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Original Article

Evaluation and Comparison of the Effects of Low and High Doses of Herbal Medicinal Plant Emblic Myrobalan (AMLA) on Red Cell Parameters of Normal Healthy Rabbits

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ABSTRACT

Objective: To study and compare the effects of low and high doses of Emblic myrobalan (Amla) on the red blood cells hemoglobin (Hb), packed cell volume (PCV) red cell count (RCC), Mean Corpuscular Volume (MCV), Mean Corpuscular Hemoglobin Concentration (MCHC) of rabbits.

Study Design: Laboratory based experimental study.

Place and Duration of Study: Department of Pharmacology, and Animal House of Baqai Medical University Karachi Pakistan, from Jul to Aug 2016.

Methodology: Twenty-seven male rabbits of 1-2kg body weight were taken and equally divided into 3 groups (group A, B and C). Group A served as control group; group B (Low dose group) was administered Amla at 2g/kg body weight while group C (High dose group) was administered Amla at 4g/kg body weight. Amla was mixed with water and administered orally with syringe for 60 days. Blood samples were drawn via cardiac puncture on day 61 for red cell parameters and reports were analyzed using Statistically Package for Social Sciences (SPSS) version 21.

Results: Administration of low dose Amla resulted in significant increase in Hb (0.001) and PCV (0.001) compared to normal while high dose Amla produced significant increase in Hb (0.001), PCV (0.001), MCV (0.043), MCH (0.027) and RCC (0.001). Administration of high dose Amla showed significant improvement in red cell parameters compared to low dose Amla.

Conclusions: Amla may be used to improve the red cell hemoglobin in patients of iron deficiency anemia.

Keywords: Emblic myrobalan, Hemoglobin, Red cell parameters.

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INTRODUCTION

Iron deficiency anemia (IDA) is the most common cause of anemia, affecting 500 million people globally. It is characterized by microcytic and hypochromic red cells on peripheral blood smear. The etiology of iron deficiency anemia is diverse depending upon age, gender and presence of absence of other comorbid conditions. Multiple pregnancies and menorrhagia are common reasons of anemia in young females of reproductive age whereas worm infestation like hookworms, is responsible for anemia in children. Anemia in older age groups usually indicates a more sinister diagnosis like malignancy or internal bleed.

Herbal supplements may be useful in treating iron deficiency anemia. They possess multiple advantages over the conventional iron supplements in terms of tolerability and safety. Emblicaofficinalis belongs to the family Euphorbiacear. It is also known as Amla in urdu language and Emblic myrobalan in English language. Its fruits are of small size having greenish yellow color, containing tannin, water, amino acids, gallic acid, flavonoids, poetin, chromium, zinc and copper. All these ingredients are active pharmacologically. Amla has been used in the past for several centuries in the subcontinent for common diseases like cough ,flu, asthma and bronchitis to name a few.[1] It is a rich source of vitamin C and plays protective role in liver, cardiovascular and hematological disorders.[2] It supposedly revitalizes the organ systems of the body and boosts the immune system. It helps in the synthesis of collagen which is responsible for bone strength and wound healing.[3,4] It also helps in improving glycemic control and lipid profile in patients of type-2 diabetes mellitus.[5] The main objective of the study was to evaluate and compare the effects of Emblic myrobalan on red cell parameters of normal healthy rabbits.

METHODOLOGY

The laboratory based experimental study was conducted at the Department of Pharmacology, Baqai Medical University in collaboration with Animal House and Pathology Department of Baqai Medical University Karachi, Pakistan from July to August 2016.

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All the procedures were approved by the institutional review board of the university.

Inclusion Criteria: Male rabbits having weight of 1-2 kg were inlcuded.

Exclusion Criteria: Female rabbits and rabbits with visible disease features were excluded from the study.

Twenty-seven male rabbits were selected via convenient non probability sampling. Rabbits were divided into 3 groups, each containing 9 rabbits. One group was kept as control (A) while the other two groups were kept as test drugs (B and C). Group B was administered 2g/kg/day of Amla for 60 days while Group C was administered 4 g/day for 60 days. Powdered form of the drug was mixed with water and administered orally with syringe without needle. At the end of study, blood samples were drawn through cardiac puncture and tested for red cell parameters including Red cell hemoglobin (Hb), Packed Cell Volume (PCV), Red Cell Count (RCC), Mean Corpuscular Volume (MCV) and Mean Corpuscular Hemoglobin Concentration (MCHC). All the parameters were analyzed using Statistical Package for Social Sciences (SPSS) version 21. Paired t test was applied to analyze the differences among various groups.

RESULTS

Significant improvement in red cell parameters was noted with administration of Amla in low as well as high doses. Table-I & II show comparison of red cell parameters of control with that of low and high dose groups, respectively. Hb in control group A was found to be 10.5g/dl while that in Group B & C was found to be 11.17g/dl and 12.9g/dl, respectively showing significant improvement in red cell Hb (*p*-value 0.001). PCV was 32.6±0.41 in control group while it was 37.0±0.67 and 39.9±0.56 in low and high dose groups, respectively, indicating a statistically significant improvement in PCV as well (*p*-value 0.001). Compared to normal, MCV, MCH, MCHC and RCC were statistically not significant in low dose group, however, these variables increased significantly in high dose group. Administration of high dose Amla proved more beneficial in improving red cell Hb (*p*-value 0.001), PCV (*p*-value 0.043) and RCC (*p*-value 0.001) compared to low dose group (Table-III).

DISCUSSION

Herbal supplements play significant role in improving the hematological parameters. Emblic myrobalan (Amla) had been extensively used in ancient Indian medicine. Amla gives 3,000 mg of vitamin C per fruit, making it one of the highest natural sources of the vitamin.[6] It helps in the absorption of iron and can be very beneficial to patients suffering from IDA.[7]

Table-I: Comparisons of Hematological Parameters Between Controls and Low Dose of Emblica Myroblan in Rabbits

Hematological Parameters	Controls (n=9)	Low dose of Emblic Myrobalan (n=9)	*p*-value
	Mean±SD	Mean±SD	
Hemoglobin (g/dl)	10.5±0.41	11.7±0.83	0.001*
Packed Cell Voulme (fl)	32.6±2.13	37.0±3.48	0.001*
Mean Corpuscular Voulme (fL)	65.3±2.13	66.2±1.87	0.124#
Mean Cell Haemoglobin (pg)	18.4±1.97	19.3±1.92	0.113#
Mean Cell Hemoglobin Concentration (g/dl)	29.9±3.06	30.0±1.92	0.875#
Red Cell Concentration (106/ul)	5.0±0.62	4.9±0.57	0.596#

**Statistically Significant (p<0.05), # Statistically non- significant (p>0.05)*

Table-II: Comparison of Hematological Parameters Between Controls and High Dose of Emblica Myroblan in Rabbits

Hematological parameters	Controls (n=9)	High dose of Emblic Myrobalan (n=9)	*p*-value
	Mean±SD	Mean±SD	
Hemoglobin (g/dl)	10.5±0.41	12.9±1.09	0.001*
Packed Cell Voulme	32.6±2.13	39.9±2.90	0.001*
Mean Corpuscular Voulme (fL)	65.3±2.13	66.6±1.97	0.043*
Mean Cell Haemoglobin (pg)	18.4±1.97	19.7±1.71	0.027*
Mean Cell Hemoglobin Concentration (g/dl)	29.9±3.06	30.4±2.13	0.450#
Red Cell Concentration (106/ul)	5.0±0.62	4.2±0.36	0.001*

**Statistically Significant (p<0.05),#Statistically non- significant (p>0.05)*

Table-III: Comparisons of Hematological Parameters in Low Dose and High Dose of Emblica Myrobalan in Rabbits

Hematological Parameters	Emblica Myrobalan		*p*-value
	Low dose (n=9)	High dose (n=9)	
	Mean±SD	Mean±SD	
Hemoglobin (g/dl)	11.7±0.83	12.9±1.09	0.001*
Packed Cell Voulme	37.0±3.48	39.9±2.91	0.004*
Mean Corpuscular Voulme (fL)	66.2±1.87	66.6±1.97	0.534#
Mean Cell Haemoglobin (PS)	19.3±1.92	19.7±1.71	0.514#
Mean Cell Hemoglobin Concentration (g/dl)	30.0±1.92	30.4±2.13	0.435#
Red Cell Concentration (106/ul)	4.9±0.57	4.2±0.36	0.002*

**Statistically Significant (p<0.05), # Statistically non- significant (p>0.05)*

This study was conducted on rabbits using Amla. The study is unique as no previous study has been conducted in past to observe the effects of Amla on hematological parameters in rabbits. Significant changes were found in the hematological parameters of test groups administered with low and high doses of the drug (Groups B & C respectively), compared to the control group (Group A). Administration of low dose Amla led to significant improvement of red cell Hb (*p*-value 0.001) and PCV (*p*-value 0.001). Mahima *et al*, and Amita *et al*. also reported similar results with administration of dried Amla in diet of fingerlings, with significant improvement in Haemoglobin percentage.[3] Another study conducted by Rajesh *et al*. also reported improvement in the red cell hemoglobin with administration of dried Amla powder in diet of broiler poultry chicken.[4] Administration of Amla in high dose (group C) also demonstrated improvement in red cell Hb (*p*-value 0.001) and PCV (0.001). However, high dose Amla was also associated with statistically significant improvement in MCV, MCH and RCC. Administration of high dose of Amla was associated with more improvement in red cell Hb (*p*-value 0.001), PCV (*p*-value 0.004) and RCC (*p*-value 0.002) compared to low dose Amla. The probable reason for this improvement may be due to stabilising action of Amla on red cell membrane integrity.[8,15] Amla extract effectively protected the RBCs and plasma proteins from the reactive oxygen species induced oxidative damage.[9,16] Liquid chromatography-mass spectrometry (LC-MS) analysis of the extract revealed the presence of gallic acid, quinic acid, and quercetin as the major constituents in addition to the other flavonoids.[10,17] Amla being a rich source of vitamin C which is the essential ingredient for absorption of iron.[11] may be another possible reason for improvement of red cell parameters.[12,18] Amla also contains iron which promotes production of new blood cells and improves circulation.[13,14]

CONCLUSION:

Emblic myrobalan is helpful in improving red cell parameters. Hence it can be recommended in patients of anemia. However further studies are recommended to determine uses in different diseases.

Conflict of Interest: None.

Author's Contribution

Following author has made substantial contributions to the manuscript as under:

IUK: & TS: Conception, study design, data acquisition, data analysis, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

AS: & MSK: Critical review, data acquisition, drafting the manuscript, approval of the final version to be published.

Author agrees to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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