


Exploring The Prevalence of Neuropathic Hand Pain Among Young Adults and Its Impact on Hand Function

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ABSTRACT

Background and Aims: To explore the prevalence of neuropathic hand pain in young adults and how it affects hand functionality.

Methodology: A convenience sampling was used to conduct a cross-sectional study on 192 medical students aged 18 to 28 years from October 2022 to March 2023. The purpose of the study was to evaluate the prevalence of neuropathic hand pain in young adults and how it affects hand functionality. Both the Duruoz Hand Index and the Douleur Neuropathique Four Questionnaire were used.

Results: This study included 192 participants, the majority of whom were females (84%) and aged 20-24 years. 16.1% of participants reported having had surgery or an injury to their upper limb in the past. Participants described neuropathic pain symptoms such as electric shocks (21.4%),

burning pain (18.2%), and painful cold (15.6%).

Limitations and Future Implications: A small sample size and a focus on a particular group of medical students may restrict the generalizability of the findings. To improve the generalizability of the findings, future research should replicate these findings using larger sample sizes and diverse populations. Insights into the development and chronicity of neuropathic hand pain in young adults may also come from longitudinal studies.

Conclusion: Our study demonstrates the prevalence of neuropathic hand pain in young adults and how it affects hand functionality. Female participants were more likely to experience pain and functional hand impairments.

Keywords: *Neurology, pain, young adults, disability, health-related quality of life, rehabilitation.*

INTRODUCTION

Globally, neuropathic pain is one of the leading causes of disability¹. It is a debilitating and complicated pain condition that can significantly negatively impact a person's quality of life². It can affect different body parts, including the hands, and shows up in various patterns, including tingling, numbness, burning, or prickling sensations³. While neuropathic hand pain is frequently associated with older people,

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it is crucial to understand that it also affects young adults⁴⁻⁵. Neuropathic pain can be caused by several conditions, including diabetes, HIV, chemotherapy, herpes zoster, multiple sclerosis, surgery, stroke, and spinal cord injury, which develops explicitly when the somatosensory nervous system is damaged or afflicted with a disease⁶. Effective management and treatment of neuropathic pain depend on differentiating it from other types of pain. Neuropathic pain is difficult for clinicians to treat because it frequently does not respond to conventional analgesics⁷. As first- and second-line treatments, experts advise using drugs like gabapentinoids, tricyclic antidepressants, and serotonin-norepinephrine reuptake inhibitors⁷. However, many patients might experience insufficient pain relief from these options. Additionally, some analgesics, such as opioids and gabapentinoids, have the potential to cause harm, underscoring the significance of appropriate and cautious use⁸. Screening instruments such as the DN4, S-LANSS, and pain DETECT have been developed to detect neuropathic pain in the community⁹. The effectiveness of these tools depends on their ability to identify common neuropathic pain symptoms like burning, electric shocks, pins and needles, and tingling¹⁰.

According to earlier studies, estimates of the prevalence of neuropathic pain ranged from 7–10% in the general population to 20–30% in people with diabetes¹¹⁻¹². Additionally, it has been discovered that neuropathic pain generally affects older people, women, and residents of underprivileged social environments more frequently. Even though neuropathic hand pain has been thoroughly researched in older populations, young adults, in particular, need to have their prevalence and effects examined¹³⁻¹⁴. Young adults may experience neuropathic hand pain due to their line of work, an injury to their neck or upper body, or other medical conditions¹⁵. Impaired hand functioning can significantly impact a young adult's quality of life, productivity, and general well-being, given the crucial role hands play in maintaining independence and carrying out daily tasks¹⁶. Thus, this study aims to ascertain the frequency of neuropathic hand pain in young adults and investigate how it affects hand functionality, emphasizing the importance of early detection and intervention.

METHODOLOGY

From October 2022 to March 2023, a cross-sectional study was conducted from different colleges of Rehabilitation Sciences. The study included 192 medical students from a medical university between 18 and 28 years, who willingly participated and were actively involved in their daily activities. Students with comorbid illnesses, active infections, traumatic injuries to the upper limbs, and those who had a history of surgery were excluded from the study. The participants were chosen via convenience sampling, which involved choosing people based on their availability and willingness to participate. Emails and WhatsApp group chats were used for recruitment, allowing for the effective distribution of the questionnaires and interaction with the participants. Each participant provided written consent to the data collection process before it started to ensure their informed consent. This step was essential to ensure that everyone involved in the study was fully informed of its goals, methods, and any possible risks or benefits of taking part. Ethical standards and principles were strictly followed throughout the study to protect the participants' rights and welfare. Following are the questionnaires used in this study: The Douleur Neuropathique Four Questionnaire (DN4)¹⁷ is a 10-item, four-section neuropathic pain diagnostic questionnaire administered by a healthcare professional. The first 7 items discuss the different types of pain (burning, uncomfortable cold, electric shocks) and how those sensations relate to other abnormal feelings (tingling, pins and needles, numbness, itching). These sensations are investigated via the patient interview. The final 3 items involve a neurological examination of the painful area (touch hypoesthesia, pinprick hypoesthesia, tactile allodynia). Duruoz Hand Index¹⁸ was used to assess hand functioning, with 18 items in total connected to hand activities. There are 5 components: cooking (1–8 items), getting dressed (2 items), maintaining personal hygiene (2 items), performing office tasks (2 items), and other (4 items). Each item is scored between 0 and 5; the overall score ranges from 0 to 90, while higher scores indicate a significant hand-related disability. The SPSS

version 20 software was used to analyze the collected data. The prevalence of neuropathic hand pain and its effects on young adults were calculated using descriptive statistics, such as percentages, means, and standard deviations (SD).

RESULTS

One hundred ninety-two students participated in this survey, with the 20-24 years range prevalent, with the highest number of females, 161 (84%) and only 31 (16%) males. The majority of participants were students of ZCRS DPT 5th year (37%), followed by (31%) in the third year, (21%) in the second year, (8%) in 4th year and (3%) from 1st year. The details are shown in Table-1.

| No of participants | N = 192 |
|--------------------|-----------|
| Age Ranges | |
| 15-19 years | 22 (12%) |
| 20-24 years | 162 (84%) |
| 25-29 years | 8 (4%) |
| Gender | |
| Female | 161 (84%) |
| Male | 31 (16%) |

Table-1: Demographic Characteristics

Participant's history

Out of 192 participants, 181 (94.3%) participants were right handed dominant while 11 (5.7%) were left-handed dominant. Further, 31(16.1%) participants having history of upper limb injury (fracture, strain and sprain) whereas, 3(1.6 %) had undergone upper limb surgery.

Neuropathic pain characteristics

The participants' responses to the DN4 questionnaire shed important light on neuropathic pain symptoms (Table-2). It was discovered that 41 participants (21.4%) reported having electric shocks in response to the first question, which evaluated the symptom's presence. Additionally, 35 participants (18.2%) reported burning pain and 30 (15.6%) reported painful cold. However, 81.8% of participants did not report any unpleasant cold. Regarding the second inquiry, which assessed the likelihood of neuropathic pain based on accompanying symptoms, 72 respondents (37.5%) reported itching while experiencing pain, suggesting a possible connection between these two sensations. 66 participants (34.4%) said they had felt numbness and pain. It is important to note that most participants did not experience numbness (65.6%) or itching (63%) due to their pain. The DN4 questionnaire's third question focused on hypoesthesia or diminished sensitivity to touch and prick. In the study, 33 participants (17.2%) and 25 participants (13%) showed hypoesthesia to touch and prick, respectively. The fourth and final question investigated whether brushing increased or caused pain. 43 people (22.4%) of the participants reported more pain when brushing the affected area, which may indicate sensitivity to brushing. However, most participants (77.6%) reported no brushing-related pain.

| S. No | Questions | Yes | No |
|-------|-----------------------|------------|-------------|
| 1 | Burning | 35 (18.2%) | 157 (81.8%) |
| 2 | Painful Cold | 30 (15.6%) | 162 (84.4%) |
| 3 | Electric Shocks | 41 (21.4%) | 151(78.6%) |
| 4 | Tingling | 58 (30.2%) | 134 (69.8%) |
| 5 | Pins and Needles | 57 (29.7%) | 135 (70.3%) |
| 6 | Numbness | 66 (34.4%) | 126 (65.6%) |
| 7 | Itching | 71 (37%) | 121 (63%) |
| 8 | Hypoesthesia to Touch | 33 (17.2%) | 159 (82.8%) |
| 9 | Hypoesthesia to Prick | 25 (13%) | 167 (87%) |
| 10 | Brushing | 43 (22.4%) | 149 (77.6%) |

Table-2: Douleur Neuropathic Four Questionnaires (DN-4)

Prevalence of Neuropathic pain factors

These results on DHI show the different levels of difficulty participants encountered when completing tasks related to kitchen activities, dressing, hygiene, office work, and using doorknobs (Table-3). When asked to hold a bowl in the C1-Kitchen questions, only 12 participants had minor difficulties, 21 had moderate difficulties, and 1 had nearly impossible difficulties. One participant could also not hold a bowl, while one found it impossible to grab a full bottle and lift it. Next, participants were asked to pour liquid from a bottle into a glass. Two found this task challenging, one found it nearly impossible, and one found it impossible.

Regarding the C2-Dressing questions, 3 participants had only a minor challenge, 2 had a moderate challenge, and one found it nearly impossible. However, all participants said it was easy to button a shirt. Most participants, 96.4%, stated that opening and closing a zip was not difficult. Only 9 participants in the C3-Hygiene section had difficulty squeezing a fresh tube of toothpaste, 1 participant had some difficulty, and 3 participants found it nearly impossible. When writing a brief sentence with a pencil or regular pen in the C4-In the office section, 7 participants had only minor difficulties, 3 experienced moderate difficulties, and 1 experienced almost impossibility. In the C5 section, 92.7% of participants said that turning a doorknob the other way was not difficult. In addition to reporting more significant impairments in hand functionality, female participants showed a higher prevalence of neuropathic pain.

| | | Yes, without difficulty | Yes, with a little difficulty | Yes, with some difficulty | Nearly impossible to do | Impossible |
|----|---|-------------------------------|-------------------------------------|---------------------------------|-------------------------------|------------|
| 1 | Can you hold a bowl? | 176 (91.7%) | 12 (6.3%) | 2 (1%) | 1 (0.5%) | 1 (0.5%) |
| 2 | Can you seize a full bottle and raise it? | 166 (86.5%) | 20 (10.4%) | 4 (2.1%) | 1 (0.5%) | 1 (0.5%) |
| 3 | Can you hold a plate full of food? | 170 (88.5%) | 15 (7.8%) | 6 (3.1%) | 1 (0.5%) | 0 (0%) |
| 4 | Can you pour liquid from a bottle into a glass? | 177 (92.2%) | 11 (5.7%) | 2 (1%) | 1 (0.5%) | 1 (0.5%) |
| 5 | Can you unscrew the lid from a jar opened before? | 161 (83.9%) | 22 (11.5%) | 6 (3.1%) | 2 (1%) | 1 (0.5%) |
| 6 | Can you cut meat with a knife? | 168 (87.5%) | 14 (7.3%) | 6 (3.1%) | 3 (1.6%) | 1 (0.5%) |
| 7 | Can you prick things well with a fork? | 180 (93.8%) | 7 (3.6%) | 4 (2.1%) | 1 (0.5%) | 0 (0%) |
| 8 | Can you peel fruit? | 171 (89.1%) | 12 (6.3%) | 5 (2.6%) | 3 (1.6%) | 1 (0.5%) |
| 9 | Can you button your shirt? | 186 (96.9%) | 3 (1.6%) | 2 (1%) | 1 (0.5%) | 0 (0%) |
| 10 | Can you open and close a zipper? | 185 (96.4%) | 3 (1.6%) | 2 (1%) | 1 (0.5%) | 1 (0.5%) |
| 11 | Can you squeeze a new tube of toothpaste? | 179 (93.2%) | 9 (4.7%) | 1 (0.5%) | 3 (1.6%) | 0 (0%) |
| 12 | Can you hold a toothbrush efficiently? | 183 (95.3%) | 4 (2.1%) | 2 (1%) | 2 (1%) | 1(0.5%) |
| 13 | Can you write a short sentence with a pencil or ordinary pen? | 181 (94.3%) | 7 (3.6%) | 3 (1.6%) | 1 (0.5%) | 0 (0%) |
| 14 | Can you write a letter with a pencil or ordinary pen? | 173 (90.1%) | 12 (6.3%) | 4 (2.1%) | 3 (1.6%) | 0 (0%) |
| 15 | Can you turn around door knob? | 178 (92.7%) | 7 (3.6%) | 5 (2.6%) | 2 (1%) | 0 (0%) |
| 16 | Can you cut a piece of paper with scissors? | 173 (90.1%) | 12 (6.3%) | 4 (2.1%) | 3 (1.6%) | 0 (0%) |
| 17 | Can you pick up coins from a table top? | 183 (95.3%) | 3 (1.6%) | 4 (2.1%) | 2 (1%) | 0 (0%) |
| 18 | Can you turn a key in a lock? | 183 (95.3%) | 4 (2.1%) | 2 (1%) | 2 (1%) | 1 (0.5%) |

Table-3: Duruoz Hand Index (DHI)

DISCUSSION

Our research aimed to determine the prevalence of neuropathic hand pain in young adults and how it related to hand functionality which has produced many significant findings. Participants' occurrence of various neuropathic hand pain types varied. Our study discovered that people who experienced electrical shock sensations reported experiencing pain the most frequently (21.4%). This result is consistent with earlier studies that showed electrical shock-like pain as a typical symptom in people with neuropathic pain. Our study, however, specifically targeted young adults aged 18 to 28 years, whereas earlier studies mainly focused on people aged 25 to 59 years¹⁹. This age gap could explain the variations in pain prevalence between our study and earlier research. Our study also revealed a high prevalence of pain symptoms related to itching. This finding differs from earlier research that claimed tingling and numbness were the main signs of neuropathic pain²⁰. Again, the age difference between the participants in our study and those in earlier studies may be a factor in these variations.

Regarding gender differences, our study revealed that women were more likely than men to experience neuropathic pain, which aligns with previous studies²¹⁻²². However, the precise causes of these gender differences are still unknown, with potential contributors including perception thresholds, psychological and social factors, coping mechanisms, and hormonal influences²³. The effect of neuropathic hand pain on hand functionality was also examined in our study. We discovered that compared to male students, female students had more pronounced disruptions in hand functionality. This result is consistent with studies that demonstrated the detrimental effects of neuropathic hand pain on hand operations, particularly in activities like kitchen work²⁴⁻²⁵.

Our study use of validated questionnaires to gauge neuropathic pain and hand functionality. The Duruoz hand index and the Douleur neuropathic four questionnaires have been used extensively in prior research, demonstrating their validity and reliability. Our study does, however, have some limitations. First, the sample size—192 participants—was relatively small, which might restrict the applicability of our findings to a larger population. The fact that our study was restricted to young adults from a particular college further limits the generalizability of the findings. It would be beneficial to validate and build upon our findings in subsequent research using more extensive and diverse sample sizes. Additionally, our study used self-report measures vulnerable to recall bias or incorrect symptom interpretation. Clinical evaluations and objective measurements could be used in future research to improve the accuracy of the findings.

CONCLUSION

Our study sheds light on the prevalence of neuropathic hand pain in young adults and its effects on hand functionality. In contrast to earlier studies, we found variations in the prevalence and symptoms of pain, which are probably explained by the age differences in our study population. The prevalence of neuropathic pain was higher in female participants, and they also reported more significant impairments in hand functionality. However, the sample size and particular population studied restrict the generalizability of our findings. It is necessary to conduct more research with more extensive and varied samples to confirm and build upon these findings.

AUTHORS' CONTRIBUTION:

The following authors have made substantial contributions to the manuscript as under:

Conception or Design: Mariam Abdelmonim Ameer, Syed Hasan Abbas Rizvi

Acquisition, Analysis or Interpretation of Data: Mariam Abdelmonim Ameer, Syed Hasan Abbas Rizvi

Manuscript Writing & Approval: Mariam Abdelmonim Ameer, Syed Hasan Abbas Rizvi

All authors acknowledge their accountability for all facets of the research, ensuring that any concerns regarding the accuracy or integrity of the work are duly investigated and resolved.

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