Bangla Version of the Shoulder Pain and Disability Index (SPADI): Translation, Cross-Cultural Adaptation, Validation and Reliability Assessment

HH RAHMAN [a], MI HASAN[b], T UDDIN[c], TC SAHA[d], MM HOJAIFA[e], ABMZ SADEQUE[f]

Abstract:

Introduction: Shoulder pain comes next to back and knee pain, considering the frequency of musculoskeletal ailments. The Shoulder Pain and Disability Index (SPADI) is considered a highly specific questionnaire for assessing shoulder pain and functions. The objective of the study was to assess the validity and reliability of the Bangla version of SPADI (B-SPADI) among the Bangla-speaking patients.

Materials and Methods: The B-SPADI was developed using a designed process that included forward translation and backward translation, authentication, response, and final rectification. Validity and reliability were conducted in 48 patients with shoulder pain. The reliability was appraised by executing internal consistency and test-retest analyses. Its validity was assessed by comparing the SPADI with the SF-36, Disabilities of the Arm, Shoulder, and Hand (DASH), and American Shoulder and Elbow Surgeons (ASES) questionnaire.

Results: The cross-cultural adaptation method was flawlessly aligned with the content or language. Internal consistency (Cronbach's alpha) was 0.97 for the total SPADI score. Intraclass Correlation Coefficient (ICC) was 0.95 for the total SPADI with 0.92 for pain subtotal and 0.96 for disability subtotal. The SPADI total score showed a correlation of 0.63–0.71 with the SF-36 physical scales, of 0.89 with the DASH and of 0.94 with the ASES. All of the items were statistically significant (P<0.001).

Conclusion: The B-SPADI came out as an appropriate valid, and reliable instrument for measuring pain and disability in patients with shoulder afflictions.

Keywords: Translation, Reliability, Validity, Shoulder pain and functions, Bangla-SPADI

Introduction

In clinical practice, research, and studies, patient-reported outcome measures (PROMs) have been a prime choice of physicians in this day and age. PROMs are excellent clairvoyants of functional status, speak for patient's perspective and apprehend the full dimensions of dysfunction and infirmity.[1] Specific questionnaire based on a certain disease or disorder is more assuredly forthcoming and sensitive than others.[2]

The easiest technique for obtaining information about shoulder pain due to musculoskeletal origin is via the use of specially designed self-administered questionnaires that seek explicit information from the responding participants.[3] Shoulder-specific questionnaires are more often used in recent times to estimate the extent of disability and treatment efficacy.[4]

a. Hasan Habibur Rahman, Assistant Professor, Department of Physical Medicine and Rehabilitation, Sheikh Hasina National Institute of Burn and Plastic Surgery, Dhaka, Bangladesh.

b. Md. Israt Hasan, Medical Officer, Department of Physical Medicine and Rehabilitation Kurmitola General Hospital, Dhaka, Bangladesh.

c. Taslim Uddin, Professor, Department of Physical Medicine and Rehabilitation, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh.

d. Tulshi Chandra Saha, MBBS, MD Assistant Professor, Department of Physical Medicine and Rehabilitation Mugda Medical College, Dhaka, Bangladesh.

e. Musa Muhammad Hojaifa, Assistant Professor, Department of Physical Medicine and Rehabilitation, Sheikh Hasina National Institute of Burn and Plastic Surgery, Dhaka, Bangladesh.

f. A B M Zafar Sadeque, Assistant Professor, Department of Physical Medicine and Rehabilitation, Shaheed Sheikh Abu Naser Specialized Hospital, Khulna, Bangladesh.

Address of Correspondence: Dr. Hasan Habibur Rahman, Assistant Professor, Department of Physical Medicine and Rehabilitation, Sheikh Hasina National Institute of Burn and Plastic Surgery, Dhaka, Bangladesh. Tel: +8801754027178, E-mail: hasanhabibr@gmail.com

Received: 29 Decem 2021   **Accepted:** 26 February, 2022

In the United States of America (USA), Roach et al. developed the Shoulder Pain Assessment and Disability Index (SPADI), which has been found to be one of the quickest (within five minutes) and easiest assessment questionnaires to complete, as well as being more responsive to change.[5]

SPADI is an easily administered assessment questionnaire that encompasses two domains, one for pain consists of 5 items regarding the severity of an individual's pain, and another for functional activities that consist of 8 items designed to measure the degree of difficulty an individual has with various activities of daily living (ADLs) that require upper extremity use.

To improve the quality of health service, psychological, mental, and physical aspects need to be addressed properly. SPADI, as a generic tool, will help in addressing these issues adequately. Limitations of activities of daily living (ADLs) are important clinical factors to the Rehabilitation physicians for the evaluation and management planning. A questionnaire is an easy, simple, rock-bottom way to collect clinical data. When a clinical instrument is adopted by a different setting like countries, cultures or languages, it must be reliable, valid, and well translated.

Rendering to the population survey, Bangla secured the sixth spot. In such a hefty population, a valid, reliable, and reproducible scale will be in needed to juxtapose the results and experiences of various therapeutic interventions.

SPADI is the most responsive shoulder instrument and has been tested successfully in different countries throughout the world, such as German,[6] Norwegian[7] and Slovene[8] and translated and cross-culturally adapted in Danish,[9] Spanish,[10] Dutch,[11] Turkish,[12] Chinese,[13] Korean,[14] Brazilian,[15] Arabic,[16] Persian,[17] Hindi,[18] Tamil[19], Greek,[20] Thai,[21] Marathi,[22] Serbian[23] languages. Nevertheless, it is not available in the Bangla language.

SPADI is a self-administered questionnaire that takes only five to ten minutes to complete and only reliable and valid region-specific measurement tool for the shoulder.[24] It is a complete self-explanatory short and responsive fathomable, and cut-rate assessment tool in all painful shoulder conditions. Bangladeshi patient populace is not conversant with English; hence B-SPADI will lessen linguistic fencing and provide valid and reliable data or information for research and clinical intent.

Materials and Methods:
The study was conducted at the Department of Physical Medicine and Rehabilitation of the Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh.

Inclusion criteria: Bangladeshi patients with shoulder pain aged >18 years and < 80 years of both genders, whose natal tongue is Bangla with reading and comprehending skills.

Exclusion criteria: Inflammatory arthropathy, malignancy, any fracture of the neck or shoulder region, any instability or dislocation of the shoulder, referred pain from the neck and internal organs, and who are cognitively impaired to complete the questionnaires autonomously.

Following the Beaton et al. guidelines, the "forward-backward" method SPADI was adapted to the Bengali population.[25] Two bilingualists independently translated the original version of SPADI into Bangla. The independent translation matched unequivocally. The two resulting Bangla draft versions were then synthesized into a single Bangla. This version was then given to a third researcher, an independent native English speaker fluent in Bangla, for back translation into English. The back translation matched the original version. To eliminate any comprehension barriers, the final Bangla version was tested on 20 volunteer patients to pledge that participants would define each item as initially intended. The final Bangla version (B-SPADI) was then evaluated to verify its reliability and validity. The B-SPADI reliability and validity were conducted in 48 patients with shoulder pain. The reliability was evaluated by performing the internal consistency and test-retest analyses. B- SPADI was tested to yield internal consistency by Cronbach's alpha. A Cronbach's alpha of 1.0 indicates a perfect correlation among all items, whether e"0.7 indicates good internal consistency. For test-retest reliability, the pre-final B-SPADI was served to subjects of 48 shoulder pain patients after being registered and with their informed consent where the participants were requested to fill questionnaire again after 7 days of the first enrollment without any medication adjustment in-between. Intra-class correlation coefficient (ICC) was used to assess the test-retest reliability. The ICC was e"0.70; that is considered acceptable for test-retest reliability.

Validation: The validity of the B-SPADI was inspected by determining how well the scores correlated with those of the Short Form 36 (SF-36), the DASH, and the ASES. The

SF-36 assesses physical, mental, and psychosocial health and ability and is a widely used outcome measure that displayed excellent responsiveness in the Bangladeshi population. The construct validity is usually quantified by non-parametric Spearman rank correlation coefficients. High correlations are expected between instruments with similar constructs (e.g., the SPADI and the ASES), proving convergent validity, and low correlations between instruments with different constructs (e.g., the SPADI and the SF-36), proving discriminant validity.[32]

Analysis: All statistical analyses were performed using SPSS version 22.0. A p-value less than 0.05 was considered statistically significant. The participants signed an informed written consent to participate in the study. The protocol was approved by the Institutional Review Board of BSMMU, Dhaka, Bangladesh.

Results:

Socio-demographic data:

In our study, among 48 patients, more than half were males (58.33%), and females were less than half (41.67%). The mean age of the test population was 56.54 ± 11.82, ranging from 18 to 80 years and mainly middle-aged to aging people. Among the responders, 11 can read and write, 16 had primary education, 8 completed SSC, 10 completed HSC, and the remaining 3 had completed higher education (graduation with or without Masters).

Regarding the profession of 48 subjects, 15 were housewives, 11 were service holders, 7 were businesspeople, 5 were unemployed, 6 were farmers, and 4 were retired persons.

Translation Process:

There was no crucial linguistic hold-up or cultural hindrance in the course of forward and backward translations. From the societal viewpoint, some trivial disparities arose. 27(56.25%) of them had understood all the items, 14(29.16%) struggled to understand 1 item, and 07(14.48%) hitched to figure out understanding 2 items.

The Bangla meaning of the word "Involved arm" was not well understood by the respondents of low educational background or slightest idea about proper Bangla language except local dialect, and the Bangla meaning of the word "Back of neck" was easily understood by patients. Practically the partakers had no complexity to distinguish the translated items, and all of them answered to all apparatuses of the B-SPADI.

Psychometrics:

Reliability:

Internal consistency (Cronbach's alpha):

Internal consistency exerted by Cronbach's alpha for B-SPADI is 0.97 for the overall score but 0.97 for the

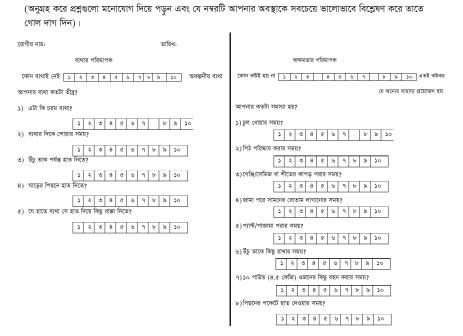Bangla Version of Shoulder Pain Assessment and Disability Index (B-SPADI)

Fig-1: *Bangla version of SPADI*

pain subscale and 0.94 for the disability subscale. Cronbach's alpha >0.7 is standard for all scores.[26]

Table-I

Internal Consistency (Cronbach's alpha)		
Number of	Item	Cronbach's Alpha
B-SPADI	13	0.97
Pain subscale	05	0.97
Disability subscale	08	0.94

Test-retest reliability:

Calculated total SPADI, Intra-class Correlation Coefficient (ICC) is 0.95 (0.93-0.97) with 0.92 for the pain subscale and 0.96 for the disability subscale, which is highly significant.[27]

Table-II

Intra-class Correlation Coefficient(ICC)		
Total SPADI	0.95,	p<0.001
Pain subscale	0.92,	p<0.001
Disability subscale	0.96,	p<0.001

Validity:

Construct validity:

The Spearman rank correlation coefficients unfolded the level of the correlation between the SPADI scores, and those of the comparing questionnaires (i.e., to inspect SPADI's construct validity) are shown in Table III. The correlations between the SPADI and the SF-36 physical dimensions and those between the SPADI and the SF-36 overall score were between 0.63 and 0.71; the correlations between the SPADI and the upper extremity specific measures were somewhat higher: 0.75–0.94.

Table-III

Spearman rank correlation coefficients showing the strength of the correlation between B-SPADI and otherinstruments	
Comparing Questionnaire	B-SPADI
SF-36 bodily pain	0.63
SF-36 physical functioning	0.63
SF-36 PCS	0.67
SF-36 overall	0.71
DASH total with SPADI total	0.89
DASH total with SPADI pain	0.75
DASH total with SPADI disability	0.90
ASES total (patient)	0.94

Table-III: All correlations were significant at $P < 0.001$ (null hypothesis, $r = 0.00$).Discussion:

An instrument is critically demanding when its appraisal properties are easily administrable, reproducible, valid, reliable, and responsive to clinical development.[28] Numerous scales were used over the days in clinical practices that were designed to elicit initial data about a disease, monitor the possible changes in symptoms, and evaluate the efficacy of the therapeutic process.[29] The SPADI questionnaire has been used in multiple studies related to pain and disability of the upper limb,[6-23,] but until today it has not been translated and ratified in the Bangla. Reliability and validity are the core point of quality assessment.[33] After translation and cultural adaptation of the SPADI questionnaire into Bangla, its internal consistency (rated by Cronbach's alpha) was calculated to be 0.97, are consistent with those obtained by the original testing of the questionnaire in English, as demonstrated in several studies,[30-31] as well as with the values obtained by testing the questionnaire in other languages.[6, 8-10, 12-14, 17-23]

The reliability of the B-SPADI was higher (SPADI total score, ICC = 0.95) than that of the English version (ICC = 0.66) like other south Asian languages such as Hindi (0.87), Tamil (0.93), Marathi (0.99) and east Asian languages Chinese (0.87) and Korean (0.99), yet corresponds to European languages like Greek (0.92), Spanish (0.92), German (0.93), Serbian (0.99), Slovene (0.94), Danish (0.88) and Turkish (0.92). The same is true for the sub scores: on the one hand, Bangla SPADI, ICC = 0.92 vs. original SPADI, ICC = 0.63 for pain which is higher but comparable to German (0.89), Tamil (0.90), Marathi (0.99), Greek (0.90) and Slovene (0.89) and on the other hand, ICC = 0.96 vs. 0.64 for disability[6] which is higher but comparable to German (0.91), Tamil (0.95), Marathi (0.99), Greek (0.89) and Slovene (0.95). According to Bot et al.,[4] an ICC e"0.90 allows the reliable assessment of individual patients. This figure was reached for the total score and almost both sub-scores.

Compared with the original SPADI, the B-SPADI has shown similar or stronger correlations with the SF-36 physical dimensions, the DASH, and the (patient) ASES and is very similar to German SPADI.[6]

Table-IV: *Comparing reliability and validity of B-SPADI with different studies*

Author	SPADI versions	Chronbach's Alpha	ICC	Validity comparing tool	Validity	
Our study	Bangla version	T= 0.97 PS=0.97 DS=0.94	T=0.95 PS=0.92 DS=0.96	SF-36, DASH, ASES (patient)	T =	SF-36=0.71 DASH=0.89 ASES=0.94
Original study	English version	T=0.95 PS=0.87 DS=0.93	T=0.66 PS=0.63 DS=0.64	Principal component factor analysis with or with varimax rotation	PS=Strongly loaded on factor 2 DS= Strongly loaded on factor 2	
Seo, HD	Korean version	T=0.94	T=0.99	NRS, DASH & ROM	T =	NRS=0.94 DASH=0.93 ROM=0.92
Yao, M	Chinese version	T=0.91	T=0.87	Constant-Murley score,VAS, SF-36	Constant-Murlay score=0.69 VAS=0.40 SF-36=0.36	
Phongamwong, C	Thai version	T=0.95 PS=0.92 DS=0.94	-	DASH	T=0.79 PS=0.59 DS=0.83	
Jeldi, AJ	Tamil version	T=0.95 PS=0.92 DS=0.93	T=0.93 PS=0.90 DS=0.95	Shoulder ROM (Criterion validity)	(-0.38 to -0.58) Strongly high negative	
Sharma, S	Hindi version	T=0.75	T=0.87	DASH	T=0.94	
Pahade, AJ	Marathi version	T=0.96 PS=0.90 DS=0.95	T=0.99 PS=0.99	Shoulder ROM (Criterion validity)	T=(0.42-0.87) for male & (0.64-0.69) for female	
			DS=0.99		Strong negative correlation	
Vrouva, S	Greek version	T=0.93 PS=0.90 DS=0.89	T=0.92 PS=0.90 DS=0.89	Quick DASH	T=0.76 PS=0.76 DS=0.68	
Sekiguchi, T	Japaneese version	T=0.96	T=0.93	DASH	T=0.83	
Nikolic, A	Serbian version	T=0.94 PS=0.88 DS=0.91	T=0.99	-	-	
Ebrahimzadeh, MH	Persian version	T=0.94	T=0.84	DASH	T=0.61	
Tores-Lacoma, M	Spanish version	T=0.96	T=0.92	Oxford Shoulder Score	T= -0.67	
Angst, F	German version	T=0.95 PS=0.93 DS=0.93	T=0.93 PS=0.87 DS=0.91	SF-36 overall, DASH, ACES	T	SF-36=0.69 DASH=0.88 ACES=0.92
Bicer, A	Turkish version	T=0.94	T=0.92	HAQ	T=0.67	
Cristiansen, DH	Danish version	T=0.94	T=0.88	-	-	
Jamnik, H	Slovene version	T=0.92 PS=0.78 DS=0.90	T=0.94 PS=0.89 DS=0.95	Principal components analysis without rotation	-	

T=Total SDADI, PS=Pain Subscale, DS=Disability subscale,PF-10= Physical functioning subscale of SF-36, DASH=Disability of Arm, Shoulder and Hand Questionnaire, ASES=American Shoulder and Elbow Surgeons.

Conclusion:

Adaptation of the B-SPADI for use in Bangladesh was successful. Our result underpins previous verdict of the original English version, demonstrating that it is valid and reliable.

Acknowledgement

Reference:

1. Kim JK, Jeon SH. Minimal clinically important differences in the Carpal Tunnel Questionnaire after carpal tunnel release. *J Hand Surg Eur Vol*. 2013 Jan;38(1):75-9. doi: 10.1177/1753193412442137.

2. Guyatt GH. A taxonomy of health status instruments. *J Rheumatol*. 1995 Jun;22(6):1188-90. PMID: 7674253.

3. Pribicevic M. The Epidemiology of Shoulder Pain: A Narrative Review of the Literature. In: Ghosh S. , editor. *Pain in Perspective* [Internet]. London: IntechOpen; 2012 [cited 2022 Jun 16]. Available from: https://www.intechopen.com/chapters/40393 doi: 10.5772/52931.

4. Bot SD, Terwee CB, van der Windt DA, Bouter LM, Dekker J, de Vet HC. Clinimetric evaluation of shoulder disability questionnaires: a systematic review of the literature. *Ann Rheum Dis*. 2004 Apr;63(4):335-41. doi: 10.1136/ard.2003.007724.

5. Roach KE, Budiman-Mak E, Songsiridej N, Lertratanakul Y. Development of a shoulder pain and disability index. *Arthritis Care Res*. 1991 Dec;4(4):143-9. PMID: 11188601.

6. Angst F, Goldhahn J, Pap G, et al. Cross-cultural adaptation, reliability and validity of the German Shoulder Pain and Disability Index (SPADI). *Rheumatology (Oxford)* 2007 Jan;46(1):87-92. doi: 10.1093/rheumatology/kel040.

7. Tveitå EK, Ekeberg OM, Juel NG, Bautz-Holter E. Responsiveness of the shoulder pain and disability index in patients with adhesive capsulitis. *BMC Musculoskelet Disord*. 2008 Dec 3;9:161. doi: 10.1186/1471-2474-9-161.

8. Jamnik H, Spevak MK. Shoulder Pain and Disability Index: validation of Slovene version. *Int J Rehabil Res*. 2008 Dec;31(4):337-41. doi: 10.1097/MRR.0b013e3282fcae09.

9. Christiansen DH, Andersen JH, Haahr JP. Cross-cultural adaption and measurement properties of the Danish version of the Shoulder Pain and Disability Index. *Clin Rehabil*. 2013 Apr;27(4):355-60. doi: 10.1177/0269215512456220.

10. Alvarez-Nemegyei J, Puerto-Ceballos I, Guzmán-Hau W, Bassol-Perea A, Nuño-Gutiérrez BL. Development of a Spanish-language version of the Shoulder Disability Questionnaire. *J Clin Rheumatol*. 2005 Aug;11(4):185-7. doi: 10.1097/01.rhu.0000173229.50674.31.

11. Thoomes-de Graaf M, Scholten-Peeters GG, Duijn E, Karel Y, Koes BW, Verhagen AP. The Dutch Shoulder Pain and Disability Index (SPADI): a reliability and validation study. *Qual Life Res*. 2015 Jun;24(6):1515-9. doi: 10.1007/s11136-014-0879-1.

12. Bumin G, Tüzün EH, Tonga E. The Shoulder Pain and Disability Index (SPADI): Cross- cultural adaptation, reliability, and validity of the Turkish version. *Journal of Back and Musculoskeletal Rehabilitation* 2008 Jan 1;21(1):57-62. doi: 10.3233/BMR-2008-21108.

13. Yao M, Yang L, Cao ZY, et al. Translation and cross-cultural adaptation of the Shoulder Pain and Disability Index (SPADI) into Chinese. *Clin Rheumatol*. 2017 Jun;36(6):1419-1426. doi: 10.1007/s10067-017-3562-4.

14. Seo HD, Lee KW, Jung KS, Chung YJ. Reliability and validity of the Korean version of shoulder pain and disability index. *J Spec Educ Rehabil Sci*. 2012;51(2):319-6.

15. Martins J, Napoles BV, Hoffman CB, Oliveira AS. The Brazilian version of Shoulder Pain and Disability Index: translation, cultural adaptation and reliability. *Rev Bras Fisioter*. 2010 Nov-Dec;14(6):527-36. English, Portuguese. PMID: 21340248.

16. Guermazi M, Ghorbel S, Yahia A, Khmekhem M, Elluech MH. Arabic translation and validation of SPADI index. *Annals of Physical and Rehabilitation Medicine* 2011;54(1): e244. doi:10.1016/j.rehab.2011.07.349.

17. Ebrahimzadeh MH, Birjandinejad A, Golhasani F, Moradi A, Vahedi E, Kachooei AR. Cross-cultural adaptation, validation, and reliability testing of the Shoulder Pain and Disability Index in the Persian population with shoulder problems. *Int J Rehabil Res*. 2015 Mar;38(1):84-7. doi: 10.1097/MRR.0000000000000088.

18. Sharma N, Sharma S, Kataria C. Translation and Adaptation of Shoulder Pain and Disability Index (SPADI) into Hindi-Part 1. *Indian Journal of Physiotherapy & Occupational Therapy* 2011 Oct 2;5(4):142-5.

19. Artaban JJ, Antony L, Appaswami GD, Roach KE. Cross-cultural adaption, reliability and validity of an Indian (Tamil) version for the Shoulder Pain and Disability Index. *Hong Kong Physiotherapy Journal* 2012;30:99-104.

20. Vrouva S, Batistaki C, Koutsioumpa E, Kostopoulos D, Stamoulis E, Kostopanagiotou G. The Greek version of Shoulder Pain and Disability Index (SPADI): translation, cultural adaptation, and validation in patients with rotator cuff tear. *J Orthop Traumatol*. 2016 Dec;17(4):315-326. doi: 10.1007/s10195-016-0425-8.

21. Phongamwong C, Choosakde A. Reliability and validity of the Thai version of the Shoulder Pain and Disability Index

(Thai SPADI). *Health Qual Life Outcomes*. 2015 Sep 4;13:136. doi: 10.1186/s12955-015-0333-2.

22. Pahade AJ, Wani SK, Mullerpatan RP, Elizabeth Roach K. Indian (Marathi) version of the Shoulder Pain and Disability Index (SPADI): Translation and validation in patients with adhesive capsulitis. *Hong Kong Physiotherapy Journal*. 2021 Dec 19;41(02):139-46.

23. Nikoliæ A, Èejoviæ S, Bjekiæ M, Šipetiæ-Grujièiæ S. Validation of Serbian shoulder pain and disability index (SPADI). *Zdravstvena Zaštita* 2019;48(3):5-12.

24. Breckenridge JD, McAuley JH. Shoulder Pain and Disability Index (SPADI). *J Physiother*. 2011;57(3):197. doi: 10.1016/S1836-9553(11)70045-5. PMID: 21843839.

25. Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the process of cross-cultural adaptation of self-report measures. *Spine (Phila Pa 1976)*. 2000 Dec 15;25(24):3186-91. doi: 10.1097/00007632-200012150-00014.

26. Dodds TA, Martin DP, Stolov WC, Deyo RA. A validation of the functional independence measurement and its performance among rehabilitation inpatients. *Arch Phys Med Rehabil*. 1993 May;74(5):531-6. doi: 10.1016/0003-9993(93)90119-u.

27. Cohen J. Statistical power analysis. *Curr Dir Psychol Sci*. 1992; 1(3): 98-101.

28. Atroshi I, Johnsson R, Sprinchorn A. Self-administered outcome instrument in carpal tunnel syndrome. Reliability, validity and responsiveness evaluated in 102 patients. *Acta Orthop Scand*. 1998 Feb;69(1):82-8. doi: 10.3109/17453679809002363.

29. Moser AD, Knaut LA, Zotz TG, Scharan KO. Validity and reliability of the Portuguese version of the American Shoulder and Elbow Surgeons Standardized Shoulder Assessment Form. *Rev Bras Reumatol*. 2012 May-Jun;52(3):348-56. English, Portuguese. PMID: 22641589.

30. MacDermid JC, Solomon P, Prkachin K. The Shoulder Pain and Disability Index demonstrates factor, construct and longitudinal validity. *BMC Musculoskelet Disord*. 2006 Feb 10;7:12. doi: 10.1186/1471-2474-7-12.

31. Hill CL, Lester S, Taylor AW, Shanahan ME, Gill TK. Factor structure and validity of the shoulder pain and disability index in a population-based study of people with shoulder symptoms. *BMC Musculoskelet Disord*. 2011 Jan 12;12:8. doi: 10.1186/1471-2474-12-8.

32. Portney LG, Watkins MP. *Foundations of Clinical Research: Applications to Practice*. Upper Saddle River, NJ: Pearson/Prentice Hall; 2009.

33. Hasan MI, Ahmed SM. Translation, cross-cultural adaptation and validation of English start back screening tool into Bangla for patients with low back pain. *Bangabandhu Sheikh Mujib Medical University Journal* 2020 Sep 19;13(3):73-8.