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OUTCOME OF BOOKLET FOR SUPRACONDYLAR HUMERAL FRACTURE

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ABSTRACT

Background: Supracondylar humeral fractures are common in pediatric orthopedics, often requiring comprehensive treatment strategies to restore limb function and mobility. This study evaluates the effectiveness of various interventions on limb mobility, muscle power, and the ability to perform specific movements in patients with these fractures. **Methods**: An experimental study was conducted, involving patients with supracondylar humeral fractures treated at the National Institute of Traumatology and Orthopedic Rehabilitation. Participants underwent a series of interventions, including educational booklets. Pre-test and post-test assessments were conducted to measure limb extension, muscle power, and the ability to perform supination and pronation. **Results**: The study observed significant improvements post-intervention. In limb extension, 62.1% of participants achieved extension above 90 degrees post-test, compared to none pre-test. Muscle power showed substantial enhancement, with 51.8% of participants reaching the highest muscle power level post-intervention. Additionally, 99.0% of participants could perform supination perfectly post-intervention, an increase from 89.2% pre-test. Pronation ability was high in both pre-test and post-test assessments. **Conclusion:** The study demonstrates the positive impact of targeted interventions on improving limb mobility, muscle power, and specific movement abilities in patients with supracondylar humeral fractures. These findings highlight the importance of comprehensive rehabilitation in the treatment of these fractures. Future research should focus on larger-scale studies with longer follow-up periods to further validate and expand upon these findings.

Keywords: Supracondylar Humeral Fractures, Rehabilitation, Limb Mobility, Muscle Power, Physiotherapy, Pediatric Orthopedics.

I. INTRODUCTION

1.1 Background

Supracondylar humeral fractures are a prevalent form of fracture among children, especially those younger than ten years old, and are a major issue in pediatric orthopedics. These injuries manifest immediately above the elbow and frequently arise from a fall onto an extended hand, resulting in a fracture at the slender portion of the humerus in close proximity to the elbow joint. The clinical significance of these fractures lies not only in their frequency but also in the potential for associated complications, which can include nerve injury, vascular injury, and problems with bone healing that can affect the elbow's function. Significantly prevalent are supracondylar humeral fractures. Approximately 3 percent of all pediatric fractures are supracondylar humeral fractures, according to Landin (1983). This statistic underscores the need for effective treatment and management strategies. The age distribution of these fractures typically peaks at around 5-7 years, coinciding with a period of rapid growth and increased physical activity in children (Cheng et al., 2001).

These fractures are defined clinically by displacement and stability. The most prevalent categorization is the Gartland classification, which divides fractures into Type I (non-displaced), Type II (partially displaced but intact posterior cortex), and Type III (totally displaced) (Gartland, 1959). This classification is important because non-displaced fractures (Type I) can be treated conservatively, but displaced fractures (Type II and III) require surgery (Babal et al., 2010). Over time, supracondylar humeral fracture therapy has changed. Displaced fractures require reduction and fixation, whereas casting and close supervision can handle non-displaced fractures. Treatment restores bone alignment to promote healing and reduce the likelihood of problems including malunion, which can impede function (Leitch et al., 2006).

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Supracondylar humeral fracture complications are serious. Neurovascular injuries, compartment syndrome, and Volkmann's ischemic contracture—a severe disorder caused by forearm muscle blood flow disruption—are examples (Ramachandran et al., 2008). These problems must be diagnosed and treated early for best results. When treated quickly, supracondylar humeral fractures have good long-term prognosis. However, the potential for growth disturbances and functional limitations exists, particularly in cases of severe displacement or complications. Regular follow-up and rehabilitation are essential components of the management strategy to ensure the best possible functional recovery (Shaw et al., 2013).

Supracondylar humeral fractures, predominantly observed in the pediatric population, are intriguing both in their nature and the common causes leading to their occurrence. These fractures are characterized by a break in the humerus bone just above the elbow joint, a region known for its vulnerability in children due to various anatomical and physiological factors. Understanding the nature and etiology of these fractures is crucial for developing effective prevention and treatment strategies.

Children are prone to supracondylar humerus fractures. This susceptibility is largely attributable to the area's anatomy. As the smallest section of the humerus, the supracondylar area is weaker and more likely to break under force (Skaggs & Flynn, 2012). Children's developing bone is less dense and more malleable than adult bone, making it more prone to fractures (Cheng et al., 2001). These fractures are categorized by displacement and bone cortical integrity. In the commonly used Gartland classification system, fractures are classified as Type I (non-displaced), Type II (partially displaced), and Type III (totally displaced) (Gartland, 1959). This classification is critical for treatment considerations.

Falling on an outstretched hand with the elbow extended and the forearm valgus stressed causes most supracondylar humeral fractures in youngsters. This damage mechanism usually causes distal fragment posterior displacement (Mulpuri & Wilkins, 2012). Sports injuries and playground equipment falls are also common (Landin, 1983). Also interesting is the age-related incidence of these fractures. They are most common in youngsters aged 5–7, a time of heightened physical activity and exploration but still developing motor coordination and risk assessment skills (Cheng et al., 2001). Due to this developmental stage and the supracondylar region's anatomical weaknesses, these fractures are common in this age range.

Supracondylar humeral fractures are more common in warmer months when outdoor activities are more common (Farnsworth et al., 1998). This seasonal tendency emphasizes the involvement of outdoor play and increased physical activity in these fractures. Boys suffer these fractures more than girls. This discrepancy is commonly attributed to boys' stronger physical activity and risk-taking (Vallamshetla et al., 2006). Preventing supracondylar humeral fractures requires understanding their causes. Educational initiatives for parents and caregivers on play supervision and safety help reduce these injuries. Softer landing surfaces and age-appropriate play equipment can also help prevent playground accidents.

Supracondylar humeral fractures, especially in children, require rapid medical attention and long-term care. According to the Gartland system, these fractures are treated differently depending on severity and kind. Post-treatment care is essential for healing, preventing problems, and restoring function. Conservative treatment is normal for non-displaced fractures (Gartland Type I). Arm immobilization in a cast or splint is typical. Maintaining fracture alignment during spontaneous healing is the goal. Omid et al. (2008) reported that conservative therapy for non-displaced fractures yields good results with few problems.

Displaced Gartland Type II and III fractures generally require surgery. Surgery focuses on reducing and securing shattered bone portions (fixation). Percutaneous pinning, a minimally invasive treatment, holds bone fragments in place. According to a study by Sankar et al. (2011), percutaneous pinning is highly effective in achieving and maintaining proper alignment in displaced supracondylar fractures. In some cases, particularly with partially displaced fractures, closed reduction followed by casting can be an option. This involves manually realigning the bone fragments without surgical incision and then immobilizing the arm in a cast. As reported by Flynn et al. (2010), this method can be effective, but it requires careful monitoring to ensure that the fracture remains properly aligned during healing. Regular follow-up appointments are essential to monitor the healing process and to detect any complications early. This includes regular X-rays to assess bone healing and alignment, as noted by Zionts et al. (2005). Follow-up care allows prompt cast repositioning and pin removal. Physical therapy is essential after treatment. It improves arm strength, range of motion, and function. Stutz et

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al. (2008) found that individualized physical therapy regimens improve supracondylar fracture outcomes in youngsters.

Educating patients and their families about the recovery process, including activity restrictions and rehabilitation exercises, is crucial. As emphasized by Shaw et al. (2013), proper education can improve adherence to rehabilitation protocols and enhance recovery outcomes.Complications such as nerve injury, vascular injury, and malunion can occur despite appropriate treatment. Early identification and management of these complications are vital. A study by Babal et al. (2010) underscored the importance of vigilant post-treatment care in identifying and addressing complications promptly.The psychological impact of the injury and treatment, especially in children, should not be overlooked. Providing psychological support and addressing concerns about pain, limitations in activity, and the overall impact on daily life are important aspects of comprehensive care, as discussed by McCarthy et al. (2005).

Patient education is crucial to treating and recovering from different medical disorders, including supracondylar humeral fractures. Education is essential to therapy success, patient adherence, and recovery. Patient education affects many elements of health care, as shown by rising research. Patient education is to help patients comprehend their condition and therapy. Griffin et al. (2014) found that well-informed patients are more likely to follow treatment recommendations. Immobilization and restricted movement are common treatments for supracondylar humeral fractures, which can be difficult for patients, especially children.

Education can greatly reduce anxiety and improve treatment satisfaction for patients and their families. Coulter and Ellins (2007) found that well-informed patients have reasonable expectations and feel more in control of their health. Pediatric fractures require parents and caregivers to help the child recuperate.

Patient education aids shared decision-making, where doctors and patients decide on treatment plans. Elwyn et al. (2012) found that shared decision-making improves health and patient satisfaction. Supracondylar humeral fractures may require judgments about surgery type or conservative vs. operational treatment. Long-term outcomes can be improved by patient education. Nutbeam (2000) found that patients with higher health literacy, which is linked to patient education, have better long-term health outcomes. Supracondylar humeral fractures require follow-up care, complication recognition, and rehabilitation exercises.

Rehabilitation is a critical component of recovery from supracondylar humeral fractures. Patient education regarding physical therapy exercises, activity modifications, and gradual return to normal activities can significantly impact the effectiveness of rehabilitation. As indicated by Stutz et al. (2008), tailored rehabilitation programs, when combined with proper patient education, lead to better functional outcomes. Educating patients about potential complications and how to avoid them is another crucial aspect of patient education. Babal et al. (2010) emphasized the importance of educating patients about signs of nerve injury and other complications that can arise from supracondylar humeral fractures. Early recognition and intervention in such cases are crucial for preventing long-term sequelae. The use of diverse educational tools, including brochures, models, and digital media, can enhance the effectiveness of patient education. Gustafson et al. (2002) found that multimedia educational programs can significantly improve patients' understanding of their condition and treatment. This is particularly relevant in the pediatric setting, where interactive and engaging educational materials can be more effective.

Effective education in health management, particularly in recovery results, treatment protocol adherence, and patient satisfaction, is becoming increasingly important. Educating children and their caregivers about supracondylar humeral fractures is crucial. This instruction covers injury types, treatment adherence, and recovery expectations. Educational approaches improve recovery outcomes dramatically. Griffin et al. (2014) found that comprehensive education regarding their disease and rehabilitation increased healing and function. Understanding healing limitations and the need of follow-up care can greatly impact supracondylar humeral fracture recovery.

For maximum recovery from supracondylar humeral fractures, strict adherence to treatment procedures is vital. Adherence can be improved through the implementation of educational programs that provide comprehensive explanations of the treatment plan, encompassing the essential components of immobilization, physiotherapy, and follow-up visits. Patient education significantly increases adherence to treatment protocols

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for a variety of medical conditions, including supracondylar humeral fractures, according to research by Kaholokula et al. (2010) and Leung et al. (2009). This finding can be extrapolated to orthopedic injuries such as supracondylar humeral fractures. Patient satisfaction is significantly influenced by the caliber and extent of instruction delivered. Well-informed patients are more likely to be satisfied with their care, since they have reasonable expectations and a greater comprehension of their treatment plan, according to a study by Coulter and Ellins (2007). Within the realm of pediatric orthopedics, greater levels of satisfaction may result from ensuring that both the kid and their caregivers are adequately informed. Additionally, the approach taken to present educational material is a critical determinant of its efficacy. Although conventional approaches like as written materials and vocal directives are frequently employed, the integration of digital resources and interactive sessions has the potential to augment comprehension and retention of information. Gustafson et al. (2002) conducted a study that emphasized the advantages of incorporating multimedia education programs to enhance patients' comprehension of their medical condition and treatment.

It is important to tailor educational content to the needs of individual patients. Factors such as age, cultural background, and literacy levels can influence how patients perceive and understand information. Personalized education, as suggested by Street et al. (2009), can lead to better outcomes in terms of adherence and satisfaction. The long-term benefits of effective patient education extend beyond the immediate recovery period. Patients and caregivers who are well-informed about the injury, its implications, and the importance of rehabilitation are more likely to engage in preventive measures and seek timely medical advice for any complications, as indicated by studies like those of Devine (1996) and Nutbeam (2000).

The educational approaches for patients with supracondylar humeral fractures, particularly in the pediatric population, have evolved significantly over the years. However, there remain several gaps and challenges that can impact the effectiveness of these educational strategies. Identifying and addressing these gaps is crucial for improving patient outcomes and satisfaction. One of the primary challenges in patient education for supracondylar humeral fractures is the lack of standardization in the information provided. As noted by Griffin et al. (2014), there can be significant variability in the content, depth, and format of educational materials across different healthcare settings. This lack of standardization can lead to inconsistencies in patient understanding and adherence to treatment protocols.

The manner in which medical information is conveyed and its inherent complexity may impede the provision of effective patient education. Particularly in high-stress situations like those just after an injury or prior to surgery, medical jargon and convoluted explanations may prove challenging for patients and their families to comprehend. Communicating in a straightforward, succinct, and jargon-free manner is crucial for increasing patient involvement and comprehension, according to Coulter and Ellins (2007). Language and cultural obstacles can have a substantial negative effect on the efficacy of patient education. Karliner et al. (2007) conducted a study that emphasized the disadvantage faced by patients who have poor proficiency in the primary language of the healthcare professional with regard to comprehending their medical condition and treatment. This is particularly relevant in diverse societies where patients may come from various cultural and linguistic backgrounds. In pediatric orthopedics, there is a challenge in creating age-appropriate educational materials that are engaging and understandable for children. As indicated by Gustafson et al. (2002), educational materials often fail to cater to the unique needs and comprehension levels of different age groups, which can affect the child's understanding and cooperation in the treatment process. Access to educational resources can be a challenge, particularly in resource-limited settings or for patients from lower socioeconomic backgrounds. A study by Sanders et al. (2009) found that access to educational materials and resources can vary greatly, which can lead to disparities in patient knowledge and outcomes.

While digital tools and technologies offer new avenues for patient education, their integration into clinical practice is often inconsistent. As reported by Nijland et al. (2011), there is a gap in the effective utilization of digital tools such as interactive apps, websites, and online videos, which can be particularly engaging and informative for patients and families. In cases involving children, the participation of caregivers is vital. Nonetheless, deficiencies may arise in the education and engagement of caregivers, who are crucial participants in the child's recuperation. According to McCarthy et al. (2005), it is critical to involve caregivers in the educational process so that they can be adequately prepared to assist in the child's recovery. There is often a

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lack of robust mechanisms to evaluate the effectiveness of patient education and to gather feedback for improvement. As suggested by Street et al. (2009), continuous evaluation and adaptation of educational strategies based on patient feedback are essential for improving the quality and effectiveness of patient education.

The utilization of educational booklets as a tool for patient education represents a significant advancement in the realm of healthcare communication and patient engagement. These booklets, designed to provide comprehensive, accessible, and tailored information, play a crucial role in enhancing patient understanding, adherence to treatment protocols, and overall satisfaction with healthcare services. A multitude of research studies have examined the efficacy of educational booklets, demonstrating their significance within the healthcare environment. Educational booklets are organized, hard copy resources that impart knowledge regarding a particular medical ailment, its therapeutic interventions, and the process of recuperation. They are designed to supplement verbal instructions and consultations, offering a reference that patients can use throughout their treatment journey. As highlighted by Coulter and Ellins (2007), the provision of written information in the form of booklets can significantly improve patients' understanding of their condition and treatment.

One of the primary advantages of educational booklets is their accessibility. Patients can refer to these booklets at their convenience, which is particularly beneficial given the limited time of consultations. Additionally, as Griffin et al. (2014) noted, booklets provide consistent information, ensuring that all patients receive the same standard of education about their condition and treatment. Educational booklets allow for the presentation of information in a comprehensive yet clear manner. The subjects addressed in these materials may be diverse, encompassing the surgical technique, post-operative care, rehabilitation activities, and the anatomy of the affected area. Effective booklet design can facilitate the attainment of clarity in patient education materials, as underlined by Gustafson et al. (2002).

Patient empowerment through the provision of comprehensive information in the form of educational pamphlets can be observed in the realm of treatment and recovery. Patient-centered care is predicated on this empowerment, which enhances an individual's sense of agency and participation in the treatment process. Sanders et al. (2009) found that patients who are better informed are more likely to be proactive and engaged in their care. It is imperative that educational pamphlets be customized in terms of both layout and substance to suit the particular requirements of the patient demographic. This entails taking into account the patients' age, literacy level, language proficiency, and cultural heritage. The significance of including language and cultural factors into patient education materials to guarantee their accessibility and pertinence to heterogeneous patient populations was emphasized by Karliner et al. (2007).

Incorporating visual aids such as diagrams, illustrations, and photographs can enhance the effectiveness of educational booklets. Visual aids can help in explaining complex medical concepts and procedures, making them more understandable to patients. A study by Houts et al. (2006) found that visual aids significantly improve patients' comprehension and recall of medical information.Including interactive elements such as checklists, questionnaires, and spaces for personal notes can make educational booklets more engaging. These elements encourage patients to actively participate in their care, as suggested by Nijland et al. (2011).One of the challenges in using educational booklets is ensuring that the information is accurate and up-to-date. Medical knowledge and treatment protocols can change rapidly, necessitating regular updates to the booklets. This requires a commitment to ongoing review and revision, as emphasized by Street et al. (2009).Another consideration is the evaluation of the effectiveness of educational booklets in improving patient outcomes. Implementing mechanisms to assess patient understanding, satisfaction, and adherence to treatment protocols is essential for determining the impact of these educational tools.

Educational booklets have emerged as a pivotal tool in patient education, offering structured, accessible, and tailored information that caters to the diverse needs of patients. These booklets, when well-designed, can significantly enhance patient understanding, adherence to treatment protocols, and overall satisfaction with healthcare services. The effectiveness of educational booklets in providing structured and accessible information has been substantiated by various research studies. Educational booklets provide a structured approach to information delivery, which is crucial for patient comprehension and recall. This structure typically

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involves a logical flow of information, starting from basic concepts about the condition and progressing to more detailed information about treatment and recovery. As noted by Coulter and Ellins (2007), structured information helps patients understand complex medical information in a step-by-step manner, which is essential for effective learning and retention.

The success of educational booklets is heavily reliant on the structure of their material. The manner in which information is presented ought to be succinct, logical, and clear. Griffin et al. (2014) underscored the significance of information organization that facilitates patient navigation and comprehension. This entails the implementation of headers, subheadings, and bullet points to effectively partition information into feasible segments. An additional crucial element of educational booklets is their accessibility. They are intentionally crafted to be readily comprehensible by patients who possess diverse levels of education and health literacy. The necessity for patient education materials to be composed in accessible language and devoid of medical jargon, which may cause confusion for patients, was emphasized by Gustafson et al. (2002).

It is critical to ensure that educational pamphlets are composed in language that is straightforward and uncomplicated. It is imperative that the legibility of these publications be suitable for the widest possible audience, including individuals with limited literacy skills. According to a study by Sanders et al. (2009), a greater proportion of patients are capable of comprehending materials that are composed at a lower reading level. In educational pamphlets, the incorporation of visual aids—including diagrams, pictures, and photographs—can significantly augment the readability of content. According to the findings of Houts et al. (2006), the utilization of visual aids might enhance patients' retention and comprehension of medical information, hence simplifying intricate topics.

Tailoring information to meet the specific needs of different patient groups is a key strength of educational booklets. This involves considering factors such as age, cultural background, language, and individual health conditions. Karliner et al. (2007) emphasized the importance of cultural and linguistic appropriateness in patient education materials. Educational booklets should be available in multiple languages and should consider cultural nuances to ensure that they are relevant and respectful to diverse patient populations. For pediatric patients, educational booklets should be designed to be age-appropriate, engaging, and understandable. This might involve the use of colorful illustrations, simpler language, and interactive elements that can hold the attention of younger patients.

One of the challenges in using educational booklets is ensuring that the information provided is accurate, up-to-date, and relevant to the patient's specific condition and treatment plan. Regular updates and reviews of the content are necessary, as medical guidelines and practices evolve. Another important consideration is the evaluation of the effectiveness of educational booklets in improving patient outcomes. Implementing feedback mechanisms and conducting research on patient comprehension and satisfaction are essential for assessing the impact of these educational tools.

The research on the use of educational booklets for patients with supracondylar humeral fractures holds significant potential for impacting various aspects of orthopedic care, particularly in enhancing patient outcomes, informing clinical practices, and contributing to the broader literature on patient education in orthopedic care. The findings from this research can be instrumental in shaping how healthcare providers approach patient education, with a focus on creating more effective, accessible, and patient-centered educational strategies.One of the most direct impacts of this research is the potential improvement in patient outcomes. Educational booklets, as demonstrated in the research, can significantly enhance patients' understanding of their condition and treatment. This improved understanding is crucial for patient compliance with treatment protocols, which is a key determinant of successful outcomes. Griffin et al. (2014) highlighted the correlation between patient education and health outcomes, particularly in pediatric care.

Additionally, instructional leaflets can decrease patient anxiety and increase care satisfaction. Well-informed patients are more likely to have reasonable expectations and a greater sense of control over their health situation, according to Coulter and Ellins (2007); this results in greater patient satisfaction. This holds specific significance within the realm of orthopedic care, given the protracted and arduous nature of the healing process. The implications of the research findings for clinical practice underscore the importance of implementing uniform patient education. As stated by Gustafson et al., educational booklets can guarantee that

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every patient is provided with thorough and consistent information (2002). Ensuring uniformity in information quality and preventing discrepancies in patient education are both dependent on this standardization. The significance of incorporating patient education into the comprehensive care plan is emphasized by the research. Rather than being an afterthought, educational booklets ought to be an integral part of the therapeutic strategy. Sanders et al. (2009) proposed that patient education be incorporated routinely into clinical care due to its significant impact on health outcomes.

By addressing certain gaps in the literature concerning patient education in orthopedic care, this study makes a valuable contribution, specifically in regards to supracondylar humeral fractures. This study offers empirically supported conclusions regarding the efficacy of educational booklets, an area that has received limited attention in the orthopedic literature. Furthermore, these results establish a foundation for subsequent investigations in this field. Through the examination of the merits and drawbacks of instructional booklets, this research paves the way for additional investigations into novel patient education strategies within the field of orthopedics. Nijland et al. (2011) argue that continuous research is needed in order to enhance patient education methodologies.

The implications of this research extend beyond individual clinical practices to influence broader policy and guidelines in orthopedic care. The evidence provided can be used to advocate for the inclusion of standardized patient education materials, such as educational booklets, in orthopedic care guidelines.This research also highlights the importance of interdisciplinary collaboration in developing effective patient education materials. The creation of educational booklets requires input from healthcare professionals, educators, graphic designers, and patients themselves. Such collaboration can lead to more effective and user-friendly educational tools, as suggested by Street et al. (2009).

II. LITERATURE REVIEW

Supracondylar humeral fractures represent a significant portion of pediatric orthopedic injuries, necessitating a comprehensive understanding of their nature, epidemiology, and implications for treatment and patient education. This section of the literature review delves into the definition of supracondylar humeral fractures and examines their epidemiological aspects, drawing on relevant research to provide a detailed overview. Supracondylar humeral fractures are characterized as fractures occurring just above the elbow, involving the distal humerus. Fractures of this nature are frequently observed in the pediatric demographic, namely in offspring aged 5 to 7 years. These fractures are caused by a fall onto an outstretched hand, with the elbow extended and the forearm undergoing valgus stress, as described by Landin (1983). This injury mechanism results in a fracture occurring right above the elbow, with potential variations in both severity and displacement. Cheng and Shen have documented those supracondylar humeral fractures are prevalent in children, constituting an estimated 17 to 18 percent of all pediatric fractures (1993). Research has indicated that the occurrence of these fractures is most prevalent during the early years of schooling, with a marginal advantage reported in boys over girls.

Seasonal variation in the incidence of supracondylar humeral fractures is significant. The occurrence of these fractures is more prevalent among youngsters during the summer months, which correlates with increased outdoor activity, according to a study by Sinikumpu et al. (2012). Additionally, social and geographical factors influence the prevalence of these fractures. Mayne et al. (2008) suggested that there may be a greater prevalence of these injuries among children residing in metropolitan regions and from lower socioeconomic strata. This disparity might be attributed to variations in play environment quality and the availability of safety equipment. As previously stated, the most frequent cause of supracondylar humeral fractures is a fall onto an outstretched hand. Other methods, including direct elbow trauma, are also capable of causing these fractures. Frequently, the kind and severity of a fracture are determined by the nature of the damage.

The classification of supracondylar humeral fractures is determined on the fracture fragments' alignment and displacement. The Gartland classification, which divides these fractures into three categories—Type I (non-displaced), Type II (partially displaced), and Type III—is the most extensively used approach (completely displaced). The categorization, as delineated by Gartland (1959), is vital in ascertaining the course of treatment and the prognosis. Numerous risk factors for supracondylar humeral fractures have been found. An element to

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consider is age, as younger children are more prone to this condition owing to their reduced motor coordination and increased amounts of physical activity. Additionally, there exists a marginal vulnerability of boys to these injuries. Furthermore, engagement in high-risk activities or play on hard surfaces are environmental factors that can augment the probability of developing these fractures.

Supracondylar humeral fractures, which are most commonly observed in children, provide a substantial challenge within the field of pediatric orthopedics. It is of the utmost need to comprehend the prevalent etiology and demographic characteristics of these fractures in order to formulate efficacious preventive measures and customize patient instruction. This segment delves into these facets, utilizing pertinent scholarly investigations to furnish an all-encompassing synopsis. Falls are the leading cause of supracondylar humeral fractures in children, specifically falls involving an outstretched hand with an extended elbow. The fracture of the weaker supracondylar portion of the humerus occurs due to the transmission of stress up the forearm to the elbow, as documented by Landin in 1983. Falls may result from sports participation, playground engagement, or even unintentional mishaps. Recreational activities that require the use of heights or speed are substantial contributors to the development of these fractures. Activities such as climbing playground equipment, riding, and skating are frequent precursors to these injuries in youngsters, according to a research by Cheng and Shen (1993). Although less frequent, supracondylar humeral fractures can also be caused by direct trauma to the elbow region. Injuries of this nature can manifest as sports collisions or incidents wherein the elbow sustains a direct hit. Sinikumpu et al. report that supracondylar humeral fractures occur most frequently in youngsters between the ages of 5 and 7 years (2012). Due to their increasing motor skills and bone strength in addition to their high levels of physical activity, this age group is especially vulnerable. A marginal male preponderance is observed in the occurrence of these fractures. Possibly explaining this disparity is the fact that boys are typically more inclined toward high-energy pursuits and risky behavior. In contrast to girls, boys have a marginally higher propensity to sustain these fractures, according to Mayne et al. (2008).

Seasonal variation in the incidence of supracondylar humeral fractures is evident. They exhibit a higher prevalence among children throughout the summer season, which corresponds with heightened engagement in outdoor activities and sports. The seasonal pattern was emphasized in the study conducted by Sinikumpu et al (2012). Additionally, socioeconomic variables impact the prevalence of supracondylar humeral fractures. Lower socioeconomic status children might be more likely to encounter hazardous play conditions, which could elevate their vulnerability to falls and injuries. Cheng and Shen (1993) examined the relationship between socioeconomic status and the likelihood of fractures in children. Additionally, geographic variation influences the incidence of these fractures. Compared to rural regions, urban areas, which have more concrete surfaces and playground equipment, may see a greater prevalence of these accidents. This is corroborated by the findings of Mayne et al. (2008), who observed an elevated prevalence in metropolitan environments.

Understanding the common causes and demographics affected by supracondylar humeral fractures has significant implications for prevention and patient education. Targeted strategies can be developed to address the specific risks associated with different activities, age groups, and environments. Preventive measures can be tailored to the activities that most commonly lead to these fractures. For instance, ensuring safe playground environments and promoting the use of protective gear during sports can reduce the risk of falls and injuries. Educational initiatives should be age-appropriate, considering the cognitive and developmental stages of the children most at risk. Interactive and engaging educational materials can be more effective for younger children. Efforts should also be made to address the gender and socioeconomic disparities in the incidence of these fractures. This includes providing equal access to safe play environments and sports facilities, regardless of socioeconomic background.

Supracondylar humeral fractures, particularly prevalent in the pediatric population, pose significant clinical challenges due to their potential for complications and the impact on the growing skeleton. This section explores the clinical significance of these fractures and reviews the typical treatment approaches, drawing from current research and clinical guidelines. Supracondylar humeral fractures are clinically significant due to their high risk of complications. These complications can include neurovascular injury, compartment syndrome, and malunion, as highlighted by Skaggs et al. (2008). The proximity of these fractures to major nerves and blood

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vessels in the elbow increases the risk of such complications, making prompt and accurate diagnosis and treatment crucial. These fractures may significantly impair the development and growth of the elbow joint in youngsters. A fracture in the elbow, which is a vital point for growth in the upper limb, may result in angular deformities or growth abnormalities. The research conducted by Omid et al. (2008) highlights this topic in particular, emphasizing the importance of cautious management in order to prevent long-term consequences. Non-operative care is often reserved for fractures that are non-displaced or have only mild displacement (Gartland Type I and some Type II fractures). The conventional method entails securing the arm in a cast or splint to immobilize it, as Cheng and Shen delineate (1993). Allowing the fracture to heal on its own while limiting the danger of displacement or additional harm is the objective.

Operative care is frequently necessary when confronted with more serious fractures (Gartland Type III and some Type II fractures). The primary objective of surgical intervention is to straighten and stabilize the fractured bones, typically by means of internal fixation or pinning. Surgical surgery has been shown to effectively mitigate the risk of malunion and other problems associated with displaced supracondylar humeral fractures, according to a study by Kocher et al. (2007). For these fractures, closed reduction and percutaneous pinning (CRPP) is the most often employed surgical method. In this minimally invasive treatment, the bone pieces are realigned and subsequently stabilized with pins without the need for a substantial incision. Leitch et al. (2006) documented exceptional success rates associated with CRPP, emphasizing its efficacy in attaining favorable functional outcomes while minimizing problems. When closed reduction is not feasible or effective, it may be essential to employ open reduction and internal fixation (ORIF). Fixation with pins or screws follows this more intrusive surgery, which entails making an incision to directly observe and correct the fracture fragments. ORIF was emphasized in a study by Babal et al. (2010) regarding the application of ORIF to severe supracondylar fractures, where it was noted that it assisted in obtaining anatomical alignment.

Post-treatment care, which includes physical therapy and rehabilitation, is essential for preventing stiffness or weakening in the affected limb and recovering function. Physical therapy often commences subsequent to the removal of the cast or splint, with the primary objective of reinstating elbow strength, range of motion, and ordinary functionality. Emphasizing the significance of rehabilitation in the course of recovery, Sponseller et al. (2008) highlight its contribution to the attainment of favorable long-term results. Consistent monitoring and follow-up are critical in order to evaluate the progress of recovery, identify any complications in their early stages, and make necessary modifications to the treatment regimen. As suggested by Zionts et al., this implies routine imaging examinations and clinical evaluations to verify appropriate bone alignment and healing (2005).

Patient education is an essential element of holistic patient care in the field of orthopedics, with significant implications for improving treatment results, patient contentment, and general health knowledge. The significance and function of patient education in orthopedics are examined in this section, with citations to pertinent literature and research. Therapy outcomes are substantially influenced by patient education, as it enhances patients' comprehension of their medical condition and the suggested course of treatment. Griffin et al. (2014) undertook a study that underscored the criticality of informed patients complying with treatment recommendations, a factor that significantly impacts the efficacy of non-surgical and surgical therapies. This compliance include the observance of prescribed physical treatment, attendance at follow-up appointments, and adherence to medication schedules. Additionally, patient education that is effective is crucial to the recovery and rehabilitation process. Coulter and Ellins (2007) claim that patients who possess comprehensive knowledge on their rehabilitation exercises and the process of recovery exhibit heightened motivation and engagement, ultimately resulting in improved functional results. This holds significant relevance in the field of orthopedics, as complete recovery hinges on the implementation of post-operative exercises and precautions.

Patients are empowered to make educated decisions regarding their care through patient education. Patients are more likely to be satisfied with their care when they have a comprehensive understanding of their disease and treatment alternatives, according to a study by Gustafson et al. (2002). This is because informed patients can actively engage in decision-making processes. Patients who are adequately informed generally experience reduced anxiety in relation to their treatment and prognosis. According to Sanders et al. (2009), confidence in the healthcare provider and the treatment plan can be increased as a result of anxieties and misconceptions being dispelled through effective education and communication. In order to promote health literacy, which is

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the capacity to comprehend and apply health information to make informed decisions regarding one's health, patient education in orthopedics is vital. The significance of health literacy in the management of chronic illnesses, such as musculoskeletal problems, was examined by Nijland et al. (2011). Patients who possess knowledge about their ailment are more capable of comprehending it and implementing self-management strategies.

Education can also lead to long-term changes in health behaviors, which is particularly important in orthopedics where lifestyle modifications may be required. Street et al. (2009) suggested that patient education can encourage behaviors that promote joint health and prevent future injuries, such as weight management and regular exercise. One of the challenges in patient education is the need to tailor information to individual patients' needs, considering factors such as age, literacy level, and cultural background. As indicated by Griffin et al. (2014), personalized education is more effective than a one-size-fits-all approach. The use of technology in patient education offers significant opportunities. Digital platforms, such as patient portals and mobile apps, can provide accessible and interactive educational materials, as explored by Gustafson et al. (2002). These technologies can supplement traditional education methods and cater to the preferences of a diverse patient population.

Patient education is a cornerstone of effective healthcare, particularly in managing chronic conditions like those often encountered in orthopedics. Various methods of patient education have been developed and implemented, each with its own strengths and challenges. This section explores these methods and evaluates their effectiveness, drawing from current research and literature. Traditional methods of patient education often involve verbal instruction and the use of printed materials such as brochures, pamphlets, and booklets. A study by Gustafson et al. (2002) indicated that while these methods are widely used due to their simplicity and low cost, their effectiveness can be limited by patients' literacy levels and recall abilities. However, they remain a staple in patient education due to their accessibility and ease of distribution. Group education sessions, where patients with similar conditions learn together, can be effective, particularly in terms of peer support and shared learning. A study by Lorig et al. (2001) demonstrated that group sessions could enhance knowledge, self-efficacy, and health behavior changes. These sessions often combine verbal instruction with interactive components such as demonstrations and role-playing.

Patient education has benefited from the development of online resources and e-learning modules brought about by the introduction of digital technology. These platforms provide compelling and dynamic material that is frequently customized to meet the specific requirements of users. According to Nijland et al. (2011), internet resources have the capacity to offer more comprehensive information and are available to a wider range of users. Nevertheless, the efficacy of these technologies may be compromised by the technological availability and digital literacy of the patients. Patient education is witnessing a surge in the utilization of mobile health applications, which provide enhanced convenience and individualized learning experiences. Free et al. (2013) conducted a study that underscored the potential of mobile applications to enhance health outcomes by means of personalized educational content, reminders, and tracking. Nevertheless, the efficacy of these applications may differ contingent upon their interface, usability, and the caliber of the data they deliver. Individualized instruction that is customized to the patient's particular condition, learning style, and concerns is possible through one-on-one therapy. Particularly successful at removing individual obstacles to comprehension and adherence, this approach may be utilized. Personalized counseling can dramatically increase patient understanding, satisfaction, and treatment adherence, according to a study by Street et al. (2009).

The utilization of interactive workshops and demonstrations, in which patients engage in active learning activities, has the potential to augment comprehension and retention of information. Particularly beneficial for instructing practical skills, such as fitness routines or self-care practices, are these approaches. Interactive approaches, according to Coulter and Ellins (2007), may increase student engagement and facilitate the application of acquired abilities. The integration of various patient education modalities, commonly known as multimodal approaches, has the potential to yield significant benefits. Griffin et al. (2014) proposed that the integration of spoken, written, and digital resources could accommodate various learning styles and preferences, therefore augmenting the overall efficacy of patient education. It is imperative to customize patient education according to their individual requirements and preferences when employing multimodal

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techniques. This include the evaluation of variables such as health state, age, reading level, and cultural background. Sanders et al. (2009) underscored the significance of tailoring education to enhance its applicability and influence on specific patients.

Patient education is an essential component of orthopedic injury management; nonetheless, it encounters numerous obstacles and deficiencies that may compromise its efficacy. By utilising current research and literature, this section examines these obstacles and deficiencies in depth in order to present a comprehensive summary. A significant obstacle in the realm of patient education pertaining to orthopedic injuries is the sometimes inadequate level of health literacy exhibited by patients. A considerable number of patients have difficulty in comprehending intricate medical terminology and treatment strategies. According to a study by Berkman et al. (2011), inadequate health literacy might result in a failure to comprehend vital health information, which is essential for the proper management of orthopedic injuries. A lack of health literacy is additionally correlated with worse adherence to therapy. Patients who do not fully comprehend their medical condition or the significance of their treatment regimen are less inclined to adhere to it accurately, potentially resulting in worse than ideal outcomes, as stated by Sanders et al. (2009).

Orthopedic offices frequently encounter difficulties when it comes to delivering language-appropriate and culturally relevant education to their various patient populations. Flores (2005) posits that linguistic and cultural disparities can substantially impede the efficacy of patient education, potentially resulting in misinterpretations and diminished adherence. A dearth exists for patient education resources and methodologies that are accessible in numerous languages and culturally sensitive. The lack of materials that are culturally suitable can impede the efficacy of education and communication, as Karliner et al. argue (2007). The proliferation of digital technology in patient education gives rise to some obstacles, most notably those associated with the digital divide. The unequal access to digital resources among patients, as emphasized by Nijland et al. (2011), can restrict the efficacy and accessibility of online patient education tools. Further, elderly folks or individuals with low technological proficiency may find the usefulness and accessibility of digital patient education tools to be obstacles. Free et al. (2013) emphasize the importance of taking into account the design and complexity of digital tools in order to guarantee that they are accessible to all patients and user-friendly.

Time limitations provide a substantial obstacle in clinical environments when it comes to delivering thorough patient education. Frequently, healthcare professionals are constrained in their amount of time spent with each patient, which can compromise the caliber and quantity of education delivered. Griffin et al. (2014) underscored the significance of time limitations in relation to the capacity to provide efficacious patient education. Due to this reliance on healthcare providers for education, patients who visit various physicians may not obtain consistent information. According to the findings of Coulter and Ellins (2007), information inconsistency may result in patient confusion and decreased adherence to treatment strategies. The content and quality of educational materials utilized in orthopedic patient education vary considerably. As stated by Gustafson et al. (2002), this discrepancy may result in patients having differing degrees of comprehension and involvement. The absence of standardized, evidence-based educational materials represents a substantial deficiency in present methodologies. Lorig et al. (2001) emphasized the need of utilizing materials supported by research in order to guarantee precision and efficacy in patient education.

Enhanced patient education is a critical factor in promoting adherence to treatment. Patients demonstrate greater compliance with prescribed therapies and are more likely to adhere to medical recommendations when they possess a comprehensive understanding of their ailment and treatment plan. Patients who were adequately educated exhibited greater levels of engagement and adherence to treatment regimens, according to Gustafson et al. (2002). Non-compliance frequently arises from an inadequate comprehension of the significance of the treatment or the proper way to adhere to it. Effective patient education decreases incidences of non-adherence caused by uncertainty or misunderstanding of treatment regimens, according to Berkman et al. (2011). Patients with more knowledge are more capable of managing their own health and rehabilitation. According to Lorig et al. (2001), patient education plays a crucial role in enabling patients to effectively self-manage chronic diseases by equipping them with the knowledge and abilities required to do so. This, in turn, results in enhanced health outcomes. Complicated cases and hospital readmissions have been found to

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decrease in tandem with enhanced patient education. Patients who got extensive education regarding their disease and post-treatment care had lower rates of problems and were less likely to be readmitted to the hospital, according to Coulter and Ellins (2007).

A strong correlation exists between patient comprehension of their health condition and therapy and patient happiness. Griffin et al. (2014) discovered that patients who were provided with comprehensive education regarding their condition and treatment reported greater levels of satisfaction. This can be attributed to the patients' improved comprehension of their health and increased self-assurance in effectively managing their condition. Enhanced patient education facilitates improved communication between healthcare practitioners and patients, so fostering heightened levels of trust and satisfaction. The importance of clear and comprehensive education in enhancing the patient-provider interaction and subsequently leading to increased patient satisfaction was underscored by Sanders et al. (2009). Enhanced patient education contributes to long-lasting modifications in health behaviors and lifestyle choices. Patients who were provided with effective instruction were more likely to adopt and maintain healthy behaviors over time, resulting in better overall health outcomes, according to Nijland et al. (2011). Education of the patient is especially vital in the setting of chronic disorders. According to Free et al. (2013), individuals with chronic diseases like diabetes or hypertension who were better educated demonstrated enhanced disease management, which ultimately resulted in more favorable long-term health outcomes. A patient education difficulty is accommodating patients' varied requirements and learning styles. Street et al. (2009) argue that in order to accommodate diverse patient populations, including individuals with variable degrees of health literacy, educational approaches must be flexible.

Another obstacle is ensuring continuity and consistency in patient education across various healthcare settings. Berkman et al. argue that in the face of increasing healthcare complexity, it is critical to uphold a consistent and ongoing approach to patient education in order to achieve the most favorable outcomes (2011). Numerous research have examined the correlation between patient education and results in orthopedic injuries. This segment provides a comprehensive overview of particular studies that have examined the effects of patient education on outcomes within orthopedic environments. These outcomes encompass patient satisfaction, treatment adherence, and recovery rates. Recovery after surgery is a major area in which patient education has demonstrated substantial influence. Griffin et al. (2014) discovered in an orthopedic environment that patients who were provided with thorough education regarding their surgical procedure, including information on the anticipated recovery period, exhibited enhanced rehabilitation outcomes and expedited recovery rates. Additionally, educational interventions have been associated with a decrease in postoperative problems. Patients who were well-informed regarding post-surgical care experienced fewer problems and a reduced likelihood of hospital readmissions, according to a study by Coulter and Ellins (2007).

Patient education is of paramount importance in physiotherapy since it directly impacts treatment adherence. Patients who were provided with comprehensive instructions and education regarding their physiotherapy regimen demonstrated increased adherence rates and more successful involvement in their rehabilitation exercises, according to a study by Lorig et al. (2001). Patient education additionally exerts a positive influence on medication adherence. Patients who comprehended the significance and function of their prescriptions were more likely to comply with their prescribed regimens, according to Berkman et al. (2011). In orthopedic settings, patient education has been found to substantially boost patient satisfaction. Patients expressed greater satisfaction with their care when they were provided with comprehensive education of their condition and available treatment options, according to a study by Gustafson et al. (2002). Additionally, educational interventions in orthopedics boost the self-efficacy of patients. Better overall results were observed when patients were informed about their disease and how to manage it, as proven by Sanders et al. (2009). Such patients felt more in charge and capable of handling their rehabilitation. Educating patients on chronic orthopedic diseases has been associated with long-lasting improvements. Patients with chronic illnesses such as osteoarthritis who received continued education had long-term gains in pain management and mobility, according to Nijland et al. (2011).

Education also influences long-term lifestyle changes, which are crucial in orthopedic injury recovery. Free et al. (2013) found that patients who received education about lifestyle modifications necessary for their recovery

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were more likely to make and maintain these changes. One challenge in orthopedic patient education is addressing the individual needs and circumstances of each patient. As noted by Street et al. (2009), personalized education plans are essential for effective patient education in orthopedics. Ensuring consistency in the information provided by different healthcare providers is another challenge. Berkman et al. (2011) emphasized the need for a standardized approach to patient education to avoid conflicting information and confusion.

III. METHODOLOGY

3.1 Design of the study

By utilizing an experimental study design, this research investigation examined the long-term effects of an educational booklet on patients who had sustained supracondylar humeral fractures.

3.2 Study Population

A wide variety of age groups and socio-demographic profiles were represented among the patients who underwent treatment for supracondylar humeral fractures at the orthopedic division of the National Institute of Traumatology and Orthopedic Rehabilitation (NITOR).

3.3 Study Area

The research was carried out in the orthopedic department of the Traumatology and Orthopedic Rehabilitation (NITOR) hospital, which was selected due to its appropriate patient demographic and controlled setting, which facilitated the intervention's administration and evaluation.

3.4 Study Period

The research was undertaken during July to November of 2023.

3.5 Selection of participants

The selection process involved identifying eligible patients based on specific criteria from the orthopedic department.

3.5.1 Inclusion Criteria

- Patients aged between 2 to 25 years.
- Confirmed diagnosis of supracondylar humeral fracture.
- Undergone either conservative treatment or surgical intervention for the fracture..
- Ability to provide informed consent, either personally or through a legal guardian (in the case of minors).
- Availability for the duration of the study period for follow-up assessments.
- Sufficient cognitive ability to understand the educational booklet and participate in the study.

3.5.2 Exclusion Criteria

- Presence of other major injuries or conditions that could have interfered with the treatment or recovery of the supracondylar humeral fracture.
- Significant language or cognitive barriers that would have prevented understanding of the educational material or communication with the research team.
- Pre-existing musculoskeletal or neurological conditions that could have affected the outcome measurements (e.g., chronic arthritis, previous fractures in the same area).
- Patients who had developed major complications following surgery for their fracture were excluded from this study.
- Patients on long-term medications were also excluded from this study.

3.6 Sample Size

Sample size for this study was based on the calculation using the following formula.

$$n= (z^2\ pq)/d^2$$

Where,

n = The desired number of samples

Z = normal standard deviation, which is the level of statistical significance. The level of significance is set at 1.96, which equates to a confidence level of five hundred and fifty percent.

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P = the projected percentage of the overall level of patient satisfaction (0.50)

The degree of absolute precision that was taken into consideration for this investigation is d, which is equal to a degree of 0.5 percent.

For a degree of confidence of 95% and an error rate of 5% (which is to be permitted), the estimated sample size for p=50 percent is set at:

n = ((1.96) ^2 (0.50) (0.50))/ ((0.05) ^2)

= 384. **N.B. As the target population is very limited, only 195 data were collected.**

3.7 Sampling technique

The study used convenience sampling to select participants from those visiting the orthopedic department. Patients meeting the inclusion criteria were approached for participation.

3.8 Research instrument and tools

A structured questionnaire, including sections on socio-demographic information, medical history, and pre- and post-intervention assessments of joint function and muscle power, was utilized. Standard clinical tools for assessing joint mobility and muscle strength were employed.

3.9 Data collection procedure

- **Initial Assessment**: Upon agreeing to participate, patients completed the baseline questionnaire covering socio-demographic and medical information, and pre-intervention joint and muscle assessments.
- **Booklet Distribution**: Participants then received the educational booklet with instructions on its use.
- **Follow-Up Assessment**: After 14 days, the same questionnaire was administered to assess changes post-intervention.

3.10 Data Processing & Analysis Plan

Data Entry and Cleaning: Data were entered into a secure database and checked for completeness and accuracy. Analysis included descriptive statistics for demographic data and comparative analysis for pre- and post-intervention measurements.

3.11 Quality Control of data

Before beginning the primary research project, a pilot test was carried out in order to guarantee the dependability and authenticity of the data. For the purpose of collecting data, training was provided, and established protocols were adhered to. Audits of the data collecting and input processes were carried out on a regular basis in order to detect and address any inconsistencies that were discovered.

3.12 Ethical Considerations

- The Ethical Review Committee (ERC) of Bangladesh Open University was successful in obtaining ethical clearance, and the ethical norms established by BOU were adhered to throughout the process.
- It was ensured that permission was secured from the BOU hospital administration.
- After providing the respondents with a comprehensive explanation of the nature and purpose of the study, they gave their agreement after being fully informed.
- A guarantee was given to the respondents that their privacy would be protected and that the confidentiality of their data would be protected.
- Additionally, the right to decline participation in the study was protected and guaranteed.
- The only purpose for which the data would be used is for study.

IV. RESULTS

Table 1 outlines the sociodemographic characteristics of the study participants. The age distribution reveals that a significant proportion falls within the 7-12 years range (54.9), closely followed by individuals less than or equal to 6 years (30.8%), while those above 12 years constitute 14.4% of the sample. Gender distribution is nearly balanced, with 51.8% male and 48.2% female respondents. In terms of education, the majority of participants have attained primary education (64.1%), followed by those with secondary education (16.9%). A smaller percentage is classified as illiterate (18.5%), and only a negligible fraction has completed graduation or above (0.5%). Occupation-wise, the respondents represent diverse sectors, with students (28.2%) and service

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professionals (26.7%) forming the two largest groups. Family size is predominantly small, with 80.0% having two or fewer family members, while the remaining 20.0% have more than two family members.

Table 1: Sociodemographic characteristic of the respondents

Variables	Category	Frequency (%)
Age	≤6 years	60 (30.8)
	7-12 years	107 (54.9)
	>12 years	28 (14.4)
Gender	Male	101 (51.8)
	Female	94 (48.2)
Education	Illiterate	36 (18.5)
	Primary	125 (64.1)
	Secondary	33 (16.9)
	Graduation and above	1 (0.5)
Occupation	Student	140 (71.8)
	Others	55 (28.2)
Number of family member	≤7	156 (80.0)
	>7	39 (20.0)

Table 2 provides a comprehensive overview of the medical information related to the respondents in the study. The majority of participants underwent surgical management for the supracondylar humeral fracture, constituting 80.0% of the sample, while 20.0% opted for conservative treatment using a plaster of Paris (POP). Concerning the duration of surgery, a significant percentage (79.0%) underwent the procedure within one week, emphasizing a relatively prompt response to medical intervention. Only a minimal fraction (1.5%) experienced a surgical duration exceeding one week. Regarding the duration the plaster was opened after the procedure, the vast majority (97.4%) had the plaster removed within one week, underscoring a timely resolution of postoperative immobilization. A small proportion (2.1%) had the plaster removed after one week. Notably, a high compliance rate was observed in terms of following the doctor's home advice about hand position with the plaster, with 98.5% indicating adherence to medical instructions. Only a minimal percentage (1.5%) reported not following the prescribed hand position advice.

Table 2: Medical information of the respondents

Variables	Category	Frequency (%)
Type of management for fracture	Conservative by POP	39 (20.0)
	Surgical	156 (80.0)
Duration of surgery	Within one week	154 (79.0)
	Above one week	3 (1.5)
Duration the plaster opened	Within one week	190 (97.4)
	Above one week	4 (2.1)
Followed doctor's home advice about hand position with plaster	Yes	192 (98.5)
	No	3 (1.5)

Figure 1 present for both the pre-test and post-test conditions, illustrates the distribution of responses regarding joint stiffness among the participants. In the pre-test, all participants reported experiencing joint stiffness. However, the post-test results indicate that despite the intervention, 97.4% of participants still

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reported joint stiffness, with only 2.6% indicating no joint stiffness. This suggests that the intervention might not have led to a significant reduction in the percentage of participants experiencing joint stiffness.

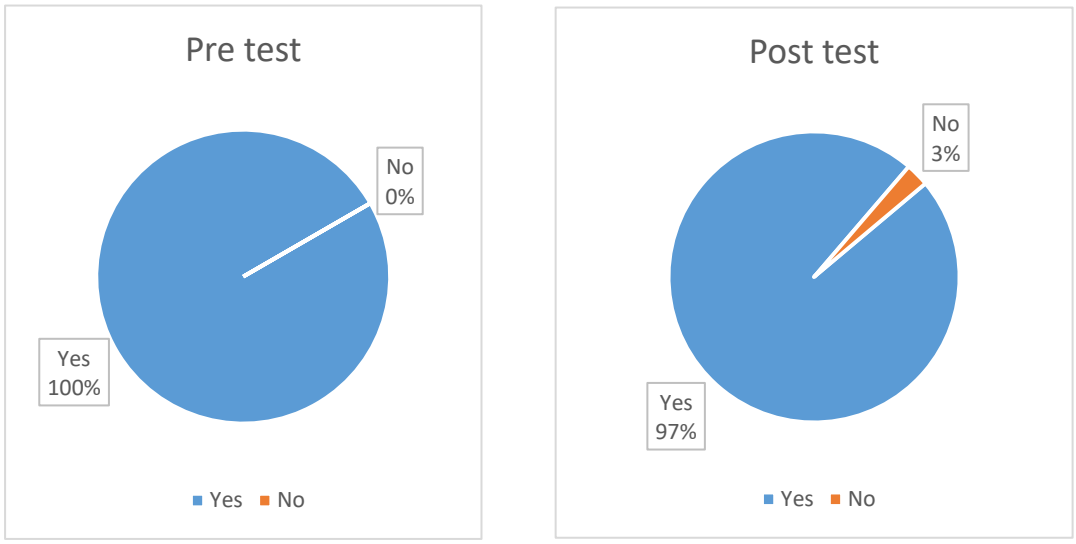

Figure 1: Comparison of joint stiffness in between pretest and post test

Figure 2 indicates notable changes in participants' ability to fold the joint perfectly before and after the intervention. In the pre-test, all participants (100%) reported an inability to fold the joint perfectly. However, in the post-test, the results reveal that 97.4% of participants still face challenges in folding the joint perfectly, with only 2.6% reporting the ability to do so. This suggests that, despite the intervention, the majority of participants continue to experience difficulty in achieving optimal joint flexibility.

Figure 2: The comparison of joint folding in between pretest and post test

Figure 3 provides valuable insights into the degree of joint flexibility among study participants before and after the intervention. In the pre-test, participants who were unable to fold the joint perfectly were asked to specify the degree up to which they could achieve flexion. The majority (80%) reported a limited range of 30-60 degrees, indicating a moderate level of joint flexibility, while 11.8% could achieve a range of 60-90 degrees. Notably, none of the participants in the pre-test reported being able to fold the joint in the 0–30-degree range, and no participants achieved a flexion range above 90 degrees.

In the post-test, the results demonstrate a positive shift in participants' ability to achieve flexion. The majority (68.9%) reported being able to fold the joint above 90 degrees, indicating a substantial improvement in joint flexibility. Additionally, 29.5% reported a flexion range of 60-90 degrees, showcasing continued progress. Notably, a small percentage (1.6%) indicated a flexion range of 30-60 degrees, suggesting that some participants experienced improvement but still within a moderate range.

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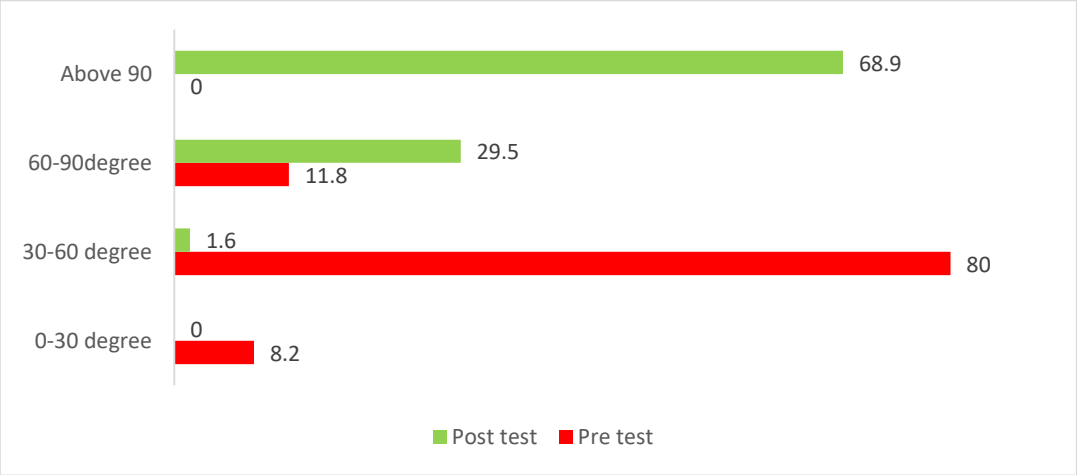

Figure 3: Comparison of pretest and post on number of degrees can fold up the respondents

Figure 4 substantial changes in participants' ability to achieve full joint extension before and after the intervention. In the pre-test, the overwhelming majority of participants (99.5%) reported an inability to extend the joint perfectly, signifying a significant limitation in joint mobility. Only a minimal percentage (0.5%) reported being able to extend the joint perfectly. In the post-test, the results indicate a marked improvement, with 36.9% of participants now reporting the ability to extend the joint perfectly. However, the majority (63.1%) still face challenges in achieving full joint extension.

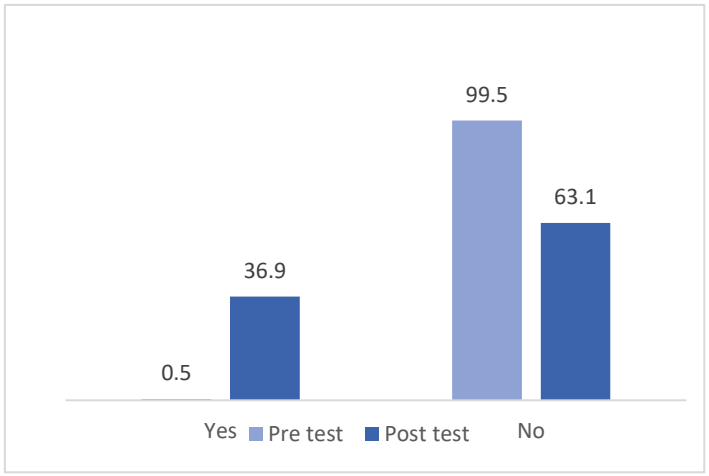

Figure 4: Percentage of the respondents who can extend their joint perfectly

Table 3 summarizes the results from a series of paired samples t-tests assessing changes in various physical functions, specifically joint stiffness, joint flexibility, and muscle power. For joint stiffness, the results indicate a slight but statistically significant reduction, with an average decrease of 0.026 units ($p = 0.025$). In contrast, the ability to fold the joint perfectly improved by the same magnitude (mean increase of 0.026) and was also statistically significant ($p = 0.025$). The ability to fold up to a certain degree when not perfect decreased substantially, with a mean reduction of 1.663 degrees, which is highly significant ($p < 0.001$). When assessing the ability to extend the joint perfectly, there was a notable improvement (mean increase of 0.364), and this was statistically significant ($p < 0.001$). However, for those who could not extend perfectly, the degree to which they could extend decreased significantly by an average of 1.704 degrees ($p < 0.001$). Muscle power of the limb showed a large improvement, with a mean increase of 1.508, and this was highly significant ($p < 0.001$). The ability to perform supination perfectly increased slightly with a mean of 0.097, which was also significant ($p < 0.001$). Finally, the improvement in the ability to perform pronation perfectly was very slight (mean increase of 0.015) and not statistically significant ($p = 0.083$). These results suggest that, overall, there were significant

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improvements in several aspects of joint functionality and muscle power, with the exception of the ability to perform pronation perfectly, which did not show a significant change.

Table 3: Pretest and post comparison

Variables	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	p-value
				Lower	Upper			
Joint stiffness	-0.026	0.158	0.011	-0.048	-0.003	-2.259	194	0.025
Folded the joint perfectly	0.026	0.158	0.011	0.003	0.048	2.259	194	0.025
If not, how many degrees folded up to	-1.663	0.546	0.04	-1.741	-1.585	-41.951	189	< 0.001
Extended joint perfectly	0.364	0.493	0.035	0.294	0.434	10.314	194	< 0.001
If not, how many degrees extended	-1.704	0.554	0.05	-1.802	-1.606	-34.393	124	< 0.001
Muscle power of limb	1.508	0.612	0.044	1.421	1.594	34.383	194	< 0.001
Performed supination perfectly	0.097	0.297	0.021	0.055	0.139	4.576	194	< 0.001
Performed pronation perfectly	0.015	0.123	0.009	-0.002	0.033	1.741	194	0.083

V. DISCUSSION

This study found that 54.9% of participants were in the 7-12 years range, followed by 30.8% less than or equal to 6 years, and 14.4% above 12 years. In line with the findings of the study, which indicated that supracondylar humeral fractures are more prevalent in pediatric groups, these findings are consistent. It has been reported by Setiawanto (2023) in the Orthopaedic Journal of Sports Medicine that boys aged 8-9 years are the most susceptible to the condition. Bojović et al. (2012) in Acta Medica Medianae discovered that the highest incidence occurs between the fifth and seventh year of age, with a slightly higher incidence in boys (Setiawanto, 2023; Bojović et al., 2012). The nearly balanced gender distribution in the study (51.8% male and 48.2% female) is consistent with some research, although a slightly higher incidence in boys is often reported. This suggests that while supracondylar humeral fractures are slightly more common in boys, they are also a significant concern in girls (Bojović et al., 2012).

The majority of the participants having primary education (64.1%) might reflect the general education level of the population attending NITOR. The diverse occupational representation, including students and service professionals, provides a broad perspective on the impact of the condition across different sectors. The finding that 80.0% of respondents have two or fewer family members is a unique sociodemographic insight, as family size is not commonly reported in the research on supracondylar humeral fractures.

This study indicates that 80.0% of participants underwent surgical management for supracondylar humeral fractures. This aligns with current trends in orthopedic practice, where surgical intervention, particularly pinning and internal fixation, is commonly preferred for these fractures. Open reduction and internal fixation with multiple plates in supracondylar humeral fractures, for instance, have been shown to yield high union rates and excellent functional outcomes, according to Salvador et al. (2017). (Salvador et al., 2017). The prompt surgical response and quick plaster removal in the study (79.0% within one week and 97.4% plaster removal within one week, respectively) are crucial for optimal recovery.

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This is in line with the findings of the research that places an emphasis on emergency surgical intervention. An example of this would be the suggestion made by Liu et al. (2022) that closed reduction with a minimally invasive approach, followed by external fixation, as an alternate treatment for delayed supracondylar humeral fractures in children (Liu et al., 2022). According to the findings of the study, the high compliance rate of 98.5 percent in following the advise of the doctor on the hand posture with the plaster is crucial for their recovery. The success of conservative therapy and postoperative care is directly correlated to the degree to which patients comply with their treatment plans.

The study's finding that 97.4% of participants still reported joint stiffness post-intervention is notable. This suggests that the educational intervention might not have been significantly effective in reducing joint stiffness. In contrast, Zhu Jian-hu (2010) reported that educational interventions, including psychological intervention and proper instruction of joint exercises, can significantly increase the total range of movement in patients (Zhu Jian-hu, 2010).The study's finding that 97.4% of participants still face challenges in folding the joint perfectly post-intervention is significant. This suggests that the intervention might not have been sufficiently effective in improving joint flexibility. In contrast, Shinde and Pawar (2022) reported that immediate physiotherapy intervention, including manual therapy and therapeutic exercises, can significantly improve range of motion, muscle strength, and pain reduction after supracondylar fracture surgery in children (Shinde & Pawar, 2022).

The study's post-test results showing a majority (68.9%) of participants achieving a flexion range above 90 degrees indicate a substantial improvement in joint flexibility. This is consistent with the research, where immediate physiotherapy intervention, including manual therapy and therapeutic exercises, has been shown to significantly improve the range of motion in patients with supracondylar fractures (Shinde & Pawar, 2022). The study's post-test results showing 36.9% of participants achieving the ability to extend the joint perfectly indicate a marked improvement in joint mobility. This is consistent with the study, where immediate physiotherapy intervention, including manual therapy and therapeutic exercises, has been shown to significantly improve the range of motion in patients with supracondylar fractures (Shinde & Pawar, 2022).

The study's findings showing substantial improvements in limb extension and muscle power levels post-intervention align with the study. Immediate physiotherapy intervention, including manual therapy and therapeutic exercises, has been shown to significantly improve range of motion, muscle strength, and functional activities in patients with supracondylar humeral fractures (Shinde & Pawar, 2022). Additionally, CPM rehabilitation therapy can maximize recovery, reduce muscle atrophy, and promote the restoration of limb function in children who have had these fractures (Qiu Neng, 2008). Operative fixation is recommended for the majority of type II and type III supracondylar humeral fractures in order to guard against malunion and guarantee that the limbs are able to move freely (Omid et al., 2008). This shows that the type of intervention, whether it be surgical or non-surgical, plays a significant effect in the recovery of limb mobility and muscular power.

In accordance with the findings of the study, the participants demonstrated an improvement in their capacity to carry out particular movements such as supination and pronation. As a result of early rehabilitation training, problems are successfully reduced, and the function of the elbow joint is improved. This rehabilitation training would involve motions such as supination and pronation (Lyu Xiujua, 2014). The long-term consequences of these fractures are an important factor to take into consideration. The long-term outcome of extension-type supracondylar humeral fractures is generally good, but it is not exclusively benign, according to Sinikumpu et al. (2016). Additionally, there is the possibility of long-term pain, ulnar nerve sensitivity, and a decrease in grip strength and range of movement in type II and type III fractures (Sinikumpu et al., 2016).

VI. CONCLUSION

Within the context of patients who have sustained supracondylar humeral fractures, this study has provided useful insights into the efficiency of therapies for improving limb mobility, muscular power, and the capacity to perform specific activities. According to the findings, there were significant gains after the intervention, particularly in the areas of joint extension, muscular strength, and the ability to perform motions such as supination and pronation. When it comes to the treatment of supracondylar humeral fractures, our findings highlight the possible advantages that could be gained from utilizing focused rehabilitation procedures. On the

other hand, the research had some shortcomings, such as a small sample size, the absence of a control group, the possibility of bias in subjective evaluations, and a very little time of follow-up. The presence of these characteristics indicates that the results should be interpreted with caution, and they also bring to light areas that require additional research. In order to expand upon these findings, future research should strive to achieve larger sample sizes that are more diverse, longer follow-up periods, and more objective assessment technologies. Taking everything into consideration, the research makes a contribution to the expanding body of evidence that demonstrates the significance of comprehensive rehabilitation in the treatment of supracondylar humeral fractures. This, in turn, paves the way for improved patient outcomes in this particular field.

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