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Original article

Development, reproducibility and validity of a food frequency questionnaire among pregnant women adherent to the Mediterranean dietary pattern

Tatiana Papazian [a, b], Hala Hout [b], Darine Sibai [b], Nour Helou [b], Hassan Younes [b, c], Nada El Osta [d, e], Lydia Rabbaa Khabbaz [a, b, *]

[a] Laboratoire de Pharmacologie, Pharmacie clinique et Contrôle de qualité des Médicaments, Faculty of Pharmacy, Saint-Joseph University of Beirut, Beirut, Lebanon
[b] Department of Nutrition, Faculty of Pharmacy, Saint-Joseph University of Beirut, Beirut, Lebanon
[c] Department of Nutrition and Health Sciences, Institut Polytechnique LaSalle Beauvais, France
[d] Department of Public Health, Faculty of Medicine, Saint-Joseph University, Beirut, Lebanon
[e] Department of Prosthodontics, Faculty of Dental Medicine, Saint-Joseph University, Beirut, Lebanon

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SUMMARY

Background & aims: Accurate dietary assessment tools are required to ensure that maternal diet supplies all the nutrients needed for fetal development. However, no dietary method could accurately estimate food intake during gestation. Food Frequency Questionnaires (FFQ), frequently used in epidemiological studies, estimate long term nutritional status of the target population. However, it is recommended to create and validate a FFQ compatible with the dietary habits of the studied population, to avoid cultural and social discrepancies.

This study aimed to develop and test the reproducibility and the validity of a semi-quantitative FFQ compatible with the diet of Mediterranean and Middle-Eastern population, in a sample of Lebanese pregnant women.

Methods: 128 women participated in the validation study, while 38 took part in the reproducibility phase, which was repeated in a time frame of 21 days. The FFQ was validated against a 24 h dietary recall (DR).

Results: The intra class correlation coefficient (ICC) ranged from 0.935 for calcium to 0.984 for vitamin D (p value < 0.001), indicating an excellent reproducibility. A satisfactory agreement between the two dietary tools was demonstrated using Bland–Altman plot and Spearman's and Pearson's correlations coefficients which varied between 0.294 for iron to 0.762 for caloric intake (p value < 0.01).

Conclusions: The newly developed FFQ englobing Mediterranean food items was culture specific and assessed the nutrient intake of our population. Administering this tool in future researches will help monitor the nutritional status of pregnant women, aiming at improving maternal and newborn health.

1. Introduction

Adequate food intake during pregnancy is a key factor affecting the health of both the mother and the infant. Along the physiological changes of her body, a pregnant woman faces the challenges of preventing and correcting any existing nutrient deficiency during both the periconceptional phase and pregnancy. This adequacy can only be achieved by a well-balanced diet providing all the necessary nutrients and energy needed for her and the fetus [1].

Strong scientific evidences confirm the impact of maternal diet on neonatal outcomes [2] and the occurrence of growth problems and chronic diseases during childhood [3].

Despite the large number of studies investigating the role of nutrition in pregnancy and neonatal outcome, few valid

* Corresponding author. Laboratoire de Pharmacologie, Pharmacie clinique et Contrôle de qualité des Médicaments, Faculté de pharmacie, Campus des sciences médicales (CSM), Rue de Damas, Université Saint-Joseph, B.P. 11-5076, Riad el Solh, Beirut 1107 2180, Lebanon. Tel.: +961 3 224 449, +961 1 4210 000x6792; fax: +961 1 421 022.
E-mail address: lydia.khabbaz@usj.edu.lb (L.R. Khabbaz).

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questionnaires to assess nutritional status during gestation exist. Hence, to monitor the dietary profile of a selected population, researchers often rely on different tools, each one having its strengths and limitations [4]. Food frequency questionnaires (FFQs) have been designed and used in many epidemiological studies, to assess the nutrient intake of different age groups, healthy or suffering from a disease state or pregnant women [4]. This questionnaire, ideally conducted by a trained dietitian, permits to evaluate the dietary intake of the respondents by asking them to report the frequency of their usual consumption of common food items, from different food groups, over a specified period of time (daily, weekly, or monthly). In addition, depending on the purpose of the study, portion sizes of the components present in the questionnaire can also be specified. In this case, the FFQ is known as a semi quantitative FFQ and permits to capture the usual intake with more precisions. However, this method cannot predict alone the exact composition of nutrients, since it reflects more the habitual diet over a certain period of time [5] and should be matched with dietary records such as recalls, which are more representative and precise [4]. Therefore, in any epidemiological study, a dietary recall should accompany the FFQ to assess the nutritional intake.

Since dietary habits are under the influence of the participants' cultural background [6,7] and because pregnancy is a critical window in a woman's life [1], it is of great interest to develop a valid tool, compatible with the diet of Mediterranean and Middle-eastern population and able to estimate the intake of nutrients in this target population.

Lebanon is a small country on the Eastern shore of the Mediterranean Sea, having dietary food ingredients highly representative of the traditional Mediterranean diet. Lebanese cuisine is composed mainly of cereals, legumes and vegetables, together with fish, meat or poultry and stuffed or blended most often with olive or sesame oil and herbs, to end up with dishes commonly known as “mezze” and “stews”. However, during the last decades, food habits of people living around the Mediterranean basin underwent some mutations, from plant-based traditional Mediterranean meals composed mainly of non-refined cereals, nuts, seeds, vegetables, fruits, olive oil and vegetables-based protein meals to animal-based westernized food patterns, low in fiber, rich in animal proteins and saturated fats [8,9]. The adherence to the Mediterranean diet and the effect of recent culinary mutations on the metabolic syndrome was studied on some population groups, such as Lebanese adults, however the tool used to assess the nutritional status was a 78 item qualitative FFQ of only individual food ingredients, lacking composite dishes and hence not truly representing the local food items [10].

Hence, the aim of this research was the development of a 157 item semi-quantitative FFQ, containing Mediterranean and Middle Eastern food items, designed to capture usual food intake of Lebanese pregnant women, to assess their nutritional status with more precisions and to help researchers in the future to use it in other population subgroups living in the Mediterranean region. The developed tool was tested for reproducibility and validity.

2. Methodology

2.1. Study design

This was a cross-sectional observational study, conducted as a part of a large longitudinal one, aiming to assess the nutritional status of women during pregnancy on neonatal outcomes and on the biochemical measures in both the mother and the offspring.

2.2. Study population

The total number of participants was 128 Lebanese women (103 pregnant and 25 included at day 1 post-partum) aged between 18 and 40 years old, healthy, not suffering from gestational diabetes, preeclampsia, or any other chronic disease affecting their nutritional status. Women with multiple gestations were excluded from participation. Participants were recruited, independently of their weeks of gestation, in private clinics in different geographic districts in the capital Beirut, the regions of Mount Lebanon, the North and the South. The sample size was determined based on the recommendations of professionals in this field confirming that 100 individuals are required to assess the agreement between tools used to evaluate dietary intakes [4,5]. Field work was conducted between January and March 2015 by trained dietitians, by face to face interviews. The study protocol was approved by the Institutional Review Board of Saint-Joseph University at Beirut Lebanon, the Hôtel-Dieu Hospital Ethic Committee (CE 624/FP 49) and the participating gynecologists. All subjects gave their written consent prior to the study.

2.3. Development of the study material

A panel composed of researchers and nutrition instructors developed the questionnaire and held multiple meetings for reviewing and making the necessary adjustments on the final consensual version. At the end of the adaptation, thirty Lebanese women, aged between 18 and 40 years, tested the pre-final version of the study material. The meaning, comprehensibility and acceptability were studied by means of individual interviews.

It was divided into 3 parts. The first one covered socio-demographic characteristics and personal information related to gestational complications, appetite modifications, gastrointestinal problems, smoking and food habits. The indicators used in the first part of the questionnaire dealing with the socioeconomic status were the crowding index (deducted by the interviewer as the total number of co-residents per household, excluding the newborn infant, divided by the total number of rooms, excluding the kitchen and bathrooms), the educational level, and the work status. A crowding index more than one, suggested a household with restricted economic resources. In this study, education was measured as a categorical variable and participants had to choose between six categories (primary, intermediate, high school, technical, a bachelor or a master degree). Both the educational level and the crowding index are recommended to be used in epidemiological studies to classify the economic status of the studied population [11].

Personal income was omitted during the statistical analyses, since a large proportion of women declined to confess it during the face to face interview.

Details on gestational weight gain, weeks of gestation, and use of vitamin supplements were copied directly from the medical files, to avoid ending-up with irrelevant data. Body mass index (BMI) was calculated as the ratio of pre-gestational weight (kg) to square of height (m), relying on the anthropometric measures (height, weight) present in the medical file. It was then categorized according to the WHO cut-off points (underweight <18.5, normal 18.5–24.9, overweight 25–29.9 and obese >30) [12].

The third part of the questionnaire dealt with the development of a semi-quantitative 157 items FFQ containing Mediterranean foods and Middle Eastern ingredients. It was initially developed in a pilot project, which consisted of recalling the intake of 50 females aged between 18 and 40 years and by compiling all the food items mentioned in their recall. In a second step, the research team reviewed all the food items and added the missing ones, due to

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