

Effect of fenugreek seed supplementation on Hemoglobin and PCV among 20-30 years old females: a pilot study

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Abstract

Background: Females are more likely than males to suffer from anemia. There have been many studies investigating the nutritional qualities of traditional plants. The of this study was to assess the effect of fenugreek seeds on hemoglobin and PCV values in 20-30 years old females. **Material and methods:** Baseline hematological tests were obtained from 10 females aged 20-30 years. Supplementation of the standard amount of fenugreek was given to the population. After 48 days the same hematological parameters were analyzed as a post-test. The results of the pre- and post-test analysis were compared by using a paired-sample t-test. Relevant details were also collected and analyzed. **Results:** The mean value of hemoglobin before supplementation (Hb1) and hemoglobin after supplementation (Hb2) was 12.3200 and 11.3300 respectively and the mean value of packed cell volume before (PCV1) and after supplementation (PCV2) was 36.7970 and 35.4700, respectively. This shows that there is a mild decrease in hemoglobin and PCV values after fenugreek supplementation, but not at a statistically significant level. **Conclusions:** Within the limitations of our pilot study, we conclude that fenugreek has no significant effect on Hemoglobin and PCV values and can't be used as an exact supplement to cure anemia.

Keywords: anemia · fenugreek supplementation · hemoglobin · PCV · hematopoietic stem cells

Citation

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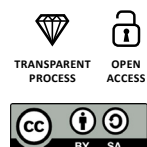
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Introduction

Anemia is defined as a decrease in oxygen-carrying capacity and hemoglobin levels from the normal range [1-3]. There are different types of anemia: iron deficiency, hemolytic, aplastic and inflammation-related [4-5]. The most common is iron deficiency anemia and it is becoming increasingly common these days because of lifestyle changes among reproductive females. During this time, physical and psychological activity will be at their peak. The risk of females being neglected by society is higher [6]. The body requires more energy and nutrition during puberty resulting in anemia in about 55% of females around the world [7]. Poverty is also one of the cause of nutritional anemia in females. Furthermore, women have blood loss during their menstrual cycle [8]. Anemia can be diagnosed by looking at the hemoglobin count, red cells count and packed cell volume. The normal value of hemoglobin is 14-16 g/dl, Red cell mass is 4.2-6.7 million cells per microlitre, Hematocrit is 35-48% [9]. Iron deficiency anemia is usually treated with oral iron supplements. Patients are also advised to take regular traditional iron-rich food supplements.

Fenugreek (*Trigonella foenum-graecum*/methi) is a traditional plant with a high nutritional profile that is commonly used to prevent or treat iron-deficiency anemia in the general population. Predominantly most of the spices of the fenugreek family (Fabaceae) serve as a flavoring agent. Although fenugreek belongs to this family, that doesn't mean it can only be used for cooking. Components of fenugreek include fiber, phospholipids, glycolipids, linolenic acid, choline, vitamins A, B1, B2, C, nicotinic acid, niacin, and other basic elements [10]. Additionally, fenugreek seeds are used in the paper, cosmetic, pickle, beverage, perfume and paint industries. Moreover, they are effective hypoglycemic, hypocholesterotic, and antithrombotic agents. The seeds were thought to contain non-nutritional saponins and alkaloids. Fenugreek seeds lower triglyceride levels as well as total cholesterol levels and also lower the density of lipoprotein cholesterol [11]. It was demonstrated in a study that soluble fibers in fenugreek, including glucomannan fiber, have essential biochemical changes like decreasing the intestinal absorption of glucose and sugars (fenugre-cin) and possess hypoglycaemic properties [12]. An extract of Fenugreek at a dose of 400 mg daily yielded a positive correlation with hyperlipidemia reduction in the study. Fenugreek extract shows more than 70% inhibition in the growth of tumour cells on repeated control [13]. Recently, insulin resistance and cholesterol metabolism properties of fenugreek were investigated [14] and fenugreek seeds were found to increase erythropoiesis in broiler breeder males [15]. In a previous study published in 2020, fenugreek seeds reversed anemia [16] in dental outpatients. However, there is only a limited amount of evidence about their effect on

anemia in adolescent females. The aim of our study was to assess the effect of soaked fenugreek seeds on hemoglobin levels and packed cell volume (PCV) in clinically healthy 20-30 year old females.

Materials and methods

In this prospective study, 10 asymptomatic females 20-30 years of age were selected using the random sampling method using a digital laboratory record system. Females during their menstruation period were excluded from the study. Validation of the study was done by expert pathologists and principal investigators. A written consent form was taken from the study participants before initiating the clinical trial. This form was for explaining the purpose of the study and clarifying their queries about the consumption of fenugreek seeds. Details regarding age, height, weight and general health conditions were recorded in all selected participants.

The fenugreek seeds were cleaned, measured for one teaspoon and soaked in 5 ml of water, and left overnight and supplemented before breakfast. On the first day before fenugreek seed supplementation, intravenous blood samples were collected from participants and analysed for hemoglobin and PCV levels. In the following days, the participants consumed fenugreek seeds orally followed by drinking water every day after breakfast. After a consecutive period of time (48 days) the IV samples were collected. Hemoglobin percentage was analyzed using an automated haematology analyzer. Haematocrit (PCV) is the measurement of the proportion of blood that is made up of cells which were obtained as a calculated value from the automated analyzer. Pair 1 represents the mean value of hemoglobin before supplementation (Hb1) and hemoglobin after supplementation (Hb2). Pair 2 represents the mean value of packed cell volume before (PCV1) and after supplementation (PCV2). The obtained haematological data were assessed using the paired t-test via the SPSS Statistics software (IBM, Armonk, USA).

Results

From the results obtained, pair 1 represents the mean value of hemoglobin before supplementation (Hb1) and hemoglobin after supplementation (Hb2) as 12.3200 and 11.3300 respectively with p value = 0.235 ($p > 0.05$). The pair 2 shows the mean packed cell volume before (PCV1) and after supplementation (PCV2) as 36.7970 and 35.4700 respectively with p value = 0.286 ($p > 0.05$). [Table 1]. After supplementation, hemoglobin and PCV mean values were decreased. However, there were no statistically significant differences in the hemoglobin and PCV measurements before and after fenugreek supplementation.

Table 1. The mean, standard deviation and statistical analysis of Hemoglobin and PCV variations before and after supplementation

Study groups	Parameters	Mean	Standard Deviation	Statistical Significance
Pair 1	Hemoglobin g/dL (before supplementation Hb1)	12.3200	1.730	p = 0.236
	Hemoglobin g/dL (after supplementation Hb 2)	11.8300	0.921	
Pair 2	PCV% (before supplementation PCV1)	36.7970	5.158	p = 0.286
	PCV% (after supplementation PCV 2)	35.4700	2.5948	

Discussion

According to the literature, elemental iron contained in fenugreek seeds was effective at boosting functions such as hemoglobin synthesis, oxygen transportation, regulation of body temperature and muscle activity [17]. Vitamin C in fenugreek leaves improves haemoglobin levels in women who suffer from anaemia [18].

In our study, Hemoglobin concentration before fenugreek supplementation seems higher (mean 12.32 gm/dl) than after 2 months of fenugreek supplementation it was insignificantly reduced (mean 11.83gm/dl). This is supported by Verma et al., who showed that fenugreek seeds were effective in decreasing glycated hemoglobin levels (HbA1C) in type 2 diabetic patients [19] (see Table 2). Doshi et al. published that fenugreek seeds increased blood hemoglobin levels and treating anemia in childbearing women [20]. Pregnancy-related hemoglobin increases may be caused by the lack of menstruation during this time. In our current study, the hemoglobin level was lower than expected, which is not consistent with our previous findings. Study by Srinivasan et al. showed that fenugreek reduces menstrual blood loss and thereby it increases the hemoglobin level in females of reproductive age [21].

PCV value before supplementation seems high (mean 36.79), when compared with after supplementation values (mean 35.47). Due to a decrease in hemoglobin, the hema-

Table 2. Hemoglobin and PCV values obtained from various previous articles

Authors	Hemoglobin (g dL ⁻¹)	PCV (%)	P-value
Roohi et al. [27]	9.45	31.55	p > 0.05
Doshi et al. [20]	12.35	-	p > 0.05
Sakhira et al. [26]	14.75	44.05	p ≤ 0.05
Rao et al. [24]	14.7	36	p > 0.05
Nagammal et al. [23]	11.56	36.76	p ≤ 0.05
Naidi et al. [25]	10.45	-	p > 0.05
Verma et al. [19]	11.23	-	p < 0.05
Our present study	11.83	36.79	p > 0.05

tocrit level also decreased. In fact, they are directly related as shown in this formula: PCV = 3 x Hb [22]. According to studies conducted by Rao et al. and Nagammal et al., fenugreek increased hemoglobin and PCV values, which is not consistent

with our study [23-24]. A study by Naidi et al. compared the effect of fenugreek with glibenclamide drugs in diabetic patients. A higher RBC count was observed in fenugreek (5.44/mm³), MCV (88.74 fL) and MCH (27.68 pg) when compared to glibenclamide. Apparently, fenugreek seems to stimulate hematopoietic stem cells, thereby improving hemoglobin levels [25-26]. Roohi et al. observed a reduction in hemoglobin and PCV values in their study on fish diet [37]. A study of fenugreek meal on male rats found significant increases in hemoglobin and PCV levels after supplementation [26].

This is a pilot study and its limitations include a small sample size and short follow-up. This can be overcome by recruiting a higher sample size and a year-long fenugreek supplementation in the future. After analyzing the clinical history of the participants (Table 3), it was discovered that the participants who had a the previous history of anemia and were treated with iron supplements had a mildly higher hemoglobin and PCV value than the other participants. These selection biases can be avoided in future studies.

With respect to the limitations of this study, we conclude that fenugreek reduced hemoglobin levels and packed cell volume among clinically healthy females of age 20-30 years. However, this reduction is not statistically significant. The data above shows that consumption of a soaked single teaspoon of fenugreek is not an effective supplementation for increasing hemoglobin and PCV and correcting anemia. This might have promising effects when taken with iron supplements. Further research on fenugreek supplementation is awaiting completion by the author.

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Table 3. Clinical history and examination findings of the study participants

Clinical History and signs	Present	Absent
Fatigue	20%	80%
Giddiness	10%	90%
Palpitations	60%	40%
Previous history of jaundice	20%	80%
Previous history of treatment for anemia	20%	80%
Pallor (conjunctiva)	50%	50%
Pallor (nails)	30%	70%

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Conflicts of interest

None.

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