

# Nutritional Profiling of Moringa Oleifera Leaves: Emphasis on High Bioavailable Iron

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## ABSTRACT

Moringa oleifera, commonly known as the drumstick tree, is widely recognized in traditional medicine as a panacea capable of treating hundreds of diseases. This review highlights its extensive use in herbal medicine, particularly in India and other tropical regions, attributing its therapeutic properties to a rich profile of bioactive phytochemicals, including flavonoids, tannins, saponins, alkaloids, and phenolic acids. Various parts of the Moringa tree exhibit significant medicinal activities, such as antitumor, anti-inflammatory, antibacterial, anti-diabetic, and antioxidant effects. The increasing global interest in herbal medicine makes Moringa a crucial, inexpensive, and accessible option for quality health services in developing nations. Nutritionally, Moringa leaves and powder are exceptionally dense in essential macro- and micronutrients. They provide high levels of protein, carbohydrates, and healthy lipids, along with significant amounts of essential minerals (iron, calcium, potassium, magnesium, zinc) and vitamins (A, C, B-complex, folate). Notably, Moringa leaves contain substantially more calcium than milk and more iron than many common foods. This dual high-nutrition and high-nutraceutical profile underscores Moringa oleifera's potential as a functional food ingredient to support general well-being, aid in disease prevention, and supplement essential dietary needs for growth and development across all age groups.

**KEYWORD** Moringa oleifera (drumstick tree), Herbal medicine, Traditional remedies, Nutritional profile, Macronutrients (protein, carbohydrates, fats), Micronutrients (vitamins, minerals), Iron, Vitamin A, Functional food ingredient, Disease prevention.

## INTRODUCTION

Preliminary nutritional profiling studies consistently highlight the exceptionally high total iron content in M. oleifera leaves, positioning them as a potentially vital food-based supplement for combating IDA. However, the efficacy of plant-derived iron is not solely dependent on its total concentration but critically relies on its bioavailability—the fraction of the mineral that is actually absorbed and utilized by the body. Plant matrices often contain anti-nutritional factors (such as phytates and polyphenols) that can chelate iron, thereby inhibiting its absorption and leading to conflicting reports on its true efficacy in an in vivo context. Conversely, the leaves are also rich in absorption enhancers, notably Vitamin C (ascorbic acid), which can counteract the effect of inhibitors

## MATERIAL METHODS

The search for relevant study material focused on the medicinal plant Moringa oleifera. A comprehensive literature review was conducted across several major scientific databases, including Scopus, PubMed, Springer, Google Scholar. The relevance of the retrieved articles was initially assessed by carefully reviewing the title and abstract of each record to ensure a clear indication of relevance to the research topic.

## BACKGROUND:

Moringa oleifera is often referred as a panacea and can be used to cure more than 300 diseases<sup>1</sup> Moringa has long been used in herbal medicine by Indians. Various parts of Moringa tree possess antitumor, antibacterial, hepatoprotective, circulatory stimulants, antispasmodic, anti-hypertensive, diuretic, antioxidant, anti-diabetic, cholesterol lowering, antifungal, antiepileptic, antipyretic, antiulcer and anti-inflammatory activities<sup>2</sup> Medicinal plant research and applications are expanding each day due to therapeutic phytochemicals, which can stimulate the progress of novel medicines. Most plant-based phytochemicals, e.g., carotenoids, phenolic acids, flavonoids, tannins, saponins, alkaloids, and glucosinolates, have beneficial effects on well-being and avoidance of malignancy<sup>3</sup>

The drumstick tree (Moringa oleifera Lam.) member of the Moringaceae family is widely spread from India to Africa and numerous other tropical and arid countries, mainly utilized as food and medicine<sup>4</sup>. Recently, the

usage of herbal medicine has been increased exponentially. Developing countries depend basically on therapeutic plants for their wellbeing needs. Consequently, moringa leaves are a suitable option in developing nations looking for quality health services that offer inexpensive and easily accessible treatment in places not accessible to Western medicine. The proper dietary consumption knowledge by medical science experts helps in slowing the growth of many diseases. The high nutritional, nutraceutical, and therapeutic profile is mainly attributed to its rich repertoire of biologically active molecules: proteins (peptides and protein hydrolysates), flavonoids, saponins, phenolic acids, tannins, isothiocyanates, lipids, minerals, and vitamins, amongst others <sup>5</sup>

## Medicinal uses

Due to its long history of usage as a traditional remedy for a variety of illnesses and problems, Moringa oleifera's medical benefits are well documented. A common folk remedy for asthma, constipation, diarrhoea, stomach pain, ulcers, intestinal spasms, headache, sore gums, Anemia, arthritis and rheumatism. is the use of this tree <sup>6</sup>

Other Compounds Other major bioactive ingredients in Moringa oleifera leaves are folates, tannins, saponins and fatty acids. Folate, a vital water-soluble vitamin, is a key component of many cell metabolisms <sup>7</sup>

IRON CONTENT-Minerals are essential for functioning of a living system due to their involvement in various cellular, metabolic and physiological pathways. Based on their function(s), elements including Ca, P, K, Na, Cl, Mg, Fe, Zn, I, Cr, Cu, F, Mo, Mn, and Se have been rendered as “essential minerals” for human body. These essential elements prominently function as activators or cofactors for various enzymes/ hormones and organic molecules that mediate/regulate different biological processes such as synthesis of DNA/RNA/protein and other biomolecules, respiration, energy generation through ATP, and many more <sup>8,9</sup>

**Table-1: Nutritional Information (per 100g)**

| Nutrient             | Amount  | Notes/Comparison             |
|----------------------|---------|------------------------------|
| Energy               | 64 kcal |                              |
| Macronutrients       |         |                              |
| Protein              | 9.4 g   | 3.3 times more than Broccoli |
| Total Lipid (Fat)    | 1.4 g   |                              |
| Carbohydrate         | 8.28 g  |                              |
| Fiber, total dietary | 2 g     |                              |
| Ash                  | 2.26 g  |                              |
| Minerals             |         |                              |
| Calcium              | 185 mg  | 1.5 times more than Milk     |
| Potassium            | 337 mg  | 2.3 times more than Cucumber |
| Iron, Fe             | 4 mg    |                              |
| Magnesium            | 42 mg   |                              |

|                       |          |                             |
|-----------------------|----------|-----------------------------|
| Phosphorus, P         | 112 mg   |                             |
| Sodium                | 9 mg     |                             |
| Zinc                  | 0.6 mg   |                             |
| Copper                | 0.105 mg |                             |
| Manganese             | 1.06 mg  |                             |
| Selenium              | 0.9 µg   |                             |
| Vitamins              |          |                             |
| Vitamin A             | 378 µg   |                             |
| Vitamin C             | 52 mg    |                             |
| Thiamin (B1)          | 0.26 mg  | Equal to Pea raw            |
| Riboflavin (B2)       | 0.66 mg  | 5.1 times more than Avocado |
| Niacin (B3)           | 2.2 mg   |                             |
| Pantothenic acid (B5) | 0.13 mg  |                             |
| Vitamin B-6           | 1.2 mg   |                             |
| Folate                | 40 µg    |                             |
| Amino Acids           |          |                             |
| Tryptophan            | 0.144 g  |                             |
| Threonine             | 0.41 mg  |                             |
| Isoleucine            | 0.45 mg  |                             |
| Leucine               | 0.79 mg  |                             |
| Lysine                | 0.54 mg  | 1.2 times more than Tofu    |
| Methionine            | 0.12 mg  | 1.3 times more than Quinoa  |

|               |         |  |
|---------------|---------|--|
| Phenylalanine | 0.49 mg |  |
| Valine        | 0.61 mg |  |

**Table-2: Nutritional Information** <sup>10,11</sup>

| Vitamin          |                                    |
|------------------|------------------------------------|
| Vitamin A        | 378µg per 100gm                    |
| Vitamin C        | 52mg                               |
| Vitamin-B1       | 0.26mg Equal to Pea raw            |
| Vitamin-B2       | 0.66mg 5.1 times more than Avocado |
| Vitamin-B3       | 2.2mg                              |
| Vitamin-B5       | 0.13mg                             |
| Vitamin-B6       | 1.2mg                              |
| Folate-          | 40µg                               |
| Tryptophan       | 0.14mg                             |
| Threonine        | 0.41mg                             |
| Isoleucine       | 0.45mg                             |
| Leucine          | 0.79mg                             |
| Lysine           | 0.54mg 1.2 times more than Tofu    |
| Methionine       | 0.12mg 1.3 times more than Quinoa  |
| Phenylalanine    | 0.49mg                             |
| Valine           | 0.61mg                             |
| Histidine        | 0.2mg                              |
| <b>Protein</b>   | 9.4g ,3.3 times more than Broccoli |
| Calcium          | 185mg, 1.5 times more than Milk    |
| Potassium        | 337mg 2.3 times more than Cucumber |
| Energy           | 64kcal                             |
| <b>Protein</b>   | 9.4g                               |
| Total lipid      | 1.4g                               |
| Ash              | 2.26 g                             |
| Carbohydrate     | 8.28g                              |
| Fiber            | total dietary-2g                   |
| Calcium          | 185mg                              |
| Iron, Fe         | 4mg                                |
| Magnesium        | 42 mg                              |
| Phosphorus       | P- 112mg                           |
| Potassium        | 337mg                              |
| Sodium           | 9mg                                |
| Zinc             | 0.6mg                              |
| Copper           | 0.105mg                            |
| Manganese        | 1.06 mg                            |
| Selenium         | 0.9                                |
| Vitamin C        | 51.7mg                             |
| Thiamin          | 0.257mg                            |
| Riboflavin       | 0.66 mg                            |
| Niacin           | 2.22 mg                            |
| Pantothenic acid | 0.125 mg                           |
| Vitamin B-6      | 1.2 mg                             |
| Folate           | 40 µg                              |
| Vitamin A        | 378 µg                             |
| Tryptophan       | 0.144 g                            |
| Protein (g)      | 22.40                              |

|                     |          |
|---------------------|----------|
| Fat (g)             | 4.30     |
| Crude fiber (g)     | 13.23    |
| Carbohydrates (g)   | 45.65    |
| Energy (K cal)      | 310.00   |
| Ash (g)             | 8.89     |
| Iron (mg)           | 24.33    |
| Beta- carotene (µg) | 32570.67 |
| Calcium (mg)        | 632.32   |
| Vitamin- C (mg)     | 100.53   |

Nutrients are organic and inorganic complexes contained in food. These are about 50 different nutrients, which are normally supplied through the foods we eat. Each nutrient has specific functions in the body. Most of the natural foods contain more than one nutrient. These may be divided into Macro nutrients and micronutrients.

## Macro nutrients

Macronutrients are proteins, fats and carbohydrates, which are often called 'proximate principles', because they form the main bulk of food in the Indian diet. They contribute to the total energy intake in the following proportions: 1-15%, Fats 10-30%, Carbohydrates 65-80%. Macronutrients (protein, carbohydrates, and lipids) are required in large amounts to provide energy, produce hormones, synthesize molecules, and regulate metabolic pathways.

Protein-Moringa has lot of minerals that are essential for growth and development among which, calcium is considered as one of the important minerals for human growth. While 8 ounces of milk can provide 300–400 mg, moringa leaves can provide 1000 mg and moringa powder can provide more than 4000 mg. The protein needs for adolescent girls vary depending on their age, body weight, and activity level. Recommended Dietary Allowance (RDA) (for average, healthy individuals): Girls aged 9 to 18 years: 34 to 46 grams of protein per day. Nutrition plays an essential role in the health, function, and proper development of children and adolescents. In particular, nutrition is a key element for disease prevention, especially for chronic diseases such as obesity and Type II Diabetes Mellitus (T2DM).<sup>12</sup> 25 grams of drumstick leaves powder provides approximately 5.6 to 7.25 grams of protein. Therefore, 25gm serving of drumstick leaves powder can fulfil between 12.17 % and 21.32 % of the recommended daily protein requirement. Functions of Protein: Antibody, Antibodies bind to specific foreign particles, such as viruses and bacteria, to help protect the body. Enzyme, Enzymes carry out almost all of the thousands of chemical reactions that take place in cells. They also assist with the formation of new molecules by reading the genetic information stored in DNA. Messenger- Messenger proteins, such as some types of hormones, transmit signals to coordinate biological processes between different cells, tissues, and organs. Structural component- These proteins provide structure and support for cells. On a larger scale, they also allow the body to move. Transport/storage-These proteins bind and carry atoms and small molecules within cells and throughout the body.<sup>13</sup> Fat: low in fat, from (4.03–9.51%), Carbohydrates 25 grams of drumstick leaves powder provides approximately 7.12 to 14.06 grams of carbohydrate.

## Micronutrients

Micronutrients are vitamins and minerals. They are called so because they are required in small amounts, which may vary from a fraction of a milligram to several grams. Micronutrients are needed in trace amounts for biochemical processes such as gene transcription, enzymatic reactions, and protection against oxidative stress.

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## Fat-Soluble Vitamins

Vitamin A (retinol): Retinol is essential for vision, cell differentiation, and growth. Dietary vitamin A can be found in animal products, including liver, kidney, oils, dairy products, and eggs, and in the form of provitamin A in plant sources, such as leafy vegetables and yellow or orange fruits and vegetables. The recommended dietary allowance (RDA) of vitamin A for healthy children is 300 to 900 mcg/d, Vitamin A-378µg per 100gm<sup>15</sup>Vitamin D (cholecalciferol): Vitamin D is a fat-soluble vitamin that plays a key role in calcium regulation and bone metabolism. Vitamin D has also been shown to be important for muscle, immune, nervous, and cardiovascular functions.<sup>16</sup>Vitamin E (tocopherol): Vitamin E is a fat-soluble vitamin that works primarily as an antioxidant, helping to protect the cell membrane.<sup>17</sup> Vitamin K (phyllloquinone): Vitamin K is a fat-soluble vitamin crucial in

coagulation pathways. Vitamin K is a cofactor in vitamin K-dependent carboxylation and is essential for synthesizing and activating prothrombin and factors VII, IX, and X <sup>18</sup>

## Water-Soluble Vitamins

Vitamin B1 (thiamine): Vitamin B1 is a cofactor for various enzymes crucial for glucose breakdown and energy metabolism <sup>19</sup>Vitamin B2 (riboflavin): Vitamin B2 is crucial for redox reactions, where riboflavin is used as an electron carrier in the form of flavin adenine dinucleotide (FAD) and flavin mononucleotide (FMN). Additionally, riboflavin has an important role as an antioxidant, as it aids in the regeneration of glutathione <sup>20</sup>Vitamin B3 (niacin): Vitamin B3 is a precursor of nicotinamide adenine dinucleotide (NAD) and nicotinamide adenine dinucleotide phosphate (NADP), crucial cofactors for cellular redox reactions. <sup>21</sup> Vitamin B5 (pantothenic acid): Vitamin B5 is of fatty acid synthase and coenzyme component A, which are needed for cell growth, energy production, and hormone synthesis. <sup>22</sup>

Vitamin B6 (pyridoxine): Vitamin B6 participates in transamination, decarboxylation, and phosphorylation reactions. It plays an important role in protein, carbohydrate, and lipid metabolism and the formation of red blood cells. Vitamin B7 (biotin): Vitamin B7 participates in energy metabolism and regulation of oxidative stress. Biotin is a cofactor in various carboxylases, essential for metabolizing protein, fats, and carbohydrates. Intake recommendations range between 5 and 35 mcg/d. <sup>23</sup>Vitamin B9 (folate): Vitamin B9 plays a crucial role in methylation reactions necessary for deoxyribonucleic acid (DNA) and ribonucleic acid (RNA) synthesis, as well as a key role in the maturation of red blood cells and the development of the nervous system. <sup>24</sup>Vitamin B12 (cobalamin): Vitamin B12 is a water-soluble vitamin that is a cofactor in synthesizing DNA, fatty acids, and myelin, as well as erythropoiesis and the development of the nervous system. <sup>25</sup>Vitamin C (ascorbic acid): Vitamin C plays a crucial role in collagen formation, iron absorption, bone formation, immune function, and as an antioxidant. Recommended intakes may vary, depending on age and gender, but fall predominantly between 40 and 120 mg/d. <sup>26</sup>

## Minerals

Minerals are essential inorganic micronutrients that play an important role in enzymes' structure or catalytic properties and participate in cellular energy transduction, second-messenger pathways, and acid-base balance. <sup>27</sup>

Calcium: Calcium is important in bone mineralization, nerve impulse transmission, and muscle contraction. Adult reference intakes are 800 to 1000 mg/d, depending on sex and age. Phosphorus: Phosphorus is crucial in energy metabolism and is a structural component of RNA, DNA, cell membranes, bones, and teeth. The RDA is 700 mg/d <sup>28</sup>Potassium: Potassium is the main intracellular cation crucial in acid-base balance, blood pressure regulation, and muscle contraction. The adequate potassium intake is 4,700 mg/d. <sup>29</sup>Sodium: Sodium is crucial to multiple bodily processes, such as fluid balance, nerve impulse transmission, and muscle contraction. The adequate intake for adults is 1,500 mg/d. <sup>30</sup>Chloride: Chloride is a mineral that plays an important role in fluid and acid-base balance, muscle contraction, and nervous function. The reference intake is 1,500 mg/d. <sup>31</sup>Magnesium: Magnesium participates in numerous functions in the human body, such as signalling pathways, energy transfer, metabolism, bone development, and neuromuscular function. The RDA for adults is 400 mg/d. <sup>32</sup>

Iron: Iron is a mineral with a crucial role in oxygen transport and metabolic processes. The RDA for adults is 8 to 18 mg/d. Moringa powder can be used as a substitute for iron tablets, hence as a treatment for anemia. Beef has only 2 mg of iron while moringa leaf powder has 28 mg of iron. It has been reported that moringa contains more iron than spinach <sup>33</sup>Zinc: Zinc is a trace mineral required for the activity of over 300 enzymes, either as a cofactor or a structural modulator. The RDA for zinc is 10 mg/d <sup>34</sup>Copper: Copper is a component of various proteins and a cofactor of many enzymes involved with redox reactions and metabolism. The copper RDA for adults is 1 mg/d. <sup>35</sup>Manganese: Manganese is a mineral required for immune function, glucose regulation, reproduction, coagulation, and energy metabolism. The daily reference intake for adults is 2 mg/d. <sup>36</sup>Selenium: Selenium is a trace mineral that forms part of selenoproteins and is important in antioxidant systems and anabolic processes. the RDA is 55 mcg/d. Molybdenum: Molybdenum is a trace mineral required for the functioning of enzymes, such as sulfite oxidase (responsible for the oxidation of sulfur amino acids), xanthine oxidase (which converts hypoxanthine to xanthine and xanthine to uric acid ), and aldehyde oxidase (essential for phase 1 drug metabolism). The molybdenum RDA for adults is 45 mcg/d. <sup>37</sup>

## Nursing, Allied health and interpersonal team interventions:

Drumstick leaves powder, derived from the Moringa oleifera, is a nutrient dense food that offers a cost-effective and sustainable way to combat various nutritional deficiencies. Its integration into healthcare, particularly through the collaborative efforts of nursing and allied health teams, is a powerful strategy for prevention and management of malnutrition. Benefits in Prevention: Combating Anemia - The combination of high iron and folate makes it a targeted intervention for different forms of anemia. Boosting Immunity- Its rich concentration of Vitamin A and Vitamin C strengthens the body's defences. Sustainable Sourcing- It can be grown locally and processed easily, ensuring a continuous, affordable supply in community health programs. Interpersonal Team Intervention Strategy the successful application of drumstick leaves powder requires a cohesive, interprofessional team approach.

## A. Nursing Role: Education and Monitoring

Nurses are on the front lines, serving as the primary link between the intervention and the patient/community.

1. Patient Education: Nurses deliver practical, culturally-sensitive teaching on how to incorporate the powder into daily meals (e.g., adding a spoonful to porridge, dough, or beverages).
2. Dosage and Administration: They ensure the correct dosage is consumed, especially for vulnerable populations like pregnant/lactating women and young children.
3. Symptom Monitoring: They monitor for early signs of nutritional improvement (e.g., increased energy, improved haemoglobin levels) and for potential side effects or non-compliance.
4. Advocacy: Nurses advocate for the inclusion of moringa powder in hospital meal plans and community health kits.

## B. Allied Health Roles: Specialized Expertise

Allied Health Professionals provide the necessary technical expertise for assessment, planning, and evaluation.

Dietitian/Nutritionist:

- Assessment: Conducts detailed dietary and nutritional assessments to identify specific deficiencies.

Integration Plan: Creates individualized meal plans that effectively integrate the moringa powder while ensuring overall dietary balance and maximum nutrient absorption.

Cooking Demonstrations: Provides practical advice and cooking demos to ensure palatability and sustained use.

Community Health Worker (CHW):

- Outreach: Bridges the gap between the clinic and the home, promoting the use of moringa powder at the village or neighbourhood level.
- Resource Distribution: Manages the distribution of the powder and educates families on storage to preserve its nutritional value.

Pharmacist/Supply Chain Manager:

- Ensures the powder is sourced from reputable suppliers, tested for quality and purity, and is consistently available in health Centres.<sup>38</sup>

**Table 3: Some reported work of Moringa oleifer**

| S.N | Author                 | Objectives of the study                                                                                                             | Application                                                                                                                              | Ref |
|-----|------------------------|-------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 1.  | Sindhu et al., 2017    | Efficacy of Moringa oleifera in treating iron deficiency anemia in women of reproductive age group.                                 | 100gm Moringa Oleifera and jaggery in a ratio of 80:20 for 30 days                                                                       | 39  |
| 2.  | Choudhary et al., 2018 | Effect of drumstick leaves supplementation for treating iron deficiency anemia in adolescence girls                                 | 25gm of dry drumstick leaves powder was given every day for three months.                                                                | 40  |
| 3.  | Sarkar et al., 2019    | A pilot study to assess the effectiveness of drumstick leaves powder supplementation in prevention of anemia among adolescent girls | with one tea spoon (about 5gm) dried drumstick leaves powder supplementation once a day with meals for 30 days to the experimental group | 41  |
| 4.  | Saturnin et al (2017)  | Effects of Moringa oleifera (Lam.) Leaves Powder in the Treatment of Anaemia in                                                     | Moringa Leaves Powder at 10 g/dl for 6 mon                                                                                               | 42  |

|     |                          |                                                                                                                                                                                                          |                                                                                                                                                            |    |
|-----|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|     |                          | Children Aged from 6 to 30 Months in Lissezoun in Central Benin                                                                                                                                          |                                                                                                                                                            |    |
| 5.  | Fatima et al., 2018-2023 | effectiveness of moringa oleifera to enhance the haemoglobin concentration in body: a systematic review                                                                                                  | form of leave powder capsules, biscuits, cakes and bread. It appears to influence on haemoglobin levels and nutritional deficiencies.                      | 43 |
| 6.  | Nur et al., (2022)       | Haemoglobin levels and mid upper arm circumference in pregnant women through the giving moringa biscuits.                                                                                                | Experimental-5 moringa leaf biscuits/ Control-multi vitamin/ 3 weeks                                                                                       | 44 |
| 7.  | Frianti et al. 2022      | The effect of moringa leaf capsules and fe administration to increase hemoglobin levels, weight, and upper arm circumference (LILA) in trimester II pregnant women with chronic energy deficiency (KEK). | Experimental-moringa leaf powder&Fe Control-Fe / for 60 days                                                                                               | 45 |
| 8.  | Wijayan Ti et al.,2021   | Consumption of Jelly Combination of Salacca Seed (Salacca zalacca) and Moringa Leaves Flour (Moringa oleifera) on Hemoglobin level in Female Adolescents with Moderate Anemia.                           | T1-&2 -100g jelly + 14.9g salacca pondoh seed flour & 5.7g Moringa leaf flour CONTROL-plain jelly & Iron tablets for 8 weeks                               | 46 |
| 9.  | Hadju et al.2020         | 'Moringa oleifera'leaf powder supplementation improved the maternal health and birth weight: A randomised controlled trial in pregnant women.                                                            | Experimental-Moringa leaf powder2 g Control-iron, folic acid /for 2 months(Giving 2g of MOLP per day for 2 months during the third trimester of pregnancy) | 47 |
| 10. | Mustapa et al., 2029     | The effect of moringa oleifera to hemoglobin levels of preconception women in the health center tibawa district tibawa, gorontalo.                                                                       | M.Oleifera extract for 6 weeks                                                                                                                             | 48 |
| 11. | Shija et al., 2019       | Effect of Moringa Oleifera leaf powder supplementation on reducing anemia in children below two years in Kisarawe District, Tanzania.                                                                    | M.Oleifera leaves powder for 6 months                                                                                                                      | 49 |
| 12. | Nurdin et al., 2018      | The Effect of Moringa Leaf Extract and Powder to Haemoglobin Concentration among Pregnant Women in Jeneponto Regency                                                                                     | ExperimentalT1-M. leaves powder T2-M. leaves extract T3-Folic acid&Iron                                                                                    | 50 |
| 13. | Sitohang et al.,2018     | Effect of Moringa (Moringa oleifera) Biscuit administration on hemoglobin levels of pregnant women.                                                                                                      | 5 Pieces of Moringa biscuit/day for twice per week                                                                                                         | 51 |
| 14. | Suzana et al.,2017       | Effect of Moringa oleifera leaves extract against hematology and blood biochemical value of patients with iron deficiency anemia.                                                                        | Moringa leaves capsules for 3 weeks                                                                                                                        | 52 |

## Acknowledgment

Sincerely thank my guide Mrs. Lt Col (Retd) Dr M Jayalakshmi for her consistent support and valuable feedback during the compilation of this literature review. Their suggestions were key to navigating the breadth of research on Nutritional Profiling of Moringa oleifera Leaves: Emphasis on High Bioavailable Iron. I also appreciate the institutional access to research materials provided by Daman Government college of Nursing and PPSU, Surat. Finally, a heartfelt thank you to my husband Mr.Peter Paul for his persistent encouragement and belief in this endeavour.

## Conclusion:

The potent nutritional profile of drumstick leaves powder makes it a valuable tool in public health. Its successful deployment relies not just on its nutritional content but on a seamless, collaborative effort where the Nurse provides continuous care and education, and Allied Health Professionals provide specialized knowledge to tackle the multifaceted challenge of nutritional deficiency. Moringa appears to be a useful local food to prevent nutritional deficiencies at this specific physiological stage. Further studies are needed to monitor its dose-dependent effects and to assess its possible adverse effects.

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