

## Validation of modified Children's Health Survey for Asthma (CHSA) Questionnaire for the Sri Lankan setting



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**ABSTRACT:** Asthma is one of the most common chronic diseases in the childhood in developing and developed countries. Health related quality of life has become essential part of health outcome measurement in chronic disorders. The present study was conducted to assess the validity and reliability of western developed scale for use in Sri Lankan children and their care givers. This study was a hospital based cross sectional study for validation of the western developed CHSA questionnaire. Study population was 100 children who was diagnosed as having asthma. Factor analysis of the data in the present study identified seven relevant factors. Two separate factors each were extracted for physical health (child) domain and emotional health (family) domain. Two separate factors each were extracted for physical health (child) domain and emotional health (family) domain. Cronbach alpha of above 0.7 for all domains indicate the internal consistency of the measure.

It was found that CHSA is a valid and reliable measure to assess the impact of the disease among children with Asthma and their care givers.

**KEYWORDS:** Childhood asthma, CHSA, Factor analysis

### 1. INTRODUCTION

Abramson and Abramson<sup>1</sup> stated that when a researcher considers the use of a study instrument that others have developed and validated, they should satisfy its validity in the present study population. If the researcher is certain that the study populations and circumstances are so similar, then the previous validation would be sufficient. When a questionnaire has to be translated from one language to another and understood by a specific population it is essential to check the validity.

The best and most obvious way of assessing the validity is comparing the findings with a gold standard or a criterion that is known or believed to be close to the truth.<sup>1</sup> The CHSA is an instrument which is used to assess the quality of life of asthma patients and their parents/ caregivers. Quality of life assessment is essentially a subjective measure and there is no gold standard to compare with.<sup>2</sup> Therefore, criterion validity which is thought to be the best cannot be proven for this measure. In the absence of a standard method, triangulation is the commonly used method to appraise validity in research tools. It is an approach where the evidence is sought by using different methods.<sup>1,3</sup>

### 2. METHODS

#### Assessment of judgmental validity

Judgmental validity is mainly based on judgement alone and it assesses whether the conceptual definition of the variable has been measured by the operational definition. It includes face validity, content validity and consensual validity. This was done by a panel of experts in the field of paediatrics, psychology, sociology and community medicine. This panel included senior registrars in paediatrics (n=2), psychologists (n=2) attached to the Psychiatry Unit of the National Hospital of Sri Lanka (NHSL), a sociologist (n=1) of the University of Colombo, a Community Physician attached to the National Institute of Health Sciences, Kalutara (n=1) and the Principal Investigator (PI).

#### Selection of the study instrument

After a thorough literature search by the Principal Investigator (PI), the following questionnaires were identified for the assessment of impact of asthma among children and their families.

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1. Children's Health Survey for Asthma (CHSA) Questionnaire<sup>4</sup>
2. Paediatric asthma quality of life questionnaire<sup>5</sup>
3. Questionnaire to measure perceived symptoms and disability in asthma<sup>6</sup>
4. A Life Activities questionnaire for childhood asthma
5. Paediatric Asthma Quality of life Questionnaire

The content of each item of the questionnaires were looked for its relevance and acceptability in terms of local cultural context in which it was to be used, by a panel of experts. They also critically reviewed each question in the questionnaires for comprehensiveness of the questions and appropriateness of the measures. Among the above questionnaires the Children's Health Survey for Asthma questionnaire was selected by the panel because it assesses the health related quality of life in both the children and their family among 5-11 years children.

### CHSA questionnaire

The CHSA is a disease specific, interviewer-administered questionnaire designed for the parents or the caregivers of the children. This instrument had been developed by the American Academy of Paediatrics in 1992. To develop the clinical aspect of the CHSA, a group of experts including pediatricians and specialists in asthma, allergy, immunology and pulmonology provided inputs. Contributions from the parents of asthma patients were also included. Its original is in English.

The questionnaire was pre-tested with the parents of asthmatic children for readability, comprehension and recall. This instrument includes assessment of five domains of child and family, namely; physical health (child), emotional health (child), activity (child), emotional health (family) and activity (family). The questionnaire has 48 items.

**Table 1: Domains and the items in CHSA**

Category	Domain	Item
Child	Physical health	15 items
	Activity	5 items
	Emotional health	5 items
Family	Activity	6 items
	Emotional health	17 items

In addition, it includes questions on health care utilization, asthma triggers and family demographics. Each item has a 5-point Likert type scale with a higher score indicating better or more positive outcome. This measure had undergone a series of psychometric tests for validation in a variety of settings in the United States (4). Validity of the CHSA has not been done in Sri Lanka.

After selecting of the CHSA, few changes were made. These changes included changing of the wordings of the few items. e.g. participating in the gymnastic classes was changed to participating in the physical training sessions at school.

### Translation of the CHSA questionnaire to Sinhala language

Translating an instrument that was developed in one language with a particular cultural background to another language with a different cultural background will pose some difficulties. The CHSA which was used as the instrument for the present study was initially developed in the western world. Therefore, it needs to be translated into Sinhale language. Hereafter, the original English questionnaire and the translated Sinhalese questionnaire will be referred to as E-CHSA and S-CHSA respectively. The following validity problems were considered during the translation and adaptation of the questionnaire into Sinhala.<sup>7,8,9</sup>

1. Content equivalence: The contents of the instrument (items of the questionnaire) describe a phenomenon relevant to both cultures. The items of the E-CHSA which measures the health related quality of life and developed in the western world should be culturally relevant to Sri Lanka.
2. Semantic Equivalence: It concerns with the retaining of the meaning of each item. The words used in the original and the translated versions should have the same meaning.
3. Technical equivalence: Similar effects to be achieved by the measuring technique in both cultures. It is mainly referred to both the technical features of the languages and their relationships in a socio cultural context. Sometimes, cultural and geographical differences are likely to lead to important differences between both cultures. e.g. In E-CHSA social plans and sports
4. Criterion equivalence: It measures whether the responses to similar items relate to the same normative concept in the two cultures.

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5. Conceptual Equivalence: It means that responses to an interview or question should relate to theoretical construct within that culture. Therefore, it needs to obtain an identical meaning of concepts which may have different cultural understandings. Most authors had emphasized the need of achieving the conceptual equivalence between measures, that is, comparability not only in what is said through translation procedures but in what is understood by the respondent. This can be achieved by careful attention to the cultural values and norms of relevant societies.

**Participants for translation:** When translating an instrument into another language, the translator should have a good technical knowledge of both the source and the target languages and full emotional understanding of the source and target languages. In addition, he should be deeply involved in the culture where the questionnaire is going to be applied to know about the cultural problems related to the concepts and terms used in the questionnaire (e.g. to avoid the use of stigmatizing concepts) and to have intergraded knowledge of the area and domains explored in the questionnaire.<sup>7</sup>

By considering all the above facts, it was decided to translate this questionnaire into Sinhala by a group of persons who were fluent in both English and Sinhala languages. In addition, some questions included in the E-CHSA questionnaire that were related to clinical aspect. Hence, it was decided to take persons with a medical background for this task in this study. This group consisted of a Medical officer, Out Patient Department (OPD) of Lady Ridgeway Hospital (LRH) for Children, a Medical Officer, Central Chest Clinic at Colombo and the PI. During the process of translation semantic, technical, criterion and conceptual equivalences were established. Developing consensus among the panel members during translation helped to modify and eliminate ambiguous items.

After establishing the semantic, technical, criterion and conceptual equivalences between the E-CHSA and S-CHSA, the questionnaire was pre-tested. This was done for both clarity and acceptance among twenty mothers who came for treatment from the OPD, and Asthma Emergency Treatment Unit at LRH. The translated and pre-tested instrument was then used for the validation study.

### **Assessment of construct validity**

The assessment of construct validity of a questionnaire is essential in a psychometric measure. Construct validity is defined as the extent to which an instrument measure a theoretical construct.

Construct validity of the questionnaire was appraised using two methods.

1. Confirmatory factor analysis
2. Assessing the discrimination between groups

### **Confirmatory factor analysis**

This is a technique of psychometric validation that examines the correlation between variables in a large set of data to see if a small number of variables or factors can explain the variation in the original set of variables. For this study, factor analysis was performed to identify independent dimensions of impact of asthma on the child and the family and to identify homogenous items suitable for measuring each dimension. If CHSA is a valid measure, the dimensions (physical health, social health and day-to-day activities of the child and the social health and day-to-day activities of the mother or the caregiver) within it should emerge from a factor analysis of the data of the population that is being validated for. Items relating to a particular dimension should be grouped together within a single factor.<sup>10</sup> The method used to perform the factor analysis was the principal component analysis. The appropriateness of the factor analysis was assessed by using test of Kaiser-Meyer-Olkin measure of sampling adequacy and Bartlett's test of sphericity. The selection of the appropriate factors was based on the variance explained by each factor, the eigen value for each factor and examination of the scree plot. The methods used to extract factors include principal component analysis with varimax rotation using Kaiser normalization. For a rotated factor to be interpretable, each factor should have two or more loadings above 0.3 and each item should have at least one factor loading above 0.3.<sup>3,11,12</sup>

### **The discrimination between groups**

The results of the validation study confirm the hypothesis concerning the expected distribution of the impact within the group (mild, moderate, and severe cases of asthma) that was examined by the measure being validated (1,10). It was hypothesized that mean scale scores for all five domains should be highest for the mild and lowest for the severe. The categorization of children into mild, moderate and severe was based on the classification given by the authors. Symptom activities were classified as number of days the child experienced wheezing or tightness of the chest in the last two weeks. It was defined as follows: mild = 0-2 days, moderate = 3-10 days, severe = 11 or more days.<sup>4</sup>

### **Assessment of reliability – internal consistency**

The reliability of an instrument is a major criterion for assessing its scientific acceptability. In a composite scale, reliability can be measured by appraising the internal consistency. It assesses the degree with which an instrument measures the attributes it is supposed to measure. This is measured by the extent to which items within the domain correlate with each other.

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Therefore, the domains which assess the physical health, social health and activities of the child and the physical health and activities of the family should be internally consistent if the responses to items that contribute to the same domain correlate well with each other (1,10). Internal consistency was assessed using Cronbach's alpha for each scale overall, item total correlation and alpha if an item was deleted for individual scale items.

### **Cronbach's Alpha**

The calculation of Cronbach's alpha is based on the number of items and the average inter-item correlation i.e. more homogenous the domain, the higher the internal consistency. A high correlation between different items in a domain will indicate that they are measuring the same thing and there is less chance for random error. A low correlation indicates that there is lot of error and items are not measuring the same items. For scales which are used as research tools, alpha may be less than in the clinical situations. Alpha values of 0.7 to 0.8 are regarded as satisfactory.<sup>12,13</sup>

### **Item total correlation**

It gives the relationship between the responses on individual questions and the overall total score on the questionnaire. A reliable question should have a positive relationship with the overall total, ideally being above 0.3. An item displaying weak or a negative relationship to the total indicates that item may be poor in reliability and thus affect the findings of the whole scale. The effect of the individual item on overall reliability of the questionnaire can be assessed by the relationship between the corrected total correlation and the alpha if item is deleted.<sup>12</sup>

### **Validation study**

S-CHSA validation was done at the Asthma Emergency Unit at OPD/ LRH, in a follow up clinic at LRH, and all the medical wards at LRH. The study subjects were identified according to the place of residence. Those who resided in areas other than the CMC area were selected. Selecting the study subjects from above places ensured coverage of a broad spectrum of clinical presentations of childhood asthma and different social groups they come from.

The subjects for this study were the children aged 5-11 years diagnosed by a paediatrician as having asthma or wheezing. The respondents were the mothers or the principal caregivers of the above children.

Exclusion Criteria were;

1. The children with other diseases in addition to asthma
2. The children who come to the Emergency Treatment Unit for asthma at OPD/ LRH without a diagnosis of asthma or wheezing by a paediatrician

There are no power tables available to assess the sample size calculation. Sample size calculation for the factor analysis is controversial. Some consider that a minimum of 2:1 participants to a variable will give stable reliability and validity estimates while others argue that a minimum sample size of 100 subjects is sufficient.<sup>11</sup> The S-CHSA in the present study has 48 items. If 1:2 ratio is considered, the sample size for 48 items is 96. Considering all above factors, it was decided to take 100 subjects for the present study.

A consecutive sample of children aged 5-11 years with asthma or wheezing who came for treatment from Emergency Treatment Unit of Asthma, at LRH, asthma follow up clinics of the LRH or admitted to wards at LRH were selected until the sample size was achieved.

Data collection instrument was the modified and validated S-CHSA. Respondents were the mothers or the caregivers of the selected children diagnosed as having asthma or wheezing. The principal investigator (PI) administered the questionnaires to the respondents.

## **3. RESULTS**

### **Confirmatory Factor Analysis**

Anti-image correlation matrices shows that sampling adequacy for all 48 items were well above the accepted level of 0.5. The Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) is 0.649. For a satisfactory factor analysis, the KMO value should be greater than 0.5.

The Bartlett's test of sphericity is significant at 0.000. If the p value is less than 0.05, it indicates that there is sufficient power to continue with the factor analysis. Therefore, the above criteria confirmed the factorability of data<sup>12</sup>. After the principal component analysis, 12 factors met the eigen value greater than one criterion.

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Scree plot revealed that scree test breaks at 4 and 7 factors. Four and seven factors were rotated using varimax rotation with Kaiser Normalization and seven factor was the most interpretable. The eigen values among these factors were ranging from 9.87 to 1.96.

### Discrimination between groups

The discrimination between groups were tested among all five domains of the CHSA with low, moderate and high sub groups of asthma children in the study. The different studies had used different criteria to categorize the severity of the asthma symptoms. The authors of the original study had used the number of days child experienced wheezing or tightness in the chest as to create the symptom activity variable. The categories of symptom activity were defined as Low=0-2 days, Moderate= 3-10days and the High=11 days or more.

Similar classification was adapted for the present study. CHSA scale scores were assembled using likert method for summed ratings and the raw scores were linearly transformed into 0-100 scale. Higher scores indicate more positive outcome or better health. The mean scores of the physical health (child), emotional health (child) and Activity (Child) domains among the subgroups were tested for significance by using the Analysis of variance (ANOVA) and it was significant at  $p=0.001$  level.

The mean scores of the emotional health (Family) and Activity (Family) domains among the subgroups were tested for significance by using the Analysis of variance (ANOVA) and it was significant at  $p=0.001$  level.

### Cronbach's Alpha

Each domain has a Cronbach's Alpha ranging from 0.76 to 0.84.

**Table 2 : Cronbach's Alpha for each domain of S-CHSA**

Domains	Physical Health (child)	emotional health(child),	Activity (child	Emotional Health (Family)	Activity (Family)
Cronbach's Alpha	0.76	0.77	0.84	0.83	0.75

### Total Item Correlation

A reliable question should have a positive relationship with the overall total correlation of above.3. All the items of the questionnaire were meet this criteria.

## 4. DISCUSSION

The criteria used for recruitment of asthma children into the validation study was purely based on clinical diagnosis, were adequate for the purpose of carrying out this study. The majority of the children recruited were categorized as mild to moderate asthma (94%), is a reflection of the role of severity of disease as the determinant for seeking health care. Because of the early relief of the often-distressing symptoms of asthma more mild& moderate types are likely to come before they get severe attacks. This discrepancy may however, be unlikely to affect the validity of the results.

Health related quality of life has become essential part of health outcome measurement in chronic disorders. In addition to the sequelae of chronic disease itself on the child, it has some impact on the family as well. Therefore, goal of prevention and treatment of chronic illness in children is to diminish the impact of the illness and prevent dysfunction.

To assess the impact of the disease several questionnaires are available in the literature. They are the Pediatric Asthma quality of life Questionnaire and Pediatric Asthma Care Givers Quality of life Questionnaire<sup>5</sup>, Questionnaire to measure perceived symptoms and disability in asthma<sup>6</sup> Children's Health of Survey for Asthma (CHSA)Questionnaire<sup>4</sup> etc. After appraising the judgmental validity by the six experts, the CHSA was selected as the study instrument for the present study. Once a study instrument is used in different setting, other than where it was developed, the researcher if using this instrument should be satisfied of its validity in the selected setting<sup>1</sup>. Therefore, the present study was conducted to assess the validity and reliability of western developed scale for use in Sri Lankan children and their care givers. When in a situation where there are no standard validation methods available, the use of several methods, however imperfect each may be, provides the most accurate assessment of the instrument properties. This method is known as Triangulation<sup>3</sup>.For the present study above method of Triangulation was used to validate the questionnaire.

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When validating a questionnaire first criterion which was looked for was the judgmental validity and it assesses that the survey instrument makes sense and reflects appropriately the domains under investigation. This was assessed by a panel of experts and it was found to be satisfactory.

This questionnaire is based on multidimensional conceptualization of health. The statistical approach of factor analysis was adopted to test whether the original conceptualized domains fitted into the data, which were collected during present study.

The precise correspondence between the factors and the domains are rare in factor analysis<sup>14</sup>. Factor analysis of the data in the present study identified seven relevant factors. Two separate factors each were extracted for physical health (child) domain and emotional health (family) domain. . Factor analysis of the data in the present study identified seven relevant factors. Two separate factors each were extracted for physical health (child) domain and emotional health (family) domain. Similar findings were seen in other studies. WHO study group<sup>15</sup> reported that the factor analysis among the WHO quality of life questionnaire confirmed the comparative fit of a four domain model and six domain model of assessment of quality of life. Wijeyasinghe et al <sup>16</sup> in their study found though the original version of the questionnaire had eleven domains they had only seven domains extracted.

In the original study the mean scale scores for children whose recent symptom activity was rated as low were consistently better and significantly higher (for all but the activity (child) domain) than for those designated as moderate to high<sup>4</sup>. But the present study showed significantly higher scores for the low symptom activity than the moderate and high symptom activity for all domains.

Internal consistency reliability for CHSA-S were above 0.7 for all domains. The high degree of internal consistency confirmed its reliability. This is compatible with the original validation study of the questionnaire<sup>4</sup>.

## CONCLUSION

The translated Sinhalese version of the western developed questionnaire is a reliable instrument for measuring the impact of Childhood Asthma in children and the family.

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