6 RESULTS AND DISCUSSION

Anaemia (iron deficiency in blood), a highly occurring malnutrition related disorder is prevalent in adolescent girls of *Thar* desert region of Rajasthan, especially in rural population. The government of Rajasthan is running a free of cost iron supplementation programme for women since last so many years. The impact of this novel scheme is much less than desired because, like other community nutrition schemes, the iron supplementation programme also has more emphasis on feeding rather than educating the illiterate rural woman folk regarding dangerous consequences of anaemia.

The present study is an action oriented research plan in which innovative educational tools (video and folk songs) have been used with or without iron folate supplementation to assess the relative effectiveness of various strategies to increase the haemoglobin level and knowledge on various aspects of anaemia among adolescent girls of *Thar* desert.

The subject, problem, and general scenario related to direct and indirect involvement of various factors concerned to present problem has been dealt in length in chapter 1 (Introduction). The Chapter 2 (Review of Literature) presents review of literature related to present study. Chapter 3 (Profile of *Thar* Desert region) describes the profile of *Thar* desert region. The specification of the problem has been given in detail in chapter 4 (specification of problem). Chapter 5 (Methodology and Execution of Research Plan) attempts to give the detailed methodology used in present investigation and execution of research plan. This chapter presents findings of the study and discussion on these findings.

The present study is unique in many respects as it involved so many factors and more over, investigator could not come across single study of such nature from India. Therefore, a fitting style has been chosen to describe and discuss the findings in a systematic manner.

6.1 BACKGROUND INFORMATION ON THE PARTICIPANTS

The general profile of selected villages has been described in chapter 5. The background information on selected participants is given in Table 6.1. In the selected villages of arid as well as semi-arid zone of *Thar* desert region, majority of participants belonged to medium sized families. However, in arid village Mogra Kalan and Sekhala 20.8% and 33% participants, respectively had large family size. Contrary to this, in semi-arid village Gundoj and

Table 6.1. Background information on the selected participants.

Particular	Arid zone		Semi arid zone	
	Mogra Kalan	Sekhala	Gundoj	Nimmera Kalan
Participants' family size				
Large (> 7) members	25 (20.8)[b]	33 (27.5)	18 (15.0)	20 (16.7)
Medium (5 - 7 members)	71 (59.2)	64 (53.3)	56 (46.7)	57 (47.5)
Small (< 5 members)	24 (20.0)	23 (19.2)	46 (38.3)	43 (35.8)
Major occupation of participants' families				
Farming	88 (73.3)	64 (53.3)	67 (55.8)	70 (58.3)
Labour	2 (1.7)	21 (17.5)	12 (10.0)	13 (10.8)
Others[a]	19 (15.8)	16 (13.3)	10 (8.3)	12 (10.0)
Farming + labour	1 (0.8)	8 (6.7)	0 (0.0)	1 (0.8)
Farming + others	7 (5.8)	4 (3.3)	31 (25.8)	24 (20.0)
Labours + others	1 (0.8)	2 (1.7)	0 (0.0)	0 (0.0)
Farming + labour + others	2 (1.7)	5 (4.2)	0 (0.0)	0 (0.0)
Land holdings of participants' families				
0 ha	2 (1.7)	21 (17.5)	12 (10.0)	13 (10.8)
0 - < 2 ha	26 (21.7)	20 (16.7)	21 (17.5)	34 (28.3)
2- < 4 ha	67 (55.8)	14 (11.7)	26 (21.7)	39 (32.5)
4- < 6 ha	10 (8.3)	22 (18.3)	27 (22.5)	20 (16.7)
6- < 8 ha	5 (4.2)	10 (8.3)	8 (6.7)	6 (5.0)
8- < 10ha	2 (1.7)	8 (6.7)	8 (6.7)	4 (3.3)
10 - < 12 ha	3 (2.5)	11 (9.2)	6 (5.0)	2 (1.7)
12 - < 14 ha	2 (1.7)	7 (5.8)	6 (5.0)	2 (1.7)
> 14 ha	3 (2.5)	7 (5.8)	6 (5.0)	0 (0.0)
Participants' families having irrigation facilities				
0 ha	120 (100.0)	112 (93.3)	85 (70.8)	87 (72.5)
0 - < 5 ha	0 (0.0)	6 (5.0)	22 (18.3)	27 (22.5)
5 - < 10 ha	0 (0.0)	2 (1.7)	9 (7.5)	4 (3.3)
10 - < 14 ha	0 (0.0)	0 (0.0)	2 (1.7)	2 (1.7)
> 14 ha	0 (0.0)	0 (0.0)	2 (1.7)	0 (0.0)

Participants' education level				
Illitrate	94 (78.3)	98 (81.7)	70 (58.3)	76 (63.3)
Studied, 1 st - < 3rd std.	10 (8.3)	7 (5.8)	18 (15.0)	16 (13.3)
Studied, 3rd - < 5th std.	6 (5.0)	5 (4.2)	12 (10.0)	14 (11.7)
Studied upto or > 5th std.	4 (3.3)	3 (2.5)	10 (8.3)	7 (5.8)
Only functionally litreate	6 (5.0)	7 (5.8)	10 (8.3)	7 (5.8)

a = Others include animal husbandry, horticulture, govt./ private services, local buisness including money lending, and family professions like iron smithy, capentry, barber, gold smithy, cobbler, etc.

b = Values in parentheses are percentages and may not add to 100 due to rounding.

Nimmera Kalan 38.3% and 35.8% participants, respectively belonged to small family size.

The agriculture is main occupation of participants' families in all the villages. Thus, the village economies in both arid and semi-arid zone is agrarian. Although traditional patterns of cultivation were dominant, some modern adaptation like use of hybrid seeds, and use of tractors in field preparations and seed sowing were seen more in semi-arid villages as compared to arid villages.

In all the villages, majority of participants families had land holding between 1 to 6 ha. In arid village Mogra Kalan and Sekhela families of 1.7 % and 17.5% participants, respectively were landless. In semi-arid village Gundoj families of 10% participants were landless, while in Nimmera Kalan 10.8% participants' families did not own any land.

As far as irrigated land is concerned, in arid village Mogra Kalan not a single participants family had any irrigation facility. Entire village depends on rain-fed farming, however in arid village Sekhela, 6.7 % participants' families had some irrigated land. In semi-arid village Gundoj, 29.2% participants' families had irrigated land, while in Nimmera Kalan, 27.2 % participants' families had source of irrigation. Rest of agricultural land in these villages were rain-fed.

Majority of participants' in all selected villages were illiterate. However, illiteracy was of higher order in arid villages as compared to semi-arid villages.

Of the 120 participants in each village, Mogra Kalan had 10(8.3%) married adolescent girls, while in Sekhala the number of married participants was 13(10.8%), and in village Gundoj and Nimmera Kalan the number of married participants was 7(5.8%) and 8(6.7%), respectively.

From these data it was clearly discernible that economic structure of semi-arid villages was relatively better as compared to arid village. More over, the level of literacy was also much better in semi-arid villages than that of arid villages. In an agrarian economy, it is always difficult to estimate the actual income and food expenditure (Kashyap and Young 1989). Though in present investigation attempt was made to quantify these factors, the task could not be accomplished precisely. However, in general, land owners, producing their own staple grain and pulses did not consider the cost of food in family budget. Labourers often obtained grain as wages and therefore, included only part of the cost of their food in such budget. However, this was not the case with labourers obtaining only cash wages and the families had other occupation than farming. For them the bulk of family budget was food related and found to be highly affected with seasonal fluctuations in market prices.

6.2 CROPS AND CROPPING PATTERNS

In *Thar* desert region though a very small area comes under semi-arid zone but there exist many variations in crops and cropping pattern in arid and semi-arid zones (Table 6.2 and Table 6.3). The cropping season 'Kharif' is closely related with south -west monsoon and 'Rabi' is associated with dry winter season. Three seasons of the year are generally recognized :

Table 6.2. Percentages of major crops cultivated in Kharif and Rabi seasons in arid village Mogra Kalan and Sekhala[a].

Crop	Mogra Kalan		Sekhala	
	Kharif	Rabi	Kharif	Rabi
Pearl millet	100.0 (98)[b]	-	89.1 (74)	-
Moong bean	27.5 (27)	-	31.3 (26)	-
Moth bean	21.4 (21)	-	37.3 (31)	-
Cluster bean	12.2 (12)	-	18.1 (15)	-
Sesamum	-	-	24.1 (20)	-
Chillies	-	-	7.2 (6)	-
Gram	-	-	-	4.8(4)
Mustard	-	-	-	8.4(7)
Wheat	-	-	-	2.4(2)
Seasonal vegetables	-	-	2.4 (2)	3.6(3)

a = Data are based on number of participants whoes families owned cultivable lands.
b= Values in parentheses indicate number of participants.

Table 6.3. Percentages of major crops cultivated in Kharif and Rabi seasons in semi-arid village Gundoj and Nimmera Kalan[a].

Crop	Gundoj		Nimmera Kalan	
	Kharif	Rabi	Kharif	Rabi
Pearl millet	78.6 (77)[b]	-	78.9 (75)	-
Moong bean	32.6 (32)	-	40.0 (38)	-
Moth bean	2.0 (2)	-	5.3 (5)	-
Cluster bean	38.8 (38)	-	42.1 (40)	-
Sesamum	24.5 (24)	-	23.1 (22)	-
Maize	30.6 (30)	-	22.0 (21)	-
Sorghum	11.2 (11)	5.1 (5)	8.4 (8)	8.4 (8)
Chillies	4.1 (4)	-	6.3 (6)	-
Barley	-	32.6 (32)	-	15.8 (15)
Gram	-	47.9 (47)	-	42.1 (40)
Mustard	-	53.1 (52)	-	48.0 (46)
Wheat	-	21.4 (21)	-	23.1 (22)
Cumin	-	30.6 (30)	-	12.6 (12)
Seasonal vegetables	30.6 (30)	21.4 (21)	22.0 (21)	20.0 (19)

a = Data are based on number of participants whoes families owned cultivable lands.
b= Values in parentheses indicate number of participants.

- The dry and cold winter season (November -February),
- The hot-summer season (April to June)
- The season of rains (July to September)

The month of October represents a transitional phase between rainy season and winter, and similarly month of March represents a transitional phase between winter and summer season.

On the basis of climate features of Indian arid zone described by Ramakrishna (1997), the arid village of present study i.e., Mogra Kalan and Sekhela had mean annual total rainfall around 300 mm, while semi-arid villages i.e., Gundoj and Nimmera Kalan had mean annual rainfall around 450 mm. Out of the total annual rainfall, 90 % is received during rainy season in both arid and semi-arid zone. The temperature regime in arid and semi-arid villages of present study did not have any significant variations. The prevalence of clear skies and high insolation results in very high temperature, especially in summer. May and June are the hottest months with mean air temperature in range of 40^{o} - $43\ ^{o}$ C. However, on individual days temperature of the order of 47^{o} to $50\ ^{o}$ C are also recorded (Ramakrishna and Rao 1992). October onwards with the withdrawal of monsoon, temperature begin to fall steadily. In winter season the minimum temperature vary from 3^{o} C to $10\ ^{o}$ C with occasional frost (temperature goes down below 0^{o} C). As far as relative humidity is concerned, in semi-arid zone villages of present study it was comparatively of higher order than the arid zone villages.

In the present study arid village Mogra Kalan was completely dependent on rain-fed agriculture. Only Kharif crop is grown in the village (Table 6.2). Pearl millet was dominant crop followed by Moong bean and Moth bean. The situation was more or less similar in other arid village i.e., 'Sekhala'. As few families in village - sekhala had irrigation sources (tube wells), therefore, Rabi crop and vegetables are also taken in small pockets. Gram and mustard were main Rabi crops.

In semi-arid village Gundoj and Nimmera Kalan, crop diversification was relatively of high order (Table 6.3). Besides, comparatively favourable climatic conditions, both the villages had sources of irrigation. In both Gundoj and Nimmera Kalan, pearl millet was main Kharif crop. Besides, pearl millet maize was other staple grain crop. The oil seed crop sesamum, was also taken during Kharif season. In Rabi, mustard was main crop in both Gundoj and Nimmera Kalan. After mustard, gram was highly favoured by the farmers as it require very little water. Wherever, irrigation facilities existed the grain spice cumin was taken frequently as cash crop. In both villages (Gundoj and Nimmera Kalan) seasonal vegetables are taken by a number of farmers in Kharif as well as in Rabi season.

From the comparison of Table 6.2 and Table 6.3, it was evident that due to relatively favourable climatic conditions and better irrigation facilities, in semi-arid village Gundoj and Nimmera Kalan the intensity of cultivation and crop diversification were of high order as compared to arid village Mogra Kalan and Sekhala. The density of rain-fed cropping vary from year depending on the rainfall pattern (Ram and Lal 1997). The production do not

commensurate with the area sown. However, in case of irrigated areas production was found to be directly related with area sown. It was very interesting that in *Thar* desert intensity of cultivation decreases from east to west (Ram et. al., 1993). The semi-arid villages of present study were also located eastward and had fairly high intensity of cultivation as compared to arid village Mogra Kalan and Shekhala located in the west.

6.3 PARTICIPANTS' FOOD HABITS, HEALTH PROBLEMS, VIEWS REGARDING EDUCATION AND SOME OTHER RELEVANT INFORMATIONS

In all the villages of present study 80 % participating adolescent girls were vegetarian (Table 6.4). A thorough discussion on food habits with participants revealed that those who responded as non-vegetarians were just occasional non- vegetarians. Tewari (1993) also found similar trends while studying the nutritional pattern of two arid villages of western Rajasthan (which were parts of *Thar* desert).

Irrespective of climatic zones (i.e., arid and semi-arid), in all the four villages of present study cereals and pulses were the most common daily foods. Milk and milk products, especially butter milk is consumed by only 14.2-17.5 % participants in their day to day food. However, percentage of participants who responded as they consume green leafy and other vegetables in their common daily foods were relatively much higher in semi-arid village Gundoj and Nimmera Kalan, as compared to arid village Mogra Kalan and Sekhala.

Table 6.4. Informations related to participants' food habits, health problems, views about education, etc.

Particular	Arid zone		Semi arid zone	
	Mogra Kalan (%)	Sekhala (%)	Gundoj (%)	Nimmera Kalan (%)
Food habits[a]				
Vegetarian	84.2 (101)*	88.3 (106)	98.3 (118)	95.7 (117)
Non-vegetarian	15.8 (19)	11.7 (14)	1.7 (2)	2.5 (3)
Common daily foods[b]				
Cereals and pulses	100.0 (120)	100.0 (120)	100.0 (120)	100.0 (120)
Milk and milk products	14.2 (17)	10.0 (12)	17.5 (21)	14.2 (17)
Green leafy vegetables	2.5 (3)	1.7 (2)	10.0 (12)	8.3 (10)
Other vegtetables	9.2 (11)	6.7 (8)	28.3 (34)	25.0 (30)
Fruits	0.0 (0)	0.0 (0)	1.7 (2)	0.8 (1)
Eggs	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)
Meat and fleshy foods	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)
Foods eaten during preganancy and lactation in addition of normal food[b]				
Milk	35.0 (42)	32.5 (39)	49.2 (59)	45.8 (55)
Butter and ghee	18.3 (22)	14.2 (17)	41.7 (50)	41.7 (50)
Dry fruits	5.8 (7)	7.5 (9)	18.3 (22)	20.0 (24)
Traditional medicinal foods	50.0 (60)	49.2 (59)	65.8 (79)	62.2 (75)
Excess fruits and vegetables	4.2 (5)	5.8 (7)	21.7 (26)	20.8 (25)
Common health problems[b]				
No problem	45.8 (55)	35.0 (42)	50.0 (60)	43.3 (52)
Pain in back	8.3 (10)	12.5 (15)	10.0 (12)	14.2 (17)
Pain in extremities	1.7 (2)	0.8 (1)	1.7 (2)	0.0 (0)
Weakness	36.7 (44)	38.3 (46)	30.0 (36)	34.2 (41)

Breathelessness	16.7 (20)	15.8 (19)	13.3 (16)	15.0 (18)
Tiredness during normal work	43.3 (52)	40.8 (49)	32.5 (39)	37.5 (45)
Doctor's help is sought in case of falling ill[a]				
Immediately	10.8 (13)	9.2 (11)	21.7 (26)	20.8 (25)
After 3-4 days	48.3 (58)	38.3 (46)	53.3 (64)	55.0 (66)
After 7 days	33.3 (40)	41.7 (50)	20.0 (24)	20.8 (25)
Never	7.5 (9)	10.8 (13)	5.0 (6)	3.3 (4)
Views regarding education[a]				
Want to study	49.2 (59)	32.5 (39)	61.7 (74)	55.0 (66)
Do not want to study	50.8 (61)	67.5 (81)	38.3 (46)	45.0 (54)
Type of education desired[c]				
Formal	16.9 (10)	12.8 (5)	40.6 (30)	31.8 (21)
Informal	20.4 (12)	41.0 (16)	21.6 (16)	16.7 (11)
Non formal	62.7 (37)	46.2 (18)	37.8 (28)	51.5 (34)
Programmes preferred on TV/ radio[a]				
Entertainment	66.7 (80)	64.2 (77)	57.5 (69)	58.3 (70)
Eduacational	21.7 (26)	11.7 (14)	21.7 (26)	17.5 (21)
Both	11.6 (14)	24.1 (29)	20.8 (25)	24.2 (29)

a = Percentages were computed on the individual response of the participants (one participant one response).

b = Percentages were computed on the basis of multiple responses of participants (one participant may have more than one response).

c = Percentages were computed only on the basis of participants having affermative response (one participant may have more than one response).

* Values in parthenses indicate number of participants.

The average age of participating adoloscent girls in village Mogra, Kalan, Sekhala, Gundoj and Nimmera Kalan was 14.9, 14.7, 16.7 and 15.9 years, respectively. As 8.3 % and 10.8 % participating adolescent girls were married in arid village Mogra Kalan and Sekhala, respectively and 5.8 % and 6.7 % in semi-arid village Gundoj and Nimmera Kalan, respectively. In addition of normal food, milk was the main supplementary food of pregnant and lactating women. However, milk and milk products had better accessibility to women in semi-arid villages as compared to arid villages. Similarly dry fruits, traditional medicinal foods and fresh fruits and vegetables were available to pregnant and lactating females of semi-arid village Gundoj and Nimmera Kalan in relatively higher quantum as compared to arid zone villages Mogra Kalan and Sekhala.

With exception of arid village Sekhala, where only 42 % participating adolescent girls did not have any health problem (according to their response), in the rest three villages 50 % participants responded as not having any health problem. The participants who had responded as that they are having some health problems, weakness and tiredness during normal work were most common ones. On asking how much time they take to seek doctors help in case of illness, more than 70 % participants in each village responded as 3-7 days or even more. However, in semi-arid village Gundoj and Nimmera Kalan 21.7 % and 20.8 % participating adolescent girls, respectively indicated that they immediately contact to doctor on falling ill. Perhaps better health care facilities in these two semi-arid villages motivated to literate rural folk of these villages in this direction.

Though the majority of selected participants in the present investigation were illiterates (in each village), a sizable chunk of participants in semi-arid village Gundoj (61.7 %) and Nimmera Kalan (55.0 %) wanted to have some kind of education. However, in arid village Mogra Kalan and Sekhala, only 49.2 % and 32.2 % participants, respectively wanted to have some kind of education. Out of total participants (in each village) who responded as willing to have some kind of education, the most common type of education desired was non formal functional education essential for day to day work.

On asking what type of programmes are preferred on radio and television, the most common reply was entertaining programmes like film music, films, dramas, serials, etc. Only very small percentage of participants in each village were found to be interested in educational programs, on radio and television.

The data presented in Table 6.1, 6.2, 6.3 and 6.4 are based on the information gathered through primary survey schedule. The personal and social background of participants in arid village Mogra Kalan and Sekhala, and semi-arid village Gundoj and Nimmera Kalan revealed that target group in present study predominantly belonged to farming community and majority of them were illiterates. The data described in section 6.1, 6.2 and 6.3 in the present chapter explained the background informations on participants, crop and cropping patterns, and food habits, health problems and attitude and opinions of participants regarding education and literacy in each selected village.

Despite the availability of irrigation facilities, especially in semi-arid zone and also in canal area of Indira Gandhi Nahar Pariyojana (IGNP) still 89 % of the area is fit only for dryland farming (Mann et. al., 1977). The system of agriculture, especially in vast arid zone of *Thar* desert region followed, is thus expressive of the limitations imposed by aridity, subsistance farming is largely in vougue which tends to make farmer security oriented (Bose et. al., 1966).

In arid zone village of present study lack of irrigation facilities prevents most farmers from taking Rabi crops and seasonal vegetables. In fact, this is the general scene of arid zone of *Thar* desert region. The failure or inconsistency of rainfall often resulted in heavy losses of Kharif crop. The such phenomenon had direct bearing on farmers economy, which in turn had a negative impact on developmental activities. In case of semi-arid zone villages of present study, the available irrigation facilities and relatively favorable climatic conditions support both Kharif and Rabbi crops. More over, 20-30.6 % farmers also take seasonal vegetables. The part of these vegetables are sold in near by markets which fetches good returns and part of these are consumed in farmers' households. The better crop production in semi-arid zone villages was directly related with better economies of farmers. The relative resource richness of farmers in semi-arid zone villages positively influenced the pace of developmental activities and can be seen in form of better educational facilities, satisfactory health care facilities, better civic facilities, etc., etc.

All above mentioned factors appeared to be closely related with female literacy patterns. Relatively high percentages of female literacy in semi-arid villages, Gundoj and Nimmera Kalan as compared to arid villages, Mogra Kalan and Sekhala were the resultant of interaction of so many factors like, over all better economy of villagers, rapid developmental activities, availability of quality food and positive attitude of villager towards education. On glancing Table 5.1, 5.2, 5.3 and 5.4 (previous chapter-Methodology and Execution of Research Plan), it is quite clear that differences in male literacy pattern of arid zone and semi-arid zone villages of present study were not significant, however, in case of female literacy, the villages of semi-arid zone were ahead. The same trend was reflected in case of participants selected for the study (sample).

All persons, especially those who are economically weaker, are liable to be affected by adverse seasonability (Chambers 1983). Adult men are also far from immune though women and children are worst affected . Careful and very detailed research in Gambia (White head et. al., 1978; Rowland et. al., 1981 ; Roberts et. al., 1982) and Bangladesh (Chowdhury et. al., 1981 ; Brown et. al., 1982) revealed that cropping patterns, climatic variations and agro-ecological conditions of terrain had direct impact on physical status of women and children. In fact, these studies raised the question whether, where and to what extent rural women in different parts of India are affected by such varied situations ?.

6.4 HAEMOGLOBIN LEVEL OF PARTICIPANTS AND IMPACT OF INTERVENTIONS

One of the major aims of present study was to analyse the impact of iron supplementation, nutrition education and combination of iron supplementation and nutrition education, on haemoglobin level of participants. This section of findings deal with pre and post intervention haemoglobin level of participants at individual village level.

6.4.1 General Trends

Data on pre and post intervention haemoglobin level of participants at individual village level are set in Table 6.5 . In the entire foregoing discussion the values of haemoglobin is given as g/100 ml, which actually refers to g/100 ml of blood.

In arid village Mogra Kalan, three treatments viz. simple iron folate tablet supplementation (T1), education on anemia through video (T2) and combination of treatment T1 and T2 (T3) were employed. Before intervention (Pre-treatment) mean haemoglobin level of participants in treatment group T1, T2 and T3 were 8.29, 8.54 and 8.25 g/100 ml, respectively. All the three intervention had positive impact on improvement of haemoglobin level of participants in different treatment groups. On an average, the post treatment haemoglobin level of participants in treatment T1, T2 and T3 registered an increase of 11.4%, 9.2% and 25.7%, respectively.

In second arid sample village Sekhala the treatments employed were simple iron folate tablet supplementation (T1), education on anaemia

Table 6.5. Mean haemoglobin level of participants before and after the treatments in each village.

Village/ Treatment	Pre treatment			Post treatment		
	Mean (g/100ml)	Std. error (±)	Range	Mean (Score)	Std. error (±)	Range
Arid Zone						
Mogra Kalan						
T1	8.29	0.04	8.0-8.8	9.36	0.07	9.0-11.5
T2	8.54	0.07	8.0-9.3	9.33	0.10	8.0-11.0
T3	8.25	0.04	8.0-8.7	10.37	0.05	10.0-11.0
Sekhala						
T1	8.50	0.07	8.0-9.2	9.71	0.10	8.0-11.5
T4	8.34	0.07	8.0-9.5	8.97	0.13	8.0-11.5
T5	8.41	0.06	8.0-9.5	9.83	0.10	8.9-11.4
Semi arid zone						
Gundoj						
T1	8.81	0.08	8.0-9.9	10.04	0.08	9.0-11.0
T2	8.71	0.09	8.0-9.7	9.51	0.10	8.0-10.5
T3	8.77	0.07	8.0-9.6	11.13	0.07	9.8-11.8
Nimmera Kalan						
T1	8.68	0.05	8.0-9.3	9.43	0.06	8.5-10.3
T4	8.69	0.07	8.0-9.7	*9.46*	*0.09*	*8.5-10.5*
T5	*8.50*	*0.06*	*8.0-9.3*	*9.91*	*0.12*	*8.8-11.7*

T1 = Simple iron folate tablet supplementation; T2 = Education on anemia through video
T3 = Combination of T1 and T2; T4 = Education on anaemia through folk songs; T5 = Combination of T1 and T4

through folk songs (T4) and combination of T1 and T4 (T5). In this village before intervention (pre-treatment) haemoglobin level of participants in treatment T1, T4 and T5 were 8.50, 8.34 and 8.41 g/100 ml, respectively. After the intervention (post-treatment) the haemoglobin level of participants increased by 14.2%, 7.5% and 16.9% in treatment T1, T4 and T5, respectively.

In semi-arid village Gundoj treatments employed were same as that of arid village Mogra Kalan (T1, T2 and T3). In this village, pre-treatment mean haemoglobin level of participants ranged from 8.71 g/100 ml (treatment group T2) to 8.81 g/100 ml (treatment group T1). These pre-treatment haemoglobin level values in different treatment groups were relatively higher than the pre-treatment haemoglibin level values of participants in different treatment groups at arid village Mogra Kalan (In semi- arid village Gundoj and arid village Mogra Kalan the treatments were same). The same trend was also reflected in the pre-treatment range of haemoglobin values of participants under different treatments groups in these two villages. The post intervention mean haemoglobin values of participants exhibited an increase of 13.9%, 9.2% and 25.5% in treatment group T1, T2 and T3, respectively in this semi-arid village (Gundoj). Like wise, in each treatment group post intervention range of haemoglobin level of participants showed an appreciable improvement.

In second selected semi-arid village Nimmera kalan, the treatments given in arid village sekhala were replicated (T1, T4 and T5). The pre treatment mean values of haemoglobin of participants in village Nimmera

Kalan were slightly on higher side as compared to arid village Sekhala. Similar trend was also evident in case of mean range of haemoglobin level of participants before intervention in different treatment groups . Like in all earlier mentioned villages, the impact of all the three treatment had positive effect on improvement of haemoglobin of participants semi-arid village Nimmera Kalan. The post treatment mean values of haemoglobin of participants in treatment T1, T4 and T5 showed an increase of 8.6%, 8.9% and 16.5%, respectively over the pre- treatment values.

From these findings , it is evident that all the treatments employed in present investigation improved the haemoglobin level of participants. According to the classification of normal limits of haemoglobin (Davidson and Passmore 1975), the haemoglobin level in 14 year old females should be around 12 g/100 ml. It is interesting to note that all the participants of the present study, irrespective of climatic zones and villages were anemic. In both the villages of arid zone, on an average, across all the treatments. the pre-intervention haemoglobin level of participants ranged from 8.25 to 8.50 g/100 ml. The same values for participants of semi-arid zone village ranged between 8.50 and 8.81 g/100 ml. Similar findings were reported by Sharma and Sharma (1992) while studying health profile of adolescent girls of tribal population in parts of Rajasthan. This chronic problem of anemia in adolescent girls of *Thar* desert region is related to malnutrition in larger extent (Tewari 1996). The common treatment i.e., T1 given in all the selected four villages, which also served as blind control (simple iron folate tablet supplementation) improved the haemoglobin level of participants to some extent. The treatment, T2 (education an anemia through vides) and T4

(education on anaemia through folk songs), which were educational strategies only succeeded in improving haemoglobin level of participants in respective village where the treatment were employed.

The combination of education on anaemia through video and iron folate supplementation (Treatment-T3), and the combination of education on anaemia through folk songs and iron folate supplementation (Treatment-T5) were found to be most effective for increasing the haemoglobin level of participants in respective villages where the treatment were employed. From the data it is crystal clear that though only iron supplementation and only education had some impact on improvement of haemoglobin level of participants in all the selected villages, however, the combination of iron supplementation with educational strategies had dramatic effect on improving the haemoglobin level of participating adolescent girls. These findings suggested that functional education on specific nutrition disorder if imparted with suitable supplementation can be very beneficial, especially to illiterate rural folks.

The innovative educational tool like video has also been proved very effective in educating illiterate rural folk regarding importance of nutrition in Philippines (the details of study has been referred by Kumar 1992). In the same study, it was also found that nutrition supplementation in combination with nutrition education through video had many folds higher impact in comparison to either nutrition education alone or sole nutrition supplementation.

6.4.2 Frequency Distribution Under Different Limits of Haemoglobin

To analyse the trend of haemoglobin level ranges in which the participants were distributed in each village before the interventions and impact of interventions on these range, light arbitrary classes of haemoglobin level ranges (each class had a difference of 0.50 g/100 ml) were formed taking the minimum pre- treatment value as lower extreme and maximum post-treatment value as upper extreme.

The pre and post frequency distribution pattern of participants under different class limits of haemoglobin at arid village Mogra Kalan and Sekhala are given in Table 6.6 and 6.7, respectively. Same data for semi-arid village Gundoj and Nimmera kalan are set in Table 6.8 and 6.9, respectively .

In arid village Mogra kalan, majority of participants in all the treatment groups before intervention were distributed in first two frequency classes of haemoglobin i.e., 8.00- g/100 ml and 8.50- g/100 ml. However, post treatment values exhibited varied trends. From the Fig.1 it is evident that in case of treatment T1 (simple iron folate tablet supplementation) there was little improvement in haemoglobin level of participants after intervention. From first two haemoglobin limit classes, they (95.7% participants) jumped into next two higher class limits (i.e. 9.00- g/100 ml and 9.50 - g/100 ml). When only education on aneamia through video was given (Treatment -T2), there was no change in class limits of haemoglobin of 32.5% participants. However 55% participants improved their class limit of haemolgobin level to some

Table 6.6. Improvement in participants' frequency distribution pattern under different class limits of haemoglobin in different treatments at arid village Mogra Kalan (In each case N= 40).

Class limits of haemoglobin (g/100 ml)	Treatment T1		Treatment T2		Treatment T3	
	Pre	Post	Pre	Post	Pre	Post
8.00 - < 8.50	23	0	16	1	25	0
8.50 - < 9.00	17	0	14	3	15	0
9.00 - < 9.50	0	21	10	19	0	0
9.50 - < 10.00	0	18	0	9	0	0
10.00 - < 10.50	0	0	0	4	0	19
10.50 - < 11.00	0	0	0	3	0	17
11.00 - < 11.50	0	0	0	1	0	4
11.50 - < 12.00	0	1	0	0	0	0

T1 = Simple iron folate tablet supplementation

T2 = Education on anemia through video

T3 = Combination of T1 and T2

Table 6.7. Improvement in participants' frequency distribution pattern under different class limits of haemoglobin in different treatments at arid village Sekhla (In each case N= 40).

Class limits of haemoglobin	Treatment T1		Treatment T2		Treatment T3	
(g/100 ml)	Pre	Post	Pre	Post	Pre	Post
8.00 - < 8.50	15	0	27	11	23	0
8.50 - < 9.00	14	1	6	6	12	1
9.00 - < 9.50	11	13	6	13	4	7
9.50 - < 10.00	0	14	1	5	1	20
10.00 - < 10.50	0	6	0	4	0	7
10.50 - < 11.00	0	3	0	0	0	3
11.00 - < 11.50	0	2	0	0	0	2
11.50 - < 12.00	0	1	0	1	0	0

T1 = Simple iron folate tablet supplementation

T4 = Education on anaemia through folk songs

T5 = Combination of T1 and T4

Table 6.8. Improvement in participants' frequency distribution pattern under different class limits of haemoglobin in different treatments at semi-arid village Gundoj (In each case N= 40).

Class limits of haemoglobin (g/100 ml)	Treatment T1		Treatment T2		Treatment T3	
	Pre	Post	Pre	Post	Pre	Post
8.00 - < 8.50	11	0	14	1	9	0
8.50 - < 9.00	6	0	7	5	11	0
9.00 - < 9.50	20	3	13	10	18	0
9.50 - < 10.00	3	11	6	12	2	1
10.00 - < 10.50	0	15	0	8	0	0
10.50 - < 11.00	0	10	0	4	0	7
11.00 - < 11.50	0	1	0	0	0	20
11.50 - < 12.00	0	0	0	0	0	12

T1 = Simple iron folate tablet supplementation

T2 = Education on anemia through video

T3 = Combination of T1 and T2

Table 6.9. Improvement in participants' frequency distribution pattern under different class limits of haemoglobin in different treatments at semi-arid village Nimmera Kalan (In each case N= 40).

Class limits of haemoglobin (g/100 ml)	Treatment T1		Treatment T2		Treatment T3	
	Pre	Post	Pre	Post	Pre	Post
8.00 - < 8.50	10	0	11	0	19	0
8.50 - < 9.00	20	4	16	10	14	2
9.00 - < 9.50	10	17	11	8	7	9
9.50 - < 10.00	0	13	2	11	0	11
10.00 - < 10.50	0	6	0	9	0	11
10.50 - < 11.00	0	0	0	2	0	4
11.00 - < 11.50	0	0	0	0	0	2
11.50 - < 12.00	0	0	0	0	0	1

T1 = Simple iron folate tablet supplementation

T4 = Education on anaemia through folk songs

T5 = Combination of T1 and T4

Fig. 1 Percentage distribution of participants under different class limits of haemoglobin (g/100 ml) before (pre) and after (post) employing different treatments.

Mogra Kalan
Haemoglobin

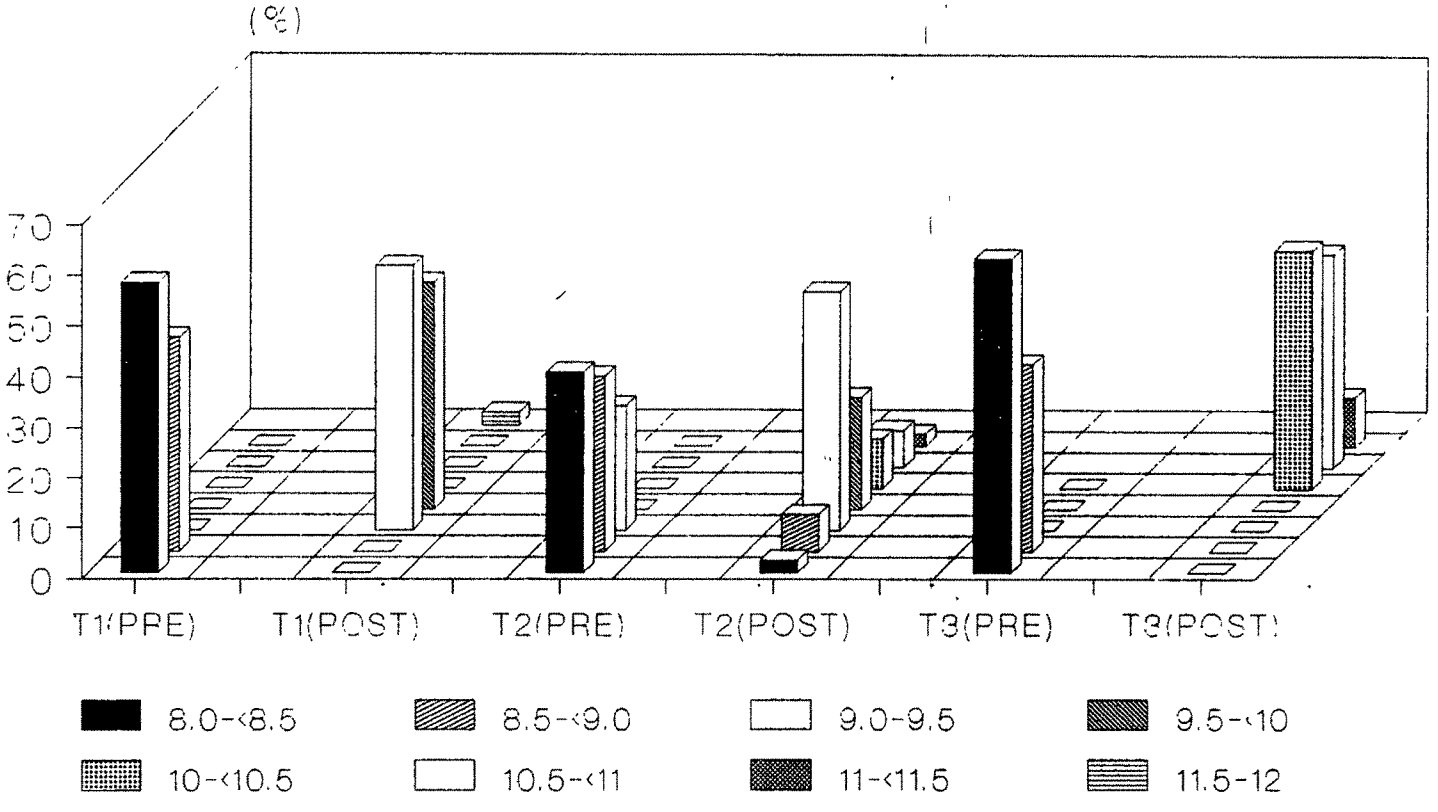

Fig.1

extent (22.5% each jumped into frequency class 9.00- 10.5 g/100 ml). In rest of the 10% participants there was an appreciable increase in haemoglobin level. The great impact of treatment T3 (education on anemia through video in combination of iron folate supplementation) was also seen in frequency distribution trend. Before treatment in this group all the participants were distributed in first two class limits of haemoglobin, however after the treatment was employed, all the participants (100.0%) improved their haemoglobin level appreciably and jumped into moderate to higher heamoglobin classes i.e. 10.00- 10.5% (47.5%). 10.5-% (42.5%) and 11.00 -, 11.5% (10%).

In second arid village i.e., Sekhala, the majority of participants in each treatment group were distributed in first three haemoglobin level range classes i.e., 8.00-% g/100 ml, 8.5- g/100 ml and 9.00- g/100ml. In case of treatment T1 where only iron folate supplementation was given, 30% participants haemoglobin level (Fig.2). The major shift in terms of improvement of haemoglobin level was observed from lower haemoglobin level range classes i.e., 8.00-8.50 g/100 ml to next higher haemoglobin range classes i.e. 9.00- g/100 ml, 9.50- g/100 ml and 10.00- g/100 ml. In case of treatment T4 (education on anaemia through folk songs), 60% participants did not show any improvement in their haemoglobin level in terms of shifting from lower class limits of haemoglobin to higher ones. In this case, the majority of shifting in frequency distribution after the administration of treatment occurred among the lower range of class limits of haemoglobin (i.e., from class limit 8.00- g/100 ml to 10.00- g/100 ml). Likewise , the treatment T3 of village Mogra Kalan, here the impact of treatment T4 (education on anaemia

Fig.2 Percentage distribution of participants under different class limits of haemoglobin (g/100 ml) before (pre) and after (post) employing different treatments.

Sekhala
Haemoglobin

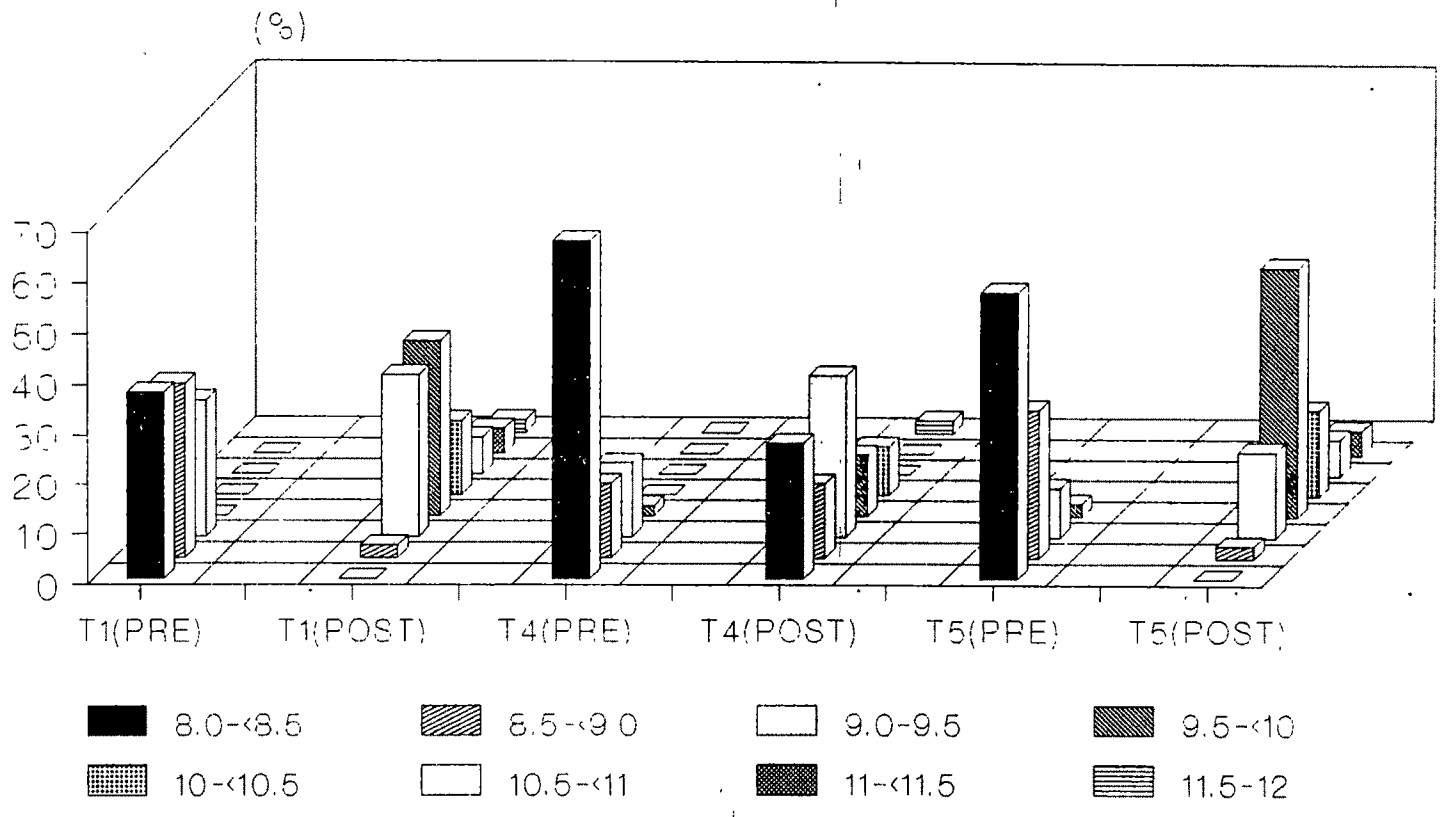

Fig.2

through folk songs in combination with iron folate supplementation was found to be maximum. Before intervention 97% participants in range limits of 8.00- g/100 ml, 8.50- g/100 ml and 9.0- g/100 ml. However, after the treatment 67.5% participants improved their haemoglobin level to the extent that they jumped into the haemoglobin range classes 9.50- g/100 ml and 10.00- g/100 ml. Twelve and a half percent participants attained a level of haemoglobin ranging from 10.5 to g/100 ml.

In semi-arid village Gundoj, majority of participants in each treatment group before interventions were distributed in haemoglobin range classes of 8.00- g/100 ml, 8.50- g/100 ml and 9.00 - 9.50 g/100 ml. After the treatment -T1 (simple iron folate supplementation) was administered, the majority of participants improved their haemoglobin level and shifted into higher haemoglobin range classes i.e., 9.50- g/ml (20%), 10.00- g/100 ml (37%) and 10.50- g/100 ml (25%) (Fig.3). In treatment T2 education on anaemia through video), 55% participants did not show any improvement in their haemoglobin range class limits, however, rest of participants improved the class limits of haemoglobin range and of them 20% were placed in haemoglobin range class of 10.00- g/100 ml and 10% in the haemoglobin range class of 10.50- g/100 ml. The maximum improvement in haemoglobin range class limits were noticed in treatment T3 (where education on anaemia was given with combination of iron folate supplementation). It is very interesting that in this treatment group before intervention cent percent participants belonged to haemoglobin range classes between 8.00 and g/100 ml. However, after intervention, 97% participants transferred into haemoglobin range classes between 10.50 to 12.00 g/100ml.

Fig. 3 Percentage distribution of participants under different class limits of haemoglobin (g/100 ml) before(pre) and after(post) employing different treatments.

Gundoj
Haemoglobin

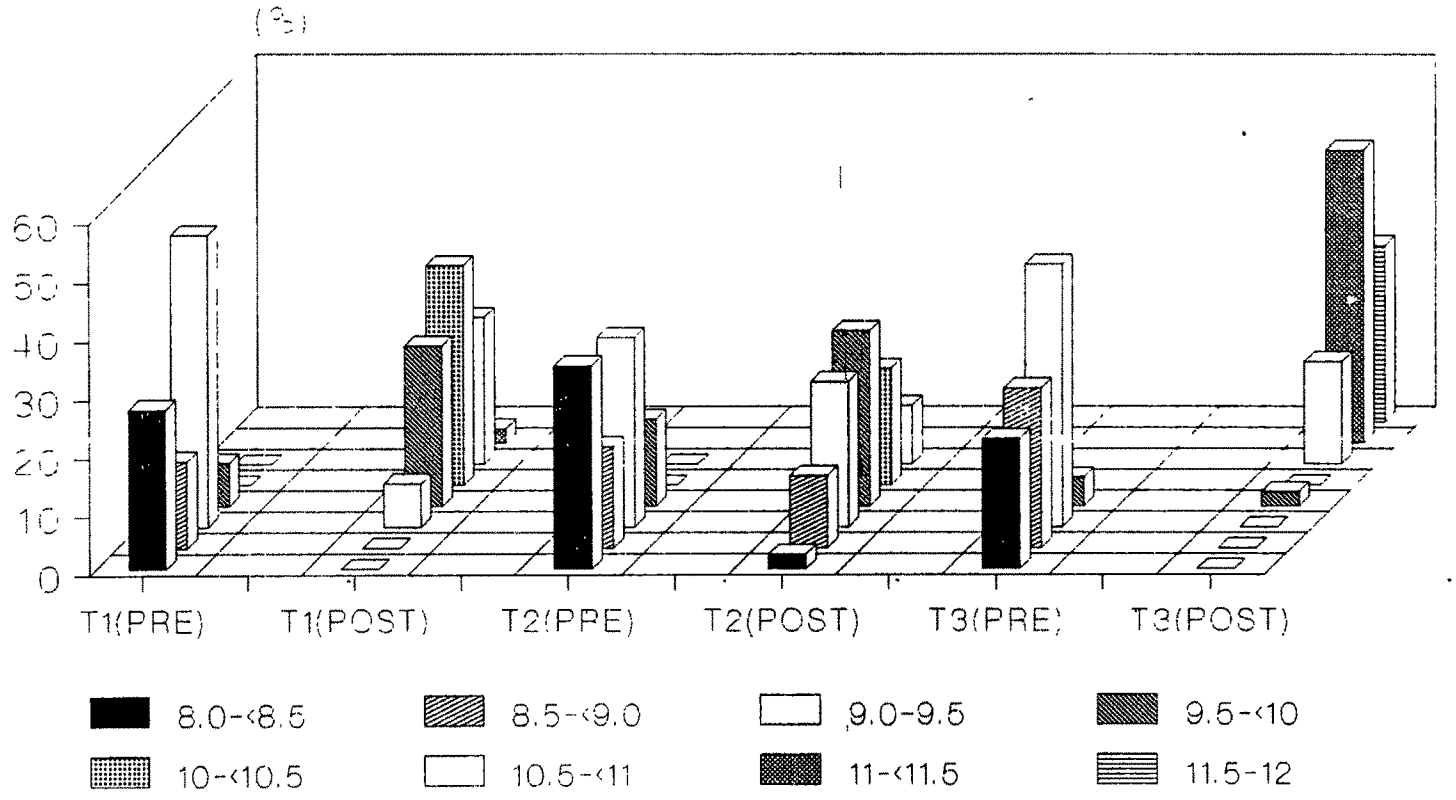

Fig.3

In another semi-arid village of present study i.e., Nimmera Kalan the trend of pre-intervention haemoglobin range class limits distribution were similar to that of village Gundoj. In general, all the treatments employed (i.e., T1,T4 and T5), improved the haemoglobin range class limits of participants (Fig.4). In this village, the treatment-T1 (simple iron folate supplementation) and treatment-T4 (education on anaemia through folk songs) found to be effective to similar extent as in case of treatment T1 and T2, respectively in arid village Sekhala, however, the treatment T5 (combination of iron folate supplementation and education on anaemia through folk songs) found to be most effective, as 72.5% participants jumped into higher haemoglobin range classes (i.e.,between 9.50 and g/100 ml) from lower haemoglobin range classes (i.e., between 8.00 and g/100 ml) after intervention.

All these findings suggested that combination of educational strategies with iron folate supplementation had maximum direct effect on improving haemoglobin level of anaemic adoloscent girls in arid and as well as in semi-arid zone villages of *Thar* desert. More over, the education through video was found to be more effective than the education through folk songs. Therefore, the impact of education on anaemia through video in combination with iron supplementation was of higher order in improving the haemoglobin level of participating adolescent girls as compared to the impact of education on anaemia through folk songs in combination of iron folate supplementation (at individual village level).

Fig. 4 Percentage distribution of participants under different class limits of haemoglobin (g/100 ml) before(pre) and after (post) employing different treatments.

Nimmera Kalan

Haemoglobin

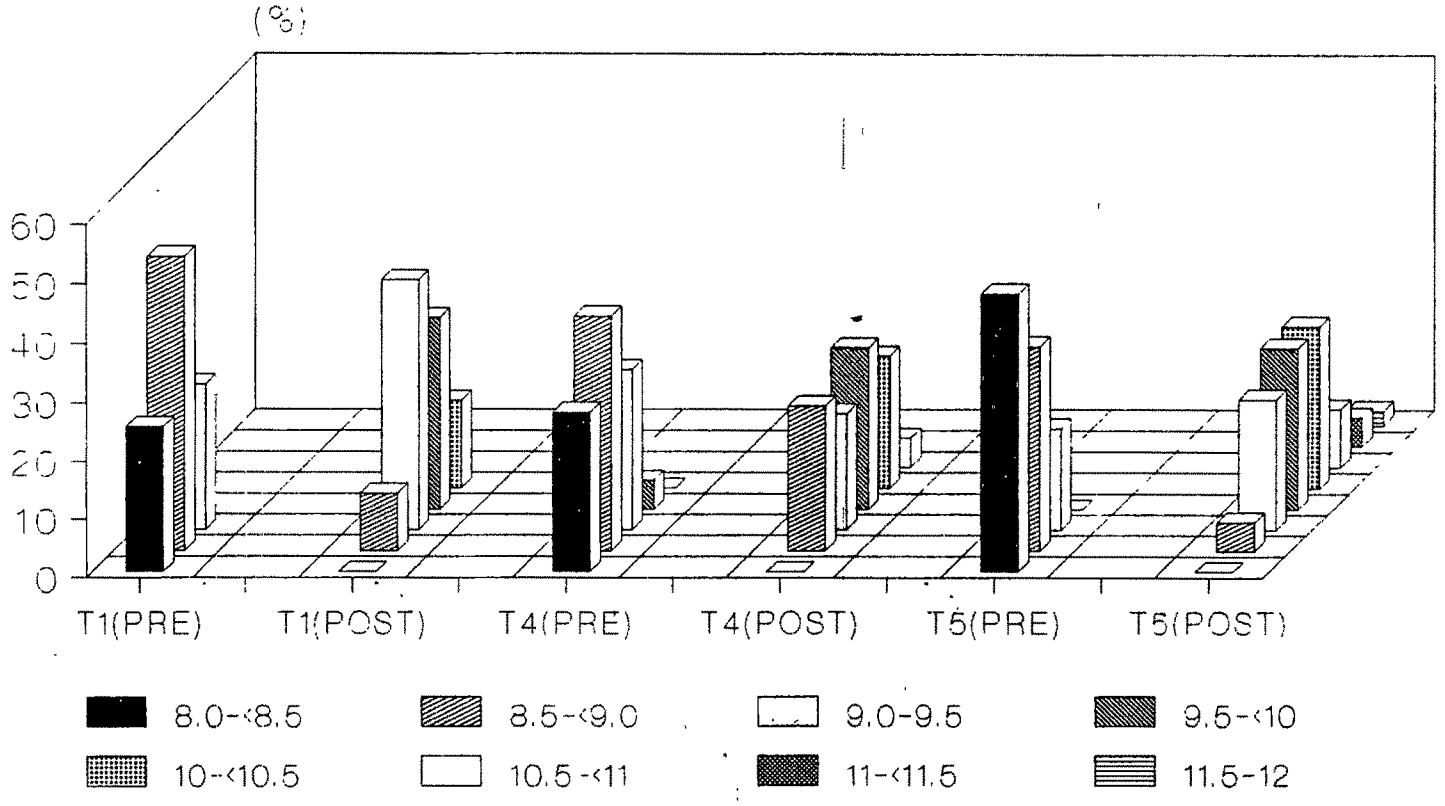

Fig.4

6.4.3 Actual Gain in Haemoglobin Level and Tests of significance

It is very important to assess the net gain in haemoglobin level of participants in each village after they are exposed to various treatment. From the Table 6.10, it is evident that the treatment-T3 (combination of education on anaemia through video and iron folate supplementation) resulted in maximum mean actual gain in haemoglobin level. In arid village Mogra Kalan, actual mean gain in heaemoglobin level of participants under this treatment was 2.15 g/100 ml, while at semi-arid village Gundoj under same treatment actual mean gain in haemoglobin level of participants was 2.36 g/100 ml. The next most effective treatment, as discussed earlier also, was T5 (combination of education on anaemia through folk songs and iron folate supplementation). Under this treatment, at arid village Sekhala and semi-arid village Nimmera Kalan, the actual mean gain in haemoglobin level of participants was 1.42 and 1.40 g/100 ml, respectively.

The treatment T1 (simple iron folate supplementation) was common to all the four villages of present study. Under this treatment actual mean gain in haemoglobin level of participants ranged between 0.75 g/100 ml (semi-arid village Nimmera Kalan) and 1.23 g/100ml (Semi-arid village Gundoj). In case of treatment-2 (education on anaemia through video) the actual mean gain in haemoglobin level of participants in arid village Mogra Kalan and semi-arid village Gundoj (where treatment was employed) was 0.79 and 0.80 g/100 ml. In treatment-T4 (education on anaemia through folk songs), the actual mean gain in haemoglobin level of participants in arid village

Table 6.10. Actual mean gain in haemoglobin level of participants (g/ 100ml) through individual treatment in each village.

Zone/ Village/Treatment	Actual gain (g/ 100ml)	Std. error of difference(±)	't' value
Arid Zone			
Mogra Kalan			
T1 (Pre) -T1 (Post)	1.07	0.07	14.16 **
T2 (Pre) -T2 (Post)	0.79	0.12	6.45 **
T3 (Pre) -T3 (Post)	2.15	0.06	33.54 **
Sekhala			
T1 (Pre) -T1 (Post)	1.20	0.12	10.02 **
T4 (Pre) -T4 (Post)	0.63	0.14	4.46 **
T5 (Pre) -T5 (Post)	1.42	0.11	13.28 **
Semi arid zone			
Gundoj			
T1 (Pre) -T1 (Post)	1.23	0.11	11.14 **
T2 (Pre) -T2 (Post)	0.80	0.13	6.05 **
T3 (Pre) -T3 (Post)	2.36	0.09	25.02 **
Nimmera Kalan			
T1 (Pre) -T1 (Post)	0.75	0.08	8.92 **
T4 (Pre) -T4 (Post)	0.76	0.12	6.49 **
T5 (Pre) -T5 (Post)	1.40	0.12	11.57 **

** $p < 0.01$

T1 = Simple iron folate tablet supplementation

T2 = Education on anemia through video;

T3 = Combination of T1 and T2;

T4 = Education on anaemia through folk songs;

T5 = Combination of T1 and T4

sekhala and semi-arid village Nimmera Kalan (where the treatment was employed) was 0.63 and 0.76 g/100 ml, respectively.

The data on pre and post treatment haemoglobin level of participants in each treatment, in each village (as per the treatment employed) were subjected to 't' test. The result of the 't' test indicated that all the selected methods were significantly effective in improving the haemoglobin level of participating adoloscent girls in all the villages. Table 6.11, 6.12, 6.13 and 6.14 present the summary of analysis of variance of post treatment haemoglobin level in village Mogra Kalan, Sekhala, Gundoj and Nimmera Kalan, respectively. The 'F' ratio values in each village for gain in haemobglobin level of participants found to be significant, indicating there by that some methods are significantly, different from each other in their effectiveness. On glancing the Table 6.5 for mean post-treatment haemoglobin level of participants, it was evident that in arid village Mogra Kalan there was no significant difference between treatment-T1 and T2, however treatment T3 significantly varied from treatment T1 and T2 (least significant difference at 5% level was 0.20).

The least significant difference (LSD) at 5% level was 0.29 when post treatment haemoglobin values of arid village Sekhala were subjected to analysis of variance. The results indicated that post-treatment haemoglobin values were not significantly different in case of treatment T1 and T5, however, both the treatments (T1 and T5) were significantly different from treatment-T4 as post intervention haemoglobin values were concerned.

*Table 6.11. Analysis of variance (ANOVA) for post treatment haemoglobin values of participants under different treatments at arid village Mogra Kalan.**

Source	*Df*	*Sum of squares*	*Mean squares*	*F- ratio*
Between	*2*	*27.678*	*13.839*	*61.466*
Within	*117*	*26.243*	*0.225*	
Total	*119*	*54.021*		

LSD at 5% level = 0.20

** For mean values of haemoglobin, refer Table 6.5*

*Table 6.12. Analysis of variance (ANOVA) for post treatment haemoglobin values of participants under different treatments at arid village Sekhala.**

Source	*Df*	*Sum of squares*	*Mean squares*	*F- ratio*
Between	*2*	*17.167*	*8.583*	*19.212*
Within	*117*	*52.270*	*0.447*	
Total	*119*	*69.437*		

LSD at 5% level = 0.29

** For mean values of haemoglobin, refer Table 6.5*

*Table 6.13. Analysis of variance (ANOVA) for post treatment haemoglobin values of participants under different treatments at semi-arid village Gundoj.**

Source	Df	Sum of squares	Mean squares	F- ratio
Between	2	54.511	27.256	106.111
Within	117	30.053	0.257	
Total	119	84.564		

LSD at 5% level = 0.22

** For mean values of haemoglobin, refer Table 6.5*

*Table 6.14. Analysis of variance (ANOVA) for post treatment haemoglobin values of participants under different treatments at semi-arid village Nimmera Kalan.**

Source	Df	Sum of squares	Mean squares	F- ratio
Between	2	5.722	2.2861	8.949
Within	117	37.408	0.320	
Total	119	43.130		

LSD at 5% level = 0.24

** For mean values of haemoglobin, refer Table 6.5*

In semi-arid village Gundoj, post treatment mean haemoglobin values of participants in all the treatments (i.e., T1, T2 and T3) differ significantly from each other (LSD at 5% level was 0.22). However, in semi-arid village Nimmera Kalan, there was no significant difference in post treatment mean haemoglobin values of participants in treatment-T1 and T4 but, treatment T-5 exhibited significant differences from treatment-T1 and T4 (LSD at 5% level was 24 in this case).

The analysis of variance of post treatment haemoglobin values of participants in each village statistically proved that treatment-T3 (combination of education on anaemia through video and iron folate supplementation) was most effective intervention. Through this intervention maximum improvement in participants' haemoglobin level could be achieved. The education on anaemia through folk songs in combination of iron folate supplementation (Treatment-T5) was also very effective in improving the haemoglobin level of participating adolescent girls but, its effectiveness was relatively less than treatment - T3.

Since independence, Govt. of India and various state government have launched several developmental programmes for women and children to combat the general problem of nutrition, child mortality and morbidity, and maternal death. All health, nutrition and family welfare programmes ultimately aim at the well being of nation's population (Devadas 1993). The developmental programmes for women and children include integrated child development services (ICDS), integrated rural development programme

(IRDP), Special Nutrition Programme (SNP), School Meal Programme (SMP), development of women and children in the rural areas (DWCRA), etc.

It is in fact, very disgusting that despite providing all the possible nutrition supplementation in priority areas of concern and even financial assistance to improve the health and nutrition status of rural folk, especially children and women, these programmes did not work up to satisfactory level. Now the question is what are the drawbacks for failure of these novel schemes ? The reason is better explained by Gopalan (1980), who stated that these programmes always emphasized feeding rather than educating the masses to change their food habits.

According to Gupta (1983), nutrition education programme in isolation are bound to fail because, malnutrition and related disorders are the results of many factors. Therefore, such programmes must be problem specific, and interventions to tackle such problems should be multi-directional. In the present investigation, all the participants in each treatment group in each village were more or less anemic. In fact, iron deficiency anaemia is the established cause of reduced immune response (Brock and Mainou - Flower 1986; Dallman 1987). Bhatia and Seshadri (1987) observed that anaemic children in India perform worst at both submaximal and maximal workloads on step tests. Tucker et. al., (1989) also recorded differences in brain function of anaemic and non-anaemic children. There may be long-term consequences of anaemia in adoloscent girls if it persists into their reproductive years, this has important implication for the long term health of their offspring (Nelson et. al., 1994).

The widely prevalent nutritional anaemia in rural women and children of *Thar* desert region of Rajasthan, as discussed in Chapter 1(Introduction) and Chapter 3 (Profile of *Thar* Desert Region) of present thesis, is a matter of great concern. The government of Rajasthan state run iron supplementation programme under national anaemia prophylaxis programme for women and children, where iron folate tablets are distributed free of cost has failed to produce desired result. The basic reasons of failure of this programme has been discussed in chapter 5 (Methodology and Execution of Research Plan). The lack of basic knowledge on anaemia and its consequences appeared to be fundamental cause of reluctance of rural women and children towards this novel scheme.

In the present study when only education on anaemia was given to the participants, they succeeded in improving their haemoglobin level to some extent. When education on anaemia was given with the combination of iron folate supplementation the haemoglobin level of participants raised to an appreciable limit. In majority of cases the lower haemoglobin level of participants was related to nutritional deficiency of iron. According to Faroda et. al., (1997) the per capita availability of cereals, pulses and oils are likely to be further decreased in *Thar* desert region in coming time and therefore, in such situation the nutritionally most vulnerable population group i.e., adolescent girls will be seriously affected. This state of affair may further aggravate the problem of anaemia, especially that of women and children in this part of world.

During the course of study, investigator while discussing with the participants regarding on going developmental programmes for women and children, health facilities and home remedies for certain kind of diseases associated with nutrition deficiency in their village/ villages, observed that many participating adolescent girls were familiar with ORS preparation and its necessity to feed the mixture frequently to person suffering from diarrhea. It was also observed that a number of participants were very well versed with child immunization and also regarding the benefits of child nutrition supplementation through 'Agan Wadi' scheme. When asked how they had learnt about all above mentioned things the most common reply was : " we have seen it so often in television and listened in radio many times". This reflected the importance of mass media in imparting functional education to illiterate masses in respect of specific health problem. When this kind of functional education programme are associated with action strategies, the impact will be many folds higher in comparison to providing only education or following only action strategies directly. Therefore, it is absolutely essential to impart functional knowledge to rural folk on anaemia through innovative education tool like video or folk songs and simultaneously iron folate supplementation should be administered. This kind of intervention will be very helpful to eradicate the iron deficiency anaemia from the *Thar* desert and also from the other parts of India.

6.5 PARTICIPANTS' KNOWLEDGE LEVEL IN RESPECT OF ANAEMIA AND IMPACT OF INTERVENTIONS

From earlier discussion on impact of various treatments in improving

haemoglobin level of participating adolescent girls in selected villages, a very important observation was that national/state level nutrition intervention programme can be very effectively used as channel for nutrition education (functional nutrition education), especially for illiterate rural folk. In the present study, investigator utilized the iron supplementation programme of Rajasthan state government while ensuring its proper implication in selected villages to target population by incorporating the educational component on anaemia using innovative instructional tools.

In the preceding section of this chapter, effectiveness of various intervention (treatment) to improve the haemoglobin level of participants has been dealt in length. the present section deals with findings in context of nutrition knowledge on anaemia gained by the participating adolescent girls in selected arid and semi-arid village through different kind of intervention. The gain in knowledge was measured in terms of knowledge score in a scale of 0 to 24 i.e., the maximum score a participant could obtain was 24 and minimum zero (details are given in chapter-5, Methodology and Execution of Research Plan).

6.5.1 General Trends

The pre and post intervention knowledge test score of participants and range of knowledge test score for each under each treatment are set in Table 6.15.

In arid village Mogra kalan and Sekhala, before intervention knowledge on anaemia of participants was very poor and therefore, mean

Table 6.15. Mean knowledge test score of participants before and after the treatments in each village.

Village/ Treatment	Pre treatment			Post treatment		
	Mean (Score)	Std. error (±)	Range	Mean (Score)	Std. Error (±)	Range
Arid Zone						
Mogra Kalan						
T1	0.95	0.24	0.0-6.0	1.15	0.27	0.0- 7.0
T2	1.30	0.25	0.0-5.0	10.87	0.28	8.0-15.0
T3	1.70	0.30	0.0-6.0	15.54	0.27	12.0-21.0
Sekhala						
T1	0.75	0.16	0.0-3.0	2.47	0.32	0.0- 6.0
T4	1.02	0.17	0.0-4.0	9.72	0.35	5.0-14.0
T5	1.00	0.22	0.0-5.0	12.25	0.10	9.0-16.0
Semi arid zone						
Gundoj						
T1	2.90	0.29	0.0-6.0	4.72	0.35	0.0- 8.0
T2	2.27	0.29	0.0-6.0	12.67	0.31	9.0-17.0
T3	2.22	0.28	0.0-6.0	14.82	0.54	7.0-21.0
Nimmera Kalan						
T1	2.02	0.31	0.0-8.0	3.60	0.36	0.0- 8.0
T4	1.77	0.28	0.0-5.0	9.95	0.28	3.0-15.0
T5	1.82	0.29	0.0-6.0	12.85	0.39	9.0-18.0

T1 = Simple iron folate tablet supplementation

T2 = Education on anemia through video

T3 = Combination of T1 and T2

T4 = Education on anaemia through folk songs

T5 = Combination of T1 and T4

knowledge test score ranged between 0.95 (treatment- T1) and 1.70 (treatment - T3) in village Mogra kalan and between 0.75 (treatment-T1) and 1.02 (treatment-T4) in village Sekhala. The situation was slightly better in semi-arid village. In semi- arid village Gundoj, before intervention, the knowledge on anaemia of participants in terms of mean knowledge score ranged from 2.22 (treatment T3) to 2.90 (treatment-T1). In second selected semi-arid village i.e., Nimmera Kalan, same was found to be in range between 1.77 (treatment-T4) and 2.02 (treatment-T1).

The first treatment i.e., T1 (simple iron folate supplementation) was common to all the four selected villages and no knowledge was imparted to selected adolescent girls of this treatment group in any village. The post treatment knowledge test score of this treatment group revealed that in all the villages participants had slightly improved their level of knowledge in respect to the problem of anaemia. In the knowledge score scale of 0-24 (adopted in present study), the pre-treatment mean knowledge test score of participants in treatment group T1 at village Mogra Kalan, Sekhala, Gundoj and Nimmera kalan was 3.9%, 3.1%,12.0% and 9.4%, respectively. However, post-treatment mean knowledge score of participants in this treatment group at village Mogra Kalan, Sekhala, Gundoj and Nimmera kalan in adopted knowledge score scale of 0-24 was 4.8%,10.3%,19.7 and 15%, respectively.

It is very interesting that when in treatment group T1 education on anaemia was not imparted at all, how the participants of this treatment group in each village improved their education level? If we further compare arid and

semi-arid villages, it is quite clear from data that gain in knowledge was comparatively better in semi-arid villages as compared to arid ones. To find the answer of this available trend, investigator visited all the four villages and discussed the related matter with few participants of this treatment group in each village through unstructured interviews. Through said unstructured interviews it was found that participants gained this amount of knowledge on anaemia through the medical doctor, when he advised them how to take the iron folate tablets at the time of distribution of medicine. The relatively higher gain in knowledge of participants of this group in semi-arid villages was definitely related with better literacy status of women. The participants who attended schools at some time, understood the medical doctors advice better (the number of such participants was higher in semi arid village) as compared to the subject of arid village (the majority of participants in selected arid villages were illiterates). A seminar organized in 1988 at Ahmedabad on the occasion of the international day for action on women health discussed in length that adolescent girls, especially in rural communities are worst sufferer on front of health and nutrition due to sex discrimination. The major conclusion emerged from the various presentation and discussion in the said seminar was that with very little efforts adolescent girls could be made functionally knowledgeable regarding their health problems related to nutritional deficiencies (Anonymous 1992). This view has been also supported by Devadas (1993) while discussing the nutrition education programme for women and children.

The treatment T2 and T4 were the main educational strategies adopted to educate the adolescent girls regarding anaemia, its consequen-

ces, and simple medicinal and nutritional intervention required for its prevention and control. The instructional tool used in treatment - T2 was a video programme on anaemia and in treatment - T4 were three folk songs. These instructional tools were developed by the investigator and details regarding same are given in chapter - 5 (Methodology and Execution of Research Plan).

In the treatment - T2 the knowledge test score of participants before intervention in 0-24 scale at arid village Mogra Kalan and semi-arid village Gundoj was 5.4% and 9.4%, respectively which after intervention increased to the level of 45.3% and 52.8%. In case of treatment T4, before intervention, the knowledge test score of participants in said scale at arid village Sekhala and semi-arid village Gundoj was 4.2% and 7.3%, respectively which after intervention attained a level of 40.5% and 41.4%, respectively.

When educational treatments were combined with iron supplementation (treatment T3 and T5), the gain in knowledge on anaemia of participants exhibited maximum improvement. In case of treatment - T3 in arid village Mogra Kalan and semi-arid village Gundoj, the pre intervention knowledge test score of participants in present adopted scale was 7.1% and 9.2%, respectively which after intervention increased to the level of 64.4% and 61.8%, respectively. In case of treatment T-5, the pre intervention knowledge test score of participants in arid village Sekhala and semi arid village Gundoj in present adopted scale was 4.2% and 7.5%, respectively which after intervention reached to the level of 51.0% and 53.5%, respectively.

These data clearly indicated that combination of educational tool like video or folk songs for imparting education on anaemia and iron supplementation had greater impact in terms of knowledge gain of participating adolescent girls. Though mass media like video has been tried with great success in many countries (Dave et.al., 1985) and in India also (Chauhan and Sinha 1979) in disseminating knowledge regarding specific problems or in specific subject to rural folks, but not a single study is available from India in which various methods like present one to assess the impact on education level of the subjects and improvement in their attitude and behavior in respect of specific action were made. However, Menon et.al., (1982) observed that rural women gained more knowledge regarding nutrition by combination of two methods than by use of one methods alone.

6.5.2 Frequency Distribution Under Different Limits of Knowledge Test Score

To further analyse the trends of pre and post intervention knowledge test score in each treatment group in each village, eleven arbitrary knowledge test score classes were formed (each class had a difference of 2 knowledge score) by taking minimum pre-treatment score as upper extreme. The first four class limits of knowledge test score (8.00-) were considered as moderate knowledge level and rest three class limits of knowledge test score (16.00-) were considered as high knowledge level. Not a single participant in any treatment group in any village of present study could obtain knowledge test score 21 at any point in present knowledge test score scale of 0-24 (Table 6.16 to 6.19).

Table 6.16. Improvement in participants' frequency distribution pattern under different class limits of knowledge test score in different treatments at arid village Mogra Kalan (In each case N= 40).

Class limits of knowledge test score	Treatment T1		Treatment T2		Treatment T3	
	Pre	Post	Pre	Post	Pre	Post
0.00 - < 2.00	28	25	26	0	22	0
2.00 - < 4.00	8	11	11	0	8	0
4.00 - < 6.00	3	3	3	0	8	0
6.00 - < 8.00	1	1	0	0	2	0
8.00 - < 10.00	0	0	0	7	0	0
10.00 - < 12.00	0	0	0	21	0	0
12.00 - < 14.00	0	0	0	8	0	2
14.00 - < 16.00	0	0	0	4	0	25
16.00 - < 18.00	0	0	0	0	0	8
18.00 - < 20.00	0	0	0	0	0	4
20.00 - < 22.00	0	0	0	0	0	1

T1 = Simple iron folate tablet supplementation

T2 = Education on anemia through video

T3 = Combination of T1 and T2

Table 6.17. Improvement in participants' frequency distribution pattern under different class limits of knowledge test score in different treatments at arid village Sekhala (In each case N= 40).

Class limits of knowledge test score	Treatment T1		Treatment T2		Treatment T3	
	Pre	Post	Pre	Post	Pre	Post
0.00 - < 2.00	26	14	31	0	29	0
2.00 - < 4.00	14	13	8	0	9	0
4.00 - < 6.00	0	11	1	1	4	0
6.00 - < 8.00	0	2	0	4	0	0
8.00 - < 10.00	0	0	0	12	0	3
10.00 - < 12.00	0	0	0	18	0	10
12.00 - < 14.00	0	0	0	2	0	15
14.00 - < 16.00	0	0	0	3	0	11
16.00 - < 18.00	0	0	0	0	0	1
18.00 - < 20.00	0	0	0	0	0	0
20.00 - < 22.00	0	0	0	0	0	0

T1 = Simple iron folate tablet supplementation

T4 = Education on anemia through folk song

T5 = Combination of T1 and T4

Table 6.18. Improvement in participants' frequency distribution pattern under different class limits of knowledge test score in different treatments at semi-arid village Gundoj (In each case N= 40).

Class limits of knowledge test score	Treatment T1		Treatment T2		Treatment T3	
	Pre	Post	Pre	Post	Pre	Post
0.00 - < 2.00	9	2	19	0	21	0
2.00 - < 4.00	11	9	10	0	10	0
4.00 - < 6.00	18	13	9	0	7	0
6.00 - < 8.00	2	15	2	0	2	2
8.00 - < 10.00	0	1	0	5	0	3
10.00 - < 12.00	0	0	0	2	0	2
12.00 - < 14.00	0	0	0	24	0	5
14.00 - < 16.00	0	0	0	7	0	7
16.00 - < 18.00	0	0	0	2	0	13
18.00 - < 20.00	0	0	0	0	0	7
20.00 - < 22.00	0	0	0	0	0	1

T1 = Simple iron folate tablet supplementation

T2 = Education on anemia through video

T3 = Combination of T1 and T2

Table 6.19. Improvement in participants' frequency distribution pattern under different class limits of knowledge test score in different treatments at semi-arid village Nimmera Kalan (In each case N= 40).

Class limits of knowledge test score	Treatment T1		Treatment T2		Treatment T3	
	Pre	Post	Pre	Post	Pre	Post
0.00 - < 2.00	17	7	22	0	20	0
2.00 - < 4.00	16	13	10	1	11	0
4.00 - < 6.00	5	12	8	1	7	0
6.00 - < 8.00	1	5	0	4	2	0
8.00 - < 10.00	1	3	0	11	0	4
10.00 - < 12.00	0	0	0	12	0	8
12.00 - < 14.00	0	0	0	4	0	12
14.00 - < 16.00	0	0	0	7	0	11
16.00 - < 18.00	0	0	0	0	0	3
18.00 - < 20.00	0	0	0	0	0	2
20.00 - < 22.00	0	0	0	0	0	0

T1 = Simple iron folate tablet supplementation

T4 = Education on anemia through folk song

T5 = Combination of T1 and T4

The pre and post frequency distribution pattern of participants under different class limits of knowledge test score for arid village Mogra Kalan and Sekhala are set in Table 6.16 and 6.17, respectively and for semi-arid village Gundoj and Nimmera Kalan are given in Table 6.18 and 6.19 respectively.

In arid village Mogra Kalan and Sekhala, the majority of participants in different treatment groups were distributed in lowest class limits of knowledge test score (0.00-) indicating there by that they (participants) were ignorant about the anaemia and its consequences, and steps needed for its prevention and control. In both the villages, post knowledge test score in treatment T1 exhibited very little shifting of participants from lower class limits of knowledge to higher ones (Fig. 5 & 6). What ever shifting occurred in this treatment was within the bracket of knowledge test score classes of lower level i.e., 0.00-, 2.00-, 4.00- and 6.00-.

In arid village Mogra Kalan, when education on anaemia through video (Treatment - T2) was given to participants the majority of participants improved their knowledge level and their frequency distribution shifted from lower knowledge level classes to moderate knowledge level classes (e.i., classes between knowledge test score 8.00 and). More or less similar trend was observed in arid village sekhala when education on anaemia was given to participants through folk song (Treatment-T4). The combination of treatment -T1 and T2 (Treatment - T3) was found to be very effective in arid village Mogra kalan. In this very treatment after intervention, 32.5% participants shifted to higher knowledge level classes (16.00- knowledge test scoring) and 67.5% participants attained knowledge level corresponded to highest

Fig. 5 Percentage distribution of participants under different class limits of Knowledge test score before(pre) and after(post) employing different treatments.

Mogra Kalan
Knowledge scores

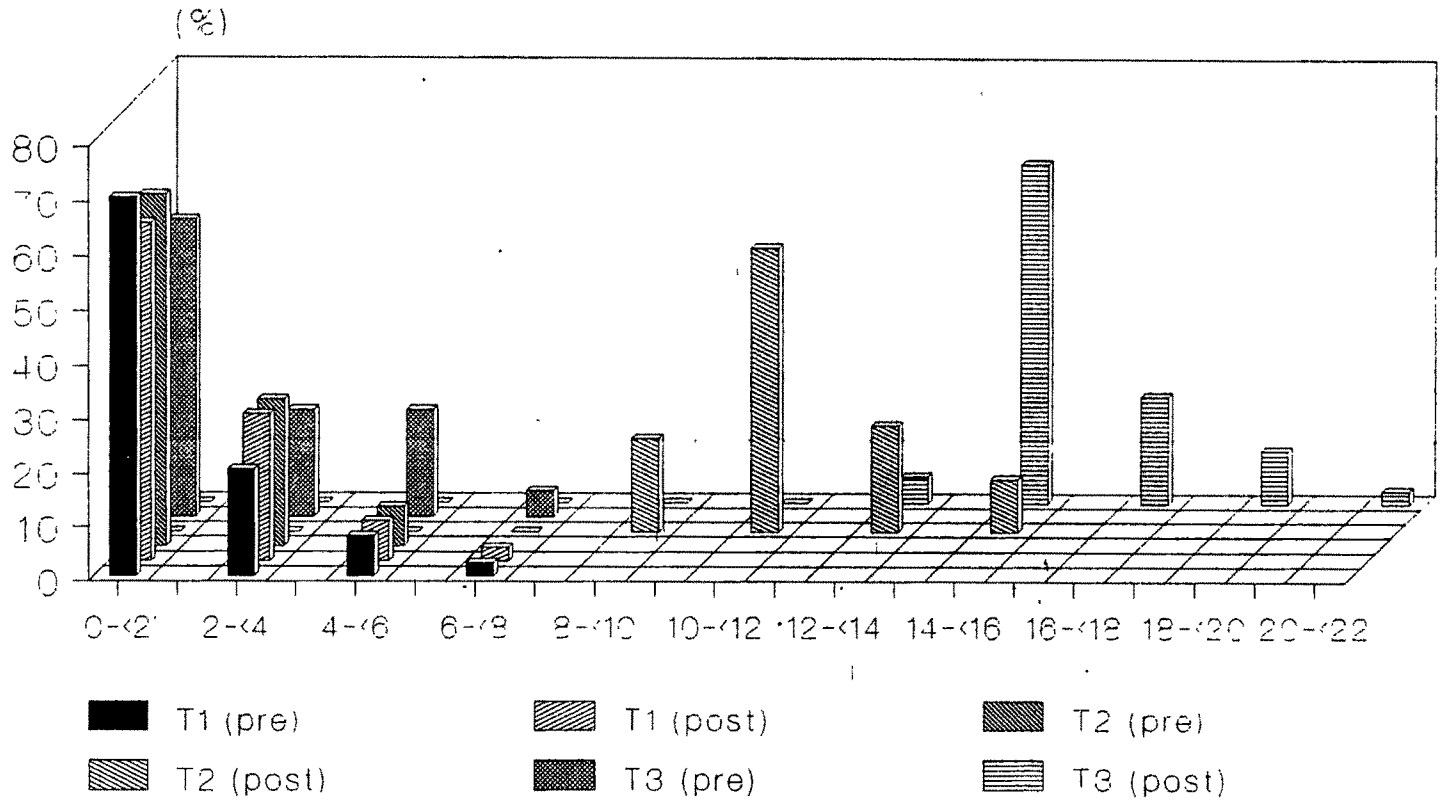

Fig.5

Fig 6 Percentage distribution of participants under different class limits of Knowledge test score before(pre) and after(post) employing different treatments.

Sekhala
Knowledge scores

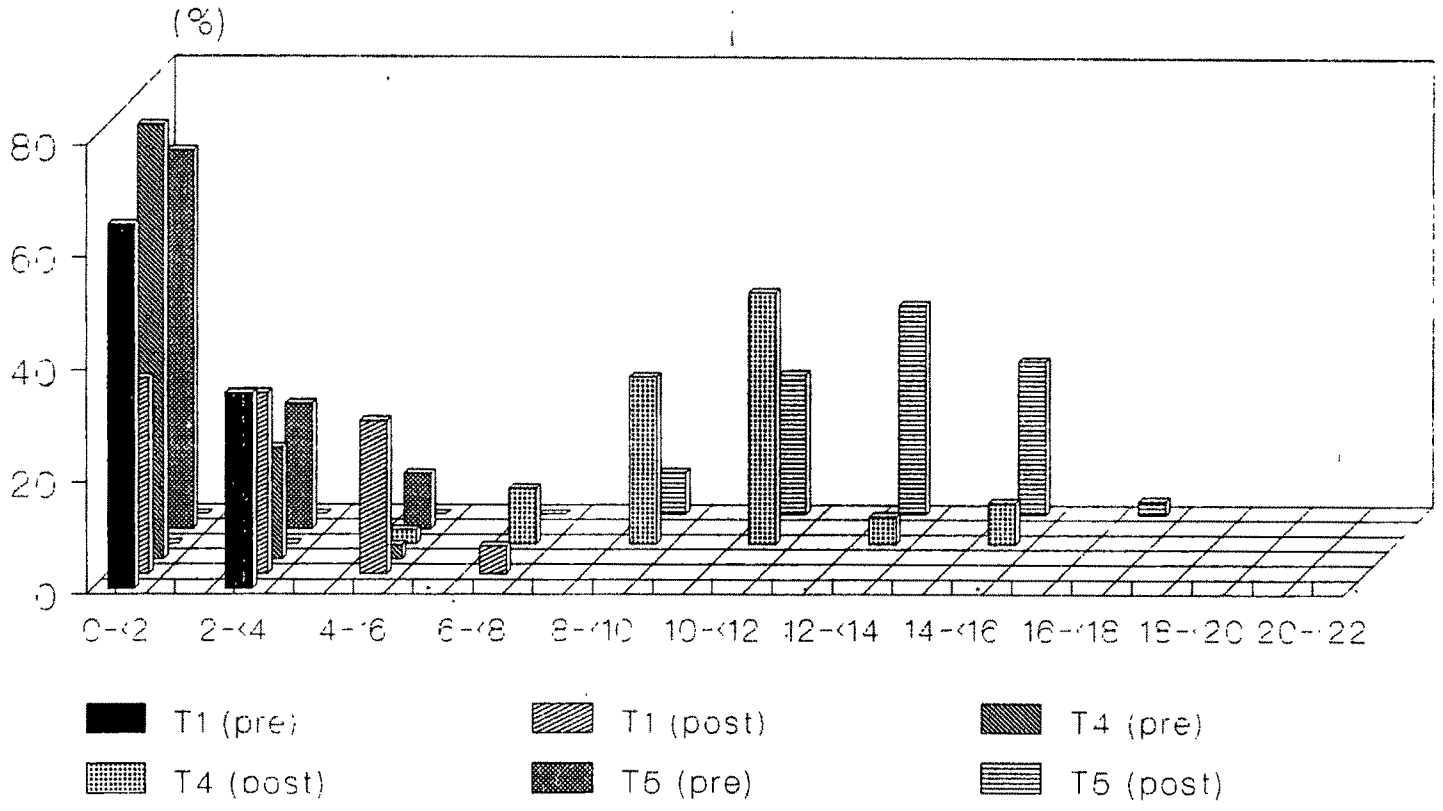

Fig.6

bracket of moderate knowledge level test-score (i.e., 12.00- and 14.00- ,16.00). In case of treatment T5 (combination of treatment T1 and T4) in arid village Sekhala 97.8% participants improved their knowledge score and shifted to moderate knowledge level class limits of knowledge test score (between the knowledge level classes 8.00 and knowledge test score.

These trend in arid villages of present study clearly indicated that educational strategies in combination with iron supplementation had maximum effect on improving the knowledge on anaemia of participating adolescent. The mass media like video appeared to be more effective in educating the illiterate adolescent girls regarding anaemia than the traditional medium like folk songs.

The pattern of post intervention shifting of various class limits of knowledge score in case of treatment T1 in semi-arid village Gundoj and Nimmera kalan was similar to that of arid village (Mogra Kalan and Sekhala) (Fig. 7 and 8). In village Gundoj when participants were imparted education on anaemia through video (Treatment-T2), 60% participants improved their knowledge level on anaemia to the extent that they attained class limits of knowledge test score 12.00- and 17.5% shifted to knowledge test score class limit 14.00-. In case of semi-arid village Nimmera Kalan, when participants were given education on anaemia through folk songs, 95% participants improved their level of knowledge on anaemia and shifted from lower knowledge level classes (knowledge test score classes between 0.00-) to moderate knowledge level classes (knowledge test score classes between 8.00-). In village, Gundoj when iron supplementation was combined with

Fig.7 Percentage distribution of participants under different class limits of Knowledge test score before(pre) and after(post) employing different treatments.

Gundoj
Knowledge scores

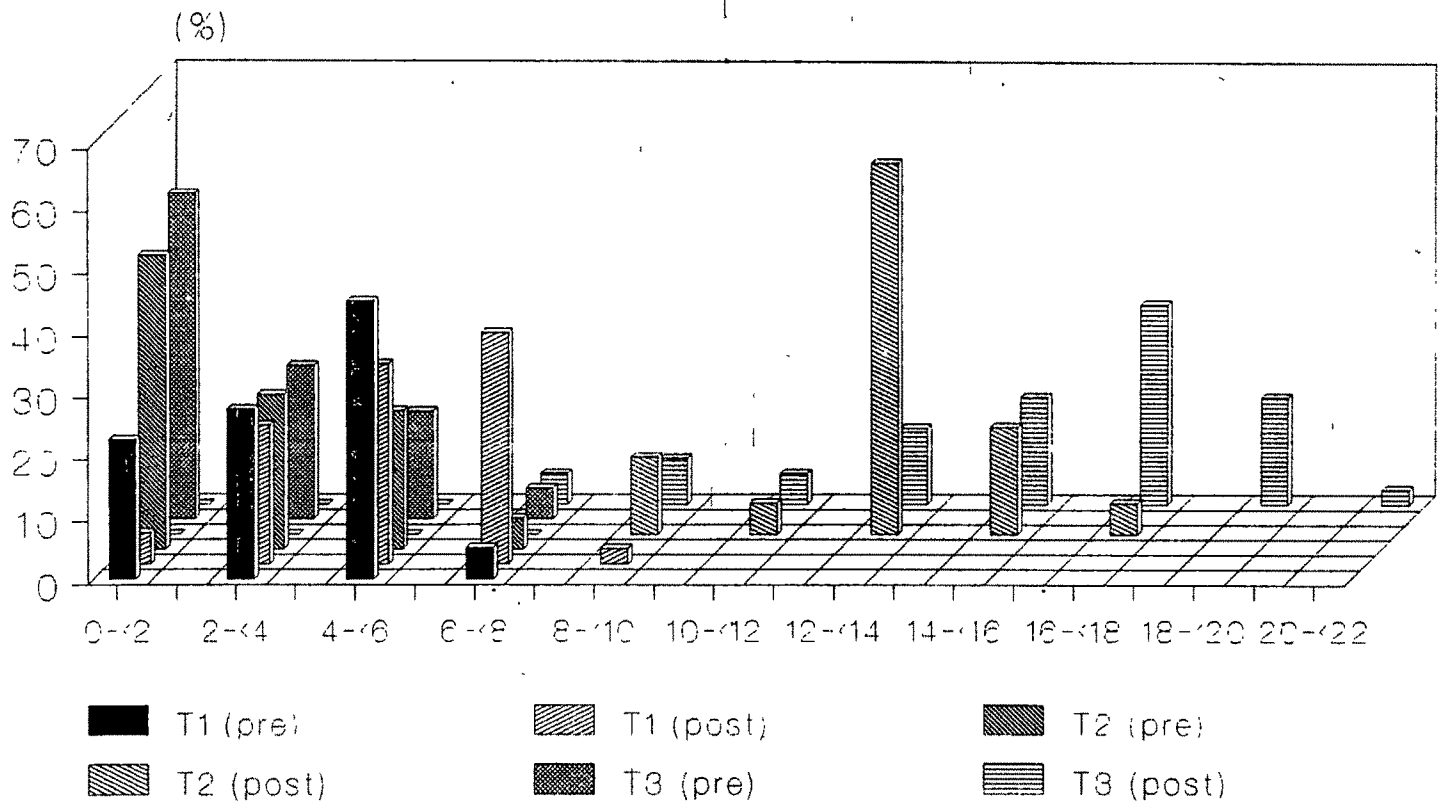

Fig.7

Fig. 8 Percentage distribution of participants under different class limits of Knowledge test score before (pre) and after(post) employing different treatments.

Nimmera Kalan
Knowledge scores

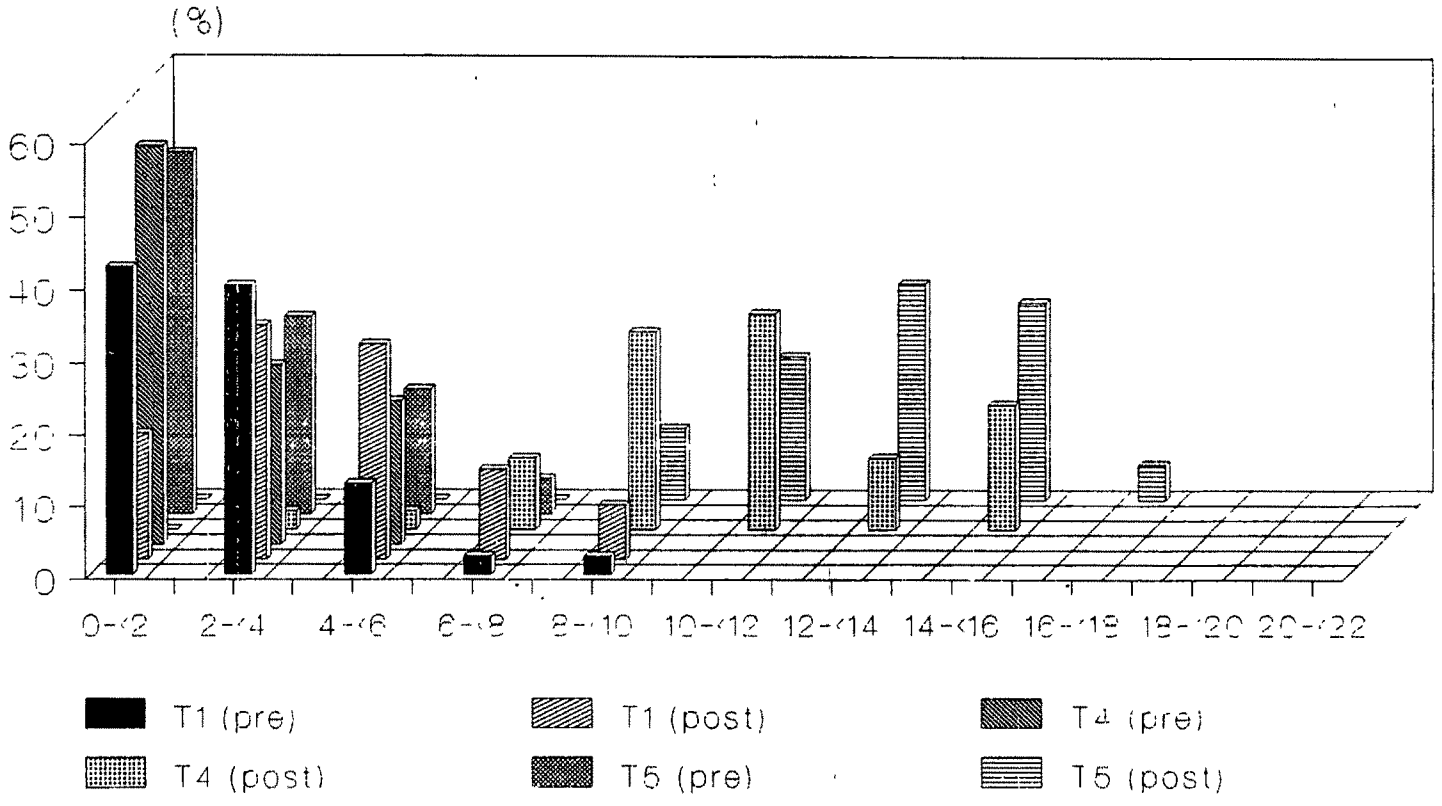

Fig.8

nutrition education on anaemia (Treatment-T3), 52.5% participants improved their knowledge to the extent that they transferred to high knowledge test score classes (i.e., 16.00- ; 18.00- and 20.00-). Thirty percent participants attained a knowledge level which corresponded to highest bracket of moderate knowledge test score classes (i.e., 12.00- and 14.00-). In village Sekhala, when iron supplementation was combined with education on anaemia through folk songs (Treatment T5), 95% participants, shifted from low knowledge level (knowledge test score classes between 0.00-) to moderate knowledge level (knowledge test score classes between 8.00-).

The results of frequency distribution of participants (in different treatment groups) in different class limits of knowledge test scale before and after intervention clearly indicated that education on anaemia through video in combination of iron folate supplementation was most effective. The second most effective strategy to enhance the knowledge of participants on anaemia was found to be iron folate supplementation in combination of education on anaemia through folk songs . These strategies in which nutrition education on anaemia was imparted through innovative educational tools like, video and folk songs to rural adolescent girls with the combination of supplementation appeared to be highly successful in bringing desired change in their attitude and behavior towards the specific problem of anaemia. The nutrition education on anaemia imparted through video or folk songs enlightened the participants regarding the problem, its consequences and steps needed to prevent and/or control the disorder on one hand; and on the other hand, iron folate supplementation besides improving their haemoglobin level helped them to remain energetic through out the day. This improvement in

their health and knowledge status resulted in their behavioural changes which made them more thoughtful regarding what have been taught to them. Consequently they also started practicing simple things which they had learnt (like inclusion of green leafy vegetable in their daily food, etc).

6.5.3 Actual Knowledge Gain and Tests of Significance

The data on actual knowledge gained by the participants (in terms of difference between mean knowledge test score before and after the intervention) in each village through the individual treatment employed are set in Table 6.20. As discussed earlier that treatment T-3 (combination of education on anaemia through video and iron folate supplementation) was found to be most effective in order to educate adoloscent girls (most of whom were illiterate) in arid and semi-arid sample village. In 0-24 knowledge test score scale, the actual gain in knowledge of participants in this treatment group at arid village. Mogra Kalan was 13.75, which was highest among all the treatments employed in present study. The corresponding value in semi-arid village Gundoj was 12.60.

When iron supplementation was combined with the education on anaemia through folk songs (treatment-T5). The absolute knowledge gain in terms of knowledge test score at arid village Sekhala was 11.25 and at semi-arid village Nimmera Kalan, it was 11.02. If we compare the zone wise trend of knowledge gained by the participants in treatment T3 and T5, it is apparent from data that in arid zone, treatment T3 (village Mogra Kalan) increased the knowledge level of participants 10.4% more than treatment-T5 (village sekhala) in the knowledge test score scale of 0-24. However, in

Table 6.20.Actual mean knowledged gained by participants in terms of improvement in knowledge test score through individual in each village.

Zone/ Village/ Treatment	Actual gain (Score)	Std. Error of Difference (±)	't' value
Arid Zone			
Mogra Kalan			
T1 (Pre) -T1 (Post)	0.20	0.36	0.56 NS
T2 (Pre) -T2 (Post)	9.52	0.37	25.51 **
T3 (Pre) -T3 (Post)	13.75	0.40	33.92 **
Sekhala			
T1 (Pre) -T1 (Post)	1.72	0.36	4.84 **
T4 (Pre) -T4 (Post)	8.70	0.38	22.61 **
T5 (Pre) -T5 (Post)	11.25	0.37	30.55 **
Semi arid zone			
Gundoj			
T1 (Pre) -T1 (Post)	1.82	0.54	4.04 **
T2 (Pre) -T2 (Post)	10.40	0.42	24.43 **
T3 (Pre) -T3 (Post)	12.60	0.60	21.09 **
Nimmera Kalan			
T1 (Pre) -T1 (Post)	1.57	0.47	3.33 **
T4 (Pre) -T4 (Post)	8.17	0.55	14.81 **
T5 (Pre) -T5 (Post)	11.00	0.48	22.61 **

** p < 0.01

NS = Not significant

T1 = Simple iron folate tablet supplementation

T2 = Education on anemia through video

T3 = Combination of T1 and T2

T4 = Education on anaemia through folk songs

T5 = Combination of T1 and T4

semi-arid zone, treatment-T3 (village Gundoj) increased the knowledge level of participants only 3% more in comparison of treatment-T5 (Nimmera Kalan).

In case of treatment T2 (education on anaemia through video) and T4 (education on anaemia through folk songs), in arid village Mogra Kalan and Sekhala the absolute knowledge gained by the participants in terms of knowledge test score was 9.52 and 8.70, respectively. The corresponding value in semi-arid villages i.e., Gundoj and Nimmera Kalan was 10.40 and 8.17, respectively. These figures of actual gain in knowledge indicated that nutrition education on anaemia through video was more effective than through the traditional medium like folk songs.

In case of treatment-T1 (which was common to all the villages), only iron folate supplementation was provided to participating adoloscent girls. In all the villages, the knowledge level of girls on anaemia exhibited little improvement even under this treatment,which in term of difference between pre and post mean knowledge test score ranged from 0.20 (village Mogra Kalan) to 1.82 (village Gundoj). This increase in knowledge level of participant even without imparting education has been discussed in length earlier in section 6.5.2 of this chapter.

The data on pre and post knowledge test score of participants in each treatment at each village (as per the treatment employed) were subjected to 't' test to analyse their statistical validity. The results of 't' test clearly demonstrated that gains in knowledge test score under treatment-T1 was

significant too (except arid village Mogra Kalan). As discussed earlier rest of the treatments improved the knowledge of participants to an appreciable limit and were highly significant as far as differences between pre and post intervention knowledge test scores were concerned.

The summary of analysis of variance of post intervention knowledge test score of participants at arid village Mogra Kalan and Sekhala are presented in Table 6.21 and 6.22, respectively and that of semi-arid village Gundoj and Nimmera Kalan in Table 6.23 and 6.24, respectively. The F-ratio values in each village for gain in knowledge (in terms of knowledge test score) were found to be significant (P). This indicated that some methods significantly differ from each other in their effectiveness to impart the education on anaemia (as evident by retention of knowledge in form of post intervention knowledge test score). The further analysis of least significant difference (LSD) values indicated that they were significant even at 1% level in each village (for mean values of post knowledge test to interpret the analysis of variance at individual village level, Table 6.15 has been referred).

In depth analysis of LSD values indicated that in each village all the employed treatments significantly varied from each other as far as post intervention knowledge test scores of participants were concerned. Anaemia in *Thar* desert region of Rajasthan is increasing with very rapid pace, especially in adoloscent girls, pregnant and lactating mothers and children,. Correction of the disorder causing the anaemia is of paramount importance. It varies from simple measures, such as correction of dietary faults and

*Table 6.21. Analysis of variance (ANOVA) for post treatment knowledge test score of participants under different treatments at arid village Mogra Kalan.**

Source	Df	Sum of squares	Mean squares	F- ratio
Between	2	4266.617	2133.308	735.461
Within	117	339.117	2.901	
Total	119	4605.992		

LSD at 5% level = 0.75

** For mean values of haemoglobin, refer Table 6.15*

*Table 6.22. Analysis of variance (ANOVA) for post treatment knowledge test score of participants under different treatments at arid village Sekhala.**

Source	Df	Sum of squares	Mean squares	F- ratio
Between	2	2059.850	1029.925	252.385
Within	117	477.450	4.081	
Total	119	2537.300		

LSD at 5% level = 0.88

** For mean values of haemoglobin, refer Table 6.15*

*Table 6.23. Analysis of variance (ANOVA) for post treatment knowledge test score of participants under different treatments at semi-arid village Gundoj.**

Source	Df	Sum of squares	Mean squares	F- ratio
Between	2	2264.467	1132.233	169.271
Within	117	780.525	6.671	
Total	119	3044.992		

LSD at 5% level = 01.13

** For mean values of haemoglobin, refer Table 6.15*

*Table 6.24. Analysis of variance (ANOVA) for post treatment knowledge test score of participants under different treatments at semi-arid village Nimmera Kalan.**

Source	Df	Sum of squares	Mean squares	F- ratio
Between	2	1790.600	895.300	131.827
Within	117	794.600	6.791	
Total	119	2585.200		

LSD at 5% level = 01.43

** For mean values of haemoglobin, refer Table 6.15.*

simple oral iron administration to major surgical procedures to correct the cause of blood loss(Firkin et.al., 1990). The majority of patients of nutritional anaemia respond quickly to oral iron supplementation and correction of dietary faults. The major objective of such iron therapy are to restore haemoglobin level to normal and to replenish exhausted tissue iron stores. In rural areas, where illiteracy prevails, it is very essential to first educate the people regarding this disorder and only then success of supplementation programmes can be ensured. It has been well established that simple functional nutrition education programmes significantly change the attitude and practice of target population of rural communities in nutritional front (Devadas 1984; Muthiah Manoharan 1988).

The results of present study clearly demonstrated that when innovative educational tools like video and folk songs were used in combination of iron folate supplementation, the participants gained maximum nutrition knowledge on anaemia and as well as improved their haemoglobin level substantially.

On comparing the impact of nutrition education on anaemia through video with supplementation of iron folate tablets and impact of traditional medium like folk songs as instructional tool for nutrition education on anaemia also with supplementation, it was discernible that former strategy was more effective in terms of both knowledge gain and improvement of haemoglobin level of participating adolescent girls. If nutrition education component could be amalgamated in large scale national/state level nutrition supplementation programme (for different type of nutritional disorders) and

other developmental schemes, especially targeted towards rural communities (in form of simple functional knowledge of nutrition), they will definitely prove highly effective. Pushpamma (1984) while discussing the role of women of being both the focus of and means for nutrition education had the similar view regarding integration of nutrition education in government run developmental schemes for rural upliftment.

6.6 HYPOTHESES TESTING

The factorial design was used to compute the analysis of variance for participants' post intervention haemoglobin values and knowledge test score.Table 6.25a and 6.25b present the summary of analysis of variance for haemoglobin values and Table 6.26 presents zone wise post intervention mean haemoglobin values of participants.Similarly,Table 6.27a and 6,27b present the summary of analysis of variance for knowledge test score.Zone wise post intervention knowledge test score of participants are set in Table 6.28.

It has been mentioned in chapter 5 (Methodology and Execution of Research Plan) that experimental design was slightly modified as the hypotheses set for the investigation were concerned for zones rather than individual village level. In order to modify the experimental design, at each village, in each treatment group pre intervention haemoglobin values and knowledge test score of the participants were subjected to analysis of variance.There was no significant difference in participants' pre intervention haemoglobin values and knowledge test score at any village. At each village

Table 6.25a. Factorial analysis of variance (ANOVA) for gain in participants haeemoglobin level through different treatments in arid and semi arid zone.

Source	Df	Sum of squares	Mean squares	F- ratio
A (zone)	1	13.53	15.63	38.00**
B (Treatment)	7	184.96	26.42	74.21**
A X B	7	36.11	5.16	14.94**
Error	624	222.75	0.36	-
Total	639	456.75	-	-

** $p < 0.01$

Table 6.25b. Standard errors of mean (SEm) and least significant difference(LSD)

Factor/ Interaction	SEm (I)	LSD 5%	LSD 1%
Factor A	0.033	0.092	0.121
Factor B	0.067	0.185	0.243
Interaction A X B	0.094	0.265	0.344

Table 6.26. Zone wise post- intervention mean haemoglobin (g/100 ml) values participants under different sets of treatments.

Treatment*	**Arid Zone**	**Semi- Arid Zone**	Mean
	Village- Mogra Kalan	Village - Gundoj	
C	8.557	8.907	8.372
T1	9.365	10.038	9.701
T2	9.338	9.515	9.426
T3	10.307	11.113	10.751
	Village- Sekhala	Village- Nimmera Kalan	
C	8.640	8.837	8.738
T1	9.707	9.430	9.568
T4	8.975	9.460	9.217
T5	8.832	9.908	9.870
Mean	9.348	9.653	-

C = Control

T1 = Simple iron folate tablet supplementation

T2 = Education on anemia through video

T3 = Combination of T1 and T2

T4 = Education on anaemia through folk songs

T5 = Combination of T1 and T4

Table 6.27a. Factorial analysis of variance (ANOVA) for gain in knowledge test score of participants in aird and semi arid zone.

Source	Df	Sum of squares	Mean squares	F- ratio
A (zone)	1	157.02	157.02	33.24**
B (Treatment)	7	16987.77	2426.82	513.67**
A X B	7	222.47	31.78	6.73
Error	624	2948.07	4.42	-
Total	639	20315.34	-	-

* $p < 0.01$

Table 6.27b. Standard errors of mean (SEm) and least significant difference(LSD)

Factor/ Interaction	SEm (I)	LSD 5%	LSD - 1%
Factor A	0.122	0.337	0.443
Factor B	0.234	0.674	0.885
Interaction A X B	0.344	0.953	1.252

Table 6.28. Zone wise post- intervention knowledge test score of participants under different sets of treatments.

*Treatment**	***Arid Zone***	***Semi- Arid Zone***	*Mean*
	Village- Mogra Kalan	*Village - Gundoj*	
C	*1.075*	*2.075*	*1.575*
T1	*1.150*	*4.725*	*2.937*
T2	*10.875*	*12.670*	*11.772*
T3	*15.545*	*14.285*	*15.185*
	Village- Sekhala	*Village- Nimmera Kalan*	
C	*1.150*	*1.950*	*1.550*
T1	*2.475*	*3.600*	*3.037*
T4	*9.725*	*9.950*	*9.837*
T5	*12.250*	*12.850*	*12.550*
Mean	*6.780*	*7.831*	-

C = Control

T1 = Simple iron folate tablet supplementation

T2 = Education on anemia through video

T3 = Combination of T1 and T2

T4 = Education on anaemia through folk songs

T5 = Combination of T1 and T4

the distribution of population was found to be normal.Therefore, at each village, forty participants out of one hundred and twenty were selected randomly using random number table. This group of 40 participants, at each village made the control (c). Thus now we had eight treatments in a zone (4 at each village).Two treatments i.e., C and T1 were common to each village. Besides this, other two treatments in arid village Mogra Kalan and Sekhala were T2 and T3, and T4 and T5, respectively. Besides common treatments i.e., C and T1 the other two treatments in semi arid village Gundoj and Nimmera Kalan were T2 and T3, and T4 and T5 respectively.

The hypotheses set for the present study are given in Chapter 4 (Specification of the Problem). There are two major hypotheses.First major hypothesis (**Hypothesis I**) states that there is a significant difference in anaemia and related knowledge of adolescent girls who receive iron folate supplementation alone and those who receive it with planned educational programmes.To statistically analyse this major hypothesis, eight sub hypotheses are derived, which are interpreted one by one in following discussion :

Hypothesis I.1.'Planned nutrition education on anaemia does not improve the haemoglobin level of adolescent girls in arid zone'. A perusal of Table 6.25a and b, and Table 6.26 indicated that the treatment of planned nutrition education in arid village Mogra Kalan (T2 education on anaemia through video) and Sekhala (T4 education on anaemia through folk

songs) significantly increased the haemoglobin level of participants (F-ratio for treatments is highly significant). While the treatment T1 at arid village Mogra Kalan was significant at 1% level (LSD for zone x interaction = 0.344), the treatment T4 at arid village Sekhala was significant at 5% level (LSD for Zone x interaction = 0.265). This leads to rejection of hypothesis. Therefore, accepted alternative hypothesis is: **Planed nutrition education on anaemia improves the haemoglobin level of adolescent girls in arid zone.**

Hypothesis I.2 ' Planned nutrition education on anaemia does not improve the haemoglobin level of adolescent girls in semi arid zone'. From the Table 6.25a and b and Table 6.26 it is evident that LSD (least significant difference) for zone x interaction is 0.265 at 5% level and 0.344 at 1% level. In semi arid village Gondoj (Treatment T2)this difference when compared with control is 0.602 and in case of village Nimmera Kalan (Treatment T4) it is 0.623.This indicate in both the semi arid villages the said treatments are significant at 1% level.These data conclude that planned nutrition education programmes significantly increase the haemoglobin level of adolescent girls in semi arid zone and suggest the rejection of hypothesis. Therefore, accepted alternative hypothesis is: **Planned nutrition education on anaemia improves the haemoglobin level of adolescent girls in semi-arid zone.**

Hypothesis I.3 "Planned nutrition education on anaemia along with iron folate supplementation does not improve haemoglobin level of adolescent girls in arid zone'. The treatment T3 in arid village Mogra Kalan includes planned nutrition education on anaemia through video in

combination of iron folate supplementation. In other arid village i.e., Sekhala treatment T5 consists planned nutrition education on anaemia through folk songs in combination of iron folate supplementation.From the Table 6.25a and b, and 6.26 it is apparent that treatment T3 and T4 resulted in maximum improvement in haemoglobin level of participants in respective village. Statistically these treatments are highly significant (p 0.01).These data suggest that hypothesis is rejected. Therefore, accepted alternative hypothesis is: **Planned nutrition education on anaemia along with iron folate supplementation improves haemiglobin level of adolescent girls in arid zone.**

Hypothesis I.4.'Planned nutrition education on anaemia along with iron folate supplementation does not improve haemoglobin level of adolescent girls in semi arid zone. Like in case of hypothesis I.4, the semi arid zone treatment T3 was employed in village Gundoj and treatment T5 in village Nimnera Kalan. On an average, in comparison of control, treatment T3 improved the haemoglobin level of participants by 2.226 g\100 ml and treatment T5 by 1.071 g\100 ml.These values are statistically significant at 1% level.In fact, in semi arid village Gundoj, under treatment T3, participants improved their haemoglobin level to an impressive value (11.133 q\100 ml) and moreover, this was the maximum improvement recorded under any treatment at any village in present investigation.These findings suggest that hypothesis is rejected. Therefore, accepted alternative hypothesis is: **Planned nutrition education on anaemia along with iron folate suplementation improves haemoglobin level of adolescent girls in semi-arid zone.**

Hypothesis I.5.'Nutrition education on anaemia does not improve the knowledge of adolescent girls in arid zone'. In arid zone treatment T2 in village Mogra Kalan and treatment T4 in village Sekhala were simple strategies employed to impart nutrition education on anaemia.From Table 6.27a it is clear that F ratio is highly significant for treatments. On glancing Table 6.27a and 6.28, it is discernible that the difference between control and post intervention knowledge test score is 9.800 in treatment T1 (education on anaemia through video) at arid village Mogra kalan. However, this difference in treatment T4 (education on anaemia through folk songs) at arid village Sekhala was 8.575. LSD for interaction (zone x treatment) at 1% level is 1.525.These. values indicate that nutrition education on anaemia significantly improves the knowledge of participants in arid zone and this finding leads to rejection of hypothesis. Therefore, accepted alternative hypothesis is: **Nutrition education on anaemia improves knowledge of adolescent girls in arid zone.**

Hypothesis I.6 'Nutrition education on anaemia does not improve the knowledge of adolescent girls in semi arid zone' Like in arid zone, treatment T2 and treatment T4 are simple educational strategies in selected villages of semi arid zone.The treatment T2 was employed at semi arid village Gundoj and treatment T4 in other selected semi arid village i.e., Nimmera kalan. In case of village Gundoj in 0-24 knowledge test score scale, the control group had knowledge on anaemia around 8%, however, in case of education on anaemia through video (Treatment T2) post intervention knowledge in the said test score scale was around 52%. In case of village

Nimmera Kalan, the control group in said scale had knowledge around 7.9% and post intervention knowledge in treatment group T4 (education on anaemia through folk songs) was 41.5%. From Table 6.27a and b, and Table 6.28 it is clear that these values are significant at 1% level and therefore, hypothesis is rejected. Therefore, accepted alternative hypothesis is: **Nutrition education on anaemia improves knowledge of adolescent girls in semi-arid zone.**

Hypothesis I.7 Planned nutrition education on anaemia along with iron folate supplementation does not improve knowledge of adolescent girls in arid zone. At arid village Mogra Kalan treatment T3 and at Sekhala treatment T4 include the educational strategies in combination with iron folate supplementation. It is evident from Table 6.27 a and b, and Table 28 that gain in knowledge in terms of knowledge test score was significantly higher than control in both the arid villages ($p < 0.01$). As discussed earlier also, the combination of educational strategies alongwith iron folate supplementation not only increased the haemoglobin level of participants upto an appreciable limit (refer Table 6.26) but knowledge of participants in respect of anaemia also increased maximum under this strategy. In light of all above mentioned discussion, hypothesis is rejected. Therefore, accepted alternative hypothesis is: **Planned nutrition education anaemia along with iron folate supplementation improves knowledge of adolescent girls in arid zone.**

Hypothesis I.8. Planned nutrition education on anaemia along with iron folate supplementation does not improve knowledge of

adolescent girls in semi arid zone. Like in arid zone, treatment T3 and T5 consist the educational strategies in combination with iron folate supplementation in semi arid zone. Treatment T3 (combination of education on anaemia and iron folate supplementation) was employed in semi arid village Gundoj and treatment T5 (combination of education on anaemia through folk songs and iron folate supplementation) was employed in other semi arid village i.e., Nimmera Kalan.At village Gondoj difference of knowledge test score between control group and T3 group was 12.75, while at village Nimmera Kalan same difference between control and T5 group was 10.90.These values are significant at 1% level (Table 27a and b and Table 28).This very high level of significance in gain of knowledge regarding anaemia leads to rejection of hypothesis. Therefore, accepted alternative hypothesis is :**Planned nutrition education on anaemia along with iron folate supplementation improves knowledge of adolescent girls in semi arid zone.**

The second major hypothesis (**Hypothesis II**) is concerned with zonal differences and states that there is significant difference on impact of planned educational programmes in combination with iron folate supplementation for controlling anaemia of adolescent girls in semi arid zone as compared to arid zone. To test this major hypothesis two sub hypothesis are formulated in null form which are analyzed in ensuing discussion.

Hypothesis II.1 The impact of video educational programme in combination with iron folate supplementation for controlling anaemia in adolescent girls is significantly not higher in semi arid zone as compared to arid zone'. From Table 6.25a, it is evident that zone x

treatment (AxB) interaction are highly significant and LSD at 5% level for this interaction is 0.265 and at 1% level is 0.344 (Table 6.25b).When education on anaemia through video was given along with iron folate supplementation (Treatment T3) in arid village Mogra Kalan and semi arid village Gundoj, the post intervention mean haemoglobin level of participants of this treatment group was 0.763 g\100 ml higher at semi arid village Gundoj than arid village Mogra Kalan.This difference was found to be highly significant (significant at 1% level).These findings clearly demonstrated that impact of video education programme with combination of iron folate supplementation for controlling the anaemia of adolescent girls was substantially higher in semi- arid zone as compared to arid zone.Therefore, the hypothesis is rejected. Therefore, accepted alternative hypothesis is: **Hypothesis II.1 The impact of video educational programme in combination with iron folate supplementation for controlling anaemia in adolescent girls is significantly higher in semi arid zone as compared to arid zone'**.

Hypothesis II.2. The impact of educational folk songs in combination with iron folate supplementation for controlling anaemia in adolescent girls is significantly not higher in semi arid zone as compared to arid zone'. When education on anaemia was given through folks songs and combined with iron folate supplementation (treatment T5), the haemoglobin level of participants increased significantly in arid and as well as in semi arid village (separately) of present study (Table 6.25a and b, and Table 6.26). When this increase was compared between arid village Sekhala and semi arid village Nimmera Kalan (where this treatment was employed), the difference in post intervention haemoglobin values of par-

ticipants were only 0.076 g\100 ml) in favour of semi arid village Gundoj, which was statistically insignificant.Therefore, the impact of educational folk songs in combination with iron folate supplementation for controlling anaemia in adolescent girls is significantly not higher in semi arid zone as compared to arid zone and this does not lead to rejection of the present null hypothesis. Therefore, null hypothesis, **The impact of educational folk songs in combination with iron folate supplementation for controlling anaemia in adolescent girls is significantly not higher in semi arid zone as compared to arid zone** is accepted.

From testing of above mentioned hypotheses, the scenario emerged in totality is as follows :

Within a zone planned nutrition education programme on anaemia alone, helped the participants in increasing their haemoglobin level.This clearly demonstrated the potential of mass media like video and traditional folk songs (composing particular message in the style and tune of popular folk songs of a particular region) to communicate the messages related to nutritional problems and their prevention and control. In the present study, majority of participants in each village were suffering from nutritional anaemia but, after exposing them to simple nutrition education on the subject, they began to improve their haemoglobin level by modifying their behaviour and attitude in respect to correction of their diet. According to Sudarsanam and Neelakantan (1983) non-formal approach to health education has to take the form of community education with focus on needs and nature of clientele groups, and they further emphasized that video and traditional medium like

folk songs are very effective approaches for communicating with community. In fact, it is absolutely essential to use simple innovative instructional tools (like video and folk songs used in present study) with appropriate messages regarding nutrition and health as an integrated component of rural upliftment schemes of national and state governments (Anonymous 1983).

When education on anaemia either through video or folk songs along with iron folate supplementation was imparted, the participants in arid and as well as semi arid zone were benefited most both in terms of haemoglobin level improvement and gain in knowledge on anaemia.According to Kashyap and Young (1989) use of mass media play very important role in improvement of knowledge related to nutrition of rural folk. If nutrition education is combined with medical interventions, the target population become more receptive which in turn facilitate adequate follow up of interventions.The results of present study also substantiated these findings.

From these observations it is obvious that mass media, if utilized properly, by designing appropriate message for prevention and control of specific nutritional problem can be very effective to educate the communities. But, our mass media have created images of science as borrowed and drawn from foreign sources (Sehgal 1993). But the image of science that would have been far more helpful to vast majority of the Indian people, relating more closely to their immediate environment and their every day life (as has been done in present study), have not been given much prominence or promoted with any comparable seriousness. This also hold true for science of nutrition education, especially for community nutrition education.

When the impact of iron folate supplementation in combination with planned nutrition education programmes (either through video or folk songs) were compared between arid and semi arid zone very interesting trend emerged.The impact of nutrition education on anaemia along with iron folate supplementation was significantly higher in semi arid zone as compared to arid zone. However, in case of nutrition education on anaemia through folk songs along with iron folate supplementation, no such significant impact was observed between the two zones. In *Thar* desert region majority of area is arid and only a very small part is agroclimatically semi-arid. As mentioned in earlier part of this chapter (Section 6.1, 6.2 and 6.3) that over all economy of semi-arid zone villages were relatively better than the arid villages. The crop production and diversification was of higher order in semi arid villages in comparison to arid villages.The population in semi arid villages had better access to entertainment\communication channels like TV and radio. Even then their interest in traditional medium like folk songs has not decreased. In fact, in arid and as well as in semi-arid part of *Thar* desert still the folk music is the way of life of rural folk and predominant mode of interpersonal communication, especially among woman folk. Perhaps this is the main reason behind non rejection of Hypothesis II.2. (Though the impact of folk songs in combination with iron folate supplementation was still higher in semi-arid zone village).If we look the whole scenario of haemoglobin level and knowledge of participating adolescent girls in arid and semi arid zone (irrespective of villages and treatments), it is apparent that both haemoglobin

and knowledge level of participants were significantly higher in semi arid zone than that of arid zone (refer, Table 6.25a, 6.26; 6.27a,b and 6.28).

This relatively higher haemoglobin level and knowledge on various aspects of anaemia among the participating adolescent girls of semi-arid zone as compared to arid zone can be attributed to relatively better female literacy rate; better education and health facilities; favourable agro climatic condition and better crop production; and better access to all sorts of communication modes in semi-arid villages.

6.7 IMPLICATIONS OF PRESENT STUDY

Swaminathan (1986) stated that nutrition intervention and nutrition education programmes for different kind of nutritional disorders for different target group should proceed side by side and nutrition education programme should culminate in widespread understanding that every family and every local community can and should solve through a malady remedy analysis of the problems of malnutrition affecting them.Coloane (1983) emphasized need for multi sectoral approach for promoting nutrition, and stated that nutrition education is a necessary step for developing a better understanding of nutritional issues and developing multisectoral and multi-disciplinary approaches for nutritional goals.This approach calls for education in food and nutrition should develop from concept to action.

The present investigation in itself is an action oriented research plan which was executed in arid and semi arid zones of *Thar* desert region.From the present study it was evident that semi arid zone of *Thar* desert region

supports relatively favourable agro climatic conditions as compared to arid zone, in which over all agro climatic conditions are hostile (refer Chapter 3,Profile of *Thar* Desert Region).The economy of entire *Thar* desert region is basically agrarian. In semi arid zone of *Thar* desert region cropping intensity, crop production and diversification and general economic condition of farmers were better than that in arid zone. Consequently literacy rate, education level and other related factor like general health of population, etc. were better in semi arid zone as compared to arid zone (refer Table 6.1, 6.2, 6.3 and 6.4). The findings of present study has far reaching implications.Government of India and various State governments are running a number of poverty alleviation and rural development schemes such as National Rural Employment Programme (NREP), Food for Work Programme, Jawahar Rozgar Yojana (JRY), Integrated Rural Development Programme(IRDP),Training of Rural Youth for Self Employment (TRYSEM),Development of Women and Children in Rural Areas (DWCRA), etc. Besides these programmes, there are a number of programmes running in social and health sectors like Integrated Child Development Service (ICDS),Agan Wadi Centres, National Anaemia Prohylaxis Programme, etc.. etc.As mentioned earlier also that these programmes are not producing desired results at all.For example, the National Anaemia Prophylaxis programme when evaluated first time during 1985-86 by Indian Council of Medical Research (ICMR) the findings were very discouraging. It was found through the said evaluation that there was absolutely no impact of programme on prevalence of anaemia in pregnant women and adolescent girls (Anonymous 1994). On the basis of this report Government of India (Ministry of Health and Family Welfare) proposed to concentrate mainly on

high risk groups i.e., pregnant and lactating women, adolescent girls and preschool children and to improve their compliance through a comprehensive strategy of nutrition education and communication on anaemia.

In the present investigation author used a video programme and educational songs composed on famous folk musical styles of *Thar* desert regions as instructional tools to impart education on problem of nutritional anaemia, its consequences and steps needed to prevent and\or control the disorder.The majority of girls were anaemic before interventions.When simple iron folate tablets were administered through motivation by medical expert the haemoglobin content of blood in this treatment group was increased and it was obvious, if one takes proper medication regularly it will definitely exhibit improvement in haemoglobin level. Now the basic question was, whether simple education on anaemia leave some impact on haemoglobin level of participants. Interestingly,all the participants in this group in all the villages significantly improved their haemoglobin level and their knowledge regarding this disorder was increased many times.When the iron folate supplementation was combined with nutrition education there occurred dramatic improvement in haemoglobin level and as well as knowledge of participants.

These findings suggest that in large scale rural development progammes, poverty alleviation programmes and nutritional supplementation programmes, nutrition education should be made an essential component. In fact, when nutrition education programmes are carried out independent of other developmental and nutrition supplementation programmes, the

results will have impact on a small section of society.The impact of nutrition education programmes can be felt better, if they are coupled with large scale production oriented or developmental or nutrition intervention programmes.The innovative instructional tools like video programmes and\or folk songs developed for educating a particular target group on specific problem require creative aptitude and approaches. If message is clear and presented in simple understandable manner, there is no doubt that such educational tools can very effectively impart functional education to rural folk. Sink (1986) also found that retention of ideas presented in video and audio modes was substantially higher than those presented only linguistically.

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