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Cross-cultural validation of the Itch Man Scale in pediatric burn survivors in a South African setting

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ABSTRACT

Introduction: Pruritus or itch is a common symptom after burn injuries. The Itch Man Scale has been recommended to assess itch severity in children. The aim of this prospective observational study was to perform a cross-cultural validation of the Itch Man Scale by comparing it with the Numeric Rating Scale (NRS) and the Toronto Pediatric Itch Scale.

Method: At Red Cross War Memorial Children's Hospital in Cape Town, South Africa, parents of pediatric burn patients assessed their child's itch with the Itch Man Scale, NRS and Toronto Pediatric Itch Scale. Children from the age of 6 years also rated the Itch Man Scale and NRS themselves. The Spearman rank order correlation between the different scales was calculated to determine construct validity.

Results: Over a two-month period, 255 pediatric burn survivors with a median age of 2.3 years (IQR 1.4–4.0) were included; 35 of them were aged 6–13 years. Parents' Itch Man Scale ratings correlated significantly with parents' NRS ratings (0.82, 95% CI 0.78–0.86) and with the Toronto Pediatric Itch Scale of the parent (0.80, 95% CI 0.75–0.84). The correlation between the older children's Itch Man Scale rating and those of their parents was 0.66 (95% CI 0.37–0.83).

Conclusion: We concluded that the Itch Man Scale has promising validity and is a user-friendly tool to use in clinical practice to determine the itch intensity in children younger than 13 years in a South African setting.

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1. Introduction

In Sub Saharan countries it is not uncommon for children to sustain burn injuries; estimates on the annual number of children under the age of 5 years who sustain burn injuries

range from 300,000 to 17.5 million [1–3]. Poor living conditions, low education level and lack of awareness of risks, may be reasons for this high prevalence of burn injuries [4–7].

Pruritus or itch is defined as a skin sensation leading to a desire to scratch, which can complicate the healing process

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of burn wounds [8]. Itch can interfere with sleep and daily activities as well [9]. Both healing and healed burn wounds, of all sizes, can cause itch [10-13]. A previous retrospective study found that 93% of 430 pediatric burn survivors reported the presence of itch at time of discharge from the hospital, 63% still reported itch at 2 years post burn [12]. A prospective study in a convenience sample of 413 pediatric burn survivors found that total symptom relief was only achieved in less than one-third of the patients that reported itch [14].

Many self-report itch instruments are available for use by adults: the Leuven Itch Scale, the Eppendorf Itch Questionnaire, the 5-D Itch Scale, the Itch Severity Scale, the Burns Itch Questionnaire and global rating scales such as the Visual Analogue Scale (VAS) and the Numeric Rating Scale (NRS) [1,12,15-18]. The only validated self-report scale for children is the Itch Man Scale. This scale has been developed in such a way that a child of six and older can complete the scale independently [3]. Parents or health professionals may complete the scale for the children below the age of 6. This scale was validated by comparing it with the VAS and the 5-D Itch Scale [3]. Likewise, the Toronto Pediatric Itch Scale was developed for use by caregivers of children younger than 6 years [19].

In this study we aimed to evaluate the reliability and validity of the Itch Man Scale in a South African pediatric hospital setting.

2. Methods

2.1. Design: prospective observational validation study

Ethical considerations: the University of Cape Town Human Research Ethics Committee has approved the study. HREC REF: 473/2015.

2.2. Patients and setting

The study population was recruited from the Red Cross War Memorial Children's hospital, Cape Town South Africa in September and October 2015. The age range for children treated at the hospital is 0-13 years. Participants were recruited at the in-patient burns-unit and two out patient clinics. No distinction for inclusion was made in age, TBSA, cause of burn or burned body part.

2.3. Instruments

The children's itch intensity was rated with the Itch-Man Scale, the NRS for itch and the Toronto Pediatric Itch Scale [3,12,19].

The Itch-Man Scale contains five different drawings of stick men each showing a different facial expression and a different amount of red dots representing itch intensity on the body. The five drawings are numbered from 0 (no itch) to 4 (most terrible itch) and contain a short sentence explaining the itch intensity represented by the drawing. The scale has been tested in the United States in 45 children, of whom 35 used it for self-report; for the 10 children younger than 5 years the parents

themselves applied the scale for estimating the itch perceived by their child. The scores correlated highly to the simultaneously scored VAS ($r=0.79$) [3].

The NRS for itch is a horizontal line displaying the numbers 0-10. The left end of the line corresponds with no itch (NRS=0); the right end of the line corresponds with worst imaginable itching (NRS=10). Subjects or observers select a number on the line that corresponds with the perceived itch intensity [12]. A large study with 471 patients with chronic pruritus has shown high reliability and construct validity ($r>0.8$; $p<0.01$) for the NRS, the VAS and the Verbal Rating Scale [20].

The Toronto Pediatric Itch Scale, designed for use by caregivers to estimate itch severity in children younger than 6 years, classifies itch from 0 (=no itch) to 3 (=severe itch). Each classification is briefly explained. Everett et al. found a moderate inter-observer agreement (Cohen's kappa=0.52) and concluded that the scale is user-friendly. It has not yet been validated by comparing it to other scales [19].

The Itch-Man scale and NRS were available in English, Afrikaans and Xhosa. For the purpose of this study, Afrikaans and Xhosa versions were provided by a person fluent in both languages. The Toronto Pediatric Itch Scale was available in English and Afrikaans.

2.4. Procedure

Data were collected in September and October 2015 in three different departments: (1) The burns unit for hospitalized burn patients. (2) The outpatient clinic, where patients attend who no longer require admission but still have healing wounds and require medical and rehabilitative intervention. (3) The occupational Therapy Clinic, where patients have healed burn wounds but scar management and rehabilitation continuous. Children under the age of 13 years and their parents were eligible for this convenience sample. Patients and parents visiting the outpatient clinics were invited to the researchers' examination room before or after seeing the doctor or the occupational therapist. In the burns ward, the researchers approached the parents at their child's bedside whenever the situation allowed it. Parents and children 6 years or older were asked to read an information form explaining the study (available in English, Xhosa and Afrikaans) and were given the opportunity to ask questions. Those willing to participate gave their consent by signing an informed consent form.

Data collection started by asking if any itching had been experienced in the past 24h. If any itch in relation to a burn wound/scar was reported, the location of the itching burn wound/scar was documented. Next, one of the researchers (KB or ND) showed the relevant scales and asked participants to complete the scales in relation to the most severe itch that was experienced over past 24h. The scales were presented in random order determined with the use of randomization tables. For combined parent-child assessments, another randomization table determined if the child or the parent performed the assessments first.

Injury characteristics were collected from the medical records: date of injury, cause of injury, Total Body Surface Area (TBSA) burned in percentage, depth of injury and the affected anatomic areas.

2.5. Statistical analysis

Background and medical characteristics of the participating children are presented as descriptive statistics using the mean and standard deviation if the variables are normally distributed. In case of non-normally distributed data, the median value and the interquartile range are presented. The ANOVA F-test was applied to test whether the order of presenting the scales influenced the scores. An F-test value smaller than the critical value ($\alpha=0.05$) signifies that the order did not influence the scores. Spearman rank order correlation coefficient (with 95% confidence interval) was applied to determine construct validity of the Itch-Man scale, NRS itch and Toronto Pediatric Itch Scale reported by the parents and of the NRS itch and Itch-Man scale assessed by the children. To determine whether first language spoken by parents affected the association between scale scores, we performed a multiple regression analyses with the NRS itch estimated by the parent as outcome variable, the Itch Man score as predictor and languages coded as dummy variables with English as a reference variable. The NRS itch was chosen as the outcome variable because it is a continuous scale whereas the Itch Man Score is an ordinal scale.

3. Results

In a 2-month period 255 assessments were conducted on 255 patients (142 boys and 113 girls); 97 at the occupational therapy burns clinic, 84 at the outpatient burns clinic and 74 in the burns unit. The median age of the children was 2.3 years (IQR 1.4-4.0); 86.3% was under the age of 6 years. First language spoken at home was primarily Xhosa (43.1%) and Afrikaans (31.8%). Hot water was the most common cause of burn (82.0%). The median TBSA burned was 9.0% (range 0.5-80.0). (Table 1) The upper limb (63.5%), the chest (50.6%) and the head/face (47.1%) were most often affected. (Fig. 1)

In 201 cases (78.4%) the mother completed the itch assessment scales; in 25 (9.8%) another family member such as a grandmother or aunt, in 17 (6.7%) the father; and in

Table 1 – Background characteristics of patients (N=255).

	N (%) unless otherwise stated
Sex	
Boy	142 (55.7)
Girl	113 (44.3)
Age in years	
Median (IQR)	2.3 (1.4-4.0)
Children 6 years and older, n (%)	35 (13.7)
Ethnicity	
Black	153 (60.0)
Mixed	101 (39.6)
White	1 (0.4)
Language	
Xhosa	110 (43.1)
Afrikaans	81 (31.8)
English	38 (14.9)
Other ¹	26 (9.6)
Type of burn injury	
Hot water burn/scalds	209 (82.0)
Flame burn	23 (9.0)
Other ²	23 (9.0)
TBSA in %³	
Median (IQR)	9 (5-14)
Depth of burn⁴	
Superficial burns	107 (60.8)
Deep partial thickness	60 (34.1)
Full thickness	9 (5.1)
Time of assessment post burn in days	
Median (IQR)	28 (7-147)

¹ Other languages: Shona, French, Chichewa, Zulu, Swahili, Amharic and Somalia.

² Other causes of burn: hot food, hot oil, hot coals, hot iron and electrical burn.

³ Unknown for 6 patients.

⁴ Unknown for 79 patients.

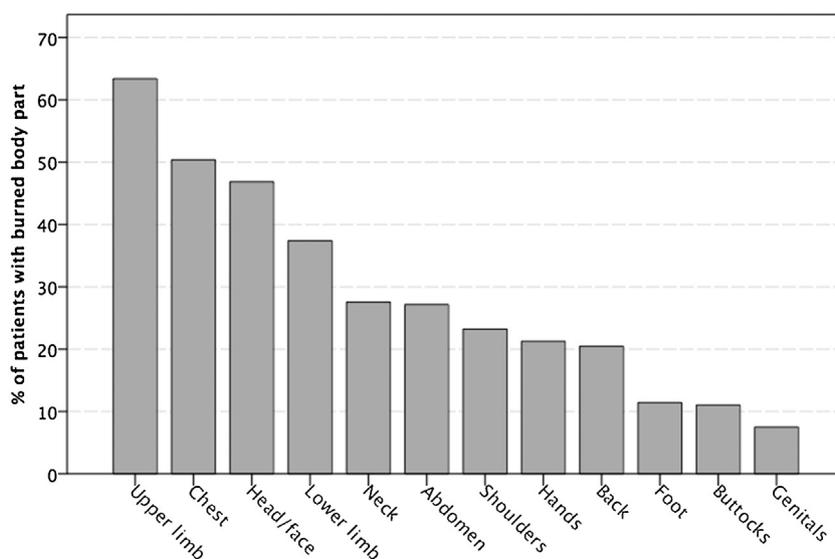


Fig. 1 – Bar graph showing percentages of burns categorized by body site.

12 (4.7%) both mother and father completed the itch scales. The score distributions for the three scales are presented in Table 2. The distributions were not significantly different for the different sequence orders. The order in which the scales were presented had no influence on the correlation between the scales. (all F-test values were below the critical value; Supplemental Table). The Itch Man Scale completed by the parents correlated significantly with their NRS (0.82, 95% CI 0.78-0.86) and Toronto Pediatric Itch Scale (0.80, 95% CI 0.75-0.84) (Table 3). The correlation between the child's and parents' Itch Man Scale assessments (N=35) was 0.66 (95% CI 0.37-0.83). Multiple regression analysis with NRS parent as outcome revealed a correlation of 0.79 with the parent-reported Itch Man Scale controlling for first language spoken by the parent. Having English as the primary language compared to Xhosa, Afrikaans or any other language did not statistically significantly change the correlation between the Itch Man Scale and the NRS itch (p-values 0.46-0.72).

4. Discussion

This study is the first large study to validate an itch scale for pediatric burn survivors in a South African setting. We found a significant correlation between the Itch Man Scale and the Toronto Pediatric Itch Scale and the NRS, as well as a significant correlation between the Itch Man Scale completed by parents and completed by children. These findings support the validity of the Itch Man Scale in the South African clinical setting. Furthermore, availability of valid instruments is crucial to objectively validate new treatment options.

Our findings are aligned with previous study's proving the itch man scale as a valid instrument to classify itch, albeit it in a different patient population and with a different study design [3]. The previous study included only 45 pediatric outpatient patients, of whom only 10 were below the age of 6 years. On the other hand, interrater reliability was established by comparing the results of two independent observers.

The Itch Man Scale was perceived user-friendlier than the NRS and the Toronto Pediatric Itch Scale, due to the different stages of itch shown and a more appealing visual representation accompanied with a short explanation. However, two mothers experiences difficulty in completing the Itch man scale as the dots, representing presence of itch on the stick

Table 2 – Distribution of scores on Itch Man Scale (parent and child), Toronto Pediatric Itch Score (parent) and NRS itch (parent and child).

Itch Man Scale (parent), N (%)	N=254
Score 0 'no itch'	59 (23.2)
Score 1	86 (33.9)
Score 2	65 (25.6)
Score 3	35 (13.8)
Score 4 'most terrible itch'	9 (3.5)
Itch Man Scale (child)	N=26
Score 0 'no itch'	4 (15.4)
Score 1	8 (30.8)
Score 2	6 (23.1)
Score 3	2 (7.7)
Score 4 'most terrible itch'	6 (23.1)
Toronto Pediatric Itch Scale (parent)	N=252
Score 0 'absence of itch'	61 (24.2)
Score 1	87 (34.5)
Score 2	86 (34.1)
Score 3 'severe itch'	18 (7.1)
NRS itch parent	N=254
Median (IQR)	3 (1-5)
NRS itch child	N=25
Median (IQR)	2 (1-6)

drawing was not in exact location or body part of where their children experienced itch. The authors of the Toronto Pediatric Itch Scale also describe their tool as user-friendly [19], but we found that the separate guidance note and example behaviors often confused the parents.

Application of the NRS proved to be difficult occasionally for example two parents (one Xhosa and one Swahili) of young children rated 10 on the NRS (reflecting the most intense itch) and gave low scores on the two other scales. In these cases the scores reported on the NRS were probably interpreted as opposite.

5. Limitations

As a possible limitation, both researchers responsible for data collection only spoke English and limited Afrikaans. Almost all parents spoke English, but the level of comprehension varied.

Table 3 – Spearman rank order correlation (and 95% confidence Intervals [CI]) between the Itch Man scale, NRS and Toronto Pediatric Itch Scale parents and child.

	Itch Man Scale parent	Toronto Pediatric Itch Scale parent	NRS child
NRS parent	0.82 (0.78-0.86)	0.75 (0.69-0.80)	0.84 (0.66-0.93)
N	254	252	25
Itch Man Scale child	0.66 (0.37-0.83)	0.48 (0.12-0.73)	0.82 (0.62-0.92)
N	25	26	24
Toronto Pediatric Itch Scale parent	0.80 (0.75-0.84)		0.57 (0.22-0.78)
N	252		25

Abbreviation: NRS; Numeric Rating Scale.

Therefore, some may not have completely understood how to apply the itch scales. In some cases a Xhosa speaking nurse served as an interpreter; unfortunately, interpreters for other African languages were unavailable at the time. Nevertheless, the multiple regression analysis revealed a non-significant effect of first language spoken by parents on the association between NRS itch and Itch Man Scale scores. Another limitation of our study was the fact that we did not study the responsiveness of the tool; i.e. the ability of the tool to detect change over time. The correct way to study responsiveness when no gold standard is available has been described by the COSMIN (Consensus-based Standards for the selection of health status Measurement Instruments) guidelines [21]. It would be valuable for future studies to compare the change in Itch Man Scale scores to the change in VAS itch or NRS itch of another proxy assessor before and after anti-itch treatment. In line with the COSMIN guidelines it would then be required to hypothesize beforehand what the expected correlation should be at least between the change scores.

6. Conclusion

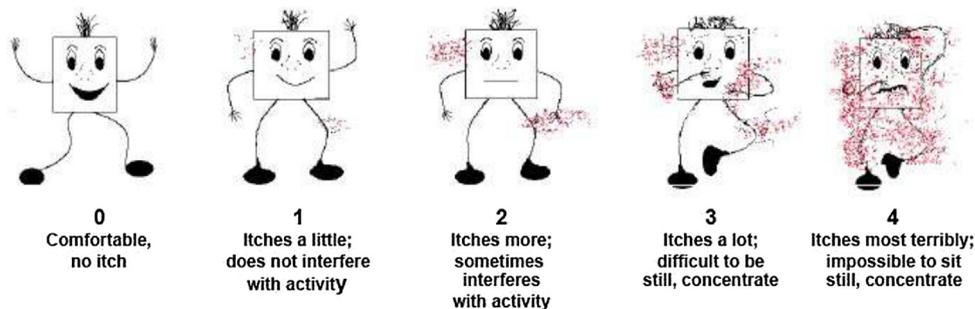
The Itch Man Scale showed promising validity and user friendliness to determine the intensity of post-burn itching for children in a South African setting. It may be helpful to objectively assess the effectiveness of different anti-pruritus treatments. Since pruritus is a common problem after burn injuries we recommend applying this scale in the daily care of pediatric burn survivors, both in hospital and in outpatient clinics.

Declaration of interest

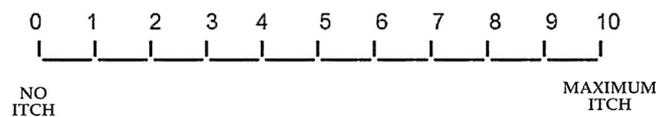
No conflict of interest to be disclosed.

Appendix A.

Itch man scale



Numeric rating scale



Toronto Pediatric Itch Scale

For infants and children aged five years or less

Itch Score

- 0 - Absence of itch
- 1 - Itch present but no disruption
- 2 - Itch present associated with some degree of disruption
- 3 - Severe itch associated with significant disruption

Note: The term *disruption* may apply to interference with the patient's daytime activity, behavior or sleep patterns. It may also include itch behavior that results in physical disruption of dressings or wound integrity.

Assessment may be aided by discussion with parents / caregivers

Examples of patients with each of the itch scores:

0 – A content relaxed child who seems unaware of their burn who engages in normal activity or is easily distracted by simple measures.

1 – A child who scratches, taps or rubs the affected area but only during quiet times. Child can be easily distracted with play, games, videos etc. The child's sleep is unaffected

2 – A child who rubs the affected area on the sheets or cot sides. Wakes from sleep in order to itch and behaves inconsistently with their usual behavior. Child rocks or wriggles and is pre-occupied with the affected area and difficult to distract.

3 – A screaming child, frequently hitting or biting their burn resulting in tissue damage. Exhausted but unable to sleep and impossible to distract their attention from the burn.

NB Real burn patients being assessed with the tool do not have to satisfy each of the criteria mentioned in the examples. The examples simply give a flavour of the spectrum of itch (and associated disruption) to which the score may be applied.

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