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Food frequency preference questionnaire (FFPQ) for Ischemic stroke patients

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Abstract
A food frequency questionnaire (FFQ) is a common method used to assess individual long-term dietary intake of foods and nutrients. The questionnaires elicit a subjectively reported "usual frequency" of consuming an item from a list of foods A food frequency and preference questionnaire (FFPQ) is needed to facilitate studies assessing the dietary patterns of ischemic stroke patients.
Objectives: This study aimed to develop and validate a food frequency questionnaire (FFQ) to assess assess the premorbid dietary habits of ischemic stroke patients.
Methods: A total of 20 Ishemic patients participated in the development of the FFQ and in the validation study, 100 subjects participating in the reproducibility study. The FFQ, consisting of 127 food items from 12 food groups, was compared with a one-day dietary record (3DR) as the reference method. The reproducibility of the FFQ was assessed through repeat administration for three times. Reliability of the scale measured by split half method, the whole test was calculated by using Spearman-Brown formula). The validity of the FF Scale was established through internal consistency analysis method,. For this purpose two sets of inter correlation were calculated. The score of items in each section were correlated with section total. In the second section, each section total was correlated with grand total score. During validity readability, feasibility, clarity of wordings, layout and style were accessed.
Results: Guttman split half coefficient of the scale was 0.321. Therefore, the reliability score is high and this developed FF scale has high reliability. The score of items in each section was correlated with the section total and the pearson correlation coefficient ranged from 0.445 to 0.533. The values ranged between 0.001 and 0.901 most of the correlations were found to be significant, thereby indicating reasonably high construct validity. The results of the validation study demonstrated good acceptance of the FFQ
Conclusion: These findings indicate that the developed FFQ is valid and reliable for measuring the average intake of food consumption in a population of ischemic patients.

Keywords: Food frequency preference questionnaire, ischemic stroke

Introduction
Unhealthy dietary pattern have been consider as the second leading reason for to stroke induced mortality worldwide (Foroughi *et al*., 2013) [5] Different factors are the reasons for stroke occurrence, among those poor dietary habits are considered the main modifiable risk factor for stroke (Boehme *et al*., 2017) [3]. Various studies show that diet plays in an equal role in both incidence and prevention of stroke (Hankey, 2012; Foroughi *et al*., 2013) [6, 5]. In case of Kerala there is rapid raise in stroke incidence per annum (Somasundaran and Potty, 2020) [12]. Recent studies shows that Keralites changing life style patterns make drastic changes in the dietary pattern and it lead to various Non- communicable diseases(NCD) (Philip, 2019) [9]. The main types of NCD are cardiovascular diseases (such as heart attacks and stroke), cancers, chronic respiratory diseases and diabetes. Tobacco use, physical inactivity, the harmful use of alcohol and unhealthy diets increase the risk of dying from an NCD (WHO, 2022) [14].
The role of diet in various diseases can assessed by different method, 24 –hr recall method and food frequency questionnaire are most commonly used methods in epidemiological studies (Shim *et al*., 2014) [11]. In case of Kerala, there is lack of data relating premorbid dietary pattern of ischemic stroke patients. A detailed food frequency assessment help to understand the unhealthy dietary patterns leading to ischemic stroke.
The premorbid nutritional status had a significant impact on stroke incidence and the patient recovery rate.

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One of the biggest challenges in epidemiological studies in Kerala is the lack of feasible and valid dietary assessment tools. Commonly, the Food Frequency Questionnaire (FFQ) is used in nutritional studies to examine the dietary intake and dietary pattern of individuals but it is time consuming not that much detail to overcome these issues a food frequency preference questionnaire developed according with Kerala cuisine.

The aim of this study is to develop a food frequency and preference questionnaire for assessing food and nutrient intakes among ischemic stroke patients and evaluate the validity and reliability.

Methods
Sample
The study was conducted among twenty ischemic stroke patients who were randomly selected after fulfilling the exclusion and inclusion criteria.
a. Acute ischemic stroke patients admitted within the first one month of onset stroke.
b. Modified Rankin Scale (mRS) less than or equal to 4.

A total of 20 Ischemic patients participated in the development of the FFQ and in the validation study, 100 subjects participating in the reproducibility study. The recruited ischemic stroke patients were those who got admitted at the Comprehensive Stroke Care Program, Department of Neurology, Sree Chitra Tirunal Institute of Medical Science and Technology (SCTIMST), Thiruvananthapuram. Sample populations were be assessed after obtaining informed written consent. If the patients are not able to give written consent due to altered sensorium, the next kin or the closest relative were approached for consent.

Construction of Food Frequency & Preference Questionnaire
The questionnaire was developed strictly in accordance with questionnaire construction principles. And this questionnaire was gradually compiled and elaborated with 12 food groups and common food preparations of Kerala.

1. Collection of statement
The first step in the preparation of food frequency and food preference questionnaire were to obtain statements to which individuals having different food consumption pattern and they respond differently. The investigator collected statements from various sources such as books, journals, magazines, discussions with specialists and experts.
Considering the principles of construction, 11 statements were prepared for food preference questionnaire. Considering the subjects, as they are the ischemic stroke patients, investigator took care to prepare short questionnaire.

2. Editing of statement
The statements were edited to ensure a terminology consistent with the purpose to be served by a 7-point scale questionnaire. Editing the statements is a much more important step. Statements having even slightly doubtful presentations were dropped. Among the 12 food groups 127 food items were retained in the questionnaire, which was used for pre- testing purposes.

3. Pre- testing of the Questionnaire
The main objective of the pre-testing was to find out the difficulties of respondents in understanding the instructions and names of food items, to find out the difficulty in statements and the practical issues during administration of questionnaire. Also, to finalize the food groups, food items and frequency. The questionnaire were given to 20 bystanders at SCTIMST, Thiruvananthapuram to check whether the respondents were understanding the items asked in the questionnaire

4. Determination of scoring weights
In the present study weight 7 was assigned to "Daily consumption of a food item", 6 for "Thrice in week", 5 as "Twice in a week", 4 as "Weekly one", 3 assigned as "Monthly one", 2 as "Rarely" and 1 assigned as "Never".

5. Administration
The interview schedule method wass used to collect the responses using the questionnaire.

6. Scoring
Each food item consuming frequency of respondents was recorded on a seven-point scale such as daily to never based on Likert scale (Finsatad, 2010) [4]. According to the degree of the statement, the respondents were asked to respond in any one of the following ways. i) daily ii) thrice in a week iii) twice in week iv) weekly one v) monthly vi) rarely vii) never, these seven points constitute the scale, as illustrated below.

Each point on the scale carries a score. Responses indicating least favorable food frequency score is 1, and the most favorable most frequently used one with highest score 7. The same thing was done in respect of each and every food item in the instrument. This way the instrument would yield a total score for each respondent, which would then measure the respondent's food frequency of use in each and every item. The score values were not indicated in the questionnaire.

Reliability and Validity Tests of the Questionnaire
Any scale need be so constructed that, in itself it does not cause any variation. It should be a dependable and stable measure and its repeated application should not give varying results. It refers to the extent to which a test is internally consistent and also the extent to which yield consistent results that is how dependable it is for predictive purpose (Petty *et al.*, 2009) [8].
Each food item consuming frequency was assessed by the interview method, and it is recorded on aseven-point scale such as daily to never. The quantity of each food item was recorded by showing standard cups and spoons.
Reliability of the scale measured by split half method, because it is the most basic method and very much suitable when a measure contain large number of items. Reliability of the whole test was calculated by using the following equation Spearman-Brown formula (Hislop *et al.*, 2014) [7].

$$Reliability\ of\ the\ whole\ test = \frac{2 \times reliability\ of\ the\ half\ test}{1 + reliability\ of\ the\ half\ test}$$

A team of nutritionists and dietitians reviewed the newly

developed FFQ to confirm its content validity. Data was collected through the administration of written questionnaires. The validity of the FF Scale was established through internal consistency analysis method, and also constructs validity also established. For this purpose two sets of inter correlation were calculated. The score of items in each section were correlated with section total. In the second section, each section total was correlated with grand total score. During validity readability, feasibility, clarity of wordings, layout and style were accessed.

A comprehensive frame work were summarized for developing a valid and a reliable questionnaire in Fig.1
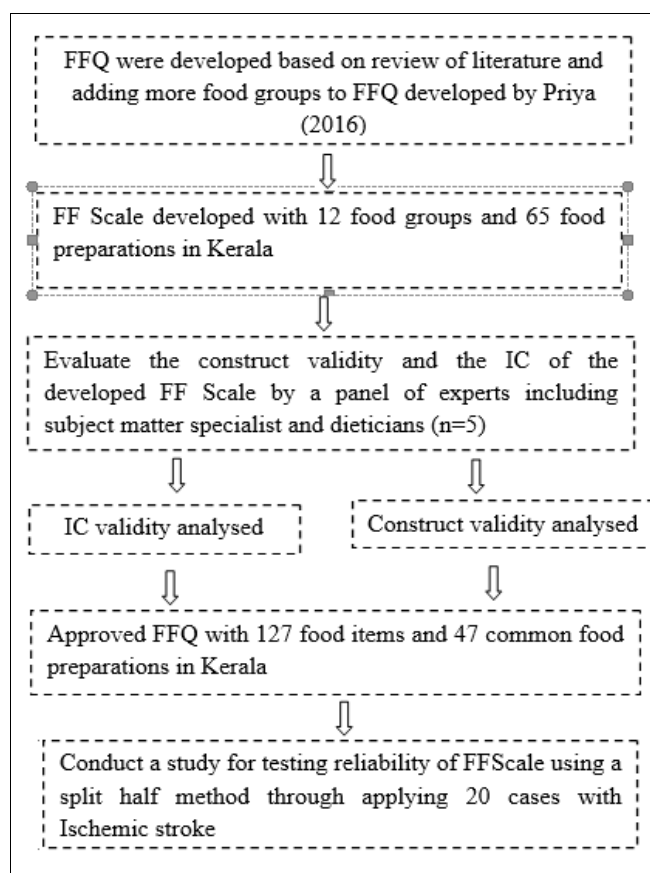
Results
Baseline Information of the Sample
As summarized in Table 1, the mean age of the selected ischemic stroke patients whereas 55.3±12.16. Regarding gender, 65 per cent of patients are male and reaming 35 per cent were female. Most of them are (75 per cent) are lived in a nuclear family system only 25 per cent from joint family. Overall mean BMI of the respondent is 26.3±4.21.

Table 1: Basic characteristics of study population

Variables	Number	M ±SD
Age (year)		55.3 ± 12.16
BMI (kg/m²)		26.3± 4.21
Gender		
Male	13 (65)	
Female	7 (35)	
Types of family		
Nuclear family	15(75)	
Joint family	5 (25)	

Abbreviations: BMI- Body mass index, SD- standard deviation.

Reliability and Validity of the Questionnaire
Guttman split half coefficient of the scale is 0.321. After the calculation of the reliability of the whole test using Spearman-Brown formula (Vet *et al.*, 2017) [13] the reliability of the test. Therefore, the reliability score is high and this developed FF scale has high reliable.

The validity of the Food frequency questionnaire was established through internal consistency analysis method, and also construct validity was established. For this purpose, two sets of inter-correlation were calculated. The score of items in each section was correlated with the section total and they ranged from 0.445 to 0.533. It is presented in Table 2.

Table 2: Validity of the developed food frequency and preference questionnaire

Items	Lowest value at 0.05 level
Cereals	0.455
Pulses	0.454
Green leafy vegetables	0.478
Roots and tubers	0.445
Other vegetables	0.452
Nuts	0.529
Spices	0.468
Fruits	0.518
Fish	0.451
Meat	0.466
Milk and milk products	0.448
Fats and oils	0.533
Sugar	0.499
Snacks	0.463
Dessert	0.500
Beverages	0.463
Food preparations	0.491

Table 3: Construct validity of the developed food frequency and preference questionnaire

Items	Section total (Pearson correlation sig.(2-tailed)	Grand total (Pearson correlation sig.(2-tailed)
Cereals	0.221	0.349
Pulses	0.181	0.446
Green leafy vegetables	0.091	0.704
Roots and tubers	0.201	0.298
Other vegetables	0.150	0.529
Nuts	0.006	0.589
Spices	0.164	0.489
Fruits	0.064	0.421
Fish	0.033	0.479
Meat	0.006	0.594
Milk and milk products	0.001	0.696
Fats and oils	0.014	0.540
Sugar	0.030	0.901
Snacks	0	0.860
Dessert	0	0.796
Beverages	0	0.745
Food preparations	0.001	0.666

In the second section, each section total was correlated with grand total score. It is presented in Table 3. The values ranged between 0.001 and 0.901 most of the correlations were found to be significant, thereby indicating reasonably high construct validity.

Discussion

In many epidemiological studies, FFQs originally developed for adults are used to assess habitual food intake. In contrast, the food list in our FFQ was developed specifically for Ischemic stroke patients, using a data-based approach. This paper describes the process of development and validation of a food frequency and preference questionnaire for Kerala scenario. Thrust was given to develop a semi-quantitative FFQ that estimated food intake using categories, as it is seen that loss of information is minimal when food intake categories are used to estimate nutrient intakes. Many studies have developed and validated food frequency questionnaires according to their study population and their place of residence (Ayoubi *et al.*, 2021) [2]. The advantages of the developed food frequency questionnaire easy to use and interpret. This study also asked the respondents about their intake of pre-specified portion sizes rather than estimates of their regular portion sizes, which made the FFQ easier to administer and more reliable. An important factor when determining FFQ reliability is the time interval between the administrations of the FFQs. If the time interval is short, the subject may be able to remember the first FFQ and reliability is overestimated. However, if the time interval is too long, dietary patterns may change, affecting the study's reliability. The results of the present study on reproducibility show good applicability of the newly developed questionnaire to food frequency and preference data regarding ischemic stroke patients. Similar reliability score found the FFQ developed for find out the overweight and obesity population (Almjwal *et al.*, 2018) [1].

Conclusion

The developed FFPQ can be further used for eliciting information regarding diet and food consumption pattern of Ischemic stroke patients. FFQ can serve as a basic tool for further dietary assessments especially for Ischemic stroke patients.

Ethical consideration

The ethics committee of SCTIMST, Thiruvananthapuram approved for the study. All ischemic stroke patients for this study recruited after obtaining written consent.

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