



## DIETARY INTAKE PATTERN OF MICRONUTRIENTS AMONG ADULT WOMEN IN GWALIOR CITY AND COMPARISON WITH RDA

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### ABSTRACT

Descriptive cross-sectional study for 450 women of age group 41-55 years was done in Gwalior city, with the general objective of finding out the dietary intake pattern of micronutrients among adult women with their increasing age. 24 hours dietary recall method was used to look into the micronutrient intake pattern by adult women living in urban area of India. Results revealed that population was consuming sufficient amount of micro nutrients like Thiamine, Niacin, Pantothenic Acid, Total Folate, Zinc and Iron in their diet as per RDA recommendations. While Riboflavin, Pyridoxine, Biotin, Vitamin B12, Total Ascorbic Acid, Retinol, Tocopherol Equivalent, Potassium and Calcium were deficient in their diet as compared to RDA by ICMR.

**KEYWORDS :** Micro-nutrient, Dietary pattern, Vitamin, mineral, RDA.

### INTRODUCTION

The pattern of growth and physical state of the body are profoundly influenced by diet and nutrition. A balanced diet with necessary macro and micro nutrients is the keys to healthy life. Studies have suggested that diet is a major factor affecting muscle mass and muscle function. Healthy eating habits may contribute to increased skeletal muscle mass and help maintain good function<sup>(10,12)</sup>.

The daily diet is often a combination of various foods, and there are often complex interactions between foods and nutrients. Analysis of Dietary pattern cover the overall diet and compared to a focus on individual nutrients or foods, dietary pattern analysis uses to capture the complexity of dietary exposure in better way to find out effect on body composition and ageing of individual.

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

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.

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

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.

According to many researches balance diet and physical activity are most important factors to keep body healthy. Weight gains can be properly managed through healthy eating and engaging in physical exercises. The aim of the present study is to find out the "Dietary intake pattern of micronutrients among adult women in Gwalior city" which may be helpful to find out the root caused of many health-

related problems in adult women.

### Methods

#### Study Population

The participants are Indian women of age 40 to 55 years in Gwalior were selected for this cross-sectional study. The samples were selected for this study was from the population residing in locale of the study and fulfilling the inclusion criteria of, adult women from urban area who aged between 40 to 55 years. Simple random sampling was used for the study.

#### Tool Used

Data were collected using "24 hours recall method". Standard bowl food weighing machine and spoons used for measuring diet intake of subjects. A food eaten is recorded for the whole day of the subjects including snacks, and beverages. With the help of "Dietary calculating software" name "Dietcal" micronutrient intake of subjects was found out. Micronutrients as calculated above were then compared with RDA for adult woman as recommended by ICMR 2010.

#### Statistical Analysis

Mean and standard deviations of various parameters were calculated. ANOVA test was used to finding out variation in variables among the three age groups.

### RESULTS

Dietary intake data was analysed with Dietcal software to look into the micronutrient consumption pattern in the urban areas, results were analysed and median values were calculated to summarised the findings as per table-1.

**Table-1: Micronutrient Intake of Adult Women**

Factor	Value	RDA* (ICMR-2010)
N	450	
Thiamine (Vit.B1) mg - median (IQR)	2.2 (1.9- 2.5)	1.1 mg/d
Riboflavin (Vit.B2) mg - median (IQR)	1.1(0.9- 1.2)	1.3mg/d
Niacin (Vit.B3) mg- median (IQR)	14.3(0.9-1.2)	14mg/d
Pantothenic Acid (vit. B5) mg - median (IQR)	6.3 (5.5- 6.9)	5 mg/d
Pyridoxine (Vit.B6) mg- median (IQR)	1.6 (1.4- 1.8)	2mg/d
Biotin (Vit.B7) $\mu$ g - median (IQR)	9.6 (7.9- 11.6)	30 $\mu$ g/d.

Total Folates (Vit.B9) µg- median (IQR)	256.7 (219.3-316.7)	200 µg/d.
Cobalamin(Vitamin B12) µg- median (IQR)	0.24 (0.12-0.36)	1 µg/d.
Ascorbic Acid (Vit.C) mg_ median (IQR)	35.1(22.7-51.1)	40mg/d
Retinol (Vit.A) µg- median (IQR)	334.6(217.3-468.7)	600 µg/d.
Tocopherol Equivalent (Vit.E) mg- median (IQR)	2.6(2.2- 3.0)	8-10mg/d
Zinc mg- median (IQR)	16.13 (14.07-17.87)	10mg/d
Potassium mg- median (IQR)	2531.63(2217.17- 2867.9)	3225 mg/d
Iron mg- median (IQR)	23.87(21.07-27.1)	21mg/d
Calcium mg- median (IQR)	406.3 (322.47-505.57)	600mg/d

Thiamine intake among the sample population was 2.2 (1.9-2.5) mg/d, median of Riboflavin (vitamin B2) intake was 1.1(0.9-1.2) mg/d, median of Niacin (Vit.B3) intake was 14.3(0.9-1.2) mg/d, median for Pantothenic Acid (vit. B5) was 6.3 (5.5- 6.9) mg/whereas for Pyridoxine (vitamin B6) it was 1.6 (1.4- 1.8) mg/d, the total folates (vitamin B9)- median intake was recorded 256 (219 - 316) µg/d. Daily average consumption of Vitamin B12 was 0.24 (0.12- 0.36) µg/d.

The median Ascorbic Acid (Vit.C) intake was 35.1(23 to 51) mg/d,Retinol (vitamin A) was consumed 334.6(217.3- 468.7) µg/d. AverageTocopherol Equivalent (Vit.E) consumption was at a level of 2.6(2.2- 3.0) mg/d. Similarly, for common micro nutrient minerals, we found that median of Iron intake was 23.87(21.07- 27.1) mg/d, median for zinc intake was 16.13 (14.07- 17.87) mg/d, median of Potassium consumption was 2531.63(2217.17- 2867.9) mg/d and median of Calcium consumption was 406.3 (322.47- 505.57) mg/d.

**Table-2: Proportion Of Sample Meeting Their Recommended Dietary Allowance**

Factor	count	Col %	Mean	(SD)
Daily Micro Nutrient intake				
Thiamine (Vit.B1) mg				
Don't Meet RDA	109	24.2	0.92	(0.16)
Meet RDA	341	75.8	2.2	(0.39)
Total	450	100.0		
Riboflavin (Vit.B2) mg				
Don't Meet RDA	382	84.9	1.017	(0.15)
Meet RDA	68	15.1	1.467	(0.23)
Total	450	100.0		
Niacin (Vit.B3) mg				
Don't Meet RDA	40	8.9	10.257	(0.83)
Meet RDA	410	91.1	14.810	(2.53)
Total	450	100		
Pantothenic Acid (Vit.B5) mg				
Don't Meet RDA	2	0.4	3.419	(0.54)
Meet RDA	448	99.6	6.41	(1.37)
Total	450	100.0		
Pyridoxine (Vit.B6) mg				
Don't Meet RDA	406	90.2	1.53	(0.23)
Meet RDA	44	9.8	2.22	(0.29)
Total	450	100.0		
Biotin (Vit.B7) µg				
Don't Meet RDA	450	100.0	9.99	(2.93)
Meet RDA	00	00		
Total	450	100.0		
Total Folates (Vit.B9) µg				
Don't Meet RDA	79	17.6	175.38	(17.60)
Meet RDA	371	82.4	272.3	(89.47)
Total	450	100.0		

Cobalamin (Vit.B12) µg				
Don't Meet RDA	450	100.0	0.07	(0.03)
Meet RDA	00	00		
Total	450	100.0		
Total Ascorbic Acid (Vit. C) mg				
Don't Meet RDA	263	58.4	23.99	(9.02)
Meet RDA	187	41.6	58.27	(16.57)
Total	450	100.0		
Retinol (Vit. A) µg				
Don't Meet RDA	347	77.2	300.22	(160.17)
Meet RDA	103	22.8	700.7	(110.48)
Total	450	100.0		
Tocopherol (Vit.E) mg				
Don't Meet RDA	419	93.11	2.66	(0.683)
Meet RDA	31	6.89	10.67	(1.86)
Total	450	100.0		
Calcium Ca mg				
Don't Meet RDA	401	89.1	393.88	(100.99)
Meet RDA	49	10.9	728.08	(185.2)
Total	450	100.0		
Iron mg				
Don't Meet RDA	112	24.9	18.90	(1.57)
Meet RDA	338	75.1	24.95	(2.44)
Total	450	100.0		
Potassium mg				
Don't Meet RDA	423	94.0	2512.86	(442.10)
Meet RDA	27	6.0	4086.48	(894.32)
Total	450	100.0		
Zinc mg				
Don't Meet RDA	3	0.7	8.32	(1.61)
Meet RDA	447	99.3	16.28	(2.94)
Total	450	100.0		

Micro nutrient data intake among the samples were further analysed (refer table -2) to look into whether the population met their micro nutritional requirement or not. The compression was based on RDA recommended by ICMR-2010.

75.8% women were consuming Thiamine (vitamin B1) as per recommended RDA, and mean score consumption was 2.2(±0.39) mg/d. For Niacin (vitamin B3) 91.1%, Pantothenic Acid (vitamin B5) 99.6 % and Total Folates (vitamin B9)82.4% samples were meeting their RDA requirement with their mean consumption score 14.810(±2.53) mg/d, 6.41(±1.37) mg/d and 272.3(±89.47) µg/d respectively.

While for Riboflavin (vitamin B2) 84.9%, Pyridoxine (vitamin B6) 90.2 %, Biotin (vitamin B7) 100% and Vitamin B12 100%,subjects were not meeting their RDA requirement as per 1.017(±0.15) mg/d, 53(±0.23) mg/d, 9.99(±2.93) µg/d and 0.07(±0.03) µg/d mean consumption in their diet.

58.4% women were not consuming Ascorbic Acid (Vit.C) as per RDA and their average consumption was 23.99(±9.02) mg/d whereas those were consuming as per RDA their average consumption was 58.27(±16.57) mg/d. Majority (77.2 %) of women were consuming 300.22(±160.17) µg/d Retinol (vitamin A), whichwas below the RDA.

Recommended RDA for Tocopherol Equivalent (Vit.E) was not maintained by about 93.11% subjects and averagewas2.66 (±0.683) mg/d. Majority (89.1%) of the subjects were consuming 393.88(±100.99) mg/d of calcium, which was not adequate as per RDA. Potassium intake was also inadequate with average 2512.86 (±442.10) mg/d intakes by majority (94%) of population. Iron intake was adequate for nearly 75% population with mean consumption 24.95(±2.44) mg/d and Zinc RDA was meeting by almost all of the participants as 16.28 (±2.94) mg/d.

## DISCUSSIONS

Above results revealed that population were consuming less Retinol (vitamin A), Riboflavin (vitamin B2) Pyridoxine (vitamin B6), Vitamin B7, Cobalamin (vitamin B12), Ascorbic Acid (vitamin C) and Alpha-Tocopherol (vitamin E) as compared to RDA recommended by ICMR-2010.

Further micro nutrients results revealed that, for vitamin B group, the 75.8% of studied population was consuming sufficient quantity of Thiamine (Vit.B1), and similarly 91.1% women consuming Niacin (Vit.B3) as per ICMR recommendations. For Pantothenic Acid (Vit.B5) 99.6% women and for total Folates (Vit.B9) 82.4% of population was consuming sufficient quantity as recommended by ICMR-2010.

While about 84.9% population was not consuming Riboflavin (Vit.B2) and about 90.2 % subjects were not consuming Pyridoxine (Vit.B6) as per RDA. Similarly, approx. 100% population showed deficiency in their diet for Biotin (Vit.B7) and Cobalamin (Vit.B12), average consumption level was 32% and 24% of RDA for Vit.B7 and Vit.B12 respectively. While in a similar study by Navneet Agrawal et al. (2020) in Gwalior city found average consumption level 1.25% of RDA for Vit.B12 for adult women of age 30 to 60 years. Vit.B12 deficiency also indicated as high as 70-100 % in the study of Gonmei Z et al. (2018).

For other vitamins result revealed that 58.4% women were not consuming Ascorbic Acid (Vit.C) as per RDA, 77.2 % of women were not consuming Retinol (Vit.A) as per RDA. And recommended RDA for Tocopherol Equivalent (Vit.E) was not maintained by about 93.11% subjects. In case of minerals, Iron intake was adequate for nearly 75% population and Zinc RDA was meeting by almost all. But Majority of the population (89.1%) were not consuming adequate calcium in their diet and average intake of Calcium was about 67.7% of the RDA i.e.32.3% less consumption as compared to RDA. In a supporting study by Navneet Agrawal et al. (2020) in Gwalior city was also reported for Calcium consumption 53.27% lesser than the RDA. Bhavani V et al. (2020) also found Calcium deficiency in diets of female. Potassium intake was also inadequate for majority (94%) of population with 78.5% intake of RDA. Venkatesh et al. (2021), Mahesh et al. (2022) also found micronutrient deficiency in India, in their study.

Ritchie et al. (2018) reported widespread deficiency of Calcium, vitamin A, B6, B12, Folate, and zinc in their study.

Null hypothesis results revealed that the body age was not significantly correlated to macro nutrient intake as well as micro nutrient intake of population. In a similar type of study in Gwalior city by Navneet Agrawal et al. (2020) also not found any association of age with any nutrient's intake by the population.

From many studies it was observed that consuming both macro and micronutrients in accordance with the appropriate RDA is crucial for healthy development and maintenance of an individual's wellbeing. A metabolic function imbalance brought on by insufficiency of these might result in multiple morbidities and deaths. Therefore, it is critical to implement a nutrition education program to inform the public about the need of a balanced diet Sharifirad et al. (2011).

Due to widespread deficiencies of micronutrient and their importance for growth and development of human body it is also termed as "Hidden hunger ". Micronutrient deficiencies may cause to poor health, vision effects, mental illness and even death to a person .

## CONCLUSION

Studies population was consuming insufficient micro-

nutrients. At present India is in the face of nutrition transition and apart underweight and overweight problem micronutrient deficiencies is also cause of major concern. Micronutrient deficiency may be due to cereal based food consumption by majority of population (Misra et al. 2011.Green et al.2016, Law et. al. 2020). Hence, it is essential to identify the type of deficiency particularly for micronutrients and prepare age-specific suggestions in addition to the food's fortification for the same.

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