Research Article

Comparison of 24 h recall and 3-day dietary cycle with 7-day dietary cycle as a tool for dietary assessment at community level in a rural South Indian community: A cross-sectional study

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ABSTRACT

Background: Dietary assessment is important to give nutritional counseling, to monitor ongoing nutritional transition, and to initiate public health policies. However, dietary intake measurement is a challenge, as type of food, portion size, and food habits vary immensely. **Objective:** The objective of the study was to compare 24 h recall and 3-day dietary cycle with 7-day dietary cycle as dietary assessment tool at community level in the rural part of Southern part of India. **Materials and Methods:** It is a community-based cross-sectional study conducted in a rural community of H D Kote Taluk of Mysuru district. Fifty-five houses were selected randomly by lottery method. Medical social workers were trained and data were collected regarding dietary consumption from the households and analyzed using SPSS version 24. **Results:** Descriptive statistics such as mean and standard deviation were used and inferential statistics such as one-way analysis of variance showed a significant difference in the recorded calorie intake by three methods of dietary assessment; $f(2) = 10.109$, $P < 0.00$. Bonferroni *post hoc* revealed significant higher recordings by 24 h recall method (2422.56 ± 1581) compared to 3-day dietary cycle (1462.14 ± 761) and 7-day dietary cycle (1782.97 ± 682.6). No significant statistical difference was noted between 3-day dietary cycle and 7-day dietary cycle. **Conclusion:** Three-day dietary cycle method could replace 7-day dietary cycle method for community-based dietary assessment, as it provides results comparable to the gold standard 7-day dietary assessment method and it is less time consuming, cost effective and ensures better compliance.

KEY WORDS: Dietary Assessment; Comparison; 24 h Recall; Seven-Day Dietary Cycle; Three-Day Dietary Cycle

INTRODUCTION

Nutrition has an important effect on health from pre-pregnancy to old age.[1] India has been witnessing a rapid transformation in the population nutritional profile over the past 20 years. There is an increase in overweight and obesity with a persistent burden of undernutrition.[2] According to the WHO, nearly half of the children under 5 years who were overweight or obese in 2016 lived in Asia.[3] Malnutrition is associated with poor health and poverty while overweight is a risk factor for a wide range of chronic diseases such as type 2 diabetes mellitus, cardiovascular diseases, and certain cancers.[1,2]

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Dietary assessment is important to give appropriate nutritional counseling and interventions at an individual level and to monitor the ongoing nutritional transition and initiate public health policies and guidelines at the population level.[4,5] Subjective methods used for dietary assessment are 24 h dietary recall method, dietary cycle method, dietary history, and food

frequency questionnaire.[6] In India, the National Nutrition Monitoring Bureau and the Indian nutrition profile survey use the 24 h recall method for the assessment of dietary intake.[7]

The 24 h recall method and dietary cycle methods are open-ended surveys and collect detailed information on a variety of food consumed over 24 h period.[6] The 24 h recall method is an in-depth interview which requires around 20–30 min and the chances of recall bias are high.[6,8] In the dietary cycle method, the respondent records the foods and beverages consumed over a period of days usually 3–4 days or 7 consecutive days. Dietary cycle methods are regarded as the gold standard as it is more accurate and actual portion size is provided. Since the food consumed is recorded as and when consumed, the chance of omission and recall bias is also less. Seven-day dietary cycle method has the advantage that since an entire week's diet is noted, the bias related to the variations in diet in certain days of the week can be reduced, and moreover, it gives a picture of the pattern of food consumed in a population.[8,9] However, as more days of records are kept, there is also a higher chance of incomplete records due to lack of motivation among the respondents.[10] With this background, the aim of the present study was to compare 24 h recall method and 3-day dietary cycle with the gold standard 7-day dietary cycle method in a rural community of Mysuru district, Karnataka, and recommend a better dietary assessment tool at community level.

Objectives

The objectives of the study were to compare 24 h recall and 3-day dietary cycle with 7-day dietary cycle as a tool for dietary assessment method at community level in rural part of H D Kote Taluk, Karnataka, India.

MATERIALS AND METHODS

A cross-sectional study was conducted at H D Kote Taluk of Mysuru district. Houses in the village were numbered and 55 houses were selected randomly by lottery method (simple random sampling). Since the medical social workers (MSW) who were trained for the collection of data were limited, we were able to collect data from only 55 households. The Institutional Ethical Committee clearance was obtained at the start of the study. During the process, the exact procedure of dietary assessment was explained to them and informed consent was taken from the head of the households before the start of the study. If any household did not agree to be the participant/or fell into the exclusion criteria of the study, the immediate next house was consented and included. The MSW workers visited the households daily for 7 days and collected data on the dietary intake from the family as a whole. The data were collected in the form of multiple 24 h recall method. During this method, the interviewer asks the respondent to recall the food consumed over the past 24 h starting with the most recent. The respondent is asked for the quantity of the food consumed and also the quantity of the leftover food which was deducted from the total cooked food. The raw ingredients which were used for cooking were also noted. The respondent was asked to show the spoons and cups used to measure the ingredients to get an accurate measurement. Keeping in mind the major disadvantage of 24 h recall method, specific week with no festivities influencing the diet in the form of fasting or feasting was selected for data collection. The collection of data was with the help of a pre-structured questionnaire [Table 1].

Information was also collected regarding the absence of family members, if any of the family members ate outside any day during the survey and if separately food was prepared for children, as these parameters would influence the assessment of dietary intake. Hence, any households reporting such issues were excluded from the study. During the process of data collection, two households dropped out from the study and three were removed from the study due to these households falling into the exclusion criteria during the course of data collection. Hence, data from a total of 50 households were considered for analysis. Data were entered into Microsoft Excel and analysis was done using SPSS V.24. Descriptive statistics such as mean, standard deviation, and proportions were used and inferential statistics such as analysis of variance (ANOVA) was used to compare the means of the calorie intake calculated by 24 h recall, 3-day dietary cycle, and 7-day dietary cycle. *Post hoc* test was done to know which among those groups, the difference in the calorie was significant statistically.

RESULTS

The total number of family members in the households ranged from 2 to 14, 32% were vegetarians by diet and 68% followed mixed dietary practices. Rice and ragi were the staple foods in 80% and 20% of the households, respectively. Total calorie consumed according to 24 h recall was compared with the average of 3-day dietary cycle and average of 7-day dietary cycle [Figure 1]. Mean and standard deviation of calorie consumed according to different dietary assessment methods were calculated [Table 2]. One-way ANOVA showed that there was a significant difference in the recorded calorie intake by the three methods of dietary assessment; $f(2) = 10.109$, $P < 0.00$ [Table 3]. Bonferroni *post hoc* revealed significant higher recordings by 24 h recall method (2422.56 ± 1581) compared to 3-day dietary cycle (1462.14 ± 761) and 7-day dietary cycle (1782.97 ± 682.6). However, there was no statistical difference seen between 3-day dietary cycle and 7-day dietary cycle [Table 4].

DISCUSSION

In the present study, the analysis shows that 3-day dietary cycle method is better than 24 h recall method as a dietary assessment tool.

Table 1: Questionnaire for 24 h recall method

	Time of meal	Rice	Ragi	Roti	Pulses	Dal	Vegetables		Tubers	Sugar	Tea/ coffee	Milk and milk products	Fish/ meat	Egg	Fruits	Others
							Leaf	Others								
Day 1–7	Breakfast															
	Lunch															
	Evening															
	Dinner															
	Total on day 1															

Amount was noted in g/ml

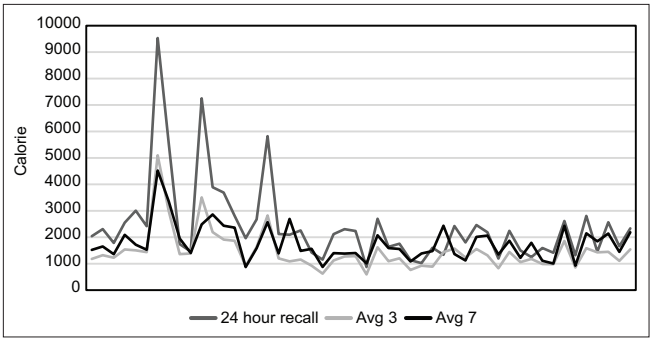

Figure 1: Graph showing difference in calorie (Kcal) consumed as calculated by 24 h recall, 3-day dietary cycle, and 7-day dietary cycle

Many national surveys use 24 h recall method for dietary assessment as it is a good method to assess the usual intake of a larger population and does not require the respondent to be literate.[9] However, 24 h recall method requires the interviewer to be trained in local foods and preparation methods and depends on the ability of the respondent to recall the food and beverage consumed over the past 24 h along with the portion sizes, thus affecting the accuracy of measurement. It is also not ideal to generalize the intake based on a single 24 h recall as the diet varies according to the days of the week.[6,9,10] The present study showed that there is overestimation of calorie intake with the 24 h recall method which was similar to the findings of Fisher *et al*. among infants and toddlers, where the 24 h recall method showed overestimated energy intake among infants by 13% and toddlers by 29%, and the author suggests that this could be due to error in the portion size estimation.[11] Crawford *et al*., in her study among 58 girls aged 9–10 years, found that the percentage absolute error ranged between 19% and 39% for 24 h recall method and 12–22% for 3-day dietary record method. The proportion of missing food (observed item not reported) and phantom foods (reported item not observed) was 30% and 33% for 24 h recall method and 25% and 10% for 3-day dietary record method, which is much lesser compared to the 24 h recall method. The author suggests that compared to 24 h recall, 3-day dietary record is a better method as the food items along with the portion size are noted soon after intake, thereby limiting the chances of recall bias and making the portion size estimation more accurate.[12] However, our study findings differed from those of Savard *et al*., in Canada, where a study among 60 pregnant women recruited from a hospital showed that 24 h recall method is better to assess intake of energy and most nutrients but less accurate for the evaluation of intake of fat. In this study, diet intake was assessed using 3-day food record method and 24 h recall method in each trimester, wherein they have used a web-based 24 h recall method, where the respondent was reminded to fill in the forms through emails and participants also had to watch a mandatory tutorial before doing the 24 h recall method probably making the responses more prompt. The author also reports that the sample size was smaller and all participants were highly educated.[13] Another study done

Table 2: Calorie recordings according to different methods of dietary assessment

Dietary assessment methods	Minimum	Maximum	Mean±Standard deviation
24 h recall	874.75	9530.75	2422.56±1581
3-day dietary cycle	594.82	5097.97	1462.14±761.7
7-day dietary cycle	873.82	4522.38	1782.97±682.6

Table 3: One-way analysis of variance showing a significant statistical difference between the dietary assessment methods

Variables	Sum of squares	df	Mean square	F-value	Significant
Between groups	23,906,640.547	2	11,953,320.273	10.109	0.000
Within groups	173,824,905.272	147	1,182,482.349		
Total	197,731,545.819	149			

Table 4: Comparison between different methods of dietary assessments

Comparison groups	Mean difference	Significant	95% confidence interval	
			Lower bound	Upper bound
24 recall				
3-day dietary cycle	960.415*	0.000	433.74	1487.09
7-day dietary cycle	639.585*	0.011	112.91	1166.26
3-day dietary cycle				
24 h recall	−960.415*	0.000	−1487.09	−433.74
7-day dietary cycle	−320.830	0.427	−847.51	205.85
7-day dietary cycle				
24 h recall	−639.585*	0.011	−1166.26	−112.91
3-day dietary cycle	320.830	0.427	−205.85	847.51

**Post hoc* Bonferroni test

in Sri Lanka by Jayawardena comparing 24 h recall method with 7-day dietary record method, the mean energy was found to be lower with 24 h recall compared to the 7-day dietary weighted food record method and they recommended 7-day food record method. The author also reported that several participants reported difficulty in measuring the food items while using 7-day dietary weighted method and that there was a change in pattern of food intake by omitting food items to reduce the burden of measuring the item.[4] Considering the above aspects, since in our study, we found that there was no statistical difference in calorie intake recorded by 3-day dietary cycle method and 7-day dietary cycle method, we suggest that 3-day dietary cycle method could replace 7-day dietary cycle method which consumes more time, workforce and requires better compliance of the study participants.

Major strength of the study is that it forms a preliminary study comparing dietary assessment methods adaptable at the rural community which is novel. An important limitation is that the sample size is small and assessment of micro-nutrients was not done.

CONCLUSION

Adopting 3-day dietary cycle method as a dietary assessment method in the field would save on expenditure and make the assessment easier, reliable, and compliant and provide results comparable to the gold standard 7-day dietary assessment method in Indian scenario specifically in rural setting.

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