

Study of dietary intake of micro and macronutrients and comparison with the Recommended Daily Allowance (RDA)

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Abstract

Introduction: For the prevention of symptoms of deficiency and to maintain satisfactory level of the nutrient in the body, consumption of nutrients as per Recommended Daily Allowance (RDA) is very important.

Aims and Objectives: To evaluate the level of micro and macro nutrients consumption among the study participants and their comparison with the current RDA recommendation.

Materials and Methods: Five hundred and two patients and their attendants visiting the OPD of Diabetes, Obesity & Thyroid Center, Gwalior, Madhya Pradesh for their routine follow ups were studied. Sociodemographic details including age, sex, height and weight were recorded. Dietary recall of two days was taken on a predesigned proforma. Details of the intake of various macronutrients and micronutrients were estimated by Dietcal software.

Results: Mean age of study participants was 44.51 ± 12.53 years with male preponderance (51.8%). Females were found to consume less macronutrients ($p < 0.001$) compared to males. In overall population, consumption of vitamin B12, iron, zinc and magnesium was 98.75%, 37.415, 45.5% and 8.07% lower than the RDA whereas participants were consuming 155.27% more selenium than the RDA. Carbohydrate consumption was also 50.04% more than the RDA whereas consumption of protein was 37.53% lesser than the RDA. In present study participants were taking too much fat which was more than 115% than the RDA.

Conclusion: Present study population had lower amount of protein, higher amount of fats and carbohydrates intake; micronutrients intake was also very low as compared to RDA.

Keywords: Recommended daily allowance, Nutritional deficiency, India, macronutrients, Micronutrients.

Introduction

Indian Council of Medical Research is responsible for revising requirements of nutrients and recommended dietary allowances (RDAs) periodically. This provide guidance to population and help in making policy related to nutrients requirements conforming a healthy population.¹

There is a difference between the nutrient requirement of any individual and dietary allowances of the population. Requirements of nutrients depends on individual's age, sex, weight of the body and physiological and metabolic status however, dietary allowances contemplate individual variation within the group, effect of processing and bioavailability of the nutrient from the diet and diet quality.²

In Indian population, micronutrient malnutrition is a common and serious problem. Reports of National Nutrition Monitoring Bureau is alarming as intake of micronutrient of 70% of the Indian population is less than 50% of the RDA.³ Micronutrient malnutrition can lead to high morbidity and mortality.⁴

There is an immediate need to control micronutrient malnutrition on a priority basis. However, balanced consumption of macronutrients (carbohydrates, protein and fats) is also important for the prevention of chronic diseases such as diabetes and cardio vascular diseases. Hence in present study we tried to evaluate the dietary intake of both micro and macronutrients and comparing their level with the current available RDA.

Materials and Methods

Present prospective study was performed on 502 patients coming to OPD of Diabetes, Obesity & Thyroid Center, Gwalior, Madhya Pradesh for their routine follow ups.

After recording sociodemographic details including age, sex, height and weight, details of two days dietary recall was obtained from each participant and recorded in a predesigned proforma. Details of dietary recall were entered in the Dietcal software to obtain the daily consumption of various macronutrients and micronutrients. Daily intake of various macro and micronutrients were compared with Recommended Dietary Allowance (RDA) proposed by the ICMR Expert Committee.

All the data analysis was performed using IBM SPSS ver. 20 software. Descriptive analysis was performed to obtain the baseline characteristics of the participants. Frequency distribution and Cross tabulation was performed to prepare the tables. Quantitative data is expressed as mean and standard deviation whereas categorical data is expressed as percentage. Means were compared using independent sample t test and p value of < 0.05 was kept as significant.

Results

Majority of the participants were male (51.8%) and had age between 31-40 years (26.5%) followed by 41-50 years (25.5%) and 51-60 years (23.5%). Mean age of study cohort was 44.51 ± 12.53 years. Out of 502 participants, 115 (22.9%) were overweight and 308(61.4%) were obese. Mean BMI was 26.90 ± 4.93 kg/m².

Table 1: Mean Nutrition intake by the study participants

| Nutrients | N | Minimum | Maximum | Mean | Std. Deviation |
|--------------|-----|---------|---------|--------|----------------|
| Protein | 502 | 15.37 | 87.79 | 37.48 | 11.52 |
| Total Fat | 502 | 13.72 | 149.52 | 53.60 | 19.77 |
| Carbohydrate | 502 | 90.00 | 369.42 | 195.05 | 56.89 |
| Calcium | 502 | 84.97 | 1061.34 | 420.56 | 171.96 |
| Copper | 502 | .48 | 2.51 | 1.27 | 0.34 |
| Iron | 502 | 2.96 | 21.18 | 10.64 | 2.86 |
| Magnesium | 502 | 111.96 | 641.47 | 312.53 | 89.27 |
| Selenium | 502 | 5.19 | 226.16 | 91.90 | 33.61 |
| Zinc | 502 | 2.16 | 13.81 | 6.54 | 1.87 |
| Vitamin B12 | 101 | .00 | .47 | 0.03 | 0.06 |

On performing ANOVA between age group and nutrition it was revealed that calcium level was significantly lower among the old age groups (61-70 years) and those having 31-40 years of age ($p < 0.001$). However, we did not find any association of age with any of the nutrients level. No significant association was found between BMI groups and nutrients received by the subjects ($p > 0.05$).

Table 2: Comparing nutrition among the genders

| Nutrients | Female | Male | P value |
|--------------|---------------|---------------|---------|
| Protein | 33.14±9.89 | 39.45±11.77 | <0.001 |
| Total fat | 48.14±16.74 | 54.77±21.57 | 0.002 |
| Carbohydrate | 174.1±51.12 | 206.94±58.92 | <0.001 |
| Calcium | 394.45±155.23 | 428.21±183.18 | 0.075 |
| Copper | 1.13±0.29 | 1.35±0.37 | <0.001 |
| Iron | 9.37±2.44 | 11.22±3.00 | <0.001 |
| Magnesium | 274.38±71.45 | 331.60±96.65 | <0.001 |
| Selenium | 77.64±27.15 | 99.87±35.28 | <0.001 |
| Zinc | 5.73±1.53 | 6.99±2.01 | <0.001 |
| Vitamin B12 | 0.043±0.09 | 0.36±0.07 | 0.723 |

Table 3: Comparing daily intake of nutrients with the RDA among subjects

| Nutrients | RDA | Mean | Percentage |
|--------------|-----------|---------------|------------|
| Protein | 60 | 37.48±11.52 | -37.53 |
| Total Fat | 25 | 53.60±19.77 | +114.4 |
| Carbohydrate | 130 g/day | 195.05±56.89 | +50.04 |
| Calcium | 800-1000 | 420.56±171.96 | -53.27 |
| Copper | 1.7 | 1.27±0.34 | -25.27 |
| Iron | 17 | 10.64±2.86 | -37.41 |
| Magnesium | 340 | 312.53±89.27 | -8.07 |
| Selenium | 36 | 91.90±33.61 | +155.27 |
| Zinc | 12 | 6.54±1.87 | -45.5 |
| Vitamin B12 | 2.4 | 0.03±0.06 | -98.75 |

Discussion

Consumption of sufficient nutrition as recommended by the RDA is an important issue in order to improve the health status and to prevent the non-communicable diseases in developing countries.⁵

In present study, females were found to consume less nutrients as compared to males in their diet ($p < 0.001$) which means females are malnourished as compared to males in the present study.

In present series iron intake was 37.415 lower than the RDA. In line with present series, a study from Iran by Azadbakht et al including 289 healthy female revealed that

Iron intake was 76% lower as compared to RDA.⁶ In present study, intake of calcium was 53.27% lesser than the RDA. A study from Iran however, reported very high deficiency of calcium where women were taking only 10% of the RDA.⁶ In present study participants were consuming 155.27% more Selenium than the RDA. In line with present study Daily selenium intakes of Isfahanian female youths was also 126% more than the RDA.⁶ Consumption of Vitamin B12 was very low in present study which was 98.75% lower than the RDA that means in our study only 1.25% of Vitamin B12 was being consumed as per the RDA which is very alarming. A study from Delhi is in line with the present

study finding where lower consumption of vitamin B12 was reported among the vegetarians as compared to non-vegetarians which was below the RDA level.⁷ However, in present study we did not checked the micronutrient level between the vegetarians and non-vegetarians. Vegetarians often develop vitamin B12 deficiencies compared to non-vegetarians due to the reduced bio-availability from plant sources.^{8, 9} In our series participants were also deficient in zinc also, as they were consuming 45.5% lesser zinc against the RDA. Shridhar et al also reported lower consumption of zinc in vegetarians.⁷ Magnesium was the only micronutrients which was being consumed near to RDA. However, it was also 8.07% lesser than the RDA. In a similar series by Gupta et al reported that majority of the adolescent girl's micronutrients (calcium, iron, zinc, folate, vitamin B6, niacin, riboflavin, and vitamin C) was found less than the RDA value.¹⁰

A study from New Delhi by Shridhar et al performed multivariate analysis for macro-nutrients and found that vegetarians were consuming less total fat ($p = 0.002$) and protein ($p < 0.0001$) and more carbohydrate ($p < 0.0001$)⁷ which is in line with the present study findings where carbohydrate consumption was also 50.04% more than the RDA whereas consumption of protein was 37.53% lesser than the RDA. In present study participants were taking too much fat which was more than 115% than the RDA. A study from Karnataka involving 422 adolescent girls reported that among macronutrient, percentage of adequacy of protein (101.9%) was found slightly higher than the RDA. The fat intake (47.89 g/day) was found apparently higher than RDA among adolescent girls.¹⁰

It is very evident that consumption of micro and macro nutrients both as per the recommended RDA is very much required for proper growth and to maintain the health of individual. Inadequacy of these can results in to imbalance in metabolic function and can lead to several morbidity and mortality. Hence it is very important to adopt nutrition education model to educate the people on the balanced nutrition. Previous studies have revealed the usefulness of nutrition education on improving dietary intake and proving a healthy eating pattern.¹¹

Present study had few limitations; small sample size was the main. Secondly we have not compared the micro and macro nutrients levels between the vegetarian and non-vegetarian people and based on their sociodemographic parameters. There is a need of large randomized clinical trial to provide strength to present study findings.

Conclusion

Present study has revealed that among micronutrients consumption of calcium, copper, iron, magnesium, zinc and vitamin B12 was below the RDA however selenium was being taken in very high among from diet. Among

macronutrients carbohydrate and fat consumption was very high whereas protein consumption was below the RDA. This mean population had lower amount of nutrients intake compared to the guidelines. So, it seems that nutrition education programs are needed in this area to promote the consumption of healthy food items containing these micro and macro nutrients.

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Conflict of interest

None.

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