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RESPONSIVENESS OF DASH-H IN COMPARISON TO DASH AND VALIDATION USING VAS IN PATIENTS WITH SUPRASPINATUS TENDONITIS IN THE INDIAN POPULATION

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ABSTRACT

Background: A comparative study was conducted in thirty consecutive patients of supraspinatus tendonitis to determine the responsiveness and comparison of Disability of Arm, Shoulder and Hand (DASH) and the Hindi version of DASH (DASH-H) in patients with supraspinatus tendonitis. The aim of this study was to find whether both scales (DASH and DASH-H) are sensitive to predict the patient's outcome in the Indian population.

Methodology: During clinical examination, patients were asked to fill either DASH or Hindi version of DASH (DASH-H) and VAS-P. Computer-generated randomised sequence was generated for administering Hindi or English version of the DASH questionnaire along with the VAS-P. Observations were taken after 3 days and after 4 weeks in the cross-over pattern. VAS-P was given at 3 days and after 4 weeks as well. Responsiveness was checked by examining the Receiver Operating Characteristics (ROC) curve statistics and these scores were used to calculate the sensitivity and specificity of DASH and DASH-H.

Results: The scores of DASH, DASH-H and VAS were found to be significantly lower post-treatment. The sensitivity of DASH and Hindi version of DASH (DASH-H) was found to be 96% each and the specificity of DASH and DASH-H was found to be 60% and 80% respectively. The Area under the Curve (AUC) plotted for DASH-H was 0.880 and for DASH was around 0.780.

Conclusion: Hindi version of DASH (DASH-H) and DASH were found to be responsive in patients with supraspinatus tendonitis. Both were found to be equally responsive and sensitive.

Keywords: Patient reported outcome, DASH, DASH-H, supraspinatus tendonitis, upper limb assessment

INTRODUCTION

Shoulder joint is a ball and socket, multiaxial, synovial joint which provides extensive range of motion. It comprises of the glenohumeral joint, acromioclavicular joint, sternoclavicular joint and the scapulothoracic joint. The shoulder joint relies on the muscles and ligaments more than the bones for its stability and integrity **[1]**. The rotator cuff plays an integral role in shoulder movement by proving dynamic stability to the shoulder joint **[2]**. Shoulder pain can be caused by intrinsic disease of the shoulder joint or pathology of the periarticular structures or it may originate from cervical spine, chest or visceral areas. Shoulder pain and/or weakness are common complaints among patients, which can lead to disability and affect a person's ability to perform daily activities. Extensive pain and weakness may be associated with shoulder conditions such as rotator cuff disorders adhesive capsulitis, superior labrum anterior to posterior lesions, lesions in the biceps, acromioclavicular joint disease, or instability **[3]**.

A thorough understanding and knowledge of the network of bony, ligamentous, muscular, and neurovascular anatomy is required to properly identify and diagnose shoulder pathology. Thus, appropriate physical examination of the shoulder is important for making an accurate diagnosis and distinguishing certain pathologies of the shoulder. Diagnosis of shoulder dysfunction is dependent upon physical examination, which involves inspection, palpation, assessment of range of motion, strength, and neurovascular integrity **[4]**. In addition, specific tests are used to reproduce symptoms and signs that would help physicians identify the pathology of the shoulder problem **[5]**. Assessment of function a major important part of shoulder joint evaluation. The functional assessment can be performed on the basis of activities of daily living, work or recreation as these are most important to the patient. They can also be based on numeric scoring charts which are derived from clinical and functional measures **[6]**.

Patient reported outcomes measures (PROM) are referred to as a set of validated and standardized questionnaires that assess patient's perception of his/her health and quality of life. Some of these measures summarize global physical, mental, and

social functioning, while others are specific to various regions of the body. Patient reported outcomes are being increasingly used as tools to assess patient's perspectives of either their improvement after surgery or the treatment provided **[8]**. They are also used to assess the impact of a condition on health status of an individual and measure the aspects of the impairment which even clinicians find difficult to examine. PROMs are being used in research as well as to measure the quality of care **[8]**.

The Disabilities of Arm, Shoulder and Hand (DASH) scale in a commonly used patient reported outcome measure, used in musculoskeletal conditions **[9]**. It was released in 1996 and its purpose was to detect upper limb disorders by measuring the upper limb function, assess their severity and changes over time, and also to evaluate the outcomes of intervention provided **[10]**. It consists of 30 items which provide the overall assessment of the upper extremity function. A shorter, 11-item version also exists which is known as QuickDASH. It was found in 2005 to reduce the administrative burden and yet it retained the main aspects of upper extremity functions in assessing disability **[11]**. It has demonstrated good reliability, validity and responsiveness in patients with upper extremity disorders. It was found to be as responsive as full DASH when applied to a simple patient population.

DASH was originally developed in Canadian/North America English. Outcome measures should be linguistically validated, i.e. translated and culturally adapted into the language of the target country and psychometric evaluation of the target population before using it in that country. The translation and cultural adaptation procedures have the purpose of semantic and experiential equivalence for successful integration in the target population **[12]**. DASH has been translated and culturally adapted to over 45 languages/cultures. Various guidelines have been formulated by the original developers of DASH regarding the stepwise translation of the DASH to the target language. Hindi is the official language of the government of India and one of the most common languages spoken worldwide. In the past, various outcome measures have been translated to Hindi for the Hindi-speaking population. This includes the DASH scale. It was translated by Saurabh P. Mehta *et al.,* (2015) to assess its reliability, validity and responsiveness in patients with shoulder tendonitis. The Hindi version of DASH or DASH-H demonstrated good test-retest reliability, validity and responsiveness in people with shoulder tendonitis **[13]**. In this study, we will be comparing the responsiveness of Hindi

version of DASH with the DASH in patients having shoulder pathology.

Responsiveness of a patient-reported outcome is reflected by its ability to detect a clinically meaningful change over time **[14]**. Responsiveness has been deemed to be one of the most important characteristics of a PRO and it also allows direct comparison between various tools while utilising them within the same population. Due to the increasing use of patient reported outcomes, and comparative data are crucial, it is essential to know which PRO tools to use in practice **[15]**. Hindi version of DASH (DASH-H) has already been created and psychometrically analysed within the Indian population. However, no comparison has been made regarding the responsiveness of the DASH-H and DASH amongst Indians. Thus, in this study we will check the responsiveness of the Indian population for the DASH-H and DASH.

Purpose of the study: Through this study, we aim to compare the responsiveness of the Disability of Shoulder, Hand and Arm (DASH) and the Hindi version of Disability of Shoulder, Hand and Arm (DASH-H) in the patients with supraspinatus tendonitis. This will help us to understand which scale is more suitable for the Indian population.

MATERIALS AND METHODS

Thirty consecutive patients who were diagnosed with supraspinatus tendonitis presenting to the Arthroplasty and Sports Injury Centre (ASIC), Delhi, between December 2020 and September 2021 were asked to participate in this study. The supraspinatus tendonitis was diagnosed by the referring orthopaedician. Informed consent was sought from the patients before data collection. This is a comparative study, where simple randomised sampling was used to select a subset of the population.

Individuals who were 18 years or older, individuals diagnosed with supraspinatus tendonitis and people who were able to read and comprehend Hindi and English were included in this study. Individuals with neurological conditions or symptoms of cervical radiculopathy, individuals with severe cognitive or communication impairment, patients with chronic systemic disease or any rheumatological condition and individuals with infectious diseases or a history of malignancy were excluded from this study.

Tests and measures: The Disability of Arm, Shoulder and Hand (DASH) consists of 30 items inquiring about an individual's functional status in presence of upper extremity musculoskeletal condition. Each item is rated on the scale of 1–5 with 1 indicating no problem and 5 indicating extreme problems or inability to perform the activity. No more than 3 items can be left unanswered to accurately calculate the score on the DASH. The full length DASH and Hindi version of DASH (DASH-H)

were administered to the participants where they were asked to read and complete the questionnaire. If an item on the DASH-H was unclear, participants had the opportunity to ask for clarification of its meaning. The reliability and validity of the DASH scale were 0.96 and 0.70 respectively. [9] The minimal clinical important difference was found to be 10.83-15 **[16]**.

The pain Visual Analog Scale (VAS-P) is a unidimensional measure of pain intensity which is widely used in diverse adult populations. It is often used in epidemiological and clinical research to measure the intensity and frequency of pain or various other symptoms. Two anchors of VAS were provided, with 0 indicating no pain or disability and 10 indicating severe pain and disability. Test–retest reliability has been shown to be good, but higher among literate (r= 0.94, P= 0.001) than illiterate patients (r = 0.71, P= 0.001) **[17]**. A minimum clinically important difference of 1.37 cm has been determined for a 10-cm pain VAS in patients with rotator cuff disease evaluated after 6 weeks of nonoperative treatment **[18]**.

Procedure: Consecutive patients diagnosed with supraspinatus tendonitis were asked to participate in this study. Upon agreeing to participate in this study, each participant was asked to fill either DASH or Hindi version of DASH (DASH-H) and VAS-P. Computer-generated randomised sequence was generated for administering Hindi or English version of the DASH questionnaire along with the VAS-P. After 3 days, second observation was taken in the cross-over pattern, i.e. the subjects who received DASH were administered Hindi version of DASH (DASH-H) in the second sequence and vice versa. Descriptive data like age, gender, level of education were also collected. The patients continued to receive physical therapy treatment for their shoulder tendonitis. After 4 weeks, the same cross-over sequence design was followed. VAS-P was given at 3 days and after 4 weeks as well.

Data analysis: Descriptive statistics which includes mean and standard deviation was calculated for all variables. Responsiveness was checked by examining the Receiver Operating Characteristics (ROC) curve statistics. ROC curve analyses of the changed scores was used to calculate the sensitivity and specificity to classify the patients as improved or not improved. Sensitivity and specificity of both DASH and DASH-H were calculated. The area under the curve was calculated at 95% Confidence Interval (CI). An area under the curve (AUC) of at least 0.70 was considered to be adequate **[19]**. SPSS was used for the calculations.

RESULTS

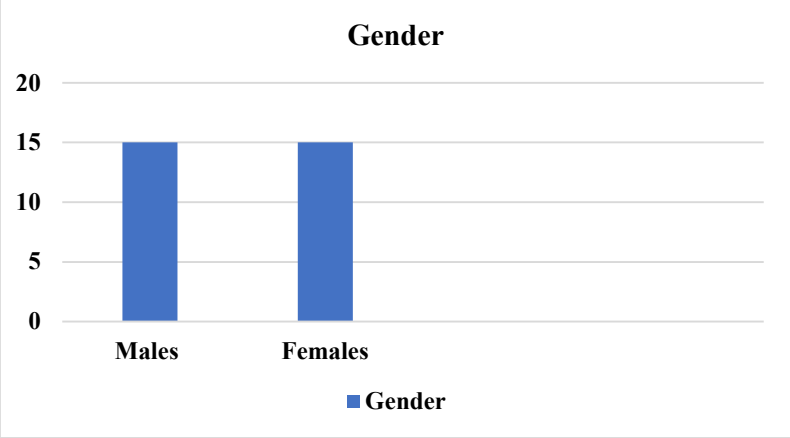
A total of 30 patients (15 males and 15 females) were able to complete the baseline questionnaires **(Graph 1)**. The mean age of the patients was found to be 47.4 ± 12.80.

The literacy level of all participants was also examined and it was found that 18 participants were University graduates, 11 participants had completed their post-graduation and one of them was an undergraduate **(Graph 2)**.

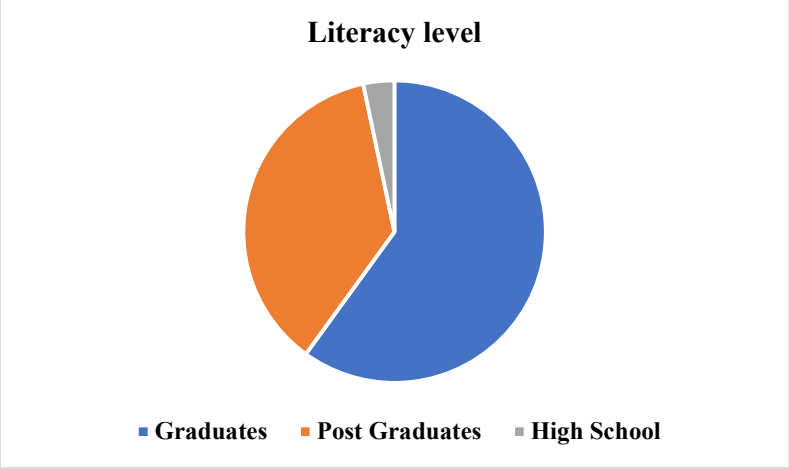
The scores of DASH, DASH-H and VAS were found to be significantly lower in the post-treatment examination. The sensitivity of DASH and Hindi version of DASH (DASH-H) was found to be 96%, each and the specificity of DASH and DASH-H was found to be 60% and 80% respectively **(Table 3)**.

The Area under the Curve (AUC) plotted for DASH-H was 0.880 and for DASH was around 0.780 **(Table 4 and 5)**.

The improvement was observed in 25(83.3%) patients, noted as per DASH-H, whereas 26(86.7%) patients showed improvement as per the DASH.



Graph 1: Gender



Graph 2: Literacy level

Table 3: Sensitivity and Specificity of DASH and DASH-H

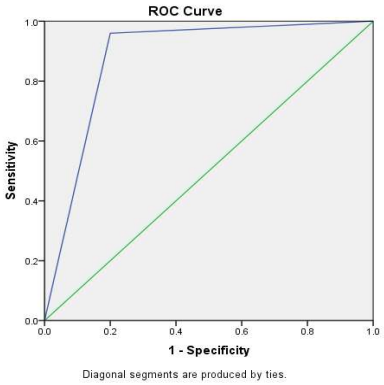
	DASH-H	DASH
SENSITIVITY	**96%**	**96%**
SPECIFICITY	**80%**	**60%**

Table 4: AUC for DASH-H

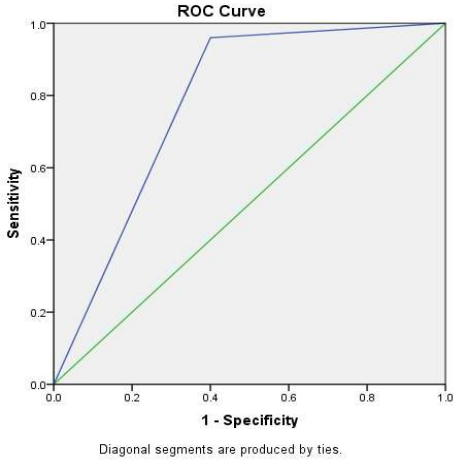
Area Under the Curve				
Test Result Variable(s): IMPROVEMENT AS PER DASH-H				
Area	Std. Error[a]	Asymptotic Sig.[b]	Asymptotic 95% Confidence Interval	
			Lower Bound	Upper Bound
.880	.109	.008	.666	1.000
a. Under the nonparametric assumption				
b. Null hypothesis: true area = 0.5				

Table 5: AUC for DASH

Area Under the Curve				
Test Result Variable(s): IMPROVEMENT AS PER DASH English				
Area	Std. Error[a]	Asymptotic Sig.[b]	Asymptotic 95% Confidence Interval	
			Lower Bound	Upper Bound
.780	.140	.040	.506	1.000
a. Under the nonparametric assumption				
b. Null hypothesis: true area = 0.5				



Graph 3: Estimation of change in Pain by DASH H compared to Change in VAS



Graph 4: Estimation of change in Pain by DASH English compared to Change in VAS

DISCUSSION

The aim of this study was to find out whether DASH-H is responsive when compared to DASH in patients with supraspinatus tendonitis in the Indian population and to find whether DASH and DASH-H are sensitive to predict the patient's outcome. Results of the study support our initial hypothesis and show that DASH and DASH-H are responsive and are sensitive to predict the patient's outcome in patients with supraspinatus tendonitis in the Indian population.

In this study, 30 participants (15 males and 15 females) were selected. The average age of the study population was found to be 47.4 ± 12.80. These findings were similar in a study conducted by Saurabh P. Mehta *et al.(*2015) where the average age of the study population was found to be 53.3 ± 6.9 years. (15) In another study conducted by Camilla B. Lundquis *et al.* (2014), the average age was found to be 55 ± 15.2 years **[20]**.

We found that the sensitivity of DASH and DASH-H was found to be 96%. Specificity of DASH and DASH-H was found to be 60% and 80% respectively. This can be correlated with another study conducted by Franco Franchignoni *et al. (*2014) where sensitivity and specificity of DASH was found to be 82% and 74%, respectively **[19]**. In other study conducted by Tarjei Rysstad *et al*. (2017) found that the sensitivity and specificity of DASH was found to be 77% and 69%, respectively **[21]**.

In our study, the Area Under the Curve (AUC) plotted for DASH-H was 0.880 and for DASH was around 0.780. The improvement was observed in 25(83.3%) patients, noted as per DASH-H, whereas 26(86.7%) patients showed improvement as per the DASH. These findings were similar in a study conducted by Tarjei Rysstad *et al*. (2017) where the Area Under the Curve was found to be 0.77 for DASH. 30 participants showed improvement whereas 13 were unchanged **[21]**. Another study conducted by Cecilie Rud Budtz *et al.* (2018) reported that the AUC of the Danish version of Quick-DASH exceeded 0.70 after both 3 and 6 months of follow-up **[22]**. In another study conducted by Camilla B. Lundquist *et al*. (2014) the AUC of the Danish version of DASH was 0.76. 25% of patients showed improvement, 70% were unchanged and 5% were worse, according to the global impression of change **[20]**.

Tendinopathy is described as a condition characterized by pain around the area of the tendon due to excessive repetitive activities. Tendonitis accounts for 30% of all musculoskeletal conditions. Supraspinatus tendonitis, in which the supraspinatus tendon is affected, is the most commonly affected tendon. It is

accepted that supraspinatus tendinopathy develops when excessive stress exceeds the healing capacity of tendon cells and the tendon fails to repair appropriately. Prevalence rates increases from 5 to 10% in patients younger than 20 years of age to over 60% in patients over 80 years **[23]**. We chose supraspinatus tendonitis because it is the most prevalent amongst shoulder injuries in a variety of age groups.

DASH has been translated and culturally adapted to over 45 languages/cultures. Hindi is one of the most common languages spoken worldwide and is the official language of the government of India. The DASH scale was translated into Hindi by Saurabh P. Mehta *et al.,* (2015*)* in order to find the reliability, validity and responsiveness of the Hindi version of DASH (DASH-H). Translation of an outcome measure in the local language helps in getting a more accurate response as compared to any other foreign language. Localisation of the patient reported outcome measure is important as some questions are not perceived well in certain context. It may also be beneficial for rehabilitation practitioners to adequately diagnose the functional disability of the Hindi-speaking population with supraspinatus tendonitis.

In this study, we eliminated the response bias by randomly selecting the language of the questionnaire to be administered. Computer-generated randomised sequence was used to determine whether Hindi version of DASH (DASH-H) or DASH was to be administered pre- and post-treatment of supraspinatus tendonitis along with VAS-P. After 3 days, second observation was taken in the cross-over pattern, i.e. the subjects who received DASH were administered Hindi version of DASH (DASH-H) in the second sequence and vice versa. This cross-over pattern ensured that both languages (English and Hindi) could be easily compared. Patients could easily pursue the Hindi translation of DASH.

The main limitation of this study was the small sample size. If the sample size was larger, responsiveness could be effectively measured. The follow up was performed after 3 days and after 4 weeks. This time period is not sufficient for certain patients for recovery. This may have resulted in some small changes in score. We also considered only patients with supraspinatus tendonitis. Patients with other shoulder disorders could also be included as a part of study for further research in the future.

CONCLUSION

In this study, the Hindi version of DASH (DASH-H) scale, which measures the functional disability was found to be responsive in the Indian population with shoulder tendonitis. The findings were similar for DASH. Both Hindi and English version of DASH were found to be equally

responsive and sensitive. Thus, in India (Hindi speaking territories), DASH-H can be easily used instead of DASH as it is equally comparable. Future researchers can easily use the Hindi version of DASH (DASH-H).

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