



NUTRITIONAL BENEFITS OF MILLETS IN IRON DEFICIENCY ANAEMIA IN CHILDREN: A REVIEW

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ABSTRACT

Objectives: Iron Deficiency Anaemia (IDA) is currently the most common and widespread nutritional disorder in the world. According to WHO global data, IDA affects approximately 37% of school children. Defective absorption of iron and inappropriate and deficient dietary intake are the causes of IDA. IDA adversely affects the growth and cognitive development in children. **Methodology:** Materials related to IDA, Millets and other relevant topics have been collected. We have also referred to the various websites and scientific journals to collect information regarding current researches on the relevant topics. **Result:** Three major approaches are followed to control IDA globally - supplementation with iron and folic acid tablets, fortification and natural food-based approaches. Despite the wide implementation of the first two approaches, IDA remains a serious malnutrition problem. The third approach mainly focuses on enrichment of diets with naturally iron-rich foods without the potential side effects of artificial additives. Millets are an excellent source of natural energy. Millets have been used as food as well as therapeutic diet in Ayurveda. Millet grains such as Sorghum (jowar), Pearl millet (bajra) have substantially higher amount of minerals like iron, zinc, calcium, magnesium, potassium, B-complex vitamins making them preferable choice over the cereal grains. **Conclusion:** This review focused on to evaluate the nutritional benefits of millets in Iron Deficiency Anaemia. More attention and consideration should be shown on millets-based offering and their nutritive value for children to avoid health issues related to nutritional deficiency for developing healthy society.

KEYWORDS: Iron Deficiency Anaemia (IDA), Millets, Nutritional Benefits.

INTRODUCTION

Anaemia is the most common haematological disease of the paediatric age group. Nutritional iron deficiency is the most common cause of anaemia worldwide and one of the most important public health problems. Highest prevalence of anaemia is seen in the developing countries. Iron Deficiency Anaemia (IDA) is most common in preschool children. In Indian children, high prevalence of anaemia varying from 27% - 90% has been reported in different studies.^[1] According to National Family Health Survey III data, incidence of anaemia in urban children is 71%, rural is 84% and overall is 79%.^[2]

Iron deficiency anaemia adversely affects the growth and cognitive development in children. Many factors cause IDA including gut health, dietary iron deficiency, bioavailability, Vit C, Vit A, Vit B12 deficiency. In developing countries, a parasitic infestation is also a significant cause of IDA.

Many recommendations for prevention of IDA have been published. Widely used approaches include iron fortified

foods in a diet, iron rich formulas, iron prophylaxis in infants.^[3] Despite the wide implementation of these approaches, IDA remains a serious malnutrition problem with an increasing trend globally. Natural food base approaches mainly focus on dietary diversification and enrichment of diet with naturally iron rich foods without the potential side effects. Given that a major part (>80%) of the diet in developing countries.^[4] comprises low iron staple food, achieving sufficient intake of iron through the remaining 20% of the diet is impractical. Therefore, it is important to diversify the staple food by including naturally iron-rich food crops such as millets.^[5]

Millets are old as well as primitive indigenous food grains to be used as staple food. The richness in dietary fibres, protein, calcium, iron, zinc, potassium, magnesium, B complex vitamins makes them preferable choice over the cereal grains. Animal sources of Heme iron are well known for their high bioavailability. However, it is not always affordable to the poorest segments of the population. Also, a vegetarian population

require alternate plant source of iron to tackle iron deficiency.

Although, millets are recognised as being naturally rich in iron, their nutrient composition varies with the type, variety and growing conditions.

AIMS AND OBJECTIVES

1. To evaluate the nutritional benefits of millets in Iron Deficiency Anaemia in children
2. To focus on millet-based offerings for children
3. To make millets easy to adapt by the children

MATERIALS AND METHODS

Materials related to IDA, Millets, Millet-based offerings and other relevant topics have been collected. We have also referred to the various websites and scientific journals to collect information regarding current researches on the relevant topics.

Millets

Millet is termed as “Miracle Grain” or “crop of the future” because cultivation of millet is very sustainable as it requires much fewer resources compared to other crops.^[6] The nutritional superiority of millets compared to regular staples like wheat and rice has entitled them to be gazetted as the Nutri-Cereals by the Government of India.^[7]

Millets are primarily categorised as Major Millets and Minor Millets. Major millet crops include Jowar or Sorghum (*Sorghum bicolor*), Bajra or Pearl millet (*Pennisetum typhoides*), Mandua/Ragi or Finger millet (*Eleusine coracana*), and Minor Millets comprising of Kangni or Foxtail millet (*Setaria italica*), Kutki or Sama or Little millet (*Panicum miliare*), Kodo millet (*Paspalum scrobiculatum*), Jhangora or Sawan or Barnyard millet (*Echinochloa frumentacea*), Cheena or

Proso millet (*Panicum miliaceum*), and Korale or Brown top millet (*Brachiaria ramosum*).

1. Pearl millet

Pearl Millet, also known as Bajara, is an important millet of India, second to Sorghum. Pearl Millet is a good source of minerals, containing appreciable amount of iron, zinc, calcium, phosphorus, magnesium.^[8]

Pearl Millet contains high amount of Iron 8mg/100mg and zinc 3mg/100 mg which may help to increase the Hb level.^[9]

2. Finger millet

Finger millet is commonly or locally named as Ragi. It is considered as the storehouse of nutritional properties and a potential solution for malnutrition.

As per the study conducted in 2018 by Chauhan and Sarita on the nutritious properties of millets, Finger millet is a great source of nutrients like iron, calcium, zinc, phosphorus and other minerals which makes it superior to other cereals.

Finger millet helps to increase the level of haemoglobin and helps to fight against malnutrition.^[10]

3. Sorghum millet

In India, Sorghum is typically addressed with the name of Jowar or Jowari. It is rich in minerals like iron, magnesium, zinc and Vitamin B.

4. Barnyard millet

Barnyard millet is emerging as one of the most significant minor millet crops in Asia.^[11] The grain does contain all the macronutrients that too in acceptable quantity but above all, it contains more micronutrients mainly iron and zinc as compared to other major cereals.^[11]

Nutritional Content in Millets

Table 1: Nutritive value of millets in comparison with commonly consumed cereals.

MILLET	IRON	ZINC	VITAMIN A	FOLLIC ACID
PEARL MILLET	8 ⁹ ; 11 ¹²	3.1 ¹³	132 ¹³	-
FINGER MILLET	3.9 ¹⁴	2.3 ¹⁵	-	18.3 ¹⁶
SORGHUM MILLET	4.1 ¹³ ; 5.4 ¹²	1.6 ¹³	47 ¹³	-
BARNYARD MILLET	15-19.5 ^{17,18}	2.6-4.75 ¹⁸	-	-
WHEAT	3.5 ¹²	2.7 ¹³	64 ¹³	-
RICE	1.8 ¹²	1.4 ¹³	0 ¹³	-

Millet Based Offerings for Children

Over the past three decades, the direct consumption of millets as food has been declining due to change in food habits, inconvenience attached with food preparation as compared fine cereals as well as increased tendency to eat a greater variety of foods and children seem to love only junk food.

A variety of millets are easily available in the market and with a simple twist to the traditional recipes, millets offer a wide range of possibilities for adding to your diet from Savory dishes to desserts. There are variety of millets recipes that are healthy, easy to make and packed with nutrition such as

- Millet upama
- Millet lemon rice
- Millet dosa

- Millet idli
- Millet roti
- Millet kheer

Also, there are variety of millet value added ready to cook products available in the market which are convenient to prepare such as

- Millet noodles
- Millet pasta
- Millet pancake
- Millet cookies, etc.

The recipe book “Millet Recipes - A Healthy Choice” developed by IIMR is a compilation of such ready to cook and ready to eat foods. All the products are nutritionally rich and proved to be benefit for all age groups.^[19] It has been in recent times only that the millets are gaining attention from the health point of view and is modified into some worthwhile outcomes such as multi grain flour biscuits, sweet, vermicelli, etc.

DISCUSSION

With the changing lifestyle, there has been increase in the consumption of junk food among school aged children. India is experiencing Nutrition Transition characterised by increasing consumption of junk food, which has been identified to have contributory role in the increasing trend of deficiency of micro and macro nutritional substances which leads to nutritional deficiency such as Iron Deficiency Anaemia.

The ready availability, taste, commercial marketing strategies make junk food popular in children. One study was conducted in Lucknow (India), showed that 98% children were fond of fast food while only 2% children did not like to consume fast food. Data of the study further revealed that pizza, burger, noodles, pasta and Maggi was most frequently consumed fast food by the children. The palatability, convenient and attractive appearance forced them to eat all kind of junk food which are non-nutritious.

The optimal way to reach the nutritional requirement is an improvement in food quality. The formulation of the millet-based offering with the incorporation of millets is a logical pragmatic strategy to provide nutrient dense foods to children who are vulnerable to nutrition deficiency like iron. Home makers should be sensitized about the importance of enhancing nutrient intake of their children by a simple method of incorporating millets in food items.

Millets can be used in variety of ways in the substitution with the other cereal grains and their flour such as roti, dosa, idli, uttapam, upama, papad, etc. After many years of sensitization, the food industry has started recognising the unique nutritional qualities of millets. Today there are many products ranging from multigrain millets, instant mixes, snacks items such as biscuits, pasta noodles,

brownie, pancakes are available in the market and gaining attention.

Also, several strategies can be implanted by the government like using millet-based food in Mid-day meal (MDM) programme. MDM's major ingredient is a cereal, particularly rice and wheat and hence there is scope to improve the nutrient content of MDMs by providing more nutritious food using millets.

CONCLUSION

Initiation of nutrition interventions to reduce the high intake of junk food by educating school going children regarding the possible deteriorating health consequences of junk food is the need of hour. This may help in inculcating the practice of the consumption of healthy foods from young age since the nutrition deficiency in childhood will have adverse effect on their growth and development, immune competence, cognition and behaviour.

There is an apparent need to develop standardise and popularise more millet- based food products for children in the form of ready to use grains or convenience foods. Millets can be included in a daily diet by creating a variety of healthy as well as delicious meals.

The introduction of millets-based meals in school feeding programmes can significantly improve the nutritional outcome of school going children compared to fortified rice-based meals. Also, it can be cost effective if millets are given government pricing support as equally as rice.

Over the decades, millets have become less and less common in India in terms of consumption, partly because of the limited knowledge on their use in preparing various foods. To meet the need for nutrition, variety and taste for children, it is important to use these grains in other forms of food in a culturally acceptable way.

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