

EFFECTIVENESS OF DIETARY GUIDANCE WITH STAPLE FOOD ON HAEMOGLOBIN AMONG ANAEMIC ELDERLY PEOPLE IN A RURAL COMMUNITY, SOUTH INDIA

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Abstract

Background: Anaemia is a common preventable nutritional problem at all ages and has a critically negative effect on a person's health. Anaemia among elderly is frequently ignored, which can potentially cause cardiovascular complications. Elderly people who are iron deficient are twice as likely to have physical decline as other people their age. The senior population in the society regardless of urban or rural require monitoring and prevention of anaemia. Iron and vitamin-c in diet is necessary for many biological processes. **Objectives:** 1. To assess and compare the hemoglobin level among the participants before and after the intervention. 2. To find the association between the post-test hemoglobin level and selected demographic variables (Age, Sex and Teeth issues) of the participants. **Materials and Methods:** A Quasi experimental research design using one group pre-test and post-test was used. The researcher selected 40 samples of elderly peoples with low hemoglobin level by using purposive sampling technique. Demographic, clinical variables and hemoglobin (Hb) were assessed during pretest. Dietary guidance was given on iron and vitamin c rich diet for daily intake. After 30 days posttest hemoglobin assessed. **Result:** The findings revealed that, the pre-test mean hemoglobin was 9.77 ± 1.20 and post-test was 12.70 ± 2.09 . ($t = 14.0$, $p < 0.001$). Therefore, the dietary guidance was effective in improving hemoglobin level.

Keywords: Effectiveness, Dietary Guidance with Iron and Vitamin-C, Hemoglobin, Elderly People.

1. INTRODUCTION

Anaemia is attributed to iron deficiency. Elderly people frequently have anaemia, which contributes to their low survival rates. Micronutrient deficiencies among elderly are common yet preventable (Watson, 2018). Causes of anaemia in the elderly are divided into three broad groups: nutritional deficiency, anaemia of chronic disease and unexplained anaemia (Stauder R, 2014). The effects of aging and micronutrient deficiencies in the older persons result in various morbidity (Crogan, 2017). Depressive symptoms were significantly higher in men and women across England with low iron status - low haemoglobin (Stewart, 2012). In NHANES-III study with more than 5000 participants, it was found that the prevalence of anaemia increases with age after age 50 (Monlezun, 2015). World Health Organization estimates that 50% of anaemia globally are caused by iron deficiency.

Hemoglobin levels have often been shown to be lower in elderly individuals than in younger individuals. Although the causes of the same are unclear, it is believed that they are a normal part of ageing. This interferes with both functional and cognitive functions, which has an effect on the patient's quality of life. The nutrition deficiency anaemia can be prevented with dietary guidance. In elderly biting, digestion, and absorbing nutrients may an issue. There are mainly two types of dietary iron namely

heme and nonheme. Vegetarian foods are good source of nonheme iron and non-vegetarian foods are good sources of heme. Vitamin C is one of the enhances has the ability to convert the ferric iron into ferrous iron and binds it in soluble complexes that can be easily absorbed by the body (Abbaspour., et al, 2014)

Iron supplements in the form of food or medication will be better absorbed in the presence of vitamin C. So, along with iron, vitamin C is also needed for better therapeutic effect to prevent or treat anaemia. Therefore, in this study it was planned to give iron and vitamin C rich diet for elderly to treat anaemia among them.

2. METHODS AND MATERIALS

The research approach in the study was evaluative and quantitative. The objectives of the study were

- 1) To assess and compare the haemoglobin level among the participants before and after the intervention.
- 2) To find the association between the post-test haemoglobin level and selected demographic variables (Age, Sex &Teeth issues) of the participants.

There were two Hypotheses formulated,

H₁ - There is significant relationship between the mean post-test haemoglobin among the participants before and after the intervention.

H₂ - There is significant association between the levels of post-test haemoglobin with selected demographic variables of the participants.

Using quantitative research approach, Quasi experimental - one group pre-test and post-test research design is used to conduct this study. The setting was at Mappedu village, Thiruvallur district, Tamil Nadu, India. The village is 19 km away from Saveetha College of nursing. Mappedu village consists of 15 streets and the total population is 36217, in which 17398 of them were males and 18819 of them were females. Most of the people are agriculture related daily wage workers, tailors and shop keepers/workers.

Population and sample: All the elderly with low haemoglobin level were the population. Inclusion criteria were elderly people who are between 60 - 80 years, both genders and those who had low haemoglobin level. In exclusion criteria were, those who are bedridden, those who had eating and swallowing problems and those who have visual and auditory problems. The samples were selected by using purposive sampling technique and the sample size of the study comprises of 40 participants.

Tools and techniques:

- 1) Demographic variables namely age, sex, educational status, occupational status and type of family were collected by interview.
- 2) Clinical parameters namely BMI – calculated based on participants height in kilogram and weight in meter square, Haemoglobin- estimated by researcher using calibrated Hemometer, teeth issues by direct visualization and interview, Specific issues with digestion is by interview.
- 3) Format to record the haemoglobin during pre and post-test. These three tools were validated by 5 nursing experts.

Intervention: Dietary guidance for iron and vitamin C rich diet for elderly was the intervention. It consists of daily serving based guidelines on iron and vitamin C rich diet for both vegetarian and non-vegetarian. It was prepared in English and in the regional language Tamil as a hand-out.

Iron and Vitamin C requirements (>60 years) for elderly

Iron – male – 19mg and female – 19mg

Vit C – male – 80mg and Female – 65mg

Days	Food	Iron (mg)	Vitamin C (mg)	Quantity
Day 1	Bajra drumstick leaves adai (kambu) with mint chutney	20	83	2 (50g each) ½ cup (100g)
Day 2	Soybean & sesame seeds laddoo * with Orange fruit	19	85	3no (25g each) 1no (200g)
Day 3	Chicken liver poriyal ** with Guava fruit	20	214	1 cup (200g) ½ cup (100g)
Day 4	Puffed rice sundal *** with Papaya fruit	20	98	1 cup (200g) 1 cup (200g)
Day 5	Ragi dosa with Horse gram chutneyPineapple fruit	19	99	2 (50g each) ½ cup (100g) 1 cup (200g)
Day 6	Rice flakes upma (Aval) with Mint Chutney Guava fruit	24	255	1 cup (200g) ½ cup (100g) ½ cup (100g)
Day 7	Rajmah sundal Gooseberry juice	19	259	1 cup (200g) ½ cup (100g)
Day 8	Bengal gram mixed sundal with dry peas Tomato soup	19	82	1 cup (200g) 1 cup (200ml)
Day 9	Sprouted green gram tikki withOnion chutney	19	104	4no (25g each) ½ cup (100g)
Day 10	Soybean cutlet Orange juice	22	85	4no (25g each)
Day 11	Goat spleen poriyalSweet lime juice	27	95	¼ cup (50g) 1 cup (200g)
Day 12	Cow pea (karamani) and soybean poriyal	19	142	1 cup (200g)
Day 13	Garden cress seeds laddoo (Halim seeds) Mint lime juice	22	85	3no (25g each) 100ml
Day 14	Corn and drumstick leaves soup (pulicha keerai)	20	80	1 cup (200 ml)
Day 15	Goat spleen gravy Capsicum poriyal	26	81	¼ cup (50g)

Source: (Longvah T et al, IFCT, NIN, ICMR, India, 2017)

*Ball like, ** Vegetable seasoned and cooked, *** Pulses cooked and seasoned

The participants have to record the daily intake of the iron and vitamin C rich diet in their diary daily for 30 days. They can record after eating the guided serving and record themselves or with a help of a family member.

Data collection procedure: Ethical approval received from college and permission to conduct the study at setting was obtained from village head. After the informed written consent, purposive sampling technique was adopted to select 40 elderly people who had low hemoglobin level. Demographic, clinical variables and hemoglobin were

assessed during pre-test. For each participant it took about 20-25 minutes time for pre-test. Dietary guidance was given on iron and vitamin C rich diet for daily intake. It consists of hand-out on daily servings of iron and vitamin rich diet with 15 different servings from vegetarian and non-vegetarian diet. The participants were educated and guided to take one serving each from iron and vitamin C rich on daily basis. They were asked to record in a format like dairy about their intake of iron and vitamin C rich diet or 30 days, either by them or with the help of family members. Followed by their doubts were clarified. After 30 days (On 31st day) post-test hemoglobin assessed. Privacy followed during data collection and confidentiality for data maintained.

3. RESULTS

The data was analysed using inferential and descriptive statistics and presented in the following three section namely demographic.

Section 1: Demographic variables and clinical parameters of the elderly.

The participants detail as per demographic details are presented in the following table 1.

Table 1: Frequency and percentage of demographic and clinical variables of the participants.

n = 40

Sl.no.	Demographic Variables	Frequency	Percentage
1. Age in years	60 – 65	18	45.0
	65 – 70	10	25.0
	70 – 75	09	22.5
	75 – 80	03	07.5
2. Sex	Male	11	27.5
	Female	29	72.5
3. Educational status	No formal education	03	07.5
	Primary Education	04	10.0
	Secondary school	25	62.5
	Graduate and above	08	20.0
4. Occupation	Working	04	10.0
	Retired	30	75.0
	House wife	06	15.0
5. Type of family	Nuclear family	29	72.5
	Joint family	11	27.5
Clinical parameters			
1. BMI	Underweight (Below 19.5)	02	05.0
	Normal (18.5 – 24.9)	30	75.0
	Overweight (25.0 – 29.0)	04	10.0
	Obesity (30 & Above)	04	10.0
2. Teeth Issues	Biting	28	70.0
	Chewing	12	30.0
3. Any issues with specific digestion	Green leaves	02	05.0
	Meat	07	17.5
	Pulses	03	07.5
	Fried items	12	40.0

The table 1 shows that most of the elderly, 18(45%) were aged between 60 – 65 years, 29(72.5%) were male, 29(72.5%) belonged to nuclear family, 28(70%) had biting issues related to teeth and 16(40%) had digestion problem with fried items.

Percentage distribution of elderly with anaemia according to the age is presented in figure 1.

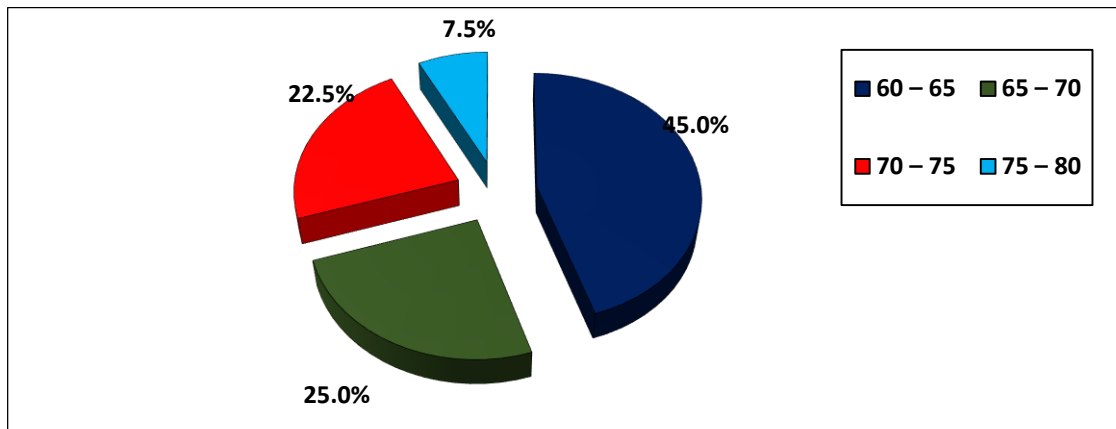


Fig 1: Percentage distribution of elderly with anaemia according to age in years

Section 2: Assessment of level of hemoglobin among elderly.

The anaemia status among the participants were assessed based on their hemoglobin level and is presented as follows in table 2.

Table 2: Level of anaemia among the elderly in the pre-test and post-test

n= 40

Sl.no.	Level of anaemia based on Hemoglobin	Pretest		Post Test	
		F	%	F	%
1	Normal (12 – 16 g/dL)	-	-	19	47.5
2	Mild anaemia (10 – 12 g/dL)	18	45.0	20	50.0
3	Moderate anaemia (8 – 10 g/dL)	16	40.0	01	02.5
4	Severe anaemia (<8 g/dL)	06	15.0	-	-

The table 2 shows that in the pre-test 18(45%) had mild anaemia, 16(40%) had moderate anaemia and 6(15%) had severe anaemia. In the post test, 19(47.5%) were normal-not anaemic, 20(50%) had mild anaemia and 1(2.5%) had moderate anaemia.

Section 3: Mean hemoglobin level among the elderly

The mean hemoglobin of the participants was presented in the following figure 2.

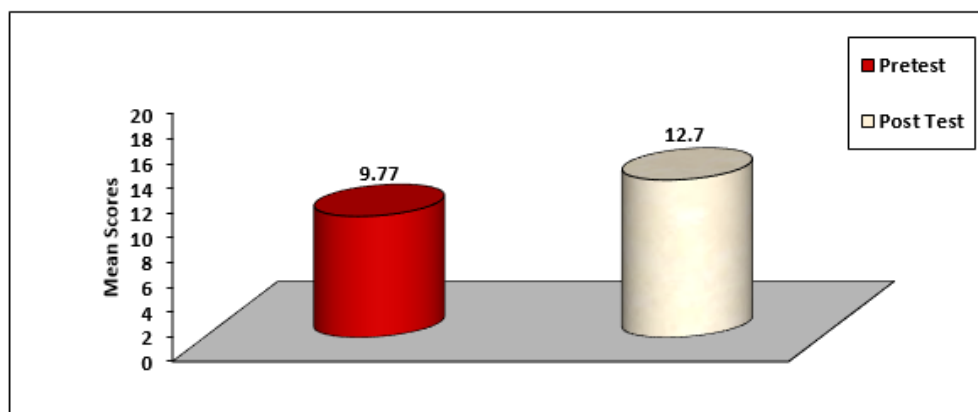


Fig 2: Mean pre-test and mean post-test hemoglobin among the elderly

Mean pre-test, mean post-test of hemoglobin among elderly people and t test were presented in the following table 3.

Table 3: Mean hemoglobin in the pre-test and post-test

n = 40

Test	Hemoglobin		Mean Difference Score	Paired 't' test & p-value
	Mean	S.D		
Pre-test	09.77	1.20	2.93	t = 14.0 p = 0.0001, S***
Post-test	12.70	2.09		

The table 3 depicts that the pre-test mean score of hemoglobin was 9.77 ± 1.20 and post-test mean score was 12.70 ± 2.09 . The mean difference score was 2.93. The calculated paired t test value of $t = 14.0$ was statistically significant at $p < 0.001$ level. This clearly shows that dietary guidance on iron and vitamin rich diet administered among elderly with low hemoglobin is found to be effective in improving the level of hemoglobin among them.

H₁ that stated earlier “There is significant relationship between the mean pre-test and mean post-test hemoglobin among the participants”

Since the ‘t’ test result so statistically significant the H₁ is accepted

Section 4: Association between the levels of hemoglobin with selected demographic variables among elderly.

The details of association are estimated using Chi-square and presented in the following table 4.

Table 4: Association of post-test level hemoglobin with selected demographic variables among elderly

n = 40

S.No	Demographic Variables	Normal		Mild		Moderate		Chi-Square Test
		F	%	F	%	F	%	
1	Age in years							$\chi^2 = 1.737$ df = 6 p = 0.942 N.S
	60 – 65	9	22.5	8	20.0	1	2.5	
	65 – 70	5	12.5	5	12.5	0	0	
	70 – 75	4	10.0	5	12.5	0	0	
	75 – 80	1	2.5	2	5.0	0	0	
2.	Sex							$\chi^2 = 0.601$ d.f = 2 p=0.741 N.S
	Male	13	32.5	15	37.5	1	2.5	
	Female	6	15.0	5	12.5	0	0	
3	Teeth Issues							$\chi^2 = 1.090$ df = 2 p = 0.580 N.S
	Biting	12	30.0	15	37.5	1	2.5	
	Chewing	7	17.5	5	12.5	0	0	

*N.S – Not Significant

The table 4 shows association. Regarding age in years majority of them (18) were aged between 60 – 65 years, the chi-square value is $\chi^2 = 1.73$, df = 6, p = 0.942, it is not significant. Regarding sex, 29 of them were females, 11 of them were males. The chi-square value is $\chi^2 = 0.601$, df = 2, p = 0.741, it is not significant. Regarding the teeth issues, 28 were having biting issues and 12 having chewing issues, the Chi-square value is $\chi^2 = 1.090$, df = 2, p = 0.580, it is not significant

The hypothesis H₂ that stated earlier “There is significant association between the levels of pre-test hemoglobin with selected demographic variables (age, sex, teeth issues) of the participants”. Since, the selected demographic variables of the participants had not shown statistically significant association with post-test level of hemoglobin, the H₂ was not accepted.

4. DISCUSSION

Objective 1: Assess and compare the hemoglobin among the participants.

In this study, pre-test mean score of hemoglobin was 9.77±1.20 and post-test mean score was 12.70±2.09. The mean difference score was 2.93. The calculated paired t test value $t = 14.0$ was statistically significant at $p < 0.001$ level. Deeraj Sharma., et al 2019 conducted the observational study among 105 elder patients aged above 60 the mean value of hemoglobin was 8.8 ± 2.3 g/dl with a range of 3.9–13 g/dl. Older age group of 80 years and above had lower mean hemoglobin (7.5 g/dl). The mean Hb level was 10.9 ± 1.9 g/dL among males and 9.9 ± 1.5 g/dL among females, and 92.1% of the elderly subjects were anemic (Gupta, 2020). Earlier studies conducted in plain regions of Puducherry was 96% by Sudarshan BP, 2016. In Haryana 88.7% was reported by Kaur M, in Karnataka 68.5% reported by Shrivastava SR, 2013, in Kerala 76% as per Renjini B, 2019 and in Andhra Pradesh 20.6% by Vadakattu SS, 2019 have reported high prevalence of anaemia among elderly population based on Hb estimation.

Objective 2: Association between the post-test Hb level and selected demographic variables

In this study, regarding age most of them (18) were aged between 60 – 65 years. The chi-square value is $\chi^2=1.73$, d.f = 6, $p=0.942$. The Hb is not significant with age. Shiho et al in 2021 conducted a cross sectional study among 156 elderly patients aged >65 years, age was significantly associated with recognition of anaemia (adjusted OR = 0.70, 95% CI, $p=0.011$). Regarding sex 11 were male and 29 were female, the chi-square value is $\chi^2=0.601$, d.f=2, $p=0.741$. Hb is not significant with sex. Raisinghani N et al in 2019 conducted a study among 90 patients, their mean Hb in males was 6.44 ± 1.68 gm% and females was 6.28 ± 1.98 gm%. The mean Hb in the mentioned age categories were observed as follows: 60–64 years - 5.95 gm%, 65–69 years - 6.7 gm%, 70–74 years - 6.58 gm%, and 75–79 years - 6.87 gm%. There was no significant difference in the mean Hb levels with the increasing age ($p = 0.33$). Regarding teeth issues 28 were biting issues and 12 were chewing issues the chi-square value is $\chi^2=1.090$. d.f=2, $p=0.580$. It is not significant. Saleedaeng. P, et al 2023 conducted quasi experimental study the total 268 older adults, there were 26 older adults (9.7%) with dysphagia. The relationship of dysphagia and under nutrition status was analysed by odds ratio. It was revealed that older adults with dysphagia were 4.8 times more likely to experience under-nutrition than those without dysphagia (95% CI = 1.75-13.13, $P = .002$)

The proportion of anaemic individuals did not differ between men and women. This is because menstrual blood loss ceases in older women, making the risk of anaemia equal for both genders (Guralnik JM, 2004). Among all factors examined, only age remained significantly associated with anaemia (Corona LP., 2014). The number of natural teeth is negatively associated with anaemia in Korean adults, and the number

of natural teeth may be considered an independent risk indicator of anaemia. Kyungdo Han, 2018.

5. LIMITATIONS

The sample size was small and non-random sampling technique used therefore the finding is limited to this sample only, cannot be generalized. The period of post- test was 30 days, could have had 90 days for new red blood cell production.

6. CONCLUSION

The analysis revealed that haemoglobin level among the elderly improved significantly after the administration of dietary guidance on iron and vitamin-c rich diet. Thus dietary guidance on iron and Vitamin c rich diet was effective among the elderly to improve haemoglobin level and treated anaemia. It can also be used to prevent iron deficiency anaemia among the elderly.

Novelty

Inclusion of vitamin C along with Iron rich diet was used in this study to treat anaemia by improving haemoglobin. Dietary sources of both vegetarian and non-vegetarian were included in the form of staple food for the participants.

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Conflict of interest – Nil

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