

## Research Article

# Modulating iron deficiency anemia through Date (*Phoenix dactylifera*) and Fig (*Ficus carica*) spread

Emaan Naveed<sup>1</sup>, Saleha Hameed<sup>1\*</sup>, Sana Azher<sup>1</sup> and Adeela Hameed<sup>2</sup>

1. Department of Human Nutrition & Dietetics, Minhaj University Lahore, Pakistan

2. Institute of Food Science & Technology, Khwaja Fareed University of Engineering and Information Technology, Pakistan

\*Corresponding author's email: [hameed.saleha@yahoo.com](mailto:hameed.saleha@yahoo.com)

### Citation

Emaan Naveed, Saleha Hameed, Sana Azher and Adeela Hameed. Modulating iron deficiency anemia through Date (*Phoenix dactylifera*) and Fig (*Ficus carica*) spread. Pure and Applied Biology. Vol. 12, Issue 2, pp901-906. <http://dx.doi.org/10.19045/bspab.2023.120090>

Received: 07/12/2022

Revised: 15/02/2023

Accepted: 28/02/2023

Online First: 11/03/2023

### Abstract

Globally, the prevalence of micronutrient deficiency is increasing gradually especially iron deficiency and there is a requirement to improve hemoglobin status with the consumption of food commodities that are cheap and locally available. Iron is an essential constituent of hemoglobin, an erythrocyte protein that helps to transport oxygen in the body. The current research was designed with intent to improve iron deficiency anemia (IDA) with the consumption of date fruit, fig fruit and its combination to ameliorate IDA. The experimental study includes fifty students selected on the basis of exclusion and inclusion criteria. On the basis of exclusion criteria, a questionnaire was prepared and filled from the students and among those who fulfilled the criteria 50 subjects were selected on the basis of random samplings and divided into five different groups D<sub>0</sub> (normal diet) D<sub>1</sub> (normal diet with date spread) D<sub>2</sub> (normal diet with fig spread) D<sub>3</sub> (normal diet with date and fig spread) D<sub>4</sub> (normal diet with iron supplement). Blood test containing hemoglobin, hematocrit and ferritin levels were observed before and after the intervention. The results explicated that the hemoglobin levels improve with the intervention and maximum was observed in D<sub>3</sub> 12.4±0.5 g/dL in comparison with control. The hematocrit and ferritin levels were also enhanced after the intervention with the maximal in date and fig spread. It was also observed that supplements also improve the hemoglobin levels with minor side effects *i.e.* abdominal pain, nausea and headache. Conclusively, dates and figs alone and their combination are effective against IDA.

**Keywords:** Anemia; Ferritin; Hematocrit; Hemoglobin; Iron

### Introduction

Anemia is a nutritional deficiency disorder affecting human health worldwide with maximal prevalence in developing countries. The main cause of anemia includes iron deficiency however other reasons may include micronutrient deficiencies, excessive menstrual blood, acute and chronic infections and hemoglobinopathy [1]. According to NNS (National Nutrition Survey, 2018), in

Pakistan prevalence of anemia in adolescent girls (10-19 years) was 54.7% and in non-pregnant women of reproductive age (15-49 years) 43% whereas, 18.2% were affecting from iron deficiency anemia. The prevalence in adolescent girls was observed tenfold in comparison with adolescent boys [2].

Human body needs oxygen to survive and its constant supply is the foundation of human life. Iron plays a vital role as it

transports oxygen to all body cells and the capacity to carry oxygen is the main feature of red blood cells. The red blood cells are packed with hemoglobin (Hb), each red blood cell contains 200-300 units of hemoglobin. The World Health Organization (WHO) confirms the normal levels of hemoglobin in females as 12-16 g/dL and in men 14-18 g/dL and the normal hematocrit values as 42-54% for men and 36-48% for women [3]. Anemia prevails when the hemoglobin levels or the number of red blood cells reduce than normal resulting in fewer supply of oxygen to the body and less energy to perform physiological functions [4].

Individuals with IDA have impaired absorption or transport of iron, inadequate intake of iron rich foods, physiologic losses that are linked with chronological or regenerative age, as well as chronic blood loss secondary to illness. Start of menstruation cycle in girls, hormonal changes and more consumption of unhealthy food are the factors which causes IDA in adolescence and early adulthood period. Nutritional needs in the body are affected by physical changes whereas eating habits and food choices are affected by lifestyle. In this regard, adolescent and early adult hood nutrition is therefore of immense importance for preventing the future health problem and supporting the physical growth of the body [5].

Nutritional anemia grows progressively after the usual iron stores have been drained in body as well as in bone marrow. Generally, women suffered from increased blood loss due to menstruation and have comparatively smaller stores of iron than men that contribute in placing them at greater risk for nutritional anemia. The level of anemia in a person is influenced by the food consumed, a person consuming food that have low iron content will cause anemia. Therefore, the measure to reduce anemia includes consumption of foods rich in Fe content. Among the food commodities that helps to elevate iron content figs and dates are also considered

as inevitable, they are used to cure or prevent number of ailments in the diverse tradition system of medicine providing ample source of iron that increase hemoglobin levels in the blood [6]. Iron content in dates can escalate the number of erythrocytes thus increasing hemoglobin levels in the blood [7].

Dates (*Phoenix dactylifera*) are one among the fruits used in the human diet that possess a high nutritional value.<sup>17</sup> There are 314 calories in 100 g of date. Ten minerals are reported, the major being selenium, copper, potassium, and magnesium. The consumption of 100 g of dates can provide over 15% of the recommended daily allowance from these minerals.<sup>18</sup> In addition, the amount of iron in dates is about 0.3 mg to 10.4 mg per 100 g. Therefore, eating a few dates daily will provide daily iron requirement of human body. In addition, dates contain vitamin C which improves iron absorption [8]. Figs contain high amount of iron that is 5% and vitamin C 3% contributing in rapid absorption of iron [9].

Therefore, the current study was designed to investigate the therapeutic potential of figs (*ficus carica*) and dates (*phoenix dactylifera*) spread to overcome iron deficiency anemia. The study is inimitable in the sense that it explored the synergistic role of figs and dates.

#### **Materials and Methods**

The raw material including Figs, Dates and jaggery were procured from local market of Lahore. The date and figs fruit samples were washed to remove dust particles, dried and then used for the preparation of fig and date functional spread. The date and fig spread were prepared in three different combinations.

- i) 100 % dates
- ii) 100 % figs
- iii) 50% dates and 50% figs

To prepare spread date and figs were soaked in water a night before. The pits and caps were removed and figs and dates were cooked separately in different pots on medium heat till softens. Remove from heat

and mash both figs and dates. Mix together and cook again on medium flame until it reaches a thick consistency than add 0.1 % lemon juice to enhance flavor and taste. Cool and preserved in clean air tight jars till further consumption.

### Study population and Sample size

This study was conducted on male and female students of Minhaj University, Lahore aged between 18-25 years. The subjects were selected on the basis of inclusion criteria having hemoglobin levels  $\leq 9.5$  mg/dL and willing to participate in research. The exclusion criteria include subjects suffering from ailments that may leads to anemia including allergies, internal bleedings, gastro intestinal disease and usage of any other medication or supplement. On the basis of this criteria a questionnaire was prepared and students were asked to fill that questionnaire and among them who fulfilled the criteria, 50 subjects were selected on the basis of random samplings and divided into five different groups i) D<sub>0</sub>: normal diet ii) D<sub>1</sub>: normal diet with date spread (75 g) iii) D<sub>2</sub>: normal diet with fig spread (75 g) iv) D<sub>3</sub>: normal diet with date and fig spread (75 g) v) D<sub>4</sub>: normal diet with iron supplement (ferrous sulphate 200mg). The normal diet plan according to their height and weight was also prepared and asked to follow during the study period of 2 months.

### Blood tests

The blood samples were analyzed for hemoglobin levels, hematocrit levels and ferritin levels before and after consumption of spread and supplements. Blood samples were collected in sterile environment and tested in pathology lab.

### Data analysis

Results were analyzed statistically by using analysis of variance (ANOVA) technique. The significance of means was at 0.05 probability level as suggested by Steel *et al.* [10].

### Results and Discussion

The mean squares values of Hb after the intervention showed maximum in D<sub>4</sub> 12.5±0.3 g/dL followed by D<sub>3</sub> 12.4±0.5

g/dL, D<sub>1</sub> 11.5±0.2 g/dL and D<sub>2</sub> 11.2±0.4 g/dL and minimum was observed in D<sub>0</sub> 9.7±0.1 g/dL (Table 1). The hematocrit (Table 2) and ferritin values (Table 3) were observed as D<sub>1</sub> 41±1.7% & 90±3.7 ng/mL, D<sub>2</sub> 40±1.9% & 85±3.5 ng/mL, D<sub>3</sub> 45±1.7% & 105±4.9 ng/mL and D<sub>4</sub> 44±1.8% & 100±4.6 ng/mL, respectively.

The most common form of anemia is iron deficiency anemia also known as nutritional anemia or hypo-chromic anemia. The progression of anemia involves a series of proceedings starting from decreased amount of iron in diet resulting reduced iron reserves in body, if dietary sources failed to provide enough iron ultimately leads to limit hemoglobin [11]. The iron deficiency anemia can be cured with increasing foods that are rich in iron and also vitamin C as it helps in the absorption of iron and they must be consumed together to enhance the absorption of iron and effect cannot be achieved if both iron and Vitamin C were consumed at different meal timings [12].

The present research benefits in this aspect as both dates and figs are rich sources of iron and vitamin C. Nadeem *et al.* [13] estimated iron content 0.65-2.52 mg/100gm in 21 different varieties of dates available in Pakistan and an average of 3900 ( $\mu$ g/100 g) of vitamin C [6]. Whereas, iron content in figs were reported as 5.69-10.09 mg/100g [14] and vitamin C as 6.62-9.29 mg/100g [15]. Irandegani *et al.* [16] explicated similar effect with the consumption of date and a significant association was observed in the increase levels of ferritin and hemoglobin levels. The iron stores in body increase gradually with the regular intake of date spread on daily basis causing ferritin reserves to increase leading to elevated hemoglobin in red blood cells.

Similar results were also obtained by Agrawal *et al.* [17] reported the use of figs to improve hemoglobin levels among anemic subjects and observed a significant increase in hemoglobin levels after eight weeks of trial. They deduced that the effect

was achieved due to increase amount of iron and vitamin C in figs and its

continuous use helps in curing iron deficiency anemia.

**Table 1. Effect of treatments on Hemoglobin (g/dL) levels in human subject**

Treatments	Hemoglobin (g/dL)			
	Before	f value	After	f value
D <sub>0</sub>	9.4±0.2	0.15	9.7±0.1d	0.00
D <sub>1</sub>	9.4±0.1		11.5±0.2b	
D <sub>2</sub>	9.5±0.2		11.2±0.4c	
D <sub>3</sub>	9.4±0.3		12.4±0.5a	
D <sub>4</sub>	9.3±0.1		12.5±0.3a	

D<sub>0</sub>=Control

D<sub>1</sub>=Spread containing dates

D<sub>2</sub>=Spread containing figs

D<sub>3</sub>=Spread containing dates and figs

D<sub>4</sub>=Supplements

**Table 2. Effect of treatments on Hematocrit (%) levels in human subject**

Treatments	Hematocrit (%)			
	Before	f value	After	f value
D <sub>0</sub>	36±1.2	0.07	37±1.3c	0.00
D <sub>1</sub>	35±1.4		41±1.7b	
D <sub>2</sub>	34±1.1		40±1.9b	
D <sub>3</sub>	36±1.2		45±1.7a	
D <sub>4</sub>	34±1.3		44±1.8a	

D<sub>0</sub>=Control

D<sub>1</sub>=Spread containing dates

D<sub>2</sub>=Spread containing figs

D<sub>3</sub>=Spread containing dates and figs

D<sub>4</sub>=Supplements

**Table 3. Effect of treatments on Ferretin (ng/ml) levels in human subject**

Treatments	Ferretin (ng/ml)			
	Before	f value	After	f value
D <sub>0</sub>	47±2.1	0.01	50±2.4e	0.00
D <sub>1</sub>	49±2.2		90±3.7c	
D <sub>2</sub>	46±2.4		85±3.5d	
D <sub>3</sub>	48±2.1		105±4.9a	
D <sub>4</sub>	49±2.5		100±4.6b	

D<sub>0</sub>=Control

D<sub>1</sub>=Spread containing dates

D<sub>2</sub>=Spread containing figs

D<sub>3</sub>=Spread containing dates and figs

D<sub>4</sub>=Supplements

Indrayani *et al.* [18] and Sari *et al.* [19] studies effect of date along with ferrous sulphate as a supplement and observed similar result as both helps in increasing hemoglobin level in blood that functions as an oxygen carrier. The increased hemoglobin levels help in proper supply of

oxygen from the lungs to all parts of the body reducing fatigue, dizziness and weakness, common signs and symptoms of anemia. However, higher doses of supplements more than 120 mg may cause other complications like constipation, diarrhea, gastric pain, nausea, heart burn

[20]. Whereas, when dates and figs were consumed they were a good source of dietary fiber as well other important nutritional components like protein, carbohydrates, vitamins and minerals that further helps in proper bowel movement and does not cause such effect to appear [21].

### Conclusion

Dates and Figs both contain immense amount of iron and vitamin C content helps in raising hemoglobin levels and improving iron stores in human body to overcome anemia. They are safe to consume, nutritious and effective, their synergistic effect imparts significant effect on hemoglobin levels relatively consuming separately. Furthermore, supplements demonstrate similar results though certain negative physiological effect may occur due to their consumption on human body.

### Authors' contributions

Conceived and designed the experiments: S Hameed, Performed the experiments: E Naveed & S Hameed, Analyzed the data: E Naveed & S Azher, Contributed materials/analysis/ tools: E Naveed, S Azher & A Hameed, Wrote the paper: S Hameed & A Hameed.

### References

1. Kaur M, Singh A, Bassi R & Kaur H (2022). Nutritional status and anemia in medical students of Sgrdimsar Amritsar. *Nat J of Physiol, Pharm and Pharmacol* 5(1): 35-49.
2. UNICEF (2018). Pakistan National Nutrition Survey: Key Findings Report. Islamabad, Pakistan.
3. Reid SA, Speedy, DB Thompson, JM, Noakes, T.D, Mulligan, G, Page, T, Campbell RG & Milne C (2004). Study of Hematological and Biochemical Parameters in Adults. *J Am Med Dir Assoc* 5: 395- 400.
4. Longo DL, Jameson JL & Kasper D (2011). Harrison's Principles of Internal Medicine, Volume 2; Macgraw-Hill.
5. Resmi S, Fathima L & Vijayaraghavan R (2017). Formulation of a herbal extract for anemia treatment and its

effect on physical work and intelligence capacity in adolescent girls with iron deficiency in India. *Afr J Pharm Pharmacol* 11(24): 284-288.

6. Al-Farsi MA & Lee CY (2008). Nutritional and functional properties of dates: a review. *Crit Rev Food Sci Nutr* 48(10): 877-887.
7. Zen AT & Pertiwi D (2013). The Effect of Date (*Phoenix dactylifera*) Juice on Haemoglobin Level an Experimental Study in Iron Supplemented Rats. *Sains Medika* 5(1): 17-19.
8. Mousavi T, Rafiei A & Yoosefpour M (2014). Nutritional value and health benefits of dates according to Islamic recourses and traditional medicine. *J Maz Uni Med Sci* 24(117): 247-265.
9. Craig WJ & Mangels AR (2009). Position of the American Dietetic Association: vegetarian diets. *J Am Diet Assoc* 109(7): 1266.
10. Steel RG, Torrie JH & Dickey DA (1997). Principles and procedures of statistics: A Biometrical Approach, 3rd ed., McGraw Hill Book Co. Inc. New York, USA.
11. Arief N (2008). Kehamilan dan kelahiran sehat. Yogyakarta: Dianloka.
12. Cook JD, Monsen ER (1977). Vitamin C, the common cold, and iron absorption. *Am J Clin Nutr* 30(2): 235-241.
13. Nadeem M, Qureshi TM, Ugulu I, Riaz MN, An QU, Khan ZI, Ahmad K, Ashfaq A, Bashir H & Dogan Y (2019). Mineral, vitamin and phenolic contents and sugar profiles of some prominent Date palm (*Phoenix dactylifera*) varieties of Pakistan. *Pak J Bot* 51(1): 171-178.
14. Khan MN, Sarwar A, Adeel M & Wahab MF (2011). Nutritional evaluation of Ficus carica indigenous to Pakistan. *Afr J Food Agric Nutr Dev* 11(5): 5187-5202.
15. Naseer MA, Maqbool M, Rafiq S, Zahid N, Hamid A & Shah SZ (2020). Comparative analysis of physical and biochemical attributes of edible fig

- (*Ficus carica* L.) collected from three districts of Azad Jammu and Kashmir located at different elevations. *Pak J Agric Res* 33: 707-713.
16. Irandegani F, Arbabisarjou A, Ghaljaei F, Navidian A & Karajibani M (2019). The effect of a date consumption-based nutritional program on iron deficiency anemia in primary school girls aged 8 to 10 years old in Zahedan (Iran). *Ped Health Med Ther* 10: 183.
  17. Agrawal N & Rawte Y (2017). Use of dried figs to improve hemoglobin percentage. *Indian J Sci Res* 12(2): 096-098.
  18. Indrayani RA & Rakhim DA (2018). Can date fruits and 7 dates replace iron tablets in increasing hemoglobin levels. *Pak J Med Health Sci* 12(4): 1750-1759.
  19. Sari A, Pamungkasari EP & Dewi YL (2018). The addition of dates palm (*Phoenix dactylifera*) on iron supplementation (Fe) increases the hemoglobin level of adolescent girls with anemia. *Bali Med J* 7(2).
  20. Hyder SZ, Persson LÅ, Chowdhury AM & Ekström EC (2002). Do side-effects reduce compliance to iron supplementation? A study of daily-and weekly-dose regimens in pregnancy. *J Health Popul Nutr* 175-179.
  21. Barh D & Mazumdar BC (2008). Comparative nutritive values of palm saps before and after their partial fermentation and effective use of wild date (*Phoenix sylvestris Roxb.*) sap in treatment of anemia. *Res J Medi Med Sci* 3(2): 173-176.