Faculty of Medicine

University of Dhaka

Prevalence and Associated Risk Factors of Shoulder Pain Among Wheelchair Basketball Players in Bangladesh

Submitted by:

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Bachelor of Science in Physiotherapy

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Bangladesh Health Professions Institute (BHPI)

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Bangladesh

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We the undersigned, certify that we have carefully read and recommended to the **Faculty of Medicine, University of Dhaka**, for acceptance of this thesis entitled, **"Prevalence and associated risk factors of shoulder pain among wheelchair basketball players in Bangladesh."** Submitted by **Md. Salman Shahriar Shovon,** for the partial fulfillment of the requirements for the degree of Bachelor of Science in Physiotherapy (B.Sc. in PT).

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Decleration

I hereby declare that the research work entitled **"Prevalence and associated risk factors of shoulder pain among wheelchair basketball players in Bangladesh."** has been carried out by me as a part of my academic requirements.

This study is original and has not been submitted in any form to any other university or institution for any degree or diploma. All sources of information and data have been duly acknowledged and referenced.

I also declare that ethical approval was obtained and all participants gave informed consent before taking part in the study.

Signature: _____ Date: _____

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Acknowledgement

I would like to begin by offering my deepest and most sincere gratitude to the Almighty, whose boundless grace, strength, and guidance have illuminated my path and enabled me to bring this research work to its meaningful conclusion. The successful completion of my study, titled **"Prevalence and associated risk factors of shoulder pain among wheelchair basketball players in Bangladesh."** would not have been possible without divine direction and inner resolve.

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ACRONYMS

CRP – Centre for the Rehabilitation of the Paralysed

SPADI – Shoulder Pain and Disability Index

WHO – World Health Organization

BMRC – Bangladesh Medical Research Council

SDG – Sustainable Development Goals

SCI – Spinal Cord Injury

NPRS – Numerical Pain Rating Scale

DASH – Disabilities of the Arm, Shoulder and Hand

CMSKP – Chronic Musculoskeletal Pain

CBP – Chronic Back Pain

CLBP – Chronic Low Back Pain

ISCIPEDS – International Spinal Cord Injury Pain Extended Dataset

EPIC-SCI – Exercise and Pain in Chronic Spinal Cord Injury

ABSTRACT

Background: Wheelchair basketball is increasingly popular in Bangladesh, promoting physical fitness, social inclusion, and mental well-being for individuals with disabilities, but the sport places significant repetitive strain on the shoulders due to propulsion and overhead activities. **Objectives:** This study aimed to determine the prevalence of shoulder pain and identify associated risk factors among Bangladeshi wheelchair basketball players to address the lack of local evidence in adaptive sports health. **Methodology:** A cross-sectional study was conducted with 47 players at the Centre for the Rehabilitation of the Paralysed (CRP), Savar, Dhaka, using convenience sampling, a structured questionnaire, and the validated Shoulder Pain and Disability Index (SPADI) for data collection and assessment. **Results:** The study found that moderate shoulder pain was most common, especially during tasks involving overhead movements like washing, reaching, and dressing. While 66% of participants performed shoulder-strengthening exercises, none used shoulder braces, indicating gaps in awareness or access to preventive measures. Chi-square analysis showed significant associations between gender and daily propulsion hours, education level with both fitted sports wheelchair use and daily propulsion time, and residential area with lack of shoulder strength. **Discussion:** These findings suggest that repetitive strain from sports rather than prior trauma is the main source of shoulder pain, and highlight the urgent need for tailored preventive strategies, better fitted equipment, strengthening programs, and increased awareness among players. Future studies should expand to larger, more diverse samples and include clinical assessments to develop effective, context-specific interventions for protecting musculoskeletal health and performance in wheelchair basketball.

Keywords: *Wheelchair basketball, shoulder pain, risk factors, Bangladesh, adaptive sports, musculoskeletal health*

CHAPTER I INTRODUCTION

1.1 Background

Wheelchair basketball is gaining prominence as a vital adaptable sport worldwide, particularly in Bangladesh, promoting both physical and social inclusion for those with impairments. This activity increases physical health by improving muscle strength, endurance, and cardiovascular fitness, while also alleviating psychological disorders like anxiety and depression, and creating relationships among players (Najafabadi et al., 2023). Reverse integration, where physically fit individuals engage with those with impairments, has demonstrated an improvement in mutual understanding and promotes the development of the sport (Ramsden et al., 2023). The rising popularity of wheelchair basketball in Bangladesh signifies broader initiatives to incorporate individuals with disabilities into mainstream society, in accordance with international obligations to social inclusion as stipulated in the Convention on the Rights of Persons with Disabilities (Schantz, 2018). Wheelchair basketball effectively improves the quality of life and social integration for those with impairments, overcoming participation obstacles and promoting a more inclusive community (Rayes et al., 2022).

Athletes with disabilities have unique physical requirements and health issues, especially with upper limb overuse injuries. Athletes who use wheelchairs and depend on manual propulsion are particularly vulnerable to upper extremity injuries resulting from repetitive pressure on joints, including the shoulder, elbow, and wrist, which can lead to disorders such as subacromial impingement and rotator cuff injuries (Creta and Zucchini, 2018). The incidence of these injuries is intensified by the distinctive biomechanics of wheelchair propulsion, frequently leading to ineffective force delivery and heightened stress on the upper limbs (Creta and Zucchini, 2018). The increasing involvement of impaired athletes in organized sports underscores the necessity for specific injury prevention techniques, as upper extremity injuries are more prevalent in this demographic than lower extremity injuries in ambulatory athletes (Fagher and Lexell, 2014). The absence of targeted research on injury patterns among impaired athletes hinders the formulation of effective preventive strategies (Fagher and Lexell,

2014). Addressing these problems is essential for improving the health and performance of athletes with impairments.

The shoulder is vital for mobility and athletic performance in wheelchair users, since it is crucial for propulsion, maneuvering, and stability in many sports. Shoulder discomfort is notably common in wheelchair athletes, with research showing a prevalence between 14% and 75%, influenced by the specific activity and individual characteristics like overuse and repeated strain (Karasuyama et al., 2022). The distinctive requirements of wheelchair sports result in heightened mechanical stress on the shoulder, leading to a considerable incidence of shoulder issues that can severely affect both athletic performance and daily activities (Hoo, 2019). Age, duration of wheelchair use, and the sports performed significantly increase the risk of shoulder injuries (Hoo, 2019). Therefore, the use of specialized shoulder rehabilitation protocols and appropriate equipment fitting is essential to reduce these hazards and improve performance results for wheelchair athletes (Riley and Callahan, 2019).

Shoulder discomfort profoundly affects quality of life, athletic performance, and autonomy in everyday activities among diverse groups. Studies demonstrate that persons afflicted with Rotator Cuff Syndrome have a reduced quality of life attributed to discomfort and limited mobility, which is associated with decreased physical activity and functional capacity (Tan, Yıkılmaz and Algun, 2024). Community-dwelling older individuals with shoulder pain report increased difficulty in executing daily tasks and have worse physical function relative to their pain-free peers (Davis et al., 2023). In persons with spinal cord injuries, shoulder discomfort is negatively correlated with perceived quality of life and physical activity, underscoring its adverse impact on community engagement and general well-being (Gutierrez et al., 2007). Interventions designed to mitigate shoulder discomfort have demonstrated potential in promoting quality of life and social interactions, indicating that addressing this concern is vital for improving independence and efficacy in everyday activities (Kemp et al., 2011).

Global research reveals a significant incidence of shoulder pain in wheelchair athletes, with prevalence rates between 38% and 76% in particular sports such as wheelchair basketball (Karasuyama et al., 2022), and an overall prevalence of 44% among wheelchair users attributed to musculoskeletal pain (Liampas et al., 2021). Contributors to this discomfort encompass overexertion, inadequate trunk stability, and extended

wheelchair utilization (Karasuyama et al., 2022). Research from several nations, particularly in Europe and North America, underscores the complex characteristics of shoulder ailments, with advancing age and prolonged disability identified as substantial risk factors (Blauwet et al., 2022). Nonetheless, there is a significant deficiency of localized data from Bangladesh, where healthcare access, training resources, and awareness of these issues may vary considerably from those in higher-income nations, highlighting the necessity for focused research to bridge these knowledge gaps and enhance athlete care in this context.

Bangladeshi wheelchair basketball athletes have unique hurdles that profoundly affect their performance and well-being. The restricted availability of physiotherapy is a significant problem, since the profession lacks formal acknowledgment and regulation in Bangladesh, resulting in insufficient rehabilitation treatments for athletes (Mamin and Hayes, 2018). This shortcoming is exacerbated by inadequate training methods, increasing the likelihood of injuries; research shows that upper extremity injuries are common among wheelchair basketball players, with many experiencing acute injuries and overload syndromes (Sá et al., 2022). Additionally, insufficient understanding of injury prevention measures exacerbates the elevated incidence of injuries, as several players may neglect to participate in efficient warm-up or cool-down routines (Afridi et al., 2023). These variables collectively impede players' maximum performance and recovery from injuries, highlighting the necessity for enhanced support mechanisms within Bangladesh's sports infrastructure.

Comprehending the determinants linked to shoulder discomfort in wheelchair athletes is essential for efficient preventative and therapy approaches. Studies demonstrate that factors such the length of wheelchair usage, sport type, training intensity, and personal anatomical variations substantially affect shoulder health. Extended periods of wheelchair use are associated with heightened chances of rotator cuff injuries, with a 6% increase in risk for each year of usage (Pepke et al., 2018). The incidence of shoulder discomfort among wheelchair basketball players was determined to be 36.4%, underscoring the influence of sport-specific activities on shoulder health (Hamid and Hamid, 2022). Factors such as gender, spasticity, and contractures contribute to the likelihood of shoulder discomfort, with females demonstrating increased chances (Bossuyt et al., 2018). Moreover, sustaining a balanced shoulder strengthening regimen is crucial to reducing injury risks linked to overuse and poor posture during sports

endeavors (Hoo, 2019). Therefore, a thorough understanding of these characteristics is essential for formulating targeted interventions to improve shoulder health in this population.

Identifying risk factors is crucial for developing targeted interventions, coaching practices, and rehabilitation programs across various domains. The COACH program illustrates that comprehending risk variables can facilitate the prevention of elder maltreatment by customizing support for caregivers, thereby alleviating stress and strengthening social support networks (Wilber, Gassoumis, and Batista-Malat, 2024). In the realm of student coaching, identifying the physical stresses linked to extended study and inadequate posture might guide the development of interventions to alleviate musculoskeletal diseases, which impact a considerable proportion of students (Santoshi et al., 2019). In athletics, recognizing intrinsic and extrinsic risk factors for stress fractures facilitates the adoption of preventative strategies, including the alteration of training protocols and enhancement of biomechanics (Kasitinon and Argo, 2020). Moreover, in cardiac rehabilitation, recognizing risk factors such as hypertension and obesity might enhance the efficacy of stress management strategies (Ingle and Blumenthal, 2012). Finally, comprehending the stresses encountered by Olympic coaches may guide the development of educational programs that provide them with coping mechanisms, therefore improving their performance and well-being (Loftus et al., 2023). Therefore, a thorough methodology for identifying risk factors can markedly enhance the effectiveness of interventions in these domains.

1.2 Rationale

Shoulder pain is a prevalent and unpleasant concern among wheelchair users, especially those participating in physically intensive sports such as wheelchair basketball. These athletes depend significantly on their upper limbs, resulting in recurrent strain and an elevated risk of overuse injuries and persistent shoulder ailments. In Bangladesh, participation in adapted sports is increasing; nevertheless, research on the health concerns encountered by these athletes remains scarce.

Most of the current research is conducted in high-income nations and may not accurately represent the circumstances of Bangladeshi athletes, who frequently encounter obstacles such as insufficient rehabilitation resources, a scarcity of skilled specialists, and socio-economic limitations. This study seeks to examine the incidence and risk variables associated with shoulder discomfort in wheelchair basketball players in Bangladesh.

The results will educate contextually pertinent preventative and rehabilitation techniques, enhance training safety protocols, and assist physiotherapists, coaches, and policymakers in optimizing athlete care and performance results.

1.3 Research Question

What is the prevalence of shoulder pain and what are the associated risk factors among wheelchair basketball players in Bangladesh?

1.4 Study Objectives

1.4.1 General Objectives

To find the relationship between shoulder pain and its associated risk factors among wheelchair basketball players.

1.4.2 Specific Objectives

- To find out sociodemographic profile of wheelchair basketball players
- To find out risk factors of shoulder injury among wheelchair basketball players.
- To find out Shoulder Pain and Disability among wheelchair basketball players.
- To find out association between sociodemographic information and risk factors of shoulder injury among wheelchair basketball players.
- To find out association between pain severity along with the associated risk factors of shoulder pain among wheelchair basketball players

1.5 Conceptual Framework

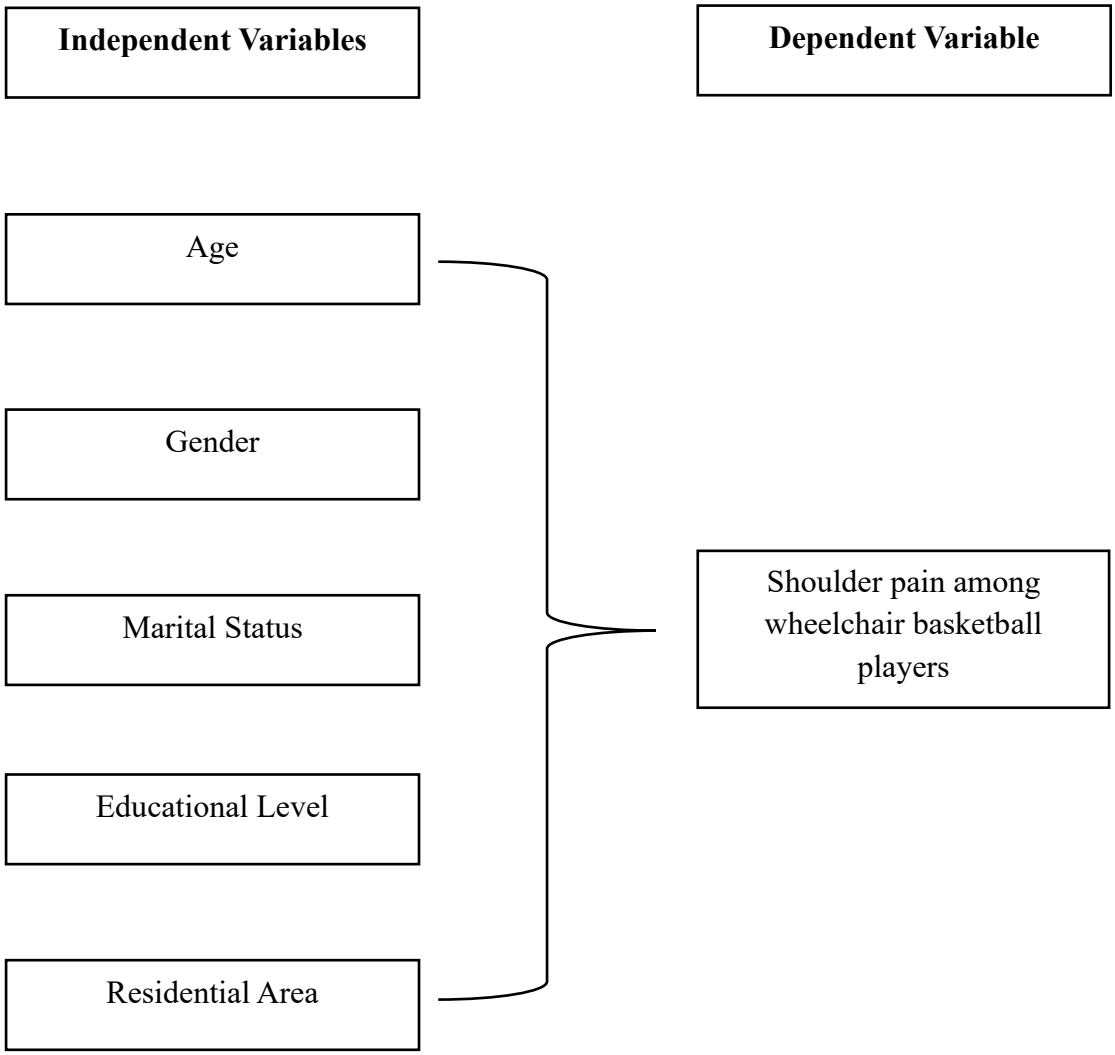

Figure 1: Conceptual Framework

1.6 Operational Definition

Shoulder pain: Shoulder pain manifests as a sharp feeling, sometimes accompanied by an initial acute episode followed by a pain-free interval and subsequent recurrence. This condition impacts athletes during practice, training, or competition, leading to stopping, absence, or alteration of their participation.

Wheelchair: A wheelchair is a wheeled mobility apparatus intended to aid those who cannot walk alone owing to diverse impairments, ailments, or injuries. It generally comprises seats, backrest, and wheels, facilitating effortless navigation around the area.

CHAPTER II LITERATURE REVIEW

Wheelchair basketball is a significantly adapted sport that fosters health, social inclusion, and physical fitness for those with disabilities. It has several advantages, such as enhanced muscle strength, endurance, and cardiovascular health, while also promoting social connections and alleviating anxiety and despair (Najafabadi et al., 2023). Nonetheless, sports provide considerable hazards, especially to the upper extremities, with shoulder injuries frequently occurring due to the repeated and vigorous nature of the associated motions (Karasuyama et al., 2022). Optimal upper limb function is essential for wheelchair athletes, since it directly influences their performance and capacity to perform sport-specific abilities. Rehabilitation treatments, such as kinematic analysis and electromyography, have demonstrated efficacy in improving shoulder function and alleviating pain, highlighting the necessity for focused injury prevention programs (Demeco et al., 2022). The prevalence of shoulder discomfort, ranging from 38% to 75%, highlights the necessity of preserving upper limb health by appropriate exercise and rehabilitation (Karasuyama et al., 2022).

Shoulder health is essential for preserving mobility and performance, especially in athletes, as shoulder injuries can severely hinder functional capacities and overall quality of life. Shoulder discomfort in athletes, particularly in overhead sports, frequently results in functional impairment, hindering their capacity to execute critical actions like throwing or lifting, important for competitive achievement (Cools, 2015). Research demonstrates that persistent shoulder discomfort is significantly associated with heightened disability and reduced health-related quality of life (HRQOL), underscoring the necessity for appropriate management measures (Bimali, Shrestha and Kandel, 2024). In adapted sports like paratriathlon, shoulder discomfort impedes athletic performance and affects everyday activities, highlighting the necessity for early diagnosis and customized rehabilitation strategies (Diaz et al., 2017). Comprehending the ramifications of shoulder discomfort in athletic environments is crucial for formulating preventative strategies and rehabilitation regimens that can improve athletes' performance and preserve their mobility (Anwer et al., 2018).

Shoulder pain is a common concern among wheelchair users, with research demonstrating a broad spectrum of occurrence rates worldwide. Comprehensive

research indicated that over 44% of wheelchair users suffer from shoulder pain, with a combined prevalence of musculoskeletal pain reaching 50% (Liampas et al., 2021). Research indicates that the prevalence of shoulder pain in people with spinal cord injuries ranges from 30% to 70% (Essi et al., 2012). Research in Pakistan revealed a significant incidence of shoulder pain at 78% among manual wheelchair users (Muhammad et al., 2022). A survey of patients with paraplegia indicated that 61% experienced shoulder pain (Kentar et al., 2018). Shoulder symptoms among wheelchair athletes varied from 16% to 76%, underscoring the multifaceted character of this problem (Heyward et al., 2017). These findings highlight the considerable burden of shoulder discomfort in this group, requiring focused therapeutic techniques.

Research indicates significant differences between athletes and non-athletes across various domains, including personality traits, physiological metrics, motivation, cognitive abilities, and balance. Athletes demonstrate elevated extraversion and conscientiousness, while exhibiting diminished emotionality and receptivity to new experiences relative to non-athletes (Zubić and Milenković, 2024). Athletes have enhanced lipid profiles, characterized by less total cholesterol and triglycerides, which are associated with a lower risk of cardiovascular disease (Chaterjee et al., 2024). Elite athletes exhibit heightened accomplishment drive and perseverance in surmounting failures (Prasetiyo, Setyawan, and Synthiawati, 2023). Cognitive disparities are apparent, as athletes exhibit superior accuracy in perceiving durations of indicated motion compared to non-athletes, indicating improved temporal perception resulting from training (Zheng, 2024). Ultimately, balance evaluations indicate that female athletes have a postural control pattern marked by more extensive although less frequent movements in comparison to non-athletes (Leske and Murphy, 2023). These data collectively highlight the diverse benefits players have over non-athletes.

Global research on adapted sports, including wheelchair basketball, underscores the substantial physical, psychological, and social advantages for those with impairments, particularly those with spinal cord injuries (SCI). These sports have developed to incorporate virtual alternatives and E-sports, particularly following COVID-19, and are being scrutinized for injury prevention, including concussion care (Rayes et al., 2022). Research on elite female wheelchair basketball athletes demonstrated a significant incidence of deep tissue injuries (DTIs), especially in individuals with central nervous system disorders (CNSd) and those who utilize wheelchairs on a daily basis,

highlighting the necessity for focused injury prevention measures (Shimizu et al., 2017). Individuals with spinal cord injury (SCI) exhibit significant prevalence of chronic musculoskeletal pain (CMSKP), chronic back pain (CBP), and chronic low back pain (CLBP), with prevalence rates of 49% for CMSKP and CLBP, and 47% for CBP (Michailidou et al., 2014). The ISCIPEDS offers a thorough framework for evaluating and treating pain in persons with spinal cord injury, highlighting the significance of recognizing pain kinds, sensory abnormalities, and psychosocial aspects (Widerström-Noga et al., 2016). The EPIC-SCI study seeks to investigate the effects of exercise on chronic pain within the SCI population, indicating that organized exercise regimens may relieve pain symptoms (Mulroy, 2020). While adaptive sports have several advantages, the incidence of pain and injuries in athletes with spinal cord injury requires continuous study and customized therapies to improve their health and performance.

Sport-specific actions, including propulsion, shooting, and passing, profoundly influence shoulder biomechanics and health, especially in athletes. The shoulder joint's broad range of motion, although beneficial, renders it susceptible to injuries due to the significant strain on its supporting components during repetitive activities prevalent in sports such as tennis, basketball, and swimming (Muccioli et al., 2020). Wheelchair basketball players have shoulder pain because to the repeated nature of propulsion, which entails intricate muscle synergies that may result in overuse problems (Tamura et al., 2024). Moreover, sports such as running and dribbling in wheelchair basketball substantially elevate shoulder strain, underscoring the necessity for meticulous preparation to reduce injury risk (Chénier et al., 2022). The asymmetrical characteristics of tennis strokes may result in muscle imbalances, causing contralateral asymmetries and possible injuries (Brito et al., 2022). Therefore, comprehending these motions is essential for formulating successful training and rehabilitation techniques.

Biomechanical considerations substantially affect the health and performance of wheelchair users, especially in relation to overuse, repetitive motion, and trunk control. Elevated loads during wheelchair propulsion may result in upper extremity injuries, with shoulder discomfort being a common concern among athletes, attributable to variables such as overuse and insufficient trunk stability (Hoo, 2019). The kind and fit of the wheelchair, whether manual or sports-specific, are essential in alleviating these dangers; appropriate ergonomic modifications can improve propulsion efficiency and

diminish muscular fatigue, especially on sloped terrain (Cooper, Cooper and Susmarski, 2018). The propulsion mode—synchronous or asynchronous—impacts biomechanical loading and performance, underscoring the necessity for customized wheelchair designs that meet specific user requirements and sports objectives (Astier et al., 2019). Therefore, a thorough understanding of these elements is crucial for enhancing wheelchair design and user results.

The training and playing practices of athletes, including duration, frequency, and the lack of warm-up or cool-down procedures, substantially affect the chance of injury. Research demonstrates that elevated training volumes are associated with heightened injury rates, especially in juvenile sports, where players exercising 7-14 hours per week experienced more injuries than their counterparts training less (Ristolainen et al., 2019). Moreover, earlier injuries increase the probability of future injuries, as kids with previous injuries exhibit a 64% heightened risk of later injuries (Räisänen et al., 2022). Demographic characteristics, including age and gender, influence injury susceptibility; for example, female athletes have a higher vulnerability to injuries compared to their male counterparts (Räisänen et al., 2022). Moreover, wheelchair athletes aged 21-30 exhibited a greater prevalence of injuries, underscoring the necessity for customized training and injury prevention measures for various demographics (Curtis & Dillon, 1985). Comprehending these elements can enhance training protocols and diminish injury rates across diverse athletic environments (Huang et al., 2025).

Limited access to rehabilitation services, lack of sports medicine support, cultural stigma, and economic constraints significantly hinder participation in sports and healthcare, particularly in low- and middle-income countries (LMICs). A significant proportion of people with disabilities encounter obstacles like financial limitations, insufficient healthcare resources, and geographical inaccessibility, which combined hinder their access to essential rehabilitative treatment (Hillaker et al., 2024). Cultural attitudes and stigma associated with disabilities further intensify these problems, hindering community engagement and participation in sports (Hillaker et al., 2024). Economic variables significantly influence sports participation, since lower socioeconomic level is associated with less engagement in sports and restricted access to facilities, hence reinforcing social inequities (Kuhn et al., 2021). It is crucial to tackle these complex obstacles via community-based rehabilitation programs and inclusive

sports efforts to ensure equal access to health and sports opportunities (Hillaker et al., 2024).

The Shoulder Pain and Disability Index (SPADI) is a validated and reliable questionnaire specifically designed to assess shoulder pain and related disability, making it a crucial tool in both clinical and research settings. Research has shown strong internal consistency, with Cronbach's alpha values between 0.82 and 0.97 across diverse groups, and significant test-retest reliability, reflecting its temporal stability (Venturin et al., 2023). The SPADI has demonstrated substantial relationships with other validated measures, including the Disabilities of the Arm, Shoulder, and Hand (DASH) and the Visual Analogue Scale (VAS), hence reinforcing its construct validity (Rahman et al., 2022). Additional instruments, such as the Numerical Pain Rating Scale (NPRS) and the 36-item Short Form Health Survey (SF-36), have been employed with SPADI to deliver a thorough evaluation of shoulder disorders (Venturin et al., 2023). The SPADI's strong psychometric qualities provide it a vital tool for assessing shoulder pain and impairment in various groups.

The Shoulder Pain and Disability Index (SPADI) is especially appropriate for populations with shoulder pain problems, such as frozen shoulder, owing to its established validity and reliability across several cultural modifications, including the Indonesian version. Research indicates that the SPADI accurately assesses pain and disability, demonstrating strong test-retest reliability (ICC values of 0.986 and 0.99) and exceptional internal consistency (Cronbach's alpha values of 0.935 and 0.95) among Indonesian patients (Deviandri et al., 2025). Moreover, the construct validity of the SPADI has been substantiated by connections with other recognized health assessments, demonstrating its efficacy in clinical environments (Deviandri et al., 2025). Its versatility across many demographics, demonstrated by successful translations and validations in Spanish and Dutch contexts, further substantiates its extensive usefulness in evaluating shoulder-related problems (Luque-Suarez et al., 2016). Consequently, the SPADI functions as an effective instrument for assessing shoulder pain and disability, rendering it an optimal selection for various patient demographics.

Research indicates a significant gap in health-related studies from Bangladesh and South Asia, particularly when compared to high-income countries. Smoking-related

mortality is anticipated to increase in Bangladesh; however, thorough data on its effects is scarce, as current research predominantly examines male smokers due to the lower incidence among females (Alam et al., 2013). The incidence of non-communicable diseases (NCDs) such as hypertension and diabetes is increasing, although the comprehension of these ailments in resource-limited environments like Bangladesh remains under investigated (Harshfield et al., 2015). The 2011 Bangladesh Demographic and Health Survey underscored socioeconomic differences in health outcomes; however, further longitudinal research is required to comprehensively understand the changing health landscape in this area (Harshfield et al., 2015). The lack of data from Bangladesh highlights the necessity for more research to guide public health efforts in South Asia (Alam et al., 2013).

Research on wheelchair basketball players, especially in poor nations, is scarce, underscoring a notable deficiency in comprehending the distinct problems encountered by these sportsmen. For example, although the necessity for suitable wheelchair technology is paramount, fewer than 1% of the 20 million individuals in developing countries who require wheelchairs have access to them, highlighting the significance of local manufacturing and community engagement in meeting these demands (Kim and Mulholland, 1999). Moreover, contextual risk factors, including cultural and socioeconomic obstacles, profoundly influence participation and performance in disability sports, as demonstrated by the overarching challenges for rights and access in low-income environments (Swartz, 2022). Moreover, the incidence of injuries among wheelchair basketball athletes, especially in professional leagues, highlights the imperative for customized preventative techniques that address the distinct injury processes and the absence of protective gear (Mahmoudkhani et al., 2023). This complex issue necessitates focused study to improve comprehension and assistance for wheelchair basketball players in these areas.

CHAPTER III METHODOLOGY

3.1 Study design:

The researcher conduct a cross-sectional study for the investigation. In this study a cross sectional study design was used to find out shoulder pain and its associated risk factors among wheelchair basketball players. This study design was appropriate to find out the objectives. The data was collected at the same time or within a short time. A cross-sectional design gives a snapshot of the study's variables at a certain point in time.

3.2 Study site:

Data was collected at the CRP, Savar, Dhaka by the researcher. This study was conducted on wheelchair basketball players with shoulder pain at the Centre for the Rehabilitation of the Paralysed (CRP), Savar, Dhaka. The players showed no difficulty in providing information to the researcher.

3.3 Study population:

The population was the total group, set of events of the observation on which a study is conducted. The researcher was interested in the population to whom they aimed to generalize the study's findings. The study's sample population consisted of wheelchair basketball players from Bangladesh.

3.4 Sampling technique:

The convenience sampling method was used to choose the sample for this study. A convenience sample was a collection of people who (conveniently) meet the criteria for the study.

3.5 Sample size:

Here,

$$n = \frac{z^2 \mathrm{pq}}{d^2}$$

$$= \frac{(1.96)^2 \times 0.5 \times (1 - 0.5)}{(0.05)^2}$$

$$= \frac{0.9604}{(0.05)^2}$$

$$= 384$$

Where,

n = Sample size

z = linked to 95% confidence interval (use 1.96)

p = expected prevalence,

= 0.5 (Macfarlane, 1997).

q = 1- p (expected non-prevalence)

d = margin of error at 5% (standard value of 0.05)

3.6 Inclusion criteria:

I. Wheelchair basketball players with shoulder pain
II. Participants who were 15 and above
III. Both male and female
IV. Participants played willingly.

3.7 Exclusion criteria:

I. Individuals who are below the age of 15
II. Players who do not want to participate in this study
III. Players with any history of pain due to external injury
IV. Players with a history of mental retardation.

3.8 Outcome measurement Tool:

SPADI:

The Shoulder Pain and Disability Index (SPADI), developed by Roach et al. (1991), serves as a self-administered instrument for assessing pain and functional impairment associated with shoulder disorders. The Shoulder Pain and Disability Index (SPADI) is a validated, self-reported questionnaire intended to assess shoulder pain and functional limitations. It consists of two subscales: pain (5 items) and disability (8 items), both evaluated on a 10 cm visual analogue scale. Patients report the intensity of their discomfort, and the degree of difficulty encountered in daily activities affecting the shoulder. Scores are transformed into percentages and averaged to get a total score that spans from 0 (indicating no pain/disability) to 100 (representing greatest pain/disability). SPADI is straightforward, requiring around 5–10 minutes to complete, and is extensively utilized in both clinical and research contexts to evaluate shoulder-related outcomes.

3.9 Data collection tools:

A consent form, self-structure questionnaire, pen, pencils, white paper, approved forms and consent forms, clip board and a bag for storing these tools.

3.10 Data collection procedure:

The participant retains the choice to decline to answer any question while completing the questionnaire, as indicated by the researcher at the commencement of the study. They were permitted to exit the research at their convenience. The researcher clearly communicated the study's goal to all participants. Participants were assured that their personal information would remain confidential. The researcher acquired the consent of each volunteer participant using a signed consent form. Upon the participants' consent, a standardized questionnaire was employed to ascertain the complaint and collect demographic information. The format of the questions was in Bangla. The interview was conducted in person, with questions provided by the researcher. Only physical circumstances were considered. To ensure the interviewee sustained enough focus, distracting stimuli were eliminated. The interviewee was, if possible, questioned in isolation with their agreement, as close relatives may occasionally influence their

responses. Throughout the interview, the researcher cultivated a rapport and elucidated her inquiries. The most effective approach for ensuring participants' complete participation in a survey is through face-to-face interviews. In-person interviews were similarly effective at delineating demographic characteristics. In-person interviews were done to collect specific information that would be used to characterize the demographic in question. To ensure that patients completely comprehend the questions and offer accurate responses, the inquiries were periodically articulated in the participants' native language, contingent upon their level of understanding. The researcher independently gathered the data to avoid errors.

3.11 Ethical consideration:

As per the rules, the study plan was sent to the BHPI review board for approval. This study strictly followed the rules set by the World Health Organisation (WHO) and the Bangladesh Medical Research Council (BMRC). For the study to be done, permission was asked from the person in charge of the Physiotherapy department at CRP. Before the interviews began, each participant signed a written consent form (appendix) and was told about the purpose of the study, their right to not answer any questions, their ability to leave the study at any time, and other things that were written on the form. The people who took part were told very clearly that their information would be kept private and safe. The person should be told that his or her name or address will not be shared. The participants will also be told that the outcome of the study won't hurt them in any way.

3.12 Informed consent:

In this research, consent forms were given to potential participants after they verbally agreed to participate in the study and understood its objectives. They were informed that their participation was entirely up to them and that they might revoke it at any time. Additionally, they were informed that privacy would be respected. Though they won't be named, information may be published in any writing or presentations. The findings of the study might not directly benefit them, but they had positive consequences on the population of physiotherapists.

CHAPTER IV RESULTS

This research involved questioning 47 participants who were wheelchair basketball players. The results were presented in various bar charts, pie charts, and tables.

Table 1: Socio-demographic characteristics of the participants

SL No.	Variable	Percentage(%)/Frequency(n)
1.	**Age**	15-25 years= 31.9% (n=15) 26-35 years= 59.6% (n=28) Above 36 years= 8.5% (n=4)
2.	**Gender**	Male= 87% (n=41) Female= 13% (n=6)
3.	**Marital Status**	Married= 55% (n=26) Unmarried= 45% (n=21)
4.	**Educational Level**	Primary Level= 38.30% (n=18) Secondary Level= 51.06% (n=24) Higher Secondary Level= 4.26% (n=4) Undergraduate/Graduate= 6.38% (n=3)
5.	**Residential Area**	Rural= 12.8% (n=6) Semi Urban= 76.6% (n=36) Urban= 10.6% (n=5)

The majority of participants 59.6% (n=28) were aged between 26–35 years. About 31.9% (n=15) were 15–25 years old, and only 8.5% (n=4) were above 36.

Most participants were male 87% (n=41), while females made up 13% (n=6).

Slightly more than half 55% (n=26) were married; 45% (n=21) were unmarried.

Most had secondary education 51.06% (n=24), followed by primary level 38.30% (n=18). A small number had higher secondary 4.26% (n=4) and undergraduate/graduate education 6.38% (n=3).

The majority lived in semi-urban areas 76.6% (n=36), while 12.8% (n=6) lived in rural and 10.6% (n=5) in urban areas.

4.1 Socio- demographic characteristic

4.1.1 Age(n=47)

Among the 47 players, the maximum players were between the 26-35 age range 59.6%(n=28), age range 15-25 were 15%(n=15) and age range above 36 were 8.5%(n=4).

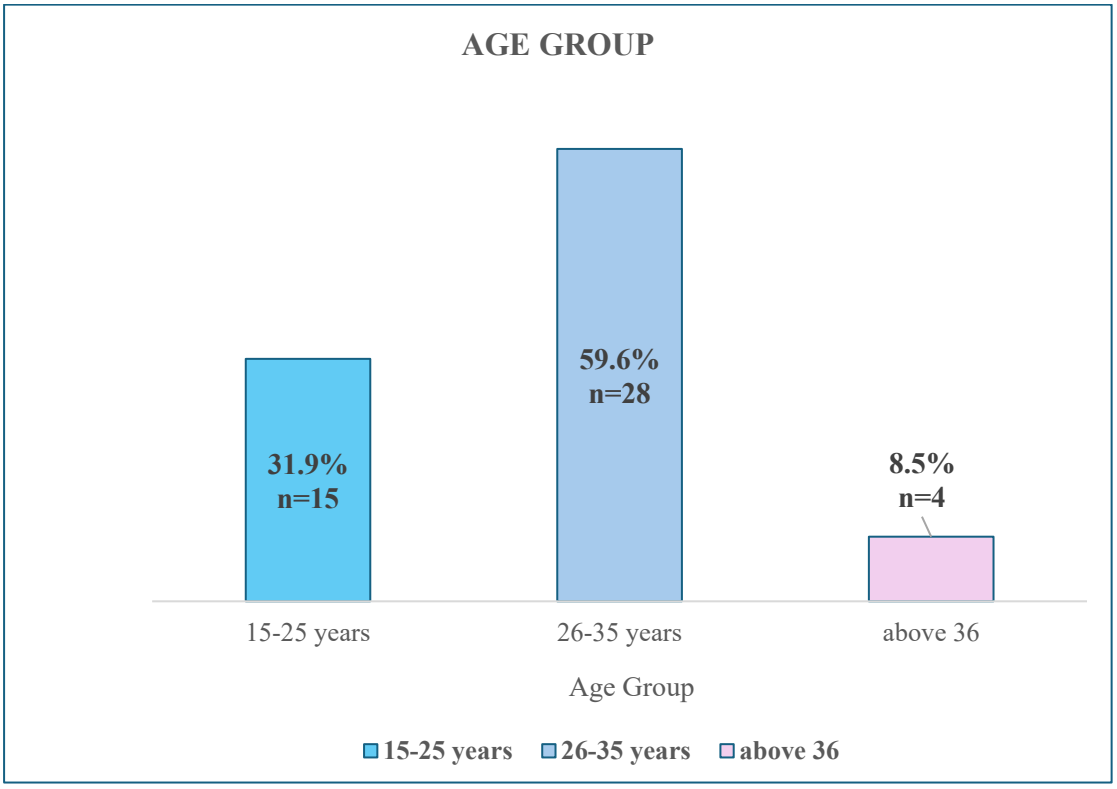

Figure 2: Age range of the participants

4.1.2 Gender(n=47)

Male was predominantly higher than female. In players (n=47) male were 87%(n=41) and female were 13%(n=6).

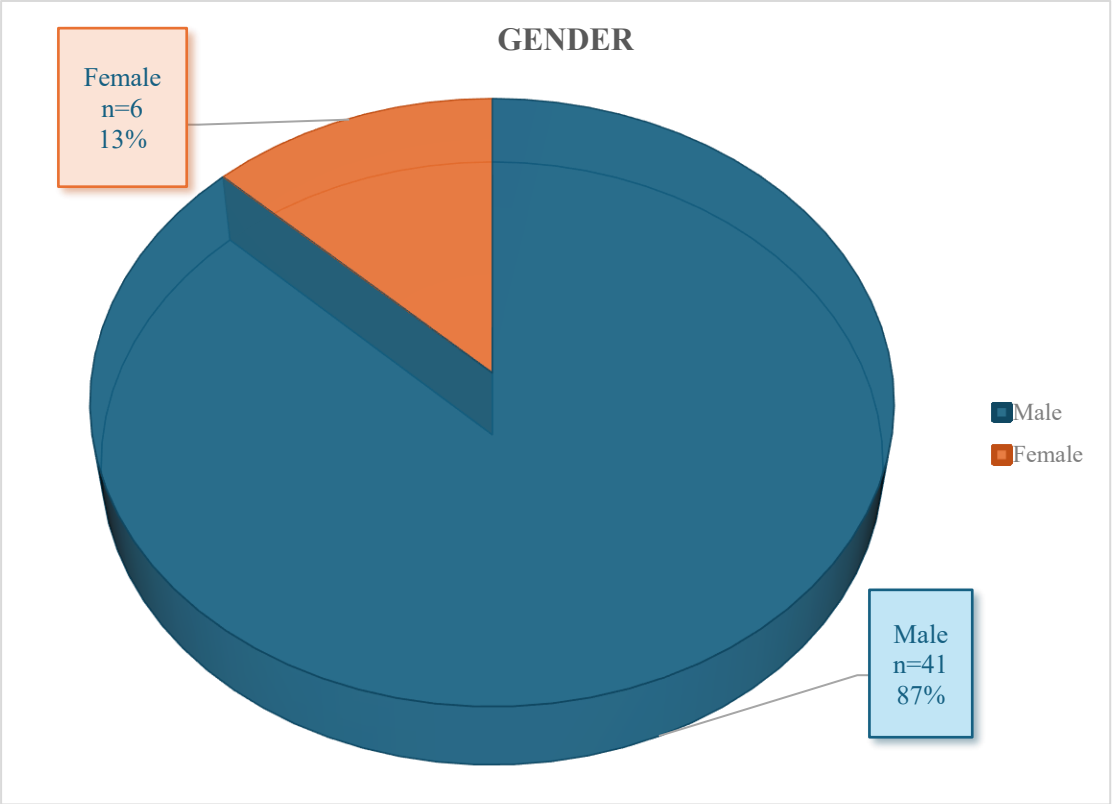

Figure 3: Gender range of the participants

4.1.3 Marital status(n=47)

Among the players (n=47), married were 55%(n=26) and unmarried were 45%(n=21).

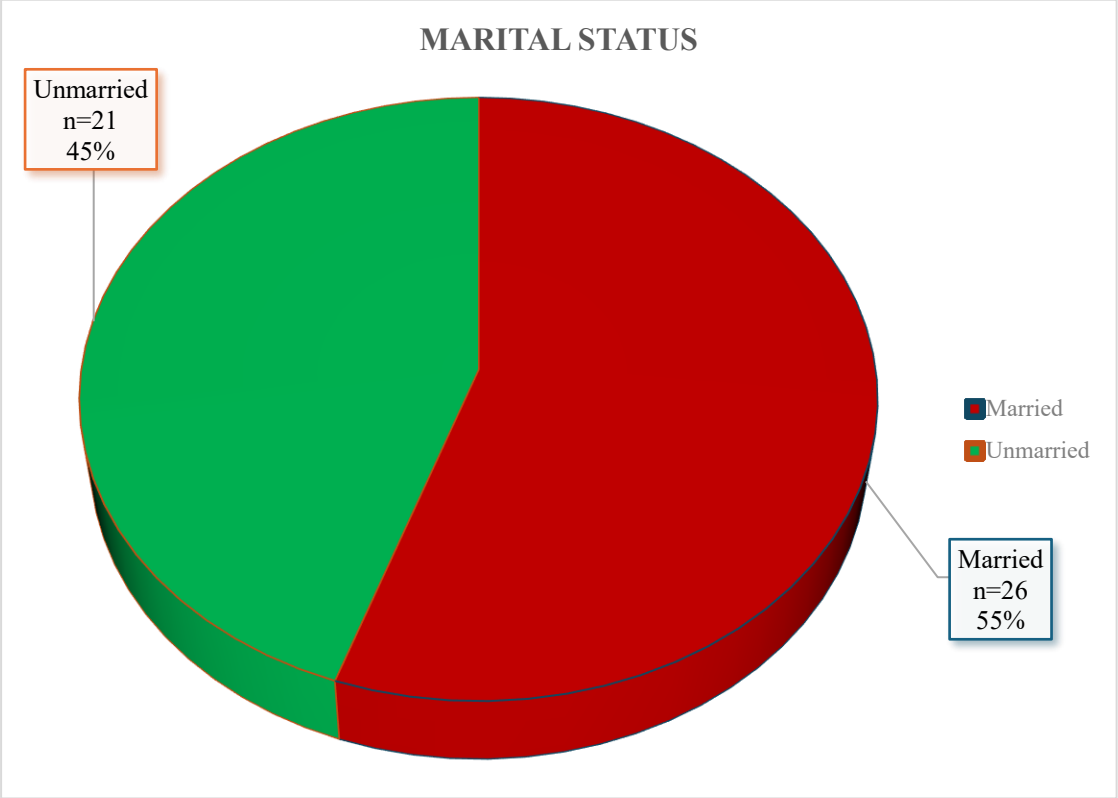

Figure 4: Marital status of the participants

4.1.4 Educational status(n=47)

Among the players (n=47), 38.30% (n=18) completed primary education, 51.06%(n=24) completed Secondary School Certificate which is the maximum in number, 4.26%(n=2) completed higher secondary level education, 6.38%(n=3) were completed undergraduate/graduate degree.

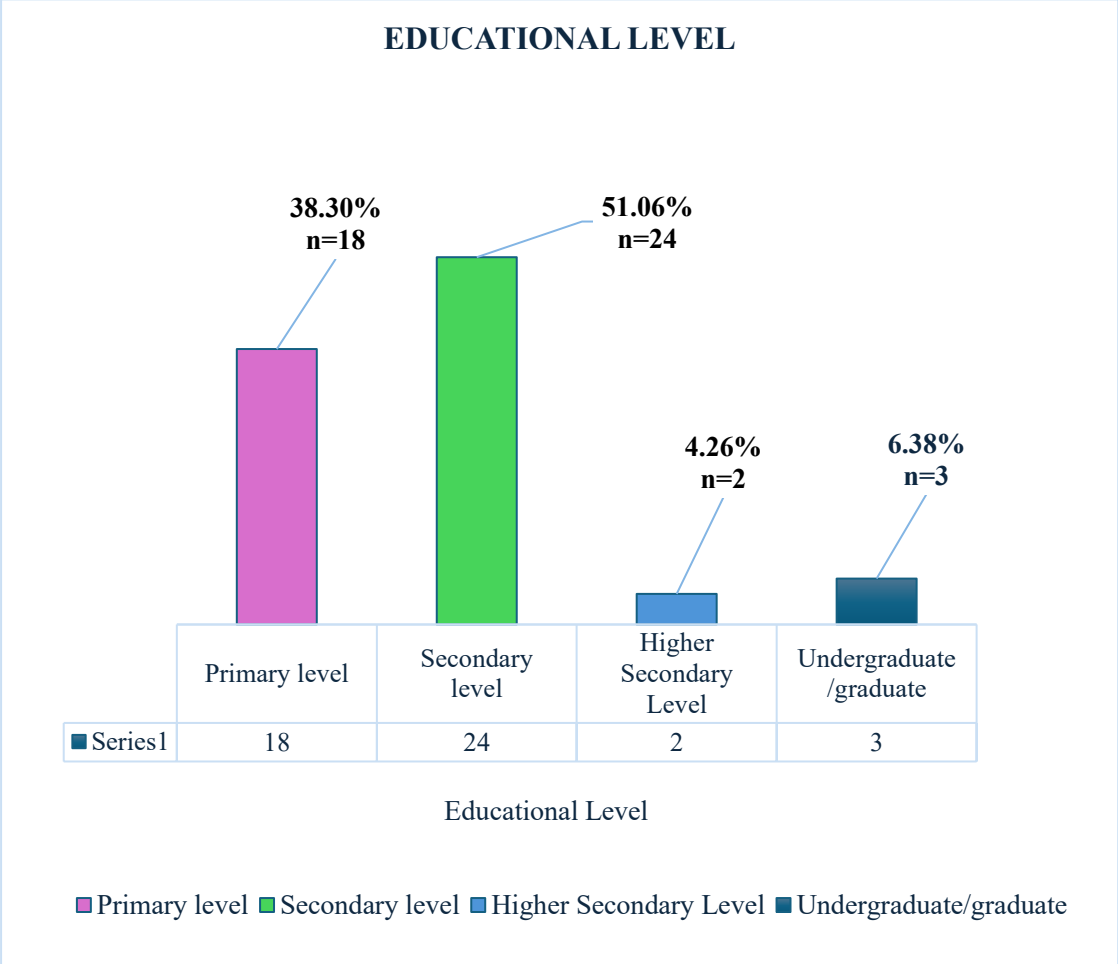

Figure 5: Educational level of the participants

4.1.5 Residential area(n=110)

Most of the respondents who were playing wheelchair basketball were from semi urban areas. In players(n=47), from rural were 12.8%(n=6), from semi urban areas were 76.6%(n=36) and from urban were 10.6%(n=5).

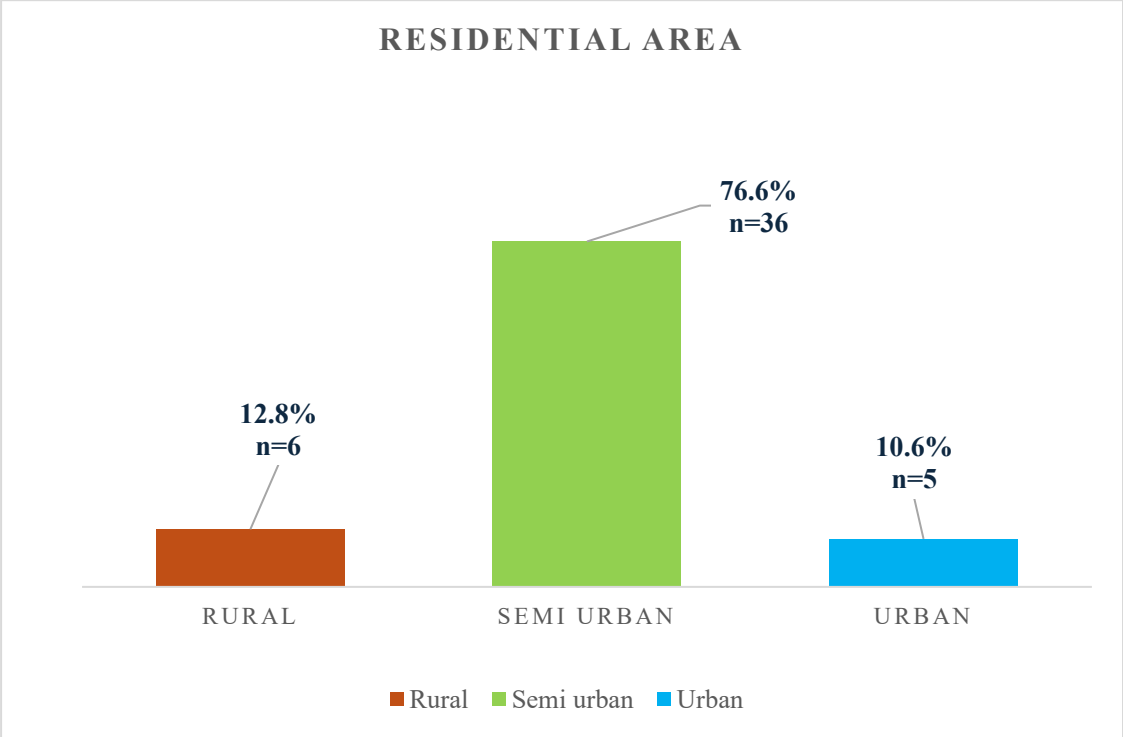

Figure 6: Residential Area of the participants

4.2 Risk factors:

4.2.1 Shoulder Injury Before Playing

All participants 100% (n = 47) acknowledged no prior shoulder injuries before initiating wheelchair basketball.

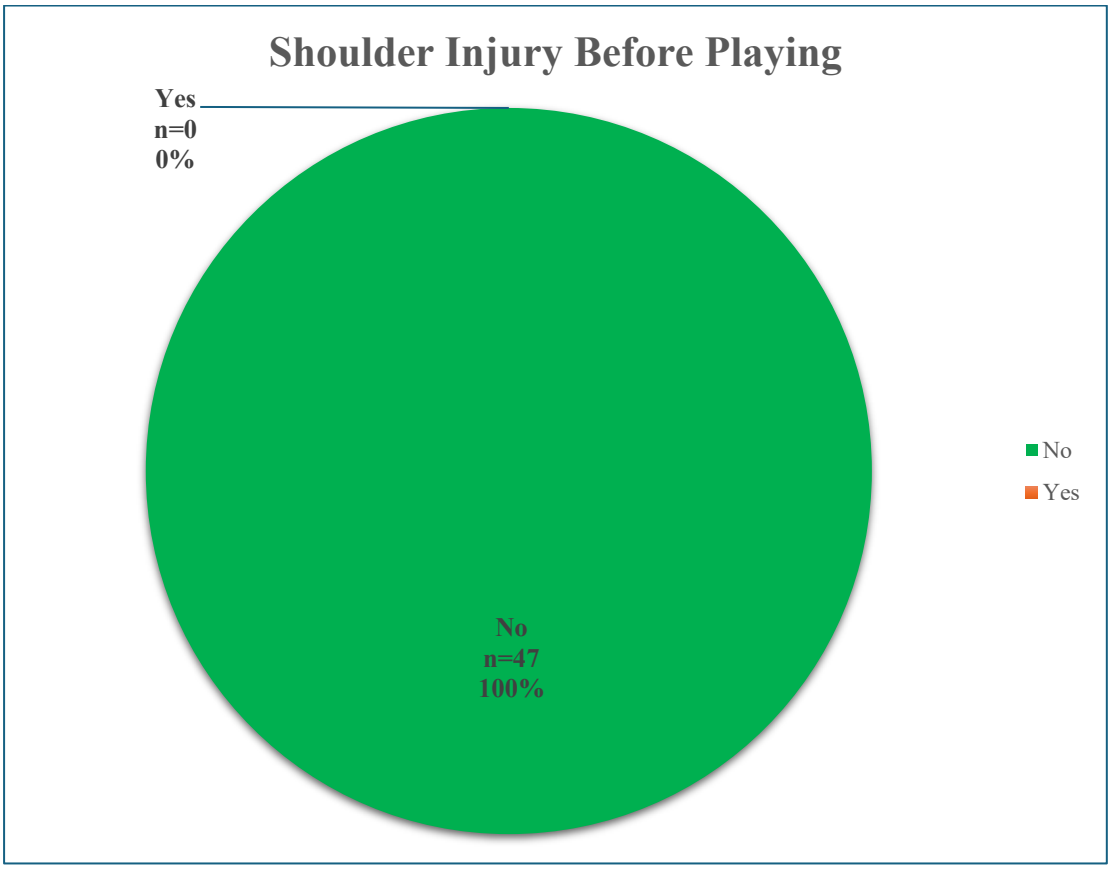

Figure 7: Shoulder Injury Before Playing

4.2.2 Type of Wheelchair

All participants 100% (n=47) use manual wheelchairs. This indicates that all wheelchair basketball players in the research used only manual wheelchairs, which may be a relevant aspect in evaluating shoulder discomfort and related dangers.

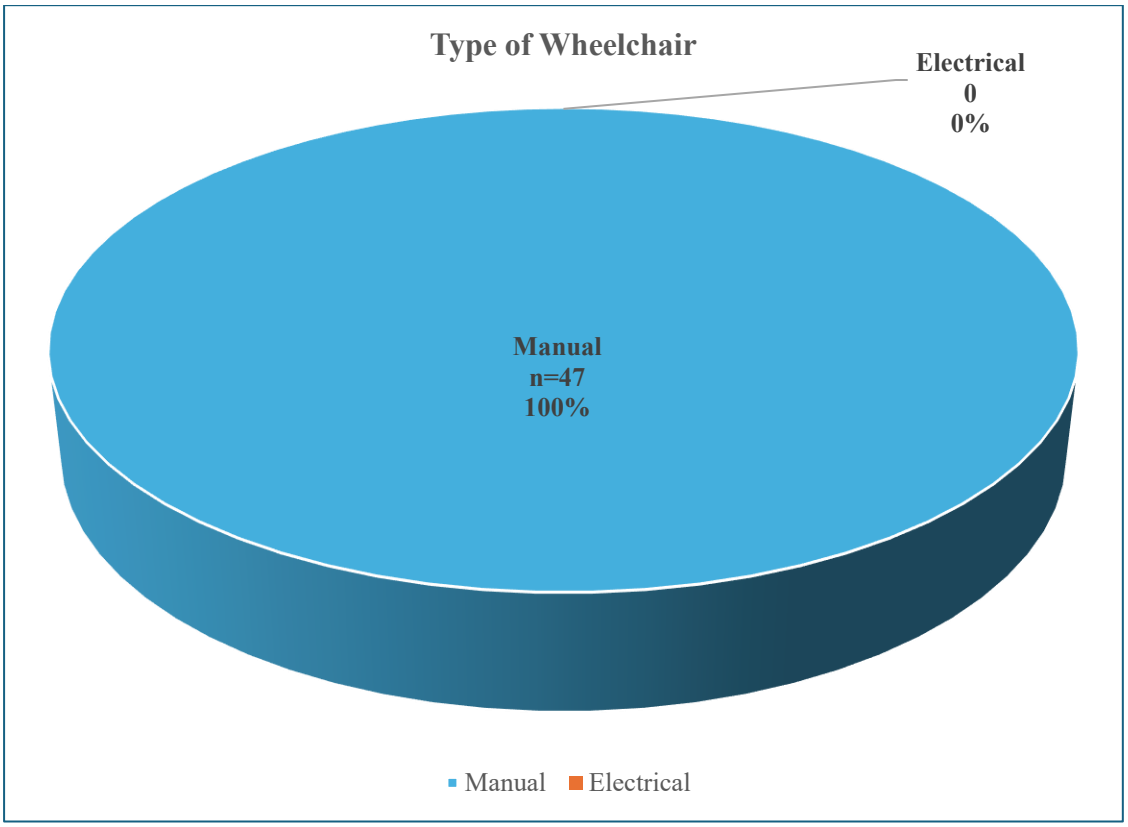

Figure 8: Type of Wheelchair

4.2.3 Fitted Regular Wheelchair

76.6% (n=36) used a custom wheelchair. 23.4% (n=11) used an unfitted wheelchair. Most people use customized or properly adjusted wheelchairs, however around 25% use non-ergonomic wheelchairs, which increases shoulder strain and injury risk.

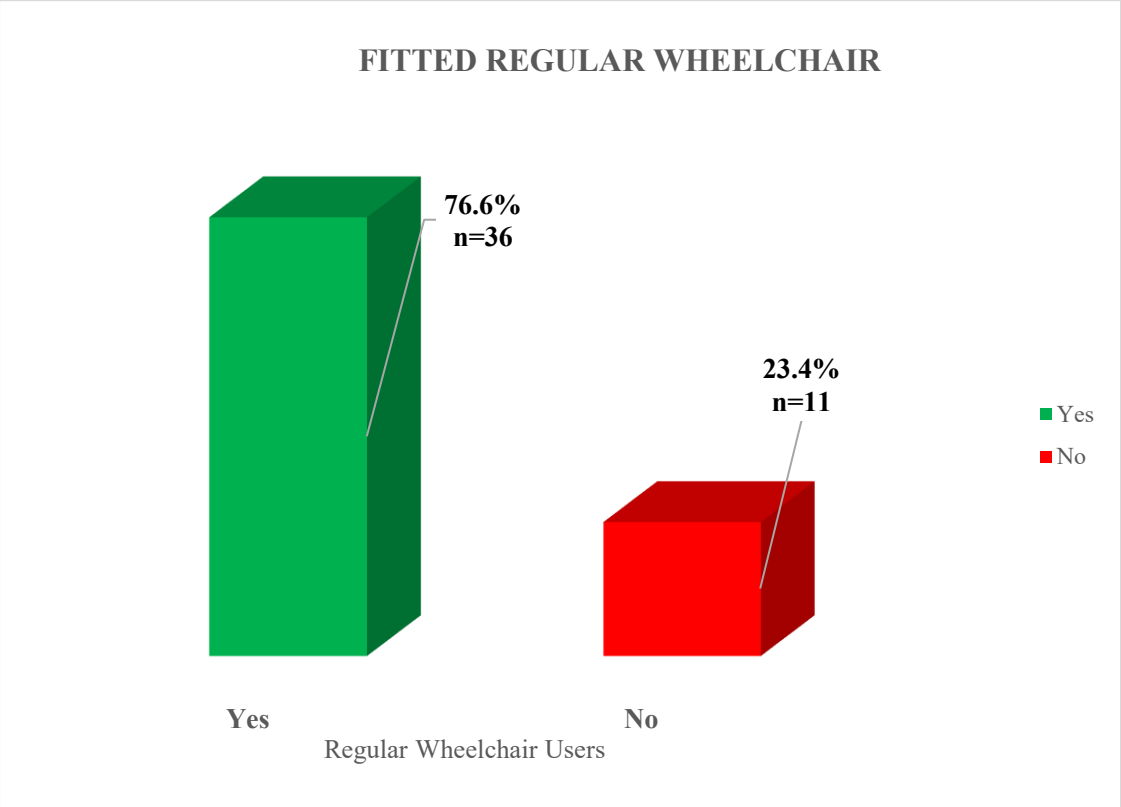

Figure 9: Fitted Regular Wheelchair

4.2.4 Fitted Sports Wheelchair

A significant majority of sports wheelchair users 89.4%(n=42) utilize a customized sports wheelchair, while a minor percentage 10.6%(n=5) do not.

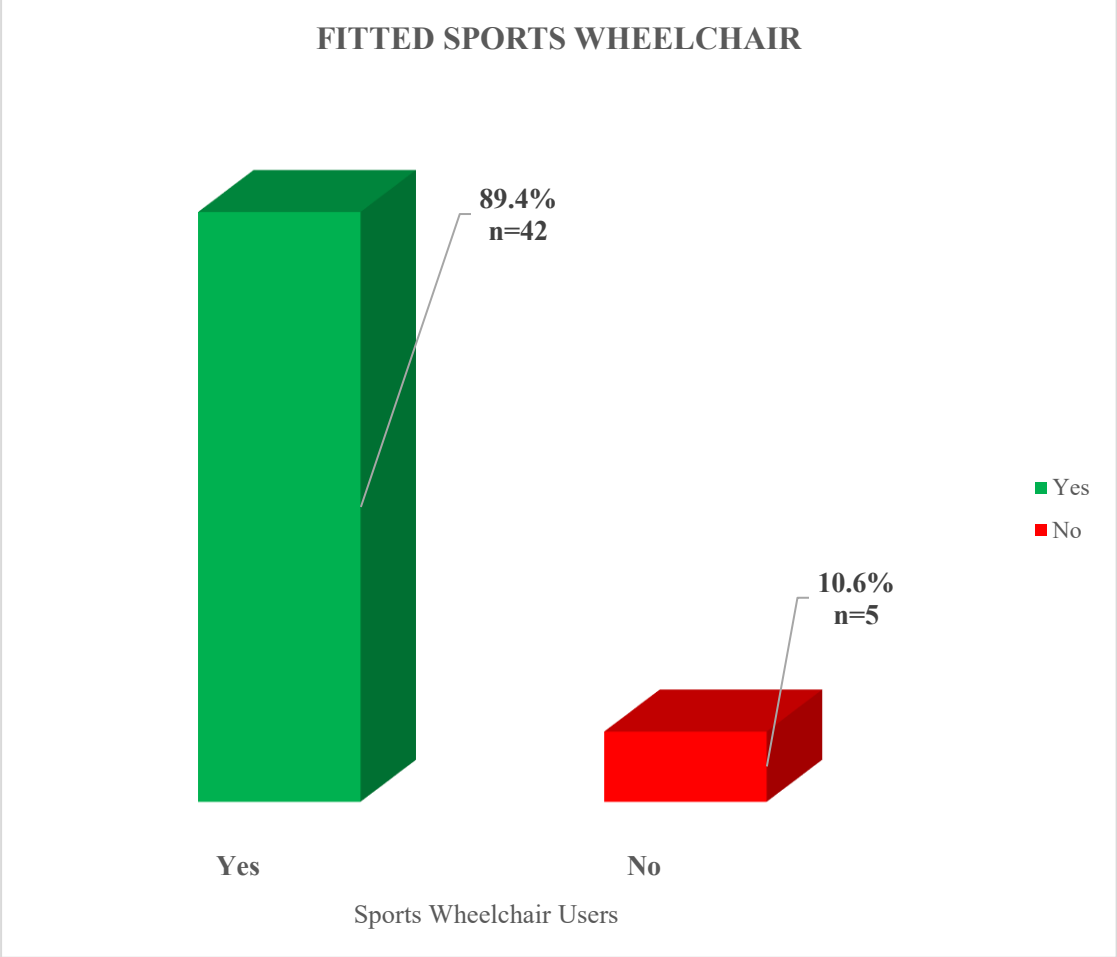

Figure 10: Fitted Sports Wheelchair

4.2.5 Daily hours of propelling

Daily propelling hours indicates that 48.94%(n=23) of wheelchair users propel for over 6 hours and 40.43%(n=19) for 3–5 hours. Only 10.64%(n=5) propel under 2 hours. This signifies that most users depend significantly on their wheelchairs for daily movement. Prolonged use may strain the upper limbs, especially the shoulders, causing tiredness or overuse issues.

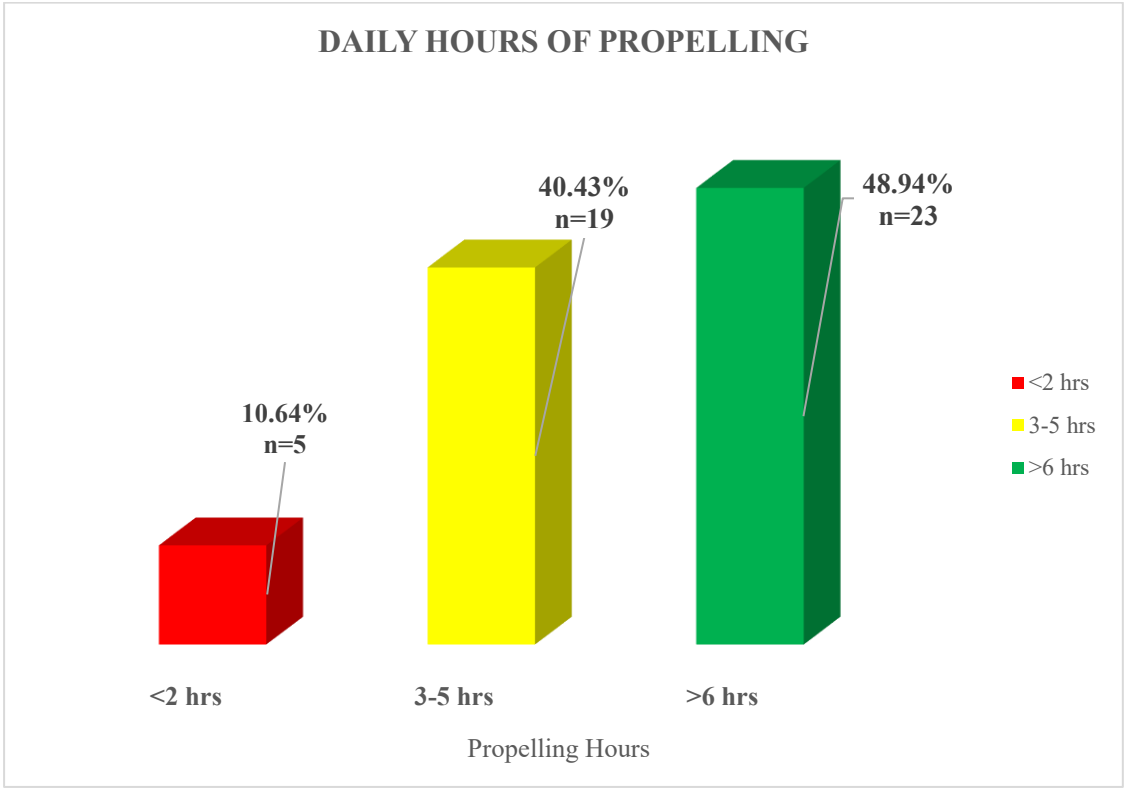

Figure 11: Daily hours of propelling

4.2.6 Uses Shoulder Brace

The data indicates that no sports wheelchair users (0%) utilize a shoulder brace, whilst 100% (n=47) reported not employing one. This signifies a total lack of shoulder brace use among the participants, beyond the risk of significant shoulder strain from prolonged propelling durations. This may indicate a deficiency in understanding, accessibility, or perceived necessity for shoulder support among this demographic.

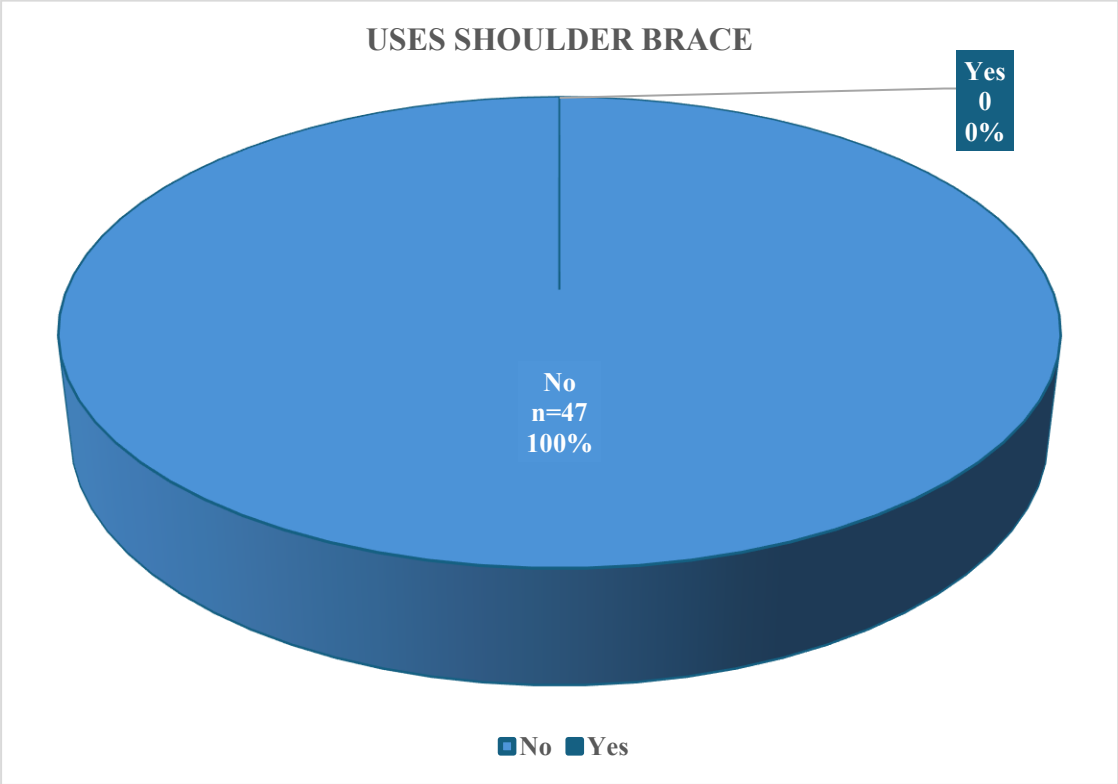

Figure 12: Uses Shoulder Brace

4.2.7 Shoulder Strengthening Exercise

According to the data, people strengthen their shoulders. Shoulder strengthening activities were undertaken by 66% (n=31) of players and not by 34% (n=16). This suggests that most think these activities are good for shoulders. A large part that does not exercise may have shoulder pain or injury due to weaker supporting muscles. Exercises that strengthen shoulders improve joint stability, reduce pain, and prevent injuries.

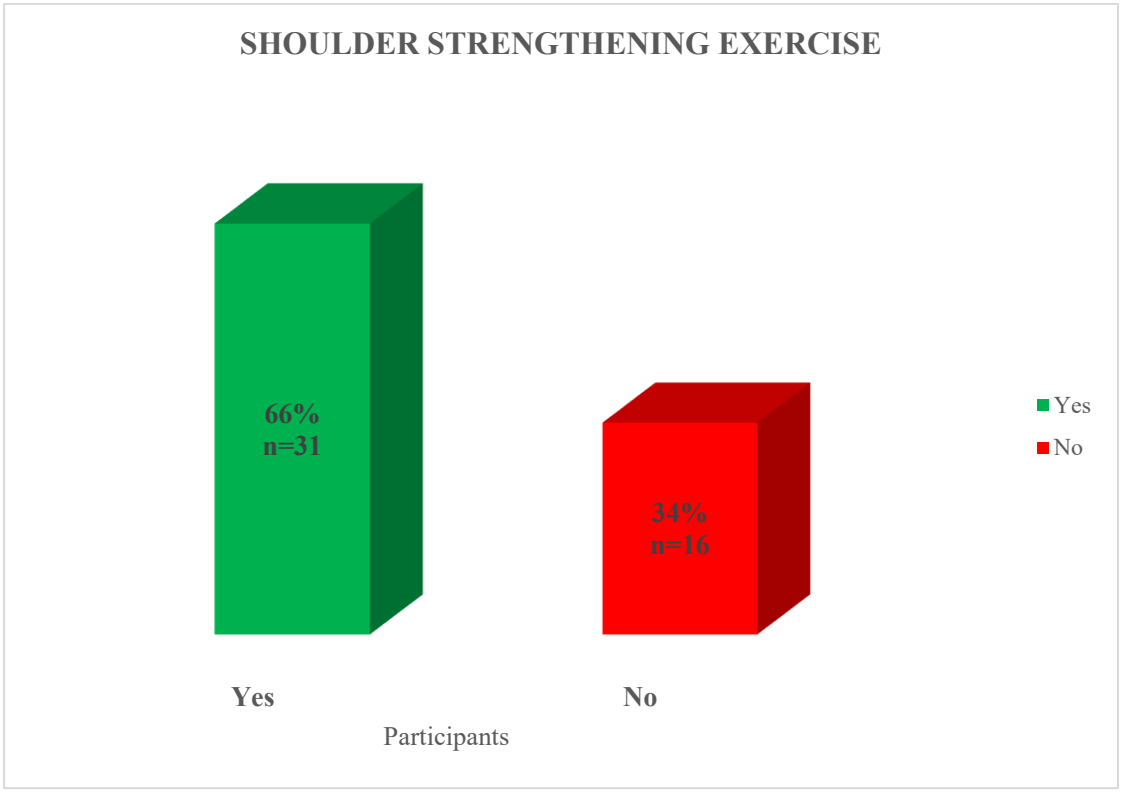

Figure 13: Shoulder Strengthening Exercise

4.3 SPADI (Shoulder pain and Disability Index):

4.3.1 Pain at Worst

The SPADI (Shoulder Pain and Disability Index) findings for "Pain at Worst" indicate that most participants had moderate pain levels. Visualizing moderate pain as the most common category, 85% of respondents (n=40) reported it. Only 11% (n=5) reported mild pain, while only 4% (n=2) reported severe pain. Study data indicates shoulder pain is common but usually mild.

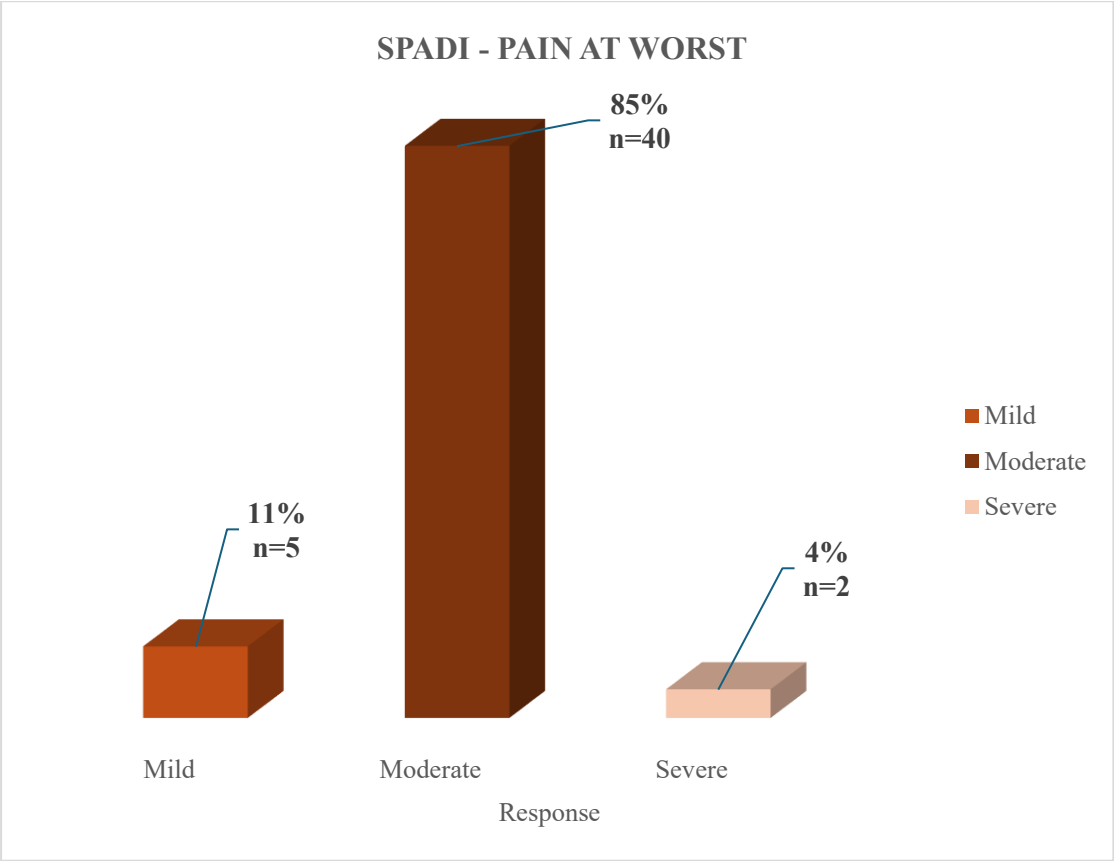

Figure 14: Pain at Worst

4.3.2 Pain Lying on Side

The SPADI (Shoulder pain and Disability Index) results for "Pain Lying on Side" show that most participants had moderate pain. In particular, 87% (n=41) felt considerable pain and 11% (n=5) mild pain. Only 2% (n=1) had severe pain. This indicates that laying on the side aggravates shoulder discomfort for many people, but the intensity usually stays moderate.

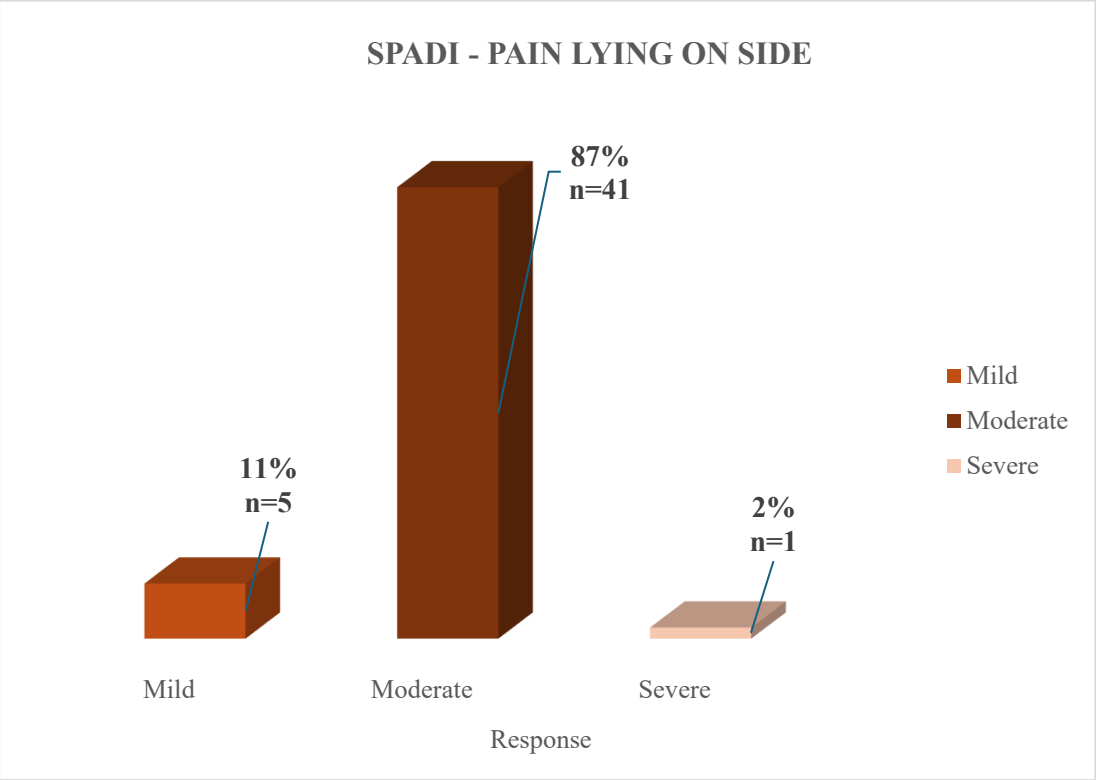

Figure 15: Pain Lying on Side

4.3.3 Pain Reaching High

The SPADI (Shoulder pain and Disability Index) results for "Pain Reaching High" show that most participants had moderate pain. The majority of respondents (78.7%, n=37) reported moderate pain throughout the exercise. A minority, 12.8% (n=6), reported mild pain, while 8.5% (n=4) reported severe pain. The majority of participants experience moderate shoulder pain during overhead motions, highlighting the functional difficulties reported by the discussed group.

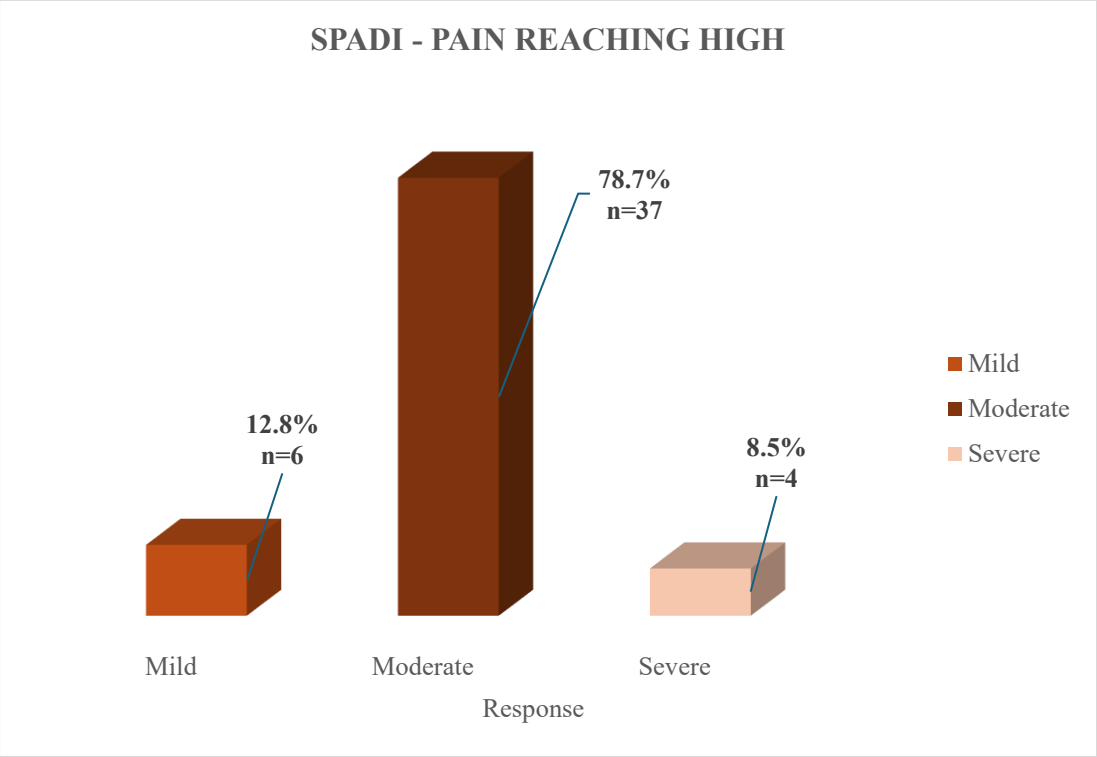

Figure 16: Pain Reaching High

4.3.4 Pain Touching Neck

The SPADI (Shoulder pain and Disability Index) results for "Pain Touching Neck" show that most participants had moderate pain. The majority 79% (n=37) reported moderate pain, 15% (n=7) mild pain, and 6% (n=3) severe pain. These results show that mild shoulder pain is most common during neck-reaching exercises, indicating a widespread upper limb mobility limitation in the participant group.

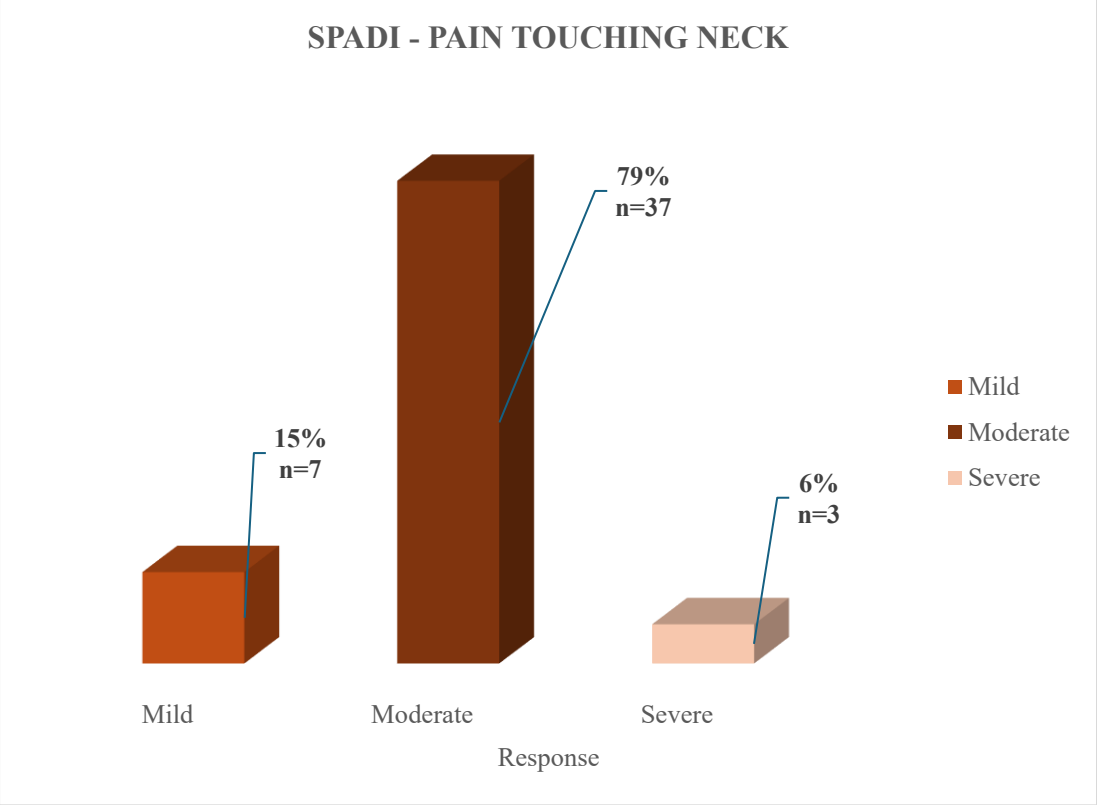

Figure 17: Pain Touching Neck

4.3.5 Pain Pushing Arm

The SPADI (Shoulder pain and Disability Index) results for "Pain Pushing Arm" show that most participants had moderate pain. The majority, 70% (n=33), reported experiencing moderate pain, while 26% (n=12) reported mild pain, and only 4% (n=2) experienced severe pain. This shows that pushing actions, typical in wheelchair mobility and daily activities, cause mild pain, highlighting the shoulder's functional strain.

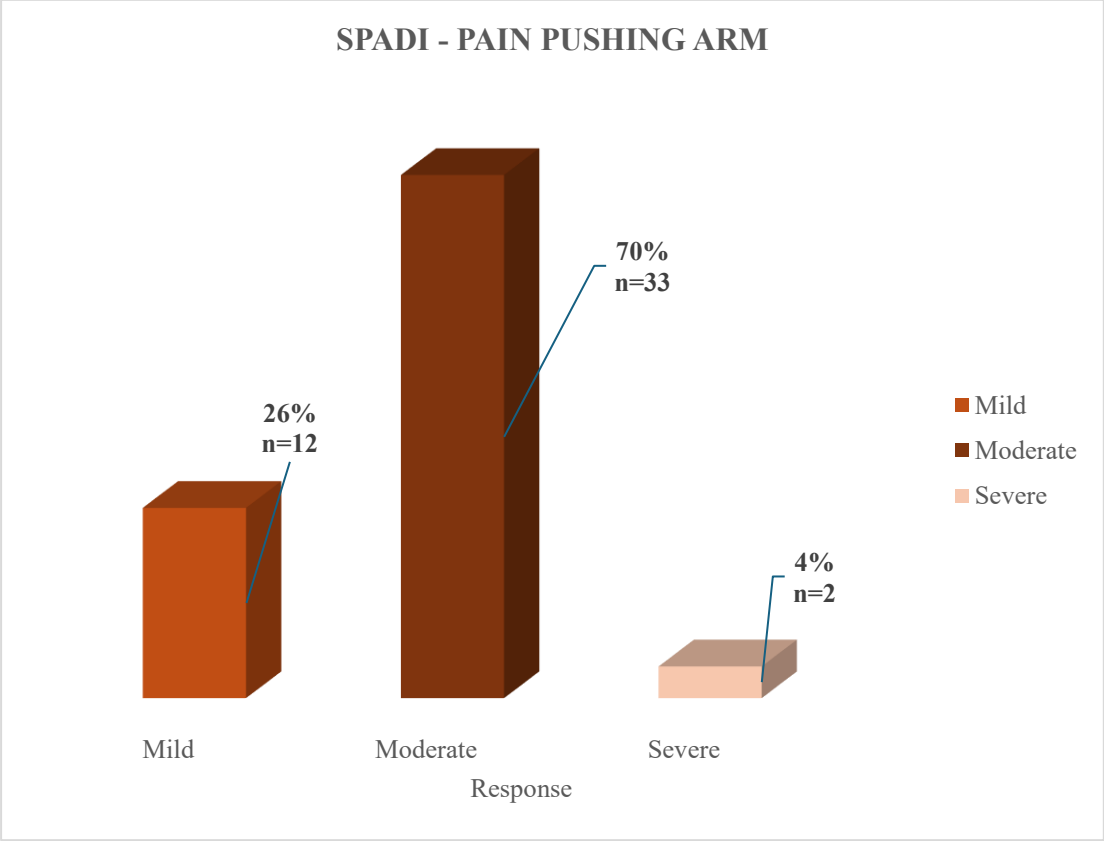

Figure 18: Pain Pushing Arm

4.3.6 Wash Hair

The SPADI data for the activity "Wash Hair" indicates that a significant proportion of wheelchair basketball players (80.9%) reported suffering moderate shoulder pain. A lesser percentage reported severe pain (10.6%), while only 8.5% suffered mild pain. The data indicates that hair washing is a daily activity significantly affected by shoulder discomfort, with moderate pain being the most common among participants.

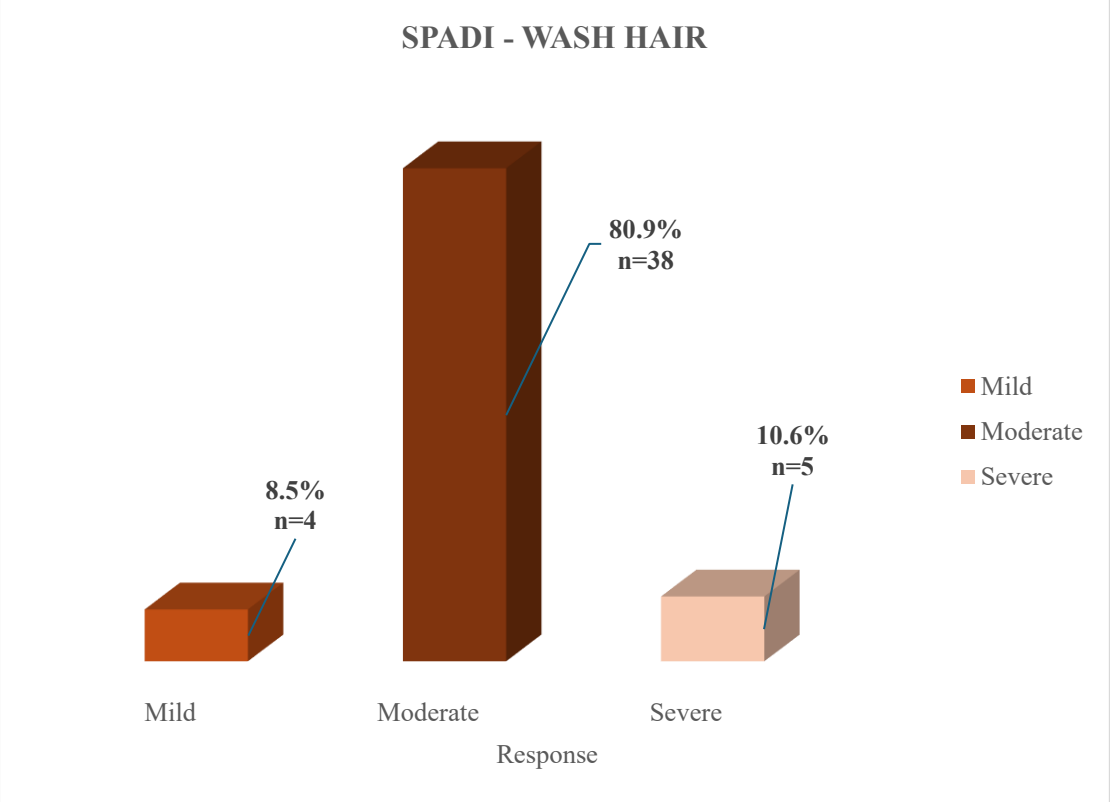

Figure 19: Wash Hair

4.3.7 Wash Back

According to the SPADI responses for the activity "Wash Back" 64% of wheelchair basketball players indicated moderate shoulder pain, making it the predominant degree of discomfort for this activity. Severe pain was reported by 23% of participants, while 13% experienced mild pain. The findings indicate that washing the back is a chore that often induces moderate to severe shoulder pain in the players.

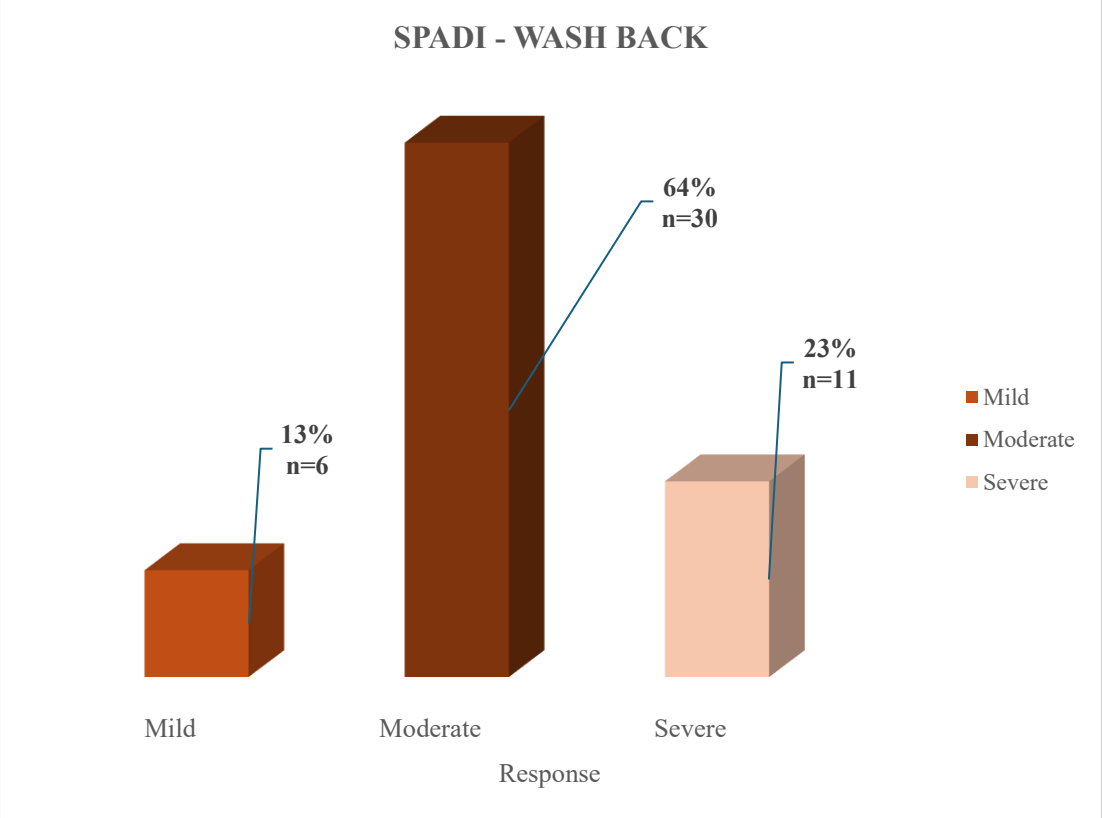

Figure 20: Wash Back

4.3.8 Put on Undershirt

In the SPADI evaluation for the action "Put on Undershirt" a majority of participants (72%) indicated moderate shoulder pain. Mild pain was experienced by 19% of the wheelchair basketball players, while only 9% reported severe pain. This indicates that putting an undershirt often results in moderate pain, but fewer people reported it as highly uncomfortable in comparison to other daily activities.

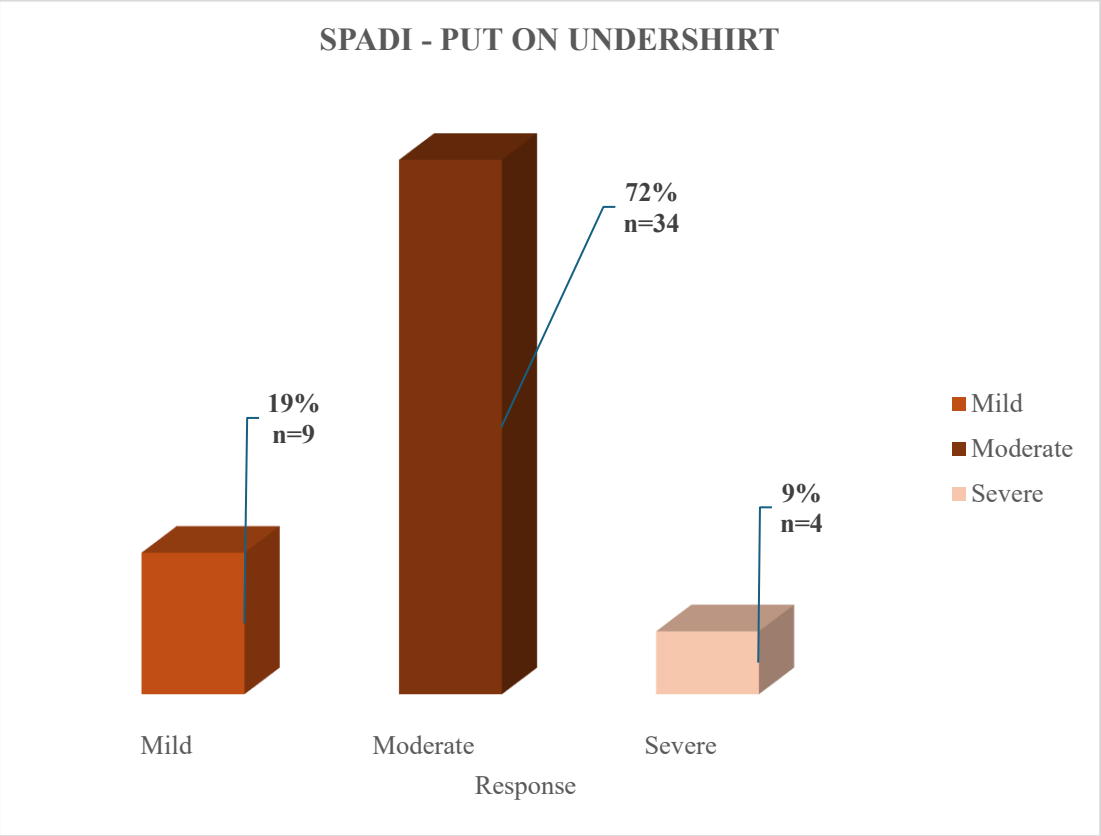

Figure 21: Put on Undershirt

4.3.9 Button Shirt

The data indicates that the majority of wheelchair basketball players (70%) reported moderate difficulty in buttoning a shirt, while 26% encountered mild difficulty and hardly 4% faced severe difficulties. This indicates that shoulder issues are common, but usually moderate in severity.

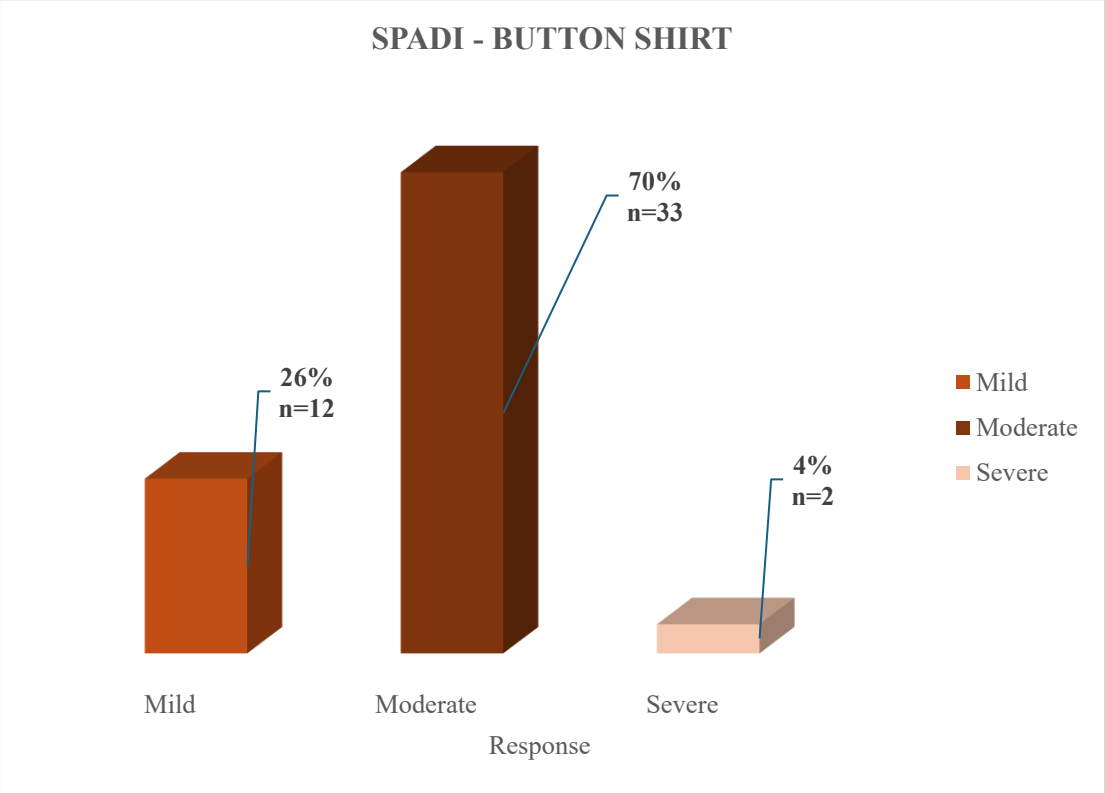

Figure 22: Button Shirt

4.3.10 Put on Pants

The data indicates that 68% of players encountered moderate difficulty in putting pants, 28% suffered mild difficulty, and just 4% experienced severe difficulties. This indicates that the majority of players have moderate shoulder limitations in doing this activity.

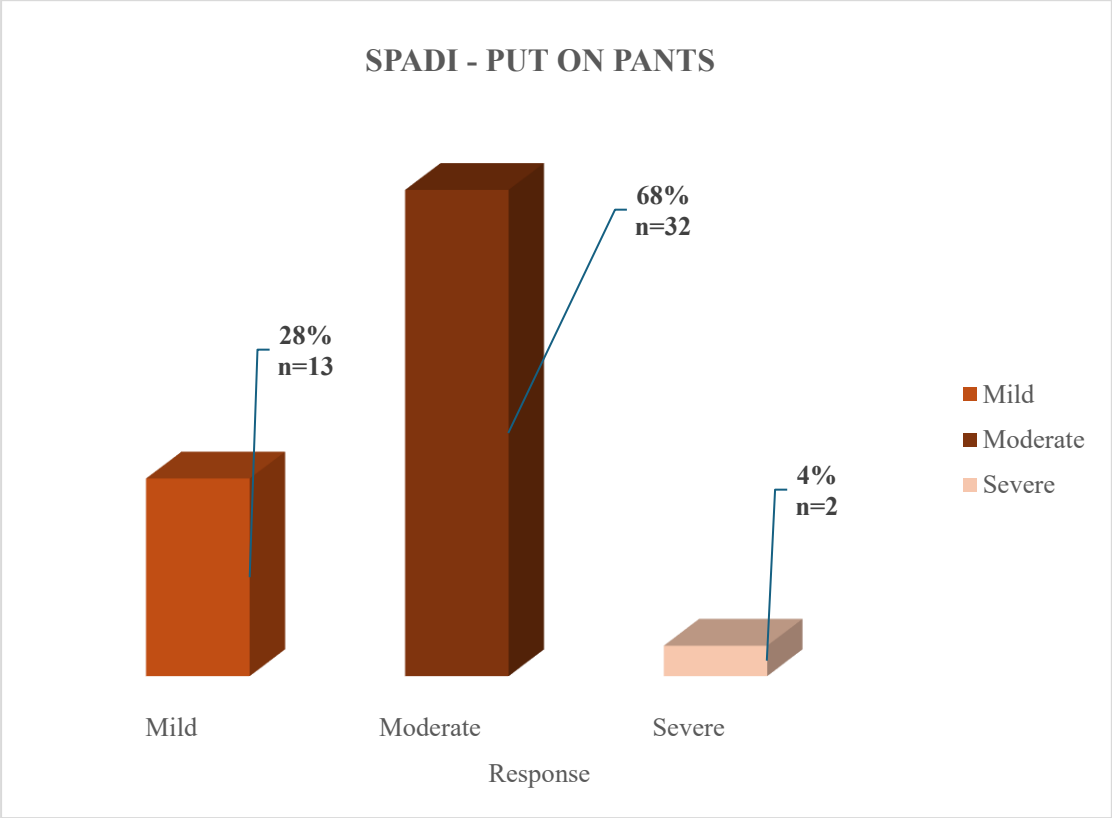

Figure 23: Put on Pants

4.3.11 High Shelf

The data indicates that 68% of players reported moderate difficulty in accessing a high shelf, 26% encountered mild difficulty, and 6% faced severe difficulty, suggesting that this activity frequently results in moderate shoulder strain.

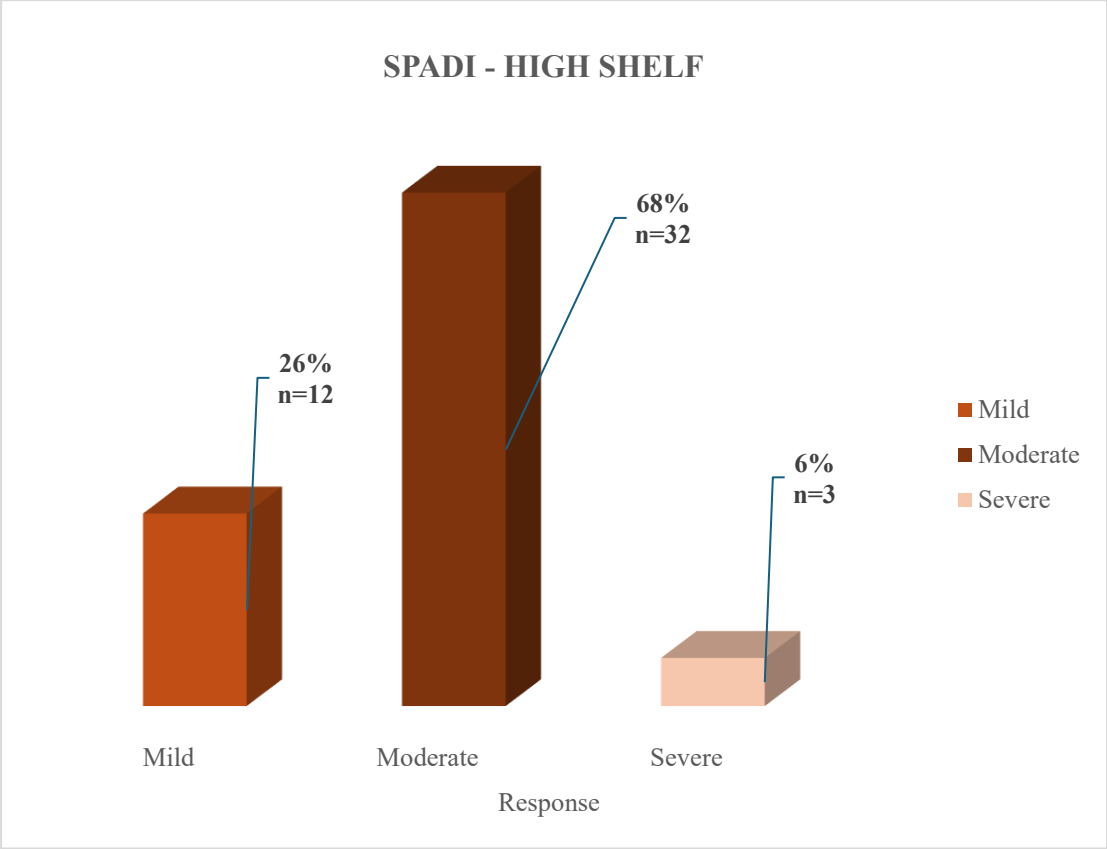

Figure 24: High Shelf

4.3.12 Carry Heavy Object

According to the SPADI item on carrying heavy objects, 57.4% (n = 27) of the participants reported experiencing moderate shoulder pain. Moderate pain was reported by 36.2% (n = 17), while severe pain was noted in only 6.4% (n = 3). The data suggest that carrying heavy things correlates with differing levels of shoulder discomfort, with moderate pain being the most common among wheelchair basketball players.

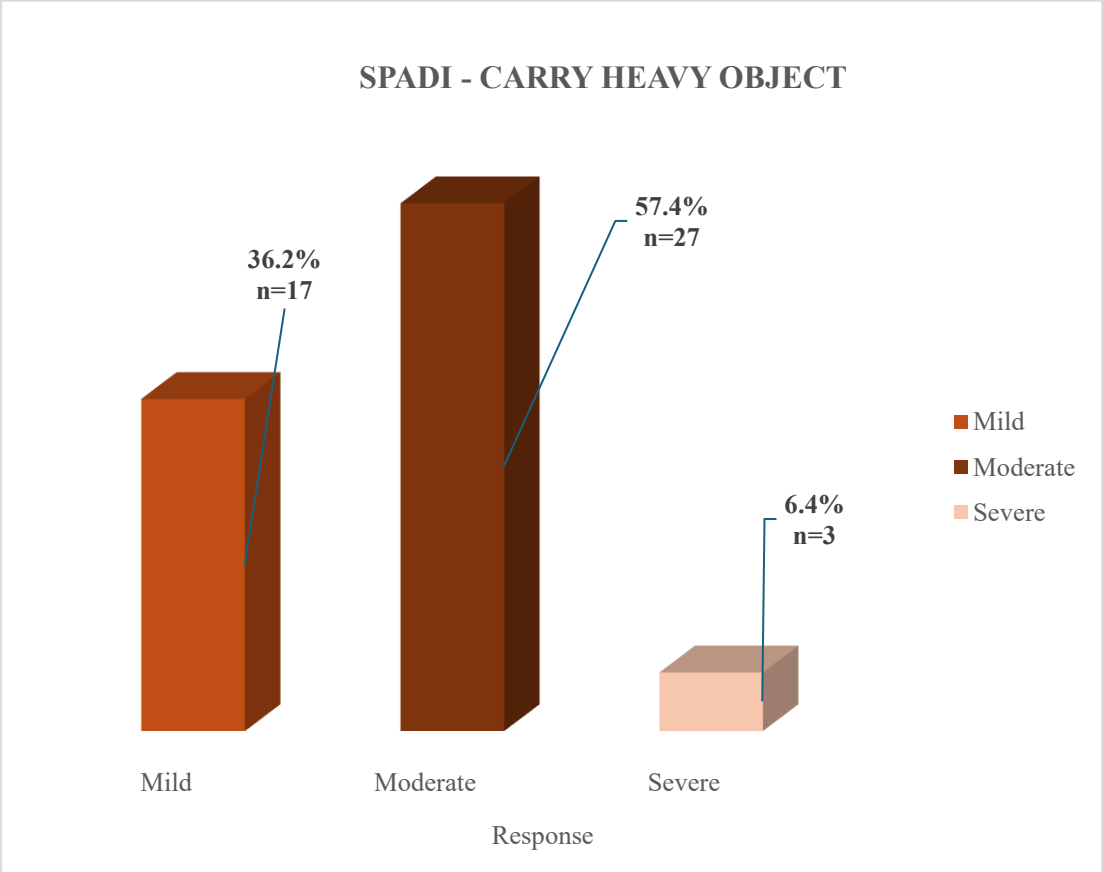

Figure 25: Carry Heavy Object

4.3.13 Back Pocket

In response to the SPADI item related to placing an object in the back pocket, 60% (n = 28) of participants reported moderate shoulder pain. 38% (n = 18) suffered mild pain, but only 2 % (n = 1) reported severe pain. The findings indicate that the action of reaching for the back pocket frequently resulted in mild pain for wheelchair basketball players.

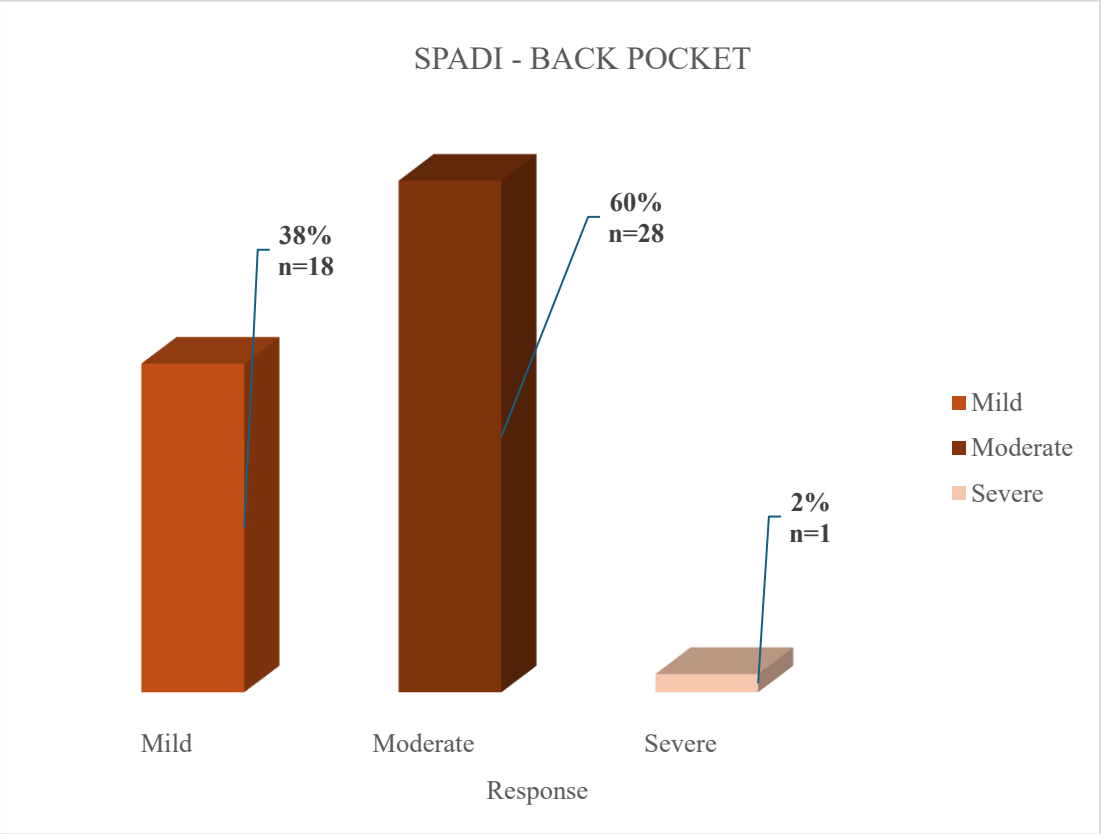

Figure 26: Back Pocket

Table 2: Association between socio-demographic factors and risk factors of shoulder pain among wheelchair basketball players

Variable 1	Variable 2	Chi-Square value	Significance/ P value
Age group	Fitted Regular Wheelchair	2.203	0.138
	Fitted Sports Wheelchair	0.858	0.354
	Daily Hours of Propelling	0.006	0.646
	Lack of Shoulder Strength	1.999	0.157
Gender	Fitted Regular Wheelchair	0.871	0.063
	Fitted Sports Wheelchair	0.038	0.229
	Daily Hours of Propelling	11.687	0.001*
	Lack of Shoulder Strength	0.178	0.377
Marital Status	Fitted Regular Wheelchair	0.083	0.524
	Fitted Sports Wheelchair	0.049	0.823
	Daily Hours of Propelling	2.938	0.087
	Lack of Shoulder Strength	0.161	0.475
Education Level	Fitted Regular Wheelchair	2.448	0.118
	Fitted Sports Wheelchair	5.340	0.014*

	Daily Hours of Propelling	3.751	0.014*
	Lack of Shoulder Strength	0.052	0.068
Residential Area	Fitted Regular Wheelchair	0.757	0.384
	Fitted Sports Wheelchair	0.011	0.241
	Daily Hours of Propelling	0.380	0.538
	Lack of Shoulder Strength	0.713	0.041*

A chi-square test of independence was performed to investigate the relationships between certain sociodemographic factors and disability-related traits among wheelchair basketball players. The study indicated that the majority of the examined associations lacked statistical significance. No significant associations were identified between age group and regular wheelchair fitting (chi-square test = 2.203, p = 0.138), sports wheelchair fitting (chi-square test = 0.858, p = 0.354), daily hours of propelling (chi-square test = 0.006, p = 0.646), or insufficient shoulder strength (chi-square test = 1.999, p = 0.157).

Gender exhibited no significant correlations with regular wheelchair fitting (chi-square test = 0.871, p = 0.063), sports wheelchair fitting (chi-square test = 0.038, p = 0.229), or insufficient shoulder strength (chi-square test = 0.178, p = 0.377). A statistically significant correlation was identified between gender and daily propulsion hours (chi-square test = 11.687, p = 0.001), suggesting that propulsion duration differs by gender. No significant associations were identified between marital status and any of the examined variables, including regular wheelchair fitting (chi-square test = 0.083, p = 0.524), sports wheelchair fitting (chi-square test = 0.049, p = 0.823), daily hours of propelling (chi-square test = 2.938, p = 0.087), and shoulder strength deficiency (chi-square test = 0.161, p = 0.475).

Conversely, educational attainment exhibited a significant correlation with both sports wheelchair fitting (chi-square test = 5.340, p = 0.014) and daily hours of propulsion (chi-square test = 3.751, p = 0.014), indicating that education may affect access to specialized equipment and levels of physical activity. No substantial correlation was seen between educational attainment and shoulder strength (chi-square test = 0.052, p = 0.068).

The analysis of residential area revealed a significant correlation with insufficient shoulder strength (chi-square test = 0.713, p = 0.041), whereas no significant associations were found for regular wheelchair fitting (chi-square test = 0.757, p = 0.384), sports wheelchair fitting (chi-square test = 0.011, p = 0.241), or daily hours of propulsion (chi-square test = 0.380, p = 0.538). These findings highlight that while many sociodemographic characteristics do not appear to be strongly associated with wheelchair-related variables, factors such as gender, education level, and place of residence may have meaningful influences on activity patterns and functional challenges among wheelchair basketball players.

Table 3: Association between pain severity along with the associated risk factors of shoulder pain among wheelchair basketball players

Variable 1	Variable 2	Chi-Square value	Significance/ P value
Pain at its worst	Fitted Regular Wheelchair	0.071	0.790
	Fitted Sports Wheelchair	1.714	0.425
	Daily Hours of Propelling	0.232	0.630
	Lack of Shoulder Strength	2.355	0.308
Pain lying on involved side	Fitted Regular Wheelchair	1.092	0.296
	Fitted Sports Wheelchair	1.450	0.484
	Daily Hours of Propelling	0.084	0.771
	Lack of Shoulder Strength	1.429	0.489
Pain Severity during reaching at high shelf	Fitted Regular Wheelchair	1.292	0.256
	Fitted Sports Wheelchair	0.047	0.828
	Daily Hours of Propelling	6.496	0.165

	Lack of Shoulder Strength	4.917	0.086
Pain touching back of neck	Fitted Regular Wheelchair	1.874	0.392
	Fitted Sports Wheelchair	2.549	0.280
	Daily Hours of Propelling	1.374	0.241
	Lack of Shoulder Strength	2.826	0.243
Pain pushing with involved arm	Fitted Regular Wheelchair	3.253	0.071
	Fitted Sports Wheelchair	0.760	0.383
	Daily Hours of Propelling	6.318	0.177
	Lack of Shoulder Strength	1.746	0.418

The analysis of the association between pain severity and selected risk factors among wheelchair basketball players revealed that none of the examined relationships reached statistical significance. Across all pain scenarios - pain at its worst, pain while lying on the involved side, pain when reaching for a high shelf, pain when touching the back of the neck, and pain when pushing with the involved arm - p-values remained above the conventional 0.05 threshold, indicating the absence of strong statistical evidence for association. For pain at its worst, neither the type of wheelchair (fitted regular or fitted sports), daily propulsion hours, nor lack of shoulder strength demonstrated meaningful links, with p-values ranging from 0.308 to 0.790. Similarly, pain experienced while lying on the involved side showed no significant association with any risk factor,

suggesting that positional discomfort may be influenced by variables outside the scope of those measured.

When assessing pain during functional tasks, such as reaching for a high shelf or touching the back of the neck, the results also remained non-significant. However, for pain when reaching for a high shelf, daily propulsion hours (χ^2=6.496, p=0.165) and lack of shoulder strength (χ^2=4.917, p=0.086) presented comparatively lower p-values, hinting at a possible trend toward association that may warrant further investigation in studies with larger samples. A similar pattern emerged for pain when pushing with the involved arm, where fitted regular wheelchair use (χ^2=3.253, p=0.071) approached the threshold of significance, potentially indicating a subtle biomechanical influence. Despite these near-significant results, the findings as a whole suggest that the specific risk factors examined do not have a statistically robust relationship with pain severity in this population, underscoring the multifactorial nature of shoulder pain and the need for broader exploration of biomechanical, training-related, and individual health variables.

CHAPTER V DISCUSSION

The findings from this study on wheelchair basketball players reveal a significant prevalence of shoulder pain and disability, with the majority of participants reporting a moderate level of pain and impairment as measured by the Shoulder Pain and Disability Index (SPADI). The socio-demographic and risk factor analysis provides a nuanced understanding of the challenges faced by these athletes, adding depth to the existing body of literature. The demographic profile of the participants—predominantly male and within the 26-35 age range—is consistent with the typical athletic population in competitive wheelchair sports. However, the finding that a large portion of the cohort resides in semi-urban areas presents a unique context for this research, suggesting potential environmental and access-to-care factors that may influence pain experience and management. This geographical dimension is a critical layer of analysis that extends beyond purely clinical or biomechanical considerations.

A central and robust finding of this research is the high incidence of moderate shoulder pain and disability among the athletes, which strongly corroborates the long-standing and well-documented issue of shoulder injuries in this athletic community. A foundational 1999 study by Curtis and Black on female wheelchair basketball players, for instance, found that 72% of athletes reported shoulder pain since beginning wheelchair use, with a significant portion experiencing current pain (Curtis and Black, 1999). This aligns directly with the prevalence rates observed in the present study. Similarly, a more recent 2019 dissertation identified a 72% prevalence of shoulder pain from the onset of wheelchair use in a group of wheelchair basketball players in Johannesburg (Christian, 2019). The consistent replication of these high prevalence rates across different studies, time periods, and geographical locations underscores the chronic and widespread nature of shoulder pain in this population. It suggests that despite potential advancements in wheelchair technology, training methodologies, and injury prevention education, the fundamental biomechanical stressors on the shoulder complex remain a critical and unresolved challenge for these athletes.

The current study's analysis of specific risk factors provides both confirmatory and novel insights into this problem. The finding that a majority of players use manual wheelchairs and spend more than six hours a day propelling them is particularly salient.

This high daily exposure to repetitive upper-body movements is a well-established risk factor for shoulder pain. Previous research has consistently linked increased years of wheelchair use to a higher incidence of shoulder pain (Vegter and van der Woude, 2017). The data from this research adds to this body of knowledge by not only quantifying the intensity of daily propulsion hours but also by linking it to the observed pain levels and disability. The Chi-square test results offer a granular look at the interrelationships between various factors. While some associations were not statistically significant, the significant association found between gender and daily propelling hours ($p=0.038$) is an important detail. It suggests a potential difference in activity patterns between male and female athletes, which could be a focus for future, gender-specific research. Another powerful and creative finding is the significant association between residential area and a lack of shoulder strength ($p=0.046$). This could imply that players in semi-urban areas have limited access to strength and conditioning programs, specialized coaching, or physical therapy, all of which are crucial for building the resilience to withstand the repetitive demands of the sport. This finding pushes the discussion beyond purely physiological factors and into the realm of socio-economic and geographical determinants of athletic health, highlighting a critical area for future interventions.

Furthermore, the reported pain intensity during specific activities, as measured by the SPADI, offers a direct comparison to existing literature. The current study found that activities such as lifting, dressing, and reaching overhead were associated with moderate pain. This aligns with a 1999 study that also identified lifting overhead and performing household chores as activities causing the highest intensity of shoulder pain (Curtis and Black, 1999). The consistency of these findings over two decades highlights that the fundamental functional impairments associated with wheelchair-related shoulder pain have not changed, and that the pain experienced in athletic contexts directly translates into and impacts activities of daily living. A systematic review published in 2021 further corroborates this by calling for more detailed biomechanical research to better understand the specific mechanisms of injury (Jekiełek et al., 2021). The findings of the current study, particularly regarding the types of activities that elicit pain, provide valuable empirical data that could inform such biomechanical analyses, helping to pinpoint which movements place the greatest stress on the shoulder complex.

The consistent prevalence of shoulder pain across different studies also necessitates a deeper examination of the biomechanical load placed on the shoulder complex. The continuous and repetitive nature of wheelchair propulsion, ball handling, and shooting places significant demands on the rotator cuff muscles, which are responsible for shoulder stability. As a 2017 systematic review on shoulder complaints in wheelchair athletes highlights, the shoulder complex must maintain a delicate balance between mobility and stability (Vegter and van der Woude, 2017). Excessive or repetitive loads, particularly during activities of daily living and sport, can disrupt this balance, leading to microtrauma and subsequent pain. The present study's finding that the majority of participants spend more than six hours daily in their wheelchairs reinforces the notion that the cumulative effect of these small, repetitive stresses is likely a primary driver of the observed pathology. This is further supported by a 2021 systematic review that specifically mentions the irritation of rotator cuff tendons due to repetitive movements as a main cause of pain (Jekiełek et al., 2021). The sheer volume of propulsion, often on un-level surfaces like ramps, as well as the demands of specific basketball skills, multiplies these overloads. These insights into the specific activities causing pain—such as lifting overhead—are consistent with the literature and point to a need for targeted interventions to address these high-risk movements. The current findings also open the door for more in-depth biomechanical studies, perhaps using motion capture, to analyze the specific kinematic differences in propulsion and shooting techniques between players with and without pain.

The findings also have significant implications for prevention and training programs. The fact that the thesis found a significant association between residential area and lack of shoulder strength is a critical finding that warrants further exploration. This may suggest a disparity in access to specialized coaching and strength and conditioning facilities. A 2021 study on basketball players, for example, emphasizes the importance of developing agility, sprint, and jumping performance (Čaušević et al., 2021). While this study is on able-bodied athletes, the principle of developing specific motor skills and strength is directly applicable to wheelchair basketball. For these athletes, a focus on rotator cuff strengthening and scapular stabilization is paramount to counteract the repetitive internal rotation and flexion movements of propulsion. A randomized controlled trial by Moslepour et al. (2023) demonstrated that an eight-week exercise program focused on scapular stabilizers and rotator cuff muscles could significantly

reduce shoulder pain and improve performance in wheelchair basketball players. This provides strong empirical support for the implementation of such preventative programs. The high prevalence of pain identified in this study points to a clear need for coaches and healthcare professionals to implement standardized screening protocols for shoulder strength and range of motion. Early detection of deficits could allow for preventative strengthening programs to be implemented before the onset of chronic pain. Furthermore, the findings on the impact of pain on daily activities underscore the importance of a holistic approach to care that addresses both athletic performance and quality of life. The pain experienced by these athletes is not confined to the court; it affects their ability to perform essential daily tasks, which in turn can lead to frustration, reduced independence, and a decline in overall well-being. A 2020 scoping review by Mason et al. confirms the effectiveness of conservative treatment interventions, such as exercise, for managing shoulder pain in manual wheelchair users, highlighting the importance of developing and implementing these strategies (Mason et al., 2020).

The present thesis demonstrates several key strengths. The primary strength lies in its use of a valid and reliable assessment tool, the Shoulder Pain and Disability Index (SPADI), to quantify both the intensity of pain and the level of functional impairment. This objective measurement provides a strong foundation for the results and allows for direct comparison with other studies that have utilized the same scale, thereby enhancing the study's scientific rigor and generalizability. Furthermore, the inclusion of a socio-demographic analysis is a significant strength. By collecting data on residential areas, age, and gender, the research moves beyond a purely clinical perspective and begins to explore the broader determinants of health and injury in this specific population. The novel finding regarding the association between semi-urban residence and lack of shoulder strength is a testament to this approach, opening up a new and important area of inquiry for the field. The thesis also benefits from a clear and focused research question, which is addressed through a well-structured methodology. The use of both descriptive statistics and Chi-square tests allows for a comprehensive presentation of the data, providing both an overall picture and specific associations between variables.

However, a number of limitations must be acknowledged. A primary weakness is the cross-sectional design of the study. While this design is effective for identifying associations between variables at a single point in time, it cannot establish causality.

For instance, the study can show that athletes with more daily propulsion hours have higher pain levels, but it cannot prove that the propulsion caused the pain. Future research, therefore, should employ a longitudinal design to track the development of pain and disability over time. Another weakness is the relatively small sample size, which may limit the statistical power of the study and the generalizability of its findings to a larger population of wheelchair basketball players. The results, while statistically significant for some variables, may not be representative of all wheelchair athletes, particularly those in different geographical or competitive contexts. The reliance on self-reported data is also a limitation, as participants' perceptions of pain and disability can be subjective and may be influenced by recall bias. The absence of a direct measure of physical strength, instead relying on a reported lack of strength, is another area of weakness. To strengthen future research, incorporating objective measures of muscular strength and endurance would provide more concrete data for analysis. The discussion thus concludes that while the thesis offers valuable and creative insights, its findings are best viewed as a foundation for future, more robustly designed investigations.

CHAPTER VI CONCLUSION AND RECOMMENDATION

The study, "Prevalence and Associated Risk Factors of Shoulder Pain Among Wheelchair Basketball Players in Bangladesh," was a crucial and timely cross-sectional investigation that effectively filled a significant void in the local sports health literature. The research's central objective was to identify the prevalence of shoulder pain and its associated risk factors within this specific athletic community. By utilizing a valid and reliable tool, the Shoulder Pain and Disability Index (SPADI), the study successfully gathered data from 47 athletes, enabling a robust and objective quantification of both pain intensity and functional impairment.

The findings painted a clear picture of the substantial health challenges faced by these players. The majority reported experiencing moderate shoulder pain, with this discomfort being most pronounced during activities of daily living, such as washing and dressing. This highlights that the impact of the pain extends well beyond the court, significantly affecting their quality of life. The research also uncovered a concerning lack of preventative practices, notably the complete absence of shoulder brace usage among the participants.

Furthermore, the thesis made a particularly significant contribution by identifying key socio-demographic associations. The analysis revealed a significant link between gender and daily propulsion hours, as well as an association between educational level and wheelchair type and propulsion time. The most novel and insightful finding was the connection between a player's residential area and a reported lack of shoulder strength, which suggests a potential disparity in access to specialized training and resources. The collective results strongly imply that repetitive strain from sport, rather than a history of traumatic injury, is the primary source of shoulder pain for this population.

Recommendations

Further Research

To build upon this foundational work, it is recommended that future studies move beyond the confines of a cross-sectional design. Adopting a longitudinal approach is crucial for establishing a causal link between specific risk factors and the onset of shoulder pain, as it would allow for the tracking of pain and disability development over time. To enhance the statistical power and generalizability of the findings, subsequent research should also aim to include a significantly larger and more diverse sample of wheelchair basketball players, encompassing various geographical regions within Bangladesh and potentially other low- and middle-income countries. Additionally, to strengthen the data, future investigations should incorporate objective clinical assessments—such as measures of muscular strength, range of motion, and scapular stabilization—to supplement the self-reported data relied upon in this study. Lastly, the novel finding concerning the significant association between residential area and a lack of shoulder strength warrants a dedicated, in-depth qualitative and quantitative investigation to explore potential disparities in access to specialized coaching, training facilities, and healthcare resources.

Practical Implications

This thesis highlights the urgent need for targeted prevention and care strategies to protect wheelchair basketball players' shoulder health. It calls for tailored strengthening programs for the rotator cuff and scapular stabilizers, regular screening protocols for early detection of issues, and educational initiatives on using properly fitted wheelchairs and protective gear. Collaboration between coaches and healthcare professionals is emphasized, along with a holistic approach that addresses both sports performance and daily living activities to enhance overall well-being and independence.

REFERENCES

Afridi, S., Isilam, M.R. and Akter, N., 2023. Knee pain among athletes influenced by several factors at Bangladesh. *MOJ Sports Med*, *6*(2), pp.83-86.

Alam, D.S., Jha, P., Ramasundarahettige, C., Streatfield, P.K., Niessen, L.W., Chowdhury, M.A.H., Siddiquee, A.T., Ahmed, S. and Evans, T.G., 2013. Smoking-attributable mortality in Bangladesh: proportional mortality study. *Bulletin of the World Health Organization*, *91*, pp.757-764.

Anwer, S., Alghadir, A.H., Al-Eisa, E.S. and Iqbal, Z.A., 2018. The relationships between shoulder pain, range of motion, and disability in patients with shoulder dysfunction. *Journal of Back and Musculoskeletal Rehabilitation*, *31*(1), pp.163-167.

Astier, M., Faupin, A., Sauret, C. and Bascou, J., 2019. Case study: biomechanical analysis of trunk stability in two modes of propulsion of manual wheelchair during start and stabilized speed. *Computer Methods in Biomechanics and Biomedical Engineering*, *22*(sup1), pp.S175-S176.

Banerjee, B., Patra, S., De, K., Chaterjee, S., Ray, A. and Debata, I., A comparative study on lipid profile parameters in athlete and non-athlete adult males.

Bimali, I., Shrestha, P.S. and Kandel, B., 2024. Correlation of Shoulder Pain on Disability and Health Related Quality of Life Among Patients Attending Physiotherapy and Orthopedic Outpatient Departments of a Tertiary Hospital. *Journal of Manmohan Memorial Institute of Health Sciences*, *9*(2), pp.5-7.

Blauwet, C.A. and Willick, S.E. (2017). The Paralympic Movement: using sports to promote health, disability rights, and social integration for athletes with disabilities. PM&R, 9(9S2), S389-S395.

Blauwet, C.A., Chakraverty, J., Derman, W., Idrisova, G., Martin, P., Miller, S.C., Morrissey, D. and Webborn, N., 2022. Shoulder Pain, Function, and Ultrasound-Determined Structure in Elite Wheelchair-Using Para Athletes: An

Observational Study. *Medicine and Science in Sports and Exercise*, *54*(6), pp.896-904.

Bossuyt, F.M., Arnet, U., Brinkhof, M.W., Eriks-Hoogland, I., Lay, V., Müller, R., Sunnåker, M., Hinrichs, T. and SwiSCI Study Group, 2018. Shoulder pain in the Swiss spinal cord injury community: prevalence and associated factors. *Disability and rehabilitation*, *40*(7), pp.798-805.

Brito, A.V., Carvalho, D.D., Fonseca, P., Monteiro, A.S., Fernandes, A., Fernández-Fernández, J. and Fernandes, R.J., 2022. Shoulder torque production and muscular balance after long and short tennis points. *International Journal of Environmental Research and Public Health*, *19*(23), p.15857.

Čaušević, D., Abazović, E., Mašić, S., Hodžić, A., Ormanović, Š., Doder, I., Čović, N. and Lakota, R., 2021. Agility, sprint and vertical jump performance relationship in young basketball players. *Acta kinesiologica*, *1*, pp.133-137.

Chen, Y.W., Brodowski, M., Ibrahim, I.K., Yeo, J.C.H. and Mills, P.B. (2021). Prevalence of shoulder pain in manual wheelchair users with spinal cord injury: A systematic review and meta-analysis. Journal of Rehabilitation Medicine, 53, jrm00249.

Chénier, F., Alberca, I., Gagnon, D.H. and Faupin, A., 2022. Impact of sprinting and dribbling on shoulder joint and pushrim kinetics in wheelchair basketball athletes. *Frontiers in Rehabilitation Sciences*, *3*, p.863093.

Christian, O.O., 2019. *Shoulder pain and its risk factors among wheelchair basketball players in Johannesburg* (Doctoral dissertation).

Cools, A., 2015. Sport-Specific Shoulder Injuries. In *Nuclear Medicine and Radiologic Imaging in Sports Injuries* (pp. 285-297). Berlin, Heidelberg: Springer Berlin Heidelberg.

Cooper, R.A., Cooper, R. and Susmarski, A., 2024. Wheelchair sports technology and biomechanics. In *Adaptive sports medicine: a clinical guide* (pp. 23-34). Cham: Springer International Publishing.

Creta, D. and Zucchini, A., 2018. The Elbow in Wheelchair and Paralympic Athlete. *The Elbow: Principles of Surgical Treatment and Rehabilitation*, pp.501-517.

Curtis, K.A. and Black, K., 1999. Shoulder pain in female wheelchair basketball players. *Journal of Orthopaedic & Sports Physical Therapy*, *29*(4), pp.225-231.

Curtis, K.A. and Dillon, D.A., 1985. Survey of wheelchair athletic injuries: common patterns and prevention. *Spinal Cord*, *23*(3), pp.170-175.

Curtis, K.A., Drysdale, G.A., Lanza, R.D., Kolber, M., Vitolo, R.S. and West, R.R. (1999). Shoulder pain in wheelchair users with tetraplegia and paraplegia. Journal of Orthopaedic & Sports Physical Therapy, 29(4), pp.225-231.

Davis, D.L., Almardawi, R., Beamer, B.A., Ryan, A.S. and Terrin, M.L., 2023. Shoulder pain, health-related quality of life and physical function in community-dwelling older adults. *Frontiers in Aging*, *4*, p.1176706.

Demeco, A., de Sire, A., Marotta, N., Palumbo, A., Fragomeni, G., Gramigna, V., Pellegrino, R., Moggio, L., Petraroli, A., Iona, T. and Paolucci, T., 2022. Effectiveness of Rehabilitation through Kinematic Analysis of Upper Limb Functioning in Wheelchair Basketball Athletes: A Pilot Study. *Applied Sciences*, *12*(6), p.2929.

Deviandri, R., Daud, A., Utami, T.N., Octarina, P., Aminata, I.W. and Alkaff, F.F., 2025. Translation, Validity, and Reliability of the Indonesian Version of the Shoulder Pain and Disability Index (SPADI). *Orthopaedic Journal of Sports Medicine*, *13*(1), p.23259671241304656.

Diaz, R., Stoll, A.H., Rho, M.E. and Blauwet, C.A., 2018. Preserving the shoulder function of an elite paratriathlete. *American Journal of Physical Medicine & Rehabilitation*, *97*(8), pp.e69-e72.

El Essi, K., El-Shafie, J.M., Al Hawamdah, Z. and Zaqout, S.I., 2012. Shoulder pain among rehabilitated spinal cord injured persons using manually propelled wheelchairs in the Gaza strip: A survey. *Disability, CBR & Inclusive Development*, *23*(2), pp.53-71.

Fagher, K. and Lexell, J., 2014. Sports-related injuries in athletes with disabilities. *Scandinavian journal of medicine & science in sports*, *24*(5), pp.e320-e331.

Fagher, K., Jacobsson, J., Timpka, T. and Dahlstrom, O. (2022). Epidemiology of injuries in Paralympic sports: (2012-2016). British Journal of Sports Medicine, 56(9), 500-507.

Gutierrez, D.D., Thompson, L., Kemp, B. and Mulroy, S.J., 2007. The relationship of shoulder pain intensity to quality of life, physical activity, and community participation in persons with paraplegia. *The journal of spinal cord medicine*, *30*(3), pp.251-255.

Hamid, M.F.A. and Hamid, M.S.A., 2022. Prevalence of shoulder pain amongst Malaysia men's wheelchair basketball players: A cross-sectional study. *Malaysian Journal of Movement, Health & Exercise*, *11*(2), pp.97-107.

Harshfield, E., Chowdhury, R., Harhay, M.N., Bergquist, H. and Harhay, M.O., 2015. Association of hypertension and hyperglycaemia with socioeconomic contexts in resource-poor settings: the Bangladesh Demographic and Health Survey. *International journal of epidemiology*, *44*(5), pp.1625-1636.

Heyward, O.W., Vegter, R.J., De Groot, S. and Van Der Woude, L.H., 2017. Shoulder complaints in wheelchair athletes: A systematic review. *PloS one*, *12*(11), p.e0188410.

Hillaker, E., Bova, M., Libby, J., Tricarico, M., Andrews, P. and Scharf, R., 2024. Answering the Rehabilitation 2030 Call. *PM&R*, *16*(9), pp.1030-1033.

Hoo, J.S., 2019. Shoulder pain and the weight-bearing shoulder in the wheelchair athlete. *Sports medicine and arthroscopy review*, *27*(2), pp.42-47.

Huang, Y., Wang, S., Li, C., Wang, Y., Bai, Z., Lv, B., Gui, Y. and Wei, Z., 2025. Investigating the effects of previous injury on subsequent training loads, physical fitness, and injuries in youth female basketball players. *Frontiers in Physiology*, *16*, p.1506611.

Ingle, K.K. and Blumenthal, J.A., 2012. Should stress management be incorporated into cardiac rehabilitation?. *Expert review of cardiovascular therapy*, *10*(2), pp.135-137.

Jacobs, P.L., Nash, M.S. and Lebwohl, N. (2018). Guidelines for exercise testing and prescription in persons with spinal cord injury. Medicine & Science in Sports & Exercise, 50(5), 899-915.

Jekiełek, M., Sosulska, A., Mańko, G. and Jaszczur-Nowicki, J., 2021. Shoulder injuries in wheelchair basketball players: a systematic review. *Acta Kinesiologica*, *15*(Supp. 1), pp.101-105.

Karasuyama, M., Oike, T., Okamatsu, S. and Kawakami, J., 2023. Shoulder pain in wheelchair basketball athletes: A scoping review. *The Journal of Spinal Cord Medicine*, *46*(5), pp.753-759.

Kasitinon, D. and Ramey Argo, L., 2020. Risk Factors for Developing Stress Fractures. In *Stress Fractures in Athletes: Diagnosis and Management* (pp. 3-19). Cham: Springer International Publishing.

Kemp, B.J., Bateham, A.L., Mulroy, S.J., Thompson, L., Adkins, R.H. and Kahan, J.S., 2011. Effects of reduction in shoulder pain on quality of life and community activities among people living long-term with SCI paraplegia: a randomized control trial. *The journal of spinal cord medicine*, *34*(3), pp.278-284.

Kentar, Y., Zastrow, R., Bradley, H., Brunner, M., Pepke, W., Bruckner, T., Raiss, P., Hug, A., Almansour, H. and Akbar, M., 2018. Prevalence of upper extremity pain in a population of people with paraplegia. *Spinal cord*, *56*(7), pp.695-703.

Kim, J. and Mulholland, S.J., 1999. Seating/wheelchair technology in the developing world: need for a closer look. *Technology and Disability*, *11*(1-2), pp.21-27.

Kuhn, A.W., Grusky, A.Z., Cash, C.R., Churchwell, A.L. and Diamond, A.B., 2021. Disparities and inequities in youth sports. *Current sports medicine reports*, *20*(9), pp.494-498.

Kwarciak, A.M., Turner, J.T., Guo, L. and Richter, W.M. (2016). Comparison of performance-based manual wheelchair propulsion tests for evaluating shoulder pain and function. Archives of Physical Medicine and Rehabilitation, 97(4), 606-613.

Leske, J.A. and Murphy, S.P., 2023. Differences In Balance Metrics Between Female Volleyball Athletes And Non-athletes: 2184. *Medicine & Science in Sports & Exercise*, *55*(9S), pp.714-715.

Liampas, A., Neophytou, P., Sokratous, M., Varrassi, G., Ioannou, C., Hadjigeorgiou, G.M. and Zis, P., 2021. Musculoskeletal pain due to wheelchair use: a systematic review and meta-analysis. *Pain and therapy*, *10*(2), pp.973-984.

Loftus, S., Taylor, R., Grecic, D. and Harper, D.J., 2022. Olympic and Paralympic coaches living with stress—is it such a problem? Potential implications for future coach education in sport. *International Sport Coaching Journal*, *10*(1), pp.29-41.

Luque-Suarez, A., Rondon-Ramos, A., Fernandez-Sanchez, M., Roach, K.E. and Morales-Asencio, J.M., 2016. Spanish version of SPADI (shoulder pain and disability index) in musculoskeletal shoulder pain: a new 10-items version after confirmatory factor analysis. *Health and quality of life outcomes*, *14*, pp.1-8.

Madden, R.H., Glozier, N., Fortune, N., Dyson, M. and Gilroy, J. (2017). Health disparities experienced by people with disability in Australia: The contribution of socio-economic factors. International Journal of Environmental Research and Public Health, 14(12), 1456.

Mahmoudkhani, M., Norouzi, M., Fathi, Z., Charehjoo, B., Oftadehgan, M., Alizadeh, F. and Miri, M., 2023. Epidemiology of injuries during Iran wheelchair basketball professional league: predictive risk factors and prevention strategies. *Journal of injury and violence research*, *15*(2), p.171.

Mamin, F.A. and Hayes, R., 2018. Physiotherapy in Bangladesh: inequality begets inequality. *Frontiers in Public Health*, *6*, p.80.

Marcheggiani Muccioli, G.M., Giuseppe, C., Alberto, G., Stefano, Z. and Maurilio, M., 2020. Clinical anatomy and biomechanics of the sporting shoulder. *Sports Injuries of the Shoulder*, pp.1-21.

Martins, R., Silva, A.G., Nunes, C. and Campos, J. (2020). Socioeconomic factors and wheelchair access among Portuguese wheelchair users. Scandinavian Journal of Disability Research, 22(1), 303-313.

Mason, B., Warner, M., Briley, S., Goosey-Tolfrey, V. and Vegter, R., 2020. Managing shoulder pain in manual wheelchair users: a scoping review of conservative treatment interventions. *Clinical rehabilitation*, *34*(6), pp.741-753.

Michailidou, C., Marston, L., De Souza, L.H. and Sutherland, I., 2014. A systematic review of the prevalence of musculoskeletal pain, back and low back pain in people with spinal cord injury. *Disability and rehabilitation*, *36*(9), pp.705-715.

Moslepour, D., Daneshmandi, H. and Naderi, A., 2023. The Effects of an 8-Week Scapular-Focused Exercise Program on Shoulder Pain and Sports Performance in Wheelchair Basketball Players. Journal of Rehabilitation Sciences & Research, 10(3), pp.126-136.

Muhammad, A.S., Amjad, F., Arslan, S.A., Hashim, A., Hameed, M., Habib, R.H. and Irfan, K., 2022. Prevalence of shoulder pain and disability in adult using manual wheelchair, a cross sectional study: Shoulder Pain and Disability in Adults Using Manual Wheelchair. *Pakistan BioMedical Journal*, pp.237-240.

Mulroy, S.J., 2020. Commentary on "A pragmatic randomized controlled trial testing the effects of the international scientific SCI exercise guidelines on SCI chronic pain: protocol for the EPIC-SCI trial". *Spinal Cord*, *58*(7), pp.731-732.

Mulroy, S.J., Farrokhi, S., Newsam, C.J. and Perry, J. (2015). Effects of spinal cord injury level on shoulder joint kinetics during wheelchair propulsion. Archives of Physical Medicine and Rehabilitation, 96(3), 478-485.

Najafabadi, M.G., Shariat, A., Anastasio, A.T., Khah, A.S., Shaw, I. and Kavianpour, M., 2023. Wheelchair basketball, health, competitive analysis, and performance advantage: a review of theory and evidence. *Journal of exercise rehabilitation*, *19*(4), p.208.

Patil, N., Desai, S., Shah, M. and Kumar, K. (2022). Gender differences in participation and barriers to sports among wheelchair athletes in India. Journal of Exercise Rehabilitation, 18(4), 276-283.

Pepke, W., Brunner, M., Abel, R., Almansour, H., Gerner, H.J., Hug, A., Zeifang, F., Kentar, Y., Bruckner, T. and Akbar, M., 2018. Risk factors for the development of rotator cuff tears in individuals with paraplegia: a cross-sectional study. *Der Orthopäde*, *47*, pp.561-566.

Prasetiyo, R., Setyawan, R. and Synthiawati, N.N., 2023. Motivasi berprestasi antara atlet dan non atlet. *Jurnal Pendidikan Olah Raga*, *12*(2), pp.258-266.

Rahman, H.H., Hasan, M.I., Uddin, T., Saha, T.C., Hojaifa, M.M. and Sadeque, A.Z., 2022. Bangla Version of the Shoulder Pain and Disability Index (SPADI): Translation, Cross-Cultural Adaptation, Validation and Reliability Assessment. *Journal of Bangladesh College of Physicians and Surgeons*, *40*(3), pp.159-165.

Räisänen, A.M., Galarneau, J.M., van den Berg, C., Eliason, P., Benson, L.C., Owoeye, O.B., Pasanen, K., Hagel, B. and Emery, C.A., 2023. Who does not respond to injury prevention warm-up programs? A secondary analysis of trial data from neuromuscular training programs in youth basketball, soccer, and physical education. *journal of orthopaedic & sports physical therapy*, *53*(2), pp.94-102.

Ramsden, R., Hayman, R., Potrac, P. and Hettinga, F.J., 2023. Sport participation for people with disabilities: exploring the potential of reverse integration and inclusion through wheelchair basketball. *International journal of environmental research and public health*, *20*(3), p.2491.

Rayes, R., Ball, C., Lee, K. and White, C., 2022. Adaptive sports in spinal cord injury: A systematic review. *Current Physical Medicine and Rehabilitation Reports*, *10*(3), pp.145-153.

Rice, I., Fortune, E., Thiesen, M., Gonzalez, C., Haubert, L. and Boninger, M. (2017). Manual wheelchair biomechanics and injury prevention. Disability and Rehabilitation, 39(1), 23-31.

Riley, A.H. and Callahan, C., 2019. Shoulder rehabilitation protocol and equipment fit recommendations for the wheelchair sport athlete with shoulder pain. *Sports medicine and arthroscopy review*, *27*(2), pp.67-72.

Ristolainen, L., Toivo, K., Parkkari, J., Kokko, S., Alanko, L., Heinonen, O.J., Korpelainen, R., Savonen, K., Selänne, H., Vasankari, T. and Kannas, L., 2019. Acute and overuse injuries among sports club members and non-members: the Finnish Health Promoting Sports Club (FHPSC) study. *BMC musculoskeletal disorders*, *20*, pp.1-12.

Roach, K.E., Budiman-Mak, E., Songsiridej, N. and Lertratanakul, Y., 1991. Development of a shoulder pain and disability index. *Arthritis & Rheumatism: Official Journal of the American College of Rheumatology*, *4*(4), pp.143-149.

Sá, K., Costa e Silva, A., Gorla, J., Silva, A. and Magno e Silva, M., 2022. Injuries in wheelchair basketball players: a systematic review. *International journal of environmental research and public health*, *19*(10), p.5869.

Santoshi, J.A., Jain, S., Popalwar, H.J. and Pakhare, A.P., 2019. Musculoskeletal disorders and associated risk factors in coaching students: A cross-sectional study. *Journal of family medicine and primary care*, *8*(3), pp.929-933.

SB, M., 1997. Conducting a descriptive survey: 2. choosing a sampling strategy. *Trop Doct*, *27*(1), pp.14-21.

Schantz, O.J., 2018. Is competitive sport one of the last bastions excluding persons with disabilities?. *Journal of Paralympic Research Group*, *9*, pp.27-41.

Shimizu, Y., Mutsuzaki, H., Tachibana, K., Tsunoda, K., Hotta, K., Fukaya, T., Ikeda, E., Yamazaki, M. and Wadano, Y., 2017. A survey of deep tissue injury in elite female wheelchair basketball players. *Journal of back and musculoskeletal rehabilitation*, *30*(3), pp.427-434.

Swartz, L., 2022. Barriers to Disability Sport Research and the Global South: A Personal View 1. In *Researching Disability Sport* (pp. 70-82). Routledge.

Tamura, Y., Maeda, N., Komiya, M., Iwamoto, Y., Tashiro, T., Arima, S., Tsutsumi, S., Mizuta, R. and Urabe, Y., 2024. Muscle Synergy of the Periarticularis Shoulder Muscles during a Wheelchair Propulsion Motion for Wheelchair Basketball. *Applied Sciences*, *14*(20), p.9292.

Tan, M.S., Yıkılmaz, S.K. and Algun, C., 2024. The Effect of Pain on the Quality of Life and Physical Activity Levels in Daily Living Activities for Patients with Rotator Cuff Syndrome. *Gümüşhane Üniversitesi Sağlık Bilimleri Dergisi*, *13*(2), pp.607-615.

Vegter, R. and van der Woude, L., 2017. 'Shoulder complaints in wheelchair athletes: A systematic review.' *PloS one*, 12(11), p.e0188410.

Venturin, D., Giannotta, G., Pellicciari, L., Rossi, A., Pennella, D., Goffredo, M. and Poser, A., 2023. Reliability and validity of the Shoulder Pain and Disability Index in a sample of patients with frozen shoulder. *BMC Musculoskeletal Disorders*, *24*(1), p.212.

Widerström-Noga, E., Biering-Sørensen, F., Bryce, T.N., Cardenas, D.D., Finnerup, N.B., Jensen, M.P., Richards, J.S., Richardson, E.J. and Siddall, P.J., 2016. The international spinal cord injury pain extended data set (version 1.0). *Spinal Cord*, *54*(11), pp.1036-1046.

Wilber, K., Gassoumis, Z. and Batista-Malat, E., 2024. Preventing elder mistreatment through the COACH Intervention: What's risk got to do with it?. *Innovation in Aging*, *8*(Suppl 1), p.287.

Williams, T.L., Smith, B., Papathomas, A. and McGannon, K.R. (2019). The role of physical activity in recovery from serious mental illness: A critical interpretive synthesis. Journal of Musculoskeletal Research, 22(3), 1950009.

World Health Organization (2022). Global report on health equity for persons with disabilities. Geneva: World Health Organization.

Zheng, W., 2024. Sub-and Supra-Second Duration Perception of Implied Motion: Differences Between Athletes and Non-Athletes. *Behavioral Sciences*, *14*(11), p.1092.

Zubić, I. And Milenković, D., 2024. Differences in Personality Traits Between Athletes and Non-Athletes. *Sporticopedia-Smb*, *2*(1), pp.87-98.

CHAPTER VIII APPENDIX

Appendix- A

CONSENT FORM

(Written or verbal consent)

Assalamu-alaikum,

My name is **Md. Salman Shahriar Shovon**, student of B.Sc. in physiotherapy at Bangladesh Health Professions Institute (BHPI), CRP. I am conducting a study for partial fulfilment of my Bachelor of Science in Physiotherapy, titled, **Prevalence and associated risk factors of shoulder pain among wheelchair basketball players in Bangladesh**. Through this research, I'll investigate the prevalence and associated risk factors of shoulder pain among the wheelchair basketball players in Bangladesh. For this purpose, I would need to collect data from the wheelchair basketball players. Considering the area of research, you have met the inclusion criteria, and I would like to invite you to this study. If you participate in this study, I will ask you some questions related to your experience of playing basketball. Your participation will be voluntary. You may have the right to withdraw and discontinue participation at any time. If you have any queries about the study, you may contact researcher **Md. Salman Shahriar Shovon** or my supervisor, **Dr. Shazal Kumar Das PhD**, Assistant Professor and Head, Department of Physiotherapy, BHPI, CRP, Savar, Dhaka-1343.

Do you have any questions before I start?

So, may I have your consent to proceed with the interview?

Yes…… No……

Signature of the participant..... Date.....

Signature of the Interviewer..... Date.....

Appendix- B

সম্মতি ফর্ম

(লিখিত বা মৌখিক সম্মতি)

আসসালামু আলাইকুম,

আমার নাম **মোঃ সালমান শাহরিয়ার শোভন**, বাংলাদেশ হেলথ প্রফেশনস ইনস্টিটিউট (বিএইচপিআই), সিআরপি-তে বিএসসি ইন ফিজিওথেরাপি বিভাগের একজন ছাত্র। আমি ফিজিওথেরাপিতে আমার ব্যাচেলর অফ সায়েন্সের আংশিক পরিপূর্ণতার জন্য একটি অধ্যয়ন পরিচালনা করছি, শিরোনাম, **"বাংলাদেশে হুইলচেয়ার বাস্কেটবল খেলোয়াড়দের মধ্যে কাঁধের ব্যথার প্রাদুর্ভাব এবং সংশ্লিষ্ট ঝুঁকিপূর্ণ কারণসমূহ"**।

এই গবেষণার মাধ্যমে আমি হুইলচেয়ার বাস্কেটবল খেলোয়াড়দের মধ্যে কাঁধের ব্যথার পরিমাণ ও এর সঙ্গে সম্পর্কিত কারণসমূহ খতিয়ে দেখবো। এই উদ্দেশ্যে আমি আপনাদের কাছ থেকে তথ্য সংগ্রহ করবো। আপনি এই গবেষণার অন্তর্ভুক্তির মানদণ্ড পূরণ করেছেন বলে আমি আপনাকে এই গবেষণায় অংশগ্রহণের জন্য আমন্ত্রণ জানাচ্ছি। আপনি যদি অংশগ্রহণ করেন, আমি আপনাকে বাস্কেটবল খেলার অভিজ্ঞতা সংক্রান্ত কিছু প্রশ্ন করবো। আপনার অংশগ্রহণ স্বেচ্ছাসেবী ভিত্তিতে হবে। আপনি যেকোনো সময়ে অংশগ্রহণ প্রত্যাহার করতে পারেন। যদি আপনার গবেষণা সম্পর্কে কোনো প্রশ্ন থাকে, আপনি গবেষক মোঃ সালমান শাহরিয়ার শোভনের সঙ্গে অথবা আমার তত্ত্বাবধায়ক ড. সজল কুমার দাস, পিএইচডি, সহকারী অধ্যাপক ও বিভাগীয় প্রধান, ফিজিওথেরাপি বিভাগ, বিএইচপিআই , সিআরপি, সাভার, ঢাকা-১৩৪৩-এর সঙ্গে যোগাযোগ করতে পারেন।

আপনার কি কোনো প্রশ্ন আছে শুরু করার আগে?

তাহলে, আমি কি আপনার সম্মতি পেতে পারি সাক্ষাৎকার শুরু করার জন্য?

হ্যাঁ..... না.....

অংশগ্রহণকারীর স্বাক্ষর: _____ তারিখ: _____

সাক্ষাৎকার গ্রহণকারীর স্বাক্ষর: _____ তারিখ: _____

Appendix- C

Questionnaire

Identification Number:

Date of Interview:

Part-1: Socio- demographic information

1.1	Age	a. 15-25 Years b. 26-35 Years c. Above 36 Years
1.2	Gender	a. Male b. Female
1.3	Marital status	a. Married b. Unmarried c. Divorce/Separated d. Widowed
1.4	Level of education	a. Illiterate b. Primary level c. Secondary level d. Higher secondary level e. Undergraduate/Graduate
1.5	Residential Area	a. Rural b. Semi urban c. Urban

Part 2: Playing and Training Habits

2.1	Do you play basketball regularly?	a. Yes b. No
2.2	How many days per week do you train or play basketball?	a. 1-2 days b. 3-4 days c. 5 or more days
2.3	How many hours per day do you spend training or playing basketball?	a. Less than 1 hour b. 1-2 hours c. More than 2 hours
2.4	Do you perform any warm-up or stretching exercises before playing?	a. Yes b. No
2.5	Do you perform any cool-down or stretching exercises after playing?	a. Yes b. No

Part 3: Shoulder Pain and Discomfort

3.1	Do you currently experience shoulder pain?	a. Yes b. No
3.2	If yes, for how long have you been experiencing shoulder pain?	a. Less than 1 month b. 1-6 months c. More than 6 months
3.3	In which shoulder do you feel pain?	a. Right b. Left c. Both

3.4	When do you feel shoulder pain?	a. During movement b. At rest c. While using wheelchair
3.5	Does the pain radiate?	a. Yes b. No
3.6	If yes, where does it radiate?	a. Above elbow b. Below elbow c. Wrist d. Hand
3.7	Do you feel any abnormal sensation?	a. Tingling b. Numbness c. Paresthesia

Part 4: Risk Factors

4.1	Have you experienced any shoulder injuries before starting wheelchair basketball?	a. Yes b. No
4.2	What type of wheelchair do you use?	a. Manual b. Electrical
4.3	Do you feel your regular wheelchair is properly fitted for your body?	a. Yes b. No
4.4	Do you feel your sports wheelchair is properly fitted for your body?	a. Yes b. No

4.5	How often do you propel your wheelchair during a typical day?	a. Less than 2 hours b. 3-5 hours c. More than 6 hours
4.6	Do you use any shoulder support or brace during basketball?	a. Yes b. No
4.7	Do you perform shoulder strengthening exercises regularly?	a. Yes b. No

Shoulder Pain and Disability Index (SPADI)

Pain scale

How severe is your pain?

Circle the number that best describes your pain where: 0 = no pain and 10 = the worst pain imaginable.

1. At its worst?	0	1	2	3	4	5	6	7	8	9	10
2. When lying on the involved side?	0	1	2	3	4	5	6	7	8	9	10
3. Reaching for something on a high shelf?	0	1	2	3	4	5	6	7	8	9	10
4. Touching the back of your neck?	0	1	2	3	4	5	6	7	8	9	10
5. Pushing with the involved arm?	0	1	2	3	4	5	6	7	8	9	10

Disability scale

How much difficulty do you have?

Circle the number that best describes your experience where: 0 = no difficulty and 10 = so difficult it requires help.

1. Washing your hair?	0	1	2	3	4	5	6	7	8	9	10
2. Washing your back?	0	1	2	3	4	5	6	7	8	9	10
3. Putting on an undershirt or jumper?	0	1	2	3	4	5	6	7	8	9	10
4. Putting on a shirt that buttons down the front?	0	1	2	3	4	5	6	7	8	9	10
5. Putting on your pants?	0	1	2	3	4	5	6	7	8	9	10
6. Placing an object on a high shelf?	0	1	2	3	4	5	6	7	8	9	10
7. Carrying a heavy object of 10 pounds (4.5 kilograms)	0	1	2	3	4	5	6	7	8	9	10
8. Removing something from your back pocket?	0	1	2	3	4	5	6	7	8	9	10

Appendix- D

প্রশ্নমালা

সনাক্তকরণ নম্বর:

সাক্ষাৎকারের তারিখ:

অংশ ১: সামাজিক ও জনসংখ্যাগত তথ্য

১.১	বয়স	ক. ১৫-২৫ বছর খ. ২৬-৩৫ বছর গ. ৩৬ বছরের উপরে
১.২	লিঙ্গ	ক. পুরুষ খ. মহিলা
১.৩	বৈবাহিক অবস্থা	ক. বিবাহিত খ. অবিবাহিত গ. তালাকপ্রাপ্ত/বিচ্ছিন্ন ঘ. বিধবা/বিপত্নীক
১.৪	শিক্ষা স্তর	ক. নিরক্ষর খ. প্রাথমিক স্তর গ. মাধ্যমিক স্তর

		ঘ. উচ্চ মাধ্যমিক ঙ. স্নাতক/স্নাতকোত্তর
১.৫	বসবাসের এলাকা	ক. গ্রামীণ খ. আধা-শহর গ. শহর

অংশ ২: খেলার ও প্রশিক্ষণের অভ্যাস

২.১	আপনি কি নিয়মিত বাস্কেটবল খেলেন?	ক. হ্যাঁ খ. না
২.২	আপনি প্রতি সপ্তাহে কতদিন খেলেন বা অনুশীলন করেন?	ক. ১-২ দিন খ. ৩-৪ দিন গ. ৫ বা তার বেশি দিন

২.৩	আপনি প্রতিদিন কত ঘণ্টা খেলার বা প্রশিক্ষণের জন্য ব্যয় করেন?	ক. ১ ঘণ্টার কম খ. ১-২ ঘণ্টা গ. ২ ঘণ্টার বেশি
২.৪	আপনি কি খেলার আগে ওয়ার্ম আপ বা স্ট্রেচিং করেন?	ক. হ্যাঁ খ. না
২.৫	আপনি কি খেলার পর কুল ডাউন বা স্ট্রেচিং করেন?	ক. হ্যাঁ খ. না

অংশ ৩: কাঁধে ব্যথা ও অস্বস্তি

৩.১	বর্তমানে কি আপনার কাঁধে ব্যথা আছে?	ক. হ্যাঁ খ. না
৩.২	যদি হ্যাঁ হয়, তাহলে কতদিন ধরে ব্যথা অনুভব করছেন?	ক. ১ মাসের কম খ. ১-৬ মাস গ. ৬ মাসের বেশি
৩.৩	কোন কাঁধে ব্যথা অনুভব করেন?	ক. ডান

		খ. বাম গ. উভয়
৩.৪	কখন কাঁধে ব্যথা অনুভব করেন?	ক. নড়াচড়ার সময় খ. বিশ্রামে গ. হুইলচেয়ার ব্যবহারের সময়
৩.৫	ব্যথা কি ছড়ায়?	ক. হ্যাঁ খ. না
৩.৬	যদি হ্যাঁ হয়, কোথায় ছড়ায়?	ক. কনুইয়ের ওপরে খ. কনুইয়ের নিচে গ. কবজি ঘ. হাত
৩.৭	কোনো অস্বাভাবিক অনুভূতি হয় কি?	ক. ঝিকঝিকানি খ. অবশভাব গ. প্যারেথেশিয়া (বিরল অনুভব)

অংশ ৪: ঝুঁকির কারণসমূহ

৪.১	হুইলচেয়ার বাস্কেটবল খেলা শুরুর আগে কি কাঁধে কোনো আঘাত পেয়েছেন?	ক. হ্যাঁ খ. না
৪.২	আপনি কী ধরনের হুইলচেয়ার ব্যবহার করেন?	ক. ম্যানুয়াল খ. বৈদ্যুতিক
৪.৩	আপনার নিয়মিত হুইলচেয়ার কি আপনার শরীরের জন্য উপযুক্ত?	ক. হ্যাঁ খ. না
৪.৪	আপনার খেলার হুইলচেয়ার কি আপনার শরীরের জন্য উপযুক্ত?	ক. হ্যাঁ খ. না
৪.৫	সাধারণ দিনে আপনি কতক্ষণ হুইলচেয়ার চালান?	ক. ২ ঘণ্টার কম খ. ৩-৫ ঘণ্টা গ. ৬ ঘণ্টার বেশি
৪.৬	আপনি কি খেলার সময় কাঁধে কোনো সাপোর্ট বা ব্রেস ব্যবহার করেন?	ক. হ্যাঁ খ. না
৪.৭	আপনি কি নিয়মিত কাঁধের শক্তি বৃদ্ধির ব্যায়াম করেন?	ক. হ্যাঁ খ. না

কাঁধের ব্যথা ও অক্ষমতা সূচক (SPADI)

ব্যথার স্কেল

আপনার ব্যথা কতটা তীব্র?

Circle the number that best describes your pain where: ০ = কোনো ব্যথা নেই

এবং ১০ = কল্পনাতীত সর্বোচ্চ ব্যথা

১. সবচেয়ে বেশি ব্যথার সময়?	০	১	২	৩	৪	৫	৬	৭	৮	৯	১০
২. আক্রান্ত পাশে শোয়ার সময়?	০	১	২	৩	৪	৫	৬	৭	৮	৯	১০
৩. উঁচু তাক থেকে কিছু নেওয়ার সময়?	০	১	২	৩	৪	৫	৬	৭	৮	৯	১০
৪. ঘাড়ের পেছনে স্পর্শ করার সময়?	০	১	২	৩	৪	৫	৬	৭	৮	৯	১০
৫. আক্রান্ত বাহু দিয়ে ঠেলার সময়?	০	১	২	৩	৪	৫	৬	৭	৮	৯	১০

অক্ষমতার স্কেল

আপনার দৈনন্দিন কাজ করতে কতটা অসুবিধা হয়?

Circle the number that best describes your experience where: কোনো

অসুবিধা নেই এবং ১০ = এত বেশি অসুবিধা যে সাহায্যের প্রয়োজন

১. চুল ধোয়ার সময়	০	১	২	৩	৪	৫	৬	৭	৮	৯	১০
২. পিঠ ধোয়ার সময়	০	১	২	৩	৪	৫	৬	৭	৮	৯	১০

৩. আন্ডারশার্ট বা জাম্পার পরার সময়	০	১	২	৩	৪	৫	৬	৭	৮	৯	১০
৪. সামনের বোতামযুক্ত শার্ট পরার সময়	০	১	২	৩	৪	৫	৬	৭	৮	৯	১০
৫. প্যান্ট পরার সময়	০	১	২	৩	৪	৫	৬	৭	৮	৯	১০
৬. উঁচু তাক থেকে কিছু রাখার সময়	০	১	২	৩	৪	৫	৬	৭	৮	৯	১০
৭. ৪.৫ কেজি ওজনের কিছু বহনের সময়	০	১	২	৩	৪	৫	৬	৭	৮	৯	১০
৮. পিছনের পকেট থেকে কিছু বের করার সময়	০	১	২	৩	৪	৫	৬	৭	৮	৯	১০

Appendix- E

IRB Approval letter

BANGLADESH HEALTH PROFESSIONS INSTITUTE

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

Ref: CRP-BHPI/IRB/12/2024/1043 Date: 15/12/2024

To
Md. Salman Shahriar Shovon
4th Year B.Sc. in Physiotherapy
Session: 2019-2020, Student ID: 112190516
BHPI, CRP, Savar, Dhaka-1343, Bangladesh

Subject: Approval of the thesis proposal "Prevalence and associated risk factors of shoulder pain among wheelchair basketball players in Bangladesh" by ethics committee.

Dear Shovon,
Congratulations.
The Institutional Review Board (IRB) of BHPI has reviewed and discussed your application to conduct the above-mentioned dissertation, with yourself, as the author and Dr. Shazal Kumar Das, PhD, Assistant Professor & Head, Department of Physiotherapy, BHPI, CRP, Savar, Dhaka-1343 as thesis supervisor. The Following documents have been reviewed and approved:

Sl. No.	Name of the Documents
1	Thesis Proposal
2	Questionnaire (English version)
3	Information sheet consent form

The purpose of the study is to explore the prevalence and associated risk factors of shoulder pain among wheelchair basketball players in Bangladesh. The study involves use of a semi structural questionnaire that may take 10 to 15 minutes to answer. Any instruction or precaution for collection of specimen and there is no likelihood of any harm to the participants and participation in the study may benefit the participants. The members of the Ethics committee have approved the study to be conducted in the presented form at the meeting held at **9 AM on July 15, 2024, at BHPI (44th 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 & Course Coordinator, MRS
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 ০১৭৩০ 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- F

Permission letter

16th January, 2025

Head

Department of Physiotherapy

Centre for the Rehabilitation of the Paralysed (CRP)

Chapain, Savar, Dhaka-1343

Through: Head, Department of Physiotherapy, BHPI.

Subject: Prayer for seeking permission to collect data for conducting research project.

Sir,

With due to respect and humble submission to state that I am Md. Salman Shahriar Shovon, a student of 4th year B.Sc. in physiotherapy at Bangladesh Health Professions Institute (BHPI). The Ethical committee has approved my research project entitled: "Prevalence and associated risk factors of shoulder pain among wheelchair basketball players in Bangladesh" under the supervision of Dr. Shazal Kumar Das, PhD, Assistant Professor & Head, Department of Physiotherapy, BHPI. I want to collect data for my research project from the Department of Physiotherapy at CRP. So, I need permission for data collection from the Musculoskeletal Unit and Spinal Cord Injury Unit of Physiotherapy Department at CRP-Savar, Dhaka-1343. I would like to assure that anything of the study will not be harmful for the participants and the Department itself.

I, therefore pray and hope that you would be kind enough to grant my application and give me permission for data collection and oblige thereby.

Yours faithfully,
Salman
Md. Salman Shahriar Shovon

4th Year B.Sc. in Physiotherapy

Class Roll: 36; Session: 2019-20

Bangladesh Health Professions Institute (BHPI)

(An academic Institution of CRP)

CRP-Chapain, Savar, Dhaka-1343.

Forwarded
SKDL
Dr. Shazal Kumar Das, PhD
Assistant Professor and Head
Department of Physiotherapy
CRP, Savar, Dhaka-1343.

Approved
29/1/25
Prof. Dr. Mohammad Anwar Hossain, PhD
Professor Physiotherapy Department BHPI
Senior Consultant & Head
Physiotherapy Department
CRP, Savar, Dhaka-1343