

# The Association between Neck Pain and Upper Limb Disability in Patients with Non-Specific Neck Pain

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## ABSTRACT

**Background:** Neck pain is a common musculoskeletal problem that affects a substantial proportion of people at some point in their lives. It has long been recognized that neck pain can result in symptoms and problems being referred into the upper limb. Thus to provide an accurate treatment to subjects with neck pain, it becomes necessary to know the severity of the neck pain as well, to see whether mechanical neck pain can result in upper limb disability, for which it is essential to measure and correlate the same.

**Method:** A validated questionnaire of Neck pain disability index (NDI) was given to the 30 participants to measure the neck pain. Baseline upper limb disability was measured using the Disabilities of Arm, Shoulder, Hand questionnaire (DASH) and The Single Arm Military Press (SAMP) test. SAMP test was performed on age match 30 healthy individuals without having neck pain for later comparison of scores. Data analysis was done to correlate the NDI % score, DASH score and SAMP score.

**Results:** There was significant difference between the mean value of SAMP score in subjects with neck pain and without neck pain, ( $p < 0.001$ ). Pair wise analysis revealed a positive correlation between NDI % and DASH score ( $r = 0.577$ ). There is negative correlation between NDI % score & SAMP score and DASH score and SAMP score of both upper limbs.

**Conclusion:** A strong relationship existed between neck dysfunction and upper limb disability. The presence of neck pain should direct clinicians towards an assessment and management of upper limb function.

**Keywords:** Neck pain, Upper limb disability, DASH, SAMP test.

## INTRODUCTION

Neck pain is a common musculoskeletal problem which affects a substantial proportion of people at some point in their lives. [1] The lifetime prevalence of neck pain in different countries is high, with more than two thirds of individuals experiencing a problem with neck pain. [2] Approximately 34.4%-54% of the general population experience neck pain in a 12 month period. [3] The point prevalence ranges between 10-25% depending on the population and the

definition of neck pain. [4] Between 13.8% and 19.3% of the general population report symptoms which last for six months or more. [5] Approximately 10% of the general population report severe levels of neck pain intensity with a further 5% reporting severely disabling neck pain.

It has long been recognized that neck pain can result in symptoms and problems being referred into the upper limb. Non-specific neck pain may also be associated with referral of symptoms into the upper limb, though the symptoms are often diffuse

and less readily investigated using standard neurological examination.<sup>[6]</sup> Clinically it is common that patients with non-specific neck pain report problems with upper limb function. However it is not known to what extent, patients with neck pain experience problems with upper limb function. Any kind of mechanical loading to the articular and ligamentous structures of the neck can result into increase in mechanical loading of upper limb. This results into pain in the upper limb and difficulties in performing upper limb activities which may inhibit patients from using their upper limb resulting into upper limb disabilities.

There are measures available to help quantify upper limb capacity in patients with neck pain. The Disabilities of Arm, Shoulder, Hand questionnaire (DASH) is a patient-completed upper limb disability questionnaire.<sup>[7]</sup> Single Arm Military Press (SAMP) is a tool used to identify the extent of upper limb disability in neck pain patients. Both these outcome measures have been validated for use in the neck pain population.<sup>[8,9]</sup> Hence the purpose of this study is to find the association between neck pain and extent of upper limb disability using DASH and SAMP in patients with non-specific neck pain.

## **METHODS**

Sixty subjects were recruited for the study after obtaining approval from institutional research committee. Group A consisted of thirty subjects with non-specific neck pain visiting musculoskeletal outpatient department. The inclusion criteria were patients with sub-acute or chronic mechanical neck pain with or without referred symptoms into the head or upper limbs, for at least more than 3 months. Patients with inflammatory, infectious, malignant conditions of cervical spine, post surgery patients with neck pain were excluded.

Group B consisted of thirty age matched healthy individuals. All the subjects filled the consent form. The basic demographic data was recorded.

The baseline neck pain/disability was measured using Neck pain disability index (NDI). Upper limb disability was measured using DASH and extent of upper limb disability was measured using SAMP test in both the groups.

### **Neck pain and disability index (NDI)**

The NDI is used to measure current severity of neck pain and disability. The NDI is a 10 item questionnaire designed to measure self-reported functional impairment due to neck pain in activities of daily living. Each item is rated on a 0-5 scale. The item scores are summed to provide a total out of 50, which is converted to a percentage. The NDI has been used extensively in clinical and research settings, and has proven validity and reliability by Vernon and Mior, 1991.

### **Upper limb disability measure**

DASH is a 30 item questionnaire measuring physical and social function and upper limb symptoms. Twenty-one of these items refer to specific upper limb activities, 3 to general daily activities, 5 to specific upper limb symptoms and 1 to self-efficacy. Each item is scored on a 5-point Likert scale. Individual item scores are summed, divided by the number of responses, subtracted by one and multiplied by 25 to provide a score out of 100. The DASH has been tested for validity and responsiveness in a neck pain population.<sup>[7]</sup>

The Single Arm Military Press (SAMP) test is a newly developed test by Mc Lean (2011). It is a physical capacity outcome measure which is designed to investigate upper limb capacity in a population with neck pain. Recent investigations demonstrate that the SAMP test has excellent reliability and validity in a female population with neck pain.<sup>[10]</sup>

SAMP test is a simple tool which can be used to identify the extent of upper limb disability in neck pain patients. This tool is quick, easy and cheap to administer. It requires no special language skill and is simple to interpret. The test consists of the subject completing as many repetitions of the SAMP technique as possible within 30

seconds using a 3kg weight (test position as shown in fig.1 & 2). All participants were instructed to do the test as fast as possible but can stop and start at anytime during the 30 seconds, though the timing continues.



Figure 1: Starting position of SAMP test



Figure 2: End position of SAMP test

Data analysis was done to correlate the NDI % score, DASH score and SAMP score in Group A and Group B.

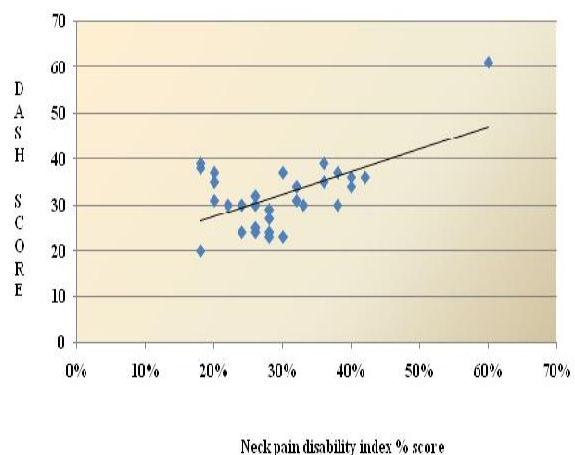
## RESULTS

As per the demographic data, the mean age of subjects in Group A was 21.03years (sd  $\pm 1.56$ ) and Group B was 21.02 years (sd  $\pm 1.68$ ). In Group A out of 30 subjects with neck pain, 19subjects (63%) complained of referred pain. Out of 19 subjects with referred pain along with the neck pain, 12subjects (63%) complained of referred pain to the shoulder, 5 subjects(26%) complained of referred pain to the shoulder-arm –finger and 2 subjects (11%) complained of referred pain to the shoulder and arm.

On analyzing NDI score, out of thirty subjects with neck pain, 20% had minimal neck pain disability, 73% had moderate neck pain disability and 5% had severe neck pain disability. On DASH Score, 30% had minimal upper limb disability, 67% had moderate upper limb disability and 3% subject had severe upper limb disability. The mean value of SAMP score in Group A on right side 8.68 and on left side was 8.7. The mean value of SAMP score in Group B on right and left side was 26.23. There was significant difference

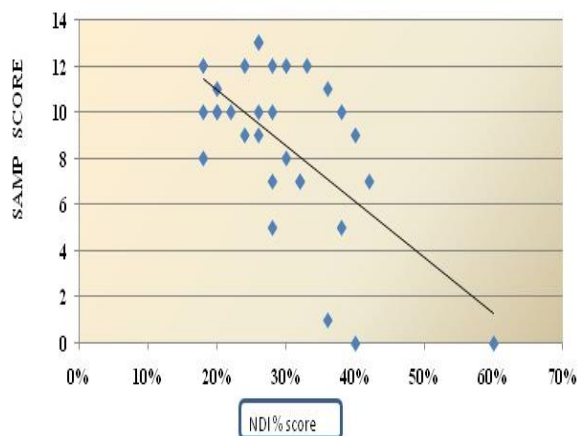
between mean value of SAMP score in subjects with neck pain and without neck pain on both right and left side, p value being less than 0.001.

Tests of associations were conducted and the results of scatter plot analysis and Pearson correlations are shown in the following graphs. The results show that baseline NDI scores and baseline DASH scores were significantly and highly correlated with one another (Pearson's r value 0.577). Graph 1



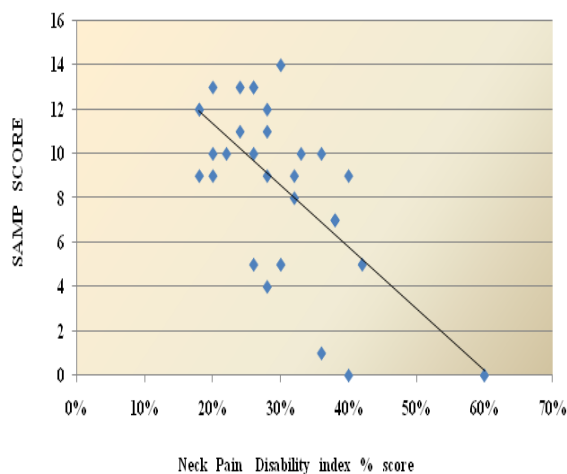
Graph 1: Correlation between NDI % Score and DASH Score

There is moderate negative correlation between NDI % score and SAMP score of right side. (r value -0.620) i.e.  $(-1 < r < 0)$  (Graph 2).



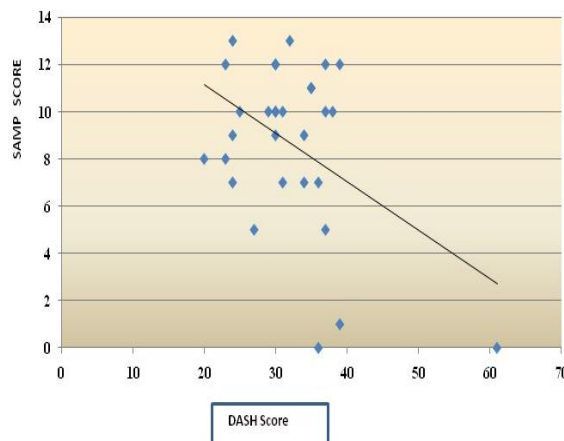
Graph 2: Correlation between NDI % score and SAMP score of right side

There is moderate negative correlation between NDI % score and SAMP score of left side. (r value -0.656) i.e.  $(-1 < r < 0)$  (Graph 3).



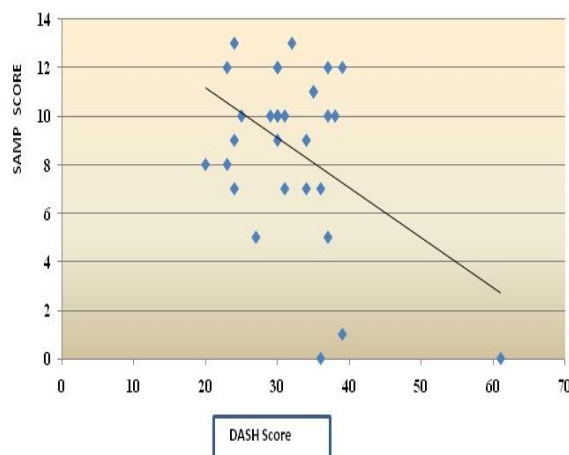
Graph 3 : Correlation between NDI% score and SAMP score of left side

As the neck pain disability index increased, the performance on SAMP score decreased. There was moderate negative correlation between DASH score and SAMP score of right side. The r value is  $(-0.44)$  i.e.  $(-1 < r < 0)$  (Graph 4).



Graph 4: correlation between DASH score and SAMP score of right side.

There was moderate negative correlation between DASH score and SAMP score of left side. The r value is  $(-0.37)$  i.e.  $(-1 < r < 0)$  (Graph 5).



Graph 5: Correlation between DASH score and SAMP score of left side

As the DASH score increased the performance on SAMP score decreased. Hence it was observed that in patients with neck pain, patient-reported upper limb disability (DASH) was in association with their performance in SAMP test.

## DISCUSSION

This study demonstrated a positive correlation between baseline NDI scores and baseline DASH scores where as negative correlation with SAMP score. Higher NDI scores indicate increasing levels of neck pain and disability. Lower SAMP scores indicate a patient's difficulties



to accomplish a range of activities. The findings from this study confirm that patients reporting severe neck problems were likely to report high levels of upper limb disability.

Patients with neck pain are more likely to avoid painful tasks or give up on tasks when faced with the possibility of pain. [11] It follows that people with high scores on Neck pain disability index avoid potentially painful functional activities, are more likely to report higher levels of upper limb disability on DASH scores and decrease performance on SAMP test.

It is clear that there is a strong relationship between the presence of neck problems and the presence of upper limb disability.

Patients with neck pain start avoiding, using upper limb, results in de-conditioning which may lead to loss of strength and endurance of the upper limb muscles. This will lead to weakness in the upper limb muscles and thus patients will have difficulties in performing the movements and functions of upper limb and thus resulting into upper limb disabilities.

This study also shows that there are significant and substantial differences in SAMP score between symptomatic and asymptomatic subjects. Using a 3 kg hand weight for 30 seconds, asymptomatic participants were able to obtain a SAMP test performance in excess of 25 repetitions. For those participants scoring less than 25, and with no other upper limb disorders, there is a presence of neck problem which is impacting upon upper limb function. In cross-sectional and longitudinal studies the prevalence of neck disorders has been linked with certain work place upper limb activities. [9,12]

Upper limb function results in sliding or elongation of neural structures throughout the brachial plexus including the neck. Elongation of inflamed and sensitive neural structures at the neck may lead to a neck pain response resulting in reluctance of these patients to use their upper limbs. Finally, if patients limit the functional use of

their upper limbs because of a direct mechanical pain response this may result in physical de-conditioning which may lead to reduced strength and endurance of muscles. [13] In this study patients reported problems with tasks which require strength and endurance i.e. heavy household chores, gardening, carrying heavy objects, and recreational tasks which involved impact through the hand such as hammering, or free movement of the arm such as badminton. Consequently higher levels of upper limb disability were associated with higher severity of baseline neck dysfunction.

## CONCLUSION

It is concluded that strong relationship existed between neck dysfunction and upper limb disability. Assessment of upper limb function and extent of upper limb disability should be included as part of the neck rehabilitation program.

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