

Sesbania Grandiflora (Humming Bird Tree) in the Management of Anemia

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ABSTRACT

Introduction: Anemia is the most common disorder of the blood and a major causative factor in a number of clinical conditions. Current treatment includes oral/parenteral supplementation of iron which may not be afforded by lower socioeconomic classes for the entire duration of treatment. Sesbania locally known as 'agati' (in hindi) is a native of the Indian subcontinent. The leaf extract contains many chemical components, the important one being iron. Hence it has been selected for the study to understand its role in management of anemia. Objectives: The primary objective of the study are to identify adults with Iron deficiency anemia, intervene in the form of Sesbania grandiflora and reassess the hemoglobin levels after intervention.

Material and methods: 100 anemic patients with iron deficiency anemia were identified, out of which 70 of them were administered with 60 grams of Sesbania grandiflora per day for a period of 60 days and in the other 30 (control group), elemental iron as tablets was administered. It's a randomized controlled and prospective study.

Results: In this study, the result after strict administration of Sesbania leaf powder for 60 days, was that 57% patients with moderate and 75% patients with mild anemia had showed significant improvement in their hemoglobin levels at the end the study period. Sesbania leaf powder would be a good supplementation for both preventing and treating mild and moderate anemia.

Conclusion

Use of Sesbania grandiflora leaf powder as an iron supplement showed improvement in hemoglobin levels of individuals with mild and moderate anemia. Consistent usage of Sesbania leaf powder will reduce the burden of Iron deficiency anemia in India and possibly reduce the number of borderline cases turning into anemia.

Keywords: anemia, hemoglobin, iron deficiency, powder, sesbania grandiflora

INTRODUCTION

Anemia is a condition where there is a decrease in the number of red blood cells (million cells/mm³)¹ or there is a decrease in the normal quantity of hemoglobin (gram/dl) in the blood, for that particular age and sex.² Since hemoglobin carries oxygen from the lungs to the rest of the body through capillaries, the condition of anemia leads to hypoxia (lack of oxygen) in organs and this can lead to a wide range of clinical consequences.³

The normal hemoglobin concentration in health is 13-18g/dl in males and 11.5-16.5g/dl in females, whereas the normal red blood cell count is considered to be 4.5-5.6 million cells/mm.^{3,4} Anemia is the most common disorder of the blood and a major causative factor in a number of clinical conditions.

Current treatment for anemia includes oral/parenteral supplementation of iron, commonly in the form of ferrous sulphate and ferrous fumarate, supplementation of vitamin

B12 or folic acid and packed cell transfusions.⁵ These supplementations may not be afforded by all socioeconomic classes for the entire course or duration of treatment.

Sesbania locally known as 'agase' (in Kannada) and 'agati' (in Hindi) has leaves up to 30 cm long with 5-15 paired leaflets that are oblong to elliptic in shape and about 3 cm in length, flowers which are white and red in colour according to the species, whereas the fruits looks like long, thin, flat beans.⁶ They are a native of the Indian subcontinent, and are easily available in the tropics and predominantly found in the rural areas. The leaf and pod extract contains many chemical components, the important ones being iron and folate.⁷ Other than that it is rich in energy, carbohydrates, protein and vitamins like thiamine, riboflavin and niacin (of B-complex) and vitamin C.⁸ As one of the rare trees where flowers and leaves can be eaten as vegetables, the nutrients of Sesbania leaves and pods are easily absorbed and no allergy has been reported.⁹ It can be added to the regular diet in a dried or liquid form¹⁰ in order to make consumption easier.¹¹ Hence it was selected for the study to understand its role in management of anemia.

This study was undertaken to evaluate the potential use of a commonly available plant source (Sesbania grandiflora) in the management of iron deficiency anemia, which can be afforded by people of all socioeconomic strata with a parallel comparison of ferrous sulphate supplementation as the mode of treatment. It is the first study of its kind which makes this endeavour more significant.

The objectives of the study were to identify adults with Iron deficiency anemia, to intervene in the form of Sesbania grandiflora for a period of 2 months, to reassess the hemoglobin levels of the individual after intervention at a regular interval of every 15 days and to correlate the supplementations of Sesbania grandiflora and ferrous sulphate in the management of anemia.

MATERIAL AND METHODS

This study was conducted in Vydehi institute of medical sciences and research center, Bangalore during April – July of the year 2015, after obtaining an ethical clearance certificate and having taken an informed consent from all the participants.

In this study, 100 patients with iron deficiency anemia were identified randomly, out of which 70 patients were administered with 60 grams of S.grandiflora per day for a period of 60 days

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and the other 30 patients were assigned as the control group, to whom iron supplementation in the form of elemental iron was administered.

Sesbania leaves were harvested and dried at a low temperature (not under direct sunlight) ensuring the nutrients remain intact in the leaf tissue. Once dried, Sesbania leaves were pulverized into a fine powder-like consistency, making them easy for use and were provided to the study group.

Initially, at the start of the study the peripheral smear, hemoglobin levels, reticulocyte count and stool examination was done and then later compared with results obtained on performing the same tests (Hb levels, peripheral smear and reticulocyte count) at the end of the study. This study is a randomized controlled and prospective study.

Trial protocol

Sampling size: 100 adults with IDA

Inclusion criteria:

- Adults identified with anemia (Hb>7g/dl and <11g/dl)
- Patients within the age group of 14-65 years.

Exclusion criteria

- Individuals with severe anemia (Hb<7g/dl)
- Patients with other comorbidities of cardiac and renal disorders.
- Patients scheduled for surgery or requiring immediate treatment.

Methodology

Adults with iron or folic acid deficiency anemia were identified, and a routine blood test was done to evaluate red blood cell levels and hemoglobin concentration. The individuals satisfying the criteria were dewormed by administering Albendazole tablet (400mg OD), after which the control group of patients was administered with the standard dose of oral iron supplementation tablets. Simultaneously, the test group of patients were administered with 60g/per day of *Sesbania grandiflora* (leaf extract), which has been made from harvested Sesbania leaves and pods, that are shade dried and then powdered. It is consumed 3 times a day in quantities of 20g per meal by adding it to their daily diet (salads or steamed rice, chapathi, curry or cooked vegetables) for a period of 2 months. Care was taken to avoid adding the dried powder with potential iron chelating effect like buttermilk, milk etc.

STATISTICAL ANALYSIS

The observations on the hemoglobin improvement after intervention with sesbania leaf powder in the intervention group are analysed descriptively and represented in the following graphs and tables by using the IBM SPSS statistics program.

RESULTS

For the study purpose patients were divided into 4 categories based on their baseline hemoglobin levels: 1 – 7-8g/dl; 2 – 8-9g/dl; 3 – 9-10g/dl and 4 – 10-11g/dl. The percentage of patients in the test group (which contains a total of 70 patients) suffering from mild and moderate anemia with hemoglobin levels in various ranges (1: 7-8g/dl, 2: 8-9g/dl, 3: 9-10g/dl and 4: 10-11g/dl) are represented in Figure-1.

The study showed significant improvement in the hemoglobin levels across all four categories of Hb levels after administration

of sesbania leaf powder, i.e., 70% improvement in category 1, 48% in category 2, 67% in category 3 and 38% in category 4 at the end of two months. The average improvement in haemoglobin levels were 0.48g/dl, 0.54g/dl, 0.6g/dl, 0.5g/dl in categories 1, 2, 3 and 4 respectively as shown in Figure-2. The comparison of the percentage improvement in hemoglobin levels between the control and test groups after administration of oral standard dose of elemental iron tablets and sesbania leaf extract respectively is represented in Figure-3.

The study also indicated that a sustained improvement in Hb levels was seen in the test group at the end of 2 months whereas in the control group maximum improvement was seen within the first 15-20 days, after which the degree of improvement was gradual.

DISCUSSION

Many different studies have been done to evaluate the medicinal properties of *Sesbania grandiflora* extracts but none regarding their efficacy in treating anemia. Hence, this study is the first of its kind. One study showed that the chemical components

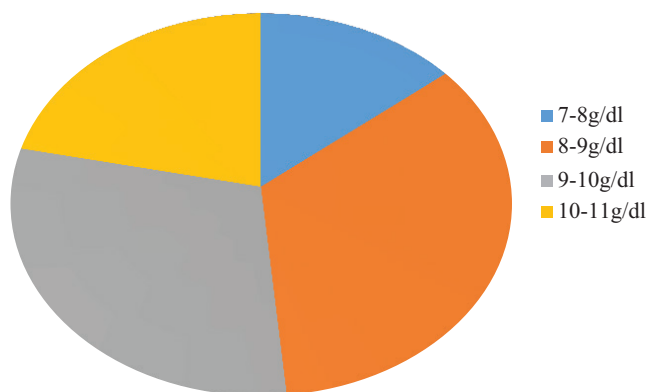


Figure-1: Percentage of patients in test group with corresponding Hb ranges

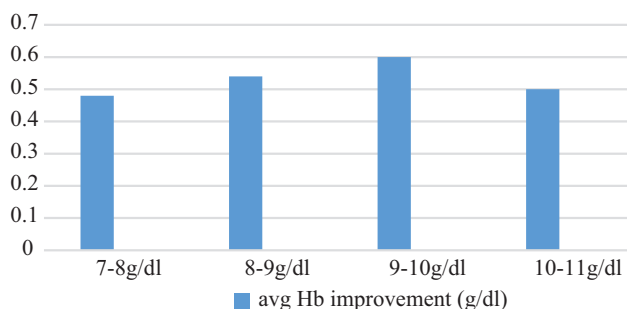


Figure-2: Hemoglobin improvement across different categories

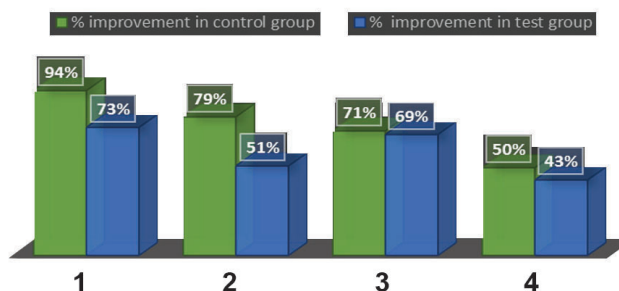


Figure-3: Comparison of the percentage improvement between control and test groups

and root extract of *Sesbania grandiflora* possessed significant antitubercular activity¹² while another study found that the nanosized leaf powder of *Sesbania* had a high ability to kill microbes.¹³ Studies also have concluded that the methanol extract of *Sesbania grandiflora* has shown potential activity in decreasing the serum glucose levels and have significant hypolipidemic activity.¹⁴

In this study, the result observed after strict administration of *Sesbania* leaf powder for 60 days, was that 57% patients with moderate anemia and 75% patients with mild anemia had showed significant improvement in their hemoglobin levels.

The observations were recorded at intervals of 15 days for all the patients. The analysis of the cumulative data at the end of 60days is represented in the above graphs. Improvement in hemoglobin levels of the intervention group patients who were provided with *Sesbania* leaf powder in their daily diet was significant at the end of two months. Thus, *Sesbania* leaf powder would be a good supplementation for both preventing and treating mild and moderate anemia. As *sesbania* is easily accessible to people, especially in the rural setup at little or no cost, patients having anemia or those on the borderline when treated with it tend to recover at a stable rate.

Based on the 4 categories of haemoglobin levels there was a comparison of percentage improvement between the test and control groups after administration of *sesbania* leaf powder and oral iron tablets respectively (Figure 3) from which it can be clearly inferred that though percentage improvement of the test group wasn't better than that of the control group, there was still a significant improvement in the test group as well.

The observed side effects of oral iron preparations are chest pain, fever, headache, joint pains, difficulty in breathing, anaphylactic reactions, lymph node enlargement, stomach upset, nausea, vomiting, constipation, diarrhoea, black or darker than normal appearing stools.¹⁵ None of these were reported in the test group where *sesbania* was administered, therefore increasing the patient compliance with this mode of management of anemia.

In India, previously the International journal of pharmacy and the journal of phytopharmacology have stated the use of *sesbania* leaves in treating anemia but no detailed study had been conducted.

The major advantage of using *Sesbania* leaves in this study was the fact that it was a local resource and easily available. In addition, *Sesbania* leaves offer very significant quantities of vitamin C, B-complex vitamins, calcium, protein, potassium, magnesium, selenium, zinc and a good balance of all the essential amino acids.

The use of *sesbania grandiflora* as prophylaxis in the prevention of anemia needs to be considered and studied.

Limitations

- The study was small and a larger study needs to be done to further prove the use of *sesbania* in anemia.
- Though a particular amount had been advised to the patients, the patient compliance regarding the amount of intake could not be monitored.
- *Sesbania* leaves rich in iron and amino acid content are not appropriate for use during initial treatment of the severely anemic and those anemic patients with other comorbidities.

CONCLUSION

Use of *Sesbania grandiflora* leaf powder as an iron and folate supplement showed improvement in hemoglobin levels of individuals with mild and moderate anemia. *Sesbania* leaf powder can be effectively utilized for treatment of anemia and patients could be instructed on directions of its use and spreading the awareness about the value of *Sesbania* in anemia treatment. Consistent usage of *Sesbania* leaf powder will reduce the burden of Iron deficiency anemia in India and possibly reduce the number of borderline cases turning into anemia, hence may even be used prophylactically.

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