

“Effectiveness of Jaggery and Roasted Chickpeas (Gur-Chana) With Lime Juice in Improving Haemoglobin Level Among Female Nursing Students in a Selected Nursing College”

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ABSTRACT

Introduction: Anemia remains a critical global public health crisis affecting 30% of the population, with prevalence rates reaching 57% nationally in India, 50.4% in Uttar Pradesh, and 52.0% locally among reproductive age women in Meerut. Female nursing students represent a highly vulnerable group, with 47.8% to 57.8% experiencing anemia due to severe academic stress, menstrual blood loss, and poor diets. Traditional pharmacological iron therapies suffer from low compliance due to severe gastrointestinal side effects, to address this gap, the present study evaluates the clinical effectiveness of a sustainable, low cost, side-effect free nutritional combination of jaggery, roasted chickpeas and lime juice to optimize intestinal iron absorption and naturally elevate haemoglobin levels among nursing students.

Objective: To evaluate the effectiveness of jaggery and roasted chickpeas (Gur-Chana) with lime juice in improving haemoglobin level among female nursing students in a selected nursing college.

Methodology: The study was conducted in College of Nursing, L.L.R.M Medical College, Meerut among 60 female nursing students (30 in experimental and 30 in control group) by using convenience sampling technique who met the eligibility criteria and provide written consent. Quasi-experimental research design was adopted. The data was collected with demographic questionnaire and haemoglobin level were assessed using calibrated digital haemoglobinometre. After the implementation of intervention for six weeks the post-test 1 at 3rd week and post-test 2 at 6th week was conducted. Descriptive and inferential statistics were used for data analysis.

Result: The mean haemoglobin level in the experimental and control group increased from 10.90 ± 0.61 g/dL at pre-test to 11.45 ± 0.64 g/dL at the 6th week, whereas in the control group it increased from 10.91 ± 0.70 g/dL to 11.02 ± 0.73 g/dL. Independent t-test showed no significant difference between the groups at pre-test ($t=0.06$, $p=0.95$) and 3rd week ($t=1.25$, $p=0.21$), while a significant difference was observed at the 6th week ($t=2.40$, $p=0.019$) at $p<0.05$. Repeated measure ANOVA revealed a highly significant improvement in haemoglobin levels within the experimental group ($F=160.37$, $p<0.001$) compared to control group ($F=11.95$, $p<0.001$), Mixed ANOVA demonstrated a significant effect of time ($F=149.41$, $p<0.001$) and a significant group $\times$ time interaction ($F=65.63$, $p<0.001$), at $p<0.05$.) indicating that the increase in haemoglobin level was significantly greater in the experimental group than in the control group. There was no significant association found between baseline level of haemoglobin and their selected demographic variable among female nursing students ($p>0.05$) except the deworming in past six months ($p<0.05$).

Conclusion: The study concluded that jaggery and roasted chickpeas with lime juice significantly improved haemoglobin levels among female nursing students. Therefore, the intervention was found to be effective, economical, and feasible dietary approach for the prevention and management of anemia.

Keywords: Haemoglobin Level, Jaggery, Roasted Chickpeas, Lime Juice, Female Nursing Students

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INTRODUCTION

Anemia is defined by the world health organization (WHO) as a condition in which the number of red blood cells or their oxygen carrying capacity is insufficient to meet physiological needs, typically diagnosed in non-pregnant women when haemoglobin (Hb) levels fall below 12.0g/dL. Globally, anemia remains a massive

public health crisis, affecting nearly one-third of the world's population, with the burden concentrated in developing nations. In India, the epidemiological data is particularly alarming according to (NFHS-5), over 57% of reproductive age women and adolescents' girls suffer from anemia. According to public health data. 50.4% of reproductive age women in the state Uttar-Pradesh are

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clinically anemic [National Health System resources Centre,2021]. At the micro-level, localized file assessment confirms that the burden persistently high in western Uttar Pradesh, where 52.0% of reproductive age women in the Meerut district diagnosed with the condition [Kumar&Jain,2024]. Traditional Chemical therapies experience low compliance due to severe gastrointestinal side-effects. This local vulnerability is highly visible in institutional setups, where female nursing students undergo intense clinical training while suffering from tissue hypoxia, causing chronic fatigue and reduce focus. To address the high regional burden of anemia, evaluating local, non-pharmacological nutritional method within health care institutional is essential. This study asses the daily dietary supplement of jaggery (Gur), roasted chickpeas (Chana) and lime juice where jaggery serves as a direct plant source of non-heme iron and folate, while roasted chickpeas provide protein and amino acids necessary for red blood cells production, Additionally, the roasting process destroys anti-nutritional factors like phytic acid and tannins that usually block mineral absorption in the human gut. Fresh lime juice act as vital activator, providing concentrated vitamin C to reduce ferric iron (Fe^{3+}) into highly soluble ferrous iron (Fe^{2+}) for maximum absorption. This study addresses a critical gap in students health, offering a sustainable, cost-effective model to naturally elevate haemoglobin levels, reduce chronic fatigue and clinical endurance.

OBJECTIVES OF THE STUDY WERE:

1. To assess the haemoglobin level of female nursing students in the experimental and control groups at baseline and at different post-test interval.
2. To compare the mean haemoglobin level between the experimental and control group across different time interval to determine the effectiveness of jaggery and roasted chickpeas (Gur-Chana) with lime-juice.
3. To find out the association between baseline haemoglobin levels among female nursing students and their selected demographic variable

METHODOLOGY

A quantitative research approach with a quasi-experimental research design was adapted for the study. The study was conducted among female nursing students of the College of Nursing, L.L.R.M Medical

College, Meerut. Formal written permission was obtained from principal of the college and written consent obtained from all the participants of the study The data collection was carried out from 10 March 2026 to 25 April 2026. A total 60 participants meeting the inclusion and exclusion criteria were selected through Non-probability Convenience Sampling technique and allocated into an experimental group ($n_1=30$) and a control group ($n_2=30$).

Female nursing student with mild to moderate anemia, willing to participate and gave formal written consent for the study and available during collection period Were included in the study and students with normal anemia, having present known history of severe anemia, chronic illness, allergic to Jaggery, roasted chickpeas and lime juice; students with reproductive disorder and who are taking folic acid, vitamin B₁₂ and any iron supplements were excluded from the study.

Baseline assessment of all participants was carried using demographic questionnaire to collect socio-demographic information and a calibrated digital haemoglobinometre to measures haemoglobin levels before the intervention. Following the pre-test assessment, all the participants received a single oral dose of Albendazole 400 mg for deworming on day 0. thereafter, participants in the experimental group received 30g of jaggery and 50 g of roasted chickpeas (Gur-Chana) along with 30 ml of lime juice daily for a period of six weeks. The intervention was administered once daily at a fixed time. The control group did not receive the intervention and continued their routine dietary practices.

Haemoglobin levels of participants in both groups were reassessed using the same calibrated haemoglobinometre at the 3rd week (post-test I) and at the 6th week (post-test II) of the intervention period. The collected data were coded, tabulated and analyzed by using appropriate descriptive and inferential statistical methods to determine the effectiveness of the intervention on haemoglobin levels among female nursing students

RESULTS

The finding of the study is presented according to the objectives of the study. The data is prepared under the subsequent sections: -

SECTION I Description of Demographic characteristics of female nursing students

Table 1- Distribution of frequency and percentage of female nursing students with their selected demographic variables N=60

S. No	Demographic Variable	Experimental group		Control group	
		Frequency (f)	Percentage (%)	Frequency (f)	Percentage (%)
1	Age in year				
	a. 18-21	13	43	13	43
	b. 22-25	17	57	11	37
	c. 26-29	0	0	5	17

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	d. 30 and above	0	0	1	3
2	Religion				
	a. Hindu	28	93	24	80
	b. Muslim	2	7	3	10
	c. Christian	0	0	2	7
	d. Other	0	0	1	3
3	Residence				
	a. Hostel	17	57	15	50
	b. Day- Scholar	13	43	15	50
4	Type of Family				
	a. Nuclear	19	60	22	73
	b. Joint	11	40	8	27
	c. Extended	0	0	0	0
5	Type of Diet				
	a. Vegetarian	23	77	15	50
	b. Non-vegetarian	7	23	15	50
6	Diet Frequency				
	a. Two times per day	5	17	6	20
	b. Three times per day	23	77	17	57
	c. >Three times per day	2	6	7	23
	d. Irregular meal pattern	0	0	0	0
7	Age of Menarche				
	a. Below 12 Years	1	3	3	10
	b. 12-14 year	21	70	22	73
	c. 15-16 year	6	20	5	17
	d. 17 year and above	2	7	0	0
8	Cycle length/Duration				
	a. 27 Days	5	17	5	16
	b. 28 Days	12	40	12	40
	c. 30 days	6	20	8	27
	d. More then 30 days	7	23	5	17
9	Duration of menstrual flow				
	a. 3 to 5 days	23	77	27	90
	b. 6 to 8 days	7	23	3	10
10	History of anemia				
	a. No History of Anemia	26	87	26	87
	b. History of anemia without medical supervision	2	7	1	3
	c. History of iron supplementation in past 6 month	2	6.	3	10
11	Deworming in past 6 month				
	a. No	25	83	29	97
	b. Yes	5	17	1	3

SECTION II: Assessment of pre-test and post-test hemoglobin level among female nursing students in experimental and control group.

Table 2.1 – Frequency and percentage distribution of sample according to level of haemoglobin among female nursing students in experimental group.N=30

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Sr. No	Level of Haemoglobin	Score Range	Experimental Group					
			Pre-Test (0 Day)		Post-Test 1 (3rd Wk.)		Post-Test 2 (6th Wk.)	
			f	%	f	%	f	%
1	Normal	>12.0	0	0	4	13	6	20
2	Mild Anemia	11.0-11.9	15	50	16	54	17	57
3	Moderate Anemia	8.0-10.9	15	50	10	33	7	23
	Total		30	100	30	100	30	100

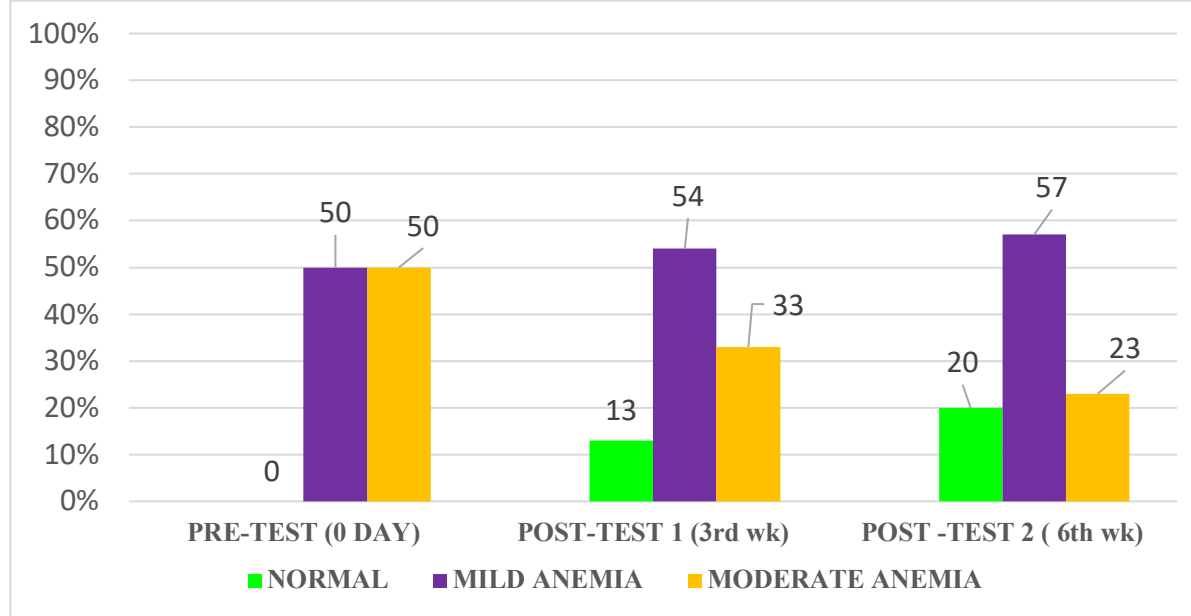


Figure 2.1: Percentage distribution of pre-test level and post-test 1 and post-test 2 level of haemoglobin among female nursing students in experimental group

Table 2.2 – Frequency and percentage distribution of sample according to level of haemoglobin among female nursing students in control group N=30

Sr. No	Level of Haemoglobin	Score Range	Control Group					
			Pre-Test (0 Day)		Post-Test 1 (3rd Wk.)		Post-Test 2 (6th Wk.)	
			f	%	f	%	f	%
1	Normal	>12.0	0	0	2	7	2	7
2	Mild Anemia	11.0-11.9	17	57	13	43	13	43
3	Moderate Anemia	8.0-10.9	13	43	15	50	15	50
	Total		30	100	30	100	30	100

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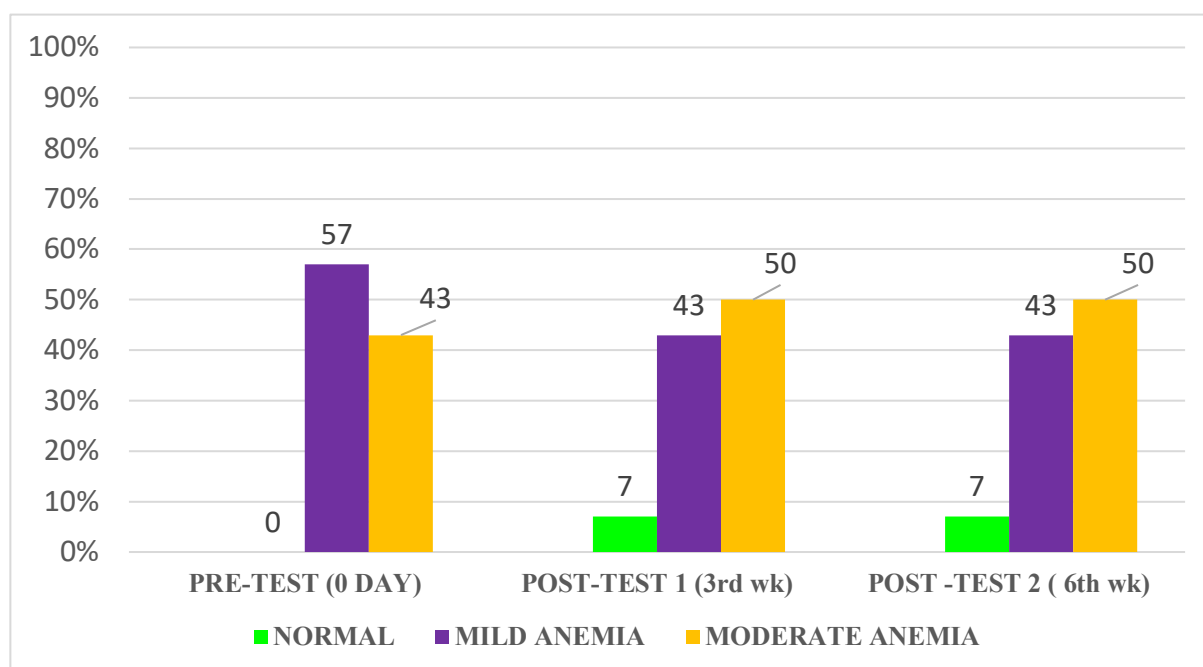


Figure 2.2: Percentage distribution of pre-test level and post-test 1 and post-test 2 level of haemoglobin among female nursing students in control group

Table 2.3 Mean and standard deviation of haemoglobin level among female nursing students in experimental and control group. N=60

Group	Pre-Test Mean $\pm$ SD	Post-Test 1 Mean $\pm$ SD	Post-Test 2 Mean $\pm$ SD	Mean Change Pre $\rightarrow$ Post 2
Experimental	10.90 $\pm$ 0.61	11.20 $\pm$ 0.63	11.45 $\pm$ 0.64	+0.54
Control	10.91 $\pm$ 0.70	10.98 $\pm$ 0.72	11.02 $\pm$ 0.73	+0.11

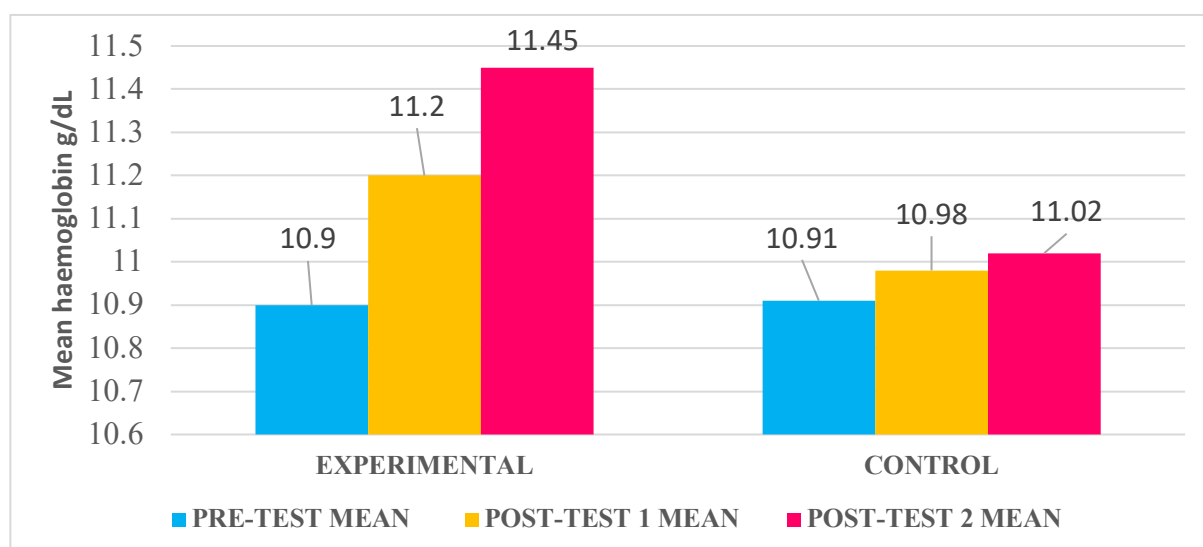


Figure 2.3: Comparison of mean of level of Hb in pre-test, post-test 1 and post-test 2 among female nursing students in experimental and control group

SECTION III- Effectiveness of jaggery and roasted chickpeas with lime-juice on hemoglobin level among female nursing students.

Table 3.1 Comparison of haemoglobin level between experimental and control group at pre-test, post-test 1, and post-test 2 among female nursing students. N=60

Time point	Experimental Mean $\pm$ SD	Control Mean $\pm$ SD	Mean difference	Independent t-test (t-value)	df	p value	Inference
Pre-test	10.90 $\pm$ 0.61	10.91 $\pm$ 0.70	0.01	0.06	58	0.953	Not significant
Post-test 1	11.20 $\pm$ 0.63	10.98 $\pm$ 0.72	0.22	1.25	58	0.215	Not significant
Post-test 2	11.45 $\pm$ 0.64	11.02 $\pm$ 0.73	0.43	2.40	58	0.019	Significant

(p<0.05 level of significance)

Table 3.2-Repeated Measures of ANOVA on haemoglobin level at different point among experimental group N=30

Source of variation	F value	Df	p value	Partial η^2	Inference
Time effect	160.37	(2,58)	<0.001	0.847	Significant

(p<0.05 level of significance)

Bonferroni post hoc pairwise comparison in experimental group

Comparison of Hb level	Mean difference	Standard error	p-value	Result
Pre-Test Vs Post-Test 1	0.30	0.05	0.001	significant
Pre-Test Vs Post-Test 2	0.55	0.06	0.001	significant
Post -Test 1 Vs Post-Test 2	0.25	0.04	0.002	significant

Table 3.3- Repeated Measures of ANOVA on haemoglobin level at different point among control group N=30

Source of variation	F value	Df	p value	Partial η^2	Inference
Time effect	11.95	(2,58)	<0.001	0.292	significant

(p<0.05 level of significance)

Bonferroni post hoc pairwise comparison in control group

Comparison of Hb level	Mean difference	Standard error	p-value	Result
Pre-Test Vs Post-Test 1	0.07	0.04	0.02	Significant
Pre-Test Vs Post-Test 2	0.11	0.05	0.009	significant
Post -Test 1 Vs Post-Test 2	0.04	0.03	0.21	Not significant

Table 3.4 Overall effect of jaggery and roasted chickpeas with lime-juice on haemoglobin level among female nursing students in experimental and control group overtime. N=60

Effect	F	df	p value	Partial η^2	Interpretation
Group	1.50	(1, 58)	0.226	0.025	No overall baseline-to-average group difference

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Time	149.41	(2, 116)	< 0.001	0.720	Haemoglobin changed significantly over time
Group × Time	65.63	(2, 116)	< 0.001	0.531	Improvement over time differed significantly by group

(p<0.05 level of significance)

SECTION IV Association between baseline haemoglobin levels of female nursing students and their selected demographic variables in experimental and control group

Table 4.1 Association between pre-test scores of haemoglobins of female nursing students of experimental group with their selected demographic variable N=30

S. No	Demographic characteristics	Mild	Moderate	df	Chi-sq. (χ^2)	p-value	Inference
1	Age in year						
	a. 18-21	7	6	1	0.1	0.7	NS*
	b. 22-25	8	9				
2	Religion						
	a. Hindu	14	14	1	0.0	1.0	NS*
	b. Muslim	1	1				
3	Residence						
	a. Hostel	7	10	1	1.22	0.26	NS*
	b. Day- Scholar	8	5				
4	Type of Family						
	a. Nuclear	8	11	1	0.1	0.66	NS*
	b. Joint	7	4				
5	Type of Diet						
	a. Vegetarian	11	12	1	0.83	0.36	NS*
	b. Non- Vegetarian	4	3				
6	Diet Frequency						
	a. Two times per day	4	1	2	4.88	0.08	NS*
	b. Three times per day	9	14				
	c. >Three times per day	2	0				
7	Age of Menarche						
	a. Below 12 Years	0	1	3	1.04	0.78	NS*
	b. 12-14 year	11	10				
	c. 15-16 year	3	3				
	d. 17 year and above	1	1				
8	Cycle length/Duration						
	a. 27 Days	3	2	3	1.81	0.61	NS*
	b. 28 Days	7	5				
	c. 30 days	3	3				
	d. More than 30 days	2	5				
9	Duration of menstrual flow						
	a. 3 to 5 days	13	10	1	1.67	0.19	NS*
	b. 6 to 8 days	2	5				
10	History of anemia						
	a. No History of Anemia	14	12	2	2.15	0.34	NS*
	b. History of anemia without medical supervision	0	2				
	c. History of iron supplementation in past 6 month	1	1				
11	Deworming in past 6 months						
	a. No	10	15	2	6.0	0.014	

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	b. Yes	5	0				S
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(p<0.05 significant level) S: Significant, NS*: Non- significant

Table 4.2 Association between pre-test scores of haemoglobins of female nursing students of control group with their selected demographic variable N=30

S. No	Demographic characteristics	Mild	Moderate	df	Chi-sq. (χ^2)	P-value	Inference
1	Age in year						
	a. 18-21	7	6	3	1.59	0.66	NS*
	b. 22-25	7	4				
	c. 26-29	2	3				
	d. 30 and above	1	0				
2	Religion						
	a. Hindu	13	11	3	0.98	0.80	NS*
	b. Muslim	2	1				
	c. Christian	1	1				
	d. Other	1	0				
3	Residence						
	a. Hostel	8	7	1	0.13	0.71	NS*
	b. Day- Scholar	9	6				
4	Type of Family						
	a. Nuclear	14	8	1	1.63	0.20	NS*
	b. Joint	3	5				
5	Type of Diet						
	a. Vegetarian	8	7	1	0.13	0.71	NS*
	b. Non- Vegetarian	9	6				
6	Diet Frequency						
	a. Two times per day	3	3	2	0.14	0.93	NS*
	b. Three times per day	10	7				
	c. >Three times per day	4	3				
7	Age of Menarche						
	a. Below 12 Years	1	2	2	4.59	0.10	NS*
	b. 12-14 year	15	7				
	c. 15-16 year	1	4				
8	Cycle length/Duration						
	a. 27 Days	1	4	3	5.15	0.16	NS*
	b. 28 Days	6	6				
	c. 30 days	6	2				
	d. More than 30 days	4	1				
9	Duration of menstrual flow						
	a. 3 to 5 days	15	12	1	0.13	0.71	NS*
	b. 6 to 8 days	2	1				
10	History of anemia						
	a. No History of Anemia	15	11	2	1.44	0.48	NS*
	b. History of anemia without medical supervision	1	0				
	c. History of iron supplementation in past 6 month	1	2				
11	Deworming in past 6 month						
	a. No	16	13	1	0.79	0.37	NS*
	b. Yes	1	0				

(p<0.05 significant level) S: Significant, NS*: Non- significant

The mean hemoglobin level in the experimental group increased from 10.90 ± 0.61 g/dL at pre-test to 11.20 ± 0.63 g/dL at the 3rd week and reached 11.45 ± 0.64 g/dL at the 6th week, showing a steady net mean gain of $+0.54$ g/dL. In contrast, the control group showed minimal progression, changing slightly from 10.91 ± 0.70 g/dL at baseline to 10.98 ± 0.72 g/dL at the 3rd week and ending at 11.02 ± 0.73 g/dL at the 6th week, a net change of only $+0.11$ g/dL. Table 3.1 presents an independent t-test confirmed that both groups were well-matched with no significant difference at pre-test ($t = 0.06$, $p = 0.953$) and remained statistically comparable at the 3rd week ($t = 1.25$, $p = 0.215$). However, a statistically significant difference emerged at the 6th week ($t = 2.40$, $p = 0.019$, $p < 0.05$), establishing that the nutritional supplement directly outpaced the control condition. The data presented in Table 3.2 shows repeated measures ANOVA revealed a highly significant improvement in haemoglobin levels within the experimental group ($F = 160.37$, $p < 0.001$, Partial $\eta^2 = 0.847$), indicating that 84.7% of the internal variance was driven by the intervention over time. Bonferroni post-hoc testing confirmed significant step-by-step improvements across all time blocks ($p \leq 0.002$). Conversely, the control group showed a much weaker time effect ($F = 11.95$, $p < 0.001$, Partial $\eta^2 = 0.292$), and its progress plateaued completely between the 3rd and 6th weeks (Mean Difference = 0.04 , $p = 0.21$). Whereas Table 3.3 shows mixed ANOVA demonstrated a significant main effect of time ($F = 149.41$, $p < 0.001$) and a highly significant group $\times$ time interaction ($F = 65.63$, $p < 0.001$, Partial $\eta^2 = 0.531$) at $p < 0.05$. This interaction confirms that the rate, pattern, and overall magnitude of haemoglobin recovery were significantly superior in the experimental group due to the supplement. Chi-square testing showed no significant association between the baseline level of haemoglobin and selected demographic variables—including age, residence, family structure, diet habits, and menstrual history—among the female nursing students ($p > 0.05$). The sole exception was recent deworming status in the past six months, which shared a highly significant association with baseline anemia severity ($\chi^2 = 6$, $df = 2$, $p = 0.014$, $p < 0.05$). Within the experimental group.

DISCUSSION

The daily nutritional snack of jaggery, roasted chickpeas, and lime juice effectively improved haemoglobin levels among female nursing students. Over six weeks, the experimental group's mean haemoglobin significantly rose from 10.90 ± 0.61 g/dL to 11.45 ± 0.64 g/dL (a gain of $+0.54$ g/dL), while the control group showed an insignificant change from 10.91 ± 0.70 g/dL to 11.02 ± 0.73 g/dL (a gain of $+0.11$ g/dL). At the end of six weeks, an independent t-test proved a significant difference between the two groups ($t = 2.40$, $p = 0.019$), confirming the intervention was successful. A Two-Way Mixed ANOVA also showed a highly significant Group $\times$ Time interaction effect ($F = 65.63$, $p < 0.001$). Finally, Chi-Square (χ^2) tests showed no significant association

between baseline anemia and demographic variables ($p > 0.05$), except for deworming in the past six months ($\chi^2 = 6$, $p = 0.014$), proving that regular parasite clearance is linked to better initial blood health. Physiologically, jaggery provides iron, chickpeas offer proteins, and lime juice supplies Vitamin C, which converts plant iron into a form that the human body can absorb easily.

These findings are congruent with study by Meher, B. R. (2018), where a jaggery supplement significantly increased mean hemoglobin from 11.35 ± 1.13 g/dL to 11.79 ± 1.07 g/dL ($p < 0.0001$). Similarly, Sumy, P. J, et al. (2017) found that a jaggery and lemon supplement produced a highly significant mean hemoglobin increase of 0.50 g/dL ($p < 0.001$). Sahu, R. (2024), also proved that citrus juice alone significantly improves hemoglobin scores. A recent study by Gugulethu et al. (2025) evaluated a nutrient bar containing roasted Bengal gram (chickpeas) and jaggery given to anemic girls. Their 90-day trial reported a highly significant increase in haemoglobin levels ($p < 0.005$), reinforcing that combining chickpeas with jaggery is an effective way to fight iron deficiency.

NURSING IMPLICATIONS

Nursing Education

The study highlights the need to strengthen nursing education emphasized on evidence-based nutritional interventions and anemia prevention strategies. Students should be equipped with knowledge and skills to promote healthy dietary practices.

Nursing Practice

Nurses should integrate nutritional counselling and dietary intervention into routine care to improve haemoglobin levels. Regular screening and health education can support anemia prevention and management.

Nursing Management

The results of study suggest that nursing administration should support the implementation of nutritional-based health program through adequate resources, training, and supervision. Policies promoting anemia prevention should be incorporated into healthcare settings.

Nursing Research

The study provides evidence for the effectiveness of dietary intervention in improving haemoglobin levels, further research with larger samples and longer follow-up periods is recommended to strengthen the findings.

RECOMMENDATIONS

- Similar studies may be conducted with larger sample size and in different populations to improve the generalizability of findings.
- Future research may assess the long-term effectiveness of intervention using extended follow-up periods and additional hematological parameters.

LIMITATIONS:

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- The study was conducted on a relatively small sample of female nursing students, single institution, limiting the generalizability of the findings.
- The intervention period was limited to six weeks, and dietary outside the intervention was not strictly controlled, which may influence haemoglobin level.

CONCLUSION:

The finding of the present study concluded that the intervention of jaggery and roasted chickpeas with lime juice was effective in improving the haemoglobin level among female nursing students. The study findings revealed that both the experimental and control groups had almost similar haemoglobin levels at the pre-test, indicating comparability between the groups at baseline. However, after the administration of the intervention, the experimental group show an improvement in haemoglobin level over time as compared to the control group. The significant improvement observed at the 6th week indicates that the intervention had positive effect on haemoglobin status. Therefore. The study supports the problem statement that regular intake of Jaggery and roasted chickpeas with lime juice can be effective dietary measures for improving mild to moderate haemoglobin levels among female nursing student

REFERENCES

1. World Health Organization. (2022). Nutritional anaemias: Tools for effective prevention and control. World Health Organization. who.int
2. Ministry of Health and Family Welfare. (2021). National Family Health Survey (NFHS-5), 2019–21: India report. International Institute for Population Sciences. rchiips.org
3. National Health Systems Resource Centre. (2021). Uttar Pradesh health dossier. Ministry of Health and Family Welfare, Government of India. nhsrcindia.org
4. Rakshit, Kumar, S., & Jain, S. (2024). Anemia in rural Meerut: A public health perspective on women of reproductive age. *International Journal of Scientific Research*, 13(12). <https://doi.org/10.36106/ijsr/7608027>
5. Masanja, H., Martin, H. D., Jumbe, T., & Gichohi-Wainaina, W. N. (2025). Efficacy of Iron-Rich Snacks in Improving Iron Status Among Adolescent Girls (10–19 Years): A Systematic Review. *Advances in nutrition (Bethesda, Md.)*, 16(12), 100549. <https://doi.org/10.1016/j.advnut.2025.100549>.
6. Ajay, A., Gaur, S. S., Shams, R., Dash, K. K., Mukarram, S. A., & Kovács, B. (2024). Chickpeas and gut microbiome: Functional food implications for health. *Heliyon*, 10(20), e39314. <https://doi.org/10.1016/j.heliyon.2024.e39314> Ministry of Health and Family Welfare. (2013). National Iron+ Initiative guidelines for control of iron deficiency anemia. Government of India. nhm.gov.in
7. Rao, G. P., & Singh, P. (2022). Value Addition and Fortification in Non-Centrifugal Sugar (Jaggery): A Potential Source of Functional and Nutraceutical Foods. *Sugar tech : an international journal of sugar crops & related industries*, 24(2), 387–396. <https://doi.org/10.1007/s12355-021-01020-3>
8. Sahu, R. (2024). A Study to Assess the Effectiveness of Lemon Juice in Improving Hemoglobin Level Among Adolescent Girls in Selected Schools of Jabalpur City. *Innovational: Journal of Nursing and Healthcare*, 9(3), 35–42. <https://doi.org/10.31690/ijnh.2023.v09i03.010>.
9. Gugulethu, B., Prashanthi, A., & Nalkar, S. D. (2025). Assessment of supplementation with nutrient-dense millet bar to anemic adolescent girls. *Int J Home Sci* 2025;11(1):377-381. DOI: 10.22271/23957476.2025.v11.i1e.1800
10. M, S., E, S., A, M. & Meher, B. R. (2018) Evaluation of efficacy of jaggery and raisins as supplements in iron deficiency anemia among medical undergraduate students in South India. *National Journal of Physiology, Pharmacy and Pharmacology*, 8 (10), 1432-1436. [doi:10.5455/njppp.2018.8.0723620072018](https://doi.org/10.5455/njppp.2018.8.0723620072018).
11. Sumy. P. J, Jayasankari. S, Rebecca Samson, Kiruba Prasanna, Leena L. Raju, Bridgitte Akila. A Study to assess the effectiveness of Nutrition Supplement with Beetroot, Jaggery and Lemon on Mild Anemia among Nursing Students in A Selected College of Nursing at Puducherry. *Int. J. Adv. Nur. Management*. 2017; 5(4): 305-310. [doi: 10.5958/2454-2652.2017.00065.8](https://doi.org/10.5958/2454-2652.2017.00065.8)