Validity and Reliability of Bengali Translated Cornell-Radimer Questionnaire Measuring Food Insecurity

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ABSTRACT: Nowadays, food security is one of the dominant and significant issues discussed in the whole world. It is one of the major indicators to measure a country's development and progress. Unfortunately there is no valid Bengali translated instrument to measure the food insecurity of mass, especially for married women with children. The aim of this study was to validate the Bengali Translated Cornell-Radimer Questionnaire (henceforth, CR-B) which would be a very helpful tool for other researchers in the future**.** Subsequently, the Bengali language version is identified as CR-B. A cross-sectional study was conducted among the women garment workers (n=180) in two garment factories located in Jamirdia, Valuka. After doing the backward-forward translations of the Cornell-Radimer questionnaire, it was followed by content and face validity. Exploratory factor analysis and Cronbach's Alpha reliability analysis were performed. Both content and face validation processes showed promising and good outcomes. Preliminary analysis for factor analysis supported factorability of the items. The item no. 14 showed non-significant association with the other items. While performing the factor analysis item no. 14 did not load significantly on the factors obtained and did not show any simple structure and optimal solutions by rotated component matrix- Varimax with Kaiser Normalization and only two items loaded on a factor obtained. It also depicted poor result using Cronbach Alpha coefficient (α). After removing item no.14, the final version of CR questionnaire was consisted of 13 items. The internal consistency was 0.94 which was considered good. The findings supported that CR-B is a valid and reliable instrument to measure and assess food insecurity for Bangladeshi women in both urban and rural areas. This is also the

first Bengali version Cornell-Radimer questionnaire which will be used in the field of food insecurity and nutrition in the future.

Keywords: Food Insecurity, Validity, Reliability, Bengali, Cornell- Radimer.

Introduction

The concept of food security first gained international prominence with the World Food Conference of 1974. It has been a powerful and useful concept, as evidenced by 200 definitions of food security (Maxwell, 1996). The most commonly cited definition is "access by all people at all times to enough food for an active, healthy life" (Reutlinger, S., 1986). Food security includes at a minimum: (a) the ready availability of nutritionally adequate and safe foods, and (b) an assured ability to acquire acceptable foods in socially acceptable ways (e.g. without resorting to emergency food supplies, scavenging, stealing or other coping strategies) (Anderson, 1990).

Similarly, Radimer in his qualitative study of low income mothers and children experienced hunger described food insecurity as "the inability to acquire or consume an adequate quality or sufficient quantity of food in socially acceptable ways, or the uncertainty that one will be able to do so" (Radimer et al.,1992).

For the unavailability of the direct measures of hunger, a wide variety of the indirect measures of the presence of hunger have often been used. Indicators of income, unemployment, food assistance program participation, dietary intake and health and nutritional status are indicated as indirect measures of hunger. In the conceptual frame work of hunger, two dimensions were proposed: household and individual. Both dimensions have four components; Food depletion, unsuitable food, food anxiety and unacceptable means of food acquisition were described as constituents of household hunger where as insufficient intake, inadequate diet, feeling deprived, lack of choice and disrupted eating pattern were illustrated as individual hunger's elements. The items were explained as quantitative, qualitative, social and psychological integrals (Radimer, 1990). It is shown in Table 1.

Table 1: Dimensions and components of a conceptual definition of hunger

Components	Dimensions	
	Household	Individual
Quantity	Food depletion	Insufficient intake
Quality	Unsuitable food	Inadequate diet
Psychological	Food anxiety	Feeling deprived, lack of choice
Social	Unacceptable means of food acquisition	Disrupted eating pattern

In the original version of Cornell-Radimer questionnaire, there were three scales of hunger with a selected number of items: household hunger, hunger in women and hunger in children. Each of the scales has four items, with two items for each sub dimension. The items were judged for face, content and construct validity. Reliability analysis was also carried out. It was 0.91 for household hunger scale, 0.92 for hunger in women scale and 0.89 for hunger in children scale. All item to scale correlations were >0.5 (Ibid). The three scales and correlated items are manifested in Table 2. A modified version of the questionnaire consisted of four scales were used here.

Table 2: Items for hunger scales

Household hunger	Hunger in women	Hunger in children
1. Do you worry whether your food will run out before you get money to buy more?	1. I can't afford to eat the way I should.	1. I cannot give my child (ren) a balanced meal because I can't afford that.
2. The food that I bought just didn't last, and I didn't have money to get more.	2. Can you afford to eat properly?	2. I cannot afford to feed my child (ren) the way I think I should.
3. I ran out of the foods that I needed to put together a meal and I didn't have money to get more food.	3. How often are you hungry, but you don't eat because you can't afford enough food?	3. My child (ren) is/are not eating enough because I just can't afford enough food.

Household hunger	Hunger in women	Hunger in children
4. I worry about where the next day's food is going to come from.	4. Do you eat less than you think you should because you don't have enough money for food?	4. I know my child (ren) is/are hungry sometimes, but I just can't afford more food.

It was strongly recommended that the two dimensions (household and individual) of hunger and hunger in women and children should be analysed separately considering different times and degrees. Three response categories like "not true, sometimes true, often true" for the statements of the respondents are probably adequate and easier for the respondents advocated by the researchers. The frequency distributions of scale scores are probably the easiest and most useful forms of data to monitor hunger. There is no strict guideline for scale scoring to equate with hunger. The authors commended the use of any scale score above the minimum value (i.e. any score above a consistent "never" or "not true" response) as indicative of hunger. The Cornell-Radimer (CR) questionnaire had been largely used for research across different languages and cultural settings (Mohamadpur et al., 2012; Baconguis, 2012; Shariff & Lin, 2004; Zalilah & Tham, 2002; Shariff & Ang, 2001). But there was a need for Bengali translated Cornell-Radimer questionnaire.

A Bengali translated Cornell-Radimer questionnaire is vital to measure the food insecurity of married women with children at the household and individual levels. It can be operated in any industrial areas or homes for both working women and housewives.

Material and methods

The following methods are involved in the validation of this study.

Study Design and Participants

The items of the new Bengali translated CR questionnaire were taken from the article of "Food Insecurity of Low Income Lone Mothers and Their Children in Atlantic Canada" from the Canadian Journal of Public Health. Permission was not necessary to use and translate the CR

questionnaire as it is gratis-granted by the author at the beginning of the study. Permission was also obtained from the authority of the garment industries to conduct and gain access for the study. Inclusion criteria were to include those females aged 19 to 40 years and exclusion criteria were to eliminate those who were pregnant and suffering from chronic or infectious disease. The items of the questionnaire are presented in Table 3.

Table 3: The Cornell/Radimer questionnaire to estimate the prevalence of hunger and food Insecurity

1. I worry whether my food will run out before I get money to buy more. †	1. Often true* 2. Sometimes true 3. Never true
2. I worry about whether the food that I can afford to buy for my household will be enough.	1. Often true 2. Sometimes true 3. Never true
3. The food that I bought just didn't last, and I didn't have money to get more.	1. Often true 2. Sometimes true 3. Never true
4. I ran out of the foods I needed to put together a meal and I didn't have money to get more food.	1. Often true 2. Sometimes true 3. Never true
5. We eat the same thing for several days in a row because we only have a few different kinds of foods on hand.	1. Often true 2. Sometimes true 3. Never true
6. I am often hungry, but I don't eat because I can't afford enough food. ‡	1. Often true 2. Sometimes true 3. Never true
7. I eat less than I think I should because I don't have enough money for food.	1. Often true 2. Sometimes true 3. Never true
8. I can't afford to eat properly.	1. Often true 2. Sometimes true 3. Never true
9. My children are not eating enough because I just can't afford enough food.	1. Often true 2. Sometimes true 3. Never true
10. I know my children are hungry sometimes, but I just can't afford more food.	1. Often true 2. Sometimes true 3. Never true
11. I cannot afford to feed my children a balanced meal because I can't afford that.	1. Often true 2. Sometimes true 3. Never true

12. Sometimes people lose weight because they don't have enough to eat. In the past year, did you lose weight because there wasn't enough food? §	1. Yes 2. No 3. Don't know
13. In the past year, have you had hunger pangs but couldn't eat because you couldn't afford food? §	1. Yes 2. No 3. Don't know
14. In the past month, have you gained weight because you could not afford to eat properly? ı	1. Yes 2. No 3. Don't know

* Answered Yes or No weeks 2-4
† Questions 1-11 reworded, 'In the past week', for weeks 2-4
‡ Asked only weeks 1 and 4
§ Questions 12, 13 re-asked only week 4 as 'In the past month.'
ı Asked only week 4.

The present validation study is a cross-sectional study. It was conducted from November to December, 2013 at two garment industries in Jamirdia, Valuka, Bangladesh. The selection of participants was based on predetermined inclusion and exclusion criteria.

The calculation of sample size for factor analysis was performed in accordance to Gorsuch's formula (Gorsuch, 1983) in which the total number of items in CR questionnaire was multiplied by 5. However, following guidance by Comrey and Lee (Comrey & Lee, 2013) for sampling adequacy: 100=poor, 200=fair, the number of sample size was increased up to 180. The sample size for factor analysis should be 150+ as indicated by Pallant (Pallant, 2016). The recruitment of the participants in this study group was based on simple random and systematic sampling methods.

Validation Process

The validation process began with the forward and backward translation process. This was followed by content, face and construct validation processes. Finally, reliability testing using Cronbach's Alpha coefficient method was applied. The CR questionnaire was translated into Bengali language since the participants of this study were local people. Forward and backward translations were carried out by a group of bi-linguists from Bangladesh Agricultural University, Bangladesh. The suffix 'B' indicated Bengali version of CR, hence, CR-B.

The content validation of CR-B was performed by three experts in the related field of study. Following content validation, a face validation was also exercised. Face validation was done considering certain issues regarding language, culture and community acceptance of terms used in this instrument.

Lastly, the construct validation process was carried out among 180 women workers. Factor analysis was executed to evaluate construct validity of CR-B. Finally, internal consistency of CR-B was measured.

Data Collection

The purpose of this study was explained prior to the administration and permission was obtained to collect the data. For the purpose of construct validity, CR-B was consisted of a socio-demographic section as well as questions. The respondents were informed about the voluntary aspects of their responses. They were assured of anonymity and confidentiality. A signed consent was secured prior to their involvement in the study.

The participants were asked to reply to all of the statements and no time limit was imposed. Data collection was handled in a group format; four women in one group each time. Due to working hours and work pressures, more than four persons were not allowed. The average completion time of the questionnaire was about 20 minutes.

Statistical Analysis

Factor analysis was carried out to assess the construct validity of items in CR-B. Data were analysed using the Statistical Package of Social Science (SPSS) version 21.0 software. Descriptive statistics were calculated for socio demographic information. The construct validity of the items was tested using Exploratory Factor Analysis (EFA) by extracting factors by Principal Component Analysis (PCA).

To ensure the adequacy of the instrument for factor analysis, the preliminary analysis for factor analysis was assessed using Kaiser-Meyer-Olkin (KMO) (Kaiser 1970; Bartlett, 1954) and

Bartlett's test of sphericity (Field, 2013).The sample was considered adequate if the KMO value was more than 0.5 (Bartlett, 1954). Bartlett's test of sphericity was significant if the p-value was less than 0.05. Components with given values of over 1 were retained as components (Pallant, 2016).

After removal of item no.14, Varimax rotation was applied to optimize the loading factor of each item on the extracted component. Items with the loading factor of more than 0.5 were considered as acceptable loading factor. Reliability analysis using Cronbach Alpha coefficient (α) method was applied to determine the internal consistency of the remaining items in CR-B. The purpose of the internal consistency was to measure the degree to which items in CR-B were related to each other.

After using Kaiser's criterion, screen test and parallel analysis, two factors were retained. Initial factor loadings resulted on two factors with rotation sums of squared loadings of 71.85%.

Results

Socio-demographic Information

Socio-demographic information of the participants is presented in the form of descriptive data. Table 4 provides a summary of the respondents' demographic information. The participants' age ranged between 19 to 40 years old with a mean age of 28.24 ± 5.44 years and the household size varied from 3 to 9 persons with a mean size of 5.01 ± 0.83. The respondents' salary levelled from TK. 3200 to TK. 18000 with a mean salary of TK. 7107.56 ± 2914.45.

The anthropometric characteristics like weight, height, body mass index (BMI), waist and hip circumferences, mid upper arm circumference (MUAC), biceps and triceps skin folds of the women garment workers are manifested in Table 5.

Table 4: Socio-demographic information of the women garment workers (n=180)

Variable	Mean(SD)	Frequency (%)
Age(y)	28.24(5.44)	
Household size	5.01(0.83)	
Farming		
No		36(20)
Yes		144(80)
Household Head		
Husband		175(97.2)
Respondent		5(2.8)
Education		
Primary		116(64.4)
Secondary		60(33.3)
S.S.C./H.S.C. equivalent		4(2.2)
Having Physical Assets		
No		9(5)
Yes		171(95)

Table 5: Anthropometric characteristics of the respondents (n=180)

Variable	Mean (SD)
Weight(kg)	49.5(7.98)
Height(m)	1.5(0.05)
BMI (kg/m^2)	21.5(3.11)
Waist circumference (cm)	83.4(9.10)
Hip circumference (cm)	91.5(7.13)
MUAC (cm)	25.3(2.69)
Biceps skinfold (mm)	5.3(2.38)
Triceps skinfold (mm)	11.3(3.59)

Translation Process

The results of the translation process were good. Only a few amendments were made on ambivalent worded items.

Content and Face Validity

The content validation by experts revealed good content validity as all of them agreed with the content of the original questionnaire of Radimer (Radimer, 1990). Minor corrections were made to simplify the language. Overall, it was concluded that CR-B showed a good content validity.

In addition, it also exhibited good face validity as all the tutees delivered were positive indicated that the items were understandable.

Construct Validity

Factor analysis was carried out to assess the construct validity of items in CR-B. Factor analysis is the most commonly used statistical analysis to evaluate the construct validity of any instrument (Tabachnick et al., 2001). The factors were extracted using PCA.

Prior to accomplishing PCA, preliminary analysis was conducted to test the suitability of data for factor analysis. The result of preliminary analysis of CR questionnaire was found to be satisfactory.

The preliminary analysis for sampling adequacy seemed to be satisfactory and fulfilled all the requirements for sampling adequacy. The item no. 14 had very low and non-significant relationship with the other items. During factor analysis it was also found that item no. 14 did not load significantly on the factors obtained and there was no any simple structure and optimal solutions by rotating component matrix- Varimax with Kaiser Normalization and only two items loaded on a factor were obtained. The internal consistency of these two items to measure the component by Cronbach Alpha coefficient was poor (α). So, item no. 14 was removed and the analysis was done with the remaining 13 items. Among the 13 items, eight (8) items showed higher factor loadings on factor 1 and another five (5) items showed higher factor loading on factor 2. The internal consistency was also good.

Reliability Testing

The internal consistency reliability of CR questionnaire was examined by item total correlation and Cronbach's alpha. The composite reliability for overall items was 0.94, items for factor no. 1 were 0.946 and items for factor 2 were 0.819.

Discussion

In the first part of this study, two translation processes were carried out. This approach is extensively applied in cross-cultural research (Bernerd, 1998). The result of the translation seems auspicious as there were very minor corrections. Furthermore, the translation of CR-B did not show any contradictions with the original questionnaire.

Following from the translation process, content and face validity were performed. Overall, CR-B evidenced good face and content validity based on the evaluations of the reviewers.

In the initial analysis, the item no.14 did not load significantly on two factors and Cronbach's alpha (α) value was 0.552 which was very poor. Generally, Cronbach's alpha value ≥0.5 was considered as the proof of an acceptable internal consistency for the considered scale. In the social science field, the widely accepted cut off alpha value is 0.70 or higher for the items in a scale (Peat et al., 2002). So, the item no.14 was eliminated and the analysis was restated with other 13 items (Kaiser, 1970).

The KMO value was 0.875, which was higher than the recommended values of 0.5 (Tabachnick et al., 2001) and 0.6 (Bartlett, 1954; Field, 2013; Peat et al., 2002) suggested as the minimum value for a good factor analysis. The Bartlett's test of sphericity was found to be highly significant with p-value of less than 0.05 which is considered appropriate for factor analysis.

Initially, the PCA revealed the presence of two factors with eight values exceeding one, explain with a total variance of 71.85%. Scree plot and Parallel analysis presented the same result.

Among the 13 items, eight items named CR-B 2, CR-B 1, CR-B 8, CR-B 11, CR-B 3, CR-B 9, CR-B 7 and CR-B 10 had higher factor loadings on factor 1, ranging from 0.570 to 0.913 and the remaining five items named CR-B 12, CR-B 6, CR-B 4, CR-B 5 and CR-B 13 had higher factor loadings on factor 2 ranged from 0.596 to 0.837.

Conclusions

As a conclusion, the Bengali translated Cornell-Radimer questionnaire is a valid and reliable food insecurity measuring instrument to be used in Bangladesh context. It is expected that many individuals will be benefitted by using this questionnaire. It will contribute a lot to the maternal and child nutrition in Bangladesh which is a negligible sector at the rural context.

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References

Andersen, S.A. (1990). Core indicators of nutritional state for difficult to sample populations. *The Journal of Nutrition*, **120(11):** 1555-1660.

Baconguis, R.T. (2012). The dynamics of agricultural development in a low income municipality: the case of Magdalena, Laguna, Philippines. *American Eurasian Journal of Agriculture and Environmental Sciences*, **12(7)**: 872-885.

Bartlett, M.S. (1954). A note on the multiplying factors for various chi square approximations. *Journal of the Royal Statistical Society*, **16(series B)**: 296-298.

Bernerd, H.R. (1998). *Research Methods in Cultural Anthropology*. Newbury Park, CA: Sage.

Comrey, A.L. and Lee, H.B. (2013). *A First Course in Factor Analysis*. Psychology Press.

Field, A. (2013). *Discovering Statistics Using IBM SPSS Statistics*. Sage.

Gorsuch, R.L. (1983). *Factor Analysis* (2nd ed.) Erlbaum, Hillsdale: New Jersey.

Kaiser, H.F. (1970). A second generation little jiffy. *Psychometrika*, **35(4):** 401-415.

Maxwell, S. (1996). Food security: a postmodern perspective. *Food Policy*, 21(2), pp.155-170.

Mohamadpour, M., Sharif, Z.M. and Keysami, M.A. (2012). Food insecurity, health and nutritional status among sample of palm-plantation households in Malaysia. *Journal of Health, Population and Nutrition*, **30(3)**: 291-302.

Pallant, J. (2016). *SPSS Survival Manual: A Step by Step Guide to Data Analysis Using IBM SPSS*. Allen & Unwin.

Peat, J., Mellis, C. and Williams, K. eds. (2002). *Health Science Research: A Handbook of Quantitative Methods*. Sage.

Radimer, K.L. (1990). *Understanding hunger and developing indicators to assess it*.

Radimer, K.L., Olson, C.M., Greene, J.C., Campbell, C.C. and Habicht, J.P. (1992). Understanding hunger and developing indicators to assess it in women and children. *Journal of Nutrition Education*, **24(1)**: 36S-44S.

Reutlinger, S. (1986). *Poverty and Hunger: Issues and Options for Food Security in Developing Countries. A World Bank Policy Study*. The World Bank, 1818 H Street, NW, Washington, DC 20433.

Sharif, Z.M. and Ang, M. (2001). Assessment of food insecurity among low income households in Kuala Lumpur using the radimer/cornell food insecurity instrument-a validation study. *Malays J Nutr*, **7**: 15-32.

Shariff, Z.M. and Lin, K.G. (2004). Indicators and nutritional outcomes of household food insecurity among a sample of rural Malaysian women. *Pakistan J Nutr*, **3(1):**50-55.

Tabachnick, B.G., Fidell, L.S. and Osterlind, S.J. (2001). Using Multivariate Statistics. (4th Ed.). Pearson/Allyn & Bacon, Boston.

Zalilah, M.S. and Tham, B.L. (2002). Food security and child nutritional status among orang asli (temuan) households in Hulu Langat, Selangor. *The Medical Journal of Malaysia*, **57(1):** 36-50.