ISSN 2515-8260 Volume 09, Issue 8, 2022

Nutritional Assessment of Anemic Individuals and Its Causative factors: An Outcome based Study

Heena Marwah[1], Mayuri Rastogi*[2]
[1]Research Scholar, School of Allied Health Science, Sharda University, Greater Noida, INDIA.
[2*]Assistant Professor, School of Allied Health Science, Sharda University, Greater Noida, INDIA. Mayuri.rastogi@sharda.ac.in

Abstract

Anemia, the condition of high prevalence is divided into various types-based on lack of nutritional deficiencies like Iron, Vitamin B12 (cobalamin), Folic acid, protein deficiency etc., on the basis of genetic disorders like sickle cell anemia and thalassemia, on the basis of morphology of hemoglobin which includes color and size of the hemoglobin such as microcytic, normocytic or macrocytic having small size, normal size and large size respectively and hypochrome characterized by light color of RBC than the normal one. This is not the only classification of anemia but it is also divided on the basis of various other factors like on the basis of etiology, clinical signs and symptoms, on the basis of severity of any inflammation and the impaired production of RBC because of the defect in bone marrow, also known as aplastic anemia.

Determinants which cause the different types of anemia includes political economy of any country or area, it's climate and geographical factors which decide the cultural pattern, educational and economical status of the population of the area to be studied. Other parameters causing anemia includes the vulnerability of the population prone to any disease like women and children in case of iron deficiency anemia which itself is the result of short birth spacing between two children and early onset of pregnancy. Other factors include the inadequate nutrition intake due to poverty or unavailability of proper diets, vulnerability to disease and infections due to which either the erythrocytes production is decreased or the loss of erythrocyte is increased.

Thus, the purpose of this study is to conduct a research on 150 anemic patients admitted in general ward of Sharda Hospital, Greater Noida to determine the nutritional status of the admitted patients and to find the exact cause/causes which are responsible for them to cause

anemia. However, numbers determined that anemia is multifactorial condition which is caused by many factors in a person which is reflected by their medical parameters and living conditions.

Keywords-Microcyte, Normocyte, Macrocyte, Hypochrome, Aplastic anemia, Multifactorial

Introduction

A. Anemia

Anemia is determined by the condition in which the red blood cell (RBC) is less than the required amount in the human body resulting in adverse health issues (WHO data 2020). It's known to have the giant impact on worldwide population irrespective of gender. As per the clinical definition of anemia given by World Health Organization (WHO) if the Hemoglobin (Hb) in women is less than 12g/dL (≤ 7.45 mmol/L) and in men less than 13g/dL (≤ 8.7 mmol/L) is considered to be anemic (WHO data 2020), (Cappellini and Motta 2018).Data suggests that globally, anemia has affected 1.62 billion people, which makes 24% of the world's population (Paramastri*et al.,* 2015).Through the analysis of Cohort survey data taken from National Health and Nutrition Examination Survey (NHANES) which was collected from 2003 to 2012 in United States it was exclaimed that 5.6% was found to be the overall prevalence of anemia and 1.5% for moderate and severe anemia (Le *et al.,* 2016). In 2006 and 2008, a repeated cross sectional study was carried out in rural Deqing China on 4456 and 2184 subjects in respective years among adults (18-64 years) acknowledged the prevalence rates of anemia was 51.5% in 2006 and 53.7% in 2008 with women having higher prevalence rate than men in both the studies (Wang *et al.,* 2015). In Government Girls' School of Delhi in October 2019, a cross sectional study was conducted among adolescent girls aged 10-19 years demonstrated the total prevalence rate of anemia to be 59% out of 203 girls out of which 48% of girls had mild level of anemia (Kamble*et al.*, 2021). A similar cross sectional study was conducted in Uttarakhand on 5776 beneficiaries of a camp organized by AIIMS Rishikesh, stated that 53.2% was the total prevalence rate out of which females has more prevalence rates than males (Kishore *et al.,* 2020). To examine the effect of gender norms of anemia a study was conducted on 124 subjects from rural India in 2015 to 2016 which states that the prevalence of iron deficiency anemia is more in women (50%) than men (23%) (Sedlendar*et al,* 2021).

Iron deficiency anemia being the most prevalent nutritional disorder, having health impacts on people from every age group in both developed and developing countries. The major cause for

iron deficiency anemia is due to low or inadequate intake of dietary iron which does not meet the daily requirement of the person. Although, diet is not the only factor which affects the low iron stores in body, other life style factors such as alcohol consumption, smoking, lack of physical activities, socioeconomic status, sleep pattern as well as their Body Mass Index (BMI) plays a significant role in determining the hemogram profile of a person. To support the relationship between nutritional deficiency, poor lifestyle conditions and anemia a cross sectional study was carried out on 2347 Korean adults which shows positive association of lifestyle and dietary factors as it leads to iron overload and abnormal iron metabolism in body which leads to disrupted hemoglobin levels (Kim *et al,* 2016). To study the impact of poor quality of sleep on low levels of hemoglobin a study was conducted on 6465 persons (2916 – males and 3549 – females) the results stated that disturbed sleep leads to increased levels of CRP which results in low hemoglobin levels (Jackowska et al,2012). Iron overload is found to be increased by 61% of heavy drinkers of age 49-79 years (> 30 g/d alcohol) when compared to non-drinkers, causing anemia in them (Kim et al, 2016). People who were having less fruit intake and underweight people are more vulnerable to anemia (Khan *et al,* 2018). In 2009 in China Health and National Survey, serum ferritin levels of 7672 adults of age 18-65 years was 42.7 ng/mL (SD: 3.1 ng/mL) for women and 135.9 ng/mL (SD: 2.7 ng/mL) for men. The potential risk factors for these values were categorized into dietary, non-dietary and biochemical variables (Hu *et al.*,2017).

However, the study to assess the nutritional status of local anemic patients who are living in the close range of Sharda Hospital, Greater Noida has not been done yet. Therefore, our vision is to explore the nutritional status, dietary habits and medical conditions of anemic patients and to find the association between causative factors and anemia.

Material and Methods

A. Data Source and Study Participants

The study used the data collected from OPD patients from Sharda Hospital, Greater Noida who were admitted to the hospital between February, 2021 to March, 2021 due to different reasons and health issues. Subjects who visited to the department were screened as per the criteria. An interview was conducted for the patients with low hemoglobin levels to fill the self-made questionnaire to collect the information for their sociodemographic data, their lifestyle and living conditions, physical activity levels, medical history, dietary habits via 24 hour dietary recall and

a food frequency questionnaire with their full consent with the collection of their recent blood reports which had the data for all of their medial issues and their hemoglobin levels with ferritin levels. All the subjects from Sharda Hospital were asked to sign the consent form after the interview for sharing the information for the research purpose, without revealing their personal identity. A total of 150 adult subjects aged 18 to 60 years participated in the study out of which 99 (66%) subjects were females and 51 (34%) were males. Analysis was approved by Institutional Ethics Committee (ICE) of School of Medical Science and Research, Sharda University.

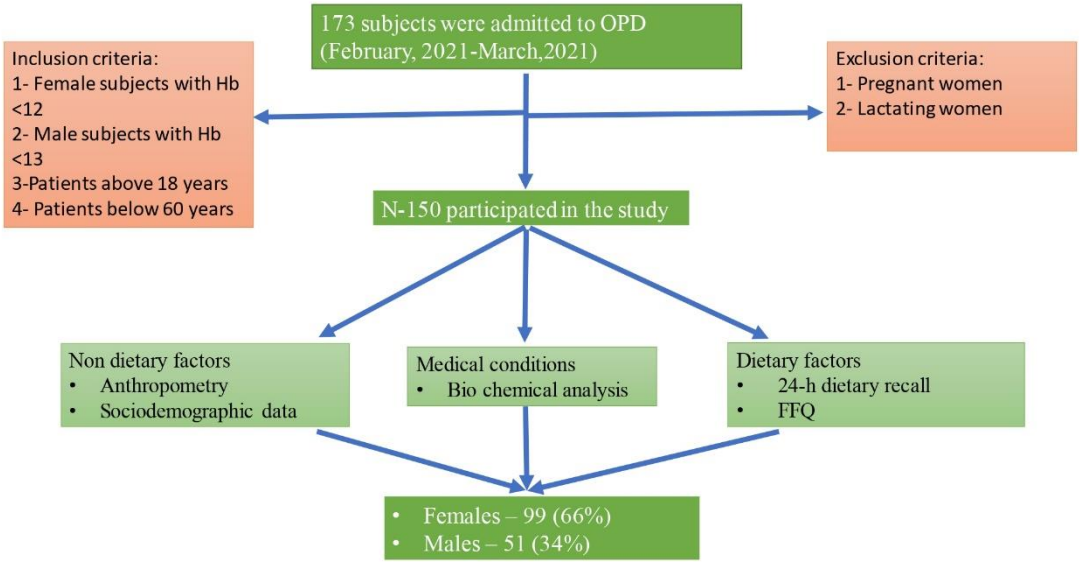

Fig. 1: Flow Chart of Study Participants

1) Non-dietary Parameters

1.1 Anthropometry Data

Anthropometric data for individual subject was retrieved. Variables of anthropometric data were body weight (in kgs) and height (in Centi meters). Body Mass Index (BMI) was calculated using weight (in kgs)/ height (in m^2) was calculated. Subjects were categorized into 3 classes of underweight (BMI < 18.5 kg/ m^2), normal weight (18.5 kg/ m^2 to 24 kg/m^2), overweight (24 kg/ m^2 to 27 kg/m^2) and obese ($\geq$ 27 kg/ m^2) depending on the status of their BMI.

1.2 Sociodemographic Data

Detailed interview was conducted using a detailed questionnaire to study and analyze the sociodemographic background of patients including their total annual income, marital status, family type (nuclear or joint) and the level of their education. To monitor the current lifestyle and routine of patient several open-ended questions were asked about their sleep patterns, quality of sleep, their physical activity levels, energy levels, tobacco intake, smoking and alcohol intake.

2) Medical Background

2.1 Biochemical Analysis

Reports which were collected from the patients during the interview had given their blood samples for testing in Sharda University. To check the presence of anemia, reports for Hemoglobin, ferritin and Vitamin B12 were collected. Subjects were distinguished and categorized for anemia, Hb < 11.6 g/dL for women and Hb < 13.2 g/dL for men. Normal serum ferritin levels for women are 12 ng/dL to 150 ng/dL and for men are 12 ng/dL t0 300 ng/dL as per the reference range given in reports collected. Ferritin levels >200 ng/mL in women and >300 ng/mL can determine the iron overload in body. Serum B12 levels for both the genders are taken into consideration to check the significant relationship between dietary, non-dietary and medical aspects and anemia whether corelated with B12 or not.

Several other reports were collected from the patients who were having other medical conditions. To check the diabetic status of anemic subject fasting (70-100 mg/dL) and post prandial (100-140 mg/dL) blood glucose were analyzed. To determine hypothyroid and hyperthyroid, T3 (0.9-2.8 nmol/L), T4 (5-12 mcg/dL) and TSH (0.5-5 mLu/L) levels were checked, data for elevated lipid profile was monitored using total cholesterol (>200 mg/dL), triglyceride levels (>150 mg/dL), HDL (<40 mg/dL) and LDL (100-129 mg/dL). Kidney issues were also taken for those who were having disrupted levels of urea (6-24 mg/dL) and creatinine (0.74-1.35 mg/dL). Serum Glutamic-oxalacetic transaminase (SGOT)/Aspartate transaminase (AST) (5-40 U/L) and glutamic-pyruvic transaminase (SGPT)/ Alanine aminotransferase (ALT) (7-56 U/L) were analyzed to check the liver issues.

ISSN 2515-8260 Volume 09, Issue 8, 2022

Table 1: Normal Range of Biochemical Parameters

S.No	Parameters	Normal range
1	Blood glucose level Fasting Post prandial	 70-100 mg/ dL 100-140 mg/dL
2	Thyroid level T3 T4 TSH	 0.9-2.8 nmol/L 5-12 mcg/dL 0.5-5 mLu/L
3	Lipid profile Total cholesterol Triglyceride level HDL LDL	 >200 mg/dL >150 mg/dL <40 mg/dL (100-129 mg/dL
4	Kidney issues Urea Creatinine	 6-24 mg/dL 0.74-1.35 mg/dL
5	Liver issues SGOT SGPT	 5-40 U/L 7-56 U/L

3) Dietary Factors

Dietary data was collected in the same interview conducted with patient using a 24-h dietary recall which was used to calculate the Total energy intake of subject along with calculation of protein and fat intake. Intake of Vitamin C and iron was also calculated using the same data collected for dietary recall. To check the consumption of iron (Fe), folate (Vit B9), cyanocobalamin (Vit B12), ascorbic acid (Vit C) and calcium rich food of the subject we have also taken the food frequency questionnaire which was made using 7 food groups – Cereals, grains and legumes, green leafy vegetable, other vegetables like capsicum, tomatoes etc., fruits, roots and tubers and non-veg consumption.

B) Statistical Analysis

For the statistical analysis, mean values of hemoglobin, ferritin and Vit B12 levels are calculated for the parameters. Subjects were divided into different categories of sociodemographic data such as age, gender, BMI, sleep hours, energy levels, and physical activities levels and mean values for Hb, ferritin and Vit B12 were calculated. Similarly, data collected from subjects was distinguished and different factors and mean values were calculated to analyze and compare the data.

ISSN 2515-8260 Volume 09, Issue 8, 2022

Results

A) Characteristics of Study Participants

The characteristics of the subjects chosen for the research is mentioned below in the Table:2. A total of 150 anemic subjects were taken. Anemia was determined on the basis of Hemoglobin levels, Ferritin levels and Vitamin B12 levels. In the table, the mean values of the parameters are calculated to determine the level of anemia in the study population. Results were also divided into 3 parts, non- dietary, dietary and biochemical parameters show the positive relationship between most of non-dietary factors, anemia on the basis of gender, different levels of BMI, based on subject's income group, sleep hours, physical activity levels and their profession in which the subjects are involved.

Energy levels were divided into 4 types, low, moderate, good and high. These values were calculated with the help of scores which was given by the subjects out of 10, where the scores between 9 or 10 were considered to be high in energy, 6-8 were considered as good in energy, subjects who gave 5 to 7 were found to be of moderate energy levels and who gave below 5 were considered as low on energy.

Fig. 2: Scale to Determine Energy Level

From Table 1, it can be seen nearly all the factors dietary, non-dietary and medical conditions leads to anemia. Females were anemic nearly 66% out of total population while 34% males were anemic. In terms of BMI, people falling in normal range were found to be more anemic 42% than the one who are underweight, overweight or obese. Major anemic population was from MIG (Medium Income Group) than HIG (High Income Group) or LIG (Low Income Group). On the basis of sleep hours, it was found out that number of anemic people were more in the one who were sleeping between 6-8 hours. Also, significant number moderately active people were found to be anemic along with sedentary and active persons.

In terms of medical conditions, diabetic patients taking metformin showed a strong relationship with anemia. Subjects with other conditions such as high lipid levels, thyroid issues, kidney issues and liver issues were also having low levels of hemoglobin.

ISSN 2515-8260 Volume 09, Issue 8, 2022

In terms of dietary factors, various different angels were considered and studied, which were overall divided into two parts, 24-hour dietary recall and food frequency questionnaire of Iron rich food and Vit C rich food. Based on the data, it was found out 50% of people were taking vegetarian diet. 99 (66%) of subjects were consuming tea more than once in a day, irrespective of anything. A good number of subjects were also having smoke, alcohol, tobacco and pan masala on regular basis.

Table:2 Anemic Levels of Subjects on the Basis of Non- dietary, Medical and Dietary factors

Variables	Groups	N	(%)	Hb (Mean)	Ferritin (Mean)	Vit B12 (Mean)
		150	(100)	10.46	118.88	418.99
	Females	99	(66)	9.94	102.83	499.56
	Males	51	(34)	11.48	150.03	262.58
	Under	23	(15)	10.4	80.90	388.66
	Normal	63	(42)	10.39	108.40	435.80
	Over	52	(35)	10.31	147.23	406.4
	Obese	12	(8)	11.63	121.1	442.62
oup	LIG	23	(15)	10.11	94.6	385.86
	MIG	91	(61)	10.64	126.76	466.67
	HIG	36	(24)	10.25	114.04	318.5
s	> 6 hours	48	(29)	10.08	167.53	362.55
	6-8 hours	107	(71)	10.62	99.01	442.04
els	Low	25	(17)	10.42	93.42	403.70
	Moderate	56	(37)	10.37	145.21	392.08
	Good	61	(41)	10.53	95.50	426.73
	High	8	(5)	10.74	202.36	606.6
	Sedentary	39	(26)	11.07	123.39	363.19
	Moderately active	76	(51)	10.26	131.79	460.00
	Active	35	(23)	10.24	85.17	391.13
Diabetes	Taking metformin	27	(18)	10.40	71.71	347.83
Lipid levels		14	(9)	11.42	68.32	406.44
Thyroid		11	(7)	10.21	99.54	403

Kidney issue		26 (17)	10.32	127.75	346.05
Liver issue		45 (30)	10.14	161.21	444.36
	Veg Egg Non veg	75 (50) 31 (21) 44 (29)	10.38 10.16 10.83	117.82 62.18 161.78	474.06 318 397.17
Energy intake	Male Female	2092.32 KCals/d 1978.34 KCals/d	11.48 9.94	150.03 102.83	262.58 499.56
Protein intake	Male Female	51.17 g/d 46.61 g/d	11.48 9.94	150.03 102.83	262.58 499.56
Fat intake	Male Female	47.20 g/d 43.33 g/d	11.48 9.94	150.03 102.83	262.58 499.56
Iron Intake	Male Female	10.5 mg/d 12.47 mg/d	11.48 9.94	150.03 102.83	262.58 499.56
Vit C intake	Male Female	53.64 mg/d 48.05 mg/d	11.48 9.94	150.03 102.83	262.58 499.56
Tea intake	Daily	99 (66)	10.33	112.56	403.16
Junk food intake	More than a week	17 (11)	10.94	211.2	367.27
Alcohol intake	Yes	36 (24)	11.33	156.82	325.91
Smoking	Yes	33 (22)	11.11	148.66	314.5

Tobacco Intake	Yes	20 (13)	10.4	126.46	319.38
Pan Masala	Yes	9 (6)	11.61	88.33	185.83

In Table 3, dietary intake of subjects is shown. Intake of energy, protein and fat as per RDA (Recommended Dietary Allowance) by ICMR (Indian Council of Medical Research) is shown in comparison with mean values of their actual intake. Intake of Iron and Vit C is also calculated and compared with RDA values. As per the values, it was found out that the intake of energy is consumed low in case of males as well as females than the required amount. Protein is already taken in significant amount and so is fat, which is the prior reason for the obesity and high cholesterol levels in the given population. Also, intake of Iron as well as Vit C is taken in significantly low amount than the desired amounts.

Table:3 Intake of Subjects Compared with RDA Values

Gender	Energy (Kcals/d)		Protein (g/d)		Fat (g/d)		Iron (mg/d)		Vit C (mg/d)	
	ICMR	Intake	ICMR	Intake	ICMR	Intake	ICMR	Intake	ICMR	Intake
Female	2170	2092.3	36.3	46.6	25		15	12.47	55	48.05
Male	2763	1978.3	42.9	51.1	31.6		11	10.5	65	53.64

*Note: RDA- Recommended Dietary Allowance

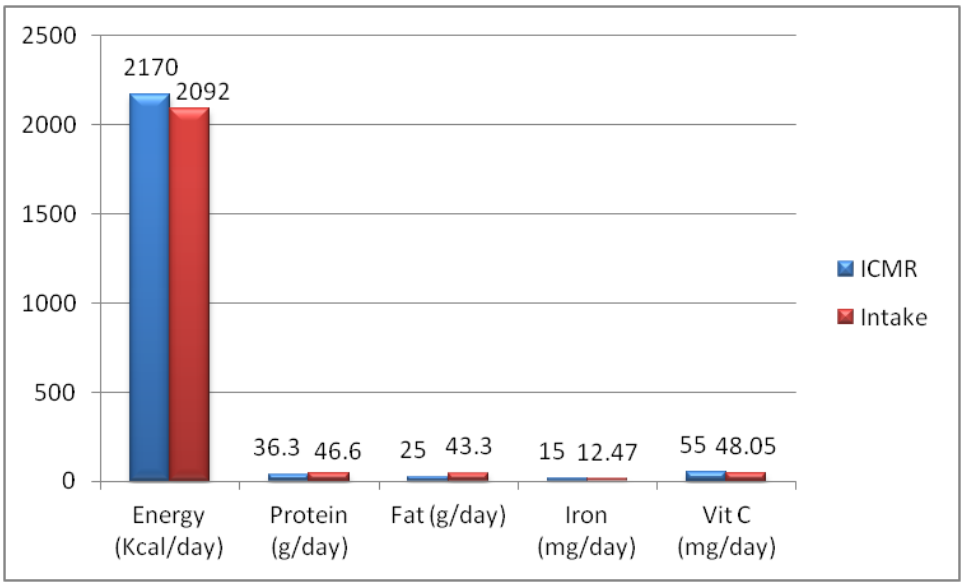

Fig.3: Dietary Intake Per Day of Females

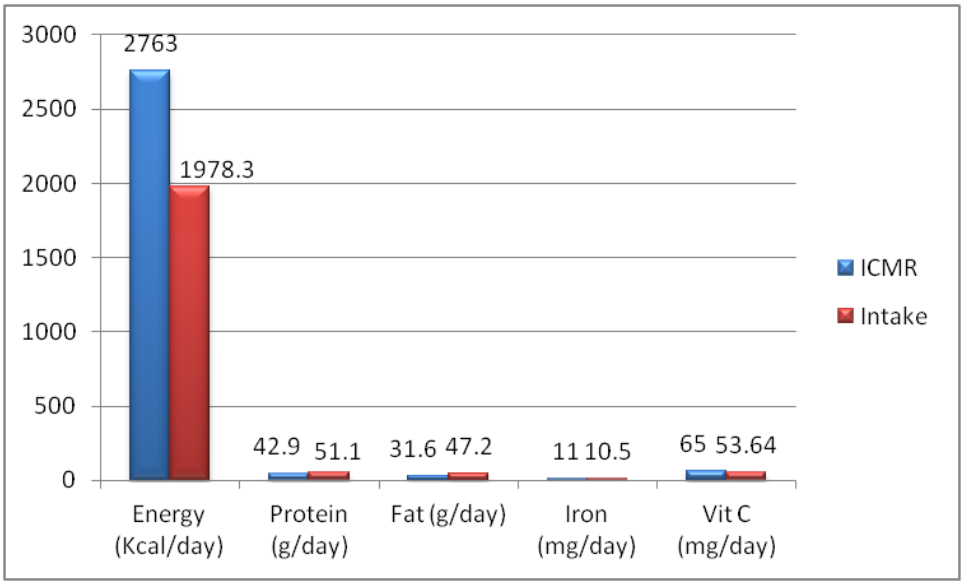

Fig. 4: Dietary Intake Per Day of Males

B) Food Frequency Questionnaire for Iron Rich Food and Vit C Rich Food

Consumption pattern of Iron and Vit C rich food of the subjects of different food groups was observed using a food frequency questionnaire. Food groups which are rich in Iron are slightly different from Vit C rich food. For the food rich in iron, 7 food groups were included which are cereals and millets, grains and legumes, green leafy vegetables, fruits, condiments, dry fruits and non veg. Tavle for Vit C rich food includes only 5 food groups, green leafy vegetables, vegetables, fruits, roots and tubers and condiments. These food groups have been selected from the book of food composition given by National Institute of Nutrition (NIN) by ICMR, 2017. Intake was calculated in the form of waw vegetables and the nutrient present in vegetables was given as per 100 grams. The names of the particulars were being changed as per the native language, to make it easy to understand by people participating in research.

It was observed that among bajra and quinoa, bajra was consumed more by the participants and maximum of it was taken on occasional levels. In case of legumes, chana dal, udad dal and arhardal was used more frequently that the others. In case of green leafy vegetables, only methi and dhaniya was preferred while the consumption of agethi and amaranth leaves was zero. Dates was consumed by 7 (4.6%) subjects on regular basis which is good but 18 (12%) preferred to have black raisins on daily basis. Methi dana, almonds and jaggery is 4.6 %, 8% and 14% which

is poor. And also, the consumption of non veg and eggs was also majorly done on weekly basis. This shows the poor intake of Iron rich food by the people who are anemic.

Table 4: Food Frequency Questionnaire for Iron Intake by the Subjects

Food groups	Food items	D N (%)	>W N (%)	W N (%)	M N (%)	O N (%)	N N (%)
Cereals and Millets	Bajra	8 (5.3)		19 (12.6)	32 (21.3)	53 (35.3)	28 (18.6)
	Quinoa	-	-	6 (4)	9 (6)	33 (22)	102 (68)
Grains and legumes	Chana dal	2 (1)	12 (8)	27 (18)	46 (30.6)	50 (33.3)	13 (8.6)
	Kala chana	-	4 (2.6)	5 (3.3)	39 (26)	98 (65.3)	4 (2.6)
	Udad	2 (1)	2 (1)	12 (8)	32 (21.3)	61 (40.6)	41 (27.3)
	Lobiya	-	-	3 (2)	2 (1)	61 (40.6)	84 (56)
	Arhar Dal	3 (2)	4 (2.6)	22 (14.6)	31 (20.6)	54 (36)	14 (9.3)
	Rajma	-	4 (2.6)	19 (12.6)	44 (29.3)	77 (51.3)	6 (4)
GLV	Agethi	-	-	-	-	4 (2.6)	
	Amaranth	-	-	-	-	-	150 (100)
	Methi	-	12 (8)	17 (11.3)	38 (25.3)	59 (39.6)	24 (16)
	Dhaniya	18 (12)		75 (50)	-	24 (16)	4 (2.6)
Fruits	Dates	7 (4.6)	-	6 (4)	12 (8)	21 (14)	
	Fig	7 (4.6)	6 (4)	18 (12)	12 (8)	17 (11.3)	
	Black raisins	18 (12)		19 (12.6)	56 (37.3)	12 (8)	19 (12.6)
	Raisins	4 (2.5)	9 (6)	18 (12)	27 (18)	31 (20.7)	61 (41)
Condiments	Curry patta	-	3 (2)	2 (1)	7 (5)	22 (15)	116 (77)
	Pudhina	-	6 (4)	17 (11)	33 (22)	27 (18)	67 (45)
	Methi dana	7 (4.6)	4 (2.6)	-	-	3 (2)	135 (90)
Dry Fruits	Almond	12 (8)		9 (6)	31 (20)	19 (13)	61 (40.6)
	Cashew	2 (1)	5 (3.3)	3 (2)	17 (11.3)	43 (28.6)	80 (53.3)
	Jaggery	21 (14)		6 (4)	11 (7.3)	19 (12.6)	66 (44)
Non veg	Eggs	4 (2.6)		7 (5)	3 (2)	-	-
	Chicken	3 (2)	7 (5)	15 (10)	15 (10)	3 (2)	-

*Note: GLV- Green Leafy Vegetables; D- Daily, >W- more than twice a week, W- Weekly, M- Monthly, O- Occasionally, N- Never. In bracket, the percentage value is shown while outside the bracket, population size is given.

Vit C (ascorbic acid) is an important Vit which is required for the absorption of non heme iron in the body. 8 foods which are rich in Vit C was not at all consumed by subjects on daily basis. The most preferred Vit C rich food is potato, taken by 14.6 % subjects on daily basis. Other green leafy vegetable rich in Vit C are cauliflower, which is taken by 39.3% population on weekly basis which is similar to the consumption of potato. Amla (gooseberry) is not taken at all by 75.3 % also the green chilies and amaranth was avoided by a maximum population.

Table:5 Food Frequency Questionnaire for Vit C Rich Foods

Food groups	Food items	D N (%)	>W N (%)	W N (%)	M N (%)	O N (%)	N N (%)
GLV	Agethi	-	-	-	-	4 (2.6)	
	Amaranth	-	-	-	-	-	
	Bathua	18 (12)	29 (19.3)	43 (28.6)	12 (8)	37 (24.6)	11 (7.3)
	Cabbage	2 (1.3)	18 (12)	27 (18)	32 (21.3)	12 (8)	59 (39.3)
	Cauliflower	-	41 (27.3)	59 (39.3)	39 (26)	9 (6)	2 (1.3)
	Methi	-	12 (8)	17 (11.3)	38 (25.3)	59 (39.3)	24 (16)
	Dhaniya	12 (8)	29 (19.3)	75 (50)	-	30 (20)	4 (2.6)
	Palak	-	6 (4)	43 (28.6)	53 (35.3)	43 (28.6)	5 (3.3)
Vegetables	Capsicum	-	10 (6.6)	35 (23.3)	57 (38)	27 (18)	21 (14)
	Aami	-	13 (8.6)	17 (11.3)	39 (26)	48 (32)	33 (22)
	Matar	16 (10.6)	29 (19.3)	31 (20.6)	64 (42.6)	11 (7.3)	-
Fruits	Aamla	3 (2)	9 (6)	12 (8)	4 (2.6)	11 (7.3)	
	P. Guava	-	7 (4.6)	2 (1.3)	9 (6)	12 (8)	120 (80)
Roots and tu	Potato	22 (14.6)	42 (28)	59 (39.3)	21 (14)	6 (4)	-
	Radish	12 (8)	27 (18)	42 (28)	31 (20.6)	30 (20)	8 (5.3)
	S. potato	6 (4)	18 (12)	32 (21.3)	51 (34)	37 (24.6)	6 (4)
Condiments	Chilies	13 (8.6)	15 (10)	18 (12)	17 (11.3)	9 (6)	78 (52)

*Note: GLV- Green Leafy Vegetables, P. Guava- pink guava, S. potato – sweet potato; D- Daily, >W- more than twice a week, W- Weekly, M- Monthly, O- Occasionally, N- Never. In bracket, the percentage value is shown while outside the bracket, population size is given.

ISSN 2515-8260 Volume 09, Issue 8, 2022

Conclusion

Anemia is the most prevalent and multifactorial condition in developing as well as developed countries. Nutritional deficiency anemia is certainly the small part of it. It has been in the root of the population of the country which is hard to remove but not impossible. Diet is not the only key parameter which can be changed to eradicate the condition but several other factors can be taken into consideration which indirectly impact the diet and to enhance the absorption of nutrients in the body. Nutrition and diet are not the independent variable but other factors are related which makes a vicious circle of causative factors.

To eradicate the prevalence of anemia, which causes morbidity, not only government but also people on ground level has to become aware and take steps to bring the change. Education, economy and quality of life are the baseline parameters which can bring the change on ground level. Before nutrition and lifestyle, psychological state of an individual brings the change in them.

After hand, governmental policies and supplementation programmes which have already been working can help the individuals. Norms have to be stricter, availability of the supplements and kits should be managed and reached till ground levels so that it can be used at maximal levels. Healthy food should be made available on cheap prices and should be encouraged among student and workers who are travelling or who are staying away from their homes. Women should take measures more actively to have good diet at home levels.

Reference

Hu, P.J., Ley, S.H., Bhupathiraju, S.N., Li, Y. and Wang, D.D., 2017. Associations of dietary, lifestyle, and sociodemographic factors with iron status in Chinese adults: a cross-sectional study in the China Health and Nutrition Survey. The American journal of clinical nutrition, 105(2), pp.503-512.

Jackowska, M., Kumari, M. and Steptoe, A., 2013. Sleep and biomarkers in the English Longitudinal Study of Ageing: associations with C-reactive protein, fibrinogen, dehydroepiandrosterone sulfate and hemoglobin. Psychoneuroendocrinology, 38(9), pp.1484-1493.

Kamble, B.D., Gunjan, M., Sumit, J., Singh, S.K., Jha, D. and Singh, S., 2021. Prevalence of anaemia among school going adolescent girls attending Test, Treat and Talk (T-3) camp under AnaemiaMukt Bharat in Delhi. Journal of Family Medicine and Primary Care, 10(2), p.898.

Khan, Z.A., Khan, T., Bhardwaj, A., Aziz, S.J. and Sharma, S., 2018. Underweight as a Risk Factor for Nutritional Anaemia-A Cross-sectional Study among Undergraduate Students of a Medical College of Haryana. Indian Journal of Community Health, 30(1).

Kim, H., Shin, C. and Baik, I., 2016. Associations between lifestyle factors and iron overload in Korean adults. Clinical nutrition research, 5(4), pp.270-278.

Kishore, S., Singh, M., Jain, B., Verma, N., Gawande, K., Kishore, S., Aggarwal, P. and Verma, S.K., 2020. A study to assess prevalence of anaemia among beneficiaries of AnaemiaMukt Bharat Campaign in Uttarakhand. Journal of family medicine and primary care, 9(3), p.1691.

Le, C.H.H., 2016. The prevalence of anemia and moderate-severe anemia in the US population (NHANES 2003-2012). PloS one, 11(11), p.e0166635.

Domenica M.,Cappellini MD, Irene Motta MD, Anemia in Clinical Practice. Definition and classification. Does Hb change with aging?

Mugisha, J.O., Baisley, K., Asiki, G., Seeley, J. and Kuper, H., 2013. Prevalence, types, risk factors and clinical correlates of anaemia in older people in a rural Ugandan population. PLoS One, 8(10), p.e78394.

Paramastri, R., Hsu, C.Y., Lee, H.A., Lin, L.Y., Kurniawan, A.L. and Chao, J.C.J., 2021. Association between dietary pattern, lifestyle, anthropometric status, and anemia-related biomarkers among adults: A population-based study from 2001 to 2015. International journal of environmental research and public health, 18(7), p.3438.

Sedlander, E., Talegawkar, S., Ganjoo, R., Ladwa, C., DiPietro, L., Aluc, A. and Rimal, R.N., 2021. How gender norms affect anemia in select villages in rural Odisha, India: A qualitative study. Nutrition, 86, p.111159.

Wang, X., Wu, Z., Chen, Y., Zhu, J., Dong, X., Fu, C. and Jiang, Q., 2015. Increased prevalence and incidence of anemia among adults in transforming rural China: two cross-sectional surveys. BMC Public Health, 15(1), pp.1-6.

ISSN 2515-8260 Volume 09, Issue 8, 2022

World Health Organization, 2015. Global anaemia prevalence and number of individuals affected. Reference Source. WHO, World Health Organization data for anemia