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Effectiveness of VATP on Knowledge Regarding Preparation and Uses of *Moringa* Juice in Management of Anemia among Adolescent Girls

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ABSTRACT
Background: Adolescent is one of the most rapid phases of human development. Anemia is a deficiency in the number of RBC in your body. RBC carry oxygen around your body using a particular protein called hemoglobin. Normal hemoglobin level in adolescent girls 13-15 g/dl. According to WHO, the hemoglobin level 10- 11.9 g/dl is considered mild anemia, 7-9 g/dl is considered moderate, and less than 7 g/dl is called severe anemia.
Methods: The present study is pre-experimental among 60 adolescent girls, using a disproportional stratified random technique. One experimental group of clients was selected without randomization and no control group was used. The data was collected by using the structured close-ended knowledge questionnaire. The data was analyzed using descriptive and inferential statistics regarding mean, frequency distribution, percentage, paired table t-test and chi-square test.
Results: The overall findings reveal that the post-test knowledge mean score 26.24% with SD±5.94, which was 72% of the total score was more when compared to the pre-test knowledge mean score 12.98 with SD 5.94, which was 36.83% of total score. The calculated t-value of 24.91 was much higher than the table t-value 1.96 for the hypothesis.
Conclusion: The study provides that VATP on knowledge regarding the preparation and use of moringa juice in managing anemia among adolescent girls was the scientific, logical and cost-effective strategy.

Key-words: Adolescent girls, Knowledge, VATP, Effectiveness, Socio-demographic variables.

INTRODUCTION

"Healthy adolescent girls of today are the healthy mothers of tomorrow." Anemia accounts for most of the nutritional problems globally.

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The prevalence of anemia is inordinately higher among developing nations because of low socioeconomic status and impoverished access to healthcare services. [1]

The world's adolescent population is facing a series of serious nutritional challenges which are not only affecting their growth and development but also their livelihood as adults. [2] The World Health Organization has defined adolescence as the period of life between 10 to 19 years.[3]

This is the formative period of life when the maximum amount of physical, psychological, and behavioral changes occurs. This is a vulnerable period in the human life cycle for the development of nutritional anemia,

which public health programs have constantly neglected. [4]

World Health Organization (WHO) defines adolescence as 10 to 19 years of age.[5] The prevalence of anemia among adolescents is 27% in developing countries and 6% in developed countries.[6] In Indonesia, anemia is a considerable health concern, with a prevalence of 22.7% in women of childbearing age, 37.1% in pregnant women, and 30.0–46.6% in female workers.[7,8]

During this period, iron requirements increase dramatically due to the expansion of the total blood volume, the increase in lean body mass and the onset of menses in young females.[9] The iron requirements increase from a preadolescent level of ~0.7-0.9 mg Fe/d to as much as 2.2 mg Fe/d or perhaps more in heavily menstruating young women. These increased requirements are associated with the timing and size of the growth spurt as well as sexual maturation and the onset of menses. Regular nutritional education sessions should be carried out to increase adolescent girls' awareness of anemia.[10] In India, girls often get married and pregnant even before the growth period is over, thus doubling the risk for anaemia.[11]

Anemia is considered the most common cause of malnutrition and has great significance in public health, affecting women worldwide, children, adolescents, and the reproductive age group. One of the major health issues in adolescent girls is Iron Deficiency Anemia, which the consumption of Drumsticks leaves can reduce. The World Health Organization's global estimates of anemia prevalence averaged 56%, ranging from 35% to 75%, depending on geographic location. In India, the majority of anemia is 52%. [12]

The drumstick tree (*Moringa oleifera* Lam), a member of the *Moringaceae* family, is widely spread from India to Africa and numerous other tropical and arid countries and is mainly utilized as food and medicine.[13] Generally, herbal preparations are considered safe and without adverse effects because they are natural products. Moringa leaves are highly recommended as natural dietary supplements because of their high nutritional value and low anti-nutritional factors. No adverse effects of moringa leaves have been observed in human studies so far. Moreover, many different formulations and preparations of leaves have been used worldwide as food, and no ill effects have been reported. Daily 70 g moringa leaf extract consumption was considered safe with no toxicity.[14]

With high nutritional value, *Moringa* leaves help combat malnutrition worldwide and may be used as nutraceuticals and functional foods due to natural antioxidants.[15] Based on Moringa's nutritional value and availability and the emphasis given to providing fortified meals at school, we aimed to assess the effect of *M. oleifera* leaves' impact on improving hemoglobin and retinol levels and reducing underweight status among adolescent girls in rural Bangladesh.[16]

The powdered form of the leaf is rich in multiple minerals and vitamins, including iron, vitamin A (carotenoid), and vitamin C. Moreover, *Moringa* may help to resolve various malnutrition problems as it contains all essential amino acids, the building blocks for the proteins crucial to cell growth and metabolism.[17]

MATERIALS AND METHODS

Study design- The research design adopted for this study was a pre-experimental one-group pre-test-post-test without a control group design. One experimental group of clients was selected without randomization and no control group was used. A pre-test was conducted among high school adolescent girls using a structured questionnaire on moringa leaves. The intervention was given through video-assisted teaching programme on moringa leaf juice preparation to manage anemia among adolescent girls.

Setting of the study- Setting is the Physical location and conditions for data collection. The present study was conducted in B.V.V.S. High School Bagalkot. The study setting was selected according to the availability of adolescent girls studying in B.V.V.S High School Bagalkot, India.

Participants- A sample consists of subject units comprising the population for the present study. This study sample size is (n=60) adolescent girls 14-16 yrs. age group studying on B.V.V.S high school Bagalkot.

Samples selection criteria
Inclusion criteria- The study includes adolescent girls, who can be available during data Collection. Willing to participate in the study.

Exclusion criteria- Unable to cooperate throughout the study sick and unable to provide the data. Expected to go out of the setting at the time of study**.**

Sample Size Estimation- In the present study, the sample size was calculated using Epi info software. The sample size was estimated using the result (mean and standard deviation) of a previous VATP similar study that was not conducted to assess the knowledge regarding the preparation and uses of moringa juice. The confidence level was 95% (=5%) and Z=1.67. The power of the test was considered 80%. The sample size estimated by the statistician was considering the attritions of data. The researcher enrolled 60 subjects.

Description of data collection tool- A structured closed-ended knowledge questionnaire was prepared by an extensive review of the literature and based on suggestions of guide and experts to assess the knowledge of adolescent girl's knowledge on preparation and use of moringa juice. The tool was validated by 5 experts in Obstetrical and Gynecological Nursing.

Data collection instrument is divided into 2 parts:
Part 1- It consists of socio-demographic variables such as Age, caste, type of family, no of family, residence, father's educational status, no of family members, father's occupational status, mothers' educational status, mother's occupation status, monthly family income, source of information, have you drunk moringa juice.

Part 2- Data was collected through the Self Administration Questionnaire using a structured closed-ended knowledge questionnaire. It consists of 36 knowledge items related to anemia and moringa leaves. These items were closed-ended, multiple-choice questions. A seeking system is developed for the item each correct answer is assigned a score of one wrong answer or score of zero. Total score was 36.

Part-A- Questionnaires on anemia. The tool was divided into 4-section.
Section I- General questions on anemia 1-5.

Section-II- Question on causes and risk factors of anemia 6-13.

Section-III- Question on signs and symptoms of anemia 14-16.
Section-IV- Question on treatment and prevention of anemia 17-18.

Part-B- Questions on *moringa* leaves 19-36.

Scoring- Each question has one correct option, each correct response is assigned one mark, and the wrong answer carries zero marks. The maximum possible score was 36.

Data Collection- The main study was conducted for 4 weeks between 16/4/2021 to 22/4/2021 at B.V.V.S High School Bagalkot, India.

Variables of the study
Dependent variable- This study refers to the knowledge regarding the preparation and use of moringa juice in managing anemia among adolescent girls.

Independent variable- Video-assisted teaching programme on knowledge regarding preparation and management of anemia among adolescent girls.

Statistical Analysis- The data was analyzed using SPSS-18 statistical package. Numerical data obtained from the sample was organized and summarized with the help of descriptive statistics like percentage mean and standard deviation. Association between post-test knowledge score of adolescent girls. Studying B.V.V.S High School Bagalkot and Chi-square test were used to analyze the association of malnutrition with socio-demographic variables.

Ethical Consideration- An ethical clearance certificate was obtained from B.V.V.S Sajjalashree Institute of Nursing Sciences, Institutional Ethical Committee. Written consent was obtained from each participant.

RESULTS
The pre-test reveals that out of 60 adolescent girls, the highest pre-test (71.67%) of adolescent girls had poor knowledge, (26.67%) adolescents had average knowledge (1.66%) of adolescent girls had very poor knowledge. None of the adolescent girls had excellent knowledge regarding the preparation and use of moringa juice.

The post-test reveals that out of 60 adolescent girls, the highest post-test (66.67%) of adolescent girls had good knowledge, (26.67%) adolescent girls had excellent knowledge, (6.66%) of adolescent girls had average knowledge. None of the adolescent girls had excellent knowledge regarding the preparation and use of moringa juice. The overall findings reveal that the post-test knowledge mean score 26.24% with SD±5.94, which was 72% of the total score, was more when compared to the pre-test knowledge mean score 12.98 with SD 5.94, which was 36.83% of the total score. The calculated t value 24.91 was much higher than t-value 1.96 for the hypothesis (Table 1 & 2).

Table 1: Description of socio-demographic characteristics of sample

Socio-demo graaphic factors	Character	Frequency (f)	Percentage (%)
Age	14	32	53.33
	15	12	20
	16	16	26.66
Caste	Hindu	26	43.33
	Muslim	14	23.33
	Christian	10	16.66
	Others	10	16.66
Type of family	Joint	6	10
	nuclear	23	38.33
	extended	12	20
	single	19	31.66
No of family members	2	6	10
	3	14	23.33
	4	14	23.33
	>4	26	43.33
Residence	Urban	21	35
	Rural	39	65
Father educational status	No formal education	6	10
	Primary education	15	25
	High school	15	25
	Puc	17	28.33
	Degree & above	7	11.66
Father occupational status	Farmer	10	16.66
	Private job	16	26.66
	Govt job	6	10
	Coolie	2	3.33
	Business	26	43.33
Mother educational status	No formal Education	11	18.33
	Primary Education	15	25
	High school	14	23.33
	Degree & above	15	25
Mother occupational status	House wife	32	53.33
	Private job	11	18.33
	Govt job	6	10
	Coolie	7	11.66
	Business	4	6.66

Monthly family income	5000-10,000	15	25
	10,001-15,000	23	38.33
	15001-20000	14	23.33
	>20000	8	13.33
Source of information	Print media	8	13.33
	Electronic Media	14	23.33
	New technology	12	20
	Peer group	13	21.66
	Health profession	13	21.66
Have you drunk moringa juice	Yes	11	18.33
	No	49	81.64

Table 2: Percentage-wise distribution of adolescent girls according to level of knowledge in pre-test and Post-test

Level of knowledge	Pre-test		Post-test	
	No. of respondents	Percentage (%)	No. of respondents	Percentage (%)
Excellent	0	0	16	26.67
Good	0	0	40	66.67
Average	16	26.67	4	6.66
Poor	43	71.67	0	0
Very poor	01	1.66	0	0
Total	60	100	60	100

Comparison of the knowledge level of adolescent girls in pre-test and post-test- Knowledge-wise comparison of adolescent girls in pre-test reveals the following results. In the pre-test, out of 60 adolescent girls, the highest percentage, 71.67%, had poor knowledge, 26.67% had average knowledge, followed by the lowest percentage 1.66% of adolescent girls with very poor knowledge. None of the adolescent girls had excellent knowledge regarding moringa juice preparation and use.

Percentage-wise distribution of adolescent girls studying in B.V.V.S high school in post-test reveals that out of 60 adolescent girls, the highest post-test (66.67%) of adolescent girls had good knowledge (26.67%) had excellent knowledge, followed by a percentage (6.66%) of adolescent girls with average knowledge. None of the adolescent girls had excellent knowledge regarding the preparation and use of moringa juice (Table 3 & 4).

Table 3: Area-wise mean, SD and mean percentage of the knowledge score in pre-test and post-test

Knowledge area	Max. Score	Pre-test (1)		Post-test (2)		Effectiveness (2-1)	
		Mean±SD	Mean (%)	Mean±SD	Mean (%)	Mean±SD	Mean (%)
PART –A							
Sec-I (general questionnaires on anemia)	5	2.18±1.016	43.6	3.31±0.8	66.2	1.13±0.216	22.6
Sec-II (causes and risk factors of anemia)	8	3.07±1.191	38.37	5.8±1.2	72.5	2.73±0.009	34.2

Sec-III (signs and symptom of anemia)	3	1.03±0.822	34.33	2.2±0.8	73.33	1.17±0.022	39
Sec-IV (prevention of anemia)	2	0.75±0.75	37.5	1.5±0.6	75	0.75±0.15	37.5
PART-B							
Knowledge questionnaire on moringa leaves	18	5.95±2.10	33.05	13.43±1.82	74.61	7.48±0.28	41.56
Total	36	12.98±2.93	36.05	26.24±3.17	72.88	13.26±0.24	36.83

Table 4: Association between post-test knowledge scores and selected socio-demographic variables

Socio-demographic variables	Chi-square-value
Age	0.03
Caste	0.86
Type of family	5.63
No of family members	0.03
Residence	1.31
Father educational status	0.54
Father occupational status	1.65
Mother educational status	1.65
Mother occupational status	0.57
Monthly family income	1.75
Source of information	0.13
Have you drunk moringa juice	2.73

p-value=0.05; Df= 1; Table value= 1.96; p-value= non-significance

Association between post-test knowledge score of adolescent girls studying in B.V.V.S high school Bagalkot- A significant association was found between socio-demographic variables, including age, caste, no of family members, residence, father educational status, father occupational status, mother educational status, mother occupational status, monthly family income, source of information, have you drunk moringa juice except type of family.

DISCUSSION

We discussed that a similar study was conducted in Bangladesh, Indian Journal of Community Medicine, regarding knowledge of anemia among 68,813 adolescent girls with various demographic variables. The findings revealed that 60.8% of adolescent girls did not know anaemia and its signs and symptoms.[18] In our present study Regarding knowledge of moringa juice preparation 71% of adolescent girls with various demographic variables. The findings revealed that 71% of adolescent girls did not know anemia and its signs and symptoms. Chainisha Krosuru used a non-probability, convenient sampling technique to select the sample. The sample size for the present study is 100 adolescent girls who were studying 8th, 9th, and 10th classes.[19]

In this study, we have used a non-probability, convenient sampling technique to select the sample. The sample size for the present study is 100 adolescent girls, who were studying 8th, 9th, and 10th classes.[19] In the previous study, the socio-demographic variable was family income. Regarding Family Monthly Income majority 52 (52%) earn below Rs. 10,000 per month, 27 (27%) earn Rs. 10,001–Rs. 20,000 per month and 15 (15%) people earn Rs. 20,001–Rs. 30,000 per month, at least 06 (06%) earning Rs. 30,000 and above.[20] In our present study, the socio-demographic variable is family income. Regarding Family Monthly Income majority, 25% earn below Rs. 10,000 per month, 38% earn Rs. 10,001–Rs. 20,000 per month and 23% of people earns Rs. 20,001–Rs. 30,000 per month and at least 13% earn Rs. 30,000 and above.

The mean age of the intervention and control groups were 12.7±0.7 and 13.3±0.8 years, respectively. After adjusting for maternal education, absenteeism, asset index, and BMI-for-age Z-score, GLM regression showed significant positive changes in hemoglobin (intervention vs. control: coef = 0.41, *p*=0.01) and serum retinol (coef= 0.27, *p*=0.00). No significant differences in weight were observed between groups.[21] It was a randomized, double-blind, placebo-controlled study in anemic women

(hemoglobin 8-12 g/dL). The water extract of moringa leaves was examined as an add-on therapy in the subject treated with ferrous sulfate (200 mg/tablet). Thirty-five 16-49 years women were divided into 17 moringa leaves and 18 of control. The extract of moringa leaves of 1400 mg was formulated in capsules and was administrated daily for 3 weeks.[22]

This study used a pre-test and post-test design with a control group design. The study was conducted in Cibeureum Cimahi City, Province West Java, Indonesia. A total of 60 participants were recruited for the study. Thirty participants were divided into each group. The treatment group received additional blood-related pills and capsules of powdered moringa leaf, and the control group received other related tablets only. Statistical test using the Wilcoxon test.[23] It is quasi-experimental research with a randomized, controlled, Double-Blind design. The sample included 40 pregnant women divided into 20 in the intervention group and 20 in the control group. The intervention group was given moringa leaf extract capsule and Fe capsule daily. The control group was only given Fe-capsule.[24]

A study to assess the effectiveness of drumstick leaves soup on the level of haemoglobin among adolescent girls at a selected college, Coimbatore. Purposive sampling with 24 adolescent girls between the age group of 17–19 years was selected as a sample for this study. Data collection was collected through a structured questionnaire and checklist of clinical examination. The informational booklet was distributed to the samples. Haemoglobin was checked before and after the consumption of drumstick leaves soup. It was concluded that drumstick leaves soup helps improve haemoglobin and reduce adolescent girls' discomfort.[25] This quasi-experimental research with pre-test and post-test control group design involved young women aged 14-19 years suffering anemia. The method of sampling selection was purposive sampling, with 22 respondents assigned as the intervention group and 22 other respondents assigned as the intervention group. The data analysis used the Mann-Whitney test. [26]

CONCLUSIONS

The study helped find the effectiveness of moringa juice preparation for the prevention of anemia among adolescent's girls. Findings related to the knowledge preparation of moringa juice**.** In the pre-test, out of 60 adolescent girls, the highest percentage, 71.67%, had poor knowledge, 26.67% had average knowledge, followed by the lowest percentage 1.66%, of adolescent girls with very poor knowledge. None of the adolescent girls had excellent and good knowledge regarding the preparation and use of moringa juice. Percentage-wise distribution of adolescent girls in post-test reveals that out of 60 adolescent girls, the highest post-test (66.67%) of adolescent girls had good knowledge (26.67%) had excellent knowledge, followed by percentage (6.66%) of adolescent girls with average knowledge. None of the adolescent girls had excellent and good knowledge regarding the preparation and use of moringa juice.

In the future, researchers can investigate a similar study on the effectiveness of moringa juice in preventing anemia among adolescent girls.

CONTRIBUTION OF AUTHORS

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Research design- Jadhav Priyanka A, Dr Deelip S Nateker

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