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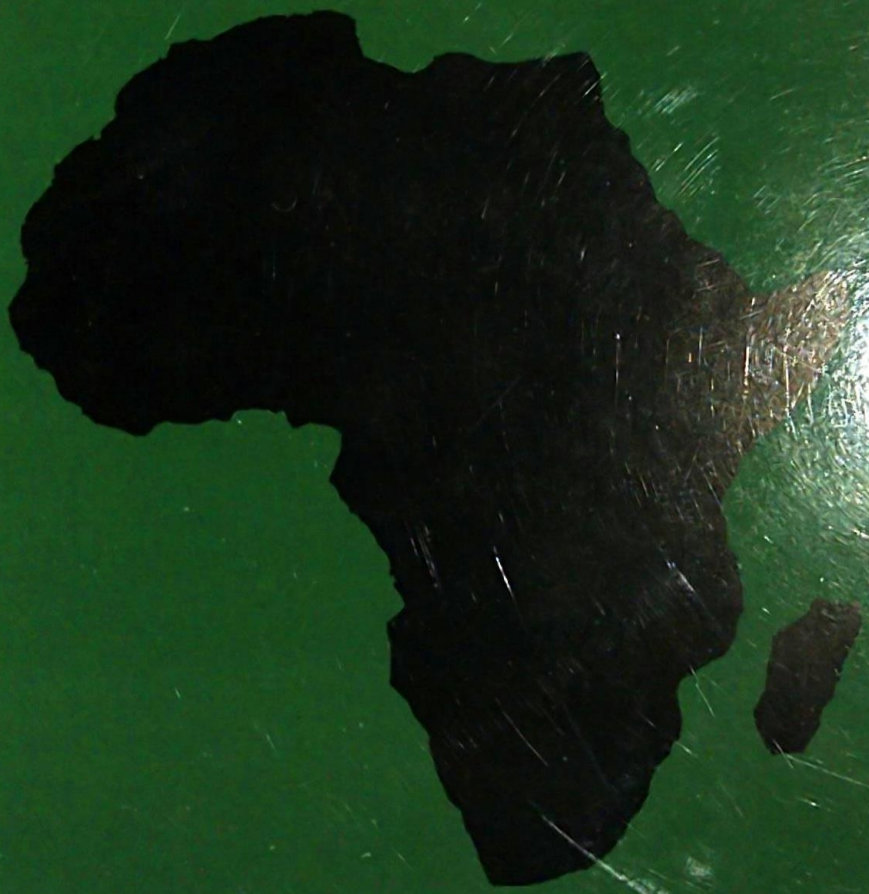

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Convergent validity of pain measuring tools among Nigerian children

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Summary

This prospective study was carried out at the Children Outpatient Clinic of the University College Hospital (UCH), Ibadan, Nigeria. The study aims to determine the convergent validity of the Oucher, Observer Pain Scale, Visual Analogue Scale (VAS) and the Numeric Rating Scale (NRS) among Nigerian children. Children aged between 6months and 12 years who required venepuncture or phlebotomy for various investigative procedures were recruited. Demographic data and pain assessment scores were documented on a data collection form. Pain was assessed by a trained research assistant at baseline, during the procedure and immediately after the procedure using the 4 pain scales. The mean age (±SD) of the children was 5.5±4.3years, boys accounted for 93 (52%) and girls 86 (48%). Pain score ranged from 0 (no pain) to 10 (worst pain) during the procedure; 72% (125) of the children had a pain score of at least 4. The median pain score during the procedure were 4 (Observer Pain Scale), 5 (Oucher) and 4 (VAS and NRS).The average measure intra-class correlation coefficient (ICC) showed that the Oucher , the VAS and the NRS pain scales are reliable pain measuring tools with an ICC of 0.63-0.69 at baseline and 0.72 - 0.73 during the procedure. The VAS, NRS and Oucher pain scales are valid pain tools that can be used to assess pain in Nigerian children.

Keywords: *Nigerian children; pain measuring tools; validity*

Résumé

Cette étude prospective était faite a la Clinique pédiatrique du Collège Hospitalier Universitaire (UCH) Ibadan, Nigeria. L'étude a pour objectif de déterminer la validité de la convergence de Oucher, l'échelle d'observation de douleur, l'échelle visuelle analogue (VAS) et l'échelle de classification numérique (NRS) parmi les enfants Nigérians. Les enfants âgés de 6 mois a 12 ans qui étaient sujettes a une venepuncture ou a une phlébotomie pour différentes procédures investigatrices étaient recrutes. Les données démographiques et une estimation du niveau de douleur étaient documentes. La douleur était évalué par un assistant de recherché forme, a la base, pendant la procédure et immédiatement après la procédure utilisant 4 échelles de douleur. L'âge moyen(+/- SD)des enfants était 5.5 +/- 4.3 ans. 93 garçons(52%)et 86 filles (48%) pendant la procédure, le niveau de douleur était classe de 0 (pas de douleur) a 10 (douleur extrême); 72% (125) des enfants avait une douleur de niveau 4 au moins. La douleur médiane pendant la procédure était 4 (Echelle d'observation de douleur), 5 (Oucher) et 4 (VAS et NRS) la mesure moyenne du coefficient de corrélation intra-classe (ICC) montrait que Oucher, le VAS et le NRS étaient des instruments de mesure de douleur sur avec un ICC de 0.63-0.69 a la base et 0.72-0.73 pendant la procédure. Le VAS, le NRS et le Oucher sont des instruments valides de mesure de douleur qui peuvent être utilisé pour évaluer la douleur chez les enfants Nigérians.

Introduction

The International Society for the Study of Pain (IASP) has defined pain as"... an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage" [1]. Pain may result from various causes ranging from everyday minor injuries such as cuts and bruises that often occur when children are at play to severe pain resulting from fractures, post surgical operation and cancer pain. In hospital setting, children undergo a wide variety of experiences that either causes pain or the fear of pain such as venepuncture, biopsy, lumbar puncture, fracture reduction and surgical operation [2-4]. The pain experienced by infants and young children may go unrecognized and sometimes not treated because of the difficulty in expressing their pain to those taking care of them. Unrecognized pain can become established, severe and difficult to control [5-6] and may have negative physical and psychological

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consequences [7]. In order to manage pain in any patient, pain assessment using a valid scale is essential, this would allow measurement of the intensity of pain and effect of treatment. Despite the fact that pain assessment tools have been validated severally among children in western culture [7-10], there is paucity of literature on pain scale validity among Nigerian children. The goal of the study was to validate the commonly used pain assessment scales among Nigerian children in order to improve pain management in clinical practice.

Materials and methods

Following approval by the joint University of Ibadan/ University College Hospital Ethics Committee and informed consent obtained from parents/guardian, children aged between 6months and 12 years were recruited into the study over a 2 months period. The children presented at the Children Outpatient (CHOP) clinic of the University College Hospital, Ibadan, Nigeria and required venepuncture or phlebotomy. Exclusion criteria include refusal to participate by older child or consenting parent/guardian, inability to understand the pain measurement scales, impaired cognitive function including developmental delays, altered sensorium, clinical instability or respiratory distress.

Demographic data including first name, hospital number, age and gender was documented while the weight and clinical diagnosis was retrieved from the participants' case notes. The pain scales used in this study include: the visual analogue scale (VAS) [8], consisting of a 10-cm horizontal line with two endpoints labeled "no pain" and "worst pain imaginable"; the Numeric Rating Scale (NRS) consisting of an arrangement of numbers from 0 to 10; the Observer Pain Scale (OPS) which group pain behaviours together to assign an increasing number of score ranging from 1 (a child laughing/euphoric) through 3 (neutral for a child that is asleep or calm) to the maximum of 5 for a child expressing a severe pain and therefore expressing any of such behaviour listed for the score of 5 (crying, sobbing, screaming) and the Oucher (the Afro-American ethnic faces [10]), which has a group of six photographs of children's faces mapped onto a 100-point scale. Pain was assessed at baseline, during the procedure and immediately after the procedure by three trained research assistant (medical interns). Each assistant assessed the four scales on a particular subject. For the Oucher pain scale only even numbers as shown in the chart were recorded as the Oucher's pain score. For statistical analysis, pain scores using the OPS and VAS were converted into discrete data (0 – 10), and the Oucher scores scaled down from 0-100 to 0 - 10.

Statistics

Convergent reliability

This was assessed with the assumption that if the pain scales were actually measuring pain intensity as they are supposed to, then the result should be similar. Intra class correlation coefficients (ICC) for groups of ratings that one expects to be measuring the same intensity of pain within a similar context were generated.

The grouping is as follows:

i. Reliability of all observer ratings for each scale at baseline
ii. Reliability of all observer ratings for each scale during procedure

The average Intra class correlations (ICC) were interpreted as follows: >0.80 is outstanding inter rater reliability or correlations, >0.60- 0.79 substantial inter rater reliability or correlations, 0.40 -0.59 moderate inter rater reliability, average measure ICC >0.70 was considered acceptable. Associations between the pain scores obtained from the Oucher scale and the other scales were measured using Spearman's rank correlation (rho). Data analysis was carried out using SPSS 15.0 for Windows (SPSS Inc., Chicago, USA).

Results

Of the two hundred and one prospective participant approached, 10 parents/guardian declined participation, data on 12 participants were discarded due to incomplete entries. Analysis was performed on the remaining 179 participants. The mean age (±SD) of participants was 5.5±4.3years. Boys accounted for 93(52%) and girls 86 (48%). The characteristics of participants and the various procedures performed were as shown in table 1.

Table 1: Patient Characteristics, type of procedure and intervention

Characteristic	N (%)
Pre-school age (<3 years)	77 (43)
School Age (>3-12 years)	102 (57)
Procedures: -Phlebotomy	158 (88)
- Pin prick	14 (8)
- Venepuncture	7 (4)
Intervention: - Breastfeeding	31 (17)
- Distraction	97 (54)
- Prize (biscuits)	5 (3)
- None	46 (26)

The median pain scores (and range) at baseline, during and after the procedure using the OPS, the Oucher, the VAS and the NRS is as shown in table 2. All the scales showed increase in pain scores during procedure compared with baseline pain scores (Table 2).

Table 2: Pain scores at baseline, during and after procedure using the OPS, Oucher, VAS and NRS median (range)

Scale	Baseline pain score	During procedure pain score	After procedure pain score
Observer	3 (0 – 5)	4 (2 – 5)	3 (0 – 5)
Oucher	2 (0 – 5)	5 (2 – 10)	2 (0 – 4)
VAS	2 (0 – 10)	4 (0 – 10)	1 (0 – 10)
NRS	2 (0 – 10)	4 (0 – 10)	1 (0 – 6)

The average measure intra-class correlation (ICC) showed that the Oucher scale has an ICC of 0.69 at baseline and 0.72 during the procedure, the VAS and NRS showed acceptable average measure of ICC during the procedure 0.727 and 0.734 respectively. Spearman's rank correlation showed that the Oucher score obtained before and during procedure correlated significantly with VAS ($r = 0.87$ and $r = 0.63$, $p < 0.0001$) and NRS ($r = 0.88$ and $r = 0.64$, $p < 0.0001$); however correlation with the OPS was poor ($r = 0.42$ and $r = 0.33$, $p < 0.0001$).

Discussion

The pain scales used in this study showed significant convergent agreement when used to measure pain intensity associated with needle insertion for venepuncture or phlebotomy. Agreement of scores obtained during the procedure was high between the VAS, the NRS and Oucher scores, while the observer pain scale (OPS) showed poor agreement with the other scales. The poor agreement of the OPS with the Oucher scale used in pre-verbal children indicate that pain measurement in this age group should be interpreted with caution as other factors such as anxiety and discomfort may be responsible for the children behaviour before the painful procedure rather than pain. However, the Oucher faces pain scale showed moderate correlation with the VAS ($r=0.63$) and NRS ($r=0.64$) during the procedure and hence could be adjudge a good measuring tool for pre-verbal children.

The inability to obtain self-reported pain scores in the pre-verbal children prompted the development of observational tools such as the OPS used in this study, comparing the OPS with Children's Hospital of Eastern Ontario Pain Scale (CHEOPS), Tyler *et al* [8] found a correlation of 0.92, $p < 0.0001$. Our correlation coefficient comparing the Oucher pain scale with the NRS was much lower ($r = 0.64$) than that observed by Lyon and colleague [11] in a study on Caucasian children attending emergency department unit ($r = 0.766$, $p < 0.0001$). The correlation of the Oucher pain scale with VAS is similar to the findings by Soyannwo and colleagues [12] ($r = 0.68$) who compared the VAS and Verbal Rating Scale in 100 Nigerian adults.

In validating the VAS, Tyler and colleague [8] demonstrated a good correlation (0.753, $p < 0.0001$) of the VAS and CHEOPS thus VAS has been found to be a valid pain measure tool. In this study convergent validity of the four scales used was assessed using the assumption that pain scores should increase during the venous puncture procedure, and all the pain measuring tools demonstrated a sharp increase in the median pain score during the procedure as shown in table 2. Another suggested method of assessing validity is by the response of the scale to interventions such as administration of analgesics or other non-pharmacological intervention. The limitation of this study is that responses to specific analgesics were not assessed. We however assessed the effect of intervention such as breastfeeding, physical distraction techniques on the intensity of pain. These interventions were comforting to 79% (105/133) of the children and therefore the pain intensity in the period after the procedure was much less than the intensity during the procedure.

Many interventions have been used to reduce the pain of intravenous cannulation such as distraction techniques [13-14] application of topical local anaesthetic agent [15] and the use of vapocoolant spray [16]. Further study is required to determine the effect of using pharmacological intervention to reduce venepuncture pain in Nigerian children.

In conclusion, this study has demonstrated that the Oucher pictorial pain scale, the VAS and the NRS scales have good convergent validity and can be used to assess acute pain such as pain of needle insertion in Nigerian children. Distraction technique such as breastfeeding, psychological preparation and visual distraction was comforting and reduced the pain associated with needle insertion in the study population.

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