



PREVALENCE OF TRIANGULAR FIBROCARTEILAGE COMPLEX INJURY IN METAL FABRICATORS.

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ABSTRACT

Introduction: Metal fabricators are at high risk for repetitive strain injuries, including TFCC tears, due to frequent forceful gripping, and repetitive ulnar deviation and heavy lifting. Thus, the present study will contribute to the literature regarding the prevalence of TFCC injury in metal fabricators. **Methodology:** Total number of 97 participants ages 30 to 40 years, were selected by simple random sampling method according to inclusion and exclusion criteria. Participants were evaluated by the 3-test load test for scaphoid side, press test for medial wrist joint and, GIRT test for grip strength of wrist. **Results:** The study of 97 metal fabricators found a 92.78% prevalence of TFCC injuries, with pain as the most common symptom. Right wrist ulnar deviation (18.27°) was significantly lower than the left (35.13°), indicating mobility impairment. A grip strength disparity (24.11 kg vs. 82.56 kg) suggests functional **Conclusion:** The total prevalence of affected population having TFCC injury is 92.78% they may be high risk of having more severe symptoms of TFCC injury impairment due to repetitive strain.

Keywords: TFCC, metal fabricators, load test, wrist pain, dynamometer, scaphoid, range of motion, goniometer, GIRT.

INTRODUCTION

Metal Fabrication is the creation of metal structures by cutting, bending and assembling processes. It is a value added process involving the creation of machine parts and structures from various raw materials. The metal fabrication can be hazardous and injurious the most common injuries develop over time, the repetitive strain injuries ^[1]. As forearm moves from 3 supinations to pronation it produces various amount of torque depending on the power of movement and with the repeated overuse it can lead to damage of the structure, and also a soft tissue injury. These soft tissue injuries contribute to wrist pain, weakness of hand grip and motion restriction ^[2]. There is ulnar side- side wrist pain and radial side wrist arthritis. There is the restriction in movements that is ulnar and radial deviation plan while allowing for wrist flexion and extension ^[3] (TFCC)- Triangular fibrocartilage complex is a load bearing structure between the lunate, triquetrum and ulnar head. The function of

TFCC is to stabilization of ulna. The risk factor of TFCC is acute or chronic injury. The patient with TFCC injury will present with ulnar side wrist pain with clicking or point tenderness between the pisiform and the ulnar head. It may occur due to load compressed on the TFCC while wrist is in ulnar deviation and forced ulnar deviation [4]. The human hand-arm system is most frequently and repetitively used part of the body in occupational repetitive task; to reduce the risk of injury hand strength data is necessary for the analysis and design of equipment concerning the grip held or manipulated by the hands. This data may be used for the design of tools or tasks with a low level of discomfort in the repetitive tasks. Over-exertion injuries of the hand/wrist and forearm have been reported to occur in several manufacturing industries at an increased rate worldwide. The Triangular Fibrocartilage Complex (TFCC) is a crucial load-bearing structure located on the ulnar side of the wrist, playing a vital role in stabilizing the distal radioulnar (DRUJ) and ulnocarpal joints. It supports essential wrist functions such as gripping, pronation, and supination movements. However, due to continuous biomechanical stress, axial compression, and exposure to vibrations, TFCC injuries are common among manual laborers. These injuries often go undiagnosed, eventually leading to chronic wrist instability, persistent pain, and long-term functional impairment. Numerous studies indicated a strong correlation between upper extremity WMSD and forceful exertions. The effects are more severe, if forceful exertions are accompanied by the high frequency of exertions. Investigated the effects of exertions on discomfort. They found that extreme flexion caused higher discomfort than the other simple types of deviations, and the combination of flexion and ulnar deviation resulted in higher discomfort than the other types of combined deviation [6]. Metal fabrication is physically demanding and has a high risk of TFCC injuries. This study examines how these injuries affect wrist function, identifies the main risk factors, and explores ways to prevent them. Understanding these risks is important for creating better workplace solutions that can protect workers, improve their health, and boost productivity.

METHODOLOGY

This observational study was carried out in D.Y. Patil College of Physiotherapy, deemed to be University, Kolhapur. **Subject Criteria:** 97 participants were included between the ages of 30-40 years, including Metal fabricators workers Experienced more than 5. Exclusion criteria were subjects with History of reconstructive wrist Surgery. Inflammatory arthritis Neurological or Systemic Disorders. **Procedure:** It was an observational study that was conducted in the local population and the duration of the study was 6 months. The study was approved by the ethical committee of the institute. The sample size was 97. A random sampling method was used. All 100 participants willingly consented and participated in the study. The participants were taken based on inclusion and exclusion criteria. The participants were made aware of the study. The proper consent from the participants was taken. The diagnosis of TFCC was done by various outcome measure that was Goniometer for range of motion of ulnar deviation, hand held dynamometer for grip strength, and load test to estimate the pain over scaphoid side, press test to estimate the medial wrist joint line pain, GRIT test to estimate the grip strength. Studies were included if the participants were aged between 30-40 years and experienced more than 5. Participants were asked to sign an informed consent form. Demographic characteristics like Age, Weight, Height, and history of working hours per day and working experience were taken.

Biostatistical analysis was done with the help of statistician, and results were obtained using appropriate biostatistical tools.

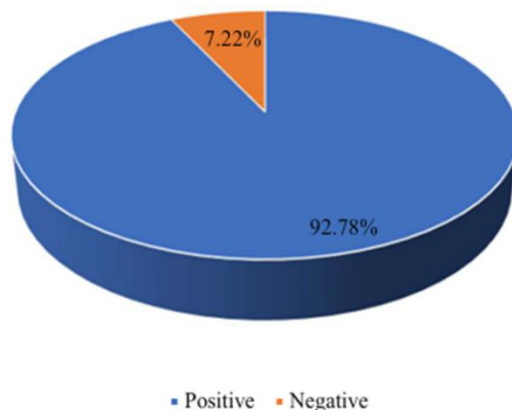
RESULTS

The average age of metal fabricators was 38.78 ± 5.87 . To rule out TFCC in Indian metal fabricators, press test, load test, GIRT test was performed. press test 96% (86 participants) were positive, load test 96% (86 participants) were positive, and GIRT test 97% (87 participants positive). To rule out reduced range of motion [ulnar deviation] the goniometer was performed 18.27 ± 5.32 for dominant hand and 35.13 ± 3.36 for non-dominant. And hand-held dynamometer for grip strength 24.11 ± 8.56 of dominant hand and 24.11 ± 8.56 and 82.56 ± 11.59 for non-dominant hand.

	MEAN	SD
AGE	38.78	± 5.87
No. of working hours	8.12	± 0.83
No. of working years	17.47	± 4.94

Table no.1 Mean and SD of Age, No. of working hours and No. of working years of participants with metal fabricators

Final Outcome Distribution



Graph 1. Prevalence value of positive and Negative in Triangular Fibrocartilage Complex (TFCC) injury among metal fabricators.

The above figure no.1 represents the final outcome distribution of the study, categorizing participants into two groups: Positive Cases (92.78%) – Blue Section: The majority of metal fabricators were affected by TFCC injuries, Negative Cases (7.22%) – Orange Section: A small portion of participants did not exhibit TFCC injuries, suggesting that only a few workers remained unaffected.

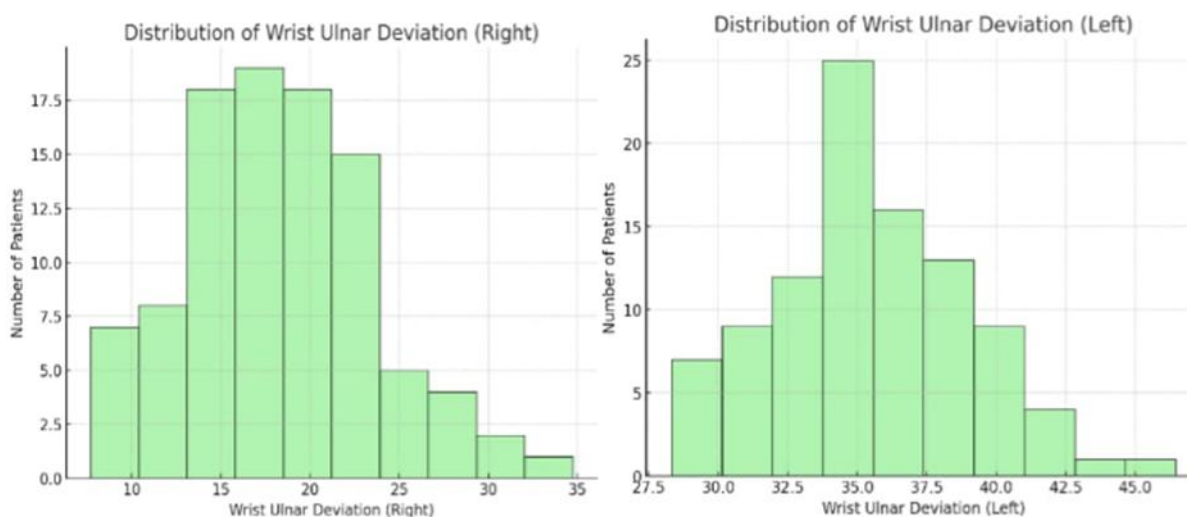


Figure 2: Range of motion of Wrist Ulnar Deviation (Right/Left)

The above Figure 2 represents the right and left wrist ulnar deviation among metal fabricators. The right wrist shows lower ulnar deviation (15°–20°) compared to the left (32°–35°). This suggests that repetitive occupational strain primarily affects the dominant hand (which is usually the right for most individuals). The mean 18.27 ± 5.32 for dominant hand and 35.13 ± 3.36 for non-dominant.

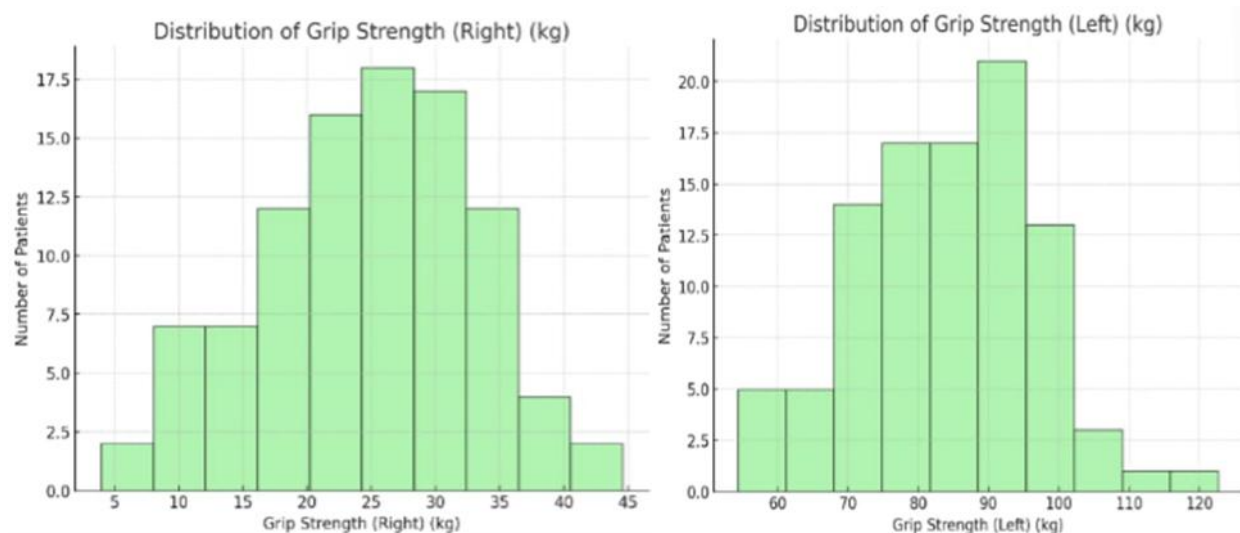


Figure 3: Grip Strength (Right/Left)

The above Figure represents the distribution of left-hand and right grip strength among metal fabricators, showing how many participants fall within specific grip strength ranges (measured in kg). In right hand the majority of participants have a grip strength between 20 kg and 30 kg, with the highest frequency around 25 kg. In most participants have a grip strength between 70 kg and 100 kg, with the peak frequency around 90 kg. Right-hand grip strength is significantly lower, likely due to repetitive strain, TFCC injuries, and occupational overuse. Left-hand grip strength remains relatively high, indicating less functional impairment. 24.11 ± 8.56 of dominant hand and 24.11 ± 8.56 and 82.56 ± 11.59 for non-dominant hand.

The Prevalence of TFCC injury among metal fabricators was studied, and it was observed that TFCC accounts for a prevalence rate of 92.78% having TFCC injury.

DISCUSSION

This study provides an in-depth investigation into the prevalence of Triangular Fibrocartilage Complex (TFCC) injuries among metal fabricators, a workforce that has previously been reported to have a notably high prevalence rate of 92.78%. The research involved a total of 97 respondents, of whom 90 individuals were confirmed to have TFCC injuries. This finding highlights a significant burden of this condition within the metal fabrication profession, emphasizing the need for targeted preventive strategies and interventions. The study highlights several key clinical symptoms observed among affected workers, including persistent ulnar-sided wrist pain, restricted range of motion during ulnar deviation, and diminished grip strength in the dominant hand. These symptoms are particularly concerning given the physically demanding nature of metal fabrication tasks, which require strength, precision, and repetitive wrist movements. The high prevalence rate noted in this occupational group exceeds that reported in other professional sectors, suggesting that metal fabricators face unique occupational risks that increase their susceptibility to TFCC injuries.

The nature of metal fabrication work often involves repetitive hand movements, prolonged gripping, and tasks requiring sustained ulnar deviation. Such repetitive and forceful wrist actions place substantial strain on the TFCC, contributing to injury development. Additionally, the use of heavy tools, frequent exposure to vibration, and the need for forceful manipulation of materials may further exacerbate the risk of wrist-related musculoskeletal disorders.

The association between ulnar-sided wrist pain and Triangular Fibrocartilage Complex (TFCC) symptoms warrants significant attention from individuals engaged in physically demanding activities, particularly those in high-risk groups such as sports players (e.g., basketball players, tennis players) and industrial workers, notably metal fabricators. These groups are frequently exposed to repetitive hand movements, heavy tool usage, and forceful wrist actions, which increase the likelihood of TFCC injuries. One potential factor contributing to the elevated prevalence of TFCC injuries among these

populations is the lack of ergonomic awareness and inadequate workplace modifications. Furthermore, studies have shown that the prevalence of TFCC injuries tends to increase with advancing age. Specifically, research has reported a prevalence rate of 49% in individuals aged 70 years or older, whereas the prevalence is comparatively lower at 27% in individuals aged 30 years or younger. This trend highlights the progressive degenerative changes that may occur in the TFCC over time, especially in individuals who engage in activities that place repetitive stress on the wrist joint.[2] In our study, participants were within the age range of 30 to 40 years, with a calculated mean age of 38.78 years (± 5.87). Our findings revealed a higher prevalence of TFCC injuries among individuals in this age group, underscoring the increased risk that middle-aged adults may face. This observation aligns with the notion that cumulative exposure to occupational and Recreational activities involving repetitive wrist movements, heavy lifting, or prolonged grip exertion may contribute to TFCC degeneration in this population. The most common symptoms of a TFCC injury include ulnar-sided wrist pain with tenderness at the fovea, minimal oedema, pain during resistance, and reduced wrist range of motion. Additional signs may include joint sagging during rotations or load bearing, an audible or palpable "click" from the ulnar side during forearm rotations, and pain with radial or ulnar deviation. Pain and reduced function on radioulnar deviation may also indicate ulnar impaction syndrome.[6]

The findings of this study indicate a high prevalence rate of Triangular Fibrocartilage Complex (TFCC) injury among metal fabricators, with an observed rate of 92.79%. This significant prevalence underscores the occupational risks faced by metal fabricators, likely due to repetitive hand movements, forceful exertions, and awkward wrist postures inherent to their work. Addressing these occupational risk factors through ergonomic interventions, improved workplace.

CONCLUSION

These findings reported in the study provide a better understanding of the impact and extent of TFCC injury in metal fabricators. There is a significant prevalence of TFCC injury in metal fabricators. The prevalence rate of TFCC in metal fabricators is 92.78%. emphasizing the need for ergonomic interventions, rehabilitation programs, and workplace modifications. Early screening and preventive care are essential for reducing occupational disability in this high-risk

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