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## Reproducibility and Validity of the Food Frequency Questionnaire in a Rural Block of Haryana, India

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**Abstract:** The present study was conducted amongst 212 subjects to assess the reproducibility and validity of the food frequency questionnaire (FFQ) methodology in a rural area of India. The findings of the present study revealed that FFQ for all the food groups is reproducible. A good validity was found between the two methodologies for all the food groups except for pulses.

**Key words:** Dietary intake, food frequency method, pulses, fruits

### Introduction

Accurate and reliable methods for assessing dietary intake of a free living population are desirable to answer important questions regarding association between processes involved in the etiology of disease (Beaton *et al.*, 1983). The food frequency method is being increasingly recognized as a suitable tool in epidemiological studies where evidence is sought for an association of diet in general, rather than with specific nutrient (Morgan *et al.*, 1978). In developed countries, the food frequency questionnaires have been utilized for identifying dietary risk factors associated with chronic diseases like coronary artery disease and various cancers (Graham *et al.*, 1967; Bjelke, 1975). However, in the Indian situations, methodological concern has been raised about the reproducibility and validity of the dietary data reported from food frequency method. No study has been undertaken to assess the reproducibility and validity of the food frequency methodology in rural India. Therefore the present study was aimed at assessing the reproducibility and validity of the food frequency questionnaire methodology in a rural area of India.

### Materials and Methods

The present study was conducted in block Kanina, District Mahendergarh, Haryana, India. The study sample consisted of 212 subjects. The inclusion criteria for the selection of the subjects were that they should be residents of the study area; were 30-60 years of age; were free from any known chronic illness so as to affect their dietary consumption pattern. Any subject who developed a chronic disease during the study period was excluded from the study and no proxy interviews were accepted.

The study was undertaken in two phases. Phase I of the study was conducted in May-June 1998 and Phase II was conducted in May and June 1999, after 12 months of the data collection of the Phase I. A total of 212 subjects were administered a semi-structured pretested questionnaire to elicit information on the parameters of identification details and frequency of consumption of

food items under the major food groups within last 2 years and consumption of different food items for prospective 7 days by using the 24 hr dietary recall method.

The food frequency questionnaire included the twelve major food groups i.e. cereals, pulses and legumes, green leafy vegetables, roots and tubers, other vegetables, fruits, milk, milk products, eggs, flesh foods, sugar and Jagger and fats and oils. Each subject was asked how frequently during the last 2 years, any food item (in a particular food group) was consumed i.e. number of days per week (1 to 7), once per fortnight, once per month or never. If a food group item was consumed only in a particular season, the frequency of consumption of that particular food group in the specific season was inquired. Assistance of mother or wife living in the same family and sharing the same kitchen, was sought to substantiate the data on dietary consumption pattern of the subject, wherever required. This data was collected to assess the reproducibility of the food frequency questionnaire methodology.

Consumption of food items in different major food groups was assessed for 7 days prospectively from each subject using the 24 hour dietary recall method. The specific food group items consumed by the subject during breakfast, lunch, evening tea and dinner were inquired. Percentage agreement between food frequency questionnaire responses given in Phase I - Phase II were calculated by cross tabulation of the data. The agreement analysis was interpreted as follows:

Percentage agreement	Interpretation*
100	perfect**
75 - 100	very good
50 - 75	good
25 - 50	fair
<25	poor

\* This interpretation was qualitative (subjective)

\*\* Subjects giving the same responses in the phases compared.

Taking into account genuine issues related to reporting and the need of logical understanding, the data collected on the food frequency questionnaire in Phase I and Phase II in terms of days per week and days per month was classified into four sub groups which were as follows :

Frequency of consumption	Classification of the responses
5-7 days per week	4
1-4 days per week	3
1-2 days per month	2
Never	1

The data obtained from each subject using the 24 hour dietary intake for consecutive 7 days was reported as the consumption of the various food groups as consumed per week. This was obtained by adding the consumption of the food group reported each day. The data was obtained in the frequency of one to seven days in a week and never. The resultant data was further classified into three groups for the agreement analysis. The data was classified as follows :

Frequency of consumption	Classification of the responses
5-7 days per week	3
1-4 days per week	2
Never	1

Taking into account genuine issues related to reporting and the need of logical understanding, the data collected on the food frequency questionnaire in terms of days per week and days per month was classified into three sub groups which were as follows:

Frequency of consumption	Classification of the responses
5-7 days per week	3
1-4 days per week	2
1-2 days per month or never	1

The percent agreement between the food frequency questionnaire and the 24 hour dietary recall methodology for consecutive seven days was utilized to assess the validity of the food frequency questionnaire method. The agreement analysis was interpreted similar to the agreement analysis interpreted for the FFQ data.

## Results

A total of 212 subjects were included in the present study and 58% of them were females. Nearly 30.7% of the subjects were in the age group of 30-40 years. Almost 40% of the subjects were illiterates.

For the assessment of reproducibility of the food frequency questionnaire in the study subjects the percent agreement was calculated on comparison of the Phase I with the Phase II data. The results of the agreement analysis revealed that there was a perfect agreement (100% agreement) for the food group cereals. There was 75.0 (70.6-79.4) percent agreement for the food group pulses. The food groups i) green leafy vegetables, ii) roots and tubers and iii) other vegetables had a percent agreement of 89.9% (86.2-93.6), 82.3% (78.4-86.2) and 73.0% (68.5-77.5), respectively. Fruits had a agreement of 77.1% (72.8-81.4). Milk had an agreement of 79.3% (75.2-83.4) while milk products had an agreement of 82.3% (78.2-86.4). Eggs and flesh foods had a percent agreement as 82.6 (78.5-86.7) and 87.5 (84.1-90.9), respectively. Fats and oils had a percent agreement of 98.1 (96.8-100.0). Sugar and Jagger had a percent agreement of 95.7 (93.7-97.7) (Table 1).

According to the subjective interpretation of the agreement analysis, there was a perfect agreement for the food group cereals. There was very good agreement between the two phases for the food groups i) pulses, ii) green leafy vegetables, iii) roots and tubers, iv) fruits v) milk, vi) milk products, vii) eggs, viii) flesh foods, ix) fats and oils and x) sugar and Jagger. The food group other vegetables had a good agreement. None of the food groups had fair or poor agreement.

The analysis of the validity of the FFQ in Phase I revealed that there was a perfect agreement (100.0%) for the food group cereals. There was a good agreement for the food group pulses and fruits. There was very good agreement between the two methodologies in the Phase I for the food groups i) roots and tubers, ii) milk, iii) milk products, iv)eggs, v) flesh foods and vi) fats and oils and vii) sugar and Jagger. None of the food groups had a poor agreement (Table 2).

The assessment of Validity of Data of FFQ Method by comparison with the 24-Hour Dietary Recall methodology in Phase II is depicted in Table 2. There was a perfect agreement (100.0%) for the food groups cereals and sugar and Jagger. There was a very good agreement for the food groups i) roots and tubers, ii) other vegetables, iii) milk, iv) milk products, v) eggs, vi) flesh foods and vii) fats and oils. The food groups pulses had fair but fruits had a poor agreement between the two methods.

## Discussion

The present study was conducted amongst 212 subjects belonging to the rural of India. There was a perfect agreement for the food group cereals. There was very good agreement between the two phases for pulses, green leafy vegetables, roots and tubers, fruits, milk, milk products, eggs, flesh foods, fats and oils and

Table 1: Percent agreement for reproducibility of the Food Frequency Population in the study population (n=212)

Food Groups	Percent	
	Agreement	Interpretation
Cereals	100.0	Perfect
Pulses	75.0 (70.6-79.4)	Very Good
GLVs	89.9 (86.2-93.6)	Very Good
Roots and Tubers	82.3 (78.4-86.2)	Very Good
Other Veg.	73.0 (68.5-77.5)	Good
Fruits	77.1 (72.8-81.4)	Very Good
Milk	79.3 (75.2-83.4)	Very Good
Milk Products	82.3 (78.2-86.4)	Very Good
Eggs	82.6 (78.5-86.7)	Very Good
Flesh foods	87.5 (84.1-90.9)	Very Good
Fats and Oils	98.1 (96.8-100.0)	Very Good
Sugar and Jagger	95.7 (93.7-97.7)	Very Good

Table 2: Percent agreement for validity between responses of Food Frequency Questionnaire and 24 hour Dietary Recall Method in the study population

Food Group	Phase I	Phase II
Cereals	100.0	100.0
Pulses	56.1 (49.3-62.9)	41.0 (34.2-47.8)
Roots and Tubers	75.5 (69.6-81.4)	97.2 (94.9-99.5)
Other Vegetables	78.1 (72.4-83.8)	97.6 (95.5-99.7)
Fruits	58.0 (51.3-64.7)	9.0 ( 5.1-12.9)
Milk	93.4 (90.0-96.8)	90.6 (86.6-94.6)
Milk Products	94.8 (91.8-97.8)	99.0 (97.7-100.0)
Eggs	91.5 (87.7-95.3)	89.1 (84.8-93.4)
Flesh Foods	96.2 (93.6-98.8)	95.7 (93.0-98.4)
Fats and Oils	99.0 (97.7-100.0)	97.6 (95.5-99.7)
Sugar and Jagger	99.0 (97.7-100.0)	100.0

sugar and Jagger. The food group other vegetables had a good agreement. None of the food groups had fair or poor agreement. The results thus revealed that FFQ for all the food groups is reproducible.

The results of the present study are comparable to another study conducted in Urban India in which they found that the FFQ for all the food groups was reproducible and validity results revealed that there was either good, very good or perfect agreement for all the food groups (Kapil *et al.*, 2003). Another study was conducted to compare the reproducibility and validity of FFQ with the 24 hour dietary recall methodology amongst low income Brazilian workers. The results indicated that the questionnaire had satisfactory

reproducibility and reasonable validity (Fornes *et al.*, 2003). The validity and reliability of the FFQ was also evaluated in the Shanghai Women's Health Study amongst 200 participants. The results revealed that the FFQ can reliably measure and accurately measure usual intake of major nutrients and food groups amongst the women in Shanghai (Shu *et al.*, 2004).

The findings of the present study revealed that there is reproducibility of the FFQ in the Indian population residing in rural areas of India. A good validity was found between the two methodologies for all the food groups, except for pulses which had fair agreement and fruits which had poor agreement in Phase II. There is a need to undertake studies with larger sample sizes in rural and urban areas of India to substantiate the findings of the present study.

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