



# PREVENTION OF ANAEMIA WITH UNDERUTILIZED GREEN LEAFY VEGETABLES

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## Abstract

Iron is essential to virtually all living organisms and is integral to multiple metabolic functions. Anaemia is defined as a condition in which the blood is deficient in red blood cells, hemoglobin, or both or deficient in total volume. Iron deficiency anaemia is the lack of iron to form normal red blood cells. According to the NFHS-4 Survey (2015-16), Non-pregnant women age 15-49 years from rural area who are anaemic (<12.0gm/dl) is 56.7 percent. Pregnant women age 15-49 years who are anaemic (<11.0gm/dl) is 49.7 percent whereas the total anaemic pregnant women in Allahabad is 53.6percent. Green Leafy Vegetables (GLV) are micronutrient dense nature's gift to mankind that provides more vitamins per mouthful than any other food. GLV are known to be rich sources of micronutrients such as vitamin A, iron, total carotene, etc. and utilizing them is one way of ensuring the micronutrient intake. In India, Maternal thinness and moderate/severe anaemia among women of the poorest urban quartile was 38.5% and 20% respectively and 1.5-1.8 times higher than the rest of urban population. Receipt of pre- and postnatal nutrition and health education and compliance to iron folic acid tablets during pregnancy was low across all quartiles. One-fourth (24.5%) of households in the lowest urban quartile consumed salt with no iodine content, which was 2.8 times higher than rest of the urban population (8.7%). The highest iron content was observed in *Celosia argentea* (169.63 mg/100 g). In general, Amaranth leaves (27.3 mg/100g), Colocasia leaves (10 mg/100 g), Mustard leaves (16.3 mg/100 g), Bathua leaves (4.2 mg/100 g) are commonly consumed iron rich leafy vegetables. Iron content in most of the selected underutilized leafy vegetable in the present study is comparable to the commonly consumed iron rich vegetables, therefore these identified underutilized vegetables like Lahsua (22.38 mg/100 g), Surwari (26.48 mg/100 g), Pathri (15.54 mg/100 g), Chirchita (15.94 mg/100 g) and Kohar (8.68 mg/100 g) can be popularized as iron rich food sources. Better communication methods and awareness about underutilized plants and their nutrient content can raise their acceptance and adoption levels as well as improve the nutritional quality of daily diets.

**Key words:** Anaemia, Chronic energy deficiency, Pre and Post natal Nutrition, Micronutrient rich Green leafy Vegetables and underutilized plants.

## Introduction

Anaemia is defined as a condition in which the blood is deficient in red blood cells, hemoglobin, or both or deficient in total volume. Iron deficiency anaemia is the lack of iron to form normal red blood cells. Iron is imperative for almost all organisms because of its ability to donate and accept electrons with relative ease (Pantopoulos *et al.*, 2012). Iron is required for cellular metabolic functions, oxygen carrying proteins, and cell growth and development. Those affected the most by iron deficiency anaemia are children, women, and obese adults. Iron is essential to virtually all living organisms and is integral to multiple metabolic functions (Naigamwalla *et al.*, 2012).

Recent statistics estimate that 821 million people in the world are undernourished and the world hunger continues to rise in recent years (FAO, 2018). The increase in hunger and food insecurity indicates that there is considerable work to be done against malnutrition and vitamin A deficiency globally (Uarrotta *et al.*, 2019). The wild edible medicinal leafy vegetables occupy an important place among food crops as these provide adequate amount of Iron, crude fiber, fats,

carbohydrates, proteins, water and mineral elements like Ca, Na, Fe, P, Mg, Zn, etc., in addition to vitamins and certain hormone precursors. In many countries of the developing world, traditional and indigenous foods, which are often more nutritious than modern foods traded on the global market, are being neglected and forgotten. The possible reasons for the low utilization of underutilized vegetables, in spite of their recognized importance are due to lack of availability of planting material, lack of awareness on nutritional and medicinal importance and lack of information on production technique of these crops (Jena *et al.*, 2018). These vegetables however contain anti-nutritional factors that can affect the availability of the nutrients. Phytochemicals, as sources of natural antioxidants, may be found in underutilized tropical vegetables (Ademoyegun *et al.*, 2013).

## Prevalence of Anaemia in Rural Women of Prayagraj District, Uttar Pradesh

Slum women never reach their full growth potential due to nutritional deprivation. Malnutrition is related to poverty, lack of awareness and illiteracy. Iron deficiency anaemia (IDA) is the most common nutritional deficiency in pregnant

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women. WHO estimates that anaemia affects 33% of women of reproductive age globally (about 613 million women between 15 and 49 years of age). Anaemia in pregnancy is a major issue in form of abortion, premature birth, intrauterine growth retardation, high infant mortality and 20 to 40 percent maternal death of India. According to the NFHS-4 Survey (2015-16), Non-pregnant women age 15-49 years from rural area who are anaemic (<12.0gm/dl) is 56.7 percent. Pregnant women age 15-49 years who are anaemic (<11.0gm/dl) (%) is 49.7 whereas the total anaemic pregnant women in Allahabad is 53.6, All women age 15-49 years who are anaemic from rural area is 56.3 percent. Nutritional anaemia is a major public health problem in India and is primarily due to iron deficiency which is more common among rural population.

### Different Strategies Formed to Combat from Anaemia for the Slum Women in India

Maternal anaemia during pregnancy increases the risk of perinatal and maternal mortality and contributes to low birth weight. While anaemia among pregnant women (Hb<11 g/dL) in the poorest urban wealth quartile, according to the present study, is 64%, other slum-based studies that assessed anaemia in pregnant women, using similar method and cutoff in India, provide figures of 81-93%. One of the prophylactic measures for anaemia prevention is consumption of one iron folic acid (IFA) tablet every day for a minimum of 100 continuous days during pregnancy, beginning from the second trimester and till 3 months postpartum. If the woman is identified as being moderately to severely anaemic, two tablets each day are recommended. It is disturbing to note that only 18.5% of women in the poorest wealth quartile took IFA tablets for 90 days or more during pregnancy.

Intestinal parasitic infections aggravate the existing anaemia, and as low as 3% women in the poorest urban wealth quartile received an antihelminthic dose during pregnancy. Abysmally low IFA compliance, coupled with high dietary inadequacy, highlights the need to: (a) regularly counsel mothers to help them overcome difficulty in consuming iron folic acid tablets; (b) in place of ferrous sulphate which is the usual present formulation of the tablets, the use of ferrous fumarate, which has fewer side-effects, should be considered; (c) ensure improved access to cereals and promote consumption of iron-rich vegetables (e.g. different types of green beans) which continue to be the largest source of iron; (d) experiment with strategies to improve compliance to consumption of iron folic acid tablets; (e) test alternative models to reduce iron-deficiency anaemia in such settings. In other developing countries, the use of energy-dense micronutrients-ready-to-use food supplements-has proven successful in the prevention of anaemia and improving birth outcomes; (f) measures to prevent helminthic infestations would also require to be strengthened, more so in slum settings where many women work or walk barefoot (and hence at a risk of hookworm infestation); and (g) contamination of water is also high, increasing the risk of intestinal worm infestation and calling for expeditious efforts to improve access of the urban poor and deprived populations to safe drinking-water. The risk of hookworm and intestinal worms makes it imperative that national deworming

guidelines for pregnant women are established explicitly, mentioning the dosage and frequency of deworming tablets. These should be distributed also in districts where prevalence data for worm infestation are not available at a given point in time.

### Underutilized Iron Rich Green Leafy Vegetables in Allahabad

The highest iron content was observed in *Celosia argentea* (169.63 mg/100 g). In general, Amaranth leaves (27.3 mg/100g), Colocasia leaves (10 mg/100 g), Mustard leaves (16.3mg/100 g), Bathua leaves (4.2 mg/100 g) are commonly consumed iron rich leafy vegetables. Iron content in most of the selected underutilized leafy vegetable in the present study is comparable to the commonly consumed iron rich vegetables, therefore these identified underutilized vegetables like Lahsua (22.38 mg/100 g), Surwari (26.48 mg/100 g), Pathri (15.54 mg/100 g), Chirchita (15.94 mg/100 g) and Kohar (8.68 mg/100 g) can be popularized as iron rich food sources.

Gupta *et al.*, 2016 reported that *Celosia argentea* contains an appreciable amount of iron so it was used in a study to improve the hemoglobin status of adolescent girls. Dehydrated *C. argentea* leaves at 20% level of incorporation were utilized to enrich "mathri". 100 adolescent girls (16-18 years), 60 of whom were anaemic, were selected for the study. Dietary intake of the subjects was collected using the 24-hour dietary recall method; anthropometric measurements and clinical signs and symptoms of anaemia were recorded. Supplementation of 100 g "mathri" was administered to the experimental subjects for six weeks. Moisture, ash, protein, fat, fiber, carbohydrate and energy content of underutilized *C. argentea* were found to be 84.39±0.13 g, 3.06±0.05 g, 1.45±0.23 g, 1.25±0.03 g, 0.68±0.04 g, 9.06±0.15 g, 53±0.45 g/100 g respectively. Values obtained for iron, calcium, vitamin C and β-carotene content of *C. argentea* (0.01) of the subjects in the experimental group, whereas the change in the control group was non-significant. This supplementation of were 26.48±0.14 mg, 170.6±2.17 mg, 60.6±7.07 mg, 2166±136 μg/100 g respectively. The mean hemoglobin levels of the experimental group and control group were 8.71 g/dl and 9.28 g/dl respectively after supplementation. Due to supplementation, there was significant rise in the weight and hemoglobin levels (14.3%) (P *C. argentea* based product "mathri" can significantly improve the hemoglobin status of adolescent girls.

### Conclusion

Underutilized green leafy vegetables found in Allahabad district contain appreciable amount of iron, calcium, β-carotene and vitamin C. The iron content of these green leafy vegetables is higher than that of commonly consumed leafy vegetables like spinach and amaranth. These selected green leafy vegetables have great nutritional importance particularly in preventing micronutrient deficiencies and can become a source of poverty alleviation of poor local community of study area. Given the high levels of under nutrition in women in the poorest urban quartile, it is

suggested that the following may be done: (i) routine screening of women who are undernourished or suffer from three key micronutrient deficiencies, using field-based methods and instituting corrective measures; (ii) improving access to food subsidy through Public Distribution System (PDS) via better access to card-holders living below poverty line (BPL) or alternative approaches that are being currently debated or piloted; (iii) free distribution of iodized salt to pregnant women during health and nutrition days and/or universalizing its subsidy through PDS; (iv) institutionalizing nutrition and health counseling for mothers, using approaches involving fixed day, time, and venue and monitoring their coverage and quality for promotion of services and consumption of micronutrient-rich foods; and (v) resetting strategies for improving compliance to iron folic acid tablets and testing efficacy of strategies for alternative micronutrient food-based supplementation, including the strengthening of measures to prevent intestinal infections. Better communication methods and awareness about underutilized plants and their nutrient content can raise their acceptance and adoption levels as well as improve the nutritional quality of daily diets.

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