Original Article

Neurosurgery

Translation and Validation Study of the First Modified Pakistani Version of the Neck Disability Index and its Revalidation

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ABSTRACT

Objective: The purpose of our study was the translation and validation of the Neck Disability Index in our specific cultural background. The Pakistani Urdu version of Neck Disability Index (NDI) was tested for validity and reliability. The Neck Disability Index (NDI) is a valid and reliable tool, designed to measure disability in routine life activities due to neck pain. International standards were followed for the translation strategy comprising forward translations, reconciliation, backward translation and pre-testing steps. The translation of the original questionnaires was performed in accordance with published guidelines and this was adapted to cultural differences in the patient population. These procedures resulted in the Pakistani modified version of the NDI.

Study Design: comparative study.

Place and Duration of Study: This study was carried out at the Department of Neurosurgery Outdoor Clinics at Benazir Bhutto Shaheed Teaching Hospital Abbottabad from April 2007-March 2009.

Materials and Methods: In the first stage, Fifty five patients (32 men, 23 women) were included over two years period at the Department of Neurosurgery Outdoor Clinics at Benazir Bhutto Shaheed Teaching Hospital Abbottabad attached with Women Medical College Abbottabad. Seventeen patients were suffering from acute phase after a neck sprain, 20 had chronic neck pain and 18 had no neck pain but had other musculoskeletal symptoms. On 3 occasions, the patients completed the Neck Disability Index and other surveys. Levels of sensitivity, test-retest reliability and validity were acceptable. In the next stage, Thirty-eight patients (16 men, 22 women) were included in a study of the modified version, twenty patients with acute neck sprain and 18 with other musculoskeletal symptoms filled out to test the modified version of the Neck Disability Index, which provided a more specific measure of disability due to neck pain.

Results: We have accumulated enough evidence to show that the Urdu version of the Neck Disability Index measures disability in activities of daily living in patients with neck pain in a reliable, valid and responsive manner. The questionnaire is considered a useful tool for research and clinical settings in local or international studies since its psychometric properties are comparable with other versions validated in different countries.

Conclusion: The Pakistani version of NDI is a reliable and valid instrument to measure psychometric properties and functional status in Pakistani patients suffering from neck disability. Being a simple and fast scale, its use can be recommended in a clinical setting and future outcome studies in Pakistan

Key words*:* neck pain, disability evaluation, Neck Disability Index, outcome assessment, Questionnaire.

INTRODUCTION

Neck pain is a highly prevalent condition among the general population, estimates range from 10% to 35% [1,2,3]. In a vast number of cases, there is no link between specific pathology and neck complaints, resulting in the term non-specific neck pain. The situation often leads to recurrences and chronicity, with a major impact on the quality of life of sufferers. In a recent prospective study assessing patients with non-specific back and neck pain seeking primary care, half of the respondents reported pain and disability at the 5-year follow-up[4]. Out of Five questionnaires measuring disability on a patient's life due to neck pain[5], the Neck Disability Index developed by Vernon and Mior[6] has been revalidated in several study populations and has shown stable psychometric properties[7,8,9,10,11].

The NDI has been tested worldwide in various languages for face validity, test-retest reliability, internal consistency, construct validity and concurrent validity[15to25]. At the same time, as suggested by Vernon & Mior, the larger group studies should be conducted to strengthen the overall relevance of the NDI[15,17]. An Urdu translation of the NDI was never tested for validity.

The purpose of this study was to validate a Pakistani Urdu version of the Neck Disability Index and to test a version that had been modified in order to improve its specificity.

MATERIALS AND METHODS

Patients Population: In the first stage, Fifty five patients (32 men, 23 women) were included over two years period from April 2007-March 2009 at the Department of Neurosurgery Outdoor Clinics at

Benazir Bhutto Shaheed Teaching Hospital Abbottabad attached with Women Medical College Abbottabad. Seventeen patients were suffering from acute phase after a neck sprain, 20 had chronic neck pain and 18 had no neck pain but had other musculoskeletal symptoms. Inclusion criteria for this study were non-specific chronic neck pain (>3 months duration), admitted for outpatient rehabilitation, age between 18 and 65 years, the ability to read and speak Urdu language (to complete questionnaires). Exclusion criteria were status post surgery in the cervical region, cardiovascular or pulmonary diseases severely diminishing physical capacity, pregnancy, addiction to drugs, and extensive psychological or behavioral problems.

The induction of patients was carried out in two groups who have neck pain and one group of patients with some other musculoskeletal disorder without neck pain (Table I). One group of patients was with acute neck pain after a neck sprain with no previous neck disorder and another group consisted of patients with chronic neck pain who were offered no treatment during this study period. In the chronic group, those patients with pain for 3 months or more were recruited.

The first part of the study consisted of 55 patients, seventeen subjects in the acute phase after a neck sprain were referred from the department on the day of the first visit, 20 subjects with chronic neck pain previously treated at the outdoor clinics of Department of Neurosurgery and 18 subjects with no neck pain but having other musculoskeletal disorders were recruited from the outpatient services of the department of Neurosurgery.

The second part of the study was designed to test a modified version of the NDI. In that part a different cohort of 38 subjects were included (20 with acute neck sprain and 18 with no neck pain).

Questionnaires: The NDI consists of 10 subheadings; pain intensity, personal care, lifting, sleeping, driving, recreation, headaches, concentration, reading and work. The 10 items, with 6 possible answers in each are scored 0 (no activity limitations) to 5 (major activity limitations) and summed up to yield a total score. In the Pakistani version used in the study all items were provided with an additional alternative, "not applicable".

The SF-36 questionnaire[12–14], produces a profile of eight domain scores, including physical functioning (PF), physical role limitations, emotional role limitations, social functioning, bodily pain, general mental health, vitality and general health perception. Each domain is scored from 0 (poor health) to 100 (optimal health). The only domain studied by us was PF.

The Disability Rating Index (DRI)[18], consists of 12 items of daily routine: dressing, outdoor walks, climbing stairs, sitting for a longer time, standing bent over a sink, carrying a bag, making a bed, running, light work, heavy work, lifting heavy objects and participation in exercise programs or sports. On 100-mm visual analogue scales (VAS) ranging from 0 (without difficulty) and 100 (unable to perform), the patient marks his/her presumed ability to perform the activity. The mean value of these measurements provides the DRI expressed as a percentage of the highest possible rating. In addition, complementary questions were also given concerning the adequacy and completeness of the NDI, items concerning neck disorders, cervical range of motion and the need for pain relievers. Two 100-mm visual analogue scales were also added: one concerning pain (anchor points "no" and "worst possible") and one concerning overall activity (anchor points "fully active" and "prevented all activities").

In the second part of the study NDI was modified to clarify that the questions asked were specific to neck pathologies. Thus "neck pain" was used instead of "pain" or "due to neck pain" was added (not for the item concerning headache) .And hence 9 of the 10 items were modified.

FIRST STUDY (To Validate Pakistani Version)
Acute Neck Pain (Neck Sprain-No Previous Neck Disorder)
Chronic Neck Pain (> 3 months Pain/New cases/Cervical Spondylosis-No Therapy)
No Neck Pain(other Musculoskeletal Disorders)
SECOND STUDY (To Test Modified Version of NDI)
Acute Neck Pain
No Neck Pain

Figure No.1: Patient Methodology

First phase

First phase of the study was performed between 2007 and 2009. Here patients were asked to fill out the forms for the Modified NDI,(helped out in our cultural setting most of the time if they were not able to do it due to any reason) and the 2 VAS (pain and overall activity). In our scenario and cultural background, 54 % of patients were helped out either due to illiteracy or difficulty to respond properly to the question when they were confronted with the questionnaire first time. The figure dropped to 28% on filling out second questionnaire. Questionnaires were filled out on 3 consecutive visits to the neurosurgery department clinic while they were receiving appropriate medicines and physiotherapy.

Second Phase

In the second part of the study the subjects with acute neck pain due to neck sprain filled in the modified NDI and the Disability Rating Index DRI on 2 occasions; first on the day of their visit to the Emergency and second in the department of Neurosurgery clinic at least 2 hours later after treatment and physiotherapy. The group with no neck pain having other musculoskeletal symptoms filled out the questionnaires once at the department of neurosurgery clinics.

Scoring was transformed to a percentage score as described for the Oswestry Low Back Pain Index (16)as the NDI is scored from 0 (no activity limitations) to 50 (major activity limitations), and as an alternative to deal with unanswered questions .

RESULTS

To begin with, patients in the chronic group filled out 85% of the items satisfactorily; the percentage in the group without neck symptoms and in the acute group was 79% and 91%, respectively. In the second part of the study the items of the modified NDI were satisfactorily filled out by 85% of the group with no neck pain and by 87% of the group with acute neck pain.

	GROUP (*n*)	GROUP M/F	AGE (MEDIAN)	AGE RANGE (years)	DURATION OF PAIN (RANGE)
PART 1 Chronic Neck Pain	20	12/8	44.5	21-65	4 – 15 years
No Neck Pain	18	10/8	35	18-64	-
Acute Neck Pain	17	10/7	30	18-47	1-3 days
PART 2					
No Neck Pain	18	9/12	35	18-63	-
Acute Neck Pain	20	7/10	29	21-52	1-3 days

Figure No.2 . Patient Data Summary

First Phase: Face validity (a test can be said to have face validity if it "looks like" it is going to measure what it is supposed to measure) was estimated based on the subject's response during the initial evaluation as to whether the questionnaire was relevant to his/her disorder. Sixteen patients in the chronic neck pain group, 13 of the patients in the acute neck pain group and 2 in the no neck pain group felt that it was relevant or partially relevant (Table II).

The content validity(a non-statistical type of validity that involves "the systematic examination of the test content to determine whether it covers a representative sample of the behavior domain to be measured) was estimated based on the response to the question: "Is there something important you think should be added?".

The concurrent validity (When the measure is compared to another measure of the same type, they will be related (or correlated) was calculated as a rank correlation using the initial evaluation of NDI/DRI, NDI/PF, NDI/VAS pain and NDI/VAS activity.

The sensitivity (also called **recall rate** in some fields) measures the proportion of actual positives which are correctly identified as such (e.g. the percentage of sick people who are correctly identified as having the condition) was estimated based on the response to the statement in the initial complementary questionnaire, "I have a neck disorder". Twenty subjects in the chronic neck pain group, 19 subjects in the acute neck pain group answered "correct" or "partially correct".

The specificity (measures the proportion of negatives which are correctly identified (e.g. the percentage of healthy people who are correctly identified as not having the condition) was estimated for the initial evaluation for the subjects with no neck pain. Six subjects in the group with no neck pain had an NDI score over 10%, 4 of these over 20%. The items most frequently misunderstood were; "difficulty in lifting" (3 subjects), "working" (6 subjects), "sleeping" (5 subjects) due to pain and the item concerning pain (3 subjects).

When analyzing the individual answers, 2 subjects in the group without neck pain answered "partially correct" to the statement "I have a neck disorder". These 2 subjects did not mark any pain on the VAS.

The test-retest reliability coefficient (is a measure of the consistency of a psychological test or assessment.) This kind of reliability is used to determine the consistency of a test across time.

FIRST STUDY (To Validate Pakistani Version)	
Acute Neck Pain (No Previous Neck Disorder)	91%
Chronic Neck Pain (> 3 months Pain-No Therapy)	85%
No Neck Pain(other Musculoskeletal Disorders)	79%
SECOND STUDY (To Test Modified Version of NDI)	
Acute Neck Pain	87%
No Neck Pain	85%

Figure No.3: Results for Validity of NDI

Second Phase: The percentage scores of the modified NDI were 18–64% for the subjects with acute neck pain. Scores of subjects with no neck pain were all below 20% and there was a significant difference when comparing the modified NDI and the DRI ($p < 0.0001$).

DISCUSSION

In Pakistan Specific Model, testing the Validation and Reliability of local version of NDI is an uphill task specially when this was never done before. Patients not exposed to such Questionnaire sometime are difficult to be objective when answering and then affect the results leading to less than comparable results with other authors. For us three options were available when measuring disability or activity limitation: generic, condition specific and patient specific instruments. The SF-36 and the DRI belong to the generic group[8]. Condition specific instruments like the NDI are thought to be more sensitive to changes in symptoms (9–11) or easier to use in clinical practice[22, 23]. The study by Riddle & Stratford[23] describes similarities in results when using the SF-36 and the NDI[15]. Westaway et al.[24] compared the Patient-Specific Functional Scale (PSFS) to the NDI. In Neurosurgical scenario, PSFS is more relevant, as here, the patient chooses which 3 important personal activities are the most difficult to perform[24]. The PSFS proved to be an excellent tool for working

with individual patients and that it should be supplemented with a generic or condition-specific measure when group decision-making (i.e. quality assurance assessments or research) is important as in our case. When assessing the functional status of patients with cervical spine problems, either the physical component summary scale or the mental component summary scale of the SF-36 or the NDI can be used since there is considerable overlap between the two tests. The Pakistani version of the NDI, which was used in the first part of our study, demonstrated good validity, sensitivity and test-retest reliability, but not optimal specificity as NDI was being applied to neck conditions. Therefore, in a modified version, we made it clear that the items specifically referred to neck pain. In the study by Vernon & Miror[15], test-retest reliability of the NDI was measured on a subset of 17 subjects with neck pain of different origin. In the first part of our study we chose groups of neck pain patients who represented an acute (Neck Sprain) or a chronic stage (Cervical Spodylosis).

Because of the results from the first part of the study, the modified version was developed. This version was clearly better, since non-specific ailments or co-morbidity did not produce false increases in the scores. For example, the item dealing with headache is not necessarily a part of the neck pain syndrome.

Suggestions for additional items indicated that the social consequences of the pain are important part of the subjects' situation which is not covered when using the NDI. Also in Pakistani settings, patients needed more guidance to understand and sometimes in filling out the Questionnaire.

We have accumulated enough evidence to show that the Urdu version of the Neck Disability Index measures disability in activities of daily living in patients with neck pain in a reliable, valid and responsive manner. The questionnaire is considered a useful tool for research and clinical settings in local or international studies since its psychometric properties are comparable with other versions validated in different countries.

CONCLUSION

The Pakistani version of NDI is a reliable and valid instrument to measure psychometric properties and functional status in Pakistani patients suffering from neck disability. Being a simple and fast scale, its use can be recommended in a clinical setting and future outcome studies in Pakistan

REFERENCES

1. Makela M, Heliovaara M, Sievers K, Impivaara O, Knekt P, Aromaa A. Prevalence, determinants and consequences of chronic neck pain in Finland. Am J Epidemiol 1991;134:1356–1367.
2. Cote P, Cassidy JD, Carroll L. The Saskatchewan Health and Back Pain Survey: The prevalence of neck pain and related disability in Saskatchewan adults Spine 1998;23:1689–1698.
3. Enthoven P, Scargren E, Oberg B. Clinical course in patients seeking Primary Care for back or neck pain: A prospective 5-year follow-up of outcome and health care consumption with subgroup analysis. Spine 2004;29:2458–2465.
4. Pietrobon R, Coeytaux RR, Carey TS, Richardson WJ, DeVellis RF. Standard scales for measurement of functional outcome for cervical pain or dysfunction. Spine 2002;27:515–522.
5. Vernon H, Mior S. The Neck Disability Index: A study of reliability and validity. J Manipulative Physiol Ther 1991;14:409–415.
6. Stratford PW, Riddle DL, Binkley JM. Using the Neck Disability Index to make decisions concerning individual patients. Physiother Can 1999;51:107–112.
7. Wloduka-Demaille S, Poiraudeau S, Catanzariti JF, Rannou F, Fermanian J, Reve M. French translation and validation of three functional disability scales for neck pain. Arch Phys Med Rehabil 2002;83:376–382.
8. Ackelman B, Lindgren U. Validity and reliability of a modified version of the Neck Disability Index. J Rehabil Med 2002;34:10–17.
9. Cook C, Richardson JK, Braga L, Menezes A, Soler X, Kume P, et al. Cross-cultural adaptation and validation of the Brazilian Portuguese version of the Neck Disability Index and Neck Pain and Disability Scale. Spine 2006;31:1621–1627.
10. Vos CJ, Verhagen AP, Koes BW. Reliability and responsiveness of the Dutch version of the Neck Disability Index in patients with acute neck pain in general practice. Eur Spine J 2006;11:1729–1736.
11. Antonopoulou M, Ekdahl C, Sgantzos M, Antonakis N, Lionis C. Translation and standardisation into Greek of the standardised general Nordic questionnaire for the musculoskeletal symptoms. Eur J Gen Pract 2004;10:33–34.
12. Sullivan M, Karlsson J, Ware J. The Swedish health survey—I. Evaluation of data quality, scaling assumptions, reliability and construct validity across general populations in Sweden. Soc Sci Med 1995; 10: 1349–1358.
13. Ware JE, Donald Sherbourne C. The MOS 36-itemshort-formhealth survey (SF-36). I. Conceptual framework and item selection. Med Care 1992; 30: 473–483.
14. Ware JE, Kosinski M, Bayliss M, McHorney C, Rogers W, Raczek A. Comparison of methods for the scoring and statistical analysis of SF-36 health pro. le and summary measures: summary of results

from the Medical Outcomes Study. Med Care 1995; 33: AS264–279.
15. Vernon H, Mior S. The neck disability index: a study of reliability and validity. J Manipulative Physiol Ther 1991; 14: 409–415.
16. Fairbank JT, Couper J, Davies JB, O'Brien JP. The Oswestry low back pain disability questionnaire. Physiother 1980; 66: 271–273.
17. Quebec Task Force on WAD. Scienti. c monograph of the Quebec Task Force on Whiplash-Associated Disorders: Rede. ning 'whiplash' and its management. Spine 1995;20:1–273.
18. Sale´n BA, Spangfort EV, Nygren AL, Nordemar R. The disability rating index: an instrument for the assessment of disability in clinical settings. J Clin Epidemiol 1994; 47: 1423–1434.
19. Kopec JA, Esdaile JM, Abrahamowicz M, Abenhaim L, Wood- Dauphinee S, Lamping DL, Williams JI. The Quebec Back Pain Disability Scale. Measurement properties. Spine 1995; 20: 341–352.
20. Patrick DL, Deyo RA. Generic and disease-speci. c measures in assessing health status and quality of life. Med Care 1989; 27: S217– 232.
21. Stucki G, Liang M, Fossel A, Katz J. Relative responsivenes s of condition-specic and generic health status measures in degenerative lumbar spinal stenosis. J Clin Epidemiol 1995; 48: 1369–1378.
22. Feinstein AR, Josephy BR, Wells CK. Scienti. c and clinical problems in indexes of functional disability. Ann Intern Med 1986; 105: 413–420.
23. Riddle DL, Stratford PW. Use of generic versus region-specific functional status measures on patients with cervical spine disorders. Phys Ther 1998; 78: 951–963.
24. Westaway MD, Stratford PW, Binkley JM. The patient-specific functional scale: validation of its use in persons with neck dysfunction. J Orthop Sports Phys Ther 1998; 27: 331–338.

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