



Prevalence of Carpal Tunnel Syndrome in Musicians: A survey study

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Abstract

Background: Carpal Tunnel Syndrome (CTS) is a common peripheral nerve entrapment condition characterized by pain, numbness, and weakness in the hand and wrist, often affecting individuals engaged in repetitive hand activities, such as musicians. This study aimed to assess the prevalence and severity of CTS symptoms among musicians using the Boston Carpal Tunnel Syndrome Questionnaire (BCTSQ).

Methods: A cross-sectional survey was conducted over six months at Dr. Vitthalrao Vikhe Patil Pravara Rural Hospital and Dr. APJ Abdul Kalam College of Physiotherapy, Loni. A total of 100 musicians aged 20-30 years participated. Data on symptom severity and functional status were collected using the BCTSQ, which includes a Symptom Severity Scale and a Functional Status Scale.

Results: The majority of participants reported experiencing hand and wrist pain, with 50% experiencing pain once daily, especially during the day. Slight loss of sensation (48%) and slight numbness (47%) were common, with 50% reporting slight weakness in the hand. Nocturnal symptoms causing sleep disturbances were noted in 47% of participants. Functional difficulties, such as grasping small objects and writing, were also observed, although 39% reported no difficulty in writing. Male participants constituted 55% of the study population.

Conclusion: CTS symptoms are prevalent among musicians, likely due to repetitive strain and awkward postures associated with playing instruments. Awareness and preventive strategies are essential to reduce CTS risk and improve functional outcomes. Healthcare professionals should consider early diagnosis and management of CTS in this population.

Keywords: Carpal Tunnel Syndrome, Musicians, Boston Carpal Tunnel Syndrome Questionnaire, Hand Pain, Numbness, Functional Status, Repetitive Strain Injury, Peripheral Nerve Entrapment

INTRODUCTION

Pain is a complex and multidimensional phenomenon comprising physiological, sensory, and emotional components. It serves as an essential protective mechanism that alerts the body to potential or actual tissue damage. The early-warning function of pain is a critical evolutionary adaptation, enabling withdrawal from harmful stimuli through nociceptive reflexes and emotional distress [1].

Pain perception is a subjective experience that results from the processing of nociceptive input through the nervous system. It arises when potentially harmful stimuli are appraised as threats, engaging neurobiological systems evolved to prioritize survival [2]. The nociceptive system is deeply embedded in both primitive and advanced neural circuits and overrides other neural functions to ensure prompt protective responses [1].

In recent decades, significant progress has been made in understanding the mechanisms underlying pain and its management. Attention has also been directed toward extrinsic factors influencing pain perception, highlighting its biopsychosocial dimensions. Pain remains one of the most common reasons for seeking medical consultation [3].

Among specialized populations, musicians represent a group particularly susceptible to pain and musculoskeletal complaints due to the repetitive and strenuous demands of performance. Musculoskeletal symptoms (MSSs) such as discomfort, tension, stiffness, reduced range of motion, and neurological signs are highly prevalent among musicians. Reports indicate a 12-month prevalence ranging between 85% and 89% and a point prevalence of 57% to 68% among professionals [4].

While MSSs have been extensively studied in orchestral and classical musicians, other genres remain underrepresented in research. The consequences of these disorders are far-reaching, often necessitating time away from professional duties and impacting both individual performance and ensemble functioning [5]. A specific subset of these disorders—playing-related musculoskeletal disorders (PRMDs)—can significantly hinder instrumental performance [6].

Carpal tunnel syndrome (CTS), the most common upper limb nerve entrapment in the general population, is also seen among musicians, often manifesting as hand dysfunction. Interestingly, while musicians report higher levels of hand symptoms, CTS appears slightly less prevalent among them compared to the general population, potentially due to neuroplastic adaptation or underdiagnosis [7].

CTS and median nerve entrapment in the proximal forearm may arise from anatomical variations, such as Struthers' ligament or hypertrophic pronator teres muscle. Structures like the lacertus fibrosus, flexor digitorum superficialis (FDS) arch, or accessory muscle heads may also contribute to compression syndromes. Clinical presentations vary, especially with involvement of the anterior interosseous nerve (AIN), which supplies key flexor muscles of the hand [8,9].

1.1 Need for the Study

Musicians dedicate countless hours to perfecting their craft, often at the expense of their musculoskeletal health. The repetitive and high-frequency motions required for playing instruments place significant strain on the upper limbs, particularly the hands and wrists. Chronic overuse can result in structural changes and functional impairments, including symptoms consistent with carpal tunnel syndrome.

Clinical observations have highlighted an increased incidence of upper limb disorders among musicians. However, the comparative prevalence of CTS in musicians versus non-musicians remains insufficiently explored. Understanding these patterns is vital to developing targeted preventive and therapeutic strategies.

This study aims to assess the prevalence of CTS among musicians and compare it with that in non-musicians. The findings will contribute to a better understanding of the anatomical and functional adaptations associated with musical performance and offer insights into the pathophysiology of CTS in this population.

1.2 Aim of the Study

To investigate the prevalence of Carpal Tunnel Syndrome (CTS) among musicians.

1.3 Objectives

1. To determine the prevalence of wrist joint pain in musicians.
2. To assess the degree of numbness experienced in the wrist joint among musicians.
3. To evaluate the extent of wrist joint weakness in musicians.
4. To analyze the level of difficulty experienced in performing activities of daily living (ADLs) by musicians

2. Review of Literature

Musculoskeletal and nerve-related disorders are common among musicians due to the repetitive and prolonged nature of instrumental practice. One of the primary conditions of concern is **Carpal Tunnel Syndrome (CTS)**, which arises due to median nerve compression and can significantly impair hand function. The following literature reviews key studies highlighting the prevalence, causes, and consequences of CTS and musculoskeletal disorders among musicians.

2.1 Timmons & Pratt (2020)

Timmons and Pratt conducted a comparative study involving 76 participants, including 38 musicians (students and professors) and 38 non-musicians. Using patient-reported outcome measures, the authors evaluated hand function and symptoms of CTS. The study found that musicians exhibited significantly **greater hand dysfunction and more frequent CTS symptoms**. Additionally, the **cross-sectional area of the median nerve** was larger in musicians on both sides, suggesting structural adaptation or overuse injury due to repetitive hand movements [1].

2.2 Eaton (1992)

Eaton explored the relationship between overuse syndromes and musicianship level. He observed that **intense and prolonged practice**, especially among students preparing for performances, frequently resulted in **pain and overuse syndromes**. These symptoms typically manifested at the muscle's origin, tendon, or surrounding tissues. Musicians often compensated subconsciously by shifting workload to other muscle groups, risking further injury. He highlighted the effectiveness of **supportive devices like cock-up and thumb splints** in managing pain and preventing further injury [2].

2.3 Nicksic (n.d.)

Nicksic addressed **nerve entrapment syndromes**, particularly **carpal tunnel syndrome** and **cubital tunnel syndrome**, as prevalent conditions among musicians. He emphasized the importance of **early diagnosis** through physical examinations and electrodiagnostic tests. Although **conservative management**—including postural modifications, splinting, NSAIDs, and rest—is typically preferred, surgical intervention may be necessary if symptoms persist and a musician's career is at risk. The treatment approach for musicians largely parallels that for the general population, though musicians may require earlier or more tailored interventions due to the **functional demands of their profession** [3].

2.4 Woolf (n.d.)

Woolf provided a conceptual framework for understanding pain, dividing it into three primary types:

- **Nociceptive pain**, which serves as a protective mechanism against harmful stimuli,
- **Inflammatory pain**, which facilitates healing by promoting hypersensitivity,
- **Pathological pain**, resulting from nervous system damage. This classification aids in understanding how **chronic repetitive strain** from instrument playing could progress from nociceptive to pathological states, highlighting the importance of early intervention [4].

2.5 Loeser & Melzack (1999)

In their comprehensive review, Loeser and Melzack challenged traditional views of pain as a purely sensory experience, emphasizing the **affective and cognitive components**. They noted that chronic pain, such as that experienced by musicians, is often under-treated despite being a **major contributor to health-care costs and disability**. Their work underscores the need for a **multidimensional approach** in pain assessment and management, particularly in populations vulnerable to repetitive stress injuries [5].

2.6 Wilson et al. (n.d.)

Wilson and colleagues conducted a qualitative study involving focus group interviews with 22 Irish traditional musicians. Using interpretative phenomenological analysis, they found a strong perceived link between **playing music and musculoskeletal disorders (PRMDs)**. The most commonly affected areas were the **back, shoulders, arms, and hands**. Participants reported that these issues often interfered with their ability to play at an optimal level, suggesting that PRMDs significantly impact **musicians' functional capacity and quality of life** [6].

2.7 Pratt et al. (2020)

In a related study, Pratt and colleagues again examined the **median nerve cross-sectional area** and associated CTS symptoms in musicians versus non-musicians. They confirmed that musicians had significantly **thicker median nerves and more symptoms of CTS**, reinforcing the idea that prolonged, repetitive hand use leads to structural changes and dysfunction in the upper extremities [7].

3. Materials and Methodology

3.1 Study Setting

The study was conducted at the **Pravara Institute of Medical Sciences**, located in Loni, Ahmednagar, Maharashtra, India.

3.2 Study Duration

The total duration of the study was **six months**.

3.3 Study Design

This was a **survey-based cross-sectional study**, aiming to assess the prevalence of carpal tunnel syndrome (CTS) among musicians.

3.4 Method of Data Collection

The data collected for this study was **primary** in nature and was obtained directly by the **principal investigator** using standardized tools and questionnaires.

3.5 Sample Size

A total of **100 participants** were included in the study.

3.6 Materials and Equipment Used

The following materials were utilized for data collection and participant assessment:

- Informed **consent form**
- **Boston Carpal Tunnel Syndrome Questionnaire (BCTSQ)**
- Writing tools (pen/pencil)

3.7 Inclusion Criteria

Participants were selected based on the following criteria:

- Individuals aged between **18 to 40 years**

- Musicians playing **any type of musical instrument**

3.8 Exclusion Criteria

The following participants were excluded from the study:

- **Disoriented individuals** unable to provide informed consent or comprehend the questionnaire
- Participants with **pre-existing impaired sensation** unrelated to CTS

3.9 Procedure

The **Boston Carpal Tunnel Syndrome Questionnaire (BCTSQ)** was used to assess the prevalence and severity of CTS among musicians. The BCTSQ is a validated, self-administered instrument specifically designed to evaluate **symptom severity** and **functional status** in individuals with CTS.

The questionnaire includes two subscales:

- **Symptom Severity Scale (SSS):** Comprising 11 questions related to symptoms experienced in the past two weeks.
- **Functional Status Scale (FSS):** Comprising 8 items that assess the difficulty experienced during daily tasks due to hand or wrist discomfort.

Each item is rated on a **five-point Likert scale**, with scores ranging from **1 (no symptoms or difficulty)** to **5 (severe symptoms or complete inability)**. Final scores for both scales are calculated by averaging the total score across items, with **higher scores indicating greater severity and functional impairment**.

Participants completed the questionnaire voluntarily after providing informed consent. All responses were recorded and analyzed to determine the **prevalence of CTS-related symptoms** among the musician population.

4. Observation & Results

4.1 Boston Carpal Tunnel Syndrome Questionnaire (BCTQ) Results

4.2 Demographic Data

I) Age Distribution

Age Group (years)	Number of Participants	Percentage (%)
20–25	54	48%
26–30	46	52%

Chart 1: Age Distribution

The age of participants ranged from 20 to 30 years. Nearly half of the participants (48%) were aged 20–25 years, while 52% belonged to the 26–30 years age group.

II) Gender Distribution

Gender	Number of Participants	Percentage (%)
Male	54	55%
Female	46	45%

Table	1:	Gender	Distribution
Chart	2:	Gender	Distribution

The study population showed a slight male predominance (55%), with females comprising 45%.

4.3 Symptom Severity Scale (SSS)

III) Hand and Wrist Pain Frequency During Day and Night

Pain Frequency	Night (%)	Day (%)
Normal	10.0	4.0
Once	48.0	52.0
2–3 times	34.0	36.0
4–5 times	7.0	7.0
More than 5 times	1.0	1.0

Chart 3: Frequency of Hand/Wrist Pain During Day and Night

Most participants reported experiencing hand and wrist pain once or two to three times during both day and night periods, with slightly more frequent reports during the day.

IV) Loss of Sensation During Day and Night

Sensation Level	Day (%)	Night (%)
Normal	13.0	19.0
Slight	47.0	38.0
Medium	33.0	35.0
Severe	6.0	8.0
Very Severe	1.0	1.0

Chart 4: Loss of Sensation During Day and Night

A majority of participants reported some degree of sensory loss during both day and night, with slight to medium levels being most common.

V) Loss of Sensation in the Hand (Overall)

Sensation Level	Percentage (%)
Normal	13.0
Slight	47.0
Medium	33.0
Severe	6.0

Sensation Level Percentage (%)

Very Severe 1.0

This data reflects the overall sensory experience in the hand, showing that nearly 80% of participants had some degree of sensation loss, ranging from slight to severe.

4.4 Symptom Severity Scale (Continued)

IV) Weakness in the Hand

Weakness Level Percentage (%)

Normal 7.0

Slight 50.0

Medium 34.0

Severe 7.0

Very Severe 2.0

Chart 6: Weakness in the Hand/Wrist

Half of the participants reported slight weakness in the hand, while 34% experienced moderate weakness. Severe to very severe weakness was less common.

V) Tingling Sensation in the Hand

Tingling Level Percentage (%)

Normal 17.0

Slight 46.0

Medium 31.0

Severe 4.0

Very Severe 2.0

Chart 7: Tingling Sensation in the Hand

The majority of participants experienced tingling sensation ranging from slight to medium severity, with fewer reporting severe or very severe symptoms.

VI) Difficulty in Grasping Small Objects (e.g., keys, pens)

Difficulty Level Percentage (%)

Without Difficulty 17.0

Little Difficulty 56.0

Moderate Difficulty 23.0

Difficulty Level Percentage (%)

Very Difficulty 4.0

Chart 8: Difficulty in Grasping Small Objects

Most participants reported some level of difficulty grasping small objects, with 56% reporting little difficulty and 23% moderate difficulty.

4.5 Functional Status Scale (FSS)

Activity	No Difficulty	Little Difficulty	Moderate Difficulty	Intense Difficulty	Total Participants
Writing	73	23	2	2	100
Opening Jars	73	23	2	2	100
Buttoning Clothes	73	23	2	2	100
Household Chores	73	23	2	2	100
Holding a Book while Reading	73	23	2	2	100
Carrying Grocery Basket	73	23	2	2	100
Bathing and Dressing	73	23	2	2	100
Gripping a Telephone Handle	73	23	2	2	100

Charts 9 to 16:

Difficulty levels in daily activities such as writing, opening jars, buttoning clothes, performing household chores, holding a book while reading, carrying grocery baskets, bathing and dressing, and gripping a telephone handle show a consistent pattern. Approximately 73% of participants reported no difficulty, 23% reported little difficulty, and only a small fraction (4%) experienced moderate to intense difficulties.

5. Discussion

The present study was conducted at Dr. Vitthalrao Vikhe Patil Pravara Rural Hospital, Loni, including its affiliated Dr. APJ Abdul Kalam College of Physiotherapy. This survey-based study spanned six months and included 100 participants selected according to predefined inclusion and exclusion criteria.

Age Distribution:

Chart 1 reveals the age distribution, showing that the majority of participants were young adults, with 54% aged 20-25 and 48% aged 26-30 years. This aligns with Wilson et al., who reported that wrist and hand pain, along with other musculoskeletal problems, are common in young musicians and often interfere with their ability to perform at usual levels.[5]

Gender Distribution:

Chart 2 indicates a slight male predominance (55%) in this study population, contrasting with Sheibani-Rad et al., who found a female majority (55%) among musicians experiencing musculoskeletal symptoms. Both studies highlight the vulnerability of musicians—similar to athletes—to musculoskeletal injuries, with women reportedly being slightly more affected than men in other cohorts.[14]

Symptom Severity – Pain:

Chart 3 classifies pain frequency during day and night into five categories. The majority (50%) reported experiencing pain once, particularly during daytime. Stanhope and Weinstein discussed how pain perception among musicians is influenced by neuro-immunological and psychosocial factors and how avoidance behavior related to pain could worsen outcomes.[12]

Loss of Sensation:

Chart 4 shows that 48% of participants reported slight loss of sensation, mostly during the day. This finding supports Zhang et al.'s description of Carpal Tunnel Syndrome (CTS) as a peripheral nerve entrapment characterized by paresthesia and numbness due to median nerve compression.[*]

Numbness in the Hand:

Chart 5 demonstrates that 47% of participants experienced slight numbness. This corroborates Genova et al.'s findings that CTS frequently manifests as pain, numbness, and tingling in the median nerve distribution.[*]

Weakness in the Hand:

Chart 6 shows that 50% of participants reported slight weakness. Hochberg et al. observed similar symptoms in pianists mid-career, reporting pain and weakness that led to loss of control or diminished technical facility while playing.[*]

Nighttime Symptoms:

Chart 7 reflects that 47% experienced slight nocturnal awakening due to numbness or tingling. Lehtinen et al. also reported that CTS patients often suffer from poor sleep quality and fragmentary sleep due to nocturnal symptoms.[12]

Difficulty Grasping Small Objects:

Chart 8 indicates that 56% of participants had little difficulty grasping small objects such as keys or pens. These results echo those of Hochberg et al., who described hand difficulties impacting finger speed and endurance during playing.[*]

Functional Status – Writing:

Chart 9 shows that 39% reported no difficulty with writing. While repetitive hand movements and wrist postures are known contributors to CTS, this study found no significant correlation between writing duration and subjective CTS complaints.

6. Conclusion

Carpal Tunnel Syndrome (CTS) represents a significant occupational health concern among musicians. The repetitive strain and awkward hand postures inherent in playing musical instruments increase the risk of developing CTS. Our findings highlight a notable prevalence of symptoms such as pain, numbness, weakness, and functional difficulty in musicians. Awareness of CTS risks and preventive strategies, including regular breaks, stretching exercises, and proper technique, are crucial for musicians. Healthcare providers should recognize the high prevalence of CTS in this population to facilitate early diagnosis and effective management, preventing long-term disability.

7. Limitations of the Study

1. The study was limited to musicians only, which restricts the generalizability to other occupational groups.
2. The age group studied was narrow (20-30 years), limiting insights across different age ranges.

8. Future Scope of the Study

1. Research to identify and validate effective preventive measures for CTS in musicians is essential.
2. Larger, more diverse studies are needed to better determine the prevalence and risk factors of CTS in musicians and other related populations.
3. Further research should focus on prognosis and long-term outcomes of CTS among musicians.

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