



Food and Nutrient Consumption Pattern In Women of Child Bearing age with Special Emphasis on Pearl Millet (*Pennisetum Typhoides*) in Nagaur, A Desert District of Rajasthan

KEYWORDS

Iron, Nutrients, Pearl Millet, Energy, RDA

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ABSTRACT **Objectives:** To estimate pattern of food and nutrient consumption pattern with special emphasis on Pearl Millet.

Methods: 30 cluster sampling approach adopted in dietary survey (24 hour recall method) to estimate dietary intake among women (15-45 years) with special emphasis on Pearl Millet and iron.

Results: Energy intake was 1757.7Kcal indicating marginal deficit of 6.3% in comparison to RDA (ICMR). Women showed adequate intake of iron, calcium, fat, protein, riboflavin whereas inadequate intake of vitamin C (13.7% deficit), niacin (18.3% deficit), folate (63.3% deficit), vitamin B 12 (80.0% deficit), and vitamin A with reference to RDA, ICMR. Mean intake of Pearl Millet flour roasted was 167.2 g/day and 100% were consumers.

Conclusion: Study will help health functionaries in formulating strategies for reduction of anaemia among women as Pearl millet is major source of micronutrients and rich in iron. Bio-fortified millet is attractive as sustainable food-based approach to enhance iron status.

Introduction

In Nagaur district, Pearl millet was sown in an area of 492,000 hectares, and its production was 488,000 metric tonnes in 2008, whereas in 2003-07, area under cultivation was 480,000 hectares and production was 413,000 metric tonnes according to data available in Deputy Directors (DD) office, Agriculture Extension Department of Nagaur District. The proportion of pearl millet production was highest i.e. 39.8 percent followed by wheat (14.1 %), Green gram (10.6 %), Mustard (7.7 %), Til (6.5 %) and Moth (6.1 %) in 2008 in Nagaur district. The total population of Nagaur district is 27,75,058 (Rural-22,97,721 & Urban-4,77,337) residing in 4,21,118 households in 1570 villages and 247 wards according to National Census(1) of 2001. The Literacy rate is 46.4 percent in Nagaur district.

Young children and women of child bearing age group are nutritionally the most vulnerable group, especially in developing regions of the world. In desert areas, women may be in a constant state of nutritional stress right from the time of an early marriage, (early growth retardation) to premature death in their thirties. Nutritional needs are high as they are doing heavy work in rural desert areas of Rajasthan, but due to old custom and traditions, women are being deprived of their requisite food intake. Micro-nutrient malnutrition is one of the burning problems in developing countries, out of which those of major public health significance are deficiency of one or more of the four micronutrients iron, zinc, iodine and vitamin A. WHO (2-3) and UNICEF(4), together urged whom to establish a micronutrient monitoring and evaluation system capable of assessing the magnitude and distribution of Micro-nutrient Deficiency Disorders (MDDs). In iron deficiency anemia, it is now recognized that even without anemia, mild to moderate iron deficiency occurs and has adverse functional consequences. It adversely affects the cognitive performance, behavior and physical growth of infants & preschool children, immune status and morbidity from infections and reduces work performance (2-4). Zinc is an essential micronutrient for healthy functioning of the human body. Though present in tiny amounts, it is critical to

life and its deficiency can have a variety of adverse consequences. Zinc deficiency may occur due to diets inadequate in bio-available zinc, certain diseases like diarrhea, loss of zinc in processed foods, and soil deprived of zinc, which can reduce the zinc content in agricultural products. Zinc deficiency in children results in stunting, underweight, and increased risk of infections like diarrhea and pneumonia.

Also sub clinical deficiencies of other micronutrients can reduce the positive effect of a single micronutrient, even when it is not limiting. Multi-centric studies carried out by ICMR(5), NNMB(6)and NFHS-3(7), Singh et al(8) show that the prevalence of anemia, vitamin A deficiency and iodine deficiency disorders continues to be high, though there is a small decline in IDD in India. In study(8) of Jodhpur district, Pregnant & lactating women suffered higher from anemia (81%) in comparison to other studies i.e. NIN(9) (MND) 2003 (76.5%) and NFHS(7) III (2005) (61.2% in Rajasthan & 57.9% in India) and 52.0% in Non industrialized countries and 22.7% in industrialized countries according to WHO(10), 2001. Iron deficiency caused an estimated 0.8 million deaths (2.4% of global DALYs), with one-third of the burden in South-East Asia. Zinc deficiency(11) accounted for a similar number of deaths, but a much higher share (2.9%) of global disease burden was in South-East Asia. Zinc deficiency affects about one-third of the world's population. Collectively, this cluster of under nutrition and micronutrient deficiencies caused about 6 million deaths in 2000 (11% of the global total) and about 17% of the entire global burden of disease. Much of this disease burden occurs among children. Indeed, these estimates suggest that at least half of all child deaths each year could be prevented if under nutrition and associated micronutrient disorders could be addressed.

Material and Methods

A cross sectional study has been implemented for estimating the average intake pattern of food and nutrients among women of child bearing age (15-45 years) with special emphasis on consumption of Pearl Millet and iron.

Study area

Study has been carried out in Nagaur, a desert district of Rajasthan in India. Nagaur district has ten tehsils / blocks as per Govt. of India census (1) 2001. The study was carried out in all ten tehsils / blocks of Nagaur district.

Study subjects

Women in the child bearing (15-45 years) were subjects for this study.

Study design

30 cluster sampling approach (as propagated by WHO) was adopted in dietary survey keeping in view the operational feasibility. The Sampling unit was kept at household level as in each house, mother and child were available. The Sample size was calculated on the basis of prevalence of iron deficiency in diet of women in desert area as reported in scientific literature (8) as 20%, level of confidence of 95% relative precision of 20% and design effect of 2 Using formula $(Z\alpha)^2 Q/(L^2) P$, sample size worked out to be 768, adjusted for a 20 percent non response. The sample size was rounded of to 900 from Nagaur district of Rajasthan or 900 / 30=30 households per cluster and 3 house hold per cluster were repeated only for dietary intake.

Selection of villages

In Nagaur, geographically, a cluster consisted of a village. These 30 clusters / villages were selected from 10 tehsils (Sub-districts) of Nagaur district by means of simple random sampling using the Indian census 2001. In each cluster / village, 30 household were selected on the basis of simple random sampling technique using a complete list of all households in each village.

Inclusion Criteria: Only those households were selected which had women of child bearing age (15-45 years) and children of age between 6 to 59 months.

Exclusion Criteria: If in one household, women of child bearing age had two or more children with age of 6 to 59 months, then only one child at that household was considered for the study.

The study has been done in two parts i.e. collection of data from the eligible women of child bearing (15-45 years) and a child between 6-59 months of age from the selected household and the biochemical analysis of the food collected from the field.

Random selection of the households

In selected villages a random walk method starting from a central place (usually a temple) in the village and proceeding in at least four different directions was adopted. A household was selected only if eligible women of child bearing (15-45 years) of age were among the members of the family.

At each household level, information on the demographic and socio-economic aspects were collected. At each household level, women, were interviewed for the dietary pattern using 24 hour recall method (Data was collected by the standard technique as followed by NIN (ICMR), Hyderabad) along with Roseland Gibson/harvest manual for 24 hour recall. Dietary intake details were collected for women of child bearing age i.e. (15-45 years) at each household (HHs) level for the day prior to the interview. HHs were shown dietary cups regarding portion sizes (actual foods and cooked items) and a small percentage of the HHs include direct weighing of portions to validate the

measuring instruments provided to the field workers. This study is a part of the Pearl Millet Project funded HarvestPlus Washington, USA.

Results

Daily Pearl Millet intake (gram/day) by women of the target population. Mean intake of Pearl Millet flour roasted was 167.2 g/day and 100 percent were consumers of this flour. Table 1 shows the energy and nutrient intakes per day by women of 15-45 years age groups. Analysis revealed that mean of energy was 1757.7 Kcal indicating marginal deficit of 6.3 percent in comparison to Recommended Dietary Allowances (RDA) ICMR. Women showed adequate intake of iron, calcium, fat, protein, and riboflavin whereas inadequate intake of vitamin C (13.7% deficit), niacin (18.3% deficit), folate (63.3% deficit), vitamin B 12 (80.0% deficit), and vitamin A with reference to RDA, ICMR.

Figure 1 shows that in case of women of child bearing age groups, milk, fats & oils and pearl millet were the main dietary source of energy i.e. 29.6, 25.9 and 23.7 percent respectively followed by roots & tubers (10.2%), pulses and vitamin C rich fruits (4.6%).

Figure 2 shows dietary sources of iron by food group among women of the studied population of Nagaur district, Rajasthan. Among women of child bearing age groups, main dietary source of iron was observed to be pearl millet i.e. 53.3 percent respectively.

Table 1. Energy and nutrient intakes per day by women

| Nutrient | EAR | RDA, NIN, ICMR | Women (15-45 years) | |
|-----------------------------|------------------------|----------------|---------------------|---|
| | | | Mean | Median (25 th , 75 th) |
| | | | N= 900 | |
| Energy, Kcal | - | 1875 (2175) | 1757.7 | 1658 (1318, 2016) |
| Protein, G | - | 50 (65) | 60.1 | 56.2 (45.1, 69.5) |
| Lipid (Fat), g | - | 20 (30) | 38.7 | 33.6 (26, 43.4) |
| Calcium, mg | 1000 | 400 (1000) | 657.1 | 532.5 (396.5, 764.5) |
| Iron, mg | Low: 29.1 Mod: 14.5 | 30 (38) | 33.9 | 29.4 (22, 41) |
| Zinc, mg | WHO: 8.2 IzINCG: 7 | - | 10.9 | 10.4 (7.4, 13.7) |
| Vitamin C, mg | 60 | 40 | 34.5 | 19.8 (9.9, 37.3) |
| Thiamine, mg | 0.9 | 0.9 | 1.2 | 1.1 (0.8, 1.4) |
| Riboflavin, mg | 0.9 | 1.1 (1.3) | 1.3 | 1.2 (0.9, 1.6) |
| Niacin, mg | 11 | 12 (14) | 9.8 | 9.0 (7.1, 11.9) |
| Folate, µg DFE ² | 320 | 400 | 146.6 | 138 (103.5, 181) |
| Vitamin B 12, µg | 2.0 | 1 | 0.2 | 0 (0, 6.8) |
| Beta-carotene, µg | - | 2400 | 1003.3 | 641 (482, 895.5) |

¹EARS are shown for non-pregnant/non-lactating women 15-45 years of age for comparison to dietary intakes. For iron, EARS are given for low (5%) and moderate (10%) iron bioavailability. For zinc, EARS are given for WHO/FAO (2005) and for IZiNCG (2004) corresponding to low bioavailability. ²Folate DFE, Dietary Folate Equivalents; Vitamin A RAE, Retinol Activity Equivalents. ³Indian Council of Medical Research (ICMR), 1989

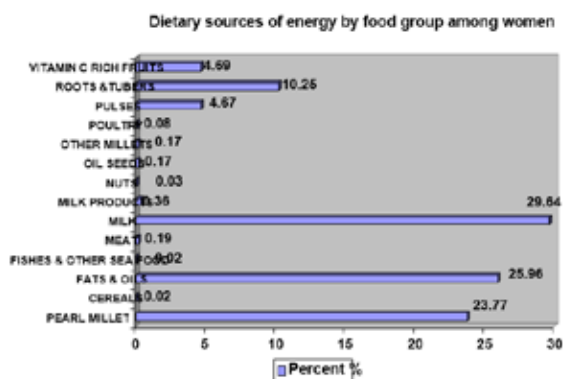


Figure 1. Dietary sources of energy by food group among women

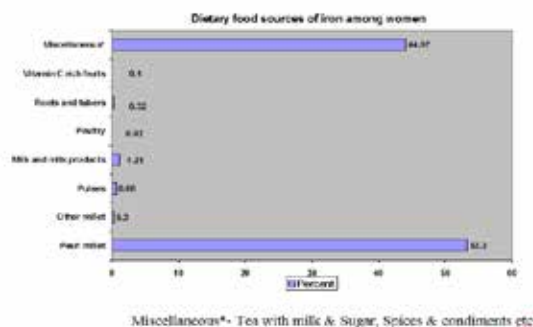


Figure 2. Dietary sources of iron by food group among women

Discussion

Nutrition background studies are required in the desert area which is the pearl millet belt in India. This proposal aimed to collect information on Food and nutrient consumption pattern in women of child bearing age with special emphasis on Pearl millet (*Pennisetum typhoides*) in Nagaur, a desert district of Rajasthan. Production and Consumption pattern of Pearl millet in populations that habitually consume large quantity of pearl millet due to demographic and economic reasons. In view of the fact that pearl millet is a major source of micronutrients and is grown and consumed extensively in rain-deficient areas, the potential to promote consumption of micronutrients through bio-fortified millet is attractive as a sustainable food-based approach to enhance iron nutritional status among women. In the present study energy and nutrient intakes per day by women of 15-45 years age groups. Analysis revealed that mean of energy was 1757.7 Kcal indicating marginal deficit of 6.3 percent in comparison to Recommended Dietary Allowances (RDA) ICMR. Women showed adequate intake of iron, calcium, fat, protein, and riboflavin whereas inadequate intake of vitamin C (13.7% deficit), niacin (18.3% deficit), folate (63.3% deficit), vitamin B 12 (80.0% deficit), and vitamin A with reference to RDA, ICMR. Another study in Jodhpur district showed that Consumption of pulses and legumes was low besides leafy vegetables. Average intake of nutrients showed

deficiency of protein and energy, iron and folic acid and vitamin A deficiency. Anemia and iodine deficiency disorder were found to be inversely proportional to education and income (12). Another study indicated that Pearl millet is rich in several nutrients as well as non-nutrients such as phenols. It has high energy, has less starch, high fiber (1.2g/100g, most of which is insoluble), 8-15 times greater α -amylase activity as compared to wheat, has low glycemic index (55) and is gluten free. The protein content ranges from 8 to 19% and it is low in lysine, tryptophan, threonine and the sulfur-containing amino acids. The energy of millet is greater than sorghum and nearly equal to that of brown rice because the lipid content is generally higher (3 to 6%). Pearl millet can be recommended in the treatment of celiac diseases, constipation and several non-communicable diseases(13).

Conclusion:

All results are indicated that Pearl Millet is the precious grain which has high nutritional value. It is useful in reducing the iron deficiency anemia among women in Western Rajasthan. Many government programs implemented for the women though if the local grain can reduce the iron deficiency by dietary practices than micronutrient deficiency can reduce as soon as possible.

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