Translation and Validation of ID-Migraine Questionnaire to North-Indian Vernacular Languages

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Abstract

Background: ID-Migraine is an established screening tool for migraine. Translation and validation in more languages can increase its reach and scope. **Aim:** To translate and validate ID-Migraine for screening migraine patients in two North-Indian vernacular languages, that is, Hindi and Punjabi. **Methods:** ID Migraine was translated into Hindi and Punjabi. Subjects with headaches in outpatient clinics were administered the questionnaire according to their preferred language of choice and referenced clinical evaluations, performed by an experienced neurologist, based on current the ICHD-3 diagnostic criteria. **Results:** One hundred subjects with complaints of headaches and 60 healthy controls were recruited after informed consent. Of the 100 subjects with headaches, 73 (73%) screened positive with a translated version of ID-Migraine, and 60 (60%) were eventually diagnosed with migraine without aura. The sensitivity of the Hindi version of ID-Migraine was 94% (95% confidence intervals, 79% to 99%); specificity, 56% (95% CI, 31% to 78%); positive predictive value, 79% (95% CI, 69% to 86%) and negative predictive value, 83% (95% CI, 55% to 95%). The Punjabi version demonstrated a sensitivity of 86% (95% CI, 68% to 96%); specificity, 43% (95% CI, 23% to 66%); PPV, 68% (95% CI, 58% to 76%); and NPV, 69% (95% CI, 44% to 86%). **Conclusion:** The translated versions of ID-Migraine demonstrated high sensitivity and fair specificity for screening migraine in Indian subjects who speak and understand Hindi and Punjabi.

Keywords: Headache, Hindi, ID-Migraine, Punjabi, screening, validation

INTRODUCTION

Migraine, one of the most common primary headache disorders, is characterized by recurrent episodes of headache.[1] Worldwide, it is the foremost cause of disability among young women and the second leading cause of disability in both genders combined.[2] Approximately, one billion people in the world suffer from migraine, yielding a prevalence of 14%.[3] The prevalence of migraine is higher in women and increases with age up to 40 years.[4]

Migraine frequently remains undiagnosed, untreated, and concealed.[5] Many times, people misdiagnosed do not seek physician advice and care and at other times, people with migraine do not receive appropriate diagnoses or may be inappropriately treated.[6]

The diagnosis of migraine is essentially clinical as there are no diagnostic markers for the condition. Investigations such as magnetic resonance imaging are often performed in affected individuals but essentially to rule out secondary causes of headaches. It is possible to make a diagnosis of migraine using an appropriate tool based on the simple questions administered even by non-specialists. The tool can serve to rapidly screen for migraine in busy clinics as well as large populations to estimate the prevalence and incidence of migraine. Lipton's ID-Migraine is one such self-administered and "easy to use" questionnaire to identify migraineurs.[5] In the original study, its sensitivity and specificity were 81% (95% CI, 77% to 85%) and 75% (95% CI, 64% to 84%) respectively. We aimed to translate the ID-Migraine to two North-Indian vernacular languages, that is,

Hindi and Punjabi and to determine the psychometric properties of the translated versions. To the best of our knowledge, it has not been translated to any Indian language.

METHODS

Subjects and setting

This study was conducted at the neurology outpatient clinic of Dayanand Medical College & Hospital, Ludhiana. One hundred subjects with complaints of headaches and another 60 healthy controls were enrolled between August 16 and October 15, 2021, after obtaining informed consent. The Institution Ethics Committee approved the study.

Questionnaire

The ID-Migraine questionnaire is a three-item questionnaire for screening subjects with migraine. It was originally

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formulated in the English language.[5] Subjects are considered migraine screen-positive if their response is positive to two or more items.

Translation of ID Migraine questionnaire

We took permission to use and translate the original English version of the ID-Migraine questionnaire. It was then translated into Hindi and Punjabi by two independent sets of bilingual experts. The translated versions were then back-translated into the English language by another two sets of bilingual experts. The original and back-translated versions were compared for correspondence by a study team member. Any discrepancy was resolved by consensus. The Hindi and Punjabi versions were then self-administered to two experts and five subjects with headaches in the outpatient clinic to assess linguistic comprehensibility and cultural acceptability [Figure 1].

Self-administered ID-Migraine questionnaires were completed by all subjects before they consulted with the physician in the outpatient clinic. Subsequently, a detailed clinical evaluation was performed by the study neurologist, and the headache was classified according to the International Classification of Headache Disorders-3 (ICHD-3) diagnostic criteria.[7] Participants were classified into three categories: migraine without aura (MO), chronic tension-type headache (CTTH), and other headaches [Supplementary Table 1]. Scores on the questionnaire were referenced to clinical examination by the neurologist. The study neurologist was considerably experienced in the diagnosis of headache disorders and was well-versed with the ICHD-3 classification.

Collection and analysis of data

Patients in the outpatient clinic were provided with the self-administered ID-Migraine questionnaire according to their preferred language along with other demographic questions [Figure 2]. Responses were double entered into an Excel spreadsheet.

Statistical analysis

Data were analyzed using the Statistical Package for Social Sciences Program, version 21 (SPSS Inc., Chicago, IL, USA). The numbers of true-positives (TPs), true-negatives (TNs), false-positives (FPs), and false-negatives (FNs) were estimated. The following parameters were then calculated along with their 95% confidence intervals:

Sensitivity (%) = (TP/TP + FN) × 100

Specificity (%) = (TN/TN + FP) × 100

Positive predictive value (PPV) (%) = (TP/TP + FP) × 100

Negative predictive value (NPV) (%) = (TN/TN + FN) × 100

To determine the performance scores of individual items and resolve trade-offs between sensitivity and specificity, the positive and negative predictive values were estimated. The positive predictive value is the probability of a migraine subject to screen positive. The negative predictive value is
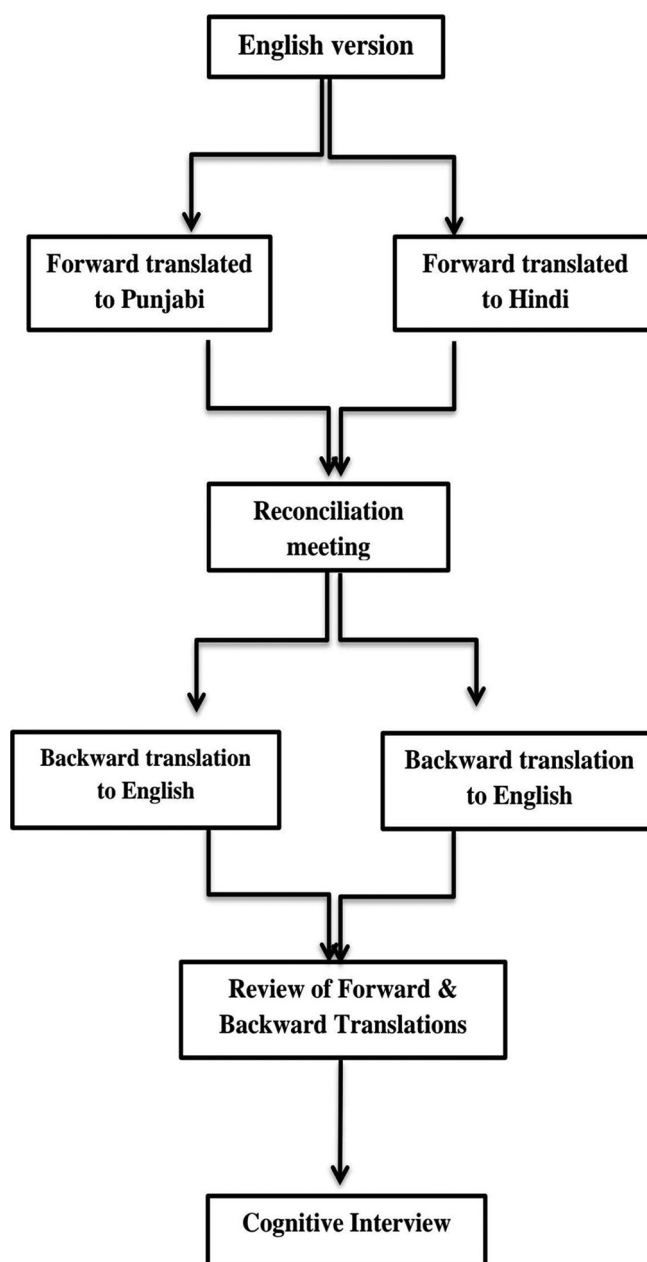

Figure 1: Steps in the translation of ID-Migraine

the probability of a subject with a migraine with a negative screening divided by the probability of subjects other than migraine having a negative screen.[8,9]

True positive rates were plotted against false-positive rates at different discrimination thresholds to generate receiver operator curves (ROCs), and the area under the curve (AUC) was measured. This was undertaken to determine optimal cut-off thresholds for a screening diagnosis of migraine, *P* < 0.05 was considered significant.

Test-retest reliability sample

To assess test–retest reliability, 10 subjects with migraine were provided the Hindi version and another 10 with the Punjabi version one month after the initial screening.

Subjects were randomly selected to complete the ID-migraine questionnaire a second time during follow-up. Cohen's kappa coefficient (κ) was used to assess test–retest reliability. It was interpreted as follows: <0 - no agreement; 0.0–0.20 - slight agreement; 0.21–0.40 - fair agreement; 0.41–0.60 - moderate agreement; 0.61–0.80 - substantial agreement; and 0.81–1.0 - perfect agreement.

RESULTS

Characteristics of Participants

In all 160 participants (100 with headache [females – 70; 70%] and 60 healthy controls) were recruited. Of the 100 subjects with headaches, we applied the Punjabi questionnaire to 50 and the Hindi questionnaire to another 50. Among 60 healthy controls, the Punjabi questionnaire was applied 30 and the Hindi questionnaire to the remaining 30. The mean ± standard deviation (SD) age of the participants was 39 ± 14 years. Demographic profile of subjects with a confirmed diagnosis of MO, CTTH, other headaches and healthy controls [Table 1]. One-half (*n* = 49) of the subjects were between 20 and 40 years of age.

Headache diagnosis

Neurological assessment confirmed a diagnosis of migraine without aura in 60 (60%), chronic tension-type headache in 18 (18%), and other types of headache in the remaining 22 (22%) patients [Table 1]. Most subjects (*n* = 77; 77%) tested positive on Question-1 of ID-Migraine and 43 (43%) patients were positive for all three questions.

The psychometric scores of the combined (Hindi and Punjabi) version of the ID-Migraine questionnaire were as follows: sensitivity, 90% (95% CI, 80% to 96%); specificity, 49% (95% CI, 32% to 65%); PPV, 73% (95% CI, 67% to 79%); and NPV, 76% (95% CI, 58% to 88%). Estimated values for the Hindi version were: sensitivity, 94% (95% CI, 79% to 99%); specificity, 56% (95% CI, 31% to 78%); PPV, 79% (95% CI, 69% to 86%); and NPV, 83% (95% CI, 55% to 95%). Estimated values for the Punjabi version were sensitivity, 86% (95% CI, 68% to 96%); specificity, 43% (95% CI, 23% to 66%); PPV, 68% (95% CI, 58% to 76%); and NPV, 69% (95% CI, 44% to 86%) [Table 2].

The ROC curve illustrated the diagnostic ability of the ID-Migraine [Figure 3]. The area under the curve (AUC) for combined, Hindi, and Punjabi versions was 0.77 (95% CI, 66% to 86%), 0.78 (95% CI, 63% to 93%), and 0.74 (95% CI, 60% to 88%), respectively. The best cut-off scores were ≥2 for the combined and Hindi versions and three for the Punjabi version [Table 3]. Cohen's kappa coefficient (κ) was 1.00 for the Hindi version and 0.74 for the Punjabi version.

DISCUSSION

Lipton's ID-Migraine questionnaire is one of the most frequent and convenient self-administered tools for screening for
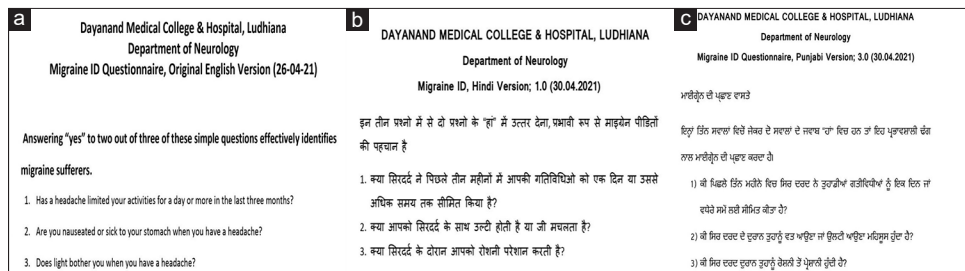

Figure 2: ID Migraine questionnaire (a) English version, (b) Hindi version, and (c) Punjabi version

Table 1: Age and gender characteristics of the subjects with migraine without aura, chronic tension-type headache, other headaches, and healthy controls

	Migraine without Aura (MO)	Chronic-tension-type headache	Other headaches	Healthy controls
	n=60	*n*=18	*n*=22	*n*=60
Mean age±SD	38±11	44±16	42±18	39±11
95% CI	(35–41)	(37–52)	(34–50)	(37–42)
Median (IQR)	40 (30–45)	44 (31–52)	42 (23–57)	42 (30–48)
Gender				
Female (%)	43 (72%)	11 (61%)	16 (72%)	43 (72%)
Age bands (years): ≤20	6 (10%)	0 (0%)	2 (9%)	2 (3%)
21–30	12 (20%)	4 (22%)	6 (27%)	14 (23%)
31–40	16 (27%)	4 (22%)	3 (14%)	13 (22%)
41–50	20 (33%)	5 (28%)	3 (14%)	23 (38%)
51–60	5 (8%)	3 (17%)	4 (18%)	7 (12%)
>60	1 (2%)	2 (11%)	4 (18%)	1 (2%)

(SD-Standard deviation, IQR-Interquartile range)

Table 2: Sensitivity, specificity, positive predictive value, and negative predictive value, with 95% CIs of individual items, combination of items, and entire tool

Items	Sensitivity (95% CI)			Specificity (95% CI)			PPV (*) (95% CI)			NPV (95% CI)		
	Combined	Hindi	Punjabi	Combined	Hindi	Punjabi	Combined	Hindi	Punjabi	Combined	Hindi	Punjabi
Q1	88% (78-95%)	97% (84-99%)	79% (60-92%)	38% (23-55%)	39% (17-64%)	38% (18-62%)	69% (63-75%)	74% (66-80%)	64% (55-72%)	70% (49-84%)	87% (48-98%)	57% (35-77%)
Q2	77% (65-87%)	72% (53-86%)	83% (64-94%)	46% (30-63%)	44% (22-69%)	48% (26-70%)	69% (62-76%)	70% (59-79%)	69% (58-77%)	56% (42-69%)	47% (29-65%)	67% (44-83%)
Q3	80% (68-89%)	84% (67-95%)	76% (56-90%)	59% (42-74%)	67% (41-87%)	52% (30-74%)	75% (67-82%)	82% (70-90%)	69% (57-78%)	66% (52-77%)	71% (50-85%)	61% (42-77%)
Q1+Q2	95% (86-99%)	100% (89-100%)	90% (73-98%)	18% (8-33%)	22% (6-48%)	14% (3-36%)	64% (61-68%)	69% (64-75%)	59% (54-64%)	74% (39-89%)	100%	50% (18-81%)
Q1+Q3	95% (86-99%)	100% (89-100%)	90% (73-98%)	26% (13-42%)	33% (13-59%)	19% (5-42%)	67% (62-71%)	73% (66-79%)	60% (54-66%)	77% (49-92%)	100%	57% (25-84%)
Q2+Q3	93% (84-98%)	94% (79-99%)	93% (77-99%)	31% (17-48%)	33% (13-59%)	29% (11-52%)	68% (63-72%)	71% (64-78%)	64% (57-71%)	75% (51-90%)	75% (40-93%)	75% (40-93%)
Q1+Q2+Q3	90% (80-96%)	94% (79-99%)	86% (68-96%)	49% (32-65%)	56% (31-78%)	43% (23-66%)	73% (67-79%)	79% (69-86%)	68% (58-76%)	76% (58-88%)	83% (55-95%)	69% (44-86%)

Combined version includes both Hindi and Punjabi

migraine. We undertook this exercise to validate the Hindi and Punjabi translated versions of the ID-Migraine questionnaire in a specialist clinic setting.

In this study, overall 73% of subjects with headaches were screened positive with the translated ID-Migraine questionnaires. ROC analysis revealed the cut-off score of "2" which was optimal to render subjects screen-positive [Table 3 and Figure 3].

We searched PubMed and found that the ID-Migraine questionnaire has been previously translated into nine languages worldwide.[10-17] We have added two more languages, that is, Hindi and Punjabi. In addition, the sensitivities and specificities of Hindi and Punjabi versions are also presented [Table 2]. The specificity of the Punjabi version was found low in comparison to the Hindi version and combined (Hindi and Punjabi) versions. This could be on account of differences between the two subject populations.

Our data indicated high sensitivities of the combined (Hindi and Punjabi) (90%; 95% CI, 80% to 96%), Hindi (94%; 95% CI, 79% to 99%), and Punjabi (86%; 95% CI, 68% to 96%) versions but relatively lower specificities of the combined (49%; 95% CI, 32% to 65%), Hindi (56%; 95% CI, 31% to 78%) and Punjabi (43%; 95% CI, 23% to 66%) versions. These psychometric properties are well within the range of estimates for other translated versions worldwide [Table 4]. The relatively lower specificities in the face of high sensitivities are perfectly acceptable for a screening tool as opposed to a diagnostic instrument, which should have both high sensitivity and specificity. One reason for the low specificity might be the large number of false-positive patients among those diagnosed with other headaches.[11] The finding could also be attributed to the fact that the test's sensitivity and specificity are generally independent of disease prevalence.[18]

Our study was limited by the small sample size and its clinic-based setting. Clinic-based data depends on the type of referral to the hospital and the reputation of the hospital. Conducting a larger study with more diverse samples before implementation is suggested. Moreover, there are many regional variations and dialects in the spoken Hindi language in India. This may also limit the generalizability of the screening questionnaire. Nonetheless, our study demonstrates that the translated versions of the ID-Migraine are easy to use and have excellent psychometric properties to allow them to be used for screening for migraine in North Indian populations.

Acknowledgment

Table 3: Youden indices, sensitivity and specificity at each threshold using the ROC curves

Positive	Sensitivity			Specificity			Youden Index		
	Combined	Hindi	Punjabi	Combined	Hindi	Punjabi	Combined	Hindi	Punjabi
0	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.97	1.00	0.93	0.13	0.17	0.10	0.10	0.17	0.03
2	0.90	0.94	0.86	0.49	0.56	0.43	0.39	0.49	0.29
3	0.59	0.59	0.59	0.82	0.78	0.86	0.41	0.37	0.44

Combined version includes both Hindi and Punjabi

Table 4: Sensitivity, specificity, positive predictive value, and negative predictive value of the original and translated- validated versions of ID Migraine to different languages

Language	Author	Country	Year	Number of patients included in the study	Sensitivity (95% CI)	Specificity (95% CI)	Positive predictive value (95% CI)	Negative predictive value (95% CI)
English	Lipton *et al*.[5]	USA	2003	563	81% (77% to 85%)	75% (64% to 84%)	93% (89.9% to 95.8%)	(Nil)
Turkish	Karli *et al*.[10]	Turkey	2007	3682	91.8% (Nil)	63.4% (Nil)	71.9% (Nil)	88.4% (Nil)
Italian	Brighina *et al*.[12]	Italy	2007	220	95% (91% to 98%)	72% (62% to 82%)	88% (82% to 93%)	87% (78% to 95%)
Portuguese	Gil-Gouveia R &Martins I[13]	Portugal	2010	142	94% (87% to 97%)	60% (46% to 73%)	80% (71% to 87%)	85% (70% to 94%)
French**	Streel *et al*.[14]	France	2015	751	87.5% (Nil)	100% (Nil)	100% (Nil)	93.5% (Nil)
Hungarian	Csépány *et al*.[11]	Hungary	2018	380	95% (92% to 97%)	42% (31% to 55%)	88% (84% to 91%)	65% (50% to 78%)
German**	Thiele *et al*	Germany	2020	105	99% (Nil)	68% (Nil)	90% (Nil)	95% (Nil)
Spanish	Rodriguez-Rivas R & Martinez CM.[16]	Spain	2022	Nil	91.7% (74.2% to 97.7%)	82.5% (68.1% to 91%)	75.9% (57.9% to 87.8%)	Nil
Chinese	Wang *et al*.[17]	China	2015	555	84.0 (75.0% to 90.0%)	64.0% (59.0% to 68.0%)	Nil	Nil

**Translation and validation are available for extended French and German versions of ID-Migraine
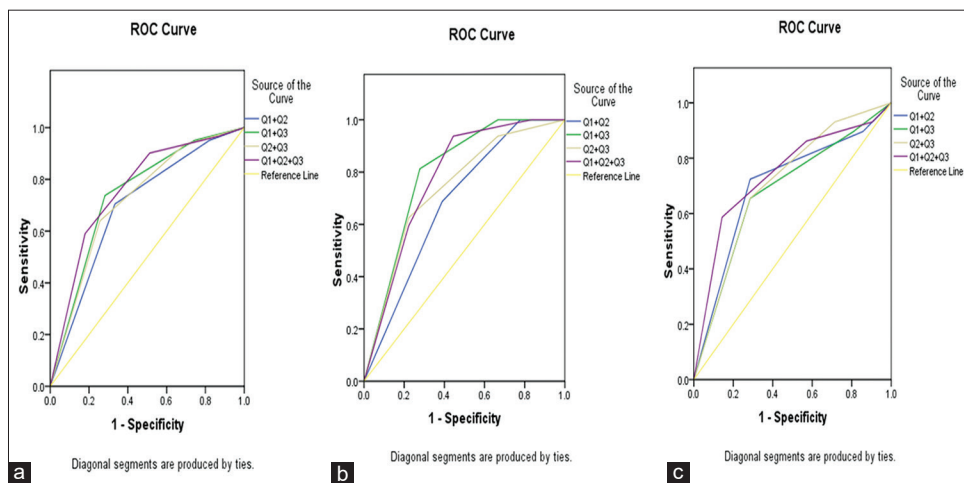
Figure 3: ROC curve with different cut-off points (0, 1, 2, or 3 "yes" answer) to demonstrate the characteristics of the ID-Migraine questionnaire for migraine without aura (a) combined version, (b) Hindi version, and (c) Punjabi version to two or more items is positive

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Table 1: Other headaches

ICHD Code group	Gender		Total
	F	M	
Cold-stimulus headache	1 (6%)	0 (0%)	1
Probable Migraine	2 (12%)	0 (0%)	2
Infrequent episode tension type headache	0 (0%)	1 (17%)	1
Frequent episode tension type headache	0 (0%)	1 (17%)	1
Probable tension-type headache	2 (12%)	0 (0%)	2
Headache attributed to traumatic injury to the head	0 (0%)	2 (33%)	2
Persistent headache attributed to traumatic injury to head	1 (6%)	0 (0%)	1
Medication overuse headache	1 (6%)	0 (0%)	1
Headache attributed to somatization disorder	1 (6%)	0 (0%)	1
Occipital Neuralgia	0 (0%)	1 (17%)	1
Cervicogenic headache	1 (6%)	1 (17%)	2
Probable infrequent episode tension type headache	1 (6%)	0 (0%)	1
Headache attributed to unruptured saccular aneurysm	1 (6%)	0 (0%)	1
Non-steroidal anti-inflammatory drug overuse headache	1 (6%)	0 (0%)	1
Headache attributed to depressive disorder	2 (12%)	0 (0%)	2
Headache attributed to generalized anxiety disorder	1 (6%)	0 (0%)	1
Migraine (M0) overlap with tension type headache	1 (6%)	0 (0%)	1
Total	16	6	22