EFFECTIVENESS OF MORINGA OLEIFERA LEAF EXTRACT IN ELEVATING HEMOGLOBIN LEVELS AMONG ANEMIC ADOLESCENT FEMALES IN BURLA, SAMBALPUR, ODISHA

Amrita Das[1] and Sathish Rajamani[2]

Nursing Tutor, School of Nursing – DRIEMS University, Cuttack, Odisha

Professor, School of Nursing – DRIEMS University, Cuttack, Odisha

Corresponding Author email – Id: amritadas787@gmail.com

ORCID – ID: 0009-0001-3781-0387

Abstract

Background: Anemia represents a significant public health concern, especially among adolescent females, often resulting in symptoms such as fatigue, inhibited growth, and diminished immune function. Moringa oleifera, commonly known as drumstick leaves, is renowned for its rich nutritional profile, particularly its iron content, which may positively influence hemoglobin levels. This study aims to assess the efficacy of drumstick leaf juice in elevating hemoglobin concentrations in anemic adolescent girls based in Burla, Sambalpur, Odisha. **Objective:** This study aims to evaluate the impact of Moringa oleifera leaf extract on hemoglobin levels in adolescent girls diagnosed with mild to moderate anemia in Burla, Sambalpur, Odisha. **Methodology:** Employing a quasi-experimental, one-group pre-test post-test design, the research involved 60 adolescent girls identified with mild to moderate anemia from a designated high school in Burla, Sambalpur. Participants were selected through non-probability sampling methods. Data collection included demographic information along with biochemical assessments (blood tests to quantify hemoglobin levels) conducted pre- and post-intervention (consumption of drumstick leaf juice). The effectiveness of the intervention was analyzed using paired t-tests to compare mean hemoglobin levels before and after the consumption of the juice. **Results:** Statistical analysis revealed a significant augmentation in mean hemoglobin levels, rising from 10.23 g/dL (SD=1.15) to 10.01 g/dL (SD=1.18) post-intervention, with a significance level of $p<0.01$. These findings indicate that drumstick leaf juice may serve as an efficacious natural therapeutic approach for addressing mild to moderate anemia in this demographic. However, limitations inherent in the study, such as the non-probability sampling method and the absence of a control group, suggest the need for further

research utilizing more robust methodologies to corroborate these results and investigate long-term effects. **Conclusion:** The study provides compelling evidence supporting the use of drumstick leaf juice as a viable intervention for enhancing hemoglobin levels among adolescent girls suffering from mild to moderate anemia. The findings advocate for the incorporation of this juice into dietary regimens as a cost-effective and accessible strategy for mitigating anemia in this vulnerable population. Future research with larger sample sizes and control groups is warranted to reinforce these results and to explore potential long-term benefits.

Key Words: Effectiveness, Moringa Oleifera Leaf, Haemoglobin, Adolescent Girls, Anaemia, High School

Introduction

Blood plays a crucial role in regulating the body's systems and maintaining homeostasis. Its other functions include supplying oxygen and nutrients to tissues, removing waste products, transporting hormones and other signals throughout the body, and regulating body pH and core temperature. Anemia in adolescents can lead to reduced mental and physical capacity, diminished concentration in both work and educational performance, and poses a significant threat to future maternal health in girls. This risk is particularly concerning because girls are more likely to be affected for various reasons.(1)

Women and adolescent girls face a significant risk of micronutrient malnutrition, particularly Iron Deficiency Anemia and Vitamin A Deficiency. It is widely recognized that iron deficiency is the leading cause of anemia globally, driven by insufficient dietary intake, the physiological demands of pregnancy, rapid growth, and iron losses from parasitic infections. Additionally, other common contributors to anemia include malaria, chronic infections, and nutritional deficiencies in vitamin A, folate, and Vitamin B12.(2)

Moringa oleifera, commonly referred to as the "drumstick tree" or "miracle tree," has been a fundamental component in the diets of numerous rural communities, particularly in tropical regions. In Senegal, for instance, the leaves of Moringa have been consumed for generations, frequently in desiccated and pulverized form. Indigenous knowledge suggests that these leaves, abundant in protein, micronutrients, and iron, can potentially mitigate malnutrition and restore iron levels. The book The Miracle Tree by Dr. Monica G. Marcu posits that Moringa's exceptional nutrient profile renders it a significant food source for populations experiencing

nutritional deficiencies, especially in terms of iron, and may present a potential intervention for iron deficiency anemia.(3)

The study explores the promising potential of Moringa Oleifera leaves as a natural remedy for addressing anemia associated with malnutrition, particularly in developing countries where these health issues are prevalent.(4) Moringa Oleifera, often referred to as the "miracle tree" or "drumstick tree," is a versatile and multi-purpose plant species that has garnered significant attention in recent years due to its remarkable medicinal and nutritional properties. The leaves of Moringa Oleifera are exceptionally rich in essential nutrients, including iron, protein, calcium, copper, vitamins, and a wide array of essential amino acids.(5) This impressive nutritional profile has led to claims that regular consumption of dried Moringa leaves can effectively prevent or even cure anemia and malnutrition. These assertions have sparked interest among researchers and healthcare professionals seeking sustainable solutions to combat widespread nutritional deficiencies. Despite the growing popularity and anecdotal evidence supporting the use of Moringa Oleifera for addressing anemia and malnutrition, there is a notable lack of scientific studies specifically conducted in Odisha, India, to evaluate its efficacy. This gap in research presents an opportunity to investigate the potential benefits of Moringa in a region where anemia and malnutrition remain significant public health concerns.(6) To address this knowledge gap, the study aims to conduct a comprehensive assessment of the impact of Moringa oleifera leaf extract on hemoglobin levels in adolescent girls diagnosed with mild to moderate anemia in Burla, Sambalpur, Odisha. Adolescent girls are particularly vulnerable to anemia due to increased iron requirements during growth spurts and menstruation, making them an ideal target population for this research. The study's focus on Burla, a town in the Sambalpur district of Odisha, provides a specific geographical context for the research. This localized approach allows for a more targeted investigation of the effectiveness of Moringa oleifera in addressing anemia within the unique socio-economic and environmental conditions of the region. By conducting this scientific evaluation, the researchers hope to provide empirical evidence that either supports or refutes the claims surrounding Moringa oleifera's ability to combat anemia. The findings of this study could have far-reaching implications for public health strategies in Odisha and potentially other regions facing similar challenges related to anemia and malnutrition. If the results prove promising, it could pave the way for the development of cost-effective, locally sourced, and sustainable interventions to improve the nutritional status and overall health of vulnerable populations. Furthermore, positive outcomes could encourage further research into the broader applications

of Moringa oleifera in addressing various nutritional deficiencies and health concerns prevalent in developing countries.

Objectives:

1. To assess the baseline hemoglobin levels of anemic adolescent females in Burla.
2. To evaluate the effectiveness of Moringa oleifera leaf extract in increasing hemoglobin levels among anemic adolescent females.
3. To examine the association between the hemoglobin levels following testing in adolescent girls who have anemia and specific demographic factors.

Hypotheses:

1. **Null Hypothesis (H0):** Moringa oleifera leaf extract supplementation does not significantly increase hemoglobin levels in anemic adolescent females in Burla.
   Alternative Hypothesis (H1): Moringa oleifera leaf extract supplementation significantly increases hemoglobin levels in anemic adolescent females in Burla.
2. **Null Hypothesis (H0):** There is no significant difference in the effectiveness of Moringa oleifera leaf extract compared to standard iron supplementation in treating anemia among adolescent females.
   Alternative Hypothesis (H1): Moringa oleifera leaf extract is significantly more effective than standard iron supplementation in treating anemia among adolescent females.
3. **Null Hypothesis: (H$_0$)** There is no notable link between the level of hemoglobin after the test in adolescent girls with anemia and the chosen demographic factors.
4. **Alternative Hypothesis (H1):** A notable association exists between the hemoglobin levels after testing in adolescent girls with anemia and various demographic factors (including age, socioeconomic status, nutritional status, education level, etc.).

Methodology

The current study utilized a quasi-experimental design (one group pre-test post-test) with a quantitative approach. The independent variable was Moringa Oleifera Leaf Extract, and the dependent variable was hemoglobin levels. Baseline variables included age, education, religion, family type, number of siblings, income, information sources, menstrual history,

dietary patterns, and hygiene practices. Conducted at Govt Girls High School in Burla, Odisha, the sample consisted of 60 adolescent girls aged 10-19 years who could read and write in Odia and English and were willing to participate. A biochemical test was developed to assess anemia incidence, along with a structured questionnaire addressing menstrual history, dietary patterns, and worm infestations. Clinical assessments of hemoglobin levels were performed before and after the intervention.

Research data collection involves systematically gathering information to address specified research questions, including demographic data acquisition through surveys. Securing approval from the school principal prior to project initiation is essential. Participants for the study were selected through non-probability purposive sampling, adhering to predetermined criteria derived from lists provided by class teachers. The final sample consisted of 10 adolescent girls. The researcher established rapport with the participants, clearly outlined the study's objectives, and obtained informed consent. A structured questionnaire facilitated the collection of demographic information, while clinical evaluations were conducted using an observation checklist. Hemoglobin levels in the participants were quantified using a hemoglobinometer. Descriptive statistics, specifically frequency distributions and percentages, were applied to analyze the demographic data. The prevalence of anemia and hemoglobin levels were assessed utilizing descriptive measures such as mean and standard deviation. To evaluate the effectiveness of drumstick leaf juice, a paired "t" test was conducted. Inferential statistics, specifically the chi-square test, were employed to explore the relationship between hemoglobin levels and various demographic variables among the adolescent girls. The study commenced following the approval from the Principal of VIMSAR Burla and consent from the Head Master at Upper Primary School, Burla Campus, Sambalpur. Each participant was thoroughly briefed on the study's aims and assured that their information would remain confidential.

Results

The samples involved in the study were categorized and presented in a detailed manner. The Table I illustrates the frequency distribution along with the corresponding percentage of each sample group. This clear representation allows for a comprehensive understanding of the sample distribution within the context of the study.

Table – I: Frequency and Percentage Distribution of Samples

(N = 60)

S. No	Socio-Demographic Variables	Experimental Group		Control Group	
		n	%	n	%
1.	**Age**				
	a. 10 – 12	11	36.7	9	30.0
	b. 13 – 15	19	63.3	21	70.0
	c. 16 years and above	0	0.0	0	0.0
3.	**Religion**				
	a. Hindu	**18**	**60.0**	**18**	**60.0**
	b. Christian	**9**	**30.0**	**9**	**30.0**
	c. Muslim	**3**	**10.0**	**3**	**10.0**
	d. Others	**0**	**0**	**0**	**0**
4.	**Area of Living**				
	a. Urban	**21**	**70.0**	**19**	**63.3**
	b. Rural	**9**	**30.0**	**11**	**36.7**
	c. Slum	**0**	**0**	**0**	**0**
5.	**Type of family**				
	a. Nuclear	**20**	**66.7**	**10**	**33.3**
	b. Joint family	**8**	**26.7**	**17**	**23.3**
	c. Extended family	**2**	**6.7**	**3**	**43.3**
6.	**Total family members**				
	a. Less than 3	**6**	**20.0**	**4**	**13.3**
	b. 4 – 6	**19**	**63.3**	**21**	**70.0**
	c. More than 6	**5**	**16.7**	**5**	**16.7**
7.	**Father's education**				
	a. No formal education.	**4**	**13.3**	**2**	**6.7**
	b. Elementary education	**13**	**43.3**	**11**	**36.7**
	c. Pre-University	**9**	**30.0**	**11**	**36.7**
	d. Graduates and higher.	**4**	**13.4**	**6**	**20.0**
	Mother's Education				
	a. No formal education.	**3**	**10.0**	**3**	**10.0**
	b. Elementary education	**15**	**50.0**	**15**	**50.0**
	c. Pre-University	**12**	**40.0**	**12**	**12.0**
	d. Graduates and higher	**0**	**0**	**0**	**0**
8.	**Monthly Income of Family**				
	a. 5.000 – 10,000 Rs	**10**	**33.3**	**4**	**13.3**
	b. 10001 – 20000 Rs	**18**	**60.0**	**20**	**66.7**
	c. Above 20001 Rs	**12**	**6.7**	**6**	**20.0**
9.	**Information Source for Anemia Prevention Strategies**				
	a. Mass Media	**15**	**50.0**	**15**	**50.0**
	b. Books and Magazines	**0**	**0**	**0**	**0**
	c. Health Personnel	**10**	**33.3**	**5**	**16.7**
	d. Relatives and Peer groups	**5**	**16.7**	**10**	**3.3**

Table I presents the distribution of samples based on socio-demographic variables. In the experimental group, 36.7% of respondents are aged 10-12, and 63.3% are aged 13-15, with no respondents aged 16 or older. The control group has a similar age distribution: 30% aged 10-12 and 70% aged 13-15.

Regarding religion, both groups report 60% Hindu, 30% Christian, and 10% Muslim, with no respondents from other religious affiliations. In terms of residence, 70% of the experimental group lives in metropolitan areas, while the control group has 63.3% in urban areas and 36.7% in rural areas.

Family structure differs, with 66.7% in nuclear families in the experimental group versus 33.3% in the control group. Household sizes show that 63.3% of the experimental group has four to six members, compared to 70% in the control group.

Educational attainment for fathers shows 13.3% with no formal education in the experimental group versus 6.7% in the control group. For mothers, both groups have 10% lacking formal education. Monthly family income in the experimental group shows 60% earning between 10,001-20,000, while 66.7% of the control group falls into the same range.

Information sources reveal that 50% of both groups obtain information from mass media, with some gaining knowledge from health personnel and relatives, but none from books or magazines.

Table – II Analysis of the Frequency and Percentage of Menstrual Cycle Patterns and Worm Infestation Rates

(N = 60)

S. no	Variables	Experimental		Control	
		n	%	n	%
Menstrual History					
1.	**Age at menarche**				
	a. < 10 years	2	6.7	1	3.3
	b. 10 – 13 years	23	76.7	24	80.0
	c. > 14 years	5	16.7	5	16.7
2.	**Pattern of Menstrual Cycle**				
	a. Regular	23	76.7	21	70.0
	b. Irregular	7	23.3	7	23.3
	c. Amenorrhoea	0	0.0	2	6.7

3.	Number of Pads Changed per Day				
	a. < 3 pads	25	83.3	22	73.3
	b. 4 – 5 pads	5	16.7	5	16.7
	c. > 6 pads	0	0.0	3	10.0
5.	Duration of bleeding				
	a. 2 – 4 days	4	13.3	6	20.0
	b. 5 – 7 days	24	80.0	20	66.7
	c. Above 7 days	2	6.7	4	13.3
	Dietary Pattern				
5.	Dietary Preferences				
	a. Vegetarian	4	13.3	4	13.3
	b. Non-Vegetarian	0	0.0	3	10.0
	c. Mixed	26	86.7	23	76.7
6.	Intake of beverages coffee / Tea / Milk				
	a. Regularly	11	36.7	4	13.3
	b. Often	17	56.7	23	76.7
	c. Uncommonly	2	6.7	3	10.0
	History of Worm Infestation				
7.	How often you will do deworming?				
	a. Once in a year	0	0.0	0	0.0
	b. Twice in a year				
	c. Never	30	100.0	30	100.0
		0	0.0	0	0.0
8.	Do you use slippers when you go to toilet?				
	a. Yes	20	66.7	20	66.7
	b. No	0	0.0	0	0.0
	c. Sometimes	10	33.3	10	33.3
9.	Do you wash hands with soap and water after each dedication?				
	a. Yes	30	100.0	30	100.0
	b. No	0	0.0	0	0.0
	c. Sometimes (if available)	0	0.0	0	0.0

Table II summarizes the frequency and percentage of menstrual patterns and worm infestation across the experimental and control groups. In the experimental group, 6.7% are under 10, 76.7% are between 10-30, and 16.7% are over 14 years old. In the control group, 3.3% are

under 10, 80% are between 10-30, and 16.7% are over 14 years. Regarding menstrual cycle patterns, 76.7% in the experimental group have regular cycles, while 23.3% are irregular. No one experiences amenorrhea. In contrast, 70% of the control group have regular cycles, 23.3% are irregular, and 6.7% report amenorrhea. For pad usage, 83.3% of the experimental group change ≤ 3 pads daily, while 16.7% change 4-5 pads. None change ≥ 6 pads. In the control group, 73.3% change ≤ 3 pads, 16.7% change 4-5 pads, and 10% use ≥ 6 pads. Bleeding patterns show that 13.3% in the experimental group bleed for 2-4 days, 80% for 5-7 days, and 6.7% for more than 7 days. In the control group, 73.3% bleed for 2-4 days, 16.7% for 5-7 days, and 10% for more than 7 days. Regarding beverage consumption, 36.7% of the experimental group drink regularly, 56.7% often, and 6.7% uncommonly. In the control group, 13.3% drink regularly, 76.7% often, and 10% uncommonly. In terms of deworming practices, both groups report 100% deworming twice a year, with no one engaging in deworming independently. For toilet hygiene, 66.7% of both groups always wear slippers, 0% never wear them, and 33.3% sometimes wear them. Lastly, 100% of respondents in both groups wash their hands with soap and water after defecation, with no reports of failing to do so.

The bar diagram below depicts the levels of hemoglobin among adolescent girls in the experimental group. In the pre-test, it shows that the majority, 56.7%, of the girls fall into the mild anemia category, while 43.3% are classified as having moderate anemia, with no girls showing a non-anemic status. In the post-test, the results demonstrate a slight change: 56.66% of girls remain in the mild anemia group, while 26.67% are now categorized as having moderate anemia, and 16.67% of the participants are no longer anemic.
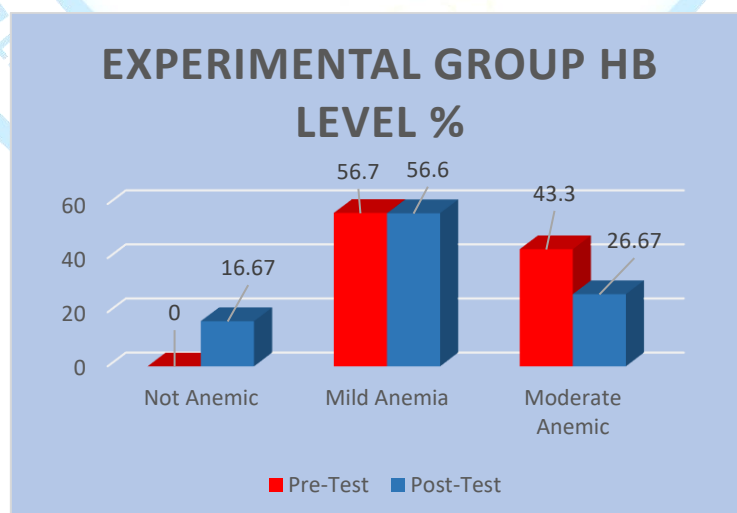
Figure – 1: Percentage distribution of Samples in the Experimental Group according to Level of Anaemia

Figure II illustrates the levels of hemoglobin in the control group of adolescent girls. Among these girls, 53.3% were found to have moderate anemia in both the pre-test and post-test assessments. Additionally, 46.7% of the girls were classified as having mild anemia in both the pre-test and post-test.
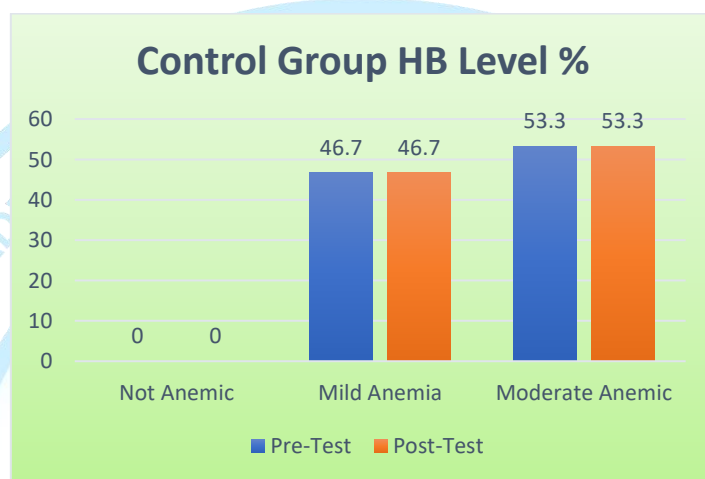

Figure – 1: Percentage distribution of Samples in the Control Group according to Level of Anaemia

Effect of Drumstick Leaf Juice on Hemoglobin Levels in Anemic Adolescent Girls (Interventional Group)

Experimental Group	Mean	Std. Deviation	t - value	p-value
Pre-Test	10.23	1.15	7.918	.000
Post-Test	10.81	1.18		

The data analysis reveals a notable rise in the average post-test knowledge scores when compared to the average pre-test knowledge scores within the samples. To determine the extent of the difference between the average pre-test and post-test knowledge scores of the samples, a paired t-test was performed. The average pre-test score is 10.23 with a standard deviation of 1.15, while the average post-test score is 10.01 with a standard deviation of 1.18. The computed t-value is 7.918, with a corresponding p-value of less than 0.01. Consequently, the null

hypothesis was rejected. This indicates that there is a significant difference in hemoglobin levels among adolescent girls with anemia in the experimental group.

Effect of Drumstick Leaf Juice on Hemoglobin Levels in Anemic Adolescent Girls (Control Group)

Control Group	Mean	Std. Deviation	t - value	p-value
Pre-Test	9.82	1.01	0.000	.000
Post-Test	9.82	1.01		

In the control group, the results for the pre-test revealed a mean score of 9.82, accompanied by a standard deviation of 1.01. These same values were observed in the post-test, indicating that there was no change in performance between the pre-test and post-test assessments for this group. This suggests that the participants in the control group exhibited consistent results throughout the testing period, with no significant differences detected.

Analysis of the frequency and percentage distribution of haemoglobin test levels among adolescent girls with anaemia, considering various demographic factors.

(n = 30)

Demographic		Moderate Anemia		Mild Anemia		Non Anemic	
		f	%	f	%	f	%
1. Age	A. Between 10-12 years	4	36.4%	4	36.4%	3	27.3%
	B. Between 13 to 15 years	4	21.1%	13	68.4%	2	10.5%
	C. 16 years and above	0	0.0%	0	0.0%	0	0.0%
2. Sex	A. Male	0	0.0%	0	0.0%	0	0.0%
	B. Female	8	26.7%	17	56.7%	5	16.7%
	C. Transgender	0	0.0%	0	0.0%	0	0.0%
3. Religion	A. Hindu	5	27.8%	10	55.6%	3	16.7%
	B. Christian	3	33.3%	5	55.6%	1	11.1%
	C. Muslim	0	0.0%	2	66.7%	1	33.3%
	D. Others	0	0.0%	0	0.0%	0	0.0%
4. Area of living	A. Urban	6	28.6%	12	57.1%	3	14.3%
	B. Rural	2	22.2%	5	55.6%	2	22.2%
	C. Slum	0	0.0%	0	0.0%	0	0.0%

5. Type of family	A. Nuclear	6	30.0%	12	60.0%	2	10.0%
	B. Joint	2	25.0%	3	37.5%	3	37.5%
	C. Extended	0	0.0%	2	100.0%	0	0.0%
6. Total family members	A. Less than 3 members	1	16.7%	5	83.3%	0	0.0%
	B. 4-6 members	5	26.3%	10	52.6%	4	21.1%
	C. More than 6 members	2	40.0%	2	40.0%	1	20.0%
7. Father's education	A. No formal education	0	0.0%	3	75.0%	1	25.0%
	B. Primary education	3	23.1%	7	53.8%	3	23.1%
	C. Higher secondary	5	55.6%	3	33.3%	1	11.1%
	D. Graduate and above	0	0.0%	4	100.0%	0	0.0%

8. Mother's education	A. No formal education	2	66.7%	0	0.0%	1	33.3%
	B. Primary education	4	26.7%	8	53.3%	3	20.0%
	C. Higher secondary	2	16.7%	9	75.0%	1	8.3%
	D. Graduate and above	0	0.0%	0	0.0%	0	0.0%
9. Monthly income of the family	A. 5,000- 10,000	2	20.0%	6	60.0%	2	20.0%
	B. 10,001- 20,000	5	27.8%	10	55.6%	3	16.7%
	C. Above 20,001	1	50.0%	1	50.0%	0	0.0%
Source of information regarding prevention of Anemia	A. Mass media	2	13.3%	10	66.7%	3	20.0%
	B. Books and magazine	0	0.0%	0	0.0%	0	0.0%
	C. Health personnel	4	40.0%	5	50.0%	1	10.0%
	D. Relatives and peer group	2	40.0%	2	40.0%	1	20.0%

Association between, the post test levels of hemoglobin among adolescent girls with anemia with selected demographic variables

Demographic	Chi-Square	DF	p-value	Significance
1. Age	3.048	2	.218	Not Significant

2.	Sex	Nil	Nil	Nil	Nil
3.	Religion	1.684	4	.794	Not Significant
4.	Area of living	.336	2	.845	Not Significant
5.	Type of family	4.796	4	.309	Not Significant
6.	Total family members	2.864	4	.581	Not Significant
7.	Father's education	8.779	6	.186	Not Significant
8.	Mother's education	2.069	6	.913	Not Significant
9.	Monthly income of the family	1.023	4	.906	Not Significant
	Source of information regarding prevention of Anemia	2.988	4	.560	Not Significant

The table presented illustrates the relationship between hemoglobin levels and various demographic factors among adolescent girls diagnosed with anemia. The analyzed demographic variables include age, religion, area of residence, family structure, total family members, educational attainment of both parents, family monthly income, and sources of information regarding the prevention of anemia. In all cases, the p-value exceeded 0.05 ($p \geq 0.05$), indicating that the results are not statistically significant. Consequently, we accept the null hypothesis, suggesting that there is no significant association between the hemoglobin levels and the demographic factors among adolescent girls suffering from anemia

Discussion

The demographic analysis of the experimental and control groups reveals notable trends. In the experimental group, 63.3% of participants are aged 13 to 15, while the control group has 70% in the same age range. All participants are female, predominantly with 60% identifying as Hindu. The experimental group has 70% living in urban areas, and 66.7% are from nuclear families, compared to 63.3% in the control group. Household sizes are similar, with 63.3% in the experimental group and 70% in the control group having 4 to 6 members. For paternal education, 43.3% of fathers in the experimental group completed primary education, while 50% of mothers in both groups did. Family income is comparable, with 60% in the experimental group earning between 10,001 and 20,000.

Behaviorally, 76.7% of the experimental group and 80% of the control group are aged 10 to 30, with a majority maintaining regular menstrual cycles. In menstrual hygiene, 83.3% of the experimental group change pads three or fewer times a day, and a balanced diet is favored by 86.7%. Both groups show strong engagement in healthcare practices like deworming and handwashing. The hemoglobin assessments indicate a significant improvement post-intervention, with the percentage of girls with moderate anemia dropping from 43.3% to 26.67%, while the non-anemic group rose to 16.67%. The control group's anemia levels remained stable. A paired t-test shows a significant increase in post-test knowledge scores in the experimental group, unlike in the control group, which had no notable change.

The research builds upon previous studies in the field. A 2020 study by **Jayasree GS et al.** examined the impact of drumstick leaves juice on hemoglobin levels in women of reproductive age in Bathinda, Punjab. The experimental group showed an increase in mean hemoglobin levels from 11.43 **(±0.91) to 12.36 (±0.69) after consuming 100ml of the juice, with a p-value of 0.69.**(7)

Khanam et al. (2022) investigated the effects of Moringa leaf consumption on hemoglobin, retinol levels, and weight in rural Bangladeshi adolescent girls. Using generalized linear model regression analysis and controlling for various factors, the study found significant increases in hemoglobin (coef = 0.41, P = 0.010) and serum retinol levels (coef = 0.27, P = 0.00) in the intervention group compared to the control. However, no significant weight changes were observed between the groups.(8)

Results

The primary goal of this study is to assess the impact of drumstick leaves on the anemic status of adolescent girls at Govt. Girls High School in Burla, Sambalpur. The statistical analysis indicated a significant difference in the levels of anemia before and after the intervention. These findings carry important implications for nursing services, education, research, and nursing administration. Nurses play a multifaceted role, acting as educators, leaders, supervisors, protectors, advocates, and team members in various work situations.

The study shows that incorporating drumstick leaves can positively influence the hemoglobin levels among adolescent girls. The results will assist nurse educators in disseminating knowledge about the effects of drumstick leaves on anemia. Furthermore, the research underscores the necessity of educating both nursing and non-nursing staff, as well as the public,

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through ongoing training programs to enhance their understanding and skills in providing guidance to adolescent girls concerning drumstick leaves and anemia.

This study can serve as a foundation for future research, potentially extending to other groups of adolescent girls experiencing anemia. Additionally, the insights gained will help nurses devise and implement educational programs using a variety of teaching methods and audiovisual materials to effectively reach their audience.

Conclusion

In conclusion, this study provides compelling evidence for the efficacy of drumstick leaves in improving anemic status among adolescent girls. The significant difference observed in post-test levels underscores the potential of this natural, accessible intervention. These findings have far-reaching implications for nursing practice, education, research, and administration. By incorporating this knowledge into various aspects of healthcare, from direct patient care to public health initiatives, nurses can play a crucial role in addressing anemia in adolescent populations. The study not only contributes to the existing body of knowledge but also paves the way for future research, potentially expanding the scope to diverse groups of anemic adolescents. As we move forward, it is imperative that healthcare professionals, educators, and policymakers recognize and harness the potential of drumstick leaves in combating anemia, ultimately improving the health and well-being of adolescent girls.

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