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Review Article

National Protocol for the Fourth Round of Assessment of Food Consumption Pattern, Nutrients Intake and Food Security in Iran, Development, Design, and Implementation

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Abstract

National food-consumption surveys are main tools for policymakers to evaluate and design interventions to ensure food and nutrition security and developing a healthy diet. The dominant methodology and rationale of Iran's latest survey in 2016 is discussed in this report. A core scientific team designed the questionnaires and field protocols. We hired local nutritionists as members for the operations teams and trained them on the procedures. The sample size was separately determined for each of the 31 provinces including its rural and urban population. The multi-stage cluster sampling method was used for the sampling design. In addition to gather general demographic and socio-economic data, two non-consecutive day recall method was used to obtain food intake data throughout a whole year to capture seasonal variations. The Iranian food composition database served as the basis for calculating energy and nutrient intakes. The forms were filled in by interviewers after interviewing with the household's food manager and sent to the core team after being checked for accuracy. A trained data entry team entered the data using a database specifically developed for this purpose.

We cleaned the data using a prepared protocol and analyzed the data to report consumption data as gram/day/capita and also the distribution across urban/rural and 5 quintiles of the socio-economic status

Keywords: Diet Quality; Food Consumption; Food Security; National Survey; Nutrients Adequacy

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Introduction

Since the 1960s, Iran has conducted four rounds of national food consumption and nutritional status surveys in 1961, 1991, 2000 and 2018 [1,2]. The data derived from food consumption national surveys are employed by multiple national agencies, particularly regulatory agencies, nutrition and health communities, the industry, agricultural department, and legislative bodies. These data provide information about food and nutrient intakes adequacy and food consumption trends in the country (which comprises of quantitative and qualitative assessments of the actual diet, nutrient deficiency or excess intake, prevalence of overweight and obesity, potential harmful chemical substances [3-7].

The data serves as a basis for monitoring food supply and security, predicting the safety aspects and economic implications of changes in food use, and ongoing evaluation and monitoring of programs and interventions in different sectors [3-8]. Additionally, the health department uses the data to identify significant pockets of undernutrition and micronutrient deficiencies among the population to implement targeted actions for their relief. Setting Covid-19 pandemic aside, the decline in the prevalence of infectious diseases in the last century has led to dramatic improvements in living conditions, education quality and the life expectancy giving rise to the high incidence of Non-Communicable Diseases (NCDs) and obesity. As diet-related risk factors play an important role in NCDs incidence Food Consumption Survey (FCS) data is crucial for tackling these diseases [9-12].

As conducting the survey needs many resources, and the information is used by different sectors, it is necessary to convene a multisectoral team made up of both implementers and end users. This team will in the first instance:

- Define objectives, research questions and priority areas with users and funders in mind

- Determine what information the potential users and funders need

- Ensure that users and funders are committed to the project from designing the study to publishing and using the data and feel a sense of ownership from the beginning to the end.

Within the team itself, it is useful to have a smaller team consisting of experts in design and conduct of national surveys and food intake methods. In Iran the main stakeholders are:

- Ministry of Health

- Ministry of Agriculture

- Department of Commerce

- Management and Planning Organization

- International organizations including FAO and WHO

- Scientific bodies like universities and research centers

The National Nutrition and Food Technology Research Institute has traditionally been the focal point of the surveys in Iran since 1961 [13] continuously serving as the host for different authorities and stakeholders to design and execute FCS with growing confidence and accumulating valuable experience and expertise.

The first survey was conducted in 1961 with the collaboration of FAO in ten provinces of Iran. 1247 households (288 rural, 959 urban) were studied using food weighing and a 5-day food recall method.

The second survey in 1991 covered 5543 households (3230 urban, 2313 rural), and a combination of 24-hour dietary recall and weighing method for 3 consecutive days was used for data collection [1].

In 2000, the food consumption survey was carried out on 8158 households (4662 urban, 2496 rural) using 24-hour dietary recall for 3 consecutive days and weighing the major food sources of energy supply. A two week national workshop on food consumption methods and interview techniques were held in Tehran, and nutritionists and health officers from all provinces participated to master the required field skills to conduct the survey. Hence, in addition to capacity building in the provinces for future research, local trained nutritionists carried out the in house interviews to overcome the problem of multiple different spoken languages and dialects across the country [2].

In the most recent FCS in 2018 we used an individual food recall for the first time in addition to the household food recall. 8200 households (6100 urban, 2100 rural) were surveyed across the country using 24-hour dietary recall and food weighing for 2 non consecutive days. The core investigators trained local nutritionists through online workshops.

All the surveys collected data on anthropometric measurements of all the household members and socio-economic status.

The 2018 survey targeted the following objectives:

- Determining the mean intakes (purchased and consumed) in individuals (gram/day) and household (per capita)

- Estimating the mean energy, macro and micronutrients intakes in individuals and household

- Estimating the mean energy and protein requirements for different age and sex groups among individuals of a defined gender, age, weight, height and level of physical activities (based on FAO/WHO methods)

- Estimating the energy and nutrients intakes adequacy ratio (NAR) and the Mean Adequacy Ratio (MAR) in individuals and households

- Identifying meal patterns at household and individuals levels

- Determining the food diversity scores at household and individuals levels

- Determining the mean height and weight by sex and age groups

- Determining the distribution of households demographic and socio-economic status

Practical objects

- Identifying populations and groups who are at risk of food insecurity

- Monitoring trends in dietary patterns

- Developing food-based dietary guidelines, optimal food basket and educational tools

- Investigating nutrition-disease relationships

- Estimating exposure to contaminants

- Monitoring and modifying policies and plans in food and nutrition sectors

- Policy planning, action plans and also resource allocation in food and nutrition to harmonize production, distribution, supply and consumption to meet the nutrients requirements [14].

Statistical design

The survey population consisted of Iranian urban and rural households in 31 provinces. The public administration in Iran is organized as 31 provinces among which a large variation consists in terms of ethnic, cultural, economic, geographic, and climate characteristics. To capture this variation, the sample households were independently recruited in each province with a corresponding calculated sample size. In reporting the data at national level, proper weights are given to the provinces according to their population reported in the most recent census (2016) [15].

The standard random multi-stage cluster sampling method is developed specifically for FCS sampling design by Iran Census Center. Each cluster included four households. According to the sample size in each province, maps and addresses of randomly selected urban and rural dwelling blocks are obtained. All the local supervisors were trained by an expert from Iran Census Center to randomly choose four households from each cluster (block). We provided a printed protocol on the method, how to deal with non-response, and other issues that might arise in the field. A day before to the actual interview, the team leader would identify the sample households in each cluster and give them a letter from local authorities indicating the importance of the survey. Families received a printed description of the study when asked to give written consent. We carried out the interviews in all four seasons, on all weekdays and a proportion of weekends.

To determine the sample size, the mean and standard deviation of energy intake from 2000 FCS were used (2636 ± 250 Kcal/day/per capita). Considering 95% confidence interval and an acceptable error of 50 Kcal in estimating the average energy intake, the minimum sample size required for each province is:

$$N = ((1.96*250)/50)^2$$

$$N = 96$$

As we used cluster sampling, we multiplied the number is multiplied by a design effect of two. Several characteristics are also taken into account to optimize the sample size in each province to capture inherent variations like metropolitan region, very large province area, different ethnic and cultural groups living there, and if there were operational obstacles to carry out the survey with the minimum sample size.

Data Collection Methods

We used a two non-consecutive-day dietary recall method at both household and individual levels. To be confident about the ingredient of each dish, we needed to include the household as in Iran more than 90% of the food (on average) is eaten at home in composite dishes.

Trained and experienced interviewers collected all the data in an effort to ensure consistency in data collection and reduce inter- and intra-rater variation. The interview team reached the selected sample household on the agreed date. They were asked to show ID cards and have a brief introduction before being permitted to enter the house. In addition, informed consent was obtained from all households involved in the study. In each household, the person in charge of preparing the food and cooking answered the questions. The study was approved by the Research Council and Institutional Ethics Committee of National Nutrition and Food Technology Research Institute (protocol code: IR.SBMU.NNFTRI.REC.1396.149; DATE: 25.09.2017).

Household Survey Component

The interview started with the inquiry of the demographic characteristics for the household members. Then the interviewer explained the food recall method and asked the person to fully describe what had been prepared, cooked, and eaten in the previous day from early in the morning after waking up. The interviewer asked the respondent to remember all the food items and helped the interviewee to estimate the amount using household utensils and or using their hand to show how much they had used from different food items. If still available in the household, the interviewer weighed the item that the respondent estimated to have used. As bread is the staple food in Iran, the interviewer explicitly asked if any bread had also been eaten for each meal time being reported.

A structured questionnaire including three main meals, breakfast, lunch and dinner and three snacks consumed in between the main meals was designed to precisely collect the food eaten during the previous day. The interviewer recorded the main dish name for each meal, and then asked what and how much of a food item was used to cook the dish. Two more questions were necessary to complete the recall: 1) how many persons were present at the mealtime, whether any member was absent or any guests were present; 2) if the whole prepared dish was consumed or some portion of the dish has remained. The interviewer was trained to ask further questions (if necessary) to help the respondent remember if any other food items or side dishes was also consumed.

Individual Intake Component

For the individual survey we decided to interview the same person who was was responsible for preparing and cooking. After finishing the household recall, the interviewer explained about the individual recall and started the questions. As the person had already named all the foods consumed on the previous day at household level, this part usually was quick and straightforward. We asked them to just tell how much they had eaten from the different dishes and food items. Foods eaten out of home were also recorded at individual level.

A small part of the interview was allocated to measuring the usual scales used in each household for cooking specific food items including rice, legumes, cooking oils, salt and also packages of meet or vegetables if available. For example, the specific tool used for measuring rice was examined and used once to weigh the rice content. We also weighed the main containers of sugar, salt, and cooking oil. When the team went back for the second day interview, they weighed the content of these containers again to find out the amount used in the period between the first and second measurement [16]. We asked further questions on unusual events that had probably happened in the period, like having a big party or lending some of these items to others.

Anthropometry

After completing the individual recall, the weight (kg), height (cm) and waist circumference (cm) of the respondents were measured following the standardized protocol. Weight was measured by Seca digital personal weighing scales (200 kgX0.1 kg) to the nearest 0.1 kg. Height was measured to the nearest 0.5 cm with a portable stadiometer (SECA). Body Mass Index (BMI) was calculated from weight and height measurements (kg/m^2).

Physical Activity

Next was the part on the physical activity of the same respondent using the Persian version of International Physical Activity Questionnaire (IPAQ) (the long form) [17]. The study conducted by verified the questionnaire's validity and reliability [18]. The long form of IPAQ asks detailed questions about walking and physical activity (in three levels of low, moderate, and high intensity) in any of the four domains below:

a. Work-related physical activity

b. Transport-related physical activity

c. Domestic and gardening (yard) activities

d. Leisure time physical activity

Socio Economic Status

At the final step the interviewer asked questions on the main assets of the household like cars, motorbikes, refrigerator, freezer, television, computer, and internet. We also asked about the area of their dwelling, and whether it was an owned or a rental property.

Nutrient Contents of Foods

Since 1980, we have an Iranian food composition table which has been regularly updated and expanded. The latest version includes 494 food items for which the macronutrients and the most important micronutrients are directly analyzed and reported [18]. However, for foods that were not included in the Iranian food composition

database, the USDA nutrient databank [19], Euro fir nutrient database [20], Dutch Food Composition data [21], Australian food composition database [22] are used for compilation of nutrients content of those foods that were not included in the Iranian food composition database.

Quality Assurance and Data Processing

We held two separate workshops for all the interviewers, supervisors, and administrators. All the participants were provided with printed copies of the questionnaires and operations manual. During the workshop, we read through the questionnaire all together and explained the ambiguities participants raised. We explained all the steps to be taken including finding the sample block, determining the households in the block and making an appointment with them. The scope and application of required skills for the interviews, especially the household and individual recalls, were demonstrated by experienced investigators through role playing. The interviewers themselves were nutritionists working in local health facilities and could speak the native language or dialect of their own province. As they could also speak the official Persian language the questionnaires were not translated. The teams were also provided with food code books by which they needed to properly assign a universal code to the foods. This code book was developed based on our previous food surveys. We knew almost all the potential main dishes and food items consumed by the population. In case an interviewer happened to encounter a food that was not included in our code book, they were asked to contact the national core team. We would then assign a code to that food and let all the teams know about it.

All the teams were provided with identical kitchen scales (5kgX-1gr), Seca digital personal weighing scales and portable stadiometers (SECA). We did our best to make the teams' set of skills uniform so that they could execute the procedures similarly. The core team was readily available to be reached by all the teams during all field operations. We also test piloted all the procedures prior to the actual field work to evaluate the practical aspects of our methods and equipment.

The operation team in each province consisted of a Provincial Supervisor (PS) who was the director of nutrition department, some County Supervisors (CS), and two members of the interview team. A member of the core team also supervised several provinces. The province and county supervisors planned the whole operation in the provinces with the provision of the resources needed.

We asked the local authorities to introduce the survey on all available media, especially through the local TV network. At the beginning of the field work, we also broadcasted a 30 minute TV show in the national TV networks where one of the principal investigators explained the survey to the audience asking for the cooperation of the people. These activities were intended to raise public awareness and facilitate the rapport between the interviewers and the households.

The interviewers showed up at the appointment and performed the interview and the measurements. In the same evening they went through the questionnaires and checked for missing data or any probable errors. If necessary, they contacted the respondent by phone to make amendments. If there was a problem, they might contact their supervisors to solve the issue. The interviewers also were responsible for assigning proper codes to all the dishes and food items recorded on the forms. The county and province supervisors randomly checked 10% of the questionnaires.

As the interviews were to be carried out across all four seasons, after finishing the sample share of each season, the PS sent all the finished forms to the core team. At this point, we had trained nutritionists to fully go through the forms. In addition, in order to find any missing data and probable errors, they also checked if proper codes had been assigned to all food items and made sure that all the portions and amounts reported had been converted to grams.

The data entry started after the national supervisor approved the filled questionnaires. Specific software was developed for data entry. A nutritionist with experience in food consumption data entry was assigned as data entry supervisor, and 20 persons were trained to do the job. The supervisor himself entered 5% of the forms as double entry so that the quality of the data entered could be assessed by cross matching the entered data.

Data Cleaning and Analysis

Once the data entry finished, we started data cleaning. This was done by two of the principal investigators who had previously carried out the task two times in the former national food consumption surveys of 1990 and 2000. We looked at the distribution of the variables, checked for outliers and missing data and did amendments where possible. Using the food codes, we linked the consumption data to the food composition database.

Household Recall

For each meal, we calculated the amount of food eaten by subtracting the remaining amount from the whole cooked meal. We divided this final eaten amount by the number of above one year old persons present at that meal. Hence, for each mealtime, we found out the amount of each food item consumed per capita. By adding all the amounts of the six daily meal and snack times, we estimated the consumed food item amount as gram per day per capita. Doing the same calculations for the second day, we added the amounts and divided them by two (days) to estimate the average daily consumption. As the consumption data tables are already linked to the food composition data, we calculated the amount of energy, macronutrients and micronutrients provided to the person by consumed food.

Individual Recall

The interviewee was the same person for whom we also recorded the individual consumption. She was aware of all the different foods prepared and consumed at home and could report the kind and amount of food she had consumed in detail. For composite dishes, based on the respondent report we added all the similar foods consumed during the day to estimate her consumption pattern.

Physical Activity

Computing the total scores requires multiplying the duration (in minutes) by frequency (days) by Metabolic Equivalent (MET) for all types of activities in all domains to yield a score in MET–minutes/week [16,17].

Socio Economic Status

We planned to categorize the household in five quintiles of socio-economic status. We gathered data on the kind of ownership and area of the house, the main capital housewares available to them, the level of education, current occupation for all adult members of the household, and the region of residence (urban versus rural). Using a

factor analysis method and a varimax rotation, we extracted a dimension on which we could categorize the households into five socio-economic quintiles.

Conflicts of Interest

The authors declare no conflict of interest.

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References

1. Kimiyagar S, Ghaffarpour M, Hormozdiari H, Houshiarrad A (1995) National food consumption in Iran(1990-95). Teran: National Nutrition and Food Technology Research Institute.

2. Kalantari N, Ghaffarpour M, HoushiarRad A, Kianfar H, Bondarianzadeh D, et al. (2005) National Comprehensive Study on Household Food Consumption Pattern and Nutritional Status. Tehran: National nutrition and food technology research institute.

3. Nesbitt A, Majowicz S, Finley R, Marshall B, Pollari F, et al. (2009) High-Risk Food Consumption and Food Safety Practices in a Canadian Community. J Food Prot 72: 2575-2586.

4. Ackers M, Mahon B, Leahy E, Goode B, Damrow T, et al. (1998) An outbreak of Escherichia coli O157: H7 infections associated with leaf lettuce consumption. J Infect Dis 177: 1588-1593.

5. Kim CI, Lee J, Kwon S, Yoon HJ (2015) Total Diet Study: For a Closer-to-real Estimate of Dietary Exposure to Chemical Substances. Toxicol Res 31: 227-240.

6. EFSA/FAO/WHO (2011) Joint guidance of EFSA, WHO and FAO. Towards a harmonised total diet study approach: A guidance document. EFSA J 9: 1-66.

7. Popkin BM, Du S (2003) Dynamics of the Nutrition Transition toward the Animal Foods Sector in China and its Implications: A Worried Perspective. The Journal of Nutrition 133: 3898S-38906S.

8. Lester H (1994) Consumption Data Needs for Food and Agricultural Policy. J Nutr 124: 1853S-1859S.

9. Al-Jawaldeh A, Hammerich A, Doggui R, Engesveen K, Lang K, et al. (2020)Implementation of WHO Recommended Policies and Interventions on Healthy Diet in the Countries of the Eastern Mediterranean Region: From Policy to Action. Nutrients 12: 3700.

10. Akkawi A, Khabsa J, Noubani A, Jamali S, Sibai AM, et al. (2020) Non-communicable diseases research output in the Eastern Mediterranean region: An overview of systematic reviews. BMC medical research methodology 20: 1-10.

11. Couture KA, Sanjur D (1982) Social and Cultural Perspectives in Nutrition. The American Journal of Nursing 82: 1002-1010.

12. Van Weel C, Alnasir F, Farahat T, Usta J, Osman M, et al. (2018) Primary healthcare policy implementation in the Eastern Mediterranean region: Experiences of six countries. Eur J Gen Pract 24: 39-44.

13. Kalantari N, Abdollahi M, Houshiarrad A, Esmaeili M, Ajami M (2018) National Comprehensive Study on Household Food Consumption Pattern and Nutritional Status. National Nutrtion and food technology research institute.

14. https://www.researchgate.net/publication/267932370_Guidelines_for_data_processing_and_analysis_of_the_International_Physical_Activity_Questionnaire_IPAQ2005_URL_httpwwwIPAQkise

15. Vasheghani-Farahani A, Tahmasbi M, Asheri H, Ashraf H, Nedjat S, et al (2011) Last 7-day, long form of the International Physical Activity Questionnaire:Translation and validation study. Asian J Sports Med 2: 106-116.

16. Esmaeili M, Houshiarrad A (2017) Iranian Food Composition Table. Tehran: National Nutrtion and Food Technology Research Institute 450.

17. https://data.nal.usda.gov/dataset/composition-foods-raw-processed-prepared-usda-national-nutrient-database-standard-reference-release-28-0

18. Esmaeili M, Houshiarrad A (2010) Iranian Food Composition Table. Tehran: National Nutrtion and Food Technology Research Institute 7: 450.

19. https://www.ars.usda.gov/northeast-area/beltsville-md-bhnrc/beltsville-human-nutrition-research-center/methods-and-application-of-food-composition-laboratory/mafcl-site-pages/sr11-sr28/.

20. https://www.eurofir.org/food-information/food-composition-databases/.

21. https://www.rivm.nl/en/dutch-food-composition-database.

22. https://www.foodstandards.gov.au/Pages/default.aspx.

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