $p > 0.05$, and $p > 0.05$, indicating limited impact on sleep preparation. For sleep participation and sleep quality, the correlations with the physical factors generally follow similar patterns as with sleep preparation.

However, pressure sores exhibit a weak negative correlation with sleep participation and a weak positive correlation with sleep quality, with respective p-values of $p > 0.05$ and $p > 0.05$. This suggests that pressure sores may slightly hinder sleep participation but have a negligible effect on sleep quality among the participants.

Notably, sleep participation demonstrates a moderate positive correlation with sleep quality ($r = 0.231$, $p < 0.05$), indicating that higher levels of sleep participation are associated with better sleep quality, a correlation that reaches statistical significance. This suggests that the relationship between physical factors and sleep among community participants is complex and multifaceted.

Table 4.4.5: *Correlation of psychological factors with sleep preparation, sleep participation and sleep quality of individuals with spinal cord injury in hospital settings (n= 63)*

	Sleep Quality	Sleep Participation	Sleep Preparation	Variables
	-0.123	-0.066	-0.155	Depression
	0.064	-0.059	-0.173	Anxiety
	-0.167	0.059	0.063	Social Isolation
	-0.192	0.111	0.049	Relationship Challenges
	-0.085	0.177	0.018	Body Image Issues
	0.142	0.320*	0.008	Traumatic Stress
	0.069	0.125	-0.251*	Chronic Stress
	-0.201	0.033	-0.139	Grief & Loss
	0.044	0.106	-0.191	Coping Strategies
	-0.063	0.004	-0.280*	Access to Mental Health Services

Table 4.13 presents the correlations between various psychological factors and the dimensions of sleep (i.e., sleep preparation, sleep participation, and sleep quality) among individuals with spinal cord injury in hospital settings.

Depression showed a negative correlation with sleep preparation ($r = -0.155$, p

> 0.05) and sleep participation ($r = -0.066$, $p > 0.05$), indicating that higher levels of depression were associated with lower scores in both dimensions of sleep. Anxiety also exhibited a negative correlation with sleep preparation ($r = -0.173$, $p > 0.05$) and sleep participation ($r = -0.059$, $p > 0.05$), although the associations were not statistically significant.

Social isolation had a positive correlation with sleep participation ($r = 0.059$, $p > 0.05$), suggesting that individuals who reported feeling more socially isolated tended to have higher levels of participation in sleep-related activities. However, this correlation was not statistically significant. Similarly, relationship challenges showed a positive correlation with sleep participation ($r = 0.111$, $p > 0.05$), but it was not statistically significant either. Among the psychological factors, traumatic stress exhibited a notable positive correlation with sleep participation ($r = 0.320$, $p < 0.05$), indicating that higher levels of traumatic stress were associated with increased participation in sleep-related activities. Chronic stress also showed a positive correlation with sleep participation ($r = 0.125$, $p > 0.05$), although it was not statistically significant. In terms of sleep quality, depression, social isolation, and body image issues demonstrated negative correlations, albeit not statistically significant. Depression had a negative correlation with sleep quality ($r = -0.123$, $p > 0.05$), indicating that individuals with higher levels of depression tended to report lower sleep quality.

Table 4.4.6: *Correlation of environmental factors with sleep preparation, sleep participation and sleep quality of individuals with spinal cord injury in community settings (n= 63)*

Sleep quality	Sleep participation	Sleep preparation	Variables
0.162	0.111	-0.085	Noise Impact
0.236*	0.194	-0.083	Light Pollution Impact
0.231*	0.265*	0.001	Temperature Impact
0.200	0.239*	-0.136	Air Quality Impact
0.286**	0.242*	-0.070	Sleeping Surface Discomfort Impact
0.159	0.221*	-0.050	Co-sleeping Impact
0.197	0.184	-0.012	Technological Device Impact

The provided correlations represent the associations between environmental factors and various aspects of sleep among individuals with spinal cord injury in community settings. These correlations are indicative of the strength and direction of these relationships, with p-values indicating their statistical significance.

In the context of overall sleep preparation, the correlations with environmental factors range from -0.085 to -0.012. These values suggest weak to negligible associations between sleep preparation and noise impact, light pollution impact, temperature impact, air quality impact, discomfort related to the sleeping surface, co-sleeping impact, and technological device impact. None of these correlations reach

statistical significance at the 0.05 level.

For sleep participation, correlations range from 0.111 to 0.265*, with temperature impact demonstrating the strongest positive correlation. This suggests that individuals with spinal cord injury in community settings may be more inclined to engage in sleep-related activities when the temperature of their sleep environment is more comfortable. Most of these correlations are statistically significant, with p-values ranging from < 0.05 to < 0.001 .

Similarly, for sleep quality, correlations range from 0.162 to 0.286**, with temperature impact again showing the strongest positive correlation. This indicates that individuals may experience better sleep quality in community settings when the temperature of their sleep environment is more favorable. These correlations are mostly statistically significant at the 0.05 level or lower.

In the hospital, significant positive correlations are observed between sleep participation, sleep quality, and both physical and psychological factors, suggesting interrelationships between these aspects within the hospital environment. However, the correlations with environmental factors in the hospital are generally lower, indicating potentially less influence on sleep outcomes compared to other factors.

Conversely, in the community, correlations between sleep preparation, participation, and quality are weaker compared to the hospital setting, suggesting a different dynamic in community environments. Additionally, correlations between physical and psychological factors in the community are notably strong, indicating a potentially greater impact on sleep outcomes from these factors outside of hospital settings.

CHAPTER V: DISCUSSION

The overall aim of this study is to compare perceived physical, psychological, and environmental factors, between individuals with spinal cord injuries in hospital and community settings, with the goal of understanding their impact on sleep preparation, participation, and quality.

5.1 Demographic, Clinical and Sleep-related Environment

The first objective of the study was to determine the socio-demographic, clinical, and sleep-related characteristics of participants in hospital and community settings. Particularly, the age distribution differed significantly between the hospital and community groups, implying varied injury onset patterns. Hospitalized patients were predominantly younger males, while the community sample encompassed a broader age spectrum with similar gender ratios. This trend aligns with established epidemiological patterns indicating a higher incidence of SCI among younger males (). Pressure sores were more common in the hospital as expected due to readmission with developing pressure sores.

5.2 Sleep Preparation, Sleep Participation, Sleep Quality

The second objective of the study reveals diverse habits, lifestyle, and individual preferences among hospital and community participants. Clinically, the findings indicate that individuals with SCI, regardless of their setting, prioritize certain fundamental aspects of sleep hygiene, such as maintaining a consistent sleep schedule and ensuring a clean and tidy sleep environment. There are significant differences between hospital and community participants in specific sleep preparation practices. Hospital participants exhibit a stronger emphasis on comfort-related practices, such as wearing loose-fitting clothing and ensuring mattress quality, which may be influenced

by the clinical environment and the need for adaptation to hospital beds.

The differences in sleep preparation practices between hospital and community participants reflect the influence of environmental factors, lifestyle choices, and individual preferences. Community participants prioritize practices related to creating a conducive sleep environment, such as using bed nets and preferring a dark and quiet bedroom, which may be influenced by their autonomy and control over their home environment.

On the other hand, hospital participants show a stronger emphasis on incorporating medication for general health well-being into their sleep routines, suggesting a greater reliance on medical management within clinical settings.

Regarding sleep participation behaviors among individuals with spinal cord injuries in hospital and community settings, assessing their adherence to regular sleep schedules, ease of falling asleep without medication, management of night-time needs, negotiation of bedtime routines within the household, and consideration for fellow sleepers' comfort and safety (Smallfield & Molitor, 2018).

According to Social Cognitive Theory, individuals' behaviors are influenced by both personal factors and environmental factors, as well as their interactions and experiences. In the context of sleep participation among individuals with SCI, the findings suggest that community participants may have greater autonomy and self-efficacy in managing their sleep routines compared to hospital participants. This autonomy could stem from the increased control over their living environment and the ability to negotiate bedtime routines within their household, leading to a higher level of engagement in sleep-related activities.

The interplay between individuals and their social and physical environments constructs social ecology perspective that can be used for explaining the phenomenon

(Meagher & Cheadle, 2020). In this study, the differences in sleep participation between hospital and community participants reflect the influence of environmental factors such as living arrangements and support systems. Community participants, residing in their home environments, may have more opportunities to negotiate and adapt bedtime routines to accommodate the needs of their household members, contributing to a higher level of sleep participation (Meagher & Cheadle, 2020). On the other hand, hospital participants, confined to clinical settings, may have less control over their sleep environment and fewer opportunities for active participation in household dynamics.

(Michaelsen & Esch, 2023) mentioned in their review that health behavior changes theories emphasize the importance of individual motivation, self-efficacy, and social support in promoting positive health behaviors. In the context of sleep participation among individuals with SCI, both hospital and community participants demonstrate a commitment to maintaining regular sleep schedules and falling asleep without medication, indicating a degree of self-regulation and self-management of sleep behaviors. However, community participants exhibit slightly higher levels of engagement in negotiating bedtime routines and ensuring the comfort and safety of fellow sleepers, potentially influenced by social support networks and familial dynamics within the household.

(Schultz et al., 2022) explained how rehabilitation psychology focuses on promoting adjustment, adaptation, and participation in meaningful activities among individuals with spinal cord injuries. In the context of sleep participation, the findings highlight the importance of empowering individuals with SCI to actively engage in managing their sleep routines, regardless of their living environment. Rehabilitation interventions should address environmental barriers and facilitate the development of adaptive strategies (Schultz et al., 2022) to promote optimal sleep hygiene and

participation in sleep-related activities, ultimately enhancing overall well-being and quality of life for individuals with SCI.

Regarding sleep performance among individuals with spinal cord injuries in hospital and community settings, examining aspects such as sleep duration, management of nighttime needs, satisfaction with sleep quality, feelings of refreshment upon waking, and the perceived impact of sleep on daily life and well-being. Health Promotion theories (Kumar & Preetha, 2012) and The Biopsychosocial Model (Budd et al., 2022) emphasize the importance of promoting positive health behaviors and environments to enhance overall well-being. In the context of sleep performance among individuals with SCI, the findings suggest that community participants experience more favorable sleep outcomes compared to hospital participants. This highlights the need for health promotion efforts aimed at optimizing sleep environments and routines, particularly within clinical settings where sleep disruptions and environmental factors may impact sleep quality.

The Biopsychosocial Model recognizes the complex interplay between biological, psychological, and social factors in influencing health outcomes (Budd et al., 2022). In this study, the differences in sleep quality between hospital and community participants reflect the influence of both environmental factors and individual perceptions and experiences. Community participants, benefiting from supportive social environments and familiar living conditions, perceive their sleep as more restorative and impactful on daily life compared to hospital participants. This highlights the importance of addressing both environmental and psychosocial factors in promoting optimal sleep outcomes for individuals with SCI.

Overall, the findings highlight the need for holistic approaches to addressing sleep-related concerns among individuals with SCI, considering the complex interplay

of biological, psychological, social, and environmental factors under predominant theories. By recognizing and addressing these factors, healthcare providers and policymakers can promote better sleep outcomes and enhance overall well-being for individuals living with SCI in both clinical and community settings.

5.3 Correlation with Perceived Physical, Psychological and Environmental Factors in Hospital and Community

The third and fourth objectives of the study was to compare and correlate the perceived physical, psychological, and environmental factors on sleep preparation, participation and quality among individuals with spinal cord injuries residing in hospital and community settings. In this study, these factors significantly impact sleep quality for individuals with SCI in both hospital and community settings. Physical factors, such as chronic pain, muscle spasms, respiratory issues, and pressure sore problems, emerged as significant contributors to sleep disturbances among individuals with SCI. These physical challenges not only directly affect comfort during sleep but also interact with psychological and social factors, leading to increased distress and exacerbation of sleep problems (Sankari et al., 2019). For example, chronic pain and respiratory dysfunction may contribute to psychological distress and social isolation, further exacerbating sleep problems (Beisbier & Laverdure, 2020; Hildebrand et al., 2023).

These mental health challenges may stem from adjusting to life with a spinal cord injury, coping with functional limitations, and facing uncertainties about the future (Dijk & Landolt, 2019; Saarloos et al., 2009). Cognitive-behavioral theories emphasize the role of maladaptive thoughts and behaviors in contributing to psychological distress and sleep disturbances (Widerstrom-Noga et al., 2020). In this study, both hospital and community participants report significant impacts of depression and anxiety on sleep quality, highlighting the importance of addressing cognitive distortions and

implementing relaxation techniques to manage symptoms. Community participants tend to report slightly higher mean scores for depression and anxiety, indicating a greater need for cognitive-behavioral interventions targeting mood regulation and sleep hygiene practices.

Interpersonal relationships and social networks play a crucial role in buffering stress and promoting well-being (Tough et al., 2017). Interestingly, both hospital and community participants report similar impacts of social isolation on sleep patterns, suggesting that perceived social support may not always align with objective measures of social connectedness. Occupational therapists can leverage group interventions and peer support networks to foster a sense of belonging and reduce feelings of isolation among individuals with SCI, regardless of their living environment.

Overall, the findings underscore the importance of considering psychological factors in understanding and addressing sleep disturbances among individuals with SCI. By adopting a multidimensional approach informed by cognitive-behavioral, social support, occupational therapy, and biopsychosocial perspectives, healthcare providers can develop tailored interventions that address the unique needs and challenges faced by individuals with SCI, ultimately promoting better sleep quality and overall well-being. Circadian Rhythm theories emphasize the role of environmental cues, such as light and temperature, in regulating sleep-wake cycles (Dijk & Landolt, 2019). In this study, both hospital and community participants report moderate impacts of light pollution on sleep quality, with slightly lower mean scores observed among community participants. This suggests that while exposure to artificial light affects sleep in both settings, community participants may have better control over light sources or access to darker sleep environments, potentially due to more personalized sleeping arrangements or environmental modifications. Environmental Psychology theories

highlight the interaction between individuals and their physical surroundings, including how environmental factors influence behavior and well-being (Saarloos et al., 2009). In this context, the findings reveal that discomfort related to the sleeping surface significantly affects sleep quality for both hospital and community participants. However, community participants report a notably higher impact, suggesting that environmental modifications, such as selecting a suitable mattress, may play a more critical role in enhancing sleep comfort and quality within community settings where individuals have more control over their living environments. This suggests the importance of considering the dynamic interplay between individuals and their social and physical environments (Saarloos et al., 2009; Stokols et al., 2013).

Moreover, environmental factors play a pivotal role in shaping sleep experiences for individuals with SCI. Issues such as light pollution, noise disturbances, uncomfortable sleeping surfaces, and lack of control over the sleep environment can significantly impact sleep quality. Considering environmental factors, Circadian Rhythm theories emphasize the role of light and temperature in regulating sleep-wake cycles (Petal et al., 2022). While both hospital and community participants report moderate impacts of light pollution on sleep quality, community participants may have better control over light sources or access to darker sleep environments, potentially due to personalized sleeping arrangements or environmental modifications. In community settings, individuals may have more autonomy to modify their environment to suit their needs, potentially leading to better sleep outcomes compared to hospital settings.

Environmental Psychology theories highlight the interaction between individuals and their physical surroundings (Curtin et al., 2020)(Billings et al., 2021).

Co-sleeping arrangements emerge as a significant factor influencing sleep quality for both hospital and community participants, with slightly higher impacts

reported by community participants. This underscores the need for interventions addressing not only individual sleep habits but also broader environmental and social factors impacting sleep outcomes (Billings et al., 2021)

The Person-Environment-Occupation model provides occupational therapists with a robust framework for tackling sleep issues (Doucet et al., 2021). Occupational therapists start by comprehensively assessing the individual's sleep patterns, habits, and challenges (Ho & Siu, 2018); Farrehi et al., 2016; Gutman et al., 2017; Leland et al., 2016). This evaluation encompasses factors such as physical functioning, sensory abilities, pain levels, and psychological well-being, all of which significantly influence sleep quality (Farrehi et al., 2016; Gutman et al., 2017; Leland et al., 2016; Tough et al., 2017).

In examining the environment, occupational therapists could analyze elements such as the bed, mattress, pillows, room lighting, noise levels, and temperature to ensure they contribute positively to optimal sleep conditions. They also assess the social environment, including the presence of caregivers or family members, to understand its role in shaping the individual's sleep routine and habits. Collaborating closely with the individual, Occupational therapists establish a structured daily routine aimed at promoting better sleep hygiene, incorporating consistent sleep and wake times, relaxation techniques, and bedtime rituals conducive to restful sleep (Farrehi et al., 2016; Gutman et al., 2017; Leland et al., 2016). Furthermore, they may suggest modifications or adaptations to daily activities to alleviate physical discomfort or pain that could disrupt sleep.

CHAPTER VI: CONCLUSION

6.1 Strengths and Limitations

6.1.1 Strengths

- The study covered multiple aspects of sleep-related behaviors and experiences, providing a holistic understanding of sleep patterns in individuals with SCI.
- By including participants from both hospital and community settings, the study captured a diverse range of experiences and environments, enhancing the generalizability of the findings.

6.1.2 Limitations

- The study was limited by a small sample size, which may have reduced the generalizability of the findings and limited the statistical power of the analysis.
- Due to constraints in data collection time, the study could not cover a wide range of community members, potentially limiting the representation of sleep patterns within the community setting.

6.2 Recommendations

6.2.1 Practice Implications

- These findings will help healthcare professionals better understand and address sleep-related challenges in individuals with spinal cord injuries.
- Policymakers can use these findings to develop policies that enhance access to quality sleep care for individuals with spinal cord injuries.
- Individuals with SCI can use this knowledge to advocate for their own sleep-related needs and make informed decisions about their care.

6.2.2 Recommendations for Future Studies

- Qualitative research methods can complement quantitative data by exploring the subjective experiences and perceptions of individuals with SCI regarding sleep and its management.
- Intervention studies evaluating the effectiveness of various interventions, including pharmacological, behavioral, and environmental interventions, in improving sleep quality among individuals with SCI are needed.

6.3 Conclusion

The study's findings shed light on the intricate relationship between spinal cord injuries and sleep, delineating the multifaceted factors that influence sleep preparation, participation, and performance among individuals with SCI in hospital and community settings. Through a comprehensive examination of physical, psychological, and environmental factors, the study underscores the complex interplay of biological, psychological, and social determinants in shaping sleep outcomes within this population. Despite the challenges posed by small sample sizes and limited data coverage, the study highlights the critical need for further research to expand the scope of inquiry, enhance methodological rigor, and validate findings across diverse populations. Moving forward, future studies should prioritize larger sample sizes, longitudinal designs, and comparative analyses to deepen our understanding of sleep disturbances in SCI and inform the development of targeted interventions aimed at optimizing sleep health and overall well-being for individuals living with SCI.

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APPENDICES

Please follow the serial according to your write-up and add more Appendix as appropriate

Appendix A: Approval / Permission Letter



বাংলাদেশ হেল্থ প্রফেশন্স ইনস্টিটিউট (বিএইচপিআই)
Bangladesh Health Professions Institute (BHPI)
(The Academic Institute of CRP)

Ref: **CRP-BHPI/IRB/10/2023/752** Date: **18.10.2023**

To
 Md. Monjurul Islam
 4th Year B.Sc. in Occupational Therapy
 Session: 2018-19; Student ID: 122180310
 Department of Occupational Therapy
 BHPI, CRP, Savar, Dhaka-1343, Bangladesh

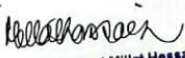
Subject: Approval of the thesis proposal “Investigating Sleep Preparation, Sleep Participation, and Sleep Performance among Individuals with Spinal Cord Injuries: A Cross-sectional Study” by ethics committee.

Dear Monjurul Islam,
 Congratulations.
 The Institutional Review Board (IRB) of BHPI has reviewed and discussed your application to conduct the above-mentioned dissertation, with yourself, as the principal investigator and Shamima Akter as thesis supervisor. The Following documents have been reviewed and approved:

Sr. No.	Name of the Documents
1	Dissertation/thesis/research Proposal
2	Questionnaire (English & / or Bengali version)
3	Information sheet & consent form

The purpose of the study is to investigating the level of sleep preparation, participation, and quality among SCI patients. The study involves use of socio demographic questionnaire and sleep quality scales to investigating the level of sleep preparation, participation and quality among SCI patient that may take about 20 to 25 minutes to fill in the questionnaire for collection of specimen and there is no likelihood of any harm to the participants and no economical benefits for the participants. The members of the Ethics committee have approved the study to be conducted in the presented form at the meeting held at 8.30 AM on 23rd September 2023 at BHPI 38th IRB Meeting.

The institutional Ethics committee expects to be informed about the progress of the study, any changes occurring in the course of the study, any revision in the protocol and patient information or informed consent and ask to be provided a copy of the final report. This Ethics committee is working in accordance to Nuremberg Code 1947, World Medical Association Declaration of Helsinki, 1964 - 2013 and other applicable regulations.

Best regards, 
 Muhammad Millat Hossain
 Associate Professor
 Project & Course Coordinator
 Dept. of Rehabilitation Science
 CRP Savar, Dhaka-1343, Bangladesh

Member Secretary
 Institutional Review Board (IRB)
 BHPI, CRP, Savar, Dhaka-1343, Bangladesh.

সিআরপি-চাপাইন, সাভার, ঢাকা-১৩৪৩, বাংলাদেশ। ফোন: +৮৮ ০২ ২২৪৪৪৫৪৬৪-৫, +৮৮ ০২ ২২৪৪৪১৪০৪, মোবাইল: +৮৮ ০১৭০০ ০৫৯৬৪৭
 CRP-Chapain, Savar, Dhaka-1343, Bangladesh. Tel: +88 02 224445464-5, +88 02 224441404, Mobile: +88 01730059647
 E-mail : principal-bhpi@crp-bangladesh.org. Web: bhpi.edu.bd

Appendix B: Information Sheet & Consent Form

Bangladesh Health Professions Institute
Occupational Therapy Department
CRP, Savar, Chapain, Dhaka

Information sheet (English Version)

Research Title: Investigating Sleep Preparation, Sleep Participation, and Sleep Quality among Individuals with Spinal Cord Injuries.

Name of the researcher: Md. Monjurul Islam

Roll No: 18

4th year, Department of Occupational Therapy

Supervisor: Shamima Akter Swapna

Associate Professor,

Department of Occupational Therapy

Bangladesh Health Professions Institute

Savar, Dhaka.

I am Md. Monjurul Islam, will like to request you to join the research. Before you make decisions to take part in the research, you need to know about the research and why this is being done. After reading this document you will be able to know how you are related to the research. Please take time to read the given information. If you confront any problem after reading this document or you need to know more about the research, you can further ask me.

Background and Aim of This Research:

I am Md. Monjurul Islam, currently studying B.Sc in occupational therapy in Bangladesh Health Professions Institute (BHPI), an academic institute of Centre for the Rehabilitation of the paralysed(CRP). As a part of my course curriculum, I am going to conduct research under the supervision of Shamima Akter Swapna, Associate

professor, Department of Occupational Therapy. The actual aim of the study is to examine and understand sleep preparation, sleep participation, and sleep quality specifically among individuals with spinal cord injuries.

What to do to participate in the study?

As I am going to investigate the Sleep preparation, participation and quality among person with SCI. I will use self-developed questionnaire to identifying the factors that decreases sleep person with SCIs. It will take 15-20 minutes to complete the survey per person.

Why are you invited to participate in the study?

My research topic is to find out the factors that made difficulties to sleep person with SCIs.

Inclusion & Exclusion criteria

Inclusion criteria

Individuals with a confirmed diagnosis of spinal cord injury.

Participants may have varying levels of injury severity, including paraplegia and tetraplegia.

In the hospital setting, inclusion criteria may specify that participants are currently receiving medical care and rehabilitation services in a hospital or clinical facility.

In the community setting, participants must be residing in the community, including those who have completed their hospital-based rehabilitation and are living independently or with family and caregivers.

Exclusion Criteria

Individuals with severe cognitive impairments or neurological conditions that could significantly affect their ability to understand and respond to study questions may be excluded.

Participants who have communication barriers that prevent effective data collection, such as severe speech or language impairments, may be excluded.

Participants with severe comorbid medical conditions that could independently affect sleep quality (e.g., severe untreated sleep disorders, advanced cancer, or end-stage organ failure) may be excluded or considered as a separate subgroup for analysis.

Individuals who decline to participate in the study or do not provide informed consent will not be included. Pregnant individuals may be excluded from certain aspects of the study, such as sleep quality assessments that may be influenced by pregnancy-related factors. Individuals with active substance abuse disorders (e.g., drug or alcohol addiction) that may significantly impact sleep patterns may be excluded or considered separately for analysis.

Do you have to take part?

Participation in the study is completely voluntary. It is important to get consent from the participants before participation in the study. After the participation, participants will be accounted for to answer all the questions asked by the researcher. Participants will be given consent and withdrawal paper so that they can cancel their participation within two weeks after collecting data.

What Are the Possible Risks and Benefits Of participation?

Participating in the research is not anticipated to cause any disturbance or discomfort. There is no financial benefit for the participants. Therefore, there is no physical or mental risk to the participants. If any problem is seen after participation, then a doctor or psychiatrist will advise,

Will Taking Part Be Confidential?

The information will not be shared with others. Researcher will strictly maintain the secrecy of the study. Participants' names and other information will not come out during the study except the consent form. Only the related researcher and supervisor will be able to know about it directly. All the information that is collected from the

interview would be kept safely and maintained confidentiality.

Who Should You Contact for Further Information?

You can contact me for further information.

Researcher: Md. Monjurul Islam

Bangladesh Health Professions Institute (BHPI)

4th year student, Occupational therapy, CRP

Phone:01631328757

Email: monjurulot1997@gmail.com

You can also contact my supervisor:

Supervisor: Shamima Akter Swapna

Associate Professor,

Department of Occupational Therapy, BHPI, CRP

Savar, Dhaka

Phone:01716806864

Thank you.

Consent form (English Version)

Research Title: Investigating Sleep Preparation, Sleep Participation, and Sleep Quality among Individuals with Spinal Cord Injuries.

Md Monjurul Islam (investigator) is a 4th year student of B.Sc. in Occupational Therapy Department, session-2018-2019 at Bangladesh Health Professions Institute (BHPI), the academic institute of Centre for the Rehabilitation of the Paralyzed (CRP). This study is a part of the course curriculum of Occupational Therapy Department. The study is supervised by, Shamima Akter Swapna, Associate

Professor, Department of Occupational Therapy, BHPI, CRP. All participants are informed about the purpose and nature of the study.

After knowing the flowing information, participants will decide to participate in the study-

Investigators will receive permission from participants to take part in the study.

- The participant will not be harmed for participating in the study.
- Investigator will be available to answer the participants any questions related to this study.
- Participants are free to decline to answer any question during the interview.
- Investigator will maintain the confidentiality of the participants.
- Participants can withdraw from the study at any time.

I am a participant of this study and is clearly informed about the aim of the study. I am participating willingly in this study. I have the right to withdraw my name from this study at any time and I am not bound to answer anyone for that.

Signature

Participant:	Date
Investigator	Date

Withdrawal from (English version)

Title of the study: Investigating Sleep Preparation, Sleep Participation, and Sleep Quality among Individuals with Spinal Cord Injuries

I _____ confirm that, wish to withdraw all of my data from the study before data analysis has been completed and that none of my data will be included in the study.

Name of the participant: _____

Signature of the participant: _____

Date: _____

**Appendix C:
Questionnaire**

**Bangladesh Health Professions Institute
Department of Occupational Therapy
Research Questionnaire
Spinal Cord Injury Specific- Sleep Preparation, Participation and
Quality Questionnaire**

Section A: General Information

Section A: General Information

1. Age:

2. Gender:

3. Duration of Injury:

4. Level of injury: skeletal level.....

Neurological level.....

5. Types of Spinal Cord Injury: Paraplegia /TetraplegiaReason of spinal cord injury.....

6. Presence of secondary complications: yes/ No.....

Comments.....

7. Current Living Environment:

Home/Hospital/Others.....

8. Current Sleeping Arrangement: Bed/ Hospital bed/ Adjustable bed.....

9. House type: Building/ Tin shed

10. Sleeping in bed with someone: Yes/No, How many people.....

11. Number of family member:

.....

12. Educational status.....13. Occupation:

14. Economic status15 Monthly

income.....

16. Marital status:

17. Sleep medication: Yes/No... If yes, how long

time.....Doses.....

18. SCIM score:

.....

19. Transfer bed in and out alone??

Yes/No.....

20. Adaptive equipment use: Yes/No

21. Caregiver: Yes/No

Section B1: Sleep Preparation

SCALE CODES				
1-Always	2-Sometimes	3-Seldom	4-Rarely	5-Never

SN	Items	Score				
1	I have a preferred bedtime and wake-up time.	1	2	3	4	5
2	I incorporate sleep hygiene activities in my sleep routine, like grooming, oral hygiene.	1	2	3	4	5
3	Before going to bed, toilet hygiene empty bladder /using catheter is mandatory.	1	2	3	4	5
4	I wear loose-fitting clothing before going to sleep.	1	2	3	4	5
5	I make sure my mattress is in good condition that offers the necessary support for restful night sleep.	1	2	3	4	5
6	I prefer my bed clean and tidy.	1	2	3	4	5
7	Preparing a bed net to avoid mosquito bites is	1	2	3	4	5

	imperative for me.					
8	Safety precaution is a part of my regular routine before sleeping.	1	2	3	4	5
9	Medication for general health well-being is a part of my routine before sleep.	1	2	3	4	5
10	I engage in eg, mindfulness, exercise, yoga, and reading before going to sleep.	1	2	3	4	5
11	Dark bedroom and quite environment is imperative before I sleep.	1	2	3	4	5
12	I finish having heavy meal at least 2 hours before to bedtime.	1	2	3	4	5
13	I avoid caffeine, Nicotine, Betel leaf.	1	2	3	4	5
14	I stay adequately hydrated throughout the day, but I limit intake before bedtime.	1	2	3	4	5
15	Avoid using electronic devices at least 30 minutes before to bedtime.	1	2	3	4	5

Section B2: Sleep Participation

SCALE CODES				
1- Strongly Disagree	2-Disagree	3-Neutral	4-Agree	5- Strongly Agree

SN	Items	Score				
1	I maintain a regular sleep schedule.	1	2	3	4	5
2	I find it easy to fall asleep and stay asleep throughout the night without any sleep medication.	1	2	3	4	5
3	I attend to toilet needs and hydration needs at night	1	2	3	4	5
4	I negotiate bedtime routines that work for everyone in my household.	1	2	3	4	5
5	I ensure the comfort and safety of fellow sleepers in my household	1	2	3	4	5

Section B3: Sleep Performance

SCALE CODES				
1- Strongly Disagree	2-Disagree	3-Neutral	4-Agree	5- Strongly Agree

SN	Items	Score				
1	I get an adequate amount of sleep per night for example 6-8hours.	1	2	3	4	5
2	I attend to toilet and hydration needs without excessive disruption to my sleep	1	2	3	4	5
3	I am satisfied with my total sleep time on an average night.	1	2	3	4	5
4	I wake up feeling highly refreshed and well-rested.	1	2	3	4	5
5	I have a positive impact of sleep on my daily life and well-being.	1	2	3	4	5

Section C1: Physical Factors

SCALE CODES			
1= To a great extent	2= To some extent	3= To a minor extent	4= Not at all

SN	Items	Score			
1	How significantly does chronic pain related to your spinal cord injury affect your ability to sleep well?	1	2	3	4
2	To what extent do muscle spasm and stiffness, disrupt your sleep?	1	2	3	4
3	How much do bladder and bowel issues contribute to sleep interruptions?	1	2	3	4
4	How significantly does respiratory dysfunction affect the quality of your sleep?	1	2	3	4
5	How much do pressure sores issues influence your sleep quality?	1	2	3	4
6	To what extent do autonomic dysreflexia contribute to sleep disturbances?	1	2	3	4
7	To what extent does the use of medications to manage SCI-related symptoms affect your sleep quality?	1	2	3	4
8	How much do sensory changes related to your SCI, such as loss of sensation, affect your sleep?	1	2	3	4

Section C2: Psychological Factors

1	To what extent does depression impact your ability to sleep well?	1	2	3	4
2	How significantly does anxiety affect the quality of your sleep?	1	2	3	4
3	To what extent does social isolation influence your sleep patterns?	1	2	3	4
4	How much do relationship challenges affect your sleep quality?	1	2	3	4
5	To what extent do body image issues impact your ability to sleep well?	1	2	3	4
6	How significantly does traumatic stress influence your sleep patterns?	1	2	3	4
7	To what extent does chronic stress affect the quality of your sleep?	1	2	3	4
8	How much does grief and a sense of loss due to SCI affect your sleep quality?	1	2	3	4
9	To what extent do your coping strategies influence your sleep patterns?	1	2	3	4
10	How significantly does limited access to mental health services impact your sleep and emotional well-being?	1	2	3	4

Section C2: Environmental Factors

1	To what extent does noise in your environment (e.g., traffic, neighbors) affect your ability to sleep well?	1	2	3	4
2	How significantly does light pollution (e.g., streetlights, electronic devices) influence the quality of your sleep?	1	2	3	4
3	To what extent does the temperature of your sleep environment (too hot or too cold) affect your sleep comfort?	1	2	3	4
4	To what extent does air quality (allergies, irritants) in your sleeping area impact your sleep comfort?	1	2	3	4
5	How much does discomfort related to your sleeping surface (e.g., mattress) impact your ability to sleep well?	1	2	3	4
6	How much co-sleeping affects your sleep quality?	1	2	3	4
7	To what extent do technological devices (e.g., electronic screens, notifications) in your room affect your sleep patterns?	1	2	3	4

Invitation letter for panel discussion

To

Kamrunnaher Koly

Jr. Consultant OT,

Inpatient unit

Subject: Invitation for Expert Panel Discussion on Research Questionnaire Development

Dear Ma'am,

Assalamualaikum. I hope this letter finds you well. My name is Md. Monjurul Islam, a 4th-year B.Sc. student in Occupational Therapy at Bangladesh Health Professions Institute (BHPI). As part of my course requirements, I am conducting research titled "Investigating the sleep preparation, participation, and sleep performance among individuals with spinal cord injuries."

To ensure the success of the questionnaire development procedure, I am organizing an expert panel discussion meeting. Your valuable expertise would be highly appreciated. The primary objective of this meeting is to ensure content validity, clarity, and cultural sensitivity while refining questions through expert input, preparing the instrument for pilot testing.

Your cooperation in identifying and resolving any inadequate expressions or concepts in the prepared questionnaire is crucial for the greater benefit of Occupational Therapy Service. I kindly request your participation as an unpaid volunteer in this endeavor.

The details of the meeting are as follows:

- Date: 06.11.23

- Time: 2:30-3:30, Venue: BHPI, CRP, Room no: 102

I am confident that your insights will significantly contribute to the content validity of the questionnaire. Your support is highly valued, and I look forward to your positive response.

Best regards,

Md. Monjurul Islam

4th-year BSc in Occupational Therapy,

Bangladesh Health Professions Institute (BHPI)

Signature of supervisor

To

Luthfun Nahar

Lecturer,

Department of occupational therapy, BHPI, CRP

Subject: Invitation for Expert Panel Discussion on Research Questionnaire Development

Dear Ma'am,

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Best regards,

Md. Monjurul Islam

4th-year BSc in Occupational Therapy,

Bangladesh Health Professions Institute (BHPI)

Signature of supervisor

To

Syed Shakawat Hossain

In-charge, Inpatient Unit

CRP, Savar

Subject: Invitation for Expert Panel Discussion on Research Questionnaire Development

Dear Sir,

Assalamualaikum. I hope this letter finds you well. My name is Md. Monjurul Islam, a 4th-year B.Sc. student in Occupational Therapy at Bangladesh Health Professionals Institute (BHPI). As part of my course requirements, I am conducting research titled "Investigating the sleep preparation, participation, and sleep performance among individuals with spinal cord injuries."

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Md. Monjurul Islam

4th-year BSc in Occupational Therapy,

Bangladesh Health Professions Institute (BHPI)

Signature of supervisor

To

Arifa Jahan Ema

Lecturer, Course coordinator-MSc in OT,

Department of occupational therapy,

Subject: Invitation for Expert Panel Discussion on Research Questionnaire Development

Dear Ma'am,

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Best regards,

Md. Monjurul Islam

4th-year BSc in Occupational Therapy,

Bangladesh Health Professions Institute (BHPI)

Signature of supervisor

Appendix D: Supervision Record Sheet

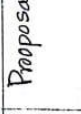
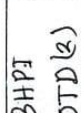
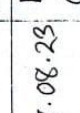
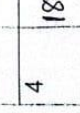
Bangladesh Health Professions Institute
 Department of Occupational Therapy
 4th Year B. Sc in Occupational Therapy
 OT 401 Research Project

Thesis Supervisor- Student Contact; face to face or electronic and guidance record

Title of thesis: Investigating Sleep Preparation, Sleep Participation and Sleep Performance among Individuals with Spinal Cord Injuries:
 A Cross-sectional study

Name of student: Md. Monjurul Islam

Name and designation of thesis supervisor: Sharmila Akter, Associate Professor
 Department of Occupational Therapy, BHPI

Appointment No	Date	Place	Topic of discussion	Duration (Minutes/Hours)	Comments of student	Student's signature	Thesis supervisor signature
1	8.8.23	BHPI OTD (2)	Proposal Method	45 minutes	Instruction to write the method	Monjurul	
2	11.08.23	BHPI OTD (2)	Proposal (Questions)	30 minutes	got clear idea	Monjurul	
3	17.08.23	BHPI OTD (2)	Proposal presentation	20 minutes	Instruction to write the proposal	Monjurul	
4	18.09.23	BHPI OTD (2)	Questionnaire development	1 hour	got clear idea	Monjurul	
5	27.09.23	BHPI	Questionnaire		received o	Monjurul	

		OTD (2)	development	1 hour	Proper guideline		
6	15.10.23	BHPI OTD (2)	Questionnaire discussion	15 minutes	To solve some Issue	Manjural	
7	28.10.23	BHPI OTD (2)	Questionnaire discussion	20 mins	To solve some Issue	Manjural	
8	09.11.23	BHPI OTD (2)	Meeting with expert panel to develop question- naire	1.00 hour	To develop Questionnaire	Manjural	
9	2.12.23	BHPI OTD (2)	Data collection Procedure	2 hours	Gave structured Instruction	Manjural	
10	16.12.23	BHPI OTD (2)	Author Contract and review	1.00 minutes	Helpful for the thesis	Manjural	
11	18.12.23	BHPI OTD (2)	Data Collection guideline Questionnaire discussion	2 hours	got clear idea about Data collection	Manjural	
12	24.12.23	BHPI OTD (2)	Checking Scoring System	1.00 hours	got structured guideline	Manjural	
13	31.12.23	BHPI OTD (2)	Discussion about SPSS and data input	1 hour	Thought about data input	Manjural	
14	20.1.24	BHPI OTD (2)	Feedback on the first draft	2 hours	Learned about my mistake	Manjural	
15	26.01.24	BHPI OTD (2)	Discussion about writing result and conclusion	1.00 hours	got proper guideline	Manjural	
16	28.01.24	BHPI OTD (2)	Feedback on second draft	2 hours	Learned about my mistake	Manjural	

17	10.10.21	BHPI OTD (2)	Instruction about writing up discussion	1 hour	Helpful to solve Some Issue	Maryam
18	11.11.21	BHPI OTD (2)	Feedback of defence presentation	30 minutes	got clear idea about presentation	Maryam
19	12.01.21	BHPI OTD (2)	Discussion about defence feedback	1 hour	Learned about my mistake	Maryam
20	09.06.21	BHPI OTD (2)	Final feedback	1 hour	got a structured feedback	Maryam

Note:

1. Appointment number will cover at least a total of 40 hours; applicable only for face to face contact with the supervisors.
2. Students will require submitting this completed record during submission your final thesis.