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### RESEARCH ARTICLE

#### ANAEMIA, EXPECTANT MOTHERS AND DIETARY HABITS: ISSUES AND CONCERNS

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#### Abstract

The problem of anaemia among expectant mothers, instead of declining has increased over the years at the all India level and also in almost all the states of the country though differentially. These revelations come from the comparative analysis of the NFHS- 4 and NFHS- 5 data on anaemia released in the year 2000 and 2022 respectively. A review of the studies attributes the problem to inadequate nutritious food available to the expectant mothers during the period of pregnancy when the need of the body for iron and calcium increases for the proper growth of the foetus. In the absence of which the women are unable to bear the pressures of bleeding in the pre and post delivery period, leading to low weight baby birth and premature births, and at times resulting in high maternal mortality. This paper examines the status of anaemia among expectant mothers and its relationship with dietary habits.

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#### Introduction:-

##### The Problem and Rationale

The primary concern of this paper is to analyze and understand the prevalence of anaemia among the pregnant women in district Kinnaur, a Scheduled Tribe Area, in Himachal Pradesh. The concern for undertaking such an exercise arises due to two peculiar conditions. First, during pregnancy the demand for iron increases in the women. Second, the women in majority are found suffering from anaemia during the period of their pregnancy, which is detrimental to the growth and overall health of the foetus. According to the World Health Organization's estimates, disclosed by Ministry of Health and Family Welfare, New Delhi, there are approximately 1.5 lakh maternal deaths taking place globally due to anaemia annually as the anaemic women are unable to withstand the pre and post delivery bleeding (Kaushal et al., 2022). There are two reasons, which always account for the increased demand for iron and calcium in expectant mothers. First, the total iron requirement during the normal course of pregnancy is about 1000 mg. Foetus and placenta is believed to account for 300 mg of iron. About 200 mg is lost through normal routes of excretion. It is stated that the loss of iron is an obligatory loss even when the mother is severely iron deficient. Therefore, in each pregnant woman, these conditions cause an additional demand for 500 mg of iron (Cunningham et al, 2001 in Reddy, 2004:8). Second, the empirical reality indicates "currently in India, the iron deficiency anaemia has almost assumed endemic proportion at the level of intergenerational prevalence. The sinister cycle of anaemic mother begetting – anaemic offspring – growing to become anaemic mother goes on. This is an already established fact constituting a non-obstetric maternal risk factor during the pregnancy in India (Reddy, 2004:28; Amel, 2013; Suryanarayana, 2017). The problem seeks serious attention as 45.7 per cent expectant mothers in the urban areas and 52.1 per cent in rural areas have 11 g/dl hemoglobin, which cause 20 per cent to 40 per cent maternal deaths, accounting for 80 per cent in maternal deaths South Asia (Kaushal et al., 2022). The problem of anaemia does not end here as a large number of studies (Whitefield, 1988; Raman, 1989; Bhatt, 1992; Sharma, 2003 cited in Reddy, 2004:29; NHHS-4 2015-16,

2017; NFHS-5 2019-21, 2022) also warn against the serious complications caused by iron deficiency anaemia among the pregnant women. These are ante-partum hemorrhage, preterm delivery, postpartum hemorrhage, maternal mortality, mild to moderately increased cardiac output (hyper-dynamic circulation), progressing cardiac failure, thrombo-phlebitis and thrombo-embolic phenomenon, puerperal infections, and stillbirths.

The statistical profile of anaemia in the year 2000 among the women in the reproductive age group (15 to 49 years age) in India reveals more than fifty per cent are anaemic with more than one third of them suffering from mild, almost fifteen per cent with moderate and two per cent with severe anaemia. Among the currently married women almost fifty-six per cent are anaemic among whom thirty-six per cent have mild, sixteen per cent moderate and three per cent severe anaemia. What is more intriguing is the fact that among different segments almost two-third of the tribal women are anaemic followed by women belonging to the scheduled castes and backward classes. The standard of living of women suffering from anaemia in more than sixty per cent cases is found low. In the case of pregnant women almost fifty per cent are anaemic with twenty-two per cent, twenty-five per cent and two and half per cent having mild, moderate and severe anaemia respectively. The number of lactating mothers suffering from this problem is almost fifty-six per cent (NFHS, 2000). After two decades, the latest fact sheet (NFHS-5, 2022) indicates 64.2%, 68.3%, and 67.1% urban, rural and total respectively among children age 6 – 59 months respectively. In comparison to which only 58.6 children were anaemic reported in NFHS-4. The non-pregnant women aged 15 – 49 years who are anaemic (<12.0 g/dl%) number 54.1%, 58.7%, and 57.2% (NFHS-5, 2022) come from urban, rural and total respectively which was only among 53.2% women (NFHS-4, 2017). Among the pregnant women in the 15 – 49 age group 45.7%, 54.3% and 52.5% in comparison to NFHS-4.

The state-wise prevalence of iron deficiency anaemia among the women indicates that Himachal Pradesh though has the least number i.e. 40.5 per cent women and bracketed with Delhi (NFHS, 2000) but the percentage is not in any way the least. It remains quite high. Even the nutritional scenario among the women in Indian society indicates 35.5 per cent fall in the malnutrition category. Even in Himachal Pradesh almost 30 per cent of the women suffer from malnutrition. But what is most worrying factor is sixty-five per cent of the tribal women in India suffering from anaemia that makes a case for viewing the prevalent situation in the tribal areas of Himachal Pradesh too. According to the data on anaemia released in NFHS-5 2019-21 (2022), even till date the percentage of pregnant women suffering from anaemia is 43.00 per cent rural and 42 per cent total, which though is less than the percentage of NFHS-4 (2017), i.e. 50.4 per cent. Although there is an improvement but still very high percentage of women suffer from anaemia.

### **Objective:-**

The primary objectives of this paper are:

1. To examine the status of anaemia among the expectant mothers in district Kinnaur, a scheduled tribe area; and,
2. To know about the dietary habits of expectant mothers and level of anaemia.

### **Methodology:-**

This paper is based on empirical analysis of 102 expectant mothers, taken from three randomly selected PHC (Primary Health Centre) based identification of 102 pregnant women at the time of the conduct of interviews. Their distribution reveals 17, 81 and 4 from Kalpa, Pooh and Nichar respectively. The study is descriptive in nature. The results of the empirically studied prevalence of anaemia are presented in percentages. The extent of anaemia prevalent among each expectant mother was determined on the basis of haemoglobin levels tested by the bio-chemist forming part of the research team.

### **Data and Discussion:-**

The following data and discussion pertains to the causes and conditions of anaemia among pregnant women. Among the major determinants are the dietary habits and the food consumed on regular basis by the expectant mother. Since staple food of a population depends upon what is locally produced both wheat and rice in combination with lentils, vegetables, meats and milk products like curd, cheese etc. are consumed by the women as in Kinnaur as part of their routine staple food. It is also a fact that in different parts of this district different climatic conditions causing variations in food production prevail. It is therefore expected that varying patterns of food consumption are likely to be observed which may even account for differentials in the levels of haemoglobin. It is in the backdrop of such physical features of the areas that an attempt is made here to understand the dietary patterns among the pregnant women and the relationship of the different items forming part of food patterns with the levels of haemoglobin.

Among the routine food articles wheat chapati constitutes an important ingredient. The intake of chapatis by the pregnant women in Kalpa reveals that more than 60 per cent of them take 4 chapatis on an average at every meal during the day time. The other women are found eating two, three and five chapatis in an increasing order of numbers respectively. The relationship between chapati intake and level of haemoglobin reveals that in the acute anaemia category the majority is concentrated in 4 chapatis per meal every day followed by lesser number of women taking two, three and five chapatis respectively. In the moderate anaemia category also the largest number is found in the 4 chapati per meal intake category followed by women taking five and three chapatis respectively. The cross tabulation between chapati intake and the levels of haemoglobin does not indicate any definite type of relationship in Kalpa.

**Table 1:-** Consumption of Wheat Chapati and Levels of Haemoglobin.

Block	Intake	Haemoglobin in Grams			Total
		< 9	9.0 to 10.9	11 plus	
Kalpa	2	7	7	-	11
		12.5	8.53	-	10.09
	3	6	7	-	13
		25.00	8.53	-	11.92
	4	9	59	1	68
		37.50	71.95	33.33	62.38
5	5	9	2	16	
	20.83	1.97	66.66	14.67	
6	1	4	-	1	
	4.16	4.87	-	0.91	
Total		24	82	3	109
		100.00	100.00	100.00	100.00
Pooh	2	6	3	-	9
		27.27	7.69	-	13.23
	3	1	5	-	6
		4.54	12.82	-	8.82
	4	13	26	5	44
		59.09	66.66	83.33	64.70
5	2	5	2	9	
	13.79	12.82	16.66	13.23	
Total		22	39	7	68
		100.00	100.00	100.00	100.00
Nichar	1	-	5	1	6
		-	6.17	25.00	5.88
	2	5	7	-	12
		29.41	8.04	-	11.76
	3	1	6	-	7
		5.88	7.40	-	6.68
4	5	54	3	62	
	29.4	66.66	75.00	60.78	
5	6	9	-	15	
	35.29	11.11	-	14.70	
Total		17	81	4	102
		100.00	100.00	100.00	100.00

In Pooh block also a similar pattern of chapati intake, as observed in the case of Kalpa, is discernible. It is found that more than two-third of the women are taking 4 chapatis per meal everyday. In relation to levels of haemoglobin the data indicate that majority of the women taking 4 chapatis per meal everyday are found suffering from acute and moderate anaemia. But no uniform pattern leading to any definite trend is visible. In view of which it may be argued that like the case of Kalpa block even in Pooh the data on chapati intake and level of haemoglobin do not indicate any relationship and definitive trend.

Even in the case of Nichar block almost two-third of the pregnant women take 4 chapati per meal a day. There is also a good number of them who eat five chapatis followed by 2 chapatis per meal per day. The relationship between chapati intake and the level of haemoglobin indicate that in each category of haemoglobin the larger number of women are found taking 4 chapatis per meal a day. It is therefore, argued that as for as taking of 4 chapati per meal by maximum number of women is concerned it from different point of views can be taken as a good eating habit. But the absence of any positive and inverse relationship suggests that the differential chapati intake does not have a determining effect on the levels of haemoglobin.

Apart from chapati as part of routine food most people in district Kinnaur take rice. In Kalpa block more than one-third and one-fourth of the total women take about three-fourth of a plate of rice and one-fourth of a plate of rice at a time respectively. The other women in good numbers take one plate followed by half a plate of rice per meal a day. However, unlike the case of chapati, the rice intake and level of haemoglobin are found to have considerable possibility of an inverse relationship in Kalpa block. This is quite visible from the fact that with the increase in the quantity of rice taken the number of women in acute as well as moderate anaemia category comes down substantially. This relationship would definitely become more obvious with the re-grouping of data i.e. instead relating five intake categories the data be re-grouped into three categories.

The rice intake by pregnant women in Pooh block reveals that almost one-third of the total take about one-fourth and three-fourth of a plate of rice per meal every day followed by those who have more than one plate of rice. But no definite order either ascending or descending is found prevalent. Therefore in the acute as well as moderate anaemia category a distorted relationship with rice intake appears. This is due to the fact that the number of women in each category of anaemia are found distributed in the minimum and maximum quantity of rice consumed. In other words, no definite trend emerges to suggest any type of relationship between rice intake and levels of anaemia in Pooh block.

**Table 2:- Rice Intake and the Levels of Haemoglobin.**

Block	Intake	Haemoglobin in Grams			Total
		< 9	9.0 to 10.9	11 plus	
Kalpa	¼ Plate	5	8	-	13
		20.83	9.75	-	11.92
	½ Plate	5	6	-	11
		20.83	7.31	-	10.09
	¾ Plate	2	36	1	39
		8.33	43.90	33.33	35.77
	1 Plate	5	2	1	21
		20.83	2.43	33.33	19.26
	1 ½ Plate	7	17	1	25
		29.16	20.73	33.33	22.93
Total		24	82	3	109
		100.00	100.00	100.00	100.00
Pooh	¼ Plate	9	7	4	20
		40.90	17.94	57.14	29.41
	½ Plate	-	3	1	4
		-	7.69	14.42	5.88
	¾ Plate	9	12	-	21
		40.90	30.76	-	30.80
	1 Plate	4	7	1	12
		18.18	17.94	14.42	17.64
	1 ½ Plate	-	10	1	11
		-	25.64	14.42	16.17
Total		22	39	7	68
		100.00	100.00	100.00	100.00
Nichar	¼ Plate	4	18	2	24
		23.52	22.22	50.00	23.5
	¾ Plate	2	22	2	26
		11.76	27.16	50.00	25.49

	1 Plate	1	15	-	16
		5.88	18.51	-	15.68
	1 ½ plate	10	26	-	36
		58.82	32.09	-	35.29
Total		17	81	1	102
		100.00	100.00	100.00	100.00

Like the case of Pooh block the data pertaining to Nichar in this respect reveals that maximum number of women are found taking more than one plate of rice at every meal per day followed by those who take three-fourth and one-fourth of a plate of rice per meal per day respectively. The relationship between rice intake and level of haemoglobin however reveal that in acute anaemia category the number of women increases substantially with the increase in the quantity of rice taken. The same trend is also found to exist in moderate anaemia category in Nichar. It may be due to the fact that the level of haemoglobin is not determined by the intake of rice alone as other food items also have a crucial role to play.

The rice or/and chapati are often eaten with lentils, vegetables or meat by the people. Lentils, therefore, constitute an important ingredient of every day food in the study area though taken by people in varying quantity. Since most people in Kinnaur are engaged in agriculture some of these high protein lentils are grown by them, such as red beans, grams etc. The consumption patterns that more than half of the women in Kalpa block followed by around one-fifth each consume one-fourth, three-fourth and one katori of dal respectively per meal per day. Among the remaining ones one and a half to two katoris are consumed. The further analysis of the relationship between dal intake and haemoglobin levels reveals that in the acute as well as moderate categories a definite inverse relationship is found. Although there is some fluctuation in data in the acute anaemia category but the inverse relationship cannot be ruled out. It is therefore argued that in Kalpa inverse relationship between dal intake and levels of haemoglobin is found prevailing.

**Table 3:- Dal Intake and the Levels of Haemoglobin.**

Block	Intake	Haemoglobin in Grams			Total
		< 9	9.0 to 10.9	11 plus	
Kalpa	¼ Katori	15	39	1	55
		625	47.56	33.33	50.4
	¾ Katori	4	17	2	23
		16.66	20.73	66.66	21.10
	1 Katori	3	21	-	24
	12.5	25.60	-	22.01	
	1 ½ Katori	1	3	-	4
		4.16	65	-	3.66
	2 Katori	1	2	-	3
	4.16	2.43	-	2.75	
Total		24	82	3	109
		100.00	100.00	100.00	100.00
Pooh	¼ Katori	15	24	6	45
		68.18	80	85.71	76.27
	¾ Katori	1	1	1	3
		4.54	3.33	14.28	5.08
	1 Katori	5	5	-	10
	22.7	16.66	-	16.64	
	2 Katori	1	-	-	1
		4.54	-	-	1.69
	Total	22	30*	7	59*
		100.00	100.00	100.00	100.00
Nichar	¼ Katori	8	29	3	40
		47.05	35.80	75.00	39.21
	¾ Katori	2	12	-	14

		11.76	14.81	-	13.72
	1 Katori	4	30	1	35
		23.5	37.83	25.00	34.31
	1 ½ Katori	-	5	-	5
		-	6.17	-	4.90
	2 Katori	3	5	-	8
		17.64	6.17	-	7.84
Total		17	81	4	102
		100.00	100.00	100.00	100.00

\* N varies because some do not consume Dal

In Pooh block too the data distribution reveals more than three-fourth and even less than one-sixth of the women consuming the least quantity of dal i.e. one-fourth of a katori and one katori of dal per meal per day respectively. In the other categories of higher quantity of dal intake there is a very small number of respondents. However, the analysis of relationship between dal intake and level of haemoglobin in acute anaemia category does not reveal clearly inverse relationship due to uneven distribution of data. But, in the moderate anaemia category the data indicate that there exists a definite inverse relationship between the two. In other words the re-grouping of data especially in the acute anaemia category may also make this relationship more obvious.

The dal intake practice in Nichar block reveals more than two-fifth of the respondents take only one-fourth katori of dal followed by more than one-third and little above one-tenth consuming three-fourth to one katori of dal respectively. The cross tabulation of data to find out a possible relationship between the two indicates prevalence of somewhat inverse relationship. It is somewhat due to fluctuating and uneven nature of data distribution. It may therefore be argued that though no clear relationship between dal intake and levels of haemoglobin in Nichar has been established but the possibility of dal having definitive determining effect on haemoglobin cannot be ruled out. This is quite evident from data on Kalpa and Nichar block.

**Table 4:-** Green and Leafy Vegetable Intake and the Levels of Haemoglobin.

Block	Intake	Haemoglobin in Grams			Total
		< 9	9.0 to 10.9	11 plus	
Kalpa	¼ Katori	17	26	1	44
		70.83	72.22	50.00	70.96
	¾ Katori	4	5	1	10
	1 Katori	3	5	-	8
		12.50	13.88	-	12.90
	Total	24	36*	2*	62*
		100.00	100.00	100.00	100.00
Pooh	¼ Katori	16	5	1	22
		80.00	100.00	100.00	84.61
	1 Katori	4	-	-	4
		20.00	-	-	15.38
		Total	20*	5*	1*
			100.00	100.00	100.00
Nichar	¼ Katori	7	16	-	23
		63.63	84.21	-	74.19
	1 Katori	4	3	1	8
		36.36	15.78	100.00	25.80
		Total	11*	19*	1*
			100.00	100.00	100.00

\* N varies because some women do not take green-leafy vegetables.

The intake of green and leafy vegetables is highly recommended as source of iron for all in general and pregnant women in particular. However, as per the data the intake of green and leafy vegetables among the respondents is

found very limited in all the three blocks of the study. The inter-block comparison indicates that in Pooh fourth-fifth of the total women take just one-fourth of a katori per meal per day of green leafy vegetables followed by Nichar with almost three-fourth and Kalpa nearly three fourth percent of total women. This may also be noted that there is a large number of women who did not report taking green and leafy vegetables. This is though quite surprising and shocking too but given the climatic conditions, it is also a social reality. It is further discernible from the data that in acute as well as moderate anaemia categories the majority of women are concentrated in the least quantity of vegetable intake in all the three blocks. On the basis of data there is sufficient evidence to suggest prevalence of an inverse relationship between the intake of green leafy and vegetable and the levels of haemoglobin. But this requires further investigation into why do the women refrain from consuming green and leafy vegetables which is a rich source of iron.

Although Kinnaur because of its hard climatic conditions does not have much fodder to support milch cattle yet consumption of milk products in little quantities is not ruled out. This is also found that in all the three blocks of the district there is a large number of women who do not take curd at all. Among those who take curd more than two-third in Kalpa block consume just one-fourth of a katori of curd per meal. In the case of Pooh more than half and in Nichar little above one-third of the pregnant women take only a very limited quantity (one-fourth of a katori) of curd per meal per day. It is further discernible that in Nichar the quantity of curd intake is found to be relatively more as there are more women taking half to one kalori of curd per meal per day.

**Table 5:-** Curd Intake and the Levels of Haemoglobin.

Block	Intake	Haemoglobin in Grams			Total
		< 9	9.0 to 10.9	11 plus	
Kalpa	¼ Katori	15	35	1	51
		62.5	72.91	50	68.91
	¾ Katori	8	10	1	19
		33.33	20.83	50.00	25.67
	1 Katori	1	3	-	4
	4.16	6.25	-	5.40	
Total		24	48*	2*	74*
		100.00	100.00	100.00	100.00
Pooh	¼ Katori	4	13	4	21
		33.33	59.09	80.00	53.84
	¾ Katori	5	8	1	14
		41.66	36.36	20.00	35.89
	1 Katori	3	1	-	4
	25.00	4.54	-	10.25	
Total		12*	22*	5*	39*
		100.00	100.00	100.00	100.00
Nichar	¼ Katori	2	14	4	20
		16.66	35.89	100.00	36.36
	¾ Katori	8	16	-	24
		66.66	41.02	-	43.63
	1 Katori	2	9	-	11
	16.66	23.07	-	20.00	
Total		12*	39*	4*	55*
		100.00	100.00	100.00	100.00

\* N varies because some women do not take curd.

The relationship between curd intake and the levels of haemoglobin reveals prevalence of inverse relationship in the case of Kalpa block. It is observed that with the increase in the quantity of curd the number of women in acute as well moderate anaemia category tends to come down considerably. However, in the case of Pooh block in acute anaemia category such a relationship exists to some extent as it is disturbed by uneven distribution of data. However this relationship becomes more clear in the moderate anaemia category. In the case of Nichar the relationship between curd intake and levels of haemoglobin indicate a positive relation at first instance but later acquired an inverse nature. On the basis of the facts observed above a large number of women do not take curd as part of their diet. It may be due

to non-availability as well as cold climatic conditions. It is therefore recommended that they must make curd part of their food minimum one katori per meal per day to keep up their health.

**Table 6:-** Ghee (Butter Oil)/ Butter Intake and the Levels of Haemoglobin.

Block	Intake In Spoons	Haemoglobin in Grams			Total
		< 9	9.0 to 10.9	11 plus	
Kalpa	1	7	9	-	16
		87.5	90	-	88.88
	2	1	1	-	2
		12.5	10.00	-	11.11
Total		8*	10*	-	18*
		100.00	100.00	-	100.00
Pooh	1	1	4	2	7
		25.00	100.00	100.00	70
	3	2	-	-	2
		50.00	-	-	20.00
	4	1	-	-	1
		25.00	-	-	10.00
Total		4*	4*	2*	10*
		100.00	100.00	100.00	100.00
Nichar	1	4	14	1	19
		57.14	63.63	100.00	63.33
	2	3	8		11
		42.85	36.36		36.66
Total		7*	22*	1*	30*
		100.00	100.00	100.00	100.00

\* N varies because some women do not take curd.

The intake of ghee/butter considered an important part of food in the cultural as well as in the ayurvedic concept of keeping good health. In Kinnaur people take special tea in which butter constitutes an important ingredient. But butter and ghee intake as part of routine food is vary limited. The data reveal a very small number of the total women taking ghee and butter in all the three blocks of district Kinnaur though varyingly. The number of those who take ghee/butter is highest in Nichar block. Although the data is limited to reflect any relationship due to very small number of women but there is visible prevalence of an inverse relationship in Kalpa and Nichar block in both the acute as well as moderate anaemia categories. It is, as also mentioned above, quite surprising to find that in Kinnaur while people take a special tea in which the intake of butter is very common but butter is not taken as part of daily food. It may be due to increasing health consciousness among the women that they tend to take less ghee and butter in their routine food.

**Table 7:-** Lassi (Butter Milk) Intake and the Levels of Haemoglobin.

Block	Intake In Glass	Haemoglobin in Grams			Total
		< 9	9.0 to 10.9	11 plus	
Kalpa	1	19	37	3	59
		82.60	100.00	100.00	93.65
	2	3	-	-	3
		13.04	-	-	4.76
	3	1	-	-	1
		4.34	-	-	1.58
Total		23*	37*	3*	63*
		100.00	100.00	100.00	100.00
Pooh	1	7	8	5	20
		70.00	100.00	100.00	86.95
	2	3	-	-	3
		30.00	-	-	13.04
Total		10*	8*	5*	23*

		100.00	100.00	100.00	100.00
Nichar	1	11	34	3	48
		100.00	91.89	100.00	94.11
	2	-	2	-	2
		-	5.40	-	3.92
	4	-	1	-	1
		-	2.70	-	1.96
Total		11*	37*	3*	51*
		100.00	100.00	100.00	100.00

\* N varies because some women do not take Lassi (Butter milk).

In continuation of limited intake of milk products the consumption of lassi (butter milk) is found missing among as many as 42 to 55 per cent of the pregnant women. Among those who take lassi the overwhelming majority among them in all the three blocks take one glass per meal per day. This is also a common observation which one can make about the situation prevalent in all the three blocks. Despite the limited data there is an evidence to suggest that there exists an inverse relationship between intake of lassi and levels of haemoglobin. This is particularly the case in acute anaemia category where the distribution of data is somewhat normally dispersed. It may, therefore, be argued that intake of butter milk a by product but quiet nutritious must be encouraged among women. It is easily digestible and also affordable even by the poorest of the poor.

**Table 8:-** Milk Intake and the Levels of Haemoglobin.

Block	Intake in Glass	Haemoglobin in Grams			Total
		< 9	9.0 to 10.9	11 plus	
Kalpa	1	10	10	-	20
		76.92	28.57	-	40.00
	2	3	25	2	30
		23.07	71.42	100.00	60.00
Total		13*	35*	2*	50*
		100.00	100.00	100.00	100.00
Pooh	1	14	15	1	30
		82.35	83.33	25.00	76.92
	2	3	3	3	9
		17.64	16.66	75.00	23.07
Total		17*	18*	4*	39*
		100.00	100.00	100.00	100.00
Nichar	1	-	3	-	3
		-	9.09	-	6.66
	2	8	26	1	35
		72.72	78.78	100.00	77.77
	3	3	3	-	6
		27.27	9.09	-	13.33
	4	-	1	-	1
		-	3.03	-	2.22
Total		11*	33*	1*	45*
		100.00	100.00	100.00	100.00

\* N varies because some women do not take milk.

The intake of milk directly, like the case of other milk products is also found considerably limited to almost 50 percent of the total pregnant women studied for understanding prevalence of anaemia. Among those who indicated consumption of milk revealed that more than three-fourth of them in Pooh block take one glass of milk per day whereas in Kalpa and Nichar three-fifth and more than three-fourth take two glasses of milk per day. The latter is highly encouraging. The data further reveal that with regard to the relationship between milk intake and level of haemoglobin an inverse relationship is quite visible in the case of acute anaemia in Kalpa block. But this relationship reverses in the moderate anaemia category. In the case of Pooh block the data in respect of milk intake and levels of haemoglobin reveals an inverse relationship in all

the three categories of haemoglobin. In Nichar block though some uneven trends are discernible in the case of moderate anaemia but the inverse relationship is, by and large, found prevalent in both acute as well as moderate anaemia categories. In view of the foregoing it may be argued that milk is one of the most important sources of calcium and proteins helpful in the formation of the red blood cells. It is therefore must for women during pregnancy as it also has a definite bearing on the health of the child.

**Table 9:-** Egg Intake and the Levels of haemoglobin.

Block	Intake In Numbers	Haemoglobin in Grams			Total
		< 9	9.0 to 10.9	11 plus	
Kalpa	1	4	6	-	10
		50.00	100.00	-	71.42
	2	4	-	-	4
		50.00	-	-	28.57
Total		8*	6*	-	14*
		100.00	100.00	-	100.00
Pooh	1	1	7	-	8
		50.00	100.00	-	88.88
	3	1	-	-	1
		50.00	-	-	11.11
Total		2*	7*	-	9*
		100.00	100.00	-	100.00
Nichar	1	3	6	2	11
		100.00	75.00	100.00	84.61
	2	-	2	-	2
		-	25.00	-	15.38
Total		3*	8*	2*	13*
		100.00	100.00	100.00	100.00

\* N varies because some women do not take egg.

The poultry and animal meat are commonly consumed food items among the people in the study area due to cold weather conditions. Also the other fact is that the vegetables, except for the locally produced, are not available in abundance. Therefore consumption of eggs may be higher and compensating but the data on egg intake among the pregnant women indicate that only a marginal number of women consume it. Among those who reported taking of egg the majority is concentrated in the one egg a day category. The data being highly limited is not indicative of any relationship between egg intake and level of haemoglobin except for Nichar block where in the moderate anaemia category some reflection of an inverse relationship is found.

**Table 10:-** Cheese Intake and the Levels of Haemoglobin.

Block	Intake In Grams	Haemoglobin in Grams			Total
		< 9	9.0 to 10.9	11 plus	
Kalpa	25	16	30	3	49
		66.66	65.21	100.00	67.12
	50	7	15	-	22
		29.16	32.60	-	30.13
	75	1	1	-	2
		4.16	2.17	-	2.73
Total		24	46*	3*	73*
		100.00	100.00	100.00	100.00
Pooh	25	10	7	2	19
		45.4	29.16	28.57	35.84
	50	7	11	5	23
		31.81	45.83	71.42	43.3
	75	5	6	-	11
		22.7	25.00	-	20.75

Total		22	24*	7	53*
		100.00	100.00	100.00	100.00
Nichar	25	10	25	-	35
		58.82	64.10	-	60.34
	50	5	13	1	19
		29.41	33.33	50.00	32.75
	75	2	1	-	3
		11.76	2.56	-	5.17
	100	-	-	1	1
		-	-	50.00	1.72
Total		17*	39*	2*	58*
		100.00	100.00	100.00	100.00

\* N varies because some women do not take cheese.

Among the milk products cheese constitutes one of the richest source of proteins. It is however, found that except for 25 to 40 per cent of the pregnant women in all the three blocks not consuming cheese, the rest of them take cheese as part of their routine food intake. It is also observed that although not consumed every day but maximum number of women under study in Kalpa consumes on an average 25 gms of cheese. In Pooh block almost an equal number takes 25 to 50 gms of cheese per day respectively. Like Kalpa in Nichar block also a larger number of women take about 25 gms of cheese per day. The further analysis of data reveals prevalence of an inverse relationship between cheese intake and levels of haemoglobin in all the three blocks in acute and moderate anaemia category respectively with the exception of Pooh block where in the moderate anaemia category no such relationship is observed. It is therefore, argued that while cheese intake has determining effect on the levels of haemoglobin its consumption needs to be encouraged among women in general and pregnant women in particular.

**Table 11:-** Meat Intake and the Levels of Haemoglobin.

Block	Intake In Grams	Haemoglobin in Grams			Total
		< 9	9.0 to 10.9	11 plus	
Kalpa	50	17	51	3	71
		70.83	68.91	100.00	70.29
	100	3	17	-	20
		12.50	22.97	-	19.80
	150	3	5	-	8
		12.50	6.75	-	7.92
	200	1	1	-	2
		4.16	1.35	-	1.98
Total		24	74*	3	101*
		100.00	100.00	100.00	100.00
Pooh	50	8	6	-	14
		44.44	21.42	-	26.41
	100	7	14	6	27
		38.88	50.00	85.71	50.94
	150	2	8	1	11
		11.11	28.57	14.28	20.75
	200	1	-	-	1
		5.55	-	-	1.88
Total		18*	28*	7	53*
		100.00	100.00	100.00	100.00
Nichar	50	7	39	2	48
		41.17	54.92	66.66	52.72
	100	4	26	1	31
		23.52	36.61	33.33	34.06
	150	5	5	-	10
		29.41	7.04	-	10.98

	200	1	1	-	2
		5.88	1.40	-	2.19
Total		17	71*	3*	91*
		100.00	100.00	100.00	100.00

\* N varies because some women do not take meat.

Since vegetables and other eatables are not available in large quantities in the study area the people tend to depend more on non-vegetarian food especially the red meat. It is also discernible from the data except for a small number of women in all the three blocks who do not take meat the rest of them are found consuming varying quantity of meat almost everyday, i.e. minimum once in a day, especially during counters. The data pertaining to Kalpa block indicate that more than two-third of women followed by one-fifth of the total women on average consume 50 gms and 100 gms of meat respectively. The data further reveal that in acute as well as moderate anaemia categories there also exists a definite and inverse relationship. But the relationship varies with the quantity of meat consumed and the level of haemoglobin. This means that the quantity of meat taken has a positive impact on the haemoglobin level of human beings in general and pregnant women in particular.

In Pooh block the data on meat consumption is more dispersed over differential quantity categories. While 50 percent of the women are found to taking on an average 100 gms of meat at a time there are one-fourth and one-fifth of the women consuming on an average 50 gms and 150 gms meat per day respectively. The further cross-tabulation between consumption and haemoglobin categories reveal prevalence of inverse relationship only in acute anaemia category. In the case of moderate anaemia such a relationship is found to exist only from 100 gms consumption of meat onwards.

In Nichar block more than 50 per cent of the pregnant women on an average take 50 gms of meat whereas one-third of them eat 100 gms meat per day on an average. The consumption of meat more than 100 gms is found among a very limited number of women. However, as for as the relationship between meat consumption and levels of haemoglobin goes a significantly inverse relationship is quite visible in all the categories of haemoglobin. On the basis of data analysis it becomes imperative to argue that meat has a determining effect on the levels of haemoglobin and its consumption therefore needs to be encouraged among the expectant mothers.

**Table 12:-** Fruit Intake and the Levels of Haemoglobin.

Block	Intake In Grams	Haemoglobin in Grams			Total	
		< 9	9.0 to 10.9	11 plus		
Kalpa	50	20	56	3	79	
		83.33	93.33	100.00	90.80	
	100	4	3	-	7	
		16.66	5.00	-	8.04	
Pooh	150	-	1	-	1	
		-	1.66	-	1.14	
	Total	24	60*	3*	87*	
		100.00	100.00	100.00	100.00	
Pooh	50	13	24	5	42	
		100.00	96.00	83.33	95.45	
	100	-	-	1	2	
		-	-	4.54	4.54	
Total	Total	13*	25*	6*	44*	
		100.00	100.00	100.00	100.00	
	Nichar	50	11	26	4	41
			91.66	86.66	100.00	89.13
100		1	3	-	4	
		8.33	10.00	-	8.69	
Total	150	-	1	-	1	
		-	3.33	-	2.17	
	Total	12*	30*	4*	46*	
		100.00	100.00	100.00	100.00	

\* N varies because some women do not take fruit.

Though the intake of fruit among the expectant mothers is generally conditioned by various myths and beliefs but fruit and fruit juices are highly significant from the point of view general health of all human beings as well as in bringing about improvement in the levels of haemoglobin. The intake of fruits like apple and dry fruits like almonds is highly nutritious as these contain iron as well as proteins respectively. The district Kinnaur has considerably high production of apples and dry fruits which are also locally available in plenty. Despite the said facts the data indicate that not all women in all the three blocks consume fruits in a regular manner. However, approximately 70 percent of the total women consuming these fruit vary in numbers as well as quantity of consumption from block to block. In Kalpa almost 91 percent of women on an average consume 50 gms fruits in a day

**Table 13:-** Sweets intake and the Levels of Haemoglobin.

Block	Intake In Grams	Haemoglobin in Grams			Total
		< 9	9.0 to 10.9	11 plus	
Kalpa	50	-	3	-	3
		-	37.5	-	25.00
	100	3	3	-	6
		75.00	37.5	-	50.00
	150	1	2	-	3
		25.00	25.00	-	25.00
Total		4*	8*	-	12*
		100.00	100.00	-	100.00
Pooh	50	1	1	-	2
		16.66	16.66	-	15.38
	100	4	3	1	8
		66.66	50.00	100.00	61.53
	150	1	2	-	3
		16.66	33.33	-	23.07
Total		6*	6*	1*	13*
		100.00	100.00	100.00	100.00
Nihar	50	-	5*	1*	6*
		-	100.00	100.00	100.00
Total		-	5	1	6
		-	100.00	100.00	100.00

\* N varies as only very few women consume sweets.

Followed by a very small number consuming 100 gms per day. The data however indicate that the maximum number of women concentrated in both acute as well as moderate anaemia categories are found consuming the least quantity of fruits. With the rise in the quantity of fruit consumption the number of women comes down considerably. The data though has limitations due to lop sided distribution, yet indicate an inverse relationship between fruit consumption and level of haemoglobin.

In Pooh block the data indicate that the fruit consumption is limited in the case of maximum number of respondents to just 50 gms per day. Because of the limited consumption of fruit not much comes out as for as any association between fruit consumption and haemoglobin levels is concerned, It is only in the case of moderate anaemia category that an inverse relationship is found existing. The similar trend is also visible in Nihar block where most of the women consume only about 50 gms fruit every day. In this block too the data indicate an inverse relationship between fruit consumption and level of haemoglobin.

### Concluding Observations:-

In general, the physicians and health educators advise the women that during pregnancy they should have healthy diet for the well being of the mother and child. The studies conducted by medical, biologists, dieticians and social scientists have pointed out considerable impact of differential diet on varying levels of haemoglobin (Teteishi et al., 2023). Since the diet consumed by women include different items the item-wise analysis of food have been found quite revealing. The findings suggest no relationship between intake of wheat made chapati and levels of haemoglobin. Although the similar kind of situation is visible in the case of rice intake but even then the possibility

of rice intake influencing the levels of haemoglobin cannot be ruled out. This is precisely due to the fact that in one of the three blocks, i.e. Kalpa, such evidence is found. Similar is also found in the case of Dal (lentils) intake.

The study further suggests the importance of green and leafy vegetables in the determination of varying levels of haemoglobin. But the findings on the consumption of green and leafy vegetables indicate very limited consumption by the women. This is perhaps due to the climatic conditions which do not make available such iron rich dietary items. Despite the limitations governing the lives of women there is need to increase the intake of green and leafy vegetables by the women. Since there is enough land around one's house some of the vegetables like spinach etc. which can be easily grown around their homes.

The varying intake of milk and milk products like curd and lassi indicate an inverse association with varying levels of haemoglobin. But the consumption of these products is very limited in all the three blocks. It is therefore quite important that the consumption of milk and milk products increases among the women. Since there are natural limitations governing the area due its topography and harsh climatic conditions, the PRIs and other people's organizations must take an active part in organizing enterprises to enhance productivity of such vital food items.

The other important food that has considerable impact on varying levels of haemoglobin is non-vegetarian food like meat. There is also evidence to suggest that most people eat meat as part of their food, especially during the winters when the vegetables are not available. The intake of meat therefore needs to be encouraged among the expectant mothers. At the same time, the need is to monitor the intake of such items as it contains considerable fats that can induce some other problems for the pregnant mothers who are otherwise also prone to anaemia as well as in some cases other complications.

Apart from meats and other type of non-vegetarian food there are other vegetarian items rich in iron and grown in abundance in Kinnaur. These items include fruits and dry fruits. The apple is an important source of iron, vitamin c and carbohydrates. The consumption of these items is there but in very limited quantity. Since these fruits are easily available the expectant mothers must be encouraged to take these in their natural condition or in a modified form.

The findings therefore indicate that on the whole the intake of dal, green and leafy vegetables, eggs, fruits and sweets remains very limited among the women in Kinnaur. Therefore there is need to encourage the intake of such items. Since curd, lassi, cheese, meats and milk considerably influence the levels of haemoglobin and have an inverse association the consumption of such items hold considerable promise for the expectant mothers and the child. Therefore need to be encouraged.

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