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# AN EXPERIMENTAL STUDY TO ASSESS THE EFFECTIVENESS OF GARDEN CRESS SEEDS ON ANEMIC LEVEL OF ADOLESCENT GIRLS IN THE AGE GROUP OF 18-19 YEARS IN CUDDALORE DISTRICT

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## ABSTRACT
Adolescent girls' anemia is a serious public health concern, especially in poor nations. It has a negative impact on cognitive and physical development, which lowers work capacity and academic achievement. This study examines how well garden cress seeds (Lepidium sativum), a naturally occurring iron source, can treat anemia in teenage girls in Cuddalore District, Tamil Nadu, who are between the ages of 18 and 19. Three hundred teenage girls between the ages of eighteen and nineteen participated in the study. (150 female students from Shree Raghavendra Arts and Science college, Keezhamoongiladi and 150 female students from Annamalai University). Information gathered about physical activity patterns, anemia prevalence, nutritional status, and nutritional understanding. All 150 teenage females receive nutritional education, and 50 anemic teenage girls from Annamalai University were chosen for the experimental group after their blood samples were taken after a month. For 45 days straight, they were given a health mix ball consisting of Health mix ball consisting of garden cress seeds along with 100ml of lemon juice. Blood samples were obtained for these 50 students following this supplementation. Fifty anemic teenage females were chosen for the control group at Shree Raghavendra Arts and Science college, Keezhamoongiladi, Cuddalore district, Tamil Nadu.. They received simply nutritional education, and after a month, blood samples were taken to check their hemoglobin levels.

**Keywords**:
Hemoglobin levels, Physical activity patterns, Health mix ball, Annamalai University. Cuddalore District.

## I. Introduction
Teenage females in underdeveloped nations are disproportionately affected by anemia, a global health issue [1]. Iron deficiency, lack nutritional awareness, and poor dietary intake are the main causes. Anemia can have a serious negative influence on adolescence, a time of essential growth and development, academic achievement, and future maternal health. In order to successfully treat the concerningly high prevalence of anemia among adolescents in India, specific interventions are required [2]. Many teenage females in Tamil Nadu's Cuddalore District suffer from anemia, which is a microcosm of this pervasive problem.

Given their high iron content and bioavailability, garden cress seeds (Lepidium sativum) offer a potentially effective natural remedy for anemia [3]. They are high in folic acid and vitamin C, which improve iron absorption and help with nutritional inadequacies, in addition to iron. In spite of their promise, nothing is known about using garden cress seeds as a dietary intervention in India [10, 11]. The purpose of this study is to close this gap by determining if garden cress seeds may raise hemoglobin levels in teenage girls and how health education can raise awareness and promote healthy habits [4].

By determining the incidence of anemia, identifying important lifestyle and demographic characteristics linked to its severity, and analyzing the effects of focused nutritional interventions and education, this study takes a comprehensive approach to understanding and preventing anemia [5]. The study aims to offer a sustainable and economical method of treating anemia in teenage females by fusing health education with garden cress seed supplementation. It is anticipated that the results of this

study will influence public health regulations and aid in the creation of all-encompassing initiatives to treat teenage anemia in environments with limited resources [6, 12].
Adolescent females should receive special attention since they are a demographic that is in a transitional stage between childhood and adulthood, marked by rapid physical growth and higher nutritional needs [7]. In addition to improving immediate health outcomes, treating anemia in adolescence lowers the chance of difficulties during pregnancy and childbirth and lays the groundwork for improved reproductive health [13, 14]. Additionally, raising hemoglobin levels and promoting general health can improve their quality of life, productivity, and academic achievement. This study supports national and international efforts to lower the prevalence of anemia and highlights the significance of long-term therapies catered to the particular requirements of teenage girls in marginalized communities.The major objective of this work is outlined as;

- To assess the prevalence of anemia among the selected adolescent girls in the age group of 18-19 years using anthropocentric, biochemical and dietary pattern.
- To study the association between demographical variables with the level of anemia, knowledge on anemia of the selected girls.
- To assess the nutritional status, nutritional knowledge on anemia and physical activity pattern of adolescent girls.
- To evaluate the effectiveness of the health education on nutritional status, nutritional knowledge on Anemia and physical activity pattern.
- To evaluate the effectiveness of garden cress seeds in improving hemoglobin level of the adolescent girls.

Rest of the paper is organized as: Section 2 summarizes the materials and methods followed by the results discussed in Section 3 and concluded in Section 4.

## II. Materials and Methods

In order to determine whether garden cress seeds can improve anaemia levels in adolescent females in the Cuddalore District who are between the ages of 18 and 19, this study uses an experimental design with a pre-test/post-test control group method. Participants will be randomised to either the control group, which will consume their regular diet without supplements, or the experimental group, which will supplement with garden cress seeds every day [8]. To ensure comparability, baseline haemoglobin levels and other health metrics will be assessed for both groups prior to the intervention. Over the course of the 8–12 week trial, progress and adherence will be routinely assessed.
The study's main result is the change in haemoglobin levels, which are measured using standardised laboratory techniques at the conclusion of the intervention. Serum ferritin levels and participants' self-reported well-being are examples of secondary outcomes. In order to distinguish the impact of garden cress seeds from other factors, the control group will be used. To guarantee ethical behaviour throughout the study, informed consent from participants and their guardians will be obtained, along with ethics approval.

## III. Results and Discussion

Distribution of the subjects based on their demographic variables by group wise is tabulated in Table 1. The demographic details of the individuals in the intervention and control groups are contrasted in the table. While the columns display the corresponding frequency and percentage of participants within each group, each row represents a distinct demographic variable. Participants were divided into age-based subgroups, such as 18 and 19 years old. Divided into three income brackets: low, middle, and high [9]. Participants were categorized according to their greatest educational attainment. Distinction between shared and nuclear households. A mixed, vegetarian, or non-vegetarian diet either rural or urban.
Table 1. Distribution of the subjects based on their demographic variables by group wise

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| Variables | Experimental | | Control | | Chi-square test value | d.f. | P-value |
|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | | | |
| Age in years | | | | | | | |
| 18 years | 22 | 44 | 31 | 62 | 3.25 | 1 | 0.071 |
| 19 years | 28 | 56 | 19 | 38 | | | |
| Place of residence | | | | | | | |
| Urban | 36 | 72 | 37 | 74 | 0.51 | 1 | 0.822 |
| Rural | 14 | 28 | 13 | 26 | | | |
| Birth Order | | | | | | | |
| First child | 2 | 4 | 2 | 4 | 1.813 | 3 | 0.612 |
| Second child | 24 | 48 | 20 | 40 | | | |
| Third child | 20 | 40 | 26 | 52 | | | |
| Fourth child | 4 | 8 | 2 | 4 | | | |
| Family Income (Monthly) | | | | | | | |
| <10000 | 15 | 30 | 22 | 44 | 2.153 | 2 | 0.341 |
| 10000-15000 | 19 | 38 | 16 | 32 | | | |
| >15000 | 16 | 32 | 12 | 24 | | | |
| Eating Outside in a week | | | | | | | |
| Rare | 17 | 34 | 26 | 52 | 7.301 | 3 | 0.063 |
| Once | 15 | 30 | 16 | 32 | | | |
| Twice | 11 | 22 | 7 | 14 | | | |
| Thrice | 7 | 14 | 1 | 2 | | | |
| Family type | | | | | | | |
| Joint Family | 9 | 18 | 13 | 26 | 0.934 | 2 | 0.627 |
| Nuclear Family | 32 | 64 | 29 | 58 | | | |
| Separated Family | 9 | 18 | 8 | 16 | | | |

Table 2 provided the distribution of the subjects based on their parent's related variables by group wise. A comparison of the parental traits in the intervention and control groups is shown in this table. These traits are essential for comprehending how the socioeconomic and educational backgrounds of the teenage participants may affect their nutritional and overall health. The participants' socioeconomic and educational environments can be inferred from the distribution of the factors connected to their parents. Given that family history might have a substantial impact on adolescents' health habits and response to interventions, this information is essential for evaluating the study's findings. Finding commonalities between groups guarantees that variations in results are caused by the intervention and not by outside influences.

Table 2. Distribution of the subjects based on their parent's related variables by group wise

| Variables | Experimental | | Control | | Chi-square test value | d.f. | P-value |
|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | | | |
| Father's Education | | | | | | | |
| Illiterate | 4 | 8 | 8 | 16 | 6.98 | 5 | .222 |
| Primary | 8 | 16 | 9 | 18 | | | |
| High School | 16 | 32 | 19 | 38 | | | |
| Secondary School | 9 | 18 | 9 | 18 | | | |
| College Education | 10 | 20 | 2 | 4 | | | |
| No more | 3 | 6 | 3 | 6 | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Mother's Education | | | | | | | |
| Illiterate | 9 | 18 | 14 | 28 | 9.61 | 5 | .087 |
| Primary | 11 | 22 | 16 | 32 | | | |
| High School | 14 | 28 | 6 | 12 | | | |
| Secondary School | 6 | 12 | 9 | 18 | | | |
| College Education | 8 | 18 | 2 | 4 | | | |
| No more | 2 | 4 | 3 | 6 | | | |
| Father's Occupation | | | | | | | |
| Unemployed | 3 | 6 | 8 | 16 | 6.54 | 4 | .162 |
| Unskilled | 20 | 40 | 24 | 48 | | | |
| Semi-skilled | 16 | 32 | 13 | 26 | | | |
| Skilled | 8 | 16 | 2 | 4 | | | |
| No More | 3 | 6 | 3 | 6 | | | |
| Mother's Occupation | | | | | | | |
| House wife | 33 | 66 | 31 | 62 | 1.10 | 4 | .893 |
| Unskilled | 5 | 10 | 7 | 14 | | | |
| Semi-skilled | 4 | 8 | 5 | 10 | | | |
| Skilled | 6 | 12 | 4 | 8 | | | |
| No More | 2 | 4 | 3 | 6 | | | |

Table 3 describes the distribution of the subjects based on their physiological variables by group wise. The physiological traits of individuals in the intervention and control groups are analysed and contrasted in this table. In order to evaluate how the intervention affected the participants' physiological parameters, it is crucial to have a baseline understanding of their health status, which these variables offer. A thorough summary of the physiological health conditions of the individuals in the intervention and control groups is given in this table. Comparing these factors helps determine how well the intervention improved these parameters and guarantees that the two groups were physiologically comparable at baseline. The physiological alterations that follow the intervention will shed light on the advantages of garden cress seed supplementation for health.

Table 3. Distribution of the subjects based on their physiological variables by group wise

| Variables | Experimental | | Control | | Chi-square test value | d.f. | P-value |
|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | | | |
| Height in cms | | | | | | | |
| <= 140 | 1 | 2 | 5 | 10 | 21.73 | 4 | <0.002 |
| 141-150 | 9 | 18 | 25 | 50 | | | |
| 151-160 | 22 | 44 | 17 | 34 | | | |
| 161-170 | 16 | 32 | 3 | 6 | | | |
| >170 | 2 | 4 | 0 | 0 | | | |
| Weight in kgs | | | | | | | |
| 31-40 | 6 | 12 | 11 | 22 | 6.232 | 4 | 0.182 |
| 41-50 | 23 | 46 | 26 | 52 | | | |
| 51-60 | 14 | 28 | 10 | 20 | | | |
| 61-70 | 4 | 8 | 3 | 6 | | | |
| 71-80 | 3 | 6 | 0 | 0 | | | |
| BMI | | | | | | | |
| <=18.50 (Under weight | 17 | 34 | 10 | 20 | 8.281 | 4 | .082 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 18,51-23.00 ( Normal) | 21 | 42 | 33 | 66 | | | |
| 23.01 – 25.00 (Over weight) | 6 | 12 | 6 | 12 | | | |
| 25.01-30.00 (Obese I) | 4 | 8 | 1 | 2 | | | |
| >30.00 (Obese II) | 2 | 4 | 0 | 0 | | | |

Table 4 delineates the distribution of the subjects based on their preference of snacks by group wise. The snack choices of participants in the intervention and control groups are analyzed in this table. Knowing snack preferences is crucial because they can affect dietary patterns in general, which may have an impact on how well nutritional interventions like supplementing garden cress seed work.We can determine the possible impact of dietary supplements or health education on food choices by comparing the snack preferences of the two groups. A change in the intervention group's snack choices toward healthier options may indicate that the instruction and supplements have improved their eating patterns.The dietary patterns and snack preferences of the teenage females in the intervention and control groups are shown in this table.

Table 4. Distribution of the subjects based on their preference of snacks by group wise

| Variables | Experimental | | Control | | Chi-square test value | d.f. | P-value |
|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | | | |
| Tea | 6 | 12 | 20 | 40 | | | |
| Coffee | 12 | 24 | 3 | 6 | | | |
| Juice | 23 | 46 | 9 | 18 | | | |
| Ice cream | 11 | 22 | 22 | 44 | | | |
| Samosa | 18 | 36 | 28 | 56 | | | |
| Panipuri | 15 | 30 | 27 | 54 | | | |
| Puffs | 26 | 52 | 6 | 12 | | | |
| Burger | 2 | 4 | 3 | 6 | | | |
| Pizza | 1 | 2 | 3 | 6 | | | |
| Noodles | 8 | 16 | 7 | 14 | | | |
| Channa Masala | 2 | 4 | 4 | 8 | | | |
| Chips | 5 | 10 | 8 | 16 | | | |
| Chocolates | 7 | 14 | 6 | 12 | | | |
| Biscuits | 3 | 6 | 13 | 26 | | | |
| Poori | 6 | 12 | 4 | 8 | | | |
| Mushroom puff | 2 | 4 | 7 | 14 | | | |
| Briyani | 4 | 8 | 10 | 20 | | | |
| Shawarmma | 1 | 2 | 4 | 8 | | | |
| Cake | 13 | 26 | 2 | 4 | | | |
| Popcorn | 0 | 0 | 1 | 2 | | | |
| Sandwich | 2 | 4 | 0 | 0 | | | |
| Chicken roll | 3 | 6 | 0 | 0 | | | |
| Fruits | 5 | 10 | 4 | 8 | | | |

Table 5 delineates the distribution of the subjects based on their frequency of healthy snacks intake by group wise. The frequency of consumption of nutritious snacks by participants in the intervention and control groups is shown in this table. A balanced diet must include nutritious snacks since they are a great source of vitamins, minerals, fiber, and healthy fats—all of which are particularly vital for the growth and development of adolescents. This table aids in evaluating the effect of the intervention on participants' eating patterns by examining the frequency of consumption of nutritious snacks. This

chart offers important information about how frequently teenage girls in both groups consume nutritious snacks. We can determine how well the garden cress seed supplementation and health education are working to improve eating habits by evaluating these patterns of intake. The intervention group's increased consumption of nutritious snacks would indicate that the intervention had a favourable.

Table 5. Distribution of the subjects based on their frequency of healthy snacks intake by group wise

| Food items | Group | Rare | Once a month | Once a week | Almost daily | Chi-Square test value | d.f. | P-value |
|---|---|---|---|---|---|---|---|---|
| DRY FRUITS - Dates | Exp | 25 | 3 | 6 | 16 | 5.923 | 3 | .115 |
| | Control | 19 | 7 | 13 | 11 | | | |
| Dry Fruits - Figs | Exp | 40 | 3 | 3 | 4 | 3.229 | 3 | .358 |
| | Control | 34 | 7 | 6 | 3 | | | |
| Dry Fruits - Raisins | Exp | 39 | 3 | 1 | 7 | 1.272 | 3 | .736 |
| | Control | 37 | 4 | 3 | 6 | | | |
| DRY NUTS | | | | | | | | |
| Badam | Exp | 35 | 2 | 1 | 12 | 10.243 | 3 | .017 |
| | Control | 25 | 3 | 11 | 11 | | | |
| Pista | Exp | 44 | 3 | 0 | 3 | 11.253 | 3 | .010 |
| | Control | 31 | 6 | 7 | 6 | | | |
| Walnut | Exp | 45 | 2 | 1 | 2 | 9.747 | 3 | .021 |
| | Control | 32 | 5 | 5 | 8 | | | |
| Pea nut | Exp | 37 | 2 | 3 | 8 | 3.719 | 3 | .293 |
| | Control | 28 | 3 | 4 | 15 | | | |

Table 6 delineates the distribution of the subjects based on their frequency of healthy snacks intake by group wise. The frequency of healthy snack consumption by participants is shown in this table, categorized by the intervention and control groups. Healthy snacks are critical for sustaining optimal nutrition and supplying necessary nutrients, particularly for teenagers going through a period of rapid growth and development. This table aids in determining if the participants' dietary preferences and frequency of consumption of healthful snacks have been impacted by the intervention (garden cress seeds and health education).The frequency of healthy snack consumption by participants in the intervention and control groups is clearly compared in this table. It is a helpful tool for assessing how well the intervention is working to encourage adolescent females to adopt healthy eating habits. The information aids in determining whether a greater consumption of nutrient-dense snacks resulted from the supplements and health education.

Table 6. Distribution of the subjects based on their frequency of healthy snacks intake by group wise

| Food items | Group | Rare | Once a month | Once a week | Almost daily | Chi-square test value | d.f. | P-value |
|---|---|---|---|---|---|---|---|---|
| CITRUS FRUITS | | | | | | | | |
| Lemon | Exp | 31 | 2 | 5 | 12 | 10.173 | 3 | .017 |
| | Control | 17 | 2 | 16 | 15 | | | |
| Orange | Exp | 34 | 1 | 7 | 8 | 4.230 | 3 | .238 |
| | Control | 24 | 1 | 12 | 13 | | | |
| Musambi | Exp | 38 | 4 | 5 | 3 | 3.463 | 3 | .326 |
| | Control | 33 | 4 | 4 | 9 | | | |
| Amla | Exp | 40 | 1 | 0 | 9 | 8.295 | 3 | .040 |
| | Control | 30 | 5 | 4 | 11 | | | |

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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| GREEN LEAFY VEGETABLES | Exp | 22 | 2 | 15 | 11 | 0.533 | 3 | .912 |
| | Control | 21 | 3 | 13 | 13 | | | |
| SPROUTS | Exp | 33 | 3 | 4 | 10 | 1.162 | 3 | .762 |
| | Control | 36 | 4 | 2 | 8 | | | |
| NON-VEGETARIAN | | | | | | | | |
| Meats | Exp | 34 | 2 | 5 | 9 | 5.427 | 3 | .143 |
| | Control | 28 | 1 | 14 | 7 | | | |
| Fish | Exp | 35 | 3 | 7 | 5 | 20.276 | 3 | .000 |
| | Control | 14 | 2 | 15 | 19 | | | |
| Egg | Exp | 21 | 3 | 10 | 16 | 5.704 | 3 | .127 |
| | Control | 16 | 0 | 9 | 25 | | | |
| Liver | Exp | 40 | 5 | 5 | 0 | 1.512 | 3 | .679 |
| | Control | 41 | 5 | 3 | 1 | | | |

The distribution of the subjects based on their dietary practice by group wise is outlined in Table 7. The table compares the frequency of coffee/tea consumption and breakfast skipping between the experimental and control groups. In terms of skipping breakfast, the experimental group contained 18 participants who did so infrequently and 9 who did it every day, while the control group had 9 and 12 participants, respectively. There is no discernible difference between the groups, according to the p-value of 0.105. The experimental group's coffee/tea intake likewise showed no significant difference, with 14 persons consuming it infrequently and 22 consuming it regularly, compared to 13 and 22 in the control group (p-value of 0.712). These findings imply that the food habits of the two groups were similar, guaranteeing that there were few confounding influences on the study's findings.

Table 7. Distribution of the subjects based on their dietary practice by group wise

| Dietary Practice | Group | Rare | Once a week | Twice a week | Thrice a week | Daily | Chi-square test p-value |
|---|---|---|---|---|---|---|---|
| *Do you have practice of missing breakfast?* | | | | | | | |
| | Experimental | 18 | 5 | 14 | 4 | 9 | 0.105 |
| | Control | 9 | 13 | 14 | 2 | 12 | |
| *Intake of coffee or tea* | | | | | | | |
| | Experimental | 14 | 4 | 6 | 4 | 22 | 0.712 |
| | Control | 13 | 8 | 5 | 2 | 22 | |

The chi-square test is used to compare the prevalence of anemia-related symptoms in the experimental and control groups, which is summarised in the table 8. There were no statistically significant differences between the groups in symptoms such as angular stomatitis, reddish-brown hair, brittle or spoon-shaped nails, or pallor skin since their p-values (e.g., 0.161, 0.110, 0.211, and 0.140) were higher than the significance level of 0.05. Interestingly, with a p-value of 0.022, cheilosis was substantially more common in the experimental group (10%) compared to the control group (0%). Additionally, the experimental group had considerably greater levels of symptoms related to mood and attention, such as mood swings ($p = 0.000$) and lacking attentiveness in class ($p = 0.000$).

Table 8. Distribution of the subjects based on their clinical symptoms by group wise

| Symptoms | Experimental | | Control | | Chi-square test value | d.f. | P-value |
|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Pallor skin | 5 | 10 | 10 | 20 | 1.961 | 1 | .161 |
| Brittle / Spoon shaped nail | 3 | 6 | 8 | 16 | 2.554 | 1 | .110 |
| Colour of Hair (Reddish Brown) | 15 | 30 | 21 | 42 | 1.563 | 1 | .211 |
| Colour of Eye : Pallor | 9 | 18 | 9 | 18 | --- | --- | --- |
| Angular Stomatitis | 6 | 12 | 2 | 4 | 2.174 | 1 | .140 |
| Mouth Ulcer | 9 | 18 | 7 | 14 | 0.298 | 1 | .585 |
| Cheilosis | 5 | 10 | 0 | 0 | 5.263 | 1 | .022 |
| Loss of hair | 45 | 90 | 44 | 88 | .102 | 1 | .749 |
| Weight loss | 16 | 32 | 15 | 30 | .047 | 1 | .829 |
| Weight gain | 10 | 20 | 6 | 12 | 1.190 | 1 | .275 |
| Missing attentiveness in class | 22 | 44 | 4 | 8 | 16.84 | 1 | .000 |
| Mood Swing | 29 | 58 | 11 | 22 | 13.50 | 1 | .000 |
| Eating raw rice, chalk, mud | 17 | 34 | 16 | 32 | 0.081 | 1 | .776 |
| Worms in the Stool | 2 | 4 | 2 | 4 | --- | --- | --- |

Table 9 compares the experimental and control groups in terms of lifestyle factors, such as engagement in outdoor games, yoga/meditation, and other physical activities. With a p-value of 0.668, which indicates no significant difference, 70% of individuals in the experimental group reported not playing outdoor games, compared to 66% in the control group. Similarly, with a p-value of 0.749, indicating no significant difference, 88% of the experimental group and 90% of the control group did not engage in yoga or meditation. With a p-value of 0.538, which likewise shows no significant difference, 90% of the experimental group and 86% of the control group did not perform any other activities.

Table 9. Distribution of the subjects based on physical exercises related variables by group wise

| Variables | Experimental | | Control | | Chi-square test value | d.f. | P-value |
|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | | | |
| *Do you play any outdoor games* | | | | | | | |
| No | 35 | 70 | 33 | 66 | 0.184 | 1 | 0.668 |
| Yes | 15 | 30 | 17 | 34 | | | |
| Yoga and meditation | | | | | | | |
| No | 44 | 88 | 45 | 90 | 0.102 | 1 | 0.749 |
| Yes | 6 | 12 | 5 | 10 | | | |
| *Do you do any other exercise* | | | | | | | |
| No | 45 | 90 | 43 | 86 | 0.379 | 1 | 0.538 |
| Yes | 5 | 10 | 7 | 14 | | | |

Menstruation-related variables are compared amongst the experimental and control groups in the table 10. With 80% of the experimental group and 68% of the control group reporting regular periods, there is no discernible change in menstrual status (p = 0.171). With a p-value of 0.186, menstrual flow duration does not significantly differ between groups such as three, four, or five days, and more than five days. Similarly, there is no significant difference between groups in uncomfortable menstrual symptoms such fatigue, sluggishness, and stomach pain (p = 0.102). There is no discernible variation in college attendance trends during the menstrual cycle (p = 0.794). Nonetheless, there is a significant difference (p = 0.043) in the number of pads used daily, with a larger percentage of people in the experimental group utilising three or more pads.

Table 10. Distribution of the subjects based on their menstrual related variables by group wise

| Variables | Experimental | | Control | | Chi-square | d.f. | P-value |
|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | | | |

| | | | | | test value | | |
|---|---|---|---|---|---|---|---|
| Menstruation status | | | | | | | |
| Regular | 40 | 80 | 34 | 68 | 1.871 | 1 | 0.171 |
| Irregular | 10 | 20 | 16 | 32 | | | |
| Menstrual flow | | | | | | | |
| Three days | 13 | 26 | 10 | 20 | 4.817 | 3 | 0.186 |
| Four days | 20 | 40 | 13 | 26 | | | |
| Five days | 12 | 24 | 22 | 44 | | | |
| More than Five days | 5 | 10 | 5 | 10 | | | |
| Uncomfortable feelings during menstrual period | | | | | | | |
| Tired | 13 | 26 | 23 | 46 | 6.198 | 3 | 0.102 |
| Lethargy | 1 | 2 | 0 | 0 | | | |
| Stomach pain | 32 | 64 | 26 | 52 | | | |
| Others | 4 | 8 | 1 | 2 | | | |
| College attendance during menstrual period | | | | | | | |
| Present | 34 | 68 | 32 | 64 | 0.461 | 2 | 0.794 |
| Absent | 4 | 8 | 6 | 12 | | | |
| sometime absent | 12 | 24 | 12 | 24 | | | |
| No.of pads required per day | | | | | | | |
| 1 | 1 | 2 | 2 | 4 | 9.848 | 4 | 0.043 |
| 2 | 10 | 20 | 22 | 44 | | | |
| 3 | 21 | 42 | 14 | 28 | | | |
| 4 | 12 | 24 | 11 | 22 | | | |
| 5-6 | 6 | 12 | 1 | 2 | | | |

The experimental and control groups' various sanitation and hygiene-related characteristics are contrasted in Table 11. In terms of lavatory amenities, there is a substantial difference (p 0.001): 66% of the experimental group had access to a shared lavatory for more than ten rooms, while just 4% of the control group did. On the other hand, a larger percentage of participants (62%) in the control group have a single toilet in each room. A significant difference between the groups was indicated by the p-value of 0.023, which showed that 26% of the experimental group and 48% of the control group reported going barefoot outside. 34% of the experimental group and 52% of the control group said they washed their hands with soap before eating, although the p-value was 0.069.

Table 11. Distribution of the subjects based on their sanitation practices related variables by group wise

| Variables | Experimental | | Control | | Chi-square test value | d.f. | P-value |
|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | | | |
| *1. Toilet facility* | | | | | | | |
| Single toilet for each room | 2 | 4 | 31 | 62 | 53.08 | 2 | <0.001 |
| Common toilet for more than 5 rooms | 15 | 30 | 17 | 34 | | | |
| Common toilet for more than 10 rooms | 33 | 66 | 2 | 4 | | | |
| *Do you walk in barefoot outside the house?* | | | | | | | |
| Yes | 13 | 26 | 24 | 48 | 5.191 | 1 | 0.023 |
| No | 37 | 74 | 26 | 52 | | | |
| *Do you wash your hands with soap before taking food?* | | | | | | | |
| Yes | 17 | 34 | 26 | 52 | 3.305 | 1 | .069 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| No | 33 | 66 | 24 | 48 | | | |
| *Do you wash your hands with soap after using toilet?* | | | | | | | |
| Yes | 42 | 84 | 47 | 94 | 2.554 | 1 | 0.110 |
| No | 8 | 16 | 3 | 6 | | | |
| *How frequent do you cut your nails?* | | | | | | | |
| Once in a week | 30 | 60 | 32 | 64 | 7.157 | 3 | 0.67 |
| Twice in a month | 8 | 16 | 11 | 22 | | | |
| Once in a month | 10 | 20 | 2 | 4 | | | |
| rare | 2 | 4 | 5 | 10 | | | |

The frequency with which the experimental and control groups consumed different foods is shown in the table 12, which is divided into three categories: "Rare," "Sometimes," and "Frequently." Since all p-values are higher than the 0.05 cutoff, the chi-square test findings show that there are no significant differences between the groups for any of the food items. For instance, the p-values for pasta, pizza, and burgers are 0.134, 0.092, and 0.300, respectively. Noodles, cake, samosas, and puffs have p-values of 0.293, 0.226, 0.190, and 0.095, respectively. These results imply that the experimental and control groups' eating patterns for these foods are similar.

Table 12. Distribution of the subjects based on their frequency of junk food intake by group wise

| Food items | Group | Rare | Some times | Frequently | Chi-Square test value | d.f. | P-value |
|---|---|---|---|---|---|---|---|
| PIZZA | Exp | 3 | 27 | 20 | 2.406 | 2 | .300 |
| | Control | 6 | 20 | 24 | | | |
| BURGER | Exp | 5 | 29 | 16 | 4.778 | 2 | .092 |
| | Control | 11 | 19 | 20 | | | |
| PASTA | Exp | 3 | 30 | 17 | 4.024 | 2 | .134 |
| | Control | 5 | 20 | 25 | | | |
| NOODLES | Exp | 5 | 14 | 31 | 2.458 | 2 | .293 |
| | Control | 4 | 8 | 38 | | | |
| CAKE | Exp | 6 | 14 | 30 | 2.978 | 2 | .226 |
| | Control | 4 | 8 | 38 | | | |
| SAMOSA | Exp | 4 | 6 | 40 | 3.322 | 2 | .190 |
| | Control | 1 | 11 | 38 | | | |
| PUFFS | Exp | 3 | 9 | 38 | 4.710 | 2 | .095 |
| | Control | 1 | 18 | 31 | | | |
| FRENCH FRIES | Exp | 5 | 31 | 14 | 2.041 | 2 | .360 |
| | Control | 6 | 24 | 20 | | | |
| CHIPS | Exp | 5 | 17 | 28 | 3.326 | 2 | .190 |
| | Control | 1 | 22 | 27 | | | |
| PANI POORI | Exp | 3 | 15 | 32 | 3.923 | 2 | .141 |
| | Control | 5 | 7 | 38 | | | |
| CUTLET | Exp | 4 | 30 | 16 | 1.983 | 2 | .371 |
| | Control | 5 | 23 | 22 | | | |
| CHOCOLATES | Exp | | 20 | 30 | 0.041 | 1 | .839 |
| | Control | | 21 | 29 | | | |
| ICE-CREAM | Exp | 4 | 8 | 38 | 0.261 | 2 | .878 |
| | Control | 3 | 7 | 40 | | | |
| SWEETS | Exp | 4 | 16 | 30 | 1.362 | 2 | .506 |
| | Control | 2 | 13 | 35 | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| MILK SHAKES | Exp | 5 | 22 | 23 | 0.902 | 2 | .637 |
| | Control | 8 | 22 | 20 | | | |

The outcomes of a t-test comparing the means of the experimental and control groups are shown in the table 13. The control group's mean is 5.80 with a standard deviation (SD) of 1.82, but the experimental group's mean is 6.56 with an SD of 1.87. With 98 degrees of freedom (d.f.), the t-test value is 2.051, and the p-value is 0.043. There is a statistically significant difference between the two groups, as indicated by the p-value being less than 0.05. As a result, we may say that the experimental group's mean is much higher than the control group's.

Table 13. Mean and Standard deviation of knowledge score by group wise at pre test

| Group | Mean | SD | t-test value | d.f. | P-value |
|---|---|---|---|---|---|
| Experimental | 6.56 | 1.87 | 2.051 | 98 | .043 |
| Group | 5.80 | 1.82 | | | |

The results of a t-test comparing the means of the experimental and control groups are shown in the table 14. The control group's mean is 5.80 with a standard deviation (SD) of 1.82, but the experimental group's mean is 6.56 with an SD of 1.87. With 98 degrees of freedom (d.f.), the t-test value is 2.051, and the p-value is 0.043. There is a statistically significant difference between the two groups, as indicated by the p-value being less than 0.05. As a result, we may say that the experimental group's mean is much higher than the control group's.

Table 14. Mean and Standard deviation of Haemoglobin values by group wise at pre test

| Group | Mean | SD | t-test value | d.f. | P-value |
|---|---|---|---|---|---|
| Experimental | 9.174 | 0.864 | 1.846 | 98 | .068 |
| Group | 8.798 | 1.152 | | | |

The results of a t-test comparing the experimental and control groups' means are shown in the table 15. The control group's mean is 7.66 with a standard deviation (SD) of 1.53, but the experimental group's mean is 9.34 with an SD of 0.93. With 98 degrees of freedom (d.f.), the t-test value is 6.606, and the p-value is 0.000. A statistically significant difference between the experimental and control groups is indicated by a p-value of less than 0.05, indicating that the experimental group's mean is significantly higher than the control group's.

Table 15. Mean and Standard deviation of knowledge score by group wise at post test

| Group | Mean | SD | t-test value | d.f. | P-value |
|---|---|---|---|---|---|
| Experimental | 9.34 | 0.93 | 6.606 | 98 | .000 |
| Group | 7.66 | 1.53 | | | |

The results of a t-test comparing the experimental and control groups' means are shown in the table 16. The control group's mean is 9.46 with a standard deviation (SD) of 1.38, whereas the experimental group's mean is 10.26 with an SD of 1.12. With 98 degrees of freedom (d.f.), the t-test value is 3.162, and the p-value is 0.002. A statistically significant distinction amongst the experimental and control groups is indicated by a p-value of less than 0.05, which implies that the experimental team's mean is significantly greater than the control group's.

Table 16. Mean and Standard deviation of Haemoglobin values by group wise at post test

| Group | Mean | SD | t-test value | d.f. | P-value |
|---|---|---|---|---|---|
| Experimental | 10.26 | 1.12 | 3.162 | 98 | .002 |
| Group | 9.46 | 1.38 | | | |

A paired t-test comparing the mean difference between the experimental and control groups is shown in the table. The experimental group's mean difference was 2.78 with a standard deviation (SD) of 2.11, whereas the control group's mean difference was 1.86 with an SD of 1.92. With 98 degrees of freedom (d.f.), the t-test value is 2.459, and the p-value is 0.016. A statistically significant difference

in the mean differences between the two groups is indicated by a p-value of less than 0.05, which implies that the experimental group exhibits a significantly larger change than the control group.

Table 17. Mean and Standard deviation of changes occurs in the knowledge score between the two groups

| Group | Mean difference | SD | t-test value | d.f. | P-value |
|---|---|---|---|---|---|
| Experimental | 2.78 | 2.11 | 2.459 | 98 | .016 |
| Group | 1.86 | 1.92 | | | |

The results of a t-test comparing the experimental and control groups' means are shown in the table. In contrast to the control group, which has a mean of 0.66 with an SD of 0.81, the experimental group's mean is 1.08 with an SD of 0.89. With 98 degrees of freedom (d.f.), the t-test value is 2.459, and the p-value is 0.016. The experimental group may have a considerably greater mean than the control group since the p-value is less than 0.05, indicating a statistically significant difference between the two groups.

Table 18. Mean and Standard deviation of changes occurs in the Haemoglobin values between the two group wise

| Group | Mean | SD | t-test value | d.f. | P-value |
|---|---|---|---|---|---|
| Experimental | 1.08 | 0.89 | 2.459 | 98 | .016 |
| Group | 0.66 | 0.81 | | | |

## IV. Conclusion

This study emphasizes how urgent it is to treat teenage girls' anemia, especially in underprivileged areas like Cuddalore District. The results emphasize how common anemia is and how lifestyle, diet, and demographic factors are linked to it. Because of their high iron content and bioavailability, garden cress seeds have showed potential as a dietary intervention to raise hemoglobin levels. Furthermore, anemia-related health education programs have been successful in increasing participants' understanding and promoting better eating and exercise habits. Adolescent girls can fight anemia and enhance their general health and well-being using a low-cost, sustainable strategy that combines education and supplementation. These findings have important ramifications for public health campaigns, highlighting the necessity of community-based activities and dietary interventions specifically designed to meet the needs of teenagers. To confirm the results and investigate the wider applicability of this intervention, more research with bigger populations and longer follow-up times is advised.

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