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ORIGINAL ARTICLE

VALIDATION OF CONCEPTUAL AND METHODOLOGICAL FRAMEWORK FOR THE STUDY OF DIETARY PRACTICES AND NUTRITIONAL STATUS OF AN ADULT POPULATION

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ABSTRACT

Background. The use of validated and reliable methods and instruments is necessary to study dietary practices and nutritional status due to their direct impacts on population health.

Objective. The aim is the validity and reliability of the conceptual and methodological framework of research on factors associated with dietary practices and nutritional status (FADPNS), carried out on adult population of the Rabat-Salé-Kenitra region in Morocco.

Material and methods. First, we developed a conceptual and methodological framework for research on FADPNS, which aimed to study dietary practices, nutritional status, and the factors associated with them in an adult Moroccan population. Then, we studied the validity and reliability of this framework in three phases. Phase 1 focused on the validation of the content of the conceptual and methodological framework, Phase 2 focused on the study by an expert committee of the internal consistency validity (ICV) of the questionnaires used in this research , and Phase 3 consisted of the study of the reliability of the items questionnaires by the test of Cronbach Alpha.

Results. Thus, the validated content of the conceptual framework of research on FADPNS includes socio-demographic, socio-economic, and socio-cultural characteristics; health status; physical activity, places of food purchase; food preparation, taking of meals, family commensality; social representations of good dietary practices; food consumption; and nutritional status. The questionnaires used in this research received an ICV score of 85%. The reliability test of the questionnaires showed a Cronbach Alpha value ≥ 0.5, which turned out to vary from "moderate" to "excellent".

Conclusion. This work enabled the validation of the conceptual framework and the methodology of the study of the factors associated with dietary practices and nutritional status in the RSK region.

Key words: *validity, reliability, conceptual and methodological framework, dietary practices, nutritional status, Morocco*

INTRODUCTION

Eating behavior refers to the physiological, psychological, and social aspects of food intake and also to the social representations of dietary practices [1]. In general, these practices encompass food purchases, processing, preparation, and consumption that affect an individual's health while being dependent on social, spatial, and cultural diversity [2]. The different dietary practices, their repercussions on nutritional status, and their determinants are presented below. First of all, food purchases from traditional or modern markets contribute to determining the type of food consumed and thus convey cultural values [3]. For the cooking methods, although they have the advantage of making food healthier by destroying all or part of the thermosensitive flora and eliminating many toxins, they could have an adverse effect on health if they are not well chosen [4]. In addition, the various cooking methods take different preparation times, which, the longer they are, the better the nutritional quality of the meal, since a long meal preparation time is generally associated with the use of primary foods with low reliance on processed foods that are predominantly high in calories, fat, and sodium [5]. Also, it is recommended to have regular meals, with a frequency of three main meals and two to three healthy snacks per day [6]. Nevertheless, the intake of snacks must be in line with the nutritional needs and specificities of each individual [7]. In addition, spending more time on meals has been associated with lower energy intake [8]. Regarding commensality and, more precisely,

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eating meals with the family, it has been associated with healthier eating habits [1]. It is evident that the pleasure of eating is important, but that of sharing food with loved ones or with family is also important [9]. Furthermore, eating outside the home, which is emerging globally, is considered a factor associated with the increase of obesity [10]. Similarly, the frequency of eating out-of-home meals and the quality of the food preparations served in various restaurants influence the nutritional status [11]. Moreover, there is a close relationship between consumers and their environment, both physical and social. In particular, the place where meals are taken is one of the physical factors involved in this relationship [12]. Besides, since the nutritional intakes defined by the type of food consumption represent a pillar of dietary practices, it is necessary to ensure adequate intakes of energy, nutrients, micronutrients, dietary fiber, and water [13]. In addition, several models of dietary behaviour have demonstrated an association of eating practices and behaviours with the representations made of them [14], with personal factors (gender, age, etc.), socio-cultural factors (family, social groups, norms and values), economic and political factors (income, budget coefficient, regulation), incentives (advertising, society), food product availability and the context of consumption [15].

Taking into account the literature cited above and in the absence of an established theory on our research topic, we have developed a conceptual frame of reference, which is a logical structure composed of variables brought together because of their relationship to the subject under study [16] (Figure 1). Furthermore, since dietary practices are essential for determining health status, they should be studied using reliable instruments. Therefore, the objective here is to study the validity and reliability of the conceptual and methodological framework developed for the research conducted in the adult population of the region of Rabat-Salé-Kenitra (RSK) in Morocco, on the factors associated with dietary practices and nutritional status (FADPNS). This work aims to validate the terms of reference and the methodology of the FADPNS research for the publication of its results.

MATERIALS AND METHODS

Sampling method

The FADPNS research, which is being validated in this article, began in 2018 and was completed in 2022. It affected 507 households[1] in urban and rural areas of the RSK region in Morocco, including the prefectures of Rabat, Salé, Skhirate-Temara, and the provinces of Kenitra, Khemisset, Sidi Kassem and Sidi Slimane.

Two adults were recruited from each household. The former has a primary role and the latter has a secondary role in food purchases and meal preparation. Thus, two groups were formed. Group 1 is called «household representatives» and group 2 is called «study population». Data of household food purchases and meal preparation were collected from «household representatives» while data on meal intake, health status, physical activity, dietary intake, and nutritional status were collected from the «study population».

The recruitment of two members per household on the condition that at least one member has information on food purchases and meal preparation was essential for this study. On the one hand, it ensured answers to questions about this component of food practices since not all household members necessarily have this information, and on the other hand, it has made it possible to have a population where women and men are represented, thus promoting the study of food practices and nutritional status in both sexes. Indeed, in this type of study, there is a risk that the researcher will end up with an entirely female population since the preparation of meals is generally done by women [17, 18, 19].

Inclusion and exclusion criteria

The inclusion criteria common to household representatives and the population studied is that they must be over the age of 18 and be Arabic-speaking (regardless of ethnicity). Indeed, the methodology was developed and tested in dialectal Arabic. As a criterion of inclusion specific to household representatives, we have retained the fact that they have all the information on food purchases and the preparation of meals adopted in their households. As a specific exclusion criterion for the study population, we have retained pregnancy status as it affects anthropometric measurements.

Data collection

To ensure triangulation of data collection methods, we developed three questionnaires, a food history guide, and a food frequency. In addition, we used the Marshal questionnaire for physical activity assessment as well as clinically valid equipment for blood pressure, heart rate, anthropometry, and body composition measurements.

The questionnaire 1 was developed to collect general data from household representatives common to household members, in particular socio-demographic, socio-economic, and socio-cultural characteristics, food purchases, and meal preparation (cooking methods, frequency, and duration of meal preparation).

1 Household: is a group of individuals living under the same roof and having common daily expenses, but not necessarily related (HCP of Morocco ; Glossary 2015) ; https://www.hcp.ma/glossary/.

The questionnaire 2 was developed to collect individual data from the study population, specifically socio-demographic characteristics, health status, physical activity, intakes and nutritional status, and meal intake (hours, frequency, locations, meal times, and family relationships).

The questionnaire 3 was developed to collect data on social representations of good dietary practices among household representatives and among the population studied. Indeed, in addition to the interview, it is possible to carry out qualitative surveys with questionnaires and on large samples in order to gather not only the opinions of the respondents but also the organization of their representations [20].

The Food Frequency Guide was developed to collect data on the frequency of consumption of natural and processed foods within households. A closed list of foods that are part of the Moroccan eating habits has been designed, taking into account the development methods of this type of instrument [21].

The Food History Guide was developed to study the food consumption of the study population because it is the most appropriate type of survey to assess subjects' typical eating habits over a given period of time [21]. In addition, an iconographic manual was used to estimate the quantities of food and food preparations consumed [22].

The Marshal questionnaire, which is used to identify subjects who are insufficiently active in primary health care, was selected for the physical activity assessment of the study population [23,24]. We have made sure to adapt the types of sports that appear in it to the Moroccan context.

The OMRON M3 type arm blood pressure monitor has been selected for taking blood pressure and measuring the heart rate of the group of household members. The measurement of blood pressure by this blood pressure monitor is clinically validated according to protocols having international recognition for its use in the general normotensive or hypertensive population [25].

The OMRON BF 214 brand 4-sensor impedance meter was selected for measuring the Body Mass Index (BMI) and body composition in fat mass and muscle mass of the group of household members. It is a medical device using the bioelectric impedance method. This material is validated clinically in accordance with current protocols [26].

Pre-test

The pre-test of the methodology was carried out using a preliminary survey of 20 households in the RSK region. It allowed some questions to be reformulated and readjusted. It also allowed estimating the duration of the questionnaire administration, which was around 40 minutes.

Statistical analysis

The statistical analysis of the results of FADPNS' research was performed by SPSS for Windows (Statistical Package for the Social Sciences) version 21 and Microsoft Office Excel 2007. Microsoft Bilnut version 2.01 was used to calculate the nutritional value of dietary intakes. To determine factors associated with dietary practices and nutritional status, various static tests were used with a threshold of significance: $p < 0.05$.

For the study of internal consistency validity (ICV) of the questionnaires used in FADPNS' research, we have submitted the questionnaires developed above to a committee of experts [27, 28, 29, 30]. In addition, for the study of realibility of those questionnaires we used the Cronbach Alpha test with the following reliability thresholds: 1) Excellent reliability, if $\alpha \geq 0.90$; 2) High reliability, if $0.70 \geq \alpha < 0.90$) ; 3) Moderate reliability, if $0.50 \geq \alpha < 0.70$; and 4) Low reliability if $\alpha < 0{,}50$ [27-30].

Ethical considerations

This study has been authorized by the Wilaya and the Regional Health Directorate of the Rabat-Salé-Kenitra region (RSK). The fundamental ethical principles governing the conduct of the research were respected, including the provision of information to study participants, volunteering, anonymity, confidentiality, and the right to interrupt their participation in the study at any time. In addition, free and informed consent was obtained from the participants before the administration of the questionnaires and the taking of the measurements.

RESULTS

In order to study validity and relialibity of the conceptual and methodological framework of FADPNS research devlopped above, we carried out three phases:

Phase 1. Validation of the content of the conceptual and methodological framework

In this phase, we have submitted the conceptual and methodological framework for evaluation to a committee of experts in nutrition, dietetics, public health, and statistics. The evaluation of the conceptual framework (Figure 1) consisted of studying the relevance and completeness of the concepts and the relationships between them, while the evaluation of the methodological framework (presented above) consisted of studying the relevance of the sampling, data collection methods and materials, items and variables under study, statistical analysis, and ethical considerations.

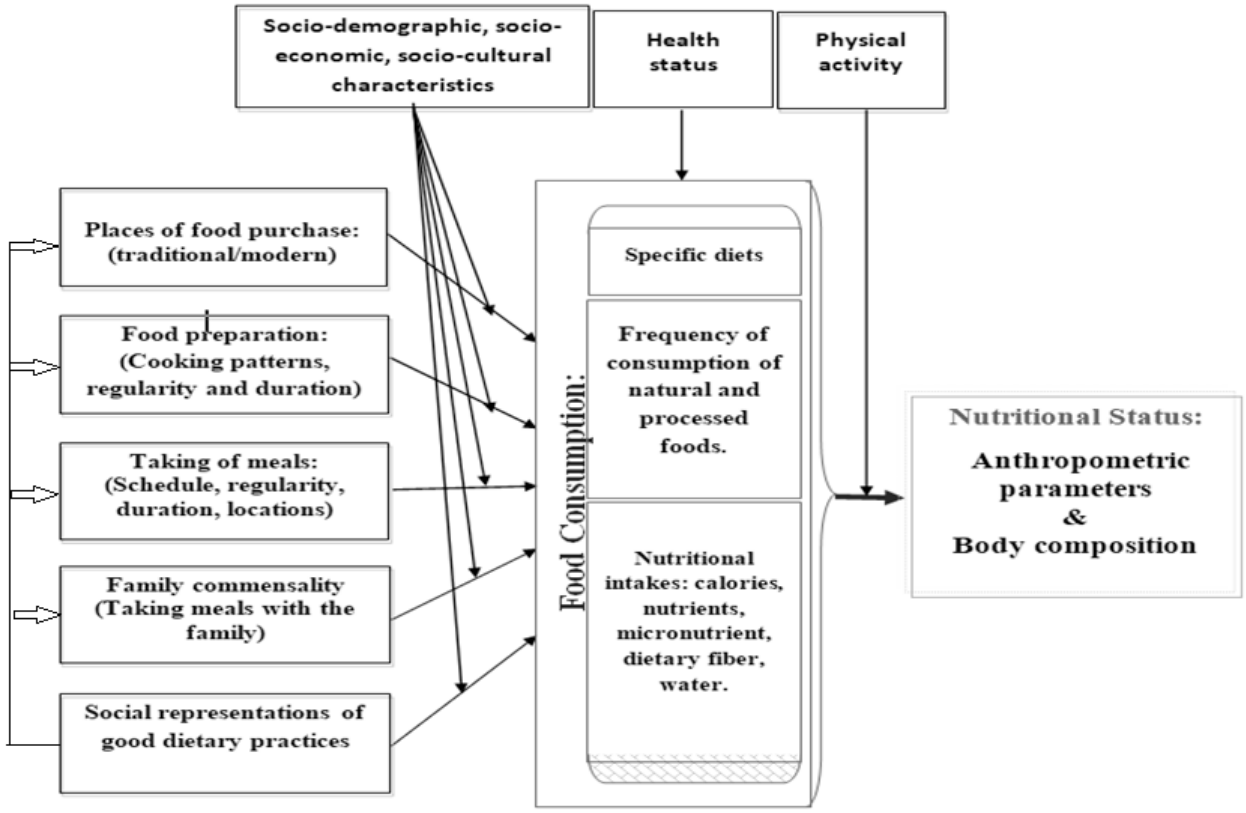

Figure 1. Conceptual Reference framework

Phase 2. Internal Consistency Validity of questionnaires

At the outset, the Committee of Experts allocated to the questionnaires an initial Internal Consistency Validity (ICV) score of 75%. Then, and after incorporating the changes and readjustments proposed by the Expert Committee, this ICV was recalculated and an 85% ICV index was reassigned to the final versions of these questionnaires.

The items retained following the ICV validation of the internal consistency of the questionnaires are presented below:

Items under study in the group of household representatives are sociodemographic, sociocultural, and socioeconomic characteristics studied (age, gender, education level, occupation, marital status, place of residence, geographical origin, ethnic origin, family type[2], household size[3], monthly income, standard of living), overall expenditure and household food expenditure; food shopping places; frequency of natural and processed food consumption; and meal preparation.

The items specific to the study population are: socio-demographic characteristics (age, sex, level of education, occupation, marital status) [15]; nutritional status measured by body mass index [31], waist circumference and hip circumference ratio [32, 33]; body composition in fat and muscle mass [26]; respondents' attitudes towards their perception of their weight status; health status (heart rate [34], blood pressure [35]; reported diseases; specific diets applied; physical activity; meal intake; nutritional intakes [13, 36, 37, 38]); and finally, diversity and dietary variety.

Social representations of good dietary practices have been studied both among household representatives and among the population studied. The items selected are cooking methods; traditional preparations; modern preparations; foods recommended by religion, organic foods; home meals; the use of spices and aromatic plants; palatability (delicious preparations); and the regularity of taking meals. Thus, the participants were asked to choose from the nine proposed items, the three that they felt most characterized (MC) good dietary practices, and then choose from the remaining six items, the three that least characterized (LC) good dietary practices. This results in three non-selected items (NS) for each respondent. A code was assigned to each characterization: code (1) for the least characteristic items, code (2) for the non-selected items, and code (3) for the most characteristic items [20, 39].

2 Family type: A family can be nuclear or extended. A nuclear family is composed of a single nucleus and can be a couple or a single parent, with or without children, or can be a sibling. An extended family includes several nuclei and may also include uncles and aunts, grandparents, cousins, nephews, and grandsons. Glossary 2015; HCP (Morocco); https://www.hcp.ma/glossary/.

3 Household size: the number of people in a household (HCP of Morocco; Glossary 2015; https://www.hcp.ma/glossary/).

Phase 3. Reliability study of the questionnaires

We present below the study of the reliability (by *Cronbach Alpha* test) of the items relating to the sources of food information, the use of places to buy food, the frequency of consumption of natural and processed foods, and the preparation and teaking meals.

The Table 1 shows that the Cronbach's Alpha coefficient is 0.51 for «food information sources», it is 0.54 for «places attendance of food shopping», and it is 0.7 for «preparation of meals».

The Table 2 shows that the *Cronbach's Alpha* coefficient is 0.6 for the items «frequency of natural food consumption» and « frequency of processed food consumption «.

Table 1. Reliabilty of food information sources, places attendance of food shopping, and meals preparation

Items & variables		Categories	Alpha of Cronbach
Food information sources	Parents and grandparents, friends and family, health professionals, the Internet, scientific journals and the media.	1) Yes 2) No	0.51*
Places of food shopping	Food shopping places: markets and souks, large and medium-sized stores, grocery stores (retail locations), wholesalers and outlets for organic and farm food.	1) < 1/w 2) ≥ 1/w	0.54*
	Factors influencing the choice of food shopping places: health, cost, proximity, ease of payment, relationship.	1) Yes 2) No	
Meals preparation	Culinary modes: stewing, steaming, baking, frying and grilling.	1) < 4 /w 2) ≥ 4 /w	0.7**
	Criteria of choice of culinary modes: health, short duration, palatability, traditional appearance.	1) Yes 2) No	
	Frequency of preparation of meals and snacks: breakfast, lunch, dinner, morning, afternoon and evening snacks.	1) < 5 /w 2) ≥ 5 /w	
	Factors influencing the frequency of preparation of meals and snacks: eating habits and culture, health status, availability and expert advice.	1) Yes 2) No	
	Daily meal preparation time.	1) < 3 h/d 2) ≥ 3 h/d	
	Duration of breakfast preparation	1) <30 mn 2) ≥30 mn	
	Duration of lunch preparation	1) < 2 h/d 2) ≥ 2 h/d	
	Duration of afternoon snak preparation	1) <30 mn 2) ≥30 mn	
	Duration of dinner preparation	1) < 1 h 2) ≥ 1 h	
	Factors influencing meal preparation time: lack of time, type of preparation, number of guests	1) Yes 2) No	

*= moderate reliability; **= high reliability; w= week; d= day; h= hour; mn= minute.

Table 2. Reliability of consumption frequency of natural and processed foods

Items & variables		Categories	Alpha of Cronbach
Frequency of natural foods consumption	Whole wheat, barley, fresh vegetables, pulses, fresh fruits, dried fruits rich in carbohydrates such as dates and dried figs, oilseeds (almonds, nuts, peanuts, etc.), fish, olive oil, argan oil, red meat (beef, veal, sheep), farm chicken, farm egg, bulk milk, natural cheese (Jben), whey, curd milk, farm butter, honey and tea.	1) < 3/w 2) ≥ 3/w	0.6*
frequency of processed foods consumption	Refined flours, pasta, pastries, commercial sweet cakes (including pastries), cornflakes, chips, packaged milk, industrial cheese, industrial yogurt, industrial chicken, industrial egg, industrial animal butter, mayonnaise, chocolate, and lemonade and sodas.		

*= moderate reliability; w = week.

The Table 3 shows that the *Cronbach's Alpha* coefficient is 0.5 for the item «taking meals with the family», it is 0.6 for the items «health status and physical activity» and «taking meals away from home», and it is 0.7 for the item «frequency and duration of taking meals».

The Table 4 shows that the *Cronbach's Alpha* coefficient is 0.5 for the items «characterization of foods recommended by the religion» and «characterization of the regularity of meals intake», it is 0.53 for the item «characterization of traditional preparations», it is 0.55 for the item «characterization of organic food», it is 0.6 for the items «characterization of eating at home» and «characterization of palatability», it is 0.7 for the item «characterization of the use of spices and aromatic plants», and it is 0.9 for the items «characterization of cooking methods» and «characterization of modern preparations».

DISCUSSION

The purpose of this article was to study the validity and reliability of the conceptual and methodological framework of the research on factors associated with dietary practices and nutritional status (FADPNS) that we conducted in the adult population of the Rabat region-Salé-Kenitra in Morocco. Certainly, the food consumption and nutritional status of the Moroccan population have been studied by various academic, scientific, and ministerial bodies. However, no previous

Table 3. Reliability of health status, physical activity, and meals intake

Items & variables		Categories	Alpha of Cronbach
Health status and physical activity	Pathologies: hypertension, type 2 diabetes, dyslipidemia	1) Yes 2) No	0.6*
	Specific diets: Hypocaloric, Hypoglucidic, Hypolipidic, Hyposodium	1) Yes 2) No	
	Physical activity	1) Sufficiently active 2) Insufficiently active	
Schedule, frequency, and duration of taking meals	Meal Intake Schedule	1) Régular 2) variable	0.7**
	Frequency of meal intake	1) < 3 meals/d 2) 3 meals/d	
	Factors influencing frequency of meal intake: suitability, expert advice, family habits, lifestyle	1) Yes 2) No	
	Length of time meals and snacks taken	1) < 90 mn 2) ≥ 90 mn	
	Factors influencing Length of time meals and snacks taken: commensality, availability, type of preparation, location of meals	1) Yes 2) No	
Taking meals with the family	Frequency of family meals: breakfast, lunch and dinner	1) ≤ 1 meal/d 2) ≥ 2 meals/d	0.5*
	Factors influencing: culture and traditions, friendliness, economic factor	1) Yes 2) No	
Taking meals away from home	Frequency of out-of-home meals: breakfast, lunch and dinner	1) < 1 /w 2) ≥ 1 /w	0.6*
	Frequency of out-of-home snacks: morning snack, afternoon snack, evening snack	1) < 1 /w 2) ≥ 1 /w	
	Factors contributing to out of home eating: change, obligation and working conditions, new lifestyles and modernization	1) Yes 2) No	
	Places where meals are taken: dairies, tea rooms/cafes/pastries, traditional Moroccan restaurants, fast food restaurants, restaurants offering fish specialties, restaurants with Western/Asian specialties, workplaces	1) < 1 /w 2) ≥ 1 /w	
	Criteria for choosing places to eat meals outside the home: proximity, hygiene, prices, palatability.	1) Yes 2) No	

*= moderate reliability; **= high reliability; w = week; d = day; h = hour; mn = minute.

Table 4. Reliability of social representations of dietary practices

Items & variables	Categories	Alpha of Cronbach
Characterization of cooking methods	1) LC ; 2) NS ; 3) MC	0.9***
Characterisation of traditional preparations	1) LC ; 2) NS ; 3) MC	0.53*
Characterization of modern preparations	1) LC ; 2) NS ; 3) MC	0.9***
Characterisation of foods provided by religion	1) LC ; 2) NS ; 3) MC	0.5*
Characterisation of organic food	1) LC ; 2) NS ; 3) MC	0.55*
Characterisation of home-eating	1) LC ; 2) NS ; 3) MC	0.6*
Characterization of the use of spices and aromatic plants	1) LC ; 2) NS ; 3) MC	0.7**
Characterisation of palatability	1) LC ; 2) NS ; 3) MC	0.6*
Characterisation of the regularity of taking meals	1) LC ; 2) NS ; 3) MC	0.5*

*= moderate reliability; **= high reliability; ***= excellent reliability; LC= least characteristic items; NS = items not selected; MC = most characteristic items

studies have simultaneously examined overall dietary practices, the nutritional status assessed by various anthropometric indicators, and the factors associated with them. The results of this research, which will be published later, have confirmed the concept of «hidden hunger» as an effect of the nutritional transition in Morocco, marked by a double burden of overload and deficiency diseases; and, on the other hand, they have revealed determinants of food practices specific to the Moroccan context on which it is necessary to act to improve the nutritional status of the population.

In order to further the objective of the present work, we have carried out three phases : the study of the validity of the conceptual and methodological framework, the study of the ICV, and the study of the reliability of the questionnaires. The study of the validity of the conceptual and methodological framework of this research was carried out by an expert committee after an evaluation of its content. Indeed, in the absence of an established theory of overall dietary practices, their influences and their consequences, we have developed a conceptual framework that encompasses the different concepts related to the subject under study, food purchases, meal preparation, meals and snacks, family commensality, social representations of good food practices, socio-demographic, socio-economic, and socio-cultural characteristics, health status, physical activity, intakes, and nutritional status [15]. In addition, we developped the methodologycal framework including the sampling method, the data collection process and instruments, the statistical analysis, and ethical considerations [16]. The validity study of the questionnaires used in the research of FADPNS showed a final ICV equal to 85%. This proves that these questionnaires have received a good VCI and therefore are valid for measuring what they were built for [27, 29, 30]. In addition, cronbach's alpha reliability test [27, 28, 29, 30] showed high reliability ($0.70 \leq \alpha < 0.90$) for the item «meal preparation», and moderate reliability ($0.50 \leq \alpha < 0.70$) for items, «food information sources», and «food purchase locations» whereas for «food consumption frequency», this test showed moderate reliability ($0.50 \leq \alpha < 0.70$). Also, this test revealed a high reliability ($0.70 \leq \alpha < 0.90$) for the item « meals intake» and moderate reliability ($0.50 \leq \alpha < 0.70$) for items, «health status and physical activity», «eating with the family», and «eating out-of-home». For the social representations of food practices, this test revealed an excellent reliability ($\alpha \geq 0.90$) for the characterization of «cooking methods» and for «modern preparations», a high reliability ($0.70 \leq \alpha < 0.90$) for the characterization of «use of spices and aromatic plants» and a moderate reliability ($0.50 \leq \alpha < 0.70$) for the characterization of «traditional preparations», «foods recomended by religion», «organic food», «eating at home», «palatability», and «regularity of teaking meals».

However, variables measured by valid equipment for which evaluation standards are available in the literature were not evaluated by the internal consistency study. These factors include heart rate, blood pressure, status, and nutritional intake [13, 26, 31-38]. Similarly, socio-demographic, socioeconomic, and socio-cultural characteristics were inspired by the literature [15] and were not the subject of an internal coherence study.

CONCLUSION

This work enabled the validation of the conceptual framework and the methodology of the study of the factors associated with dietary practices and nutritional status in the RSK region.

Conflicts of interest

The authors declare that they have no conflicts of interest.

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