AATCC Review

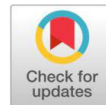**Research Article**   **Open Access**

Assessment of women's knowledge and perceptions on anaemia- an intervention with nutrition education

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ABSTRACT

Background: Anemia and iron deficiency adversely affect women of reproductive age and young children in middle and low-income countries. It is considered a major health problem worldwide. In India, the prevalence of anemia is very high, about 53% of women are suffering from anemia. The Government of India and other research institutes have been promoting nutrition education to increase knowledge and awareness of dietary habits and intake, health, and nutritional status among women. The present study aimed to determine the effectiveness of nutrition education on iron deficiency anemia among women of reproductive age.

Methods: An experimental (pre-posttest) research design was selected for the study. The respondents were categorized into experimental groups and control groups. A total of 300 women were selected from five villages. A structured questionnaire was used to collect the data and the data was analyzed using SPSS.

Results: The results revealed that the majority of the respondents were within the age group of 15–26 years, had a high school education, and had mild anemia. The study found that the nutritional education intervention had a significant increase in the scores of knowledge and perception levels of the respondents in the experimental group.

Keywords: Anemia, Nutrition education, Adolescence and women's health, Nutritional status, nutrition deficiencies, micronutrient deficiencies, health education, malnutrition and iron deficiency.

Introduction

Anemia is a serious global public health problem that particularly affects young children and pregnant women. World Health Organisation (WHO) estimates that 42% of children less than 5 years of age and 40% of pregnant women worldwide are suffering from anemia [23].. The African and Eastern Mediterranean regions and Southeast Asian countries carry a high burden of anemia among WRA. India is one of the countries with a very high prevalence of anemia in the world.

According to WHO estimates (2021), anemia affects 53% of women of reproductive age (15-49) in India. According to NHFS-5 data (2019-2021), 67.1% of the children (6-59 months), 57.2% of the non-pregnant women (15-49 years), 52.2% of pregnant women (15-49 years), 57.0% of all women (15-49 years), and 59.1% of all women age 15-19 years are suffering from anemia, while in Telangana state, 70% of the children (6-59 months), 57.8% of non-pregnant women (15-49 years), 53.2% of pregnant women (15-49 years), 57.6% of all women (15-49 years), and 64.7% of all women age 15-19 years are suffering from anemia [15].

Anemia is more common in women of reproductive age (WRA) with low socio-economic status, are underweight, or have recently given birth. Anemia is a condition in which the number of red blood cells or the hemoglobin concentration within them is lower than normal (WHO). This results in symptoms such as fatigue, weakness, dizziness, and shortness of breath. The optimal hemoglobin concentration needed to meet physiologic needs varies by age, sex, residence, smoking habits, and pregnancy status. The most common causes of anemia include nutritional deficiencies, particularly iron deficiency, folate, vitamins B12, and vitamin A deficiency. Anemia is associated with impaired cognitive and motor development in children, as well as reduced labor capacity in adults, all of which have an impact on a country's economic development. Anemia during pregnancy and the first two years of children has irreversible effects on infants' brain growth, which reduces their Intelligence Quotient (IQ) [6,17]. Anemia in adolescents, reduces concentration, academic performance, productivity, and physical strength, and increases the risk of infection. Anemia among pregnant women can result in poor maternal and fetal outcomes such as abortion, intrauterine growth retardation, post-partum hemorrhage, stillbirths, low birth weight, prematurity, and perinatal mortality [1,10,22]. Prevalence of iron deficiency anemia is high in low socio-economic groups [12].

Anemia has become a major challenge in India and has also had an impact on the country's economic development. Several studies show that nutrition education reduces the prevalence of certain diseases, including anemia, in many countries. Therefore, given the increase in anemia in the country, promoting and educating people about anemia through nutrition education interventions is essential.

Several studies reported that after a 3-month educational intervention program, there was an increase in the mean score of knowledge, attitude, perceived behavioral control, and intention, and also there was an increase in the iron intake in the experimental group [7]. After the educational intervention program the mean score of enabling factors, and predisposing factors decreased and also there was an increase in the iron intake among the participants from 68 to 95% 3 months after the intervention [24]. After intervention through the PRECEDE educational model, (Predisposing, Reinforcing, and Enabling Constructs in Educational Diagnosis and Evaluation) there was a significant increase in the mean scores of awareness and attitude levels in the intervention group [21].

Given the importance of prevention of iron deficiency anemia, the necessity of nutrition education for women of reproductive age, and the lack of knowledge about anemia among women, the present study aimed to determine the effectiveness of nutrition education on iron deficiency anemia among women of reproductive age.

Methodology

Research design and sample selection

An experimental (pre-posttest) research design was adopted for the study. The respondents were categorized into experimental groups and control groups. A total of 300 women who are in the reproductive age group (15-49) were selected from 5 adopted villages (Gungal, Subhanpur, Amdapur, Edira, and Kaslabad) of All India Coordinated Research Project on Women in Agriculture (AICRP-WIA), Rangareddy district. A sample of 250 respondents was classified as the experimental group and 50 respondents as the control group.

Instruments

A structured questionnaire was used for the study. It included profile characteristics, and anemia knowledge and perception.

Data collection

In the first discussion, the aim and procedures of the study were explained to the respondents of the selected villages, and the respondents were assured of voluntary participation, confidentiality of all provided data, and the right to withdraw at any moment. The respondents' hemoglobin levels (Hb) were tested with the help of a healthcare professional. The pretest questionnaire was administered and explained to all the respondents, and blood samples were collected from both groups. Anthropometric measurements of height, weight, and mid-upper arm circumference of all the respondents were taken to assess their Body Mass Index (BMI).

The nutrition education program was conducted with only the experimental group over 45 days. The intervention group and the control group were provided with the post-test questionnaires to assess the impact of the nutrition education programme on knowledge, and perception levels, but the control group did not undergo the educational program. The duration of this intervention was chosen based on previous research, which showed that intervention durations ranged from one week to three months [2,5].

Nutrition education program

The nutrition education program materials (videos) were developed based on the knowledge and perception gaps and needs that were identified from the pre-test. The videos were screened as a nutrition education program over 45 days, and each session lasted for approximately 20 min. The content of the nutrition program material was appropriate, updated, and simple information about anemia, symptoms, food sources, balanced diet, and nutritional values of food items that are related to anemia. The intervention was instructed in the local language (Telugu) and checked by the experts for content validity.

Data analysis

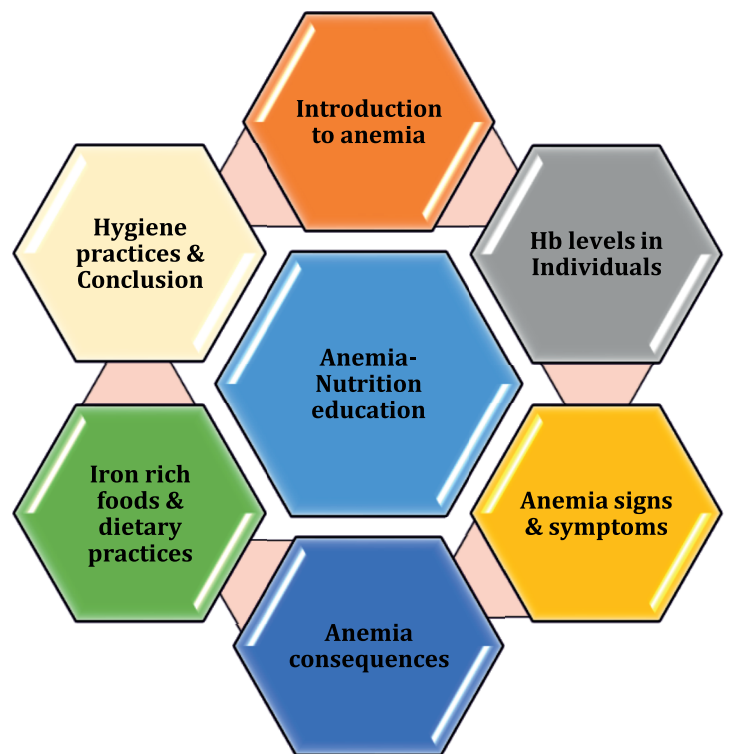Data analysis was performed using IBM SPSS Statistics for Windows, Version 16.0.

Fig.1 The content or themes presented in the Anemia-Nutrition education Program

Results

Table 1. Profile characteristics of the respondents

Variable	Frequency	Percent
Age		
15-26	183	61.00
26-37	58	19.33
37-49	59	19.67
Education		
Illiterate	39	13.00
Primary School	25	8.33
Middle School	29	9.67
High School	86	28.67
Intermediate/ Diploma	80	26.67
Graduation& Above	41	13.67
Marital status		

Married	188	62.67
Un married	112	37.33
Occupation		
Agriculture	84	28.00
Labour	69	23.00
Small business	3	1.00
Government Job	1	0.33
Housewife	96	32.00
Any other(students)	47	15.67

Table 1 presents the general profile of the respondents. Out of the total population, 61.00% of the respondents were within the age group of 15-26 years, 28.67% of the respondents had a high school education, 62.67% were married, and 32.00% of them were housewives.

Table 2. Distribution of respondents according to the BMI

BMI Parameters	BMI range	Frequency	Percentage
Underweight	below 18.5	78	26.00%
Normal	18.5-24.9	189	63.00%
Overweight	25-29.9	23	7.67%
Obese	30 and above	10	3.33%

Findings related to BMI levels indicated that according to the ICMR guidelines, the majority (63.00%) of the population had normal BMI levels, while 26.00% of the respondents were suffering from underweight, 7.76% were overweight and 3.33% were obese. A study reported that 70% were normal, 21.1% were underweight, 7.6% were overweight and 1.4% were obese [9]. According to the National Health Family Survey (NHFS)-5 report (2019-2021) in India, 21.2% of the women were underweight and 19.7% obese in rural areas, while in Telangana, 21.6% of the women were underweight and 23.8% of the women were obese [15]. Underweight can result in health issues like anemia, malnutrition, and osteoporosis, while being overweight or obese leads to chronic diseases such as type 2 diabetes, high blood pressure, heart or blood vessel problems, cardiovascular disease, and musculoskeletal problems. A study reported that pre-diabetic and diabetic participants had higher BMIs [16].

Table 3. Distribution of the respondents according to grade of anemia

Anemia indicator	Hemoglobin (g/dl)	Frequency	Percent
Normal/ Non-anemic	≥12	38	12.67%
Mild anemia	10.0-11.9	132	44.00%
Moderate anemia	7.0-9.9	123	41.00%
Severe anemia	Less than 7	7	2.33%

Findings related to the prevalence of anemia indicated that, according to the WHO guidelines, out of the total population, 87.33% of the respondents were suffering from anemia. Based upon the severity of anemia, 44.00% had mild anemia, 41.00% had moderate anemia and 2.33% had severe anemia. Meanwhile, 12.67% of the respondents were non-anemic. The possible reasons for these differences might be their consideration of different age groups, eating habits, and varied socio-economic status. Iron is an essential element for blood production. About 70% of the body's iron is found in the red blood cells of the blood called hemoglobin. Hemoglobin is essential for transferring oxygen in your blood from the lungs to the tissues. Insufficient levels of Hb in the blood result in anemia. A study reported that reported nutritional anemia and low BMI lead to serious health issues among women of the reproductive

age group. They also found that 58% of the respondents were anemic in their study [14].

Knowledge of the respondents anemia before and after intervention

Table 4 presents the knowledge of respondents with regard to anemia before and after intervention. The results demonstrated that before intervention in the experimental group, about 51.60% had heard about iron deficiency anemia, 44.80% of the respondents could recognize symptoms/signs of anemia, 31.20% knew health risks to children, 32.80% knew health risks to adolescents, 36.40% knew health risks to pregnant women, 26.40% could recognize causes of anemia, 29.60% knew anemia prevention methods, 39.20% could identify or knew sources of iron-rich foods, 14.40% were familiar with the foods that help the body absorb and use iron. Only 6% of the respondents knew the daily requirements of iron as a nutrient.

Meanwhile, in the control group, 42% had heard about iron deficiency anemia, 36% of the respondents could recognize symptoms/signs of anemia, 22% knew health risks to children, 28% knew health risks to adolescents, 38% knew health risks to pregnant women, 40% could recognize causes of anemia, 32% knew anemia prevention methods, 46% could identify or knew sources of iron-rich foods, and 18% were familiar with the foods that help the body absorb and use iron. Only 6% of the respondents knew the daily requirements for iron nutrients.

After the nutritional education intervention on anemia, there was an increase in knowledge levels in the experimental group, there was no significant change in the control group. The results demonstrated that after intervention in the experimental group, all the respondents (100%) had heard about iron deficiency anemia, 93.60% of the respondents could recognize symptoms/signs of anemia, 92.40% knew health risks to children, 82.40% knew health risks to adolescents, 83.20% knew health risks to pregnant women, 90.40% could recognize causes of anemia, 79.60% knew anemia prevention methods, 82.40% could identify or knew sources of iron-rich foods, 67.2% of the respondents knew the daily requirements of iron nutrient and 89.20% were familiar with the foods that help the body absorb and use iron.

Meanwhile, in the control group, 64% had heard about iron deficiency anemia, 36% of the respondents could recognize symptoms/signs of anemia, 22% knew health risks to children, 28% knew health risks to adolescents, 38% knew health risks to pregnant women, 40% could recognize causes of anemia, 32% knew anemia prevention methods, 46% could identify or knew sources of iron-rich foods, and 18% were familiar with the foods that help the body absorb and use iron. Only 6% of the respondents knew the daily requirements for iron nutrients.

Perceptions of the respondents on anemia before and after intervention

Table 5 presents the perceptions of the respondents concerning anemia before and after intervention. The results demonstrated that before intervention in the experimental group, 22% considered anemia as a serious health problem, 20.4% prepared iron-rich foods, 28% confident in preparing iron-rich foods, 39.6% liked the taste of iron-rich foods, 35.6% sought medical attention, 10.4% checked Hb levels regularly, 34.4% willing to take iron supplements, 46% washing hands with soap before consuming food, 54.8% used soap for hand washing after defecation and 68.4% trims their nails regularly.

Concerning the control group, 14% considered anemia as a

serious health problem, 22% prepared iron-rich foods, 32% were confident in preparing iron-rich foods, 54% liked the taste of iron-rich foods, 50% sought medical attention, 8% checked hb levels regularly, 40% willing to take iron supplements, 58% washing hands with soap before consuming food, and 50% used soap for hand washing after defecation and 64% trims their nails regularly.

After the nutritional education intervention on anemia, there was an increase in perception levels in the experimental group, however, there was no significant change in the control group. The results demonstrated that after intervention in the experimental group, 64.8% considered anemia as a serious health problem, 87.6% prepared iron-rich foods, 59.2% confident in preparing iron-rich foods, 50.8% liked the taste of iron-rich foods, 89.2% sought medical attention, 11.2% checked hb levels regularly, 74.8% willing to take iron supplements, 79.2% washing hands with soap before consuming food, 92.8% used soap for hand washing after defecation and 80.88% trims their nails regularly.

Concerning the control group, 14% considered anemia as a serious health problem, 226% prepared iron-rich foods, 32% were confident in preparing iron-rich foods, 54% liked the taste of iron-rich foods, 50% sought medical attention, 8% checked Hb levels regularly, 40% willing to take iron supplements, 60% washing hands with soap before consuming food, 50% used soap for hand washing after defecation and 64% trim their nails regularly.

Table 4. Knowledge on anemia- Before and after intervention

Statement	Before intervention				After intervention			
	Experimental group (n=250)		Control group (n=50)		Experimental group (n=250)		Control group (n=50)	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Heard about iron-deficiency anemia	129	51.60	21	42	250	100.00	32	64
Can recognize symptoms/signs of anemia	112	44.80	18	36	234	93.60	18	36
Knows the health risks to children	78	31.20	11	22	231	92.40	11	22
Knows health risks to adolescents	82	32.80	14	28	206	82.40	14	28
Knows health risks to pregnant women	91	36.40	19	38	208	83.20	19	38
Knows the causes of anemia	66	26.40	20	40	226	90.40	20	40
Knows how anemia can be prevented	74	29.60	16	32	199	79.60	16	32
Knows sources of iron-rich foods	98	39.20	23	46	206	82.40	23	46
knows the daily requirements of iron	15	6.00	3	6	168	67.2	3	6
Knows foods that help the body absorb and use iron	36	14.40	9	18	223	89.20	9	18

Table 5. Perception on anemia- Before and after intervention

Statement	Before intervention				After intervention			
	Experimental group (n=250)		Control group (n=50)		Experimental group (n=250)		Control group (n=50)	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Anemia is a serious health concern	55	22	7	14	162	64.8	7	14
Prepares meals with iron-rich foods	51	20.4	11	22	219	87.6	13	26
Confident about preparing meals with iron-rich food	70	28	16	32	148	59.2	16	32
Likes the taste of an iron-rich food item or meal	99	39.6	27	54	127	50.8	27	54
Seeks medical attention if suspects anemia	89	35.6	25	50	223	89.2	25	50
Checks Hb levels periodically	26	10.4	4	8	28	11.2	4	8
Willing to take iron tablets if prescribed for anemia	86	34.4	20	40	187	74.8	20	40
Washing hands with soap before consuming food	115	46	29	58	198	79.2	30	60
Washing hands with soap after defecation	137	54.8	25	50	232	92.8	25	50
Trims nails regularly (weekly)	171	68.4	32	64	202	80.8	32	64

Table 6. Percentage difference in anemia knowledge and perception variables in pre and post-situations

Statement	Knowledge (Experimental group n=250)			Perception (Experimental group n=250)		
	Pre scores	Post scores	difference	Pre scores	Post scores	difference
I	51.6	100	48.4	22	64.8	42.8
II	44.8	93.6	48.8	20.4	87.6	67.2
III	31.2	92.4	61.2	28	59.2	31.2
IV	32.8	82.4	49.6	39.6	50.8	11.2
V	36.4	83.2	46.8	35.6	89.2	53.6
VI	26.4	90.4	64	10.4	11.2	0.8
VII	29.6	79.6	50	34.4	74.8	40.4
VIII	39.2	82.4	43.2	46	79.2	33.2
IX	6	67.2	61.2	54.8	92.8	38
X	14.4	89.2	74.8	68.4	80.8	12.4
Overall difference (mean)			54.8			33.08

Table 6 presents the percentage difference in anemia knowledge and perception variables in pre and post-situations. The results revealed that, an overall difference of 54.8% was found in knowledge after the nutrition education intervention, while in perception, there was 33.08% of overall difference was found. This could be concluded that nutrition education video intervention contributed to increase the scores of difference in knowledge and perceptual levels in the posttest. The findings clearly reveal that the nutrition education intervention had a positive impact on respondents' knowledge and practice levels. Several research indicated that after intervention there was a significant improvement in the mean scores of knowledge, food selection ability, compliance rate, andhemoglobin level for the intervention group than for the control group [4]. Nutrition education initiatives have a good impact on improving nutritional health [11].

Discussion

The current study examined the impact of anemia nutrition education on women's knowledge and perceptions. To assess the women's knowledge and perceptions regarding anemia, respondents were interviewed on anemia signs & symptoms, causes, prevention, treatment, complications, dietary behavior, hygiene and additional information about anemia. The study found that most of the respondents belonged to a young age group, had normal BMI levels, and had mild anemia. Most of the respondents had never heard of anemia, while some of the respondents identified it as a shortage of blood levels. Before the nutrition education intervention, they could not identify the signs, symptoms, and causes of anemia. Further, they were not aware of the signs, symptoms, causes, and consequences caused by anemia. Deep discussions with respondents revealed that, some of the respondents described weakness and paleness as being caused by anemia. The most common symptoms of anemia are several micronutrient deficiencies, blood loss, and hookworms [3].

Further, the respondents were not aware of the iron-rich foods, which some of the respondents identified as jaggery, sesame seeds, meat, and some green leafy vegetables. These foods were consumed fortnightly. The study also identified that they did not know foods that absorb iron and daily requirements of iron. Pretest study results indicated that there was a substantial lack of knowledge about anemia among the women in the reproductive age group. Lack of knowledge can be a risk factor for undernutrition [19]. The study results were similar to previous studies in which the respondents had low knowledge levels about anemia before the nutrition education interventions.

Based on the pre-test results, the intervention program was planned and executed for the experimental group. A nutrition education program is the type of intervention that aims to bring about change in the behavior of individuals. It is essential to create awareness and to disseminate knowledge related to lifestyle diseases. After the intervention, the results revealed that there was a significant improvement in the mean score of knowledge and perceptions regarding anemia in the experimental group, while there was no improvement in the control group. It is important to note that nutrition education has improved not only the knowledge levels of the respondents but also their dietary and hygiene practices. The findings explain that nutrition education intervention programs are effective at improving the behavior of individuals. Several studies indicated that achieving the desired changes in behavior in health and nutrition depends on gaining sufficient knowledge, attitudes, good practice, and self-efficacy [20]. Health education has been demonstrated to be very effective and has resulted in a considerable improvement in hemoglobin levels and nutrition knowledge [8]. Nutrition knowledge is essential for individuals to acquire a lifestyle that is healthy and free from disease [13,18]. Hence, there is a need for health care providers and other concerned departments to provide not only iron-folic acid supplements but also nutrition education and counseling to women in the reproductive age group.

Conclusion

Nutritional education interventions have been widely used for reinforcing knowledge about food habits or healthy lifestyles and are considered a useful strategy for preventing non-transmissible chronic diseases at early ages. In the present study, the nutrition education intervention program encouraged participants to consume more green leafy vegetables, millet, fruits, and other sources of iron and vitamin C. The study shows that nutrition education intervention had a significant increase in the knowledge and perception levels of women about iron deficiency anemia in the intervention group. The study also suggests that a combination of strategies such as nutrition education and supplementation would be effective, to increase nutrient intake and Hb levels in the participants. Hence, the results of the study suggest that to improve health status, particularly in the prevention of iron deficiency anemia,

nutrition educational intervention programs should be implemented using appropriate models of health education along with the active participation of girls and mothers in the education process in schools.

Conlict of interest
All the authors declare that they have no conlicts of interest.

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