

Hand Numbness among Patients with Musculoskeletal Pain: A link to Neck Pain and micronutrient—A Case-control observation study

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ABSTRACT

Background of study

Musculoskeletal disorders are among the leading causes of pain and disability worldwide. Patients with musculoskeletal pain frequently present with neurological symptoms such as hand numbness, tingling sensations, and weakness. Neck pain resulting from cervical spine disorders is a well-recognized cause of upper limb neurological symptoms. Increasing evidence also suggests that deficiencies of essential micronutrients, including Vitamin B12, Vitamin D, folic acid, iron, magnesium, calcium, and zinc, may contribute to peripheral neuropathy and chronic musculoskeletal pain.

Aim

To evaluate the association between hand numbness among patients with musculoskeletal pain, neck pain, and micronutrient deficiency using a case-control study.

Objectives

The study aims to compare patients with musculoskeletal pain presenting with hand numbness and those without hand numbness, assess the presence of neck pain, evaluate micronutrient status, and identify possible risk factors associated with neurological symptoms.

Methodology

A case-control study will be conducted among adult patients with musculoskeletal pain. Cases will include patients experiencing hand numbness, while controls will include patients with musculoskeletal pain but without hand numbness. Demographic information, clinical characteristics, neck pain assessment, and available laboratory investigations related to micronutrient status will be collected using a structured data collection form. Statistical analysis will be performed using appropriate descriptive and inferential methods.

Result

Among the 350 participants, 57.1% were cases and 42.9% were controls. Hand numbness was more common in individuals aged 41–50 years and was observed more frequently in females. Neck pain showed a strong association with hand numbness, with 84% of cases reporting neck pain. Vitamin D deficiency was the most common micronutrient deficiency, followed by Vitamin B12 deficiency. Patients with hand numbness also had greater pain severity and functional disability compared to the control group.

Conclusion

The study concludes that hand numbness in patients with musculoskeletal pain is strongly associated with neck pain and micronutrient deficiencies, particularly Vitamin D and Vitamin B12 deficiency. Early screening for nutritional deficiencies, along with proper evaluation of cervical spine disorders, can help improve diagnosis, treatment, and patient quality of life. A combined approach involving medication, nutritional supplementation, physiotherapy, and lifestyle modifications may provide better clinical outcomes.

Keywords: Hand numbness, Musculoskeletal pain, Neck pain, Micronutrient deficiency, Vitamin D deficiency, Vitamin B12 deficiency, Case control study, Peripheral neuropath

INTRODUCTION

Musculoskeletal Disorders and Hand Numbness

Musculoskeletal disorders are common health problems that affect muscles, bones, joints, ligaments, tendons, and other supporting tissues. They can cause pain, stiffness, weakness, restricted movement, and difficulty in performing daily activities. Hand numbness is one of the neurological symptoms that may occur in patients with musculoskeletal problems. It can be experienced as reduced sensation, tingling, burning, or a “pins and needles” feeling. The condition may affect one hand, both hands, or occur intermittently depending on the underlying cause.

Neck Pain and Cervical Spine Disorders

Neck-related disorders are an important cause of hand numbness. Conditions such as cervical spondylosis, disc degeneration, and cervical nerve-root compression can interfere with normal nerve function. When cervical nerves are irritated or compressed, symptoms may extend from the neck towards the shoulder, arm, and hand, producing pain, tingling, numbness, and muscle weakness. Therefore, proper assessment of the cervical spine is important when patients with musculoskeletal pain present with hand numbness.

Role of Micronutrients

Apart from structural problems, nutritional factors may also influence neurological and musculoskeletal symptoms. Micronutrients such as Vitamin B12, Vitamin D, folic acid, iron, magnesium, calcium, and zinc are required for normal nerve function, muscle activity, energy production, and tissue maintenance. Deficiency of these nutrients can interfere with nerve signalling and may contribute to numbness, tingling, weakness, fatigue, and musculoskeletal discomfort. Vitamin B12 is particularly important for maintaining the protective myelin covering of nerves, while Vitamin D contributes to bone and muscle health.

Relationship Between Neck Pain and Micronutrient Deficiency

Hand numbness may have more than one contributing factor. Cervical spine abnormalities and micronutrient deficiencies can occur together and may produce similar neurological symptoms. This makes it difficult to identify the exact cause of numbness based only on clinical symptoms. Evaluating both cervical conditions and nutritional status may therefore provide a more complete understanding of the patient's condition.

Need for the Study

Although hand numbness is commonly associated with cervical disorders, nutritional deficiencies may receive less attention during routine clinical assessment. Early identification of correctable deficiencies may help in better symptom management and patient care. Therefore, the present case-control study focuses on comparing patients with musculoskeletal pain who have hand numbness with those who do not, particularly in relation to neck pain and micronutrient status. The findings may help healthcare professionals recognize possible risk factors and support comprehensive evaluation and management of affected patients.

MATERIALS AND METHODS

Study Design

This study was conducted as a hospital-based observational case-control study. A case-control design is useful for identifying factors that may be linked to a specific disease or health condition. In this study, participants with hand numbness (cases) were compared with those without hand numbness (controls) to determine whether certain risk factors or exposures were associated with the condition. Study population

Patients aged 18–70 years attending the orthopaedics'/General Medicine OPD with a chief complaint of musculoskeletal pain, who satisfy the eligibility criteria detailed below, will be recruited and allocated to the case or control group.

Study Duration

The proposed study period is 6 months, comprising 1 month for protocol finalization and 4 months for data and sample collection, and 1 month for data analysis and report writing.

Cases

Patients diagnosed with musculoskeletal pain present with symptoms of hand numbness.

Controls

Patients diagnosed with musculoskeletal pain present without symptoms of hand numbness. The study will compare both groups with respect to neck pain, demographic characteristics, medical history, and micronutrient status.

Case Group

Patients with musculoskeletal pain accompanied by one or more of the following symptoms:

- Hand numbness
- Tingling sensation
- Reduced sensation
- Burning sensation
- Pins and needles feeling
- Mild sensory loss

Control Group

Patients diagnosed with musculoskeletal pain who do not report any symptoms suggestive of hand numbness or peripheral sensory impairment.

Both groups will undergo similar clinical evaluation to facilitate comparison.

Sample Size

The sample size was calculated by using the Cochran's formula

$$n = \frac{Z^2 \times p \times (1 - p)}{e^2}$$

The Calculation

Z = 1.96 (95% confidence level) P = 0.50 (maximum variability) e = 0.05238 (5.24% margin of error)

Calculation

$$\begin{aligned} n &= \frac{(1.96)^2 \times 0.5 \times (1 - 0.5)}{(0.05238)^2} \\ n &= \frac{3.8416 \times 0.25}{0.002744} \\ n &= \frac{0.9604}{0.002744} \\ n &\approx 350 \end{aligned}$$

Sample method Inclusion Criteria

Participants meeting the following criteria will be considered eligible for inclusion:

- Adults aged 18 years or older.
- Patients diagnosed with musculoskeletal pain by a qualified registered physician.
- Participants who provide informed content.
- Patients who are able to understand the study procedures and requirements.
- Patients presenting with or without symptoms of hand numbness.
- Patients with available relevant laboratory investigation reports or those willing to undergo investigations as part of routine clinical evaluation.

Exclusion Criteria

- The categories of patients will be excluded in study: Patients below 18 years of age.
- Patients with recent traumatic injuries involving the upper limbs.
- Patients with congenital neurological disorders, severe psychiatric illnesses, or terminal systemic diseases were excluded from the study to minimize confounding factors and ensure reliable assessment of hand numbness associated with musculoskeletal pain and micronutrient deficiency.
- Patients unwilling to participate.
- Patients unable to provide informed consent.
- Patients with incomplete clinical records.
- These eligibility criteria are established to minimize potential confounding variables and enhance the internal validity and reliability of the study findings.
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RESULTS

1. Distribution of Study Participants

GROUP	NUMBER	PERCENTAGE (%)
CASE	200	57.1
CONTROLS	150	42.9
TOTAL	350	100

Table 1: Distribution of Study Participants

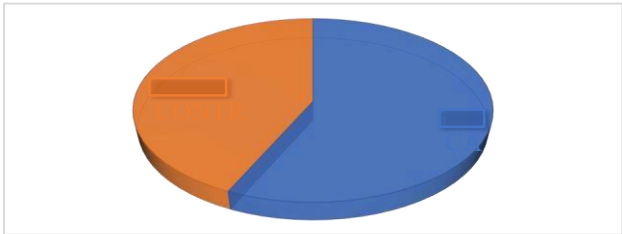


Figure 1 Distribution of Study Participants

A total of 350 patients with musculoskeletal pain were included, with 200 (57.1%) having hand numbness and 150 (42.9%) without numbness. This comparison helped assess the relationship between hand numbness, neck pain, and micronutrient deficiencies. 2.Age Distribution

AGE [Years]	CASE	CONTROLS	TOTAL
18-30	35	32	67
31-40	48	39	87
41-50	60	42	102

51-60	40	24	64
61-70	17	13	30
TOTAL	200	150	350

Table 2: Age distribution

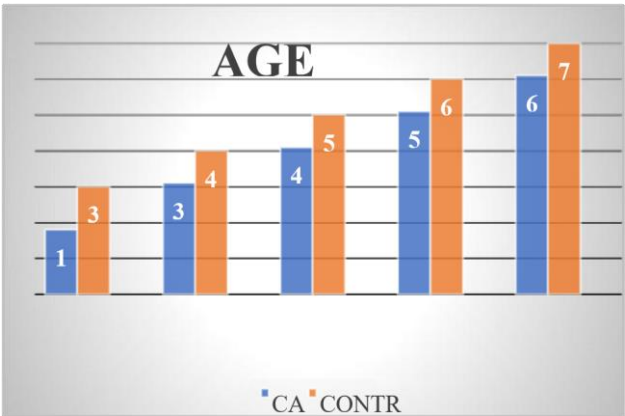


Figure 2: Age Distribution

➤ Most participants were aged 41–50 years (29.1%), followed by 31–40 years (24.9%). Hand numbness increased with age, particularly after 40 years, possibly due to age-related spinal changes and long-term musculoskeletal problems.

3. Gender Distribution

GENDER	CASE	CONTROLS	TOTAL
MALE	82	69	151
FEMALE	118	81	199
TOTAL	200	150	350

Table :3 Gender distribution

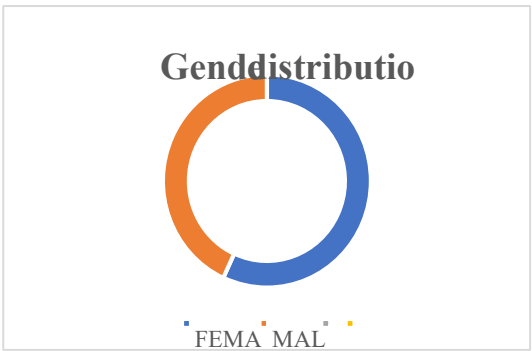


Figure :3: Gender distribution

➤ Among the study participants, females comprised 56.9% of the population, while males represented 43.1%. The prevalence of hand numbness was comparatively higher among female participants. This observation may be influenced by multiple factors, including hormonal variations, a greater likelihood of certain micronutrient deficiencies, and repetitive hand use associated with occupational or household activities.

4 Occupation- Associated medical condition That may influence the occurrence of Hand Numbness

Occupation	Cases with Hand Numbness n (%) (n=200)	Controls n (%) (n=150)	Common Occupation-Associated Medical Conditions Influencing Hand Numbness
Homemaker	58 (29.0%)	34 (22.7%)	Repetitive household work, prolonged neck flexion, cervical spondylosis, shoulder strain, Vitamin D deficiency, Vitamin B12 deficiency
Manual Labourer	48 (24.0%)	22 (14.7%)	Heavy lifting, repetitive hand movements, vibration exposure, cervical radiculopathy, osteoarthritis, peripheral nerve compression
Office Worker	42 (21.0%)	36 (24.0%)	Prolonged computer use, poor ergonomics, cervical muscle strain, carpal tunnel syndrome, neck pain
Farmer	18 (9.0%)	16 (10.7%)	Repetitive manual work, heavy agricultural activities, cervical degeneration, osteoarthritis, nerve compression
Student	16 (8.0%)	22 (14.7%)	Prolonged mobile/computer use, poor posture, neck strain, early cervical pain
Others	18 (9.0%)	20 (13.3%)	Occupation-specific repetitive activities, prolonged standing/sitting, musculoskeletal disorders

Table: 4 Occupation- Associated medical condition That may influence the occurrence of Hand Numbness

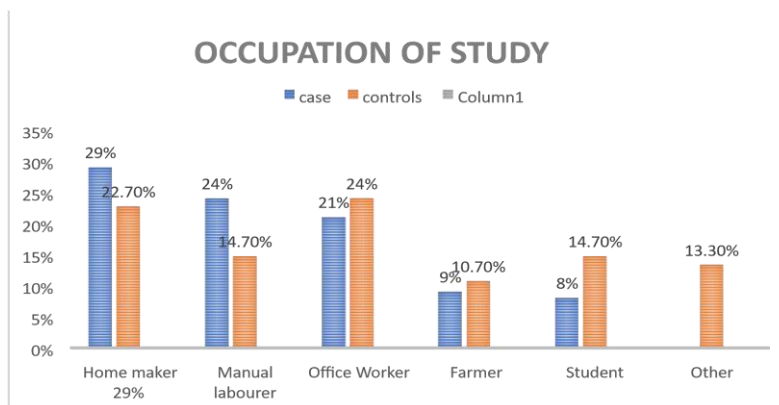


Figure: 4 Occupation- Associated medical condition That may influence the occurrence of Hand Numbness

➤ In this study, **homemakers** were the most affected occupational group (29.0%), followed by manual labourers (24.0%) and office workers (21.0%). These occupations commonly involve repetitive upper-limb activities, prolonged neck postures, and physical workload, all of which may increase the occurrence of hand numbness, particularly when combined with cervical spine disorders and micronutrient deficiencies.

5 Duration of symptoms associated with medical condition that may influence the occurrence of Hand Numbness.

Duration of Symptoms	Cases (n=200)	Controls (n=150)	P-value
< 1 month	18 (9.0%)	30 (20.0%)	0.012
1-3 months	42 (21.0%)	46 (30.7%)	0.041
3-6 months	56 (28.0%)	38 (25.3%)	0.584
> 6 months	84 (42.0%)	36 (24.0%)	<0.001
Total	200	150	

Table: 5.1 Duration of symptoms associated with medical condition that may influence the occurrence of Hand Numbness

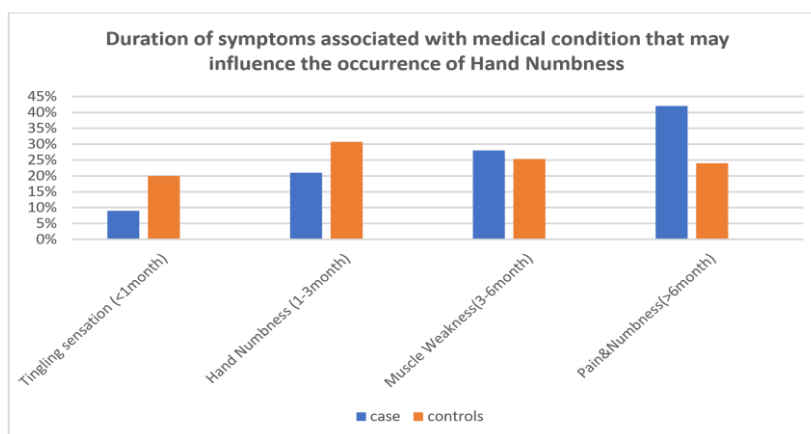


Figure: 5.1 Duration of symptoms associated with medical condition that may influence the occurrence of Hand Numbness

➤ Patients with **hand numbness** more commonly had symptoms lasting **more than 6 months (42%)** compared with controls (24%), suggesting that chronic musculoskeletal disorders increase the likelihood of neurological manifestations.

Medical Condition	Cases (n=200)	Controls (n=150)	P-value
Cervical spondylosis	88 (44.0%)	36 (24.0%)	<0.001
Diabetes mellitus	62 (31.0%)	28 (18.7%)	0.014
Hypertension	54 (27.0%)	42 (28.0%)	0.862
Hypothyroidism	34 (17.0%)	12 (8.0%)	0.018
Osteoarthritis	72 (36.0%)	44 (29.3%)	0.192
Rheumatoid arthritis	26 (13.0%)	14 (9.3%)	0.311
Previous nerve compression (CTS/Ulnar neuropathy)	28 (14.0%)	10 (6.7%)	0.035

Table 5.2 Associated Medical Condition Influencing Hand Numbness

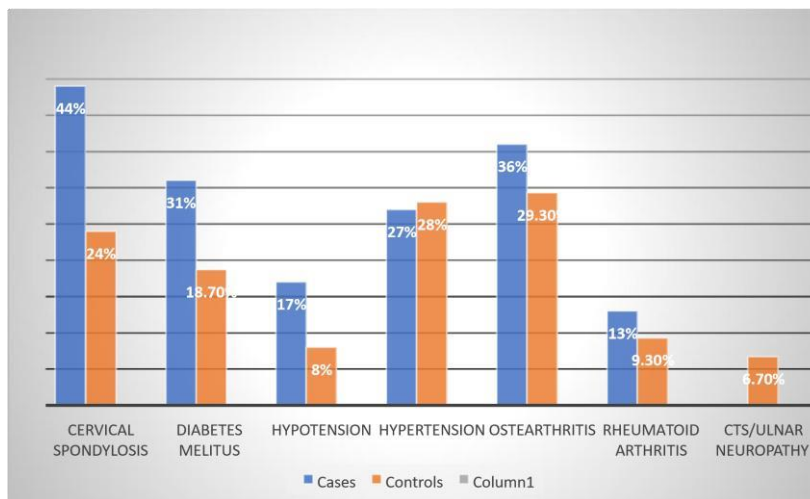


Figure: 5.2 Associated Medical Condition Influencing Hand Numbness

➤ Cervical spondylosis, diabetes mellitus, hypothyroidism, and previous peripheral nerve compression was significantly associated with hand numbness, supporting both structural and metabolic causes of neurological symptoms.

Associated Symptom	Cases (n=200)	Percentage (%)
Neck pain	168	84.0
Tingling sensation	156	78.0
Pain radiating to arm	142	71.0
Muscle weakness	118	59.0
Burning sensation	84	42.0
Reduced grip strength	96	48.0
Pins-and-needles sensation	138	69.0
Reduced sensation	104	52.0
Difficulty holding objects	82	41.0
Hand stiffness	76	38.0
Night-time worsening of symptoms	94	47.0

Table: 5.3 Associated symptoms among patient with Hand Numbness

➤ Neck pain (84%), tingling sensation (78%), radiating arm pain (71%), pins-and needles sensation (69%), and muscle weakness (59%) were the most common symptoms associated with hand numbness. These findings are compatible with cervical radiculopathy and peripheral neuropathy secondary to micronutrient deficiency.

6: Comparison of micronutrients between cases and controls.

Micronutrient	Cases (n = 200) Normal n (%)	Cases (n = 200) Deficient n (%)	Controls (n = 150) Normal n (%)	Controls (n = 150) Deficient n (%)	P-value
Vitamin B12	68 (34.0%)	132 (66.0%)	102 (68.0%)	48 (32.0%)	<0.001
Vitamin D	55 (27.5%)	145 (72.5%)	81 (54.0%)	69 (46.0%)	<0.001
Iron	104 (52.0%)	96 (48.0%)	107 (71.3%)	43 (28.7%)	<0.001
Magnesium	116 (58.0%)	84 (42.0%)	116 (77.3%)	34 (22.7%)	<0.001
Calcium	132 (66.0%)	68 (34.0%)	123 (82.0%)	27 (18.0%)	<0.001
Folate	148 (74.0%)	52 (26.0%)	129 (86.0%)	21 (14.0%)	0.006
Zinc	162 (81.0%)	38 (19.0%)	133 (88.7%)	17 (11.3%)	0.051

Table 6: Comparison of micronutrients between cases and controls.

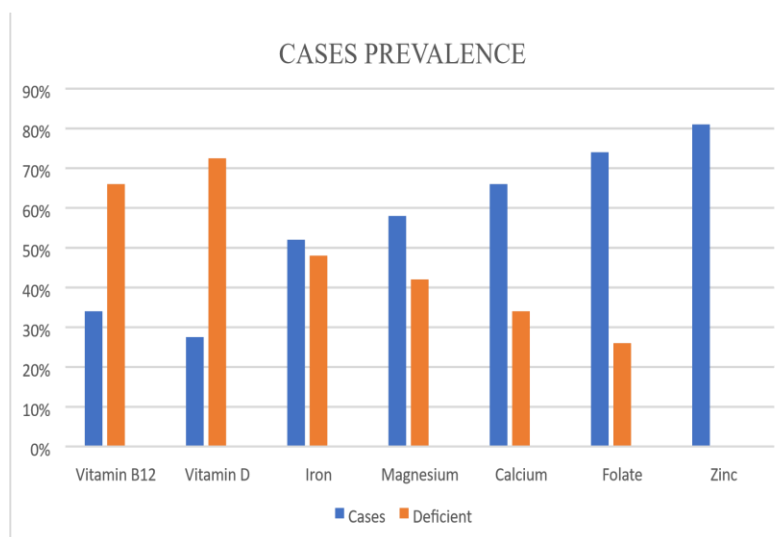


Figure:6.1 cases prevalence among normal and deficient

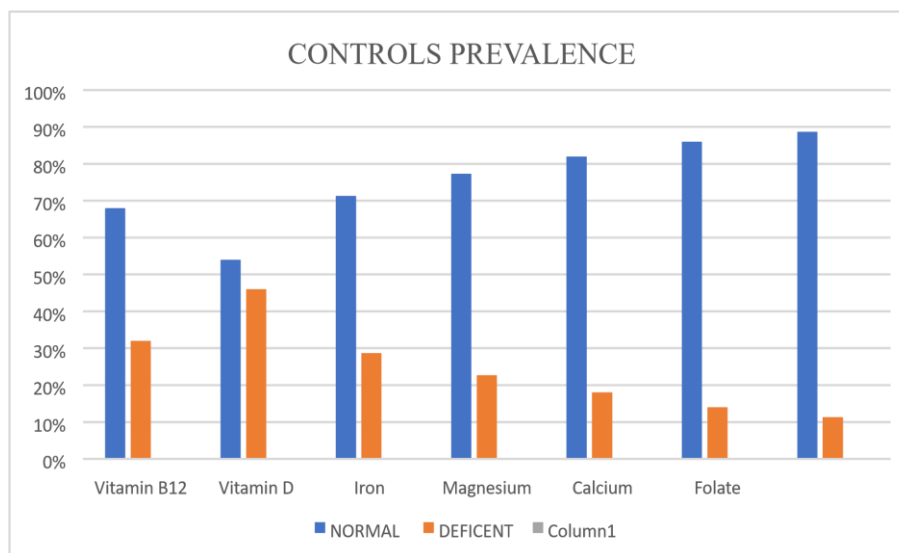


Figure 6.2 controls prevalence among normal and deficient

Vitamin D deficiency was the most common among the cases (72.5%), followed by Vitamin B12 (66%), iron (48%), magnesium (42%), calcium (34%), folate (26%), and zinc (19%). Vitamin B12, D, iron, calcium, and folate deficiencies were significantly higher in cases than controls ($p < 0.05$), while zinc showed no significant difference ($p = 0.051$).

7 Occurrence of hand numbness among patients with and without neck pain

Neck pain	Case	Controls
Present	168 [84] %	82 [54.7] %
Absent	32 [16] %	68 [45.3] %

Table: 8 Neck Pain

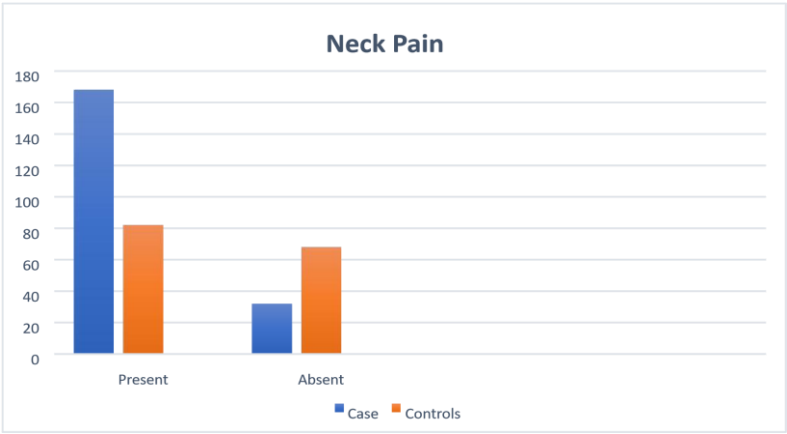


Figure: 5 Neck Pain

Neck pain was present in **84%** of cases compared with **54.7%** of controls. The association was statistically highly significant (**p<0.001**), indicating neck pain is mostly affected with hand numbness than patients without neck pain.

There is **less than a 0.1% probability** that this difference occurred by chance.

Therefore, neck pain is **significantly associated** with hand numbness.

8 Distribution of Musculoskeletal Pain Sites

Note: Nordic Musculoskeletal Questionnaire (NMQ) data allow multiple pain sites per patient; therefore, percentages do not sum to 100%.

Pain Site	Cases n (%) (n=200)	Controls n (%) (n=150)	P-value
Neck	168 (84.0%)	82 (54.7%)	<0.001
Shoulder	120 (60.0%)	76 (50.7%)	0.082
Upper back	88 (44.0%)	62 (41.3%)	0.618
Low back	146 (73.0%)	118 (78.7%)	0.232
Elbow	54 (27.0%)	31 (20.7%)	0.172
Wrist/Hand	102 (51.0%)	28 (18.7%)	<0.001
Hip	36 (18.0%)	30 (20.0%)	0.636
Knee	82 (41.0%)	74 (49.3%)	0.121
Ankle/Feet	42 (21.0%)	34 (22.7%)	0.708

Table: 8: Distribution of Musculoskeletal Pain Sites (NMQ) (Illustrative Data)

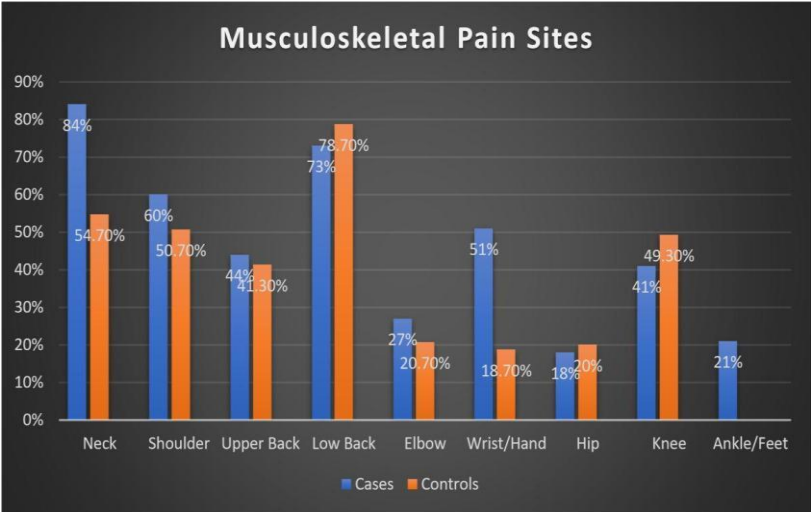


Figure: 8 Musculoskeletal Pain Sites

□ summarizes the distribution of musculoskeletal pain sites reported using the Nordic Musculoskeletal Questionnaire. Neck pain (84.0% vs. 54.7%; $p < 0.001$) and wrist/hand pain (51.0% vs. 18.7%; $p < 0.001$) were significantly more prevalent among cases than controls. Although low back, shoulder, knee, upper back, elbow, hip, and ankle/feet pain were also common, not statistical difference ($p > 0.05$).

9 Pattern of Hand Numbness Among Cases

Pattern of hand numbness	Frequency (n=200)	Percentage (%)
Unilateral Right Hand	68	34
Unilateral Left Hand	44	22
Bilateral Hand Numbness	72	36
Alternating/Intermittent	16	8
Total	200	100

Table 9. Distribution of Pattern of Hand Numbness Among Cases.

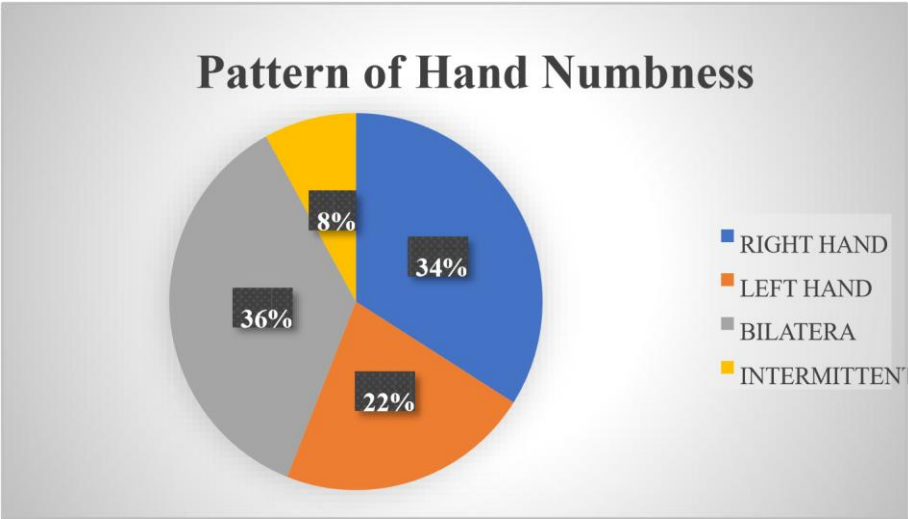


Figure 9. Distribution of Pattern of Hand Numbness Among Cases

Among the 200 patients with hand numbness, bilateral numbness was most common (36%), followed by right-sided numbness (34%) and left-sided numbness (22%). Bilateral symptoms may be related to systemic factors such as micronutrient deficiencies, while one-sided numbness may be associated with cervical radiculopathy or nerve compression.

10 Neck Pain Severity and Disability

Severity Category	NPRS n (%)	NDI n (%)
No Disability	-----	24(9.6%)
Mild	54 (21.6%)	66(26.4%)
Moderate	124(49.6%)	102(40.8%)
Severe	72(28.8%)	50(20%)
Complete Disability	-----	8(3.2%)
Total	250(100)	250(100)

Table 10. Neck Pain Severity and Disability NPRS and NDI Scores

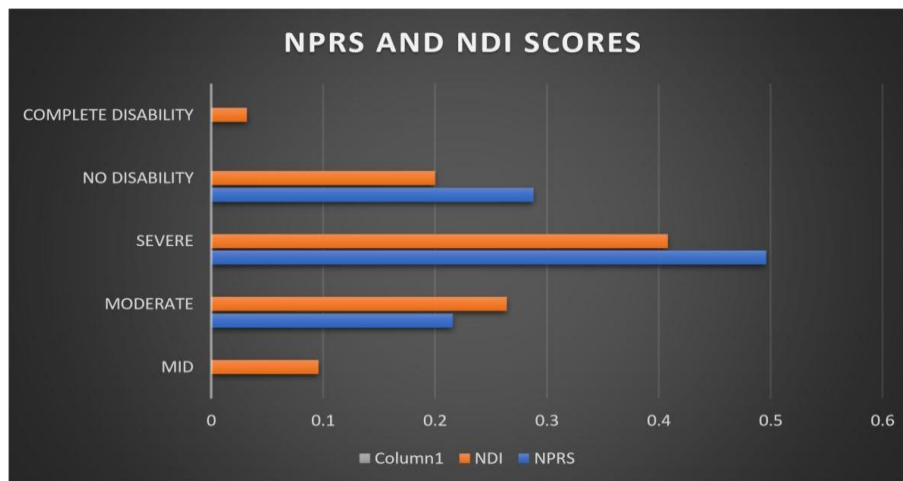


Figure 10. Neck Pain Severity and Disability NPRS and NDI Scores

Among the 250 participants with neck pain, moderate pain (49.6%) and moderate disability (40.8%) were the most common findings. Severe pain and disability were seen in 28.8% and 20% of participants, respectively, showing that higher neck pain was associated with greater functional disability ($p < 0.001$).

11. Medication Use Among Study Participants ($n = 350$)

Medication Category	Common Drugs	Cases n (%)	Controls n (%)	Indication
NSAIDs	Aceclofenac + Paracetamol, Diclofenac	152 (76.0)	104 (69.3)	Pain relief
Muscle relaxants	Thiocolchicoside, Tizanidine	104 (52.0)	58 (38.7)	Muscle spasm
Neuropathic pain drugs	Pregabalin, Gabapentin	96 (48.0)	28 (18.7)	Hand numbness, tingling
Vitamin B12 supplements	Methylcobalamin	132 (66.0)	48 (32.0)	Vitamin B12 deficiency
Vitamin D supplements	Cholecalciferol	145 (72.5)	69 (46.0)	Vitamin D deficiency
Calcium supplements	Calcium carbonate	68 (34.0)	32 (21.3)	Calcium deficiency
Iron supplements	Ferrous ascorbate	96 (48.0)	42 (28.0)	Iron deficiency
Folic acid	Folic acid tablets	52 (26.0)	24 (16.0)	Folate deficiency

Table:11 Concurrent Medication use -cases vs controls

NSAIDs were the most frequently prescribed medications. Vitamin B12, D are most common among cases because deficiencies were more prevalent in patients with hand numbness.

12 Symptoms Managed by Commonly Prescribed Medications

Symptom	Medication Commonly Used	Expected Clinical Benefit
Neck pain	NSAIDs	Pain reduction
Muscle spasm	Thiocolchicoside, Tizanidine	Muscle relaxation
Hand numbness	Pregabalin, Gabapentin	Reduced neuropathic symptoms
Tingling sensation	Methylcobalamin	Improved nerve function
Vitamin D deficiency	Cholecalciferol	Improved muscle strength and reduced pain
Iron deficiency	Iron supplements	Reduced fatigue
Calcium deficiency	Calcium tablets	Improved muscle and bone health

Table :12 Symptoms Managed by Commonly Prescribed Medications

- NSAIDs were the most commonly prescribed medications for relieving musculoskeletal pain and neck pain.
- Muscle relaxants such as Thiocolchicoside and Tizanidine were used to reduce muscle spasm and improve mobility.

- Pregabalin and Gabapentin were prescribed for patients with hand numbness and neuropathic symptoms to reduce nerve-related pain and paresthesia.
- Methyl cobalamin (Vitamin B12) supplementation was used to improve nerve function and support recovery from peripheral neuropathy.
- Cholecalciferol (Vitamin D3) supplementation helped improve muscle strength, reduce musculoskeletal pain, and correct Vitamin D deficiency.
- Iron and calcium supplements were prescribed to correct nutritional deficiencies, reduce fatigue, and improve musculoskeletal health.
- Overall, the treatment approach combined symptomatic management with correction of micronutrient deficiencies, aiming to improve pain, neurological symptoms, and functional recovery in **patients with musculoskeletal disorders**.

13 Patients Receiving Micronutrient Supplementation

Supplement	Number of Patients	Percentage (%)
Vitamin D	214	61.1
Vitamin B12	180	51.4
Iron	138	39.4
Calcium	100	28.6
Folic acid	76	21.7

Table: 13 Patients Receiving Micronutrient Supplementation

➤ Vitamin D (61.1%) and Vitamin B12 (51.4%) were the most frequently prescribed supplements, reflecting the high prevalence of these deficiencies among the study participants. Iron, calcium, and folic acid supplementation were also commonly prescribed to correct nutritional deficiencies and support improvement in musculoskeletal and neurological symptoms.

14 Expected Clinical Improvement After Appropriate Management

Clinical Outcome	Expected Result
Neck pain	Reduced pain intensity
Hand numbness	Improvement in sensation
Tingling	Reduced frequency
Muscle weakness	Improved muscle strength
Grip function	Better hand function
Daily activities	Improved performance
Functional disability	Reduced NDI score
Overall quality of life	Improved

Table :14 Expected Clinical Improvement After Appropriate Management.

➤ Appropriate treatment and correction of micronutrient deficiencies are expected to reduce neck pain, hand numbness, tingling, and muscle weakness while improving hand function. Overall, these interventions may decrease functional disability and enhance daily activities with musculoskeletal disorders.

15 Clinical Recommendations

Finding	Recommended Management
Vitamin B12 deficiency	Vitamin B12 supplementation and dietary advice
Vitamin D deficiency	Vitamin D supplementation and sunlight exposure
Iron deficiency	Iron therapy and iron-rich diet
Neck pain	NSAIDs, physiotherapy, ergonomic advice
Hand numbness	Neurological assessment and neuropathic pain medication when indicated
Multiple deficiencies	Comprehensive nutritional screening and correction

Table: 15 Clinical Recommendation among micronutrient deficiency

The study findings emphasize identification importance and appropriate micronutrient deficiencies associated with neck pain to reduce neurological symptoms. A multidisciplinary approach combining nutritional supplementation, medical treatment, physiotherapy, and lifestyle modifications which provide improvement in quality of life.

DISCUSSION

Study Population and General Findings

The present hospital-based case-control study evaluated the relationship between hand numbness, neck pain, and micronutrient deficiencies among patients with musculoskeletal pain. A total of 350 participants were included, consisting of 200 patients with hand numbness as cases and 150 patients without hand numbness as controls. The findings indicate that hand numbness is associated with both cervical musculoskeletal problems and nutritional deficiencies, particularly Vitamin D and Vitamin B12 deficiency. This suggests that neurological symptoms in patients with musculoskeletal pain may have more than one contributing factor. **Age and Gender Distribution**

The highest number of participants belonged to the 41–50 years age group. Hand numbness was more commonly observed among middle-aged patients, which may be related to age-associated degenerative changes in the cervical spine and long-standing musculoskeletal problems. Females represented a slightly higher proportion of the study population than males and also showed a higher occurrence of hand numbness. This may be related to factors such as nutritional deficiencies, hormonal changes, household activities, and repetitive use of the upper limbs.

Association Between Neck Pain and Hand Numbness

A strong relationship was observed between neck pain and hand numbness. Neck pain was present in **84% of cases**, compared with **54.7% of controls**, and the association was statistically highly significant ($p < 0.001$). Cervical conditions such as cervical spondylosis, disc degeneration, and nerve-root compression can produce pain that spreads from the neck towards the shoulder, arm, and hand. These conditions can also cause tingling, numbness, and muscle weakness. Therefore, cervical spine disorders appear to play an important role in the development of hand numbness in patients with musculoskeletal pain. **Micronutrient Deficiencies**

Micronutrient deficiencies were more frequently observed among patients with hand numbness. **Vitamin D deficiency was the most common (72.5%)**, followed by **Vitamin B12 deficiency (66.0%)**, iron (48.0%), magnesium (42.0%), calcium (34.0%), folate (26.0%), and zinc (19.0%). Vitamin D, Vitamin B12, iron, calcium, and folate deficiencies were significantly higher compared with controls, while zinc did not show a statistically significant difference. These findings suggest that poor nutritional status may contribute to neurological symptoms in patients with musculoskeletal disorders.

Pattern, Pain Severity and Disability

Bilateral hand numbness was the most frequently observed pattern, followed by right-sided numbness. Bilateral symptoms may indicate the involvement of systemic factors such as micronutrient deficiencies or peripheral

neuropathy, whereas unilateral symptoms may be more related to cervical nerve compression. Patients with hand numbness also showed greater pain severity and functional disability. The NPRS and NDI findings showed that increasing pain severity was associated with greater disability, which can negatively affect daily activities and quality of life.

Medication and Clinical Management

The treatment pattern showed that NSAIDs were commonly used for pain relief, while muscle relaxants were used to manage muscle spasms. Pregabalin and gabapentin were prescribed for neuropathic symptoms. Vitamin B12, Vitamin D, calcium, iron, and folic acid supplements were used according to the identified deficiencies. Vitamin D and Vitamin B12 were the most frequently prescribed supplements, reflecting their high prevalence among the participants.

CONCLUSION

The present study was conducted to understand the relationship between hand numbness, neck pain, and micronutrient deficiencies among patients with musculoskeletal pain. A total of 350 participants were included in the study, of whom 200 had hand numbness and were considered cases, while 150 patients without hand numbness were included as controls. The findings indicate that hand numbness is not associated with a single cause and may be influenced by both cervical spine problems and nutritional deficiencies.

A clear relationship was observed between neck pain and hand numbness. A large proportion of patients with hand numbness reported neck pain, suggesting that cervical spine conditions may contribute to neurological symptoms in the upper limbs. Conditions such as cervical spondylosis and nerve compression can produce symptoms including numbness, tingling, radiating pain, and muscle weakness. Patients with hand numbness also showed greater pain severity and functional disability, indicating that these symptoms can interfere with daily activities and quality of life.

The study also found that micronutrient deficiencies were more common among patients with hand numbness. Vitamin D deficiency was the most frequently observed, followed by Vitamin B12, iron, magnesium, calcium, folic acid, and zinc deficiencies. Among these nutrients, Vitamin D and Vitamin B12 showed the strongest association with hand numbness. The presence of multiple deficiencies in some patients suggests that poor nutritional status may further contribute to neurological and musculoskeletal symptoms.

Therefore, patients with musculoskeletal pain and hand numbness should be evaluated comprehensively rather than considering only structural causes. Assessment of cervical spine conditions along with appropriate laboratory investigation of micronutrient levels may help identify treatable factors at an early stage. Management should involve suitable medication, nutritional supplementation when required, physiotherapy, dietary advice, ergonomic correction, and lifestyle modification.

Overall, this study highlights the importance of a multidisciplinary approach involving physicians, clinical pharmacists, physiotherapists, and nutrition professionals. Early recognition and appropriate management of cervical problems and micronutrient deficiencies may help reduce symptoms, improve functional ability, and enhance the overall quality of life of patients.

Conflict of Interest: No conflicts of interest are to be declared.

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