IS THE 24-HOUR RECALL VALID FOR MEASURING RURAL ALGERIAN WOMEN'S DIETARY INTAKE ?

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ABSTRACT

The aim of the study was to validate the 24-hour recall as a tool for nutrition surveys in Algeria. The reference was the weighing method. The study took place in a rural district of North-Eastern Algeria. The subjects were 50 women of child-bearing age, chosen at random in the district population. The methods, recall and reference, were used to measure food intake over the same two days. We computed differences in paired observations (recall - reference) to detect a level-dependent bias, and a constant bias when the former was absent, and we assessed the precision of the method.

We detected a level-dependent bias for lipid, vitamin A and iron intakes. High lipid intake was markedly underestimated with the recall. For vitamin A and iron, the bias was of small magnitude; it was symmetrical for iron but not for vitamin A. There was no constant bias for energy, protein and carbohydrate intakes. Moreover, for these nutrients, two thirds or more of recall estimates were within ±20% of the reference. The small differential bias in vitamin A intake disappeared once omissions and additions of foods were removed. Bias in the 3rd tertile of lipid intake was mainly due to an underestimation of portion size in fat-rich dishes, and to lesser extent to errors in the amount of fat in recipes.

The 24-hour recall is valid for measuring rural Algerian women's energy, protein and iron intakes but needs to be improved for estimating vitamin A and lipid intake.

INTRODUCTION

In Algeria surveys have been conducted to estimate family food consumption using the weighing method, but individual surveys have never been done in free-living populations.

In the 80's, INA, the National Institute of Agronomy of Algiers, initiated research into nutritional problems, such as protein-energy malnutrition, iron, folate and vitamin A deficiency. No data were available on individual nutrient intakes among vulnerable groups, women in particular.

The objective of this study was to adapt the 24-hour recall and validate it in a population of rural Algerian women of child-bearing age for future descriptive and epidemiological nutrition surveys.

SUBJECTS AND METHODS

Context: the study took place in the rural district of Toudja (North-Eastern Algeria) in the summer of 1994.

Subjects: a random sample of 50 women of child-bearing age (18-45 ys).

Study design: the 24-hour recall (24HR) was compared to the weighing technique (WT) used as the reference (Figure 1).

day 1	Weighing technique	
day 2	Weighing technique	Recall of day 1
day 3		Recall of day 2

Fig. 1: Study design

Coding: for coding composite dishes individual recipes were collected with both methods. Nutrient intakes were computed using a local food composition table compiled for the study.

Analysis: we used the Kruskal-Wallis ANOVA, Wilcoxon rank-sum test, and Spearman rank order correlations. Results are expressed as the mean of the 2 consecutive days of survey (mean ± SE).

Problems with the reference: for 21 women, some meals could not be weighed. Thus validation is based on 90% of group intake. Meals that were not weighed were removed from the 24HR data file.

Mean intakes: when all meals were included, mean intakes estimated with the recall were: energy 1923 ± 93 kcal/d, protein 56.6 ± 2.8 g/d, lipid 53.8 ± 3.3 g/d, CHO 310.5 ± 16.6 g/d, iron 10.2 ± 0.5 mg/d, vitamin A 539 ± 40 mg/d.

RESULTS

Differential bias

There was a differential bias with the 24HR for lipid, vitamin A and iron intakes. High lipid intakes (3rd tertile) were markedly underestimated by the recall (Figure 2). For vitamin A and iron, the bias was of small magnitude. It was symmetrical for iron (« flat slope syndrome »); mean differences relative to mean reference intakes were +1.7%, +4.6%, and -6.7% respectively by tertile. It was not symmetrical for vitamin A (-1.4%, +13.3% and -13.9%). Energy, protein and CHO intakes were estimated without differential bias.

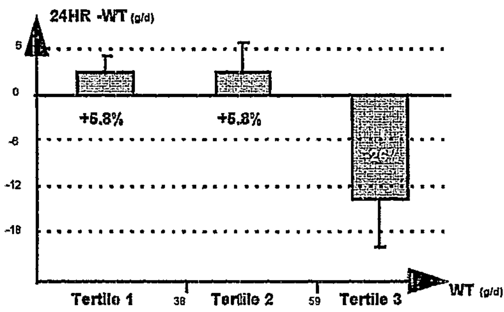

Fig. 2: Differential bias in lipid intakes

Constant bias

There was no constant bias for estimates of energy, protein and CHO intakes (Table 1). The mean difference as a percentage of mean reference intakes was 3.5% for energy, 2.1% for protein, 3.3% for CHO.

Iron intakes were tested for constant bias because the differential bias was small and symmetrical ; there was no significant constant bias (Table 1). The mean difference represented 5.9% of mean reference iron intakes.

Table 1 : Mean differences between methods for energy and nutrient intakes (n=50)

	24HR	WT	mean difference 24HR - WT	P
Energy (kcal/d)	1730 ± 86	1794 ± 82	-63 ± 54	0.25
Protein (g/d)	51.2 ± 2.6	52.3 ± 2.4	-1.1 ± 1.6	0.37
CHO (g/d)	277.6±14.7	287.0±13.6	-9.4 ± 9.5	0.18
Iron (mg/d)	9.5 ± 0.5	10.1 ± 0.5	-0.6 ± 0.3	0.10
Fat (g/d)	49.3 ± 3.1	51.7 ± 3.0	-2.4 ± 2.8	-
Vitamin A (µg/d)	503 ± 40	505 ± 30	-2 ± 30	-

Precision

Table 2 presents standard errors of mean differences expressed as a percentage of mean reference intakes. Standard errors were small for energy, protein, CHO and iron (~3%). They were higher for lipid and vitamin A (> 5%).

Spearman rank order correlations were high for energy, protein and CHO (~0.80), medium for iron and vitamin A (~0.70) and low for lipid (~0.60) (Table 2).

Proportion of subjects correctly classified

The proportion of subjects whose intake was estimated with the recall within ± 20% of their reference intake, which is a summary index of validity and precision, was satisfactory for energy, protein and iron (> 60%), and low for lipid and vitamin A (~40%).

Table 2 : Precision, correlation and classification of intakes (n=50)

	Standard error of mean difference* (%)	Rank correlation	Correctly classified (%)
Energy	3	0.82	70
Protein	3	0.79	66
CHO	3	0.79	66
Iron	3	0.70	64
Lipid	5	0.63	34
Vitamin A	6	0.71	46

*As a percentage of mean reference intakes.

Sources of error for lipid and vitamin A intakes

Three types of error were studied : omissions and additions of foods or dishes, errors in the estimation of portion size, and errors in the estimation of recipes.

Vitamin A intakes

Omissions and additions represented respectively 4.7%, and 4.3% of mean reference intakes. These errors did not depend on the level of intake.

When data were recoded by eliminating foods or dishes omitted and added, the differential bias disappeared; mean differences relative to mean reference intakes were +1.7%, +4.6%, and -6.7% respectively by tertile. There was no constant bias (mean difference 0.1µg).

Lipid intakes

Omissions and additions represented respectively 3.3% and 3.0% of mean reference intakes. These errors did not depend on the level of intake. Overall the mean resulting error was -0.16 g/d, i.e. 6.7% of the mean difference between methods. Omissions and additions were not a major source of error in the estimation of lipid intake.

Mean differences relative to mean reference intakes due to the combination of errors in portion size and recipes were +4.4%, +7.8%,-27.0% respectively by tertile. This was the main source of error in the estimation of lipid intakes (93.3% of total error).

To separate these two sources of error the data were recoded:

- errors in portion size: recall data were recoded using weighed (reference) recipes. Mean differences between methods by tertile represented +1%, -9%, -34% of mean reference intakes.
- errors in recipes: weighed data were recoded using recalled recipes. Mean differences between intakes estimated with recalled and weighed recipes represented 0%, 4%, -18% of weighed intakes.

Errors in both portion size and recipe produced a marked underestimation of high lipid intake. Errors in portion size were more important than errors in recipes (Figure 3).

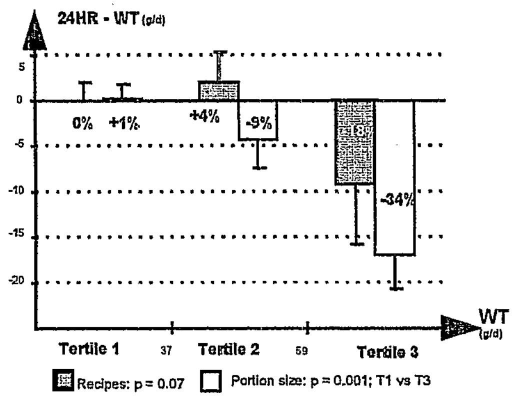

Fig. 3 : Lipid intake: errors in recipes and portion size

Errors in portion size were analysed by type of dish : there was an important underestimation of portion size in lipid-rich dishes (fried vegetables, cakes and cookies).

The main sources of lipids were oil and margarine (53% of lipids). There was a significant underestimation of intake of these foods in the 3rd tertile (-37.5%).

CONCLUSION

The 24-hour recall is valid for estimating rural Algerian women's intakes of energy, protein, CHO and iron.

The method must be improved to estimate lipid and vitamin A intakes. This study suggests specific improvements : 1/ more training of field-workers for the estimation of portion size, 2/ development of more precise household measures and food models and 3/ a sub-study of fat-containing recipes by weighing.

This study provided an assessment of the relative validity of the 24-hour recall and showed how the method should be improved in the specific context of application. This type of validation should be done systematically when a population dietary survey is planned.

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