

Comparison of effect of *Phyllanthus emblica* (Indian Gooseberry) with and without honey on Hemoglobin, RBC and PCV among adolescents

Running title: Comparison of effect of *Phyllanthus emblica* (Indian Gooseberry) with and without honey among adolescents

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Abstract

Introduction: *Phyllanthus emblica* commonly known by names such as Indian gooseberry, amla belongs to the Phyllanthaceae. The plant is used as a medicine and tonic which is highly nutritious and forms an important dietary source of vitamin C and amino acids. Honey is rich in iron which helps in boosting the hemoglobin content in blood by increasing their synthesis. Complete blood count (CBC) is an array of tests to evaluate the cells in the blood which are the red blood cells, white blood cells, platelets.

Aim: The aim of the study is to compare the effect of *Phyllanthus emblica* (Indian Gooseberry) with and without honey on hemoglobin, RBC (Red Blood Cell) and PCV (Packed cell volume) among adolescents.

Materials and Methods: Ten adolescents including both male and female were selected as subjects for the study. The first group of subjects were categorised to consume gooseberry alone and the second group of subjects were categorised to consume gooseberry along with honey. After 15 days, CBC was taken for the subjects of both groups to analyse the results. Independent 't' test was applied to evaluate the significance of clinical trials performed in two groups.

Results and Discussion: The participant history included fatigueness, pallor, menstrual history, blood pressure, pulse. There is an increase in the mean value of Hb (Hemoglobin), RBC (Red Blood Cell), HCT (Hematocrit), MCV (Mean corpuscular volume), MCH (Mean corpuscular hemoglobin) and RDW (Red cell distribution width). Independent statistical analysis showed that p value is not significant as all the values are not <0.05 .

Conclusion: The present study concludes that gooseberry with honey supplementation has shown better results than gooseberry supplementation but it is not statistically significant. It is evident that gooseberry has nutritive and restorative properties. Daily use of gooseberries is safe and can show more significant increase in counts of RBC, Hb in longer duration.

Keywords: Gooseberry; honey; innovative technique; adolescents; RBC; Hb

Introduction

Phyllanthus emblica commonly known by names such as Indian gooseberry, amla belongs to the Phyllanthaceae. The plant is used as a medicine and tonic which is highly nutritious and forms an important dietary source of vitamin C and amino acids. It is reported to be chemotherapeutic and possess free scavenging activity (1). Amla is a potent rejuvenator and immunomodulatory and found to enhance digestion, treat constipation, reduce fever and cough, and used for various other ailments (2). Honey is a sweet, viscous substance made by honeybees. Honey is used worldwide commercially and for human consumption. The main uses of honey are for cooking and as a sweetener in some beverages. Honey acts as an antioxidant, antifungal and antibacterial agent. It aids in wound healing, digestive problems and acts as a phytonutrient powerhouse. Honey is rich in iron which helps in boosting the haemoglobin content in blood by increasing their synthesis. It acts as one of the most

valuable and best nutrition supplements (3). It is finding its place in modern medicine due to its easy availability and high nutritious value(4).

Complete blood count (CBC) is an array of tests to evaluate the cells in the blood which are the red blood cells, white blood cells and platelets. It is a test which helps to evaluate the overall health of a person and useful for the detection of many diseases and metabolic conditions. It is used for screening diseases and also monitors the status of the disease (5–7). Normal RBC count is between 4.5 to 5.5 million/mm³. Normal WBC count is 4000 to 11000 cells/mm. Normal platelet count is 1.5-4.5 lakhs/mm³. Hemoglobin is a conjugated protein present in the blood that possesses oxygen carrying capacity. It plays an important role in maintaining the red colour of the blood. Normal Hb count is 14-17 g/dl for males and 12-14 g/dl for females. Variation in Hb occurs due to various etiological factors.

In case of any shift or decrease in count of blood cells, it can cause various disorders amongst which most common is anaemia. Anaemia is a pathological condition in which there is a decrease in the number of red blood cells or their oxygen carrying capacity. Iron deficiency anaemia occurs due to imbalance in iron content or inability of the erythrocytes to utilize or metabolize iron (8). This condition shows high variation with age, sex and several other factors. Fatigue, weakness, dizziness and drowsiness constitute the symptoms of its severe form. Pregnant women and children are more vulnerable to this condition. Anaemia is classified based on different factors such as morphology, genetic factors, deficiencies etc. Our team has extensive knowledge and research experience that has translate into high quality publications (9) (10–23) ,(24–28). The aim of this study is to compare the effect of *Phyllanthus emblica* (Indian Gooseberry) with and without honey on hemoglobin, RBC and PCV among adolescents.

Materials and Methods

The present prospective study included ten adolescents both male and female were selected as study subjects from Saveetha dental college and hospitals, Chennai. The subjects of the study were divided into two equal groups each containing five members. The first group of subjects were categorised to consume gooseberry alone and the second group of subjects were categorised to consume gooseberry along with honey. Randomized open label trial sampling was done with the approval from the Institutional Human Ethics Committee of Saveetha University (IHEC/SDC/BDS/1907/01).

An informed consent regarding the study was taken from the subjects before starting the clinical trial. The informed consent explained in detail about the purpose of the study and consisted of all clarifications for the questions and queries by the subjects about their personal and health information. The study included adolescents of both genders who are within the age group of 18-20 years. The study excluded adolescents with a profile of long term medication, systemic diseases also with limited sample size, lesser duration of supplementation and follow up of time of consumption was not feasible. Adolescents (five participants) with normal complete blood count (CBC) were taken as control group. Validation of the study was done by Guide, Principal instructor and Expert pathologist.

The demographic data including age, gender, blood pressure, pulse rate and general and systemic health history were collected from the subjects. Complete blood count (CBC) was taken for the subjects before supplementation and the results were recorded. Gooseberries were cut into fine pieces. One portion of the diced gooseberries were mixed with two

tablespoons of honey. Two tablespoons of diced gooseberries were given to the first group. Two tablespoons of diced gooseberries mixed along with honey were given to the second group.

This pattern was followed for about fifteen days. After fifteen days, CBC was taken for the subjects who were supplemented with gooseberries with and without honey to analyse the results. The blood results were segregated and tabulated in google spreadsheets. The data was statistically analysed using SPSS software. Independent 't' test was applied to evaluate the significance of clinical trials performed in study and control groups.

Results

In the present study, the parameters such as Hb, RBC, HCT, MCV, MCH, RDW were taken to analyse the effect of gooseberry and gooseberry with honey among the participants. The p value of the parameters were calculated using SPSS software and tabulated (Table-1). The mean values of parameters of the present study were compared with few previous studies (Table-2). The independent 't' test values Hb, RBC, HCT after supplementation of gooseberry without honey and gooseberry with honey were compared and depicted in the form of a bar graph where the mean value of RBC and HCT is found to be greater with consumption of gooseberry with honey than gooseberry with 5.26 and 42.16 respectively. P value for Hb is 0.448 (>0.05), RBC is 0.156 (<0.05) and HCT is 0.245 (>0.05) and is statistically insignificant (Figure-1).

The independent 't' test values MCV, MCH, RDW after supplementation of gooseberry without honey and gooseberry with honey were compared and depicted in the form of a bar graph where, the mean value of MCV is found to be 80.74 in participants who consumed gooseberry which is greater than the mean value 80.44 in participants who consumed gooseberry with honey. The mean value of MCH is found to be greater with consumption of gooseberry with honey than gooseberry. RDW mean value is 13.14 in participants who consumed gooseberry alone and 13.12 in participants who consumed gooseberry with honey. P value for MCV is 0.561 (>0.05), MCH is 0.213 (>0.05) and RDW is 0.096 (>0.05) and is statistically insignificant (Figure-2). Independent t test with error bars are represented in the form of bar graph with a error of 33.33% (Figure-3).

Table-1-Table showing the p values of the parameters.

Parameters	P-Value
Hb (g/dl)	0.448
RBC(10^6 /ul)	0.156
HCT(%)	0.245
MCV(fL)	0.561
MCH(pg)	0.213
RdW(%)	0.096

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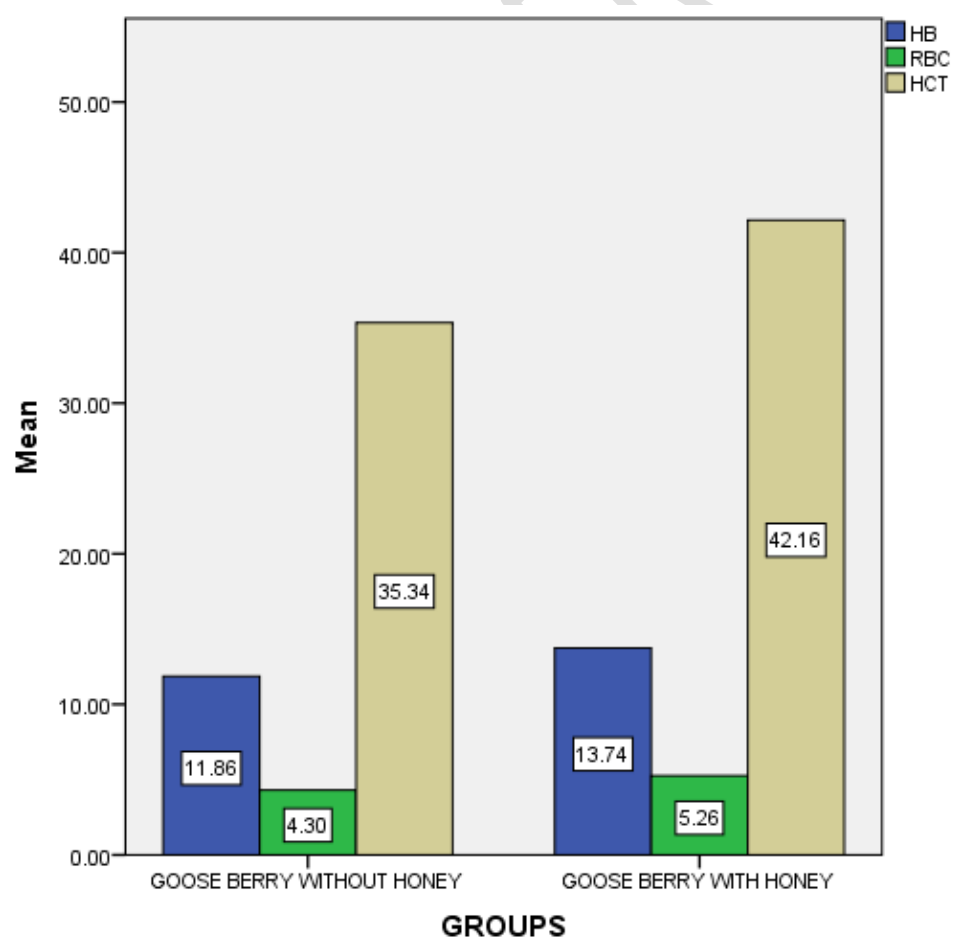


Figure-1-Bar graph depicts the independent 't' test values Hb, RBC, HCT after supplementation of gooseberry without honey and gooseberry with honey. Blue colour denotes Hb, green colour denotes RBC and beige colour depicts HCT. In comparison, the mean value of Hb is found to be 13.74 in participants who consumed gooseberry with honey which is greater than the mean value 11.86 in participants who consumed gooseberry alone . The mean value of RBC and HCT is found to be greater with consumption of gooseberry with honey than gooseberry with 5.26 and 42.16 respectively. P value for Hb is 0.448 (>0.05), for RBC is 0.156(<0.05) and HCT is 0.245 (>0.05).

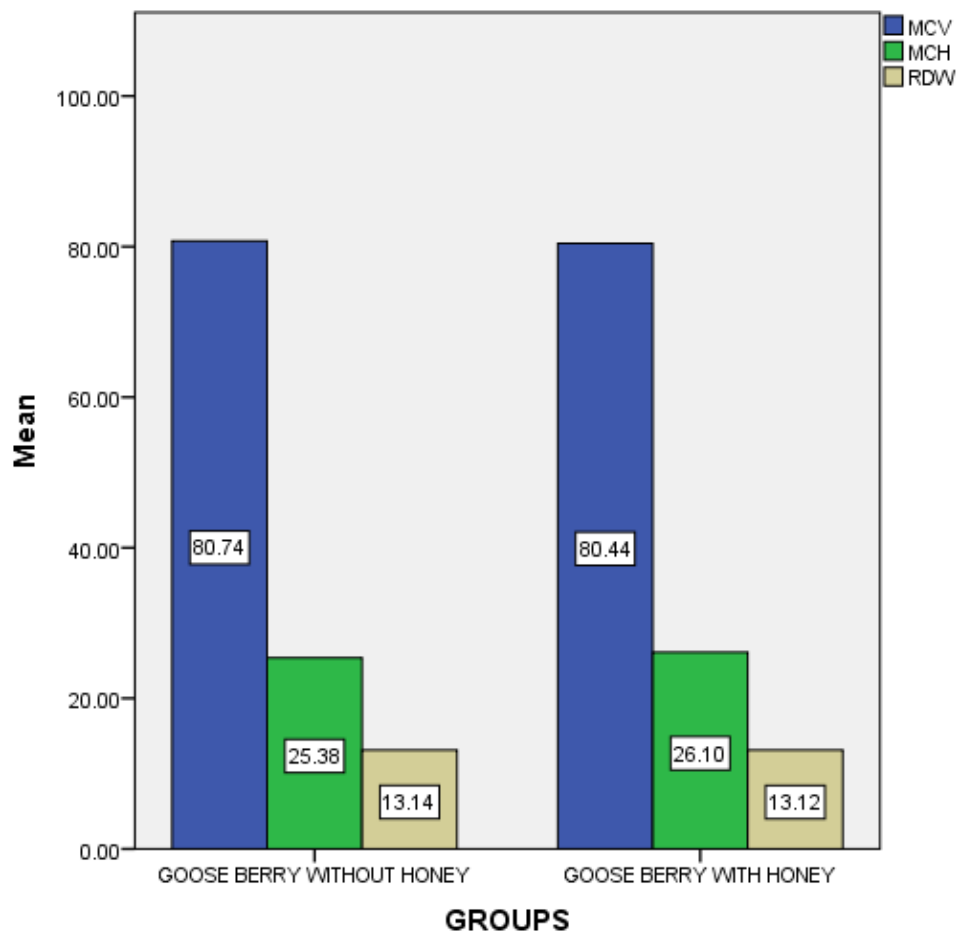


Figure-2-Bar graph depicts the independent 't' test values MCV, MCH, RDW after supplementation of gooseberry without honey and gooseberry with honey. Blue colour denotes MCV, green colour denotes MCH and beige colour depicts RDW. In comparison, the mean value of MCV is found to be 80.74 in participants who consumed gooseberry which is greater than the mean value 80.44 in participants who consumed gooseberry with honey. The mean value of MCH is found to be greater with consumption of gooseberry with honey than gooseberry. RDW mean value is 13.14 in participants who consumed gooseberry alone and 13.12 in participants who consumed gooseberry with honey. P value for MCV is 0.561 (>0.05), MCH is 0.213 (>0.05) and RDW is 0.096 (>0.05).

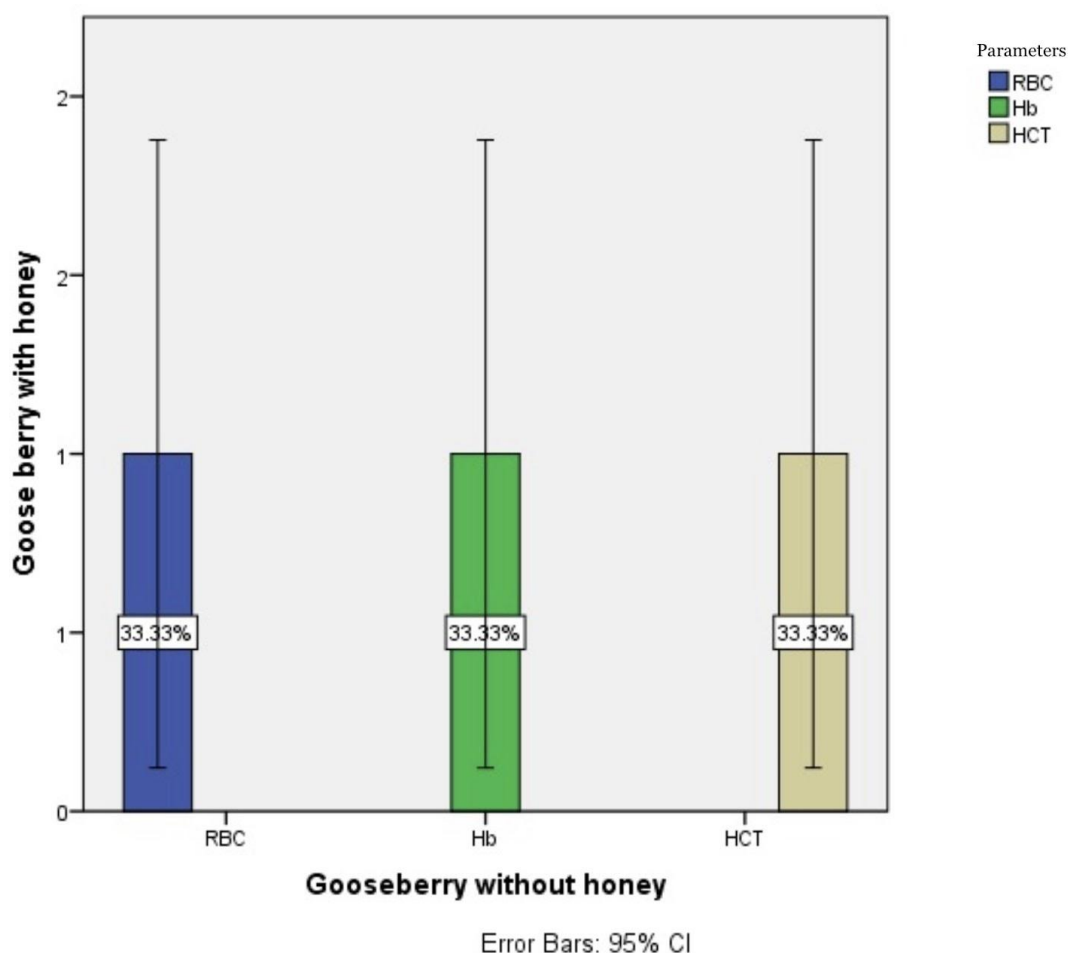


Figure-3- Bar graph depicts the independent ‘t’ test values with error bars of RBC, Hb, HCT after supplementation of gooseberry without honey and gooseberry with honey. Blue colour denotes RBC, green colour denotes Hb and beige colour depicts HCT.

Table-2-Table showing the comparison of mean values of parameters of different studies with the present study.

Parameters (Mean values)/ Authors	Mahendra Parkash Kapoor et al.,2020	Shaizi Layeeq et al.,2015	Tareq Khalaf Hasan Aljumaily et al.,2019	Our study
Hb (g/dl)	14.4 ± 0.41	10.6±0.72	10.69±0.38	12.8±3.82
RBC(10 ⁶ /ul)	4.6 ± 12.8	4.5±0.47	2.75±0.15	4.78±1.56
HCT(%)	44.6 ± 1.20	33.7±1.98	27.74±0.81	38.75±10.76
MCV(fL)	91.7 ± 0.98	23.67±1.85	39.02±1.75	80.59±7.34
MCH(pg)	29.9 ± 0.36	75.23±4.54	101.64±7.33	25.74±1.8
RdW(%)	-	-	-	13.13±0.74
P-value	P<0.05	P<0.05	P>0.05	P>0.05

Discussion

In general, there is a correlation between the menstrual history of women and anaemia. Irregular periods can act as a parameter for identifying a woman with anaemia (29). Age and gender play a major role in influencing certain factors. In the study by Gerardo et al., majority females specifically older adults, there was high prevalence of anaemia (30–32). In a study by Mirza et al, the dependence on gender was lesser but age dependence was higher where older adults and young children had anaemia because they are prone age groups due to nutritional status (33). In this study, all the participants were college students and majority of the populations were females.

Only gooseberry supplementation was given to the first group of participants. Study by Resmi et al., Amla was effective in increasing the level of Hb in adolescent females having Iron deficiency anaemia (34). In an opposing study by Aslin et al., effectiveness of amla juice on hemoglobin levels was shown but it was suggested that it can be supplemented with other sources for better results (35). In this study, there is an increase in the levels of Hb, RBC, PCV among the participants.

Gooseberry along with honey was given as supplementation to the second group of participants. Study by Joncy et al., were amla juice with honey showed positive results with significant increase in counts of RBC, Hb where the supplementation was given for 21 consecutive days (36). In this study, there was an increase in the parameters.

The comparison of mean values of parameters of different studies with the present study is shown in Table-2. In the study by Mahendra Parkesh Kapoor et al., (37) the Hb mean value was 14.4 ± 0.41 which is higher than the mean value of the present study whose Hb value is 12.8 ± 3.82 . In the previous study by Tareq Khalaf Hasan Aljumaily et al., (38) the mean value of RBC is least with 2.75 ± 0.15 whereas in the present study the mean value of RBC is highest with 4.78 ± 1.56 . The Hematocrit value is highest with 44.6 ± 1.20 in the study by Mahendra Parkash Kapoor et al., (37) but in the present study the hematocrit mean value is 38.75 ± 10.76 which is comparatively lesser than the previous study.

In the study by Shaizi Layeeq et al., (39) 23.67 ± 1.85 is the mean MCV value which is least when compared to the mean value of MCV of the present study. The mean value of MCH is highest in the study by Tareq Khalaf Hasan Aljumaily et al., (38) but in the present study the mean value is comparatively less. The RDW value is not taken as a parameter in the previous studies. In the present study, RDW mean value is determined as it is a hematopoietic stimulant.

The present study has very limited population and the duration of supplementation was very less and it can be overcome by including more sample population and increasing the duration of supplementation in the future.

Conclusion

The present study concludes that gooseberry with honey supplementation has shown better results than gooseberry supplementation but it is not statistically significant. On comparison with the control group, there was a significant difference in all the parameters measured for

the participants who had supplementation with gooseberry. It is evident that gooseberry has nutritive and restorative properties. Daily use of gooseberries is safe and can show more significant increase in counts of RBC, Hb in longer duration.

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