5. Results & Discussion

CHAPTER 5

RESULTS AND DISCUSSION

The broad objective of the present study was to study the effectiveness of imparting nutrition heath and food safety education to mothers with children below three years in improving the nutritional status and reducing the diarrheal morbidities among these children. This chapter presents the results of the study, under the following heads.

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Phase I

5.1 Situational Analysis

5.1.1 General information

5.1.1.1 Child

Background information of the child is presented in Table 5.1.1. Out the 536 children enrolled most (47.6%) were in the age group of 13-24 month. The enrolled subjects had almost equal percentage of males and females. Fifty percent of the subjects were the first offspring of their parents.

Table 5. 1.1 : Background information of the child

		No.	%
Age	**Mean ± S.D: 18.41± 7.74**		
	6-12 months	153	28.5
	13 – 24 months	255	47.6
	25 – 36 months	128	23.9
Sex	Males	285	53.2
	Females	251	46.8
Birth order	First	268	50.0
	Second	194	36.2
	Third	54	10.1
	Fourth	15	2.8
	Fifth	2	0.4
	sixth and above	3	0.6

5.1.1.2 Family

Majority of the families (88.2%) were Hindus with only a small percentage of families (2.1%), belonging to the upper high SES group with majority of families 43.7% belonging to lower middle group. Almost an equal distribution was observed in the family composition with 31.7% nuclear families, 36.0% joint and 32.3% extended families. Almost 75% families were non vegetarians (Table 5.1.2). Table 5.1.3 summarizes the background information of the enrolled subjects parents. The average age of the mothers was 25 yrs and that of fathers was 30 yrs. About 10% mothers didn't know their age or their husband's age.

Table 5.1.2: Background information of the family			
		No.	**%**
Religion	Hindus	473	88.2
	Muslims	61	11.4
	Christians	2	0.4
Socio economic status	Upper High	11	2.1
	High	53	9.9
	Upper Middle	200	37.3
	Lower Middle	234	43.7
	Poor	37	6.9
	Very Poor	1	0.2
Type of Family	Nuclear	170	31.7
	Joint	193	36.0
	Extended	173	32.3
Type of food consumed	Vegetarian	132	24.6
	Ovo vegetarian	4	0.7
	Non vegetarian	400	74.6

With respect to their literacy status a majority of parents attended higher secondary school (mothers: 60.8%; fathers: 67.7%). Only 16% mothers and 7% fathers were illiterate. Majority of the mothers, (94.25%) were houses wives.

Table 5.1.3: Background information of the parents			
		No.	**%**
Age of mother	**Mean ± S.D: 25.27± 3.59**		
	18 – 20	17	3.2
	21 – 25	283	52.8
	26 – 30	145	27.1
	31 and above	37	6.9
	Don't Know	54	10.1
Age of father (3 were dead)	**Mean ± S.D: 30.42 ± 4.78**		
	18 – 20	3	0.6
	21 – 25	72	13.5
	26 – 30	191	35.8
	31 and above	214	40.2
	Don't Know	53	9.9
Educational qualification of mother	Illiterate	84	15.7
	Primary to higher secondary (Grade 1 to 10)	126	23.5
	Grade 11 and above	326	60.8
Educational qualification of father	Illiterate	37	6.9
	Primary to higher secondary (Grade 1 to 10)	135	25.3
	Higher senior secondary (Grade 11 &above)	361	67.7
Mother's working status	Working	31	5.8
	Not working	505	94.2

5.1.1.3 Household

The household information of the families is summarized in Table 5.1.4. More than half the families were residing in *semi pakka* houses and almost all used safe source of water for drinking and household purposes.

Table 5.1.4: Household information of the families

		No.	%
Type of house	*Kaccha*€	62	11.6
	Semi Pakka£	325	60.6
	Pakka¥	149	27.8
Drainage facility	Open	345	64.4
	Close	191	35.6
Source of drinking water	piped water/ municipal supply	83	15.5
	Open well	6	1.1
	Hand pump/ Borehole	257	47.9
	Bottled water	59	11.0
Source of cooking water	piped water/ municipal supply	118	22.0
	Open well	11	2.1
	Handpump/ Borehole	348	64.9
	Bottled water	59	11.0
Source of water for other household activities	Piped water/ municipal supply	164	30.6
	Handpump/ Borehole	372	69.4

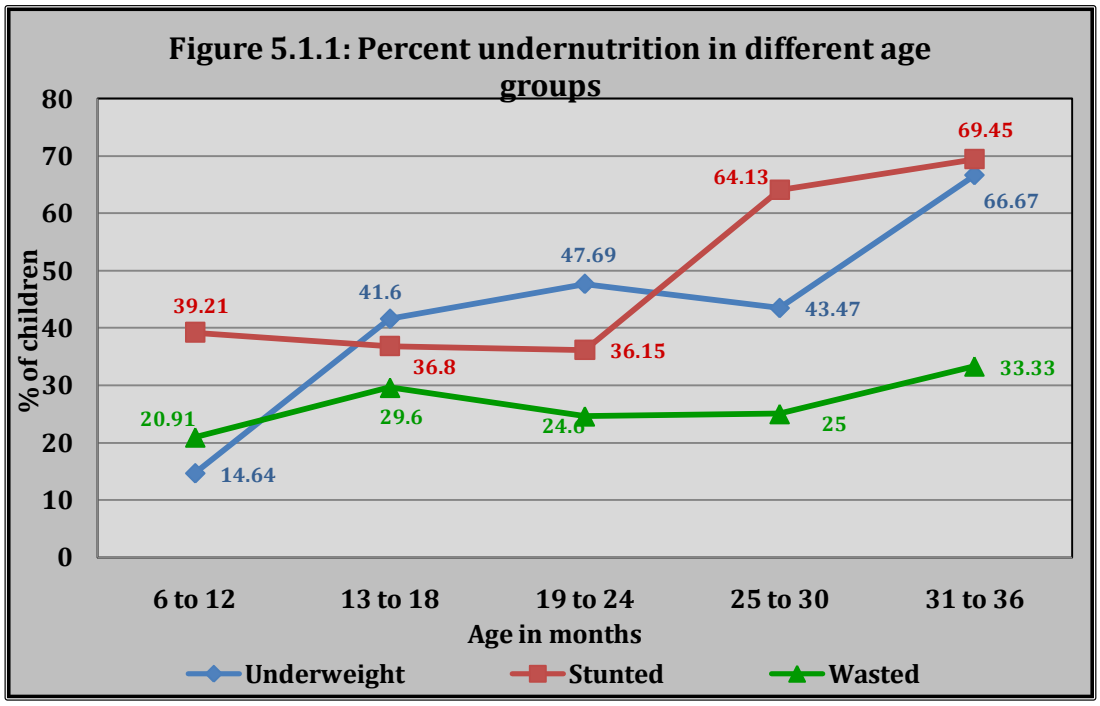
€: house with temporary roof and walls, made of materials like wood, tin sheets, hay, asbestos etc.
£: House with concrete walls but temporary roof.
¥: house with concrete roof and walls.

5.1.2 Health status of the children

5.1.2.1 Nutritional status

According to WHO standards (2007) that classifies the children into various grades of nutritional status, a high prevalence of under nutrition was observed among children studied. Of the total 536 children investigated 231 (43.09 %) were moderate to severely underweight, 273 (50.93%) were stunted and 136 (25.38) were wasted (Table 5.1.5). Figure 5.1.1 shows the percentage of undernourished children in different age groups. As evident an upward trend was observed in the percentage of children suffering from underweight and stunting with increasing age.

Table 5.1.5: Nutritional Status of the children			
Z score	**Weight for age (WFA, Underweight)**	**Length for age (LFA, Stunted)**	**Weight for length (WFL, (Wasted)**
	No. (%)	No. (%)	No. (%)
6-12 months: 153			
N	61 (39.87%)	56(36.6%)	90 (58.82%)
-1	39 (25.49%)	37(24.18%)	31 (20.26%)
-2	34 (22.22%)	18 (11.76%)	20 (13.07%)
-3	19 (12.42%)	42 (27.45%)	12 (7.84%)
13-18 months: 125			
N	44 (35.2%)	39 (31.2%)	66 (52.8%)
-1	29 (23.2%)	40 (32.00%)	22 (17.6%)
-2	29 (23.2%)	14 (11.2%)	19 (15.2%)
-3	23 (18.4%)	32 (25.6%)	18 (14.4%)
19-24 months: 130			
N	32 (24.62%)	53 (40.77%)	65 (50.0%)
-1	36 (27.69%)	30 (23.08%)	33(25.4%)
-2	27 (20.77%)	23 (17.69%)	16(12.30%)
-3	35 (26.92%)	24 (18.46%)	16(12.30%)
25-30 months: 92			
N	17 (18.48%)	19 (20.65%)	50 (54.35%)
-1	35 (38.04%)	14 (15.22%)	19 (20.65%)
-2	25 (27.17%)	26 (28.26%)	14 (15.22%)
-3	15 (16.30%)	33 (35.87%)	9 (9.78%)
31-36 months: 36			
N	6 (16.7%)	8 (22.2%)	14 (38.89%)
-1	6 (16.7%)	3 (8.33%)	10 (27.78%)
-2	15 (41.67%)	11 (30.56%)	8 (22.22%)
-3	9(25.00%)	14 (38.89%)	4 (11.11%)
Total= 536			
N	160(29.85%)	146 (27.24%)	285 (53.17%)
-1	145 (27.05%)	117 (21.83%)	115 (21.46%)
-2	130(24.25%)	98 (18.28%)	77 (14.37%)
-3	101 (18.84%)	175 (32.65%)	59(11.01%)



The average WAZ was -1.75 and boys were found to be more underweight than the girls (Figure 5.1.2). The odds of males being underweight (-2 or -3SD) was 1.2 times higher than the girls (Table 5.1.6). Similarly the average HAZ scores for boys were lower as compared to girls. However both the sexes were equally likely to be wasted.

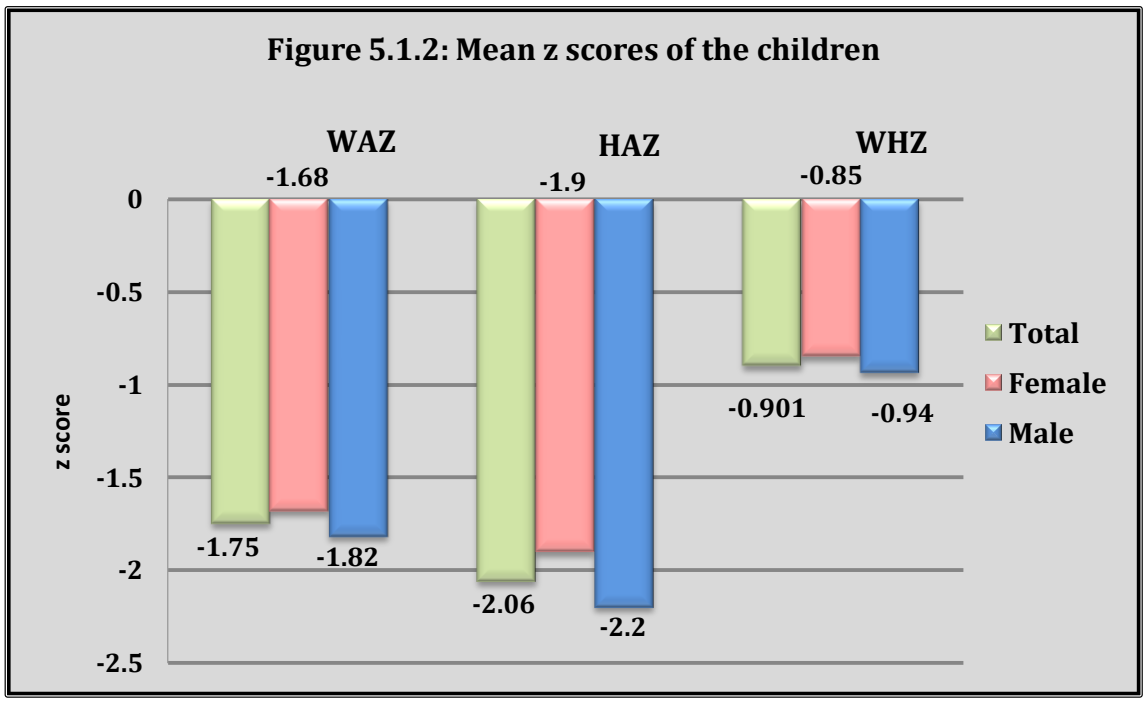


Table 5.1.6: Differences in the prevalence of undernutrition amongst maleand female subjects			
	Z scores		
WAZ	**N or -1 SD**	**-2 or -3 SD**	**Odds ratio**
Female	127	131	Odds ratio: 1.204
Male	124	154	CI: 0.84 - 1.72
HAZ	**N or -1 SD**	**-2 or -3 SD**	**Odds ratio**
Female	124	127	Odds ratio: 1.55
Male	110	175	CI: 1.09 – 1.55
WHZ	**N or -1 SD**	**-2 or -3 SD**	**Odds ratio**
Female	183	68	Odds ratio: 1.00
Male	208	77	CI: 0.67 – 1.49

F value determined for studying age wise differences in the mean z scores for various grades of undernutrition revealed that there was a significant difference in the nutritional status of children among different age groups (Table 5.1.7).

Table 5.1.7: Difference in the mean z scores of the children in different age groups.			
Age in Months	**WAZ**	**HAZ**	**WHZ**
6-12	-1.42 ± 1.36^{a}	-1.68 ± 1.87^{a}	-0.52 ± 1.86^{a}
13 -18	-1.62 ± 1.45^{abcd}	-1.77 ± 1.76^{ad}	-1.62 ± 1.45^{b}
19 -24	-1.98 ± 1.41^{b}	-2.51 ± 1.72^{bd}	-1.02 ± 1.62^{ac}
25 – 30	-1.95 ± 1.21^{c}	-2.31 ± 1.46^{cbd}	-1.01 ± 1.48^{ab}
31 - 36	-2.3 ± 1.28^{d}	-2.34 ± 1.30^{d}	- 1.43 ± 1.72^{bc}
Total	-1.75 ± 1.39	-2.06 ± 1.74	-1.04 ± 1.88
F value	**5.521*****	**5.692*****	**8.214*****

Level of significance:* p- value <0.0001; NS = Not Significant; abcde: the non identical letters in any two rows within the column denotes a significant difference at minimum 5% level**

The odds of children above 18 months to be underweight and stunted was 1.78 and 1.84 times higher respectively than the children below 18 months of age (Table 5.1.8). In contrast the odds of children below 18 months to be wasted was 1.04 times higher than the ones older than them

Table 5.1.8: Differences in the prevalence of undernutrition amongst children below and above 18 months			
	Z scores		
WAZ	**N or -1 SD**	**-2 or -3 SD**	**Odds ratio**
>18	125	153	Odds ratio: 1.78
≤ 18	153	105	CI: 1.25 – 2.55
HAZ	**N or -1 SD**	**-2 or -3 SD**	**Odds ratio**
>18	161	97	Odds ratio: 1.84
≤ 18	132	146	CI: 1.28 – 2.63
WHZ	**N or -1 SD**	**-2 or -3 SD**	**Odds ratio**
>18	70	188	Odds ratio: 1.04
≤ 18	75	194	CI: 0.70 – 1.55

5.1.2.2 Morbidity profile

As reported by mothers, 69% children suffered from cough and cold, with 31.2% mothers reporting of fever along with it. Diarrhoea was reported in 35.3% children in the past one month, of which majority, (90.5%) had watery diarrhoea, 9.5% had bloody diarrhoea and 10 children were admitted to hospital during the diarrhoeal episodes (Table 5.1.9).

Table 5.1.9 : Morbidity profile of the children		
	No. of Subjects	**%**
Cough and cold	370	69.0
Fever due to cough and cold	167	31.2
Fever due to other reason	58	10.8
Diarrhoea	189	35.3
Type of Diarrhoea		
Watery diarrhoea	171	90.5
Bloody diarrhoea	18	9.5
Admitted	10	5.3

5.1.3 Hygiene and sanitation knowledge and practices of the mothers

5.1.3.1 Environmental hygiene

Table 5.1.10 summarizes the responses of mothers to the questions related to environmental hygiene. As indicated majority of mothers (71.3%) had excellent scores for knowledge on environmental hygiene (KEH) i.e. the mothers were aware that environmental hygiene is an important determinant for child's health. Mothers knew that accumulated water, flies, fecal matter outside the house and

mopping, sweeping; animals and flies inside the house can affect their child's health. Disposing household solid waste in open was considered desirable by almost 43% mothers.

Table 5.1.10: Knowledge of mothers on environmental hygiene

S.No	Question	Responses	No.	%
1.	Does the environmental sanitation of and around the house affects the child's heath?	Yes (2)	413	77.1
		No (1)	77	14.4
		No Response/ Don't know (1)	46	8.6
		Mean ± S.D	1.77 ± 0.42	
2.	What according to you is the best way to dispose of the solid waste	Burying (2)	7	1.3
		Burning (2)	229	42.7
		Keeping in covered dustbin (2)	69	12.9
		Throwing in open (1)	228	42.5
		No Response/ DK (1)	3	0.6
		Mean ± S.D	1.57 ± 0.5	
3.	Do you think that water accumulation outside house can affect child health	Yes (2)	444	82.8
		No (1)	64	11.9
		No Response/ Don't know (1)	28	5.2
		Mean ± S.D	1.83 ± 0.4	
4.	Can presence of flies outside house affect your child's health	Yes (2)	424	79.1
		No (1)	89	16.6
		No Response/ Don't know (1)	23	4.3
		Mean ± S.D	1.79 ± 0.4	
5.	Can presence of fecal matter outside the house affect your child's health	Yes (2)	411	76.7
		No (1)	94	17.5
		No Response/ Don't know (1)	31	5.8
		Mean ± S.D	1.77 ± 0.42	
6.	Can presence of animals (goat/ dogs etc) inside the house affect your child's health	Yes (2)	406	75.7
		No (1)	93	17.4
		No Response/ Don't know (1)	36	6.7
		Mean ± S.D	1.76 ± 0.3	
7.	Can presence of flies inside the house affect your child's health	Yes (2)	420	78.4
		No (1)	87	16.2
		No Response/ Don't know (1)	29	5.4
		Mean ± S.D	1.78 ± 0.4	
8.	Does mopping and sweeping affect child's health?	Yes (2)	445	83.0
		No (1)	69	12.9
		No Response/ Don't know (1)	22	4.1

		Mean ± S.D	1.83 ± 0.38
Mean % score		88.10	
Mean ± S.D (Max Score: 16)		14.1 ± 2.68	
Ranking of the mothers for knowledge on environmental hygiene			
% score	**Grade**	**No.**	**%**
≤ 60%	Poor	71	13.2
61-75%	Fair	47	8.8
76-90%	Good	36	6.7
91-100%	Excellent	382	71.3
Number in parenthesis adjacent to each response indicate maximum score			

Results of the environmental hygiene practices (Table 5.1.11) were comparatively poor, with almost 50% mothers scoring ≤60%. The most undesirable practices included open defecation by 44.6% families and open collection and disposal of solid waste by 79.3% and 61.4% families respectively and not using any disinfectant for mopping by 63.8% families.

Table 5.1.11: Environmental hygiene practices of the mothers

S.No	Question	Responses	No.	%
1.	Toilet facility used by the household	Individual toilet (2)	260	48.5
		Public toilet/ common toilet (2)	37	6.9
		Open defecation (1)	239	44.6
		Mean ± S.D	1.56 ± 0.5	
2	Disposal of child's faeces	Children use toilet (2)	40	7.5
		Thrown into toilet (2)	154	28.7
		Thrown in open (1)	342	63.8
		Mean ± S.D	1.36 ± 0.48	
3	Collection of household garbage	Covered dustbin (2)	37	6.9
		Thrown in open (1)	425	79.3
		Open dustbin (1)	74	13.8
		Mean ± S.D	1.1 ± 0.30	
4.	Disposal of solid household waste	Buried (2)	14	2.6
		Burned (2)	173	32.3
		collected by sweeper (2)	20	3.7
		Thrown in open (1)	329	61.4
		Mean ± S.D	1.36 ± 0.48	
5.	Mopping of floor	Using plain water with disinfectant (2)	205	38.2
		Just plain water (1)	331	61.8
		Mean ± S.D	1.38± 0.49	
Mean % score		67.3		
Mean ± S.D (Max. score:10)		6.73 ± 1.49		

Ranking of the mothers for environmental hygienepractices			
% score	**Grade**	**No.**	**%**
≤ 60%	Poor	267	49.8
61-75%	Fair	95	17.7
76-90%	Good	99	18.5
91-100%	Excellent	75	14.0
Number in parenthesis adjacent to each response indicate maximum score			

5.1.3.2 Food hygiene

Ranking of the mothers for knowledge on food hygiene showed that majority of the mothers (47.8%) scored fairly. Most of the mothers, 59% were unaware about the safe temperatures for heating leftover moist food for consumption and almost half the mothers didn't know about the safe duration of storage of cooked moist food stored at room temperature before consumption. A large percentage of mothers, 88.8% regarded "bulk washing only once" as the ideal way of washing fruits and vegetables. Sixty seven percent mothers believed that "warming" the stored moist weaning foods is sufficient before feeding the baby (Table 5.1.12).

Table 5.1.12: Knowledge of mothers on food hygiene				
S.No	**Question**	**Responses**	**No.**	**%**
1.	What can be done to make water safe for drinking?*	Boil (3)	204	38.1
		Add bleach/chlorine (3)	85	15.9
		Sieve with cloth (2)	226	42.2
		Water filter (3)	7	1.3
		Any other	1	0.2
		No response/Don't know (1)	71	13.2
		Mean ± S.D	2.39± 0.71	
2.	How can we use the leftover food from one meal to another	Heat thoroughly (2)	107	20.0
		Should be discarded (2)	82	15.3
		As it is (1)	24	4.5
		Warm it (1)	317	59.1
		No response/Don't know (1)	6	1.1
		Mean ± S.D	1.36 ± 0.48	
3.	What is the safe duration of storage of cooked moist food stored at room temperature before consumption	Within 2 hours (2)	213	39.7
		> 2hours (1)	40	7.5
		No Response/ DK (1)	283	52.8
		Mean ± S.D	1.4 ± 0.49	
4.	How should you wash fruits and vegetables	Tap water/bulk washing twice (2)	51	9.5
		Bulk washing only once (1)	476	88.8
		Do not wash (1)	8	1.5
		Mean ± S.D	1.1 ± 0.29	

5.	Is it necessary to wash knife before and after use	Yes (2)	530	98.9
		No (1)	6	1.1
		Mean ± S.D	1.98 ± 0.13	
6.	What are the safe temperatures of heating milk/other weaning foods before use	Heat to boil (2)	40	7.5
		Discard (2)	70	13.1
		Warm it before feeding (1)	359	67.0
		No need to heat (1)	60	11.2
		No Response/ DK (1)	7	1.3
		Mean ± S.D	1.75 ± 0.38	
Mean % Score		72.4		
Mean ± S.D (Max. Score 13)		9.41 ± 4.18		

Ranking of mothers for knowledge on food hygiene			
% score	**Grade**	**No.**	**%**
≤ 60%	Poor	37	6.9
61-75%	Fair	256	47.8
76-90%	Good	198	36.9
91-100%	Excellent	45	8.4

Number in parenthesis adjacent to each response indicate maximum score
* More than one response was given; hence the total number is more than 536.

High percentage of mothers (78.9%) were ranked as "very good" for practices food hygiene (PFH) indicating that a majority followed desirable food hygiene practices. Desirable food hygiene practices followed by mothers included using soap for washing utensils, washing fruits and vegetables before use and air drying of utensils after washing. The most undesirable food hygiene practices included dipping a container in stored water vessel (where hand comes in contact with water) for drawing water and consuming moist leftover food without sufficient heating (Table 5.1.13).

Table 5.1.13: Food hygiene practices of the mothers				
S.No	**Question**	**Responses**	**No.**	**%**
1.	How do you remove water from the drinking water container?	Pouring (either by tilting the vessel or by using container with handle) (2)	234	43.7
		Container has a spigot or tap (2)	14	2.6
		Dipping a container (where hand comes in contact with water) (1)	288	53.7
		Mean ± S.D	1.46 ± 0.50	
2.	Do you consume moist leftover after thorough heating?	Yes (1)	163	30.4
		No (2)	373	69.6
		Mean ± S.D	1.32 ± 0.47	
3.	Do you wash fruits and vegetables before cooking/ consuming	No (1)	1	0.2
		Yes (2)	535	99.8
		Mean ± S.D	1.99 ± 0.047	
4.	What do you use to wash your utensils with?	Ash and water (2)	14	2.6
		Soap and water (2)	491	91.6
		Ash, soap and water (2)	30	5.6
		Mud (1)	1	0.2
		Mean ± S.D	1.99 ± 0.04	
5.	How do you dry the utensils after washing?	Air dry (2)	322	60.1
		Use a wiping cloth (1)	150	28.0
		Air drying and wiping (1)	64	11.9
		Mean ± S.D	1.61 ± 0.49	
Mean % Score		83.9		
Mean ± S.D (Max. Score: 10)		8.41 ± 0.82		

Ranking of the mothers for food hygiene practices			
% score	**Grade**	**No.**	**%**
≤ 60%	Poor	1	0.2
61-75%	Fair	63	11.8
76-90%	Good	423	78.9
91-100%	Excellent	49	9.1
Number in parenthesis adjacent to each response indicate maximum score			

5.1.3.3 Personal hygiene

Knowledge of mothers on personal hygiene is summarized in Table 5.1.14. Excellent scores were obtained by most of the mothers 76.5%. Almost all mothers, 97.8% knew that washing their hands and child's hands (94.4%) before feeding the child is necessary. Many knew that washing hands with soap is much better than water alone as it facilitates efficient removal of dirt and germs and helps prevent diseases.

Table 5.1.14: Knowledge of the mothers on personal hygiene				
S.No	**Question**	**Responses**	**No.**	**%**
1.	Do you think wearing clean clothes is necessary for child's health	Yes (2)	396	73.9
		No (1)	42	7.8
		Don't know (1)	98	18.3
		Mean ± S.D	1.76 ± 0.44	
2.	Is it necessary to wash your hands before feeding your child?	Yes (2)	524	97.8
		No (1)	1	0.2
		Don't know (1)	11	2.1
		Mean ± S.D	1.98 ± 0.15	
2.1	If yes Why?*	To remove dirt, oils and spices (2)	366	68.3
		To remove germs (2)	66	12.3
		To prevent diseases (2)	102	19.0
		It smells good (1)	5	0.9
		No Response/ Don't know (1)	35	6.5
		Mean ± S.D	1.92 ± 0.27	
3.	Do you think washing your child's hands is necessary before feeding your child?	Yes (2)	506	94.4
		No (1)	16	3.0
		No Response/ Don't know (1)	14	2.6
		Mean ± S.D	1.94 ± 0.23	
3.1	If yes Why?*	To remove dirt (2)	366	68.3
		To remove germs (2)	66	12.3
		To prevent diseases (2)	102	19.0
		It smells good (1)	5	0.9
		No Response/ Don't know (1)	35	6.5
		Mean ± S.D	1.89 ± 0.31	
4.	Do you think washing hands with soap is better than washing with water alone	Yes (2)	391	72.9
		No (1)	13	2.4
		Sometimes (1)	124	23.1
		No Response/ Don't know (1)	8	1.5
		Mean ± S.D	1.73 ± 0.44	
4.1	If yes Why?*	To remove dirt (2)	334	62.3
		To remove germs (2)	64	11.9
		To prevent diseases (2)	84	15.7
		It smells good (1)	5	0.9
		No Response/ Don't know (1)	77	14.4
		Mean ± S.D	1.84 ± 0.37	
5.	Should you tie your hair while cooking	Yes (2)	533	99.4
		No (1)	0	0.0
		Sometimes (1)	3	0.6
		Mean ± S.D	1.99 ± 0.07	
6.	Should a wound on finger be covered before feeding the child /cooking	Yes (2)	448	83.58
		No (1)	4	0.75
		DK/Sometimes (1)	84	15.67
		Mean ± S.D	1.83 ± 0.37	

7.	Should one wash hands after touching animals	Yes (2)	512	95.5
		No (1)	1	0.2
		Sometimes (1)	22	4.1
		No Response/ Don't know (1)	1	0.2
		Mean ± S.D	1.96 ± 0.21	
Mean % score		94.0%		
Mean ± S.D (Max. Score 20)		18.83 ± 1.9		
Ranking of the mothers for knowledge on personal hygiene				
% score	**Grade**		**No.**	**%**
≤ 60%	Poor		14	2.6
61-75%	Fair		24	4.5
76-90%	Good		88	16.4
91-100%	Excellent		410	76.5
Number in parenthesis adjacent to each response indicate maximum score * More than one response was given; hence the total number is more than 536.				

Personal hygiene practices of the mothers were assessed primarily with respect to their hand washing practices with soap. Mothers were questioned regarding use of soap for washing hands before and after a number of activities. The responses are summarised in Table 5.1.15.

All the mothers used soap after visiting toilet and also after attending the child who has defecated. Every mother bathed daily and wore clean clothes. Only half used soap for washing hands before feeding the child and an almost similar number before eating food.

Insufficient use of soap was found before cooking, before breastfeeding the child and after touching raw foods. The overall scores showed that only 29.7% mother had excellent scores for personal hygiene practices.

Table 5.1.15: Hand washing and personal hygiene practices of the mothers				
S.No	**Question**	**Responses**	**No.**	**%**
Activities after or before which hands are washed using soap				
1.	Before cooking food	Yes (3)	215	40.1
		No (1)	13	2.4
		Sometimes (2)	308	57.5
		Mean ± S.D	2.35 ± 0.53	
2.	Before feeding a child	Yes (3)	268	50.0
		No (1)	39	7.3
		Sometimes (2)	229	42.7
		Mean ± S.D	2.38 ± 0.62	
3.	Before breastfeeding a child	Yes (3)	64	11.9
		No (1)	343	64.0
		Sometimes (2)	129	24.1
		Mean ± S.D	1.51 ± 0.70	
4.	Before eating	Yes (3)	279	52.1
		No (1)	94	17.5
		Sometimes (2)	163	30.4
		Mean ± S.D	2.35 ± 0.76	
5.	After attending to a child who has defected	Yes (3)	536	100.0
		No (1)	0	0.0
		Sometimes (2)	0	0.0
		Mean ± S.D	3.0 ± 0.0	
6.	After changing child nappies	Yes (3)	303	56.5
		No (1)	76	14.2
		Sometimes (2)	157	29.3
		Mean ± S.D	2.43 ± 0.72	
7.	After visiting a toilet	Yes (3)	536	100.0
		No (1)	0	0.0
		Sometimes (2)	0	0.0
		Mean ± S.D	3.0 ± 0.0	
8.	Do you wash your child's hands after s/he has defecated?	Yes (3)	359	67.0
		No (1)	69	12.9
		Sometimes (2)	108	20.1
		Mean ± S.D	2.54 ± 0.71	
9.	After touching raw foods	Yes (3)	210	39.2
		No (1)	223	41.6
		Sometimes (2)	103	19.2
		Mean ± S.D	1.98 ± 0.9	
10.	Do you take bath every day in the morning before starting days work	Yes (3)	536	100.0
		No (1)	0	0.0
		Sometimes (2)	0	0.0
		Mean ± S.D	3.0 ± 0.0	
11.	Do you change clothes every day	Yes (3)	536	100.0
		No (1)	0	0.0
		Sometimes (2)	0	0.0

		Mean ± S.D	3.0 ± 0.0	
12.	Do you cut your nails atleast once in a week	Yes (3)	366	68.3
		No (1)	30	5.6
		Sometimes (2)	140	26.1
		Mean ± S.D	2.66 ± 0.51	
Mean % Score		83.9		
Mean ± S.D (Max. Score 36)		30.2 ± 3.69		
Ranking of the mothers for personal hygiene practices				
% score	**Grade**		**No.**	**%**
≤ 60%	Poor		13	2.4
61-75%	Fair		100	18.7
76-90%	Good		264	49.3
91-100%	Excellent		159	29.7
Number in parenthesis adjacent to each response indicate maximum score				

5.1.3.4 Spot Observations

5.1.3.4.1 Household environmental hygiene

Individual households were observed and graded for their environmental hygiene. A high percentage of households were observed to have either soap or ash at the hand washing place (93.5%) and had all the drinking water containers covered (97.3%). Flies were found inside (71.8%) and outside (75.2%) the house in majority of the cases. Almost 59% houses were swept during the visit but only 42.5% were mopped. Almost half the percentage (48.7%) of households had garbage dumped in their vicinity (Table 5.1.16).

Table 5.1.16: Environmental hygiene observations of the household				
S.No	**Question**	**Responses**	**No.**	**%**
1.	Are the following items present at the place for hand washing? (observe and check all that apply)	Both soap or ash and water (2)	501	93.5
		Only water (1)	35	6.5
		Mean ± S.D	1.93 ± 0.25	
2.	House swept	Yes (2)	314	58.6
		No (1)	222	41.4
		Mean ± S.D	1.59 ± 0.5	
3.	House mopped	Yes (2)	228	42.5
		No (1)	308	57.5
		Mean ± S.D	1.43 ± 0.50	
4.	Are the drinking water containers covered?	All are (2)	523	97.6
		Some are	13	2.4
		Mean ± S.D	1.97 ± 0.15	
5.	Flies inside the house	Yes (2)	385	71.8
		No (1)	151	28.2
		Mean ± S.D	1.33 ± 0.46	
6.	Flies outside the house	Yes (2)	403	75.2
		No	133	24.8
		Mean ± S.D	1.25 ± 0.40	
7.	Stagnant pool of water just outside the house	Yes (2)	158	29.5
		No (1)	378	70.5
		Mean ± S.D	1.71 ± 0.46	
8.	Garbage dumped near the house	Yes (2)	261	48.7
		No (1)	275	51.3
		Mean ± S.D	1.71 ± 0.46	
9.	Open sewage close to the house	Yes (2)	124	23.1
		No (1)	412	76.9
		Mean ± S.D	1.77 ± 0.43	
10.	Pets inside the house	Yes (2)	116	21.6
		No (1)	420	78.4
		Mean ± S.D	1.78 ± 0.42	
11.	Cooking area clean	Yes (2)	318	59.3
		No (1)	218	40.7
		Mean ± S.D	1.71 ± 0.46	
12.	Utensils containing food covered	Yes (2)	459	85.6
		No	77	14.4
		Mean ± S.D	1.86 ± 0.35	
Mean % Score		82.3		
Mean ± S.D (Max. Score 24)		19.72 ± 3.10		

Ranking of the households for environmental hygiene observations			
% score	**Grade**	**No.**	**%**
≤ 60%	Poor	17	3.2
61-75%	Fair	187	34.9
76-90%	Good	152	28.4
91-100%	Excellent	180	33.6
Number in parenthesis adjacent to each response indicate maximum score			

5.1.3.4.2 Personal hygiene of the mother and child

Results of the personal hygiene observations are summarized in Table 5.1.17. Mother and child were scored for the cleanliness and tidiness of their clothes, hair and nails. The mean score obtained by the mothers were more than the children. Most of the mothers 67% had excellent to good scores as compared to 56.8% children.

Table 5.1.17: Personal hygiene observations of mother and child.

Score (Max=10)	Grading	MOTHER		CHILD	
		7.68 ± 1.92		7.10 ± 2.07	
		No.	%	No.	%
10	Excellent	144	26.9	115	21.5
7-9	Good	216	40.3	189	35.3
5-6	Fair	134	25.0	156	29.1
4	Poor	42	7.8	76	14.2

5.1.4 Infant and child feeding knowledge and practices of the mothers

5.1.4.1 Breastfeeding

Mothers had relatively poor breastfeeding knowledge as almost 70% were ranked as poor. Almost 90% mothers knew that the first beast milk is different from the normal breast milk but only 13% knew that it is referred to as "*chep*" or yellow milk. About 68% mothers knew that colostrum is good for the child but only 10.6% could mention its correct advantage. When asked about the benefits of colostrum mothers gave responses like it develops brain, fills stomach etc (Table 5.1.18). Some mothers (12.5%) also indicated that colostrums is not good for the child as it sticks to child's throat, is dirty/ stale milk and causes diarrhoea.

Only 73.9% mothers knew that the child should be exclusively breastfed till 6 months and only 30.2% knew that giving prelactals is not good for the child. Some of the reasons given for giving prelactals included that it removes dirt from the child's stomach, inculcates good values, is nutritious and healthy etc.

Table 5.1.18: Breastfeeding knowledge of the mothers				
S.No.	**Question**	**RESPONSES**	**No.**	**%**
1.	Do you know that the first milk that comes out of the breast looks different from the later milk	Yes (1)	480	89.6
		No/ DK (0)	56	10.4
		Mean ± S.D	0.31 ± 0.89	
2.	What is this milk called	Chep (1)	59	11
		Yellow milk (1)	10	1.9
		DK/ No response: NR (0)	468	87.3
		Mean ± S.D	0.13 ± 0.33	
3.	Is colostrum good for the child	Yes (1)	362	67.5
		No (0)	67	12.5
		DK/NR (0)	107	20
		Mean ± S.D	0.68 ± 0.50	
4.	If good why (more than 1 response was given by some mothers hence total % is more than 100)	Child becomes healthy (0)	75	14.0
		Nutritious (0)	51	9.5
		Full to energy (0)	16	3.0
		Improves immunity (1)	57	10.6
		DK/NR (0)	353	65.9
		Makes child happy (0)	1	0.2
		Good for eye sight (0)	2	0.4
		Fills stomach (0)	1	0.2
		Doctor said (0)	2	0.4
		Everyone says so (0)	2	0.4
		Develops brain (0)	1	0.2
		Since mother has medicine during pregnancy and delivery so milk becomes yellow and not good for child (0)	1	0.2
		Mean ± S.D	0.10 ± 0.30	
5.	If bad why (out of 67) No score given	Unhealthy for child	9	13.43
		It is dirty/ stale	11	16.42
		Don't know/ No reason	38	56.72
		Doctor said	3	4.48
		Causes diarrhoea	2	2.99
		Child falls sick	1	1.49
		Not good, elders say	2	2.99
		Sticks to throat	1	1.49
6.	Till how many months should one exclusively breast feed the child	Upto 6 months (1)	396	73.9
		Any other/ NR/DK (1)	140	26.1
		Mean ± S.D	0.75 ± 0.43	
7.	Are prelactals good for the child	Yes (0)	242	45.1
		No (1)	162	30.2
		NR/DK (0)	132	24.6
		Mean ± S.D	0.31 ± 0.47	
8.	Reasons for giving	Dirt in child's stomach is	14	5.79

	prelacteals (out of 242) No score given.	removed		
		Inculcates good values	8	3.31
		Initially no breast milk and child is hungry	59	24.38
		Family members told me to do so	27	11.16
		Do not know	65	26.86
		Nutritious & Healthy	27	11.16
		Child speaks softly/ sweetly	9	3.72
		Religious belief	7	2.89
		Improves digestion	6	2.48
		Child sleeps well	2	0.83
		Prevents cough and cold	6	2.48
		Doctor says	1	0.41
		Good in summers, (*sharir ma garmi na thaye*)	2	0.83
		initally childs mouth is dry	1	0.41
		child gets fair and speaks early	2	0.83
		improves blood quantity	2	0.83
		jaggery bring warmth in body of the child	1	0.41
		to develop taste for food	1	0.41
		child doesn't cry	1	0.41
		Jaggery has iron and gives strength	1	0.41
Mean % Score		47.5		
Mean ± S.D (Max. Score 6)		2.85 ± 1.33		
Ranking of the mothers for breastfeeding knowledge				
% score		**Grade**	**No.**	**%**
≤ 60%		Poor	372	69.4
61-75%		Fair	119	22.2
76-90%		Good	32	6.0
91-100%		Excellent	14	2.6

NR: No Response; DK: Don't know

The breastfeeding practices of the mothers are summarized in table 5.1.19. As high a 75% mothers breastfed their babies after the birth. Prelactels like honey. *Ghutti*, sugar water was given by 13.7% mothers. Prelactels were given to the child by using a spoon, cloth or cotton piece or by finger. About 77% mothers fed colostrums to their child and out of this 45.1% fed their child within 1 hour of birth.

Table 5.1.19: Breastfeeding practices of the mothers				
S.No	**Question**	**Responses**	**No.**	**%**
1.	What was given to the child immediately after birth?	Breastmilk (1)	400	74.6
		Water (0)	3	0.6
		Prelacteals (0)	73	13.7
		Top milk (0)	60	11.2
		Mean ± S.D	0.74 ± 0.44	
4.	If prelacteals were given specify (out of 73)	Ghutti	12	16.44
		Jaggery	5	6.85
		Honey	49	67.12
		Glucose water	5	6.85
		Sugar water	2	2.74
3.	How were the prelacteals given to the child (out of 73)	Spoon/ any other vessel	31	42.5
		Finger	30	41.1
		Cotton/ Cloth	6	8.2
		Don't emember	2	2.7
		Dropper	1	1.4
		jewellery	3	4.1
4.	Did you give the first milk to your child	Yes (1)	412	76.9
		No (0)	124	23.1
		Mean ± S.D	0.77 ± 0.42	
5.	How long after birth did you first put your child to breast	Within 1 hour (1)	242	45.1
		After 1 hour (0)	264	49.3
		Don't Rem (0)	30	5.6
		Mean ± S.D	0.50 ± 0.50	
Mean % Score		65.54		
Mean ± S.D (Max. Score 3)		1.97 ± 0.97		

Ranking of the mother for breastfeeding practices			
Score	**Grade**	**No.**	**%**
3	Excellent	194	36.2
2	Good	178	33.2
1	Fair	116	21.6
0	Poor	48	9.0

5.1.4.2 Complementary feeding

Complementary feeding knowledge of the mothers is summarized in table 5.1.20. Mothers were asked to state the right age of initiating complementary feeds. A fair percentage (67.2%) of mothers could rightly mention that complementary feeds should be initiated after the child completes 6 months of age**.** Stating the reasons for startingcomplementary feeds, almost 67% mothers could rightly state the reasons as breastfeed being less, increase in child's food requirements and to make the child healthy. Some undesirable responses included reasons like child remains playful, sleeps well, does not cry etc. Almost one fifth (20.7%) mothers

did not give any response. Mothers were also asked to state the different foods that could be fed to the child. Only 8.6% mothers could state different variety of foods that included all the 5 food groups. More than half (58.2%) mothers were graded to have excellent knowledge on complementary feeding.

Table 5.1.20: Complementary feeding knowledge of the mothers

S.No	Question	Responses	No.	%
1.	When should one start with complementary feeds	Before 6 months (0)	73	13.6
		More than 7 months (0)	61	11.4
		Don't know/ no response (0)	42	7.8
		After completing 6 months (1)	360	67.2
		Mean ± S.D	0.7 ±0.47	
2.	Why should we start with complementary feeds	Child remains healthy, Give more nutrition, needs more food, breast milk is less (1)	359	66.98
		child becomes playful, child sleeps well, child does not fall ill, inculcate eating habits improves digestion, everyone says so, child remains full, stomach remains full and the child will not bother the mother less, child started eating himself when other family members had food, to increase child's weight, stomach remains clean, when child grows we have to give food, to improve immunity, aww advised, child remained hungry, child does not cry (0)	66	12.31
		Don't know (0)	111	20.71
		Mean ± S.D	0.67 ±0.43	
3.	What all foods should be fed to the child in the initial months (any of the following items: Milk, mashed fruits or juices, Khichdi/ rice, curd, dal water, boiled vegetables, mashed chapatti, biscuits with milk, balbhog,	DK (0)	54	10.1
		1-2 (1)	286	53.4
		3-4 (2)	150	28.0
		5 OR MORE (3)	46	8.6
		Mean ± S.D	1.35	0.78

	commercially available baby feeds, rice water, raab, sheera, upma, curd.		
Mean % Score		53.7	
Mean ± S.D (Max. Score 5)		2.68 ± 1.22	
Ranking of the mother for complementary feeding knowledge			
Score	**Grade**	**No.**	**%**
3 and above	Excellent	312	58.2
2	Good	134	25.0
1	Fair	66	12.3
0	Poor	24	4.5

Table 5.1.21 depicts the complementary feeding practices of the mothers. As many as 74% mothers had not started CF at the right age. Most of the children (81.2%) were fed by any of the elders in the family and almost 49% were encouraged to finish their meals and only 9.5% were force fed. Almost 92% children were fed in separate vessels and 95% were fed foods from more than four food groups. More than half the mothers prepared special foods for their children like *balbhog, sheera, raab*, etc.

Only 28 mothers (5.2%) were found to have excellent complementary feeding practise. Almost an equal percentage (34%) of mothers were graded as fair and poor.

Table 5.1.21: Complementary foods feeding practices of the mothers				
S.No	**Question**	**Responses**	**No.**	**%**
1.	Were Complementary feeds started after 6 months?	Yes (1)	116	21.6
		No (0)	397	74.1
		Don't remember (0)	23	4.3
		Mean ± S.D	0.22 ± 0.4	
2.	Who feeds the child	Child himself/herself (0)	101	18.8
		Any elder (1)	435	81.2
		Mean ± S.D	0.81 ± 0.39	
3.	How do you ensure that the child eats his/her food (20 not started)	Force him/her to eat (0)	51	9.5
		Encourage the child to finish up the meal (1)	261	48.7
		Feed the child on demand-when he/she asks for food (0)	135	25.2
		Give food and leave him/her alone to finish the meal (0)	108	20.1
		Mean ± S.D	0.5 ± 0.5	
4.	How do you feed your child? (out of 516)	In your plate (0)	68	13.2
		Separate vessel (1)	448	90.7
		Mean ± S.D	0.5 ± 0.5	
5.	What all foods do you feed your child? (in terms of 7 food groups)	CF not started (0)	20	3.7
		Upto 3 food groups (1)	8	1.5
		4 for more food groups (2)	508	94.8
		Mean ± S.D	1.83 ± 0.53	
6.	Do you prepare any special food items for the child?	Yes (1)	301	56.1
		No (0)	235	43.9
		Mean ± S.D	0.5 ± 0.5	
Mean % Score		68.27		
Mean ± S.D (Max. Score 7)		4.78 ± 1.35		

Ranking of the mother for complementary feeding knowledge			
Score	**Grade**	**No.**	**%**
≤ 60%	Poor	182	34.0
61-75%	Fair	184	34.3
76-90%	Good	142	26.5
91-100%	Excellent	28	5.2

5.1.4.3 Other health related perceptions and practices

Mother's perception regarding child health and growth was assessed by asking various questions. As many as 80% mothers reported that they took their child for growth monitoring regularly. Majority of children were immunized as per the schedule at the time of interview (immunization card was checked for reference). About 67% mothers believed that their child was healthy but about 32% of the children amongst them were suffering from undernutrition. More than half the

mothers were unaware about the real causes of undernutrition and its serious consequences (Table 5.1.22).

Table 5.1.22: Mothers perception and practices with respect to child's health

S.No	Question	Responses	No.	%
1.	Do you take your child for growth monitoring	Yes (1)	431	80.41
		No (0)	105	19.59
		Mean ± S.D	0.82 ± 0.38	
2.	Is the child immunized as per the schedule (Check availability of immunization card)	Yes (1)	461	86.01
		No (0)	75	13.99
		Mean ± S.D	0.86 ± 0.35	
3.	Do you think your child is healthy	Yes (child is healthy) (1)	187	34.89
		No (child is healthy) (0)	61	11.38
		Yes (child is under nourished) (0)	175	32.65
		No (child is undernourished) (1)	94	17.54
		DK (0)	19	3.54
		Mean ± S.D	0.5 ± 0.5	
4.	Do you think diet always play an important role in determining your child's health	Yes (1)	384	71.64
		No (0)	11	2.05
		NR/ DK (0)	141	26.31
		Mean ± S.D	0.70 ± 0.45	
5.	What do you think are the causes of malnutrition	food deficiency, illness and infection, if mother is unhealthy at the time of pregnancy then child is born undernourished, low birth weight (1)	255	47.57
		Evil eyes, teething, feeding less breast milk, if mother is week then she will feed the child less, bad weather, mother not taking care, poor hygiene, keeping child dirty, mother eating something bad, child is stubborn, incomplete immunization, when child cries a lot, water change, cold foods, too much breastmilk, child not breastfed, if mother is pregnant then she cannot brestfeed the child hence the child gets weak, don't know	312	58.21
		Mean ± S.D	0.5 ± 0.50	

6.	If the child is malnourished then what are its consequences	Growth failure, Low Weight, Less active, Fall sick, Will lag behind in studies/ have low IQ	186	35.26
		Don't know, death, cry, hands get deformed, child develops some digestive problems	343	64.74
		Mean ± S.D	0.31 ± 0.46	
Mean % Score		61.60		
Mean ± S.D (Max. Score 6)		3.70 ± 1.38		
Ranking of the mother for diarrhoea cause and management knowledge				
Score	**Grade**	**No.**	**%**	
≤ 60%	Poor	244	45.52	
61-75%	Fair	137	25.56	
76-90%	Good	94	17.54	
91-100%	Excellent	61	11.38	

5.1.5: Childhood diarrhoea

5.1.5.1 Knowledge of mothers

Table 5.1.23 summarizes the responses to various questions asked to judge their knowledge regarding childhood diarrhoea cause and management. Mothers were asked the causative factors for diarrhoea and only 183 mothers could state the correct reason. The various desirable responses stated as causative factors for diarrhoea included microbes in food, feeding leftover food, not washing hands, poor hygiene etc.

A wide range of undesirable responses were also obtained which included reasons like child not having nutritious food, bad weather, evil eyes, teething, poor digestion etc. Mothers were also asked to state a few symptoms of diarrhoea but as many as 45% could not state any. About 52% could state 1-2 symptoms.

As high as 81% women mentioned that breastfeeding should be continued while the child suffered from diarrhoea and 76% recommended continued complementary feeding. About 47% mothers could state 1-2 food items that could be fed to the child during diarrhoeal episodes. These included rice, dal, coconut, lime, fennel water, curd, *khichidi*, pomegranate juice etc. Fourty three percent mothers could not enlist any food item. A high percentage of mothers (67.7%) did not know what all foods should be avoided during diarrhoea but a high percentage (83.2%) of mothers knew about ORS.

Mothers were also asked to state a few preventive measures for diarrhoea. Only 51 mothers (9.5%) could correctly state the same and their responses included maintaining hygiene, washing hands, boiling water etc. Only 1.87 % mother were graded as excellent and majority, 64.37% were categorized to have poor diarrhoea cause and management knowledge.

Table 5.1.23: Diarrhoea cause and management knowledge of the mothers

S.No	Question	Responses	No.	%
1.	Why does the child suffer from diarrhea	**Desirable response (1):** Microbes in food, Feeding leftover food, Not washing hands, dirty water, keeping house dirty, infection/virus, dust, poor hygiene (1)	183	34.14
		Undesirable response (0): child not having nutritious food, child eating outside food, evil eyes, teething, fever, bad/ hot / changing weather, child eating bad food, over feeding, mother not eating properly, poor digestion, not feeding child on time, mother not taking proper care, gas, not feeding enough food, cough and cold, drinking more milk, when he drinks too much water, eating something that is not digested properly, after immunization, eating spicy and hot foods, heavy food, eating ice cream and sweets, eating raw fruits, hotness in body, plays in sunlight, other illnesses, mother eating something that causes diarrhoea. (0)	442	58.39
		DK/NR (0)	129	24.1
		Mean ± S.D	0.30 ± 0.46	
2.	What are the symptoms of diarrhoea (except watery stools)	0 symptoms(0)	241	45.0
		1-2 symptoms (1)	280	52.2
		3-4 symptoms (2)	15	2.8
		Mean ± S.D	0.59 ± 0.55	
3.	Should we breast feed during diarrhea	Yes (1)	434	81.0
		No (0)	60	11.2
		DK (0)	42	7.8

		Mean ± S.D	0.81 ± 0.39	
4.	Should we continue CF during diarrhea?	Yes (1)	408	76.1
		No (0)	67	12.5
		DK (0)	61	11.4
		Mean ± S.D	0.75 ± 0.43	
5	What all should be fed when the child suffers from diarrhea Any of the following food items (plain water, juice, coconut water, rice water, khichdi, dal water, curd, banana/ fruits, tea, pomegranate juice, glucose water).	DK (0)	232	43.3
		1-2 foods (1)	251	46.8
		3-4 foods (2)	52	9.7
		5 or more foods (3)	1	0.2
		Mean ± S.D	0.66 ± 0.65	
6.	What all should be avoided if the child is suffering from diarrhoea. Any of the following (spicy food, oily foods, besan, outside food, sweets, milk, chocolate, whole grain, non veg foods, stale food)	DK (0)	363	67.7
		1-2 foods (1)	173	32.3
		Mean ± S.D	0.32 ± 0.47	
7.	Are you aware about ORS	Yes (1)	446	83.2
		No (0)	90	16.8
		Mean ± S.D	0.83±0.37	
8.	How can we prevent diarrhoea	**Desirable responses (1)** maintaining hygiene, washing hands, do not feed stale food, boil water before giving it to the child, Prevent dust	51	9.51
		Undesirable responses (0) feeding healthy/ nutritious food to the child, keeping them away from evil eyes, giving medicines, give *jaiphal*, avoid outside foods, avoid spicy foods, worship god, do not feed the food that child doesn't like, give light foods, feed less amount to child, do not allow child to play in intense sunlight/ hot weather, take good care ,give more fluids, feed pomegranate, give	93	17.35

		lime water, make child wear *moti*, give castor oil, take proper care, do not allow child to eat food that has fallen down, avoid foods that contain *besan*, not to feed food that causes diarrhoea, consult doctor, hitting child on hips, mother should not eat brinjal, give foods that the child can digest, not to feed child open food		
		DK	394	73.5
		Mean ± S.D	0.1 ± 0.31	
Mean % Score		51.25		
Mean ± S.D (Max. Score 10)		4.37 ± 1.86		
Ranking of the mother for diarrhoea cause and management knowledge				
Score		**Grade**	**No.**	**%**
≤ 60%		Poor	345	64.37
61-75%		Fair	126	23.51
76-90%		Good	55	10.26
91-100%		Excellent	10	1.87

5.1.5.2 Management practices of the mothers

Mothers were questioned regarding their diarrhoea management practices and their responses are summarized in table 5.1.24. Out of the total sample 138 mothers reported that their child never suffered from diarrhoea, hence data for 398 mothers is presented.

As many as 337 mothers gave CF and BF while the child suffered from diarrhoea. Out of 337 mothers 179 prepared special foods to mange diarrhoea. These foods included dal, rice, glucose, *sabudana*, honey water, pomegranate juice etc. Very few mothers (43) gave ORS and a similar number could state ways to prevent diarrhoea in future. Some mothers were in the practice of giving certain locally made medicines which claimed of curing diarrhoea. Some stated that they made the child wear *tilsmi moti* or magnetic belt as the child starts teething to prevent diarrhoea (Plates 5.1 to 5.5).Almost 90% mothers whose children suffered from diarrhoea were graded to have poor diarrhoea management practices.

Table 5.1.24: Diarrhoea management practices of the mothers (n=398)				
S.No	**Question**	**Responses**	**No.**	**%**
1.	Did you give complementary feed and BF to your child during diarrhea (398)	Only BF (0)	61	15.3
		CF + BF (1)	337	84.7
		Mean ± S.D	0.85 ± 0.36	
2.	Did you feed any special foods when your child suffered from diarrhea (OUT OF 337)	Yes (1)	179	33.39
		No (0)	158	29.47
		Mean ± S.D	0.45 ± 0.50	
3.	If yes what (out of 179)	1-2 FOODS (1)	165	92.2
		3 OR MORE (2)	14	7.8
		Mean ± S.D	0.44± 0.530	
4.	ORS given	Yes (1)	43	10.8
		No (0)	355	89.2
		Mean ± S.D	0.44± 0.530	
5.	What will you do to ensure that the child doesn't suffer from diarrhea in future	**Desirable responses (1):** Maintain hygiene, wash hands	42	10.5
		Undesirable responses (0):consult doctor, provide good, nutrition, worship god/ go to temple/ *dargah,* prevent from evil eyes, give medicine provided by professional or *baba* etc, avoid outside food, tie *tilsmi moti* or magnetic belt in childs neck, do not give food that causes diarrhoea, take proper care during changing weather/ change in weather, avoid bad food, doctor said give ice cream to give coolness to ice cream avoid oily foods, can't avoid due to teething, feed cow milk	127	31.9
		DK/NR (0)	229	57.5
		Mean ± S.D	0.07± 0.25	
Mean % Score		31.95		
Mean ± S.D (Max. Score 6)		1.92 ± 1.28		

Ranking of the mother for diarrhoea cause and management knowledge			
Score	**Grade**	**No.**	**%**
≤ 60%	Poor	357	89.7
61-75%	Fair	0	0
76-90%	Good	39	9.8
91-100%	Excellent	2	0.5

P:5.1

P:5.2

P:5.3

P:5.4

P:5.5

Plates 5.1 to 5.5: Local medicines and devices used for preventing and treating diarrhoea amongst children by mothers.

5.1.6 Factors affecting nutritional status and diarrhoeal morbidities in children

Correlation and regression analysis was carried out to identify the factors that affect nutritional status and occurrence of diarrhoea in children.

5.1.6.1 Weight for age

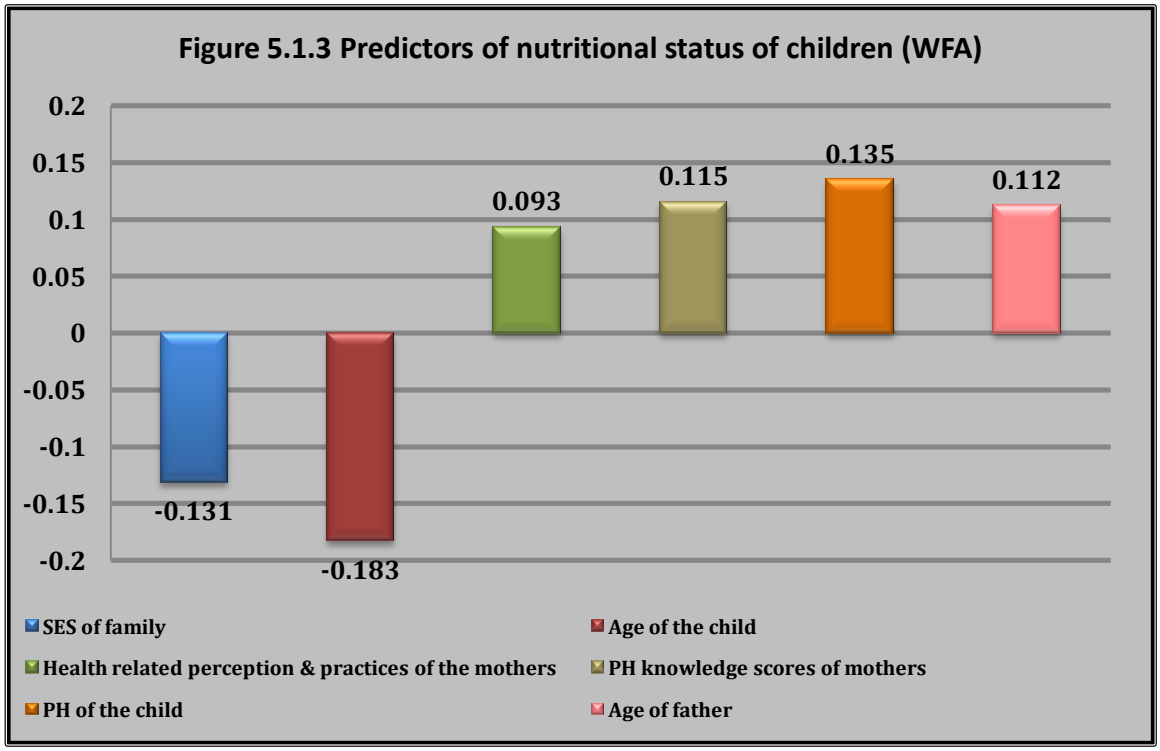
Correlation and regression analysis were conducted to examine the relationship between nutritional status of the child in terms of weight for age and various potential predictors. Various regression models were exercised in order to reach the best fit model (R^2=15.7) for the identification of substantial regressors for weight forage z scores of the child. As indicated in table 5.1.25 of all the 31 predictors, 17 were significantly correlated.

As seen in table 5.1.26, stepwise liner regression was used and of all the variables entered in the regression equation, SES of the family, age of the child came out to be negatively impacting the WAZ of the children. Health related perceptions and practice scores of the mothers, KPH scores of the mothers, OPH scores of the child and age of the father regressed the WAZ of the children positively.

Age of the child was negatively correlated with the nutritional status of the child indicating that as the age increases the nutritional status of the child deteriorates. Child's personal hygiene scores, health related perceptions and practice scores of the mothersand KPH scores of the mothers were positively correlated indicating that higher the score better is the nutritional status of the child. Figure 5.1.3 represents the contribution of 6 predictors.

Table 5.1.25 : Correlation of various predictors with WFA			
		r value	p value
General information of the child			
1.	Age	-0.201***	0.000
2.	Birth order	0.02^{NS}	0.621
3.	Sex	0.049^{NS}	0.253
General information of the parents			
4.	Age of mother	0.066^{NS}	0.126
5.	Age of father	0.163	0.000
6.	Mothers education	0.097***	0.025
7.	Fathers education	0.155***	0.000
8.	Working status of mother	0.030^{NS}	0.490
Background information of the family			
9.	SES	-0.264***	0.000
10.	Religion	-0.062^{NS}	0.152
11.	Type of family	0.049^{NS}	0.260
12.	No of family members	-0.006^{NS}	0.882
General household information			
13.	Type of house	0.177***	0.000
14.	Drainage	0.068^{NS}	0.117
Hygiene and sanitation knowledge and practices			
15.	Knowledge on environmental hygiene	0.039^{NS}	0.370
16.	Environmental hygiene practices	0.191***	0.000
17.	Knowledge on food hygiene	0.141**	0.001
18.	Food hygiene practices	0.039^{NS}	0.373
19.	Knowledge on personal hygiene	0.187***	0.000
20.	Personal hygiene practices	0.085*	0.049
21.	Observation on environmental hygiene	0.215***	0.000
22.	Personal hygiene observation of the mother	0.238***	0.000
23.	Personal hygiene observation of the child	0.253***	0.000
IYCF knowledge and practices			
24.	Knowledge on Breastfeeding	0.086	0.047
25.	Breastfeeding practices	0.018^{NS}	0.68
26.	Knowledge on complementary feeding	0.069^{NS}	0.113
27.	Complementary feeding practices	0.017^{NS}	0.700
Diarrhoea management practices and knowledge			
28.	Knowledge diarrhoea cause and management	0.021^{NS}	0.627
29.	Diarrhoea management practices	-0.031^{NS}	0.472
30.	Diarrhoeal morbidities	-0.091*	0.035
31.	Health related perceptions and practices of the mothers	0.224***	0.000

Table 5.1.26: Predictors of WFA				
Variables entered	**Adjusted R^2**	**Significant regressors**		
		Name	**Std β coefficient**	**Sig.**
Age of the child	15.7	SES of family	-0.131	0.004
Age of father				
Mothers education				
Fathers education		Age of the child	-0.183	0.000
SES of the family				
Type of house		Health related perceptions and practices of the mothers	0.093	0.031
PEH scores of the mother				
KFH scores of the mothers				
KPH scores of the mothers		KPH scores of the mothers	0.115	0.005
PPH scores of the mothers				
OEH scores of the households				
OPH scores of the mothers		PH scores of the child	0.135	0.003
OPH scores of the child				
KBF of the mothers				
Diarrhoeal morbidities amongst children		Ageoffather	0.112	0.007
Health related perceptions and practices of the mothers				



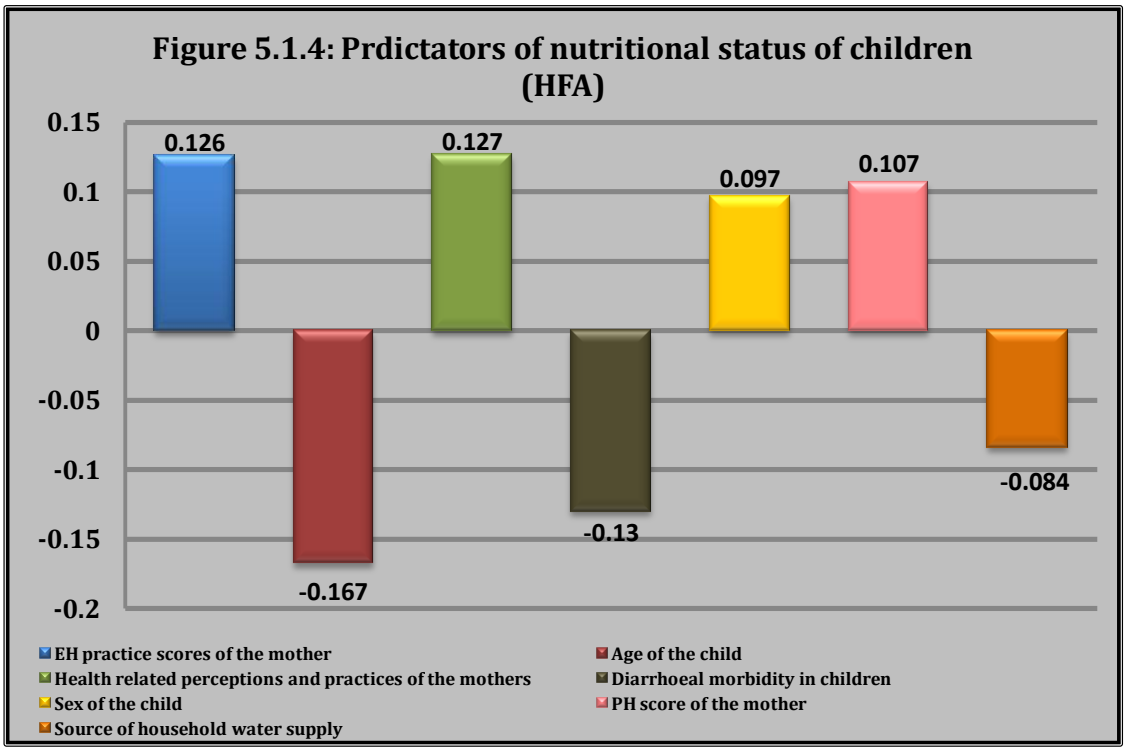
5.1.6.2 Height for age

Correlation analysis conducted to identify parameters that affect height for age among children studied showed that 17 factors significantly correlated (Table 5.1.27). Regression analysis gave a R square value of 0.131, indicating a combined effect of 13.1% on nutritional status of the children (Table 5.1.29). Further stepwise regression analysis showed that of the 17 factors only 6 factors namely EH practice scores of the mother, age of the child, health seeking behaviour scores of the mother, gender of the child, diarrhoeal morbidity, and religion of the family were the main regressors (Table 5.1.28).

As indicated in figure 5.1.4 age of the child, diarrhoeal morbidities in children and source of household drinking water are contributing negatively to HFA indicating that older children were more stunted than the younger ones. In contrast the ones having no diarrhoeal morbidities were more stunted than the ones having diarrhoea.

Table 5.1.27 : Correlation of various predictors with HFA			
		r value	p value
General information of the child			
1.	Age	-0.177***	0.000
2.	Birth order	-0.067^{NS}	0.122
3.	Sex	0.088*	0.043
General information of the parents			
4.	Age of mother	0.083^{NS}	0.055
5.	Age of father	0.115**	0.008
6.	Mothers education	0.145**	0.001
7.	Fathers education	0.138**	0.001
8.	Working status of mother	0.017^{NS}	0.696
Background information of the family			
9.	SES	- 0.201***	0.000
10.	Religion	-0.013^{NS}	0.758
11.	Type of family	0.040^{NS}	0.354
12.	No of family members	0.001^{NS}	0.986
General household information			
13.	Type of house	0.167***	0.000
14.	Drainage	0.136**	0.002
Hygiene and sanitation knowledge and practices			
15.	Knowledge on environmental hygiene	0.023^{NS}	0.593
16.	Environmental hygiene practices	0.242***	0.000
17.	Knowledge on food hygiene	0.130**	0.003
18.	Food hygiene practices	0.031^{NS}	0.478
19.	Knowledge on personal hygiene	0.127**	0.003
20.	Personal hygiene practices	0.049^{NS}	0.259
21.	Observation on environmental hygiene	0.19***	0.000
22.	Personal hygiene observation of the mother	0.214***	0.000
23.	Personal hygiene observation of the child	0.218***	0.000
IYCF knowledge and practices			
24.	Knowledge on Breastfeeding	0.055^{NS}	0.202
25.	Breastfeeding practices	0.026^{NS}	0.551
26.	Knowledge on complementary feeding	0.117**	0.007
27.	Complementary feeding practices	0.084^{NS}	0.051
Diarrhoea management practices and knowledge			
28.	Knowledge diarrhoea cause and management	0.008^{NS}	0.858
29.	Diarrhoea management practices	-0.02^{NS}	0.630
30.	Diarrhoeal morbidities	-0.150***	0.000
31.	Health related perceptions and practices of the mothers	0.220***	0.000

Table 5.1.28: Predictors of HFA				
Variables entered	**Adjusted R^2**	**Significant regressors**		
		Name	**Std β coefficient**	**Sig.**
Age of the child	13.1	PEH scores of the mothers	0.147	0.001
Sex of the child				
Age of father				
Mothers education		Age of the child	-0.169	0.000
Fathers education				
SES of the family				
Type of house		Health seeking behaviour of the mother	0.127	0.004
Drainage				
PEH scores of the mother				
KFH scores of the mothers				
KPH scores of the mothers		Diarrhoeal morbidities amongst children	-0.121	0.004
PPH scores of the mothers				
OEH scores of the households				
OPH scores of the mothers		Sex of the child	0.102	0.012
OPH scores of the child				
KCF of the mothers				
Diarrhoeal morbidities amongst children		OPH scores of the mother	0.095	0.031
Health related perceptions and practices of the mothers				



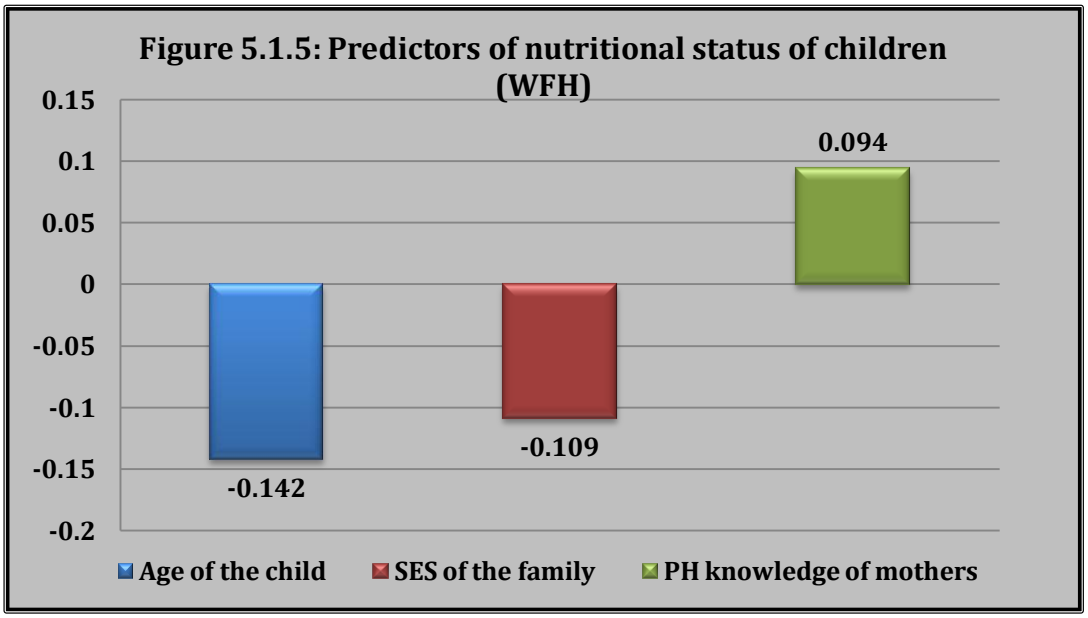
5.1.6.2 Weight for height for age

Table 5.1.29 shows the result of correlation analysis conducted to identify parameters that affected nutritional status of the children in terms of weight for height. Five factors namely age of the child, SES of family,PH knowledge of mothers, PH scores of mother and child were significantly correlated.

Results of the regression analysis showed that only three factors contributed only by 4% in determining weight for height among the children (Table 5.1.30).

Table 5.1.29 : Correlation of various predictors with WFH			
		r value	p value
General information of the child			
1.	Age	-0.145**	0.001
2.	Birth order	0.025^{NS}	0.564
3.	Sex	0.025^{NS}	0.568
General information of the parents			
4.	Age of mother	-0.003^{NS}	0.937
5.	Age of father	0.081^{NS}	0.062
6.	Mothers education	-.007^{NS}	0.863
7.	Fathers education	0.054^{NS}	0.213
8.	Working status of mother	0.023^{NS}	0.602
Background information of the family			
9.	SES	-0.129**	0.003
10.	Religion	0.063^{NS}	0.145
11.	Type of family	0.018^{NS}	0.686
12.	No of family members	-0.014^{NS}	0.739
General household information			
13.	Type of house	0.063^{NS}	0.117
14.	Drainage	-0.031^{NS}	0.479
Hygiene and sanitation knowledge and practices			
15.	Knowledge on environmental hygiene	0.031^{NS}	0.468
16.	Environmental hygiene practices	0.016^{NS}	0.712
17.	Knowledge on food hygiene	0.060^{NS}	0.69
18.	Food hygiene practices	0.034^{NS}	0.427
19.	Knowledge on personal hygiene	0.117**	0.007
20.	Personal hygiene practices	0.054^{NS}	0.211
21.	Observation on environmental hygiene	0.064^{NS}	0.136
22.	Personal hygiene observation of the mother	0.086*	0.046
23.	Personal hygiene observation of the child	0.113**	0.009
IYCF knowledge and practices			
24.	Knowledge on Breastfeeding	0.029^{NS}	0.502
25.	Breastfeeding practices	0.010^{NS}	0.824
26.	Knowledge on complementary feeding	-0.012^{NS}	0.785
27.	Complementary feeding practices	-0.074^{NS}	0.085
Diarrhoea management practices and knowledge			
28.	Knowledge diarrhoea cause and management	0.022^{NS}	0.616
29.	Diarrhoea management practices	-0.041^{NS}	0.346
30.	Diarrhoeal morbidities	0.026^{NS}	0.552
31.	Health related perceptions and practices of the mothers	0.068^{NS}	0.114

Table 5.1.30: Predictors of WFH				
Variables entered	**Adjusted R^2**	**Significant regressors**		
		Name	**Std β coefficient**	**Sig.**
Age of the child	4.0	Age of the child	-0.142	0.001
SES of the family				
KPH scores of the mothers		SES of the family	-0.109	0.012
OPH scores of the mother				
OPH scores of the child		PH knowledge scores of the mothers	0.094	0.029



5.1.6.4 Diarrhoeal morbidities

Correlation and multiple regression analyses were conducted to examine the relationship between occurrence of diarrhoea in children and various potential predictors. As indicted in Table 5.1.31 when all the 33 predictors were analysed, 21 predictors were significantly correlated. Children from low SES and *hindu* families had more diarrhoeal morbidities as compared to the ones from higher SES and *muslim* families. Better housing conditions in terms of closed drainage and *pakka* houses also translated into lesser diarrhoeal morbidities among children.

Table 5.1.31: Correlation of various predictors with diarrhoeal morbidities in children			
General information of the child information			
		r value	**p value**
1.	Age	-0.123**	0.004
2.	Birth order	0.101*	0.020
3.	Sex	0.050 NS	0.249
General information of the parents			
4.	Age of mother	-0.122***	0.000
5.	Age of father	-0.143**	0.001
6.	Mothers education	-0.094*	0.030
7.	Fathers education	-0.058 NS	0.176
8.	Working status of mother	0.090*	0.038
Background information of the family			
9.	SES	0.190***	0.000
10.	Religion	0.127**	0.003
11.	Type of family	0.005 NS	0.916
12.	No of family members	0.065 NS	0.132
Household information			
13.	Type of house	-0.134**	0.002
14.	Drainage	-0.087*	0.044
IYCF knowledge and practices			
15.	Knowledge on Breastfeeding	-0.055NS	0.205
16.	Breastfeeding practices	-0.031NS	0.478
17.	Knowledge on complementary feeding	-0.069NS	0.111
18.	Complementary feeding practices	-0.107*	0.013
Diarrhoea management practices and knowledge			
19.	Knowledge diarrhoea cause and management	-0.058NS	0.182
20.	Diarrhoea management practices	0.118**	0.006
Hygiene and sanitation knowledge and practices			
21.	Knowledge on environmental hygiene	-0.054NS	0.212
22.	Environmental hygiene practices	0.152***	0.000
23.	Knowledge on food hygiene	-0.086*	0.047
24.	Food hygiene practices	-0.008NS	0.847
25.	Knowledge on personal hygiene	-0.065NS	0.135
26.	Personal hygiene practices	-0.138**	0.001
27.	Observation on environmental hygiene	-0.156***	0.000
28.	Personal hygiene observation of the mother	-0.177***	0.000
29.	Personal hygiene observation of the child	0.190***	0.000
30.	Health related perceptions and practices of the mothers	-0.126**	0.004
Nutritional status of the child			
31.	Weight for age	-0.091*	0.035
32.	Height for age	-0.`150***	0.000
33.	Weight of height	0.026NS	0.552

Regression analysis to identify the best fit model for predictors of diarrhoeal morbidities amongst children (R^2=12.8%) showed that only 7 factors, of the 21 were the regressors for diarrhoeal morbidities in children. (Table 5.1.32).

Table 5.1.32: Predictors of diarrhoeal morbidities amongst children

Variables entered	Adjusted R^2	Significant regressors		
		Name	Std β coefficient	Sig.
Age of the child	12.8	SES of the family	0.122	0.007
Birth order of the child				
Age of the mother				
Age of father		Religion of the family	0.146	0.000
Mothers education				
Working status of the mother				
SES of the family		CD management scores of the mothers	0.167	0.000
Religion of the family				
Type of house				
Drainage		Age of the child	-0.180	0.000
PEH scores of the mother				
KFH scores of the mothers				
PPH scores of the mothers		OPH scores of the child	-0.131	0.004
OEH scores of the households				
OPH scores of the mothers				
OPH scores of the child		HAZ of the child	-0.119	0.005
PCF of the mothers				
CD management scores of the mothers				
Health related perceptions and practices of the mothers		OPH scores of the mothers	-0.094	0.022
WAZ of the children				
HAZ of the child				

As seen in the figure 5.1.6 age of the child, PH of the child, HAZ of the child and PH of the mother has a negative contribution indicating that younger children have lower diarrhoeal morbidities.

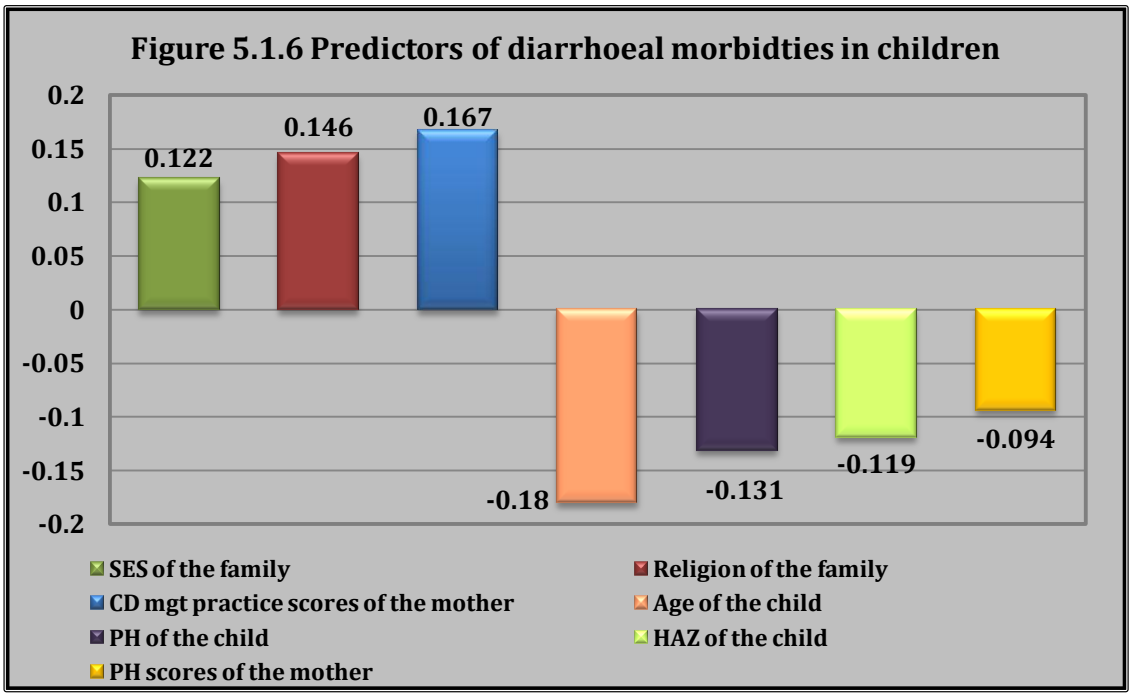


Figure 5.1.6 Predictors of diarrhoeal morbidties in children
0.2
0.15
0.1
0.05
0
-0.05
-0.1
-0.15
-0.2
0.122
0.146
0.167
-0.18
-0.131
-0.119
-0.094
SES of the family
Religion of the family
CD mgt practice scores of the mother
Age of the child
PH of the child
HAZ of the child
PH scores of the mother

PHASE II

5.2 IMPACT EVALUATION OF THE NUTRITION HEALTH (NH) AND FOOD SAFETY EDUCATION (FSE).

Mothers are the primary care givers of the children whose nutritional status is greatly affected by the knowledge levels of the mothers. Mothers need to know about the optimal infant and child feeding practices for healthy upbringing of their children. Apart from knowledge regarding correct feeding knowledge and practices, mothers should also know about management of common childhood illness which affect the nutritional status to a great extent. Hence the mothers of the undernourished children needs to be educated about these two important aspects so that the health status can be improved. Therefore an intervention was carried out so as to educate the mothers about different aspects of infant and young child feeding along with management of childhood diarrhoea which special emphasis on food safety.

Baseline data revealed that mothers had poor, nutrition, health and food safety knowledge and practices. In view of the same 100 mothers (out of 536) were selected from 8 different villages of Chikhli taluka, who were imparted nutrition, health and food safety education pertaining to care and diarrhoea management in young children. Out of 100 mothers 11 mothers were dropouts hence the final sample group of intervened mother was 89. The reasons for dropout included migration, non compliance and personal reasons like delivery of the child etc.

The control group comprised of 103 mothers of which data of 94 mothers is presented as 9 were dropouts due to various reasons. The detailed experimental design is given in Chapter 3, on Methods anf material (Figure: 3.1).

5.2.1 General information of the child, family and parents of experimental and control group.

The general information of the children, family and parents from experimental and the control group is summarized in table 5.2.1. Chi square test revealed that the experimental and the control were similar with respect to all the socio economic parameters. The average age of the children in both the groups was

about 18 months. Almost 53% families in both the groups belonged to lower income group. Age of the parents in both the groups was between 21-30 years and most of them had completed schooling till class 10th.

Table 5.2.1: General information of the experimental and control group

A. Child					
Variable		**Sub Category**	**EG (N=89)**	**CG (N=94)**	**Chi square value**
1.	Age	**Mean Age:**	**18.03 ± 6.83**	**18.54 ± 7.23**	χ^2=0.59^{NS} p value= 0.75
		6-12 months	31 (34.83)	29 (30.9)	
		12 – 24 months	40 (44.94)	42 (44.7)	
		24 – 36 months	18 (20.22)	23 (24.5)	
2.	Sex	Males	47 (52.81)	57 (60.6)	χ^2= 1.14^{NS} p value= 0.29
		Females	42 (47.19)	37 (39.4)	
3.	Religion	Hindus	84 (94.38)	87 (92.6)	χ^2=0.25^{NS} p value= 0.62
		Muslims	5 (5.62)	7 (7.4)	
4.	Birth order	First	45 (50.56)	49 (52.1)	χ^2=5.75^{NS} p value= 0.13
		Second	28 (31.46)	37 (39.4)	
		Third	14 (15.73)	5 (5.3)	
		Fourth	2 (2.25)	3 (3.2)	
B. Family					
5.	Type of Family	Nuclear	33 (37.08)	30 (31.9)	χ^2=1.20^{NS} p value= 0.55
		Joint	30 (33.71)	39 (41.5)	
		Extended	26 (29.21)	25 (26.6)	
7.	Total income of the family (in Rs/mon)	< 3000	3 (3.37)	4 (4.3)	χ^2=4.90^{NS} p value= 0.18
		3000- 5000	35 (39.32)	23 (24.5)	
		5000 – 10,000	29 (32.58)	33 (35.1)	
		10,000 and above	22 (24.72)	34 (36.2)	
8.	Socio economic status	High	3 (3.37)	4 (4.26)	χ^2= 5.92^{NS} p value= 0.12
		Upper Middle	28 (31.46)	37 (39.36)	
		Lower Middle	47 (52.81)	50 (53.19)	
		Poor	11 (12.36)	3 (3.19)	
9.	Total no. of family members	3	12 (13.48)	11 (11.70)	χ^2=1.53^{NS} p value= 0.68
		3-6	52 (58.43)	56 (59.57)	
		6-10	18 (20.22)	16 (17.02)	
		10 and above	7 (7.87)	11 (11.70)	

10.	No. of children under 3 years other than the subject	None	81 (91.10)	82 (87.23)	χ^2= 0.67^{NS} P value= 0.41
		1	8 (8.99)	12 (12.77)	
11.	Type of food consumed	Vegetarian	16 (7.98)	27 (28.72)	χ^2= 2.94^{NS} p value= 0.09
		Non vegetarian	73 (82.02)	67 (71.28)	
C. Parents					
12.	Age of mother	**Mean age:**	**24.97 ± 4.45**	**25.18 ± 3.32**	χ^2= 1.04^{NS} p value= 0.60
		18 - 20	3 (3.37)	2 (2.13)	
		21 – 25	45 (50.56)	51 (54.26)	
		26 - 30	21 (23.60)	33 (35.11)	
		31 and above	5 (5.62)	6 (6.38)	
		DK (not included)	15 (16.85)	2 (2.13)	
13.	Age of father	**Mean age:**	**29.73 ± 5.15**	**30.73 ± 4.82**	χ^2= 3.92^{NS} p value= 0.14
		21 – 25	14 (15.91)	8 (8.51)	
		26 - 30	34 (38.64)	42 (44.68)	
		31 and above	26 (29.55)	40 (42.55)	
		DK (not included)	14 (15.91)	4 (4.26)	
14.	Educational qualification of mother	Illiterate	28 (31.46)	21 (22.34)	χ^2= 3.33^{NS} p value= 0.19
		10th pass	33 (37.08)	32 (34.04)	
		12th pass and graduate	28 (31.46)	41 (43.62)	
15.	Educational qualification of father	Illiterate	10 (11.36)	3 (3.19)	χ^2= 4.60^{NS} p value= 0.10
		10th pass	41 (46.59)	49 (52.13)	
		12th pass and graduate	37 (41.57)	42 (44.68)	
15.	Mother's working status	Working	4 (4.49)	7 (7.45)	χ^2= 0.71^{NS} p value= 0.40
		Not working	85 (95.51)	87 92.55)	

5.2.2 Household information of the family of experimental and control group.

The household information of both the groups is summarized in table 5.2.2. As shown there was no difference in the housing conditions of both the groups and

as discussed n Phase I, all households were using safe source of water for drinking as well as for all other activities.

Table 5.2.2: Household information of the family of experimental and control group.

Variable	Sub Category	EG (N=89)	CG (N=94)	Chi square
Type of house	*Kaccha*€	11 (12.36)	22 (23.40)	χ^2= 3.93^{NS} p value= 0.14
	Semi Pakka£	43 (48.31)	42 (44.68)	
	Pakka¥	35 (39.33)	30 (31.91)	
Drainage facility	Open	41 (46.07)	48 (51.06)	χ^2= 0.46^{NS} p value= 0.50
	Close	48 (53.93)	46 (48.94)	

€: house with temporary roof and walls, made of materials like wood, tin sheets, hay, asbestos etc.
£: House with concrete walls but temporary roof.
¥: house with concrete roof and walls.

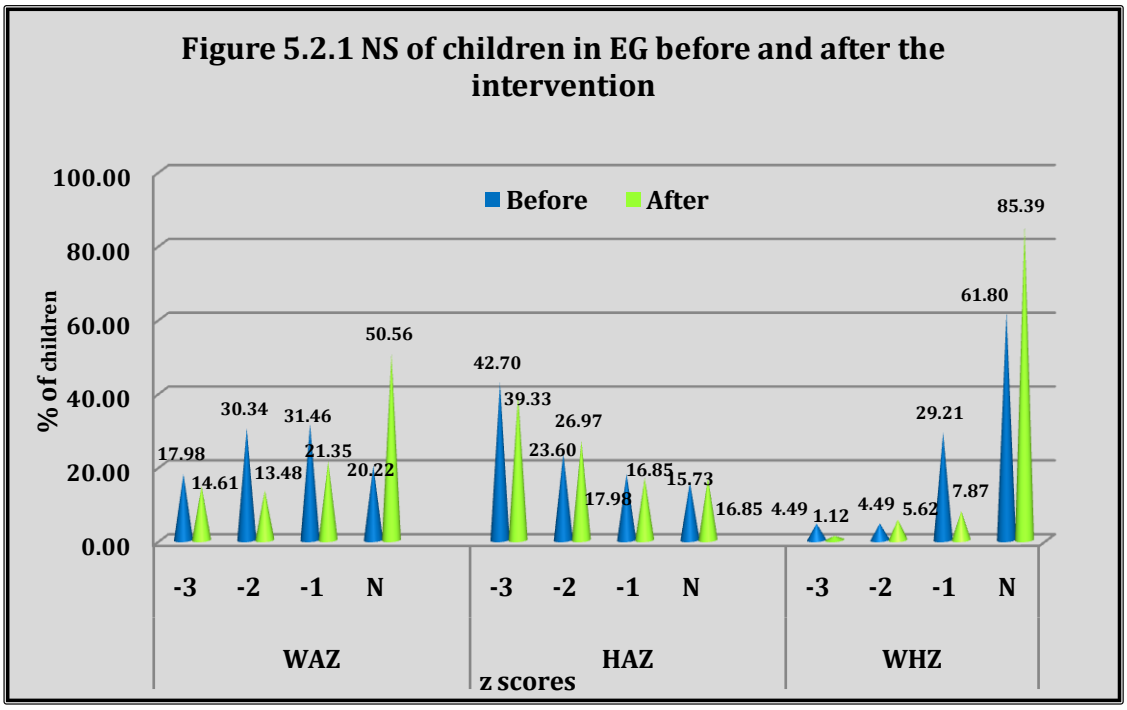
5.2.3 Effect of NH and FSE on nutritional status of the children

Table 5.2.3 and figures 5.2.1; 5.2.2 illustrates the nutritional status of the children in the two groups before and after the intervention. As evident a significant ($p < 0.001$) increase was observed in the number of children classified as normal with respect to weight for age in the experimental group, as the children having normal weight for age increased from 18 to 45. Similarly a significant reduction was observed in wasting among children in the experimental group post intervention. In contrast no significant changes were observed in the nutritional status of children in the control group.

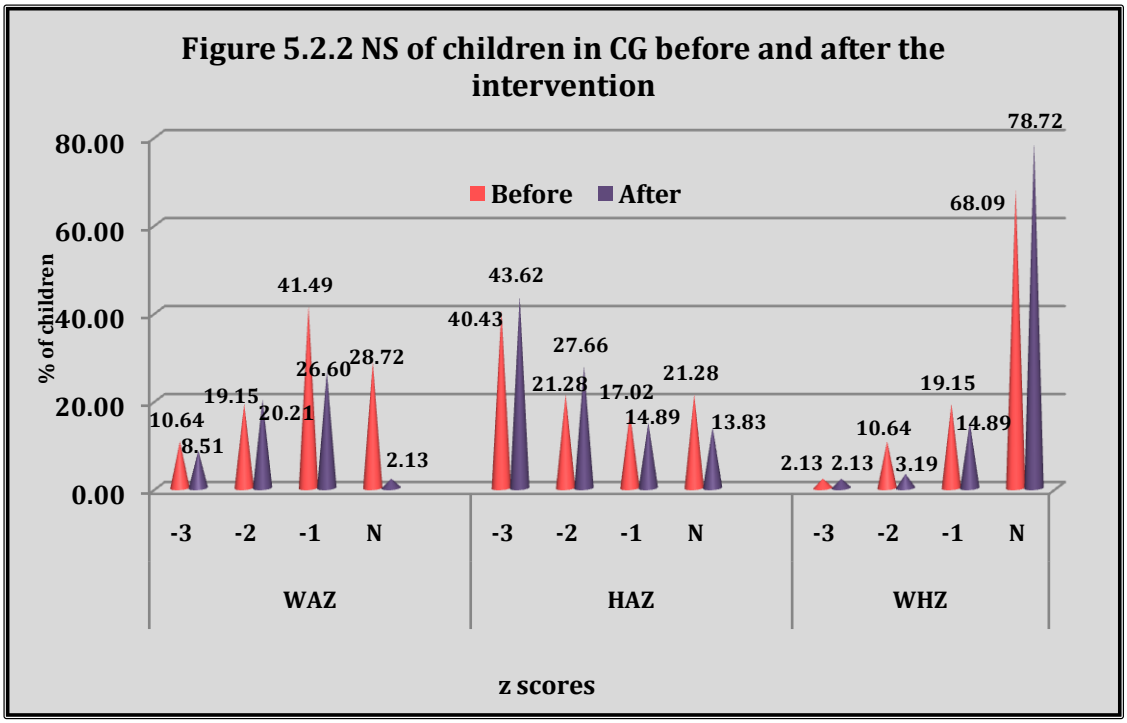
Table 5.2.3: Number of children categorized under different grades of undernutrition before and after theintervention

		Experimental group				Control group				Chi square value
		-3	-2	-1	N	-3	-2	-1	N	
WAZ	Before	16	27	28	18	10	18	39	27	χ^2=6.66^{NS}; p value= 0.084
	After	13	12	19	45	8	19	25	42	χ^2= 3.56^{NS}; p value=0.313
	χ^2= 19.4***; p value= 0.000					χ^2= 6.57^{NS}; p value= 0.087				
HAZ	Before	38	21	16	14	38	20	16	20	χ^2= 0.947^{NS}; p value= 0.814
	After	35	24	15	15	41	26	14	13	χ^2= 0.60^{NS}; p value= 0.90
	χ^2= 0.39^{NS}; p value= 0.942					χ^2= 2.51^{NS}; p value= 0.473				
WHZ	Before	4	4	26	55	2	10	18	64	χ^2= 5.59^{NS}; p value= 0.375
	After	1	5	7	76	2	3	14	74	χ^2= 3.11^{NS}; p value= 0.375
	χ^2= 16.2**; p value= 0.001					χ^2= 5.69^{NS}; p value= 0.128				

WAZ: Weight for age z scores**; HAZ:** Height for age z scores**, WHZ:** Weight for height z scores



WAZ: Weight for age z scores; **HAZ:** Height for age z scores, **WHZ:** Weight for height z scores



As illustrated in table 5.2.4 the z scores of the children in both the groups improved significantly but higher percentage improvement was observed in EG post intervention as compared to the CG. The percent improvement in the WAZ and WHZ of children from EG was 20.7% and 43.16% higher than the children from CG respectively. In contrast the HAZ for CG showed a percent decrease of 13.98% as compared to 14.42% increase in the EG. The WAZ scores improved more in males as compared to females.

5.2.4: Mean z scores of the children in EG and CG before and after the intervention

	Before	After	% ↑ or ↓	"t" value	Before	After	% ↑ or ↓	"t" value
	Experimental Group				Control Group			
WAZ								
Total	-1.92 ± 1.32	-0.99 ± 1.82	48.44 (↑)	**-7.79*****	-1.55 ± 1.13	**-1.12** ± 1.39	**27.74** (↑)	**- 4.5*****
Female	-1.94 ± 1.37	-1.02 ± 1.98	47.42 (↑)	**- 5.52*****	-1.59 ± 1.12	-1.31 ± 1.35	17.61 (↑)	**-1.63**^{NS}
Male	-1.91 ± 1.29	-0.96 ± 1.68	49.74 (↑)	**-5.51*****	-1.53 ±1.15	-0.95 ±1.41	37.91 (↑)	**-4.51*****
HAZ								
Total	-3.12 ± 1.60	-2.67 ± 1.68	14.42 (↑)	**-7.16*****	-2.36 ± 1.74	-2.69 ± 1.40	13.98 (↓)	**- 2.7****
Female	-3.04 ± 1.90	- 2.59 ± 1.94	14.08 (↑)	**5.82*****	-2.42 ± 1.35	-2.66 ± 1.28	16.12 (↓)	**1.54**^{NS}
Male	-3.20 ± 1.31	- 2.75 ± 1.46	14.06 (↑)	**4.69*****	-2.31 ± 1.99	-2.72 ± 1.49	9.52 (↓)	**2.24***
WHZ								
Total	-0.60 ± 1.25	0.94 ± 1.91	256.67 (↑)	**-10.25*****	**-0.37 ± 1.39**	**0.42 ± 1.79**	213.51 (↑)	**- 5.67*****
Female	-0.58 ± 1.23	0.91 ± 1.99	256.90 (↑)	**-7.13*****	-0.30 ± 1.39	0.37 ± 1.75	223.33 (↑)	**-2.3***
Male	-0.62 ± 1.28	0.97 ± 1.86	256.45 (↑)	**-7.13*****	-0.44 ± 1.40	0.47 ± 1.80	206.81 (↑)	**-5.57*****

^{NS}: Not significant *: p< 0.05 **: p<0.01 ***: p<0.00

Table 5.2.5: Differences in the z scores of the children from EG and CG before and after the intervention.		
Parameter	**t value**	**p value**
WAZ	2.97^{**}	0.003
HAZ	3.70^{***}	0.000
WHZ	-1.81^{NS}	0.07

Since both the groups showed an improvement in the z scores further analysis was carried out to analyse whether the differences in the z scores before and after the intervention was statistically significant in both the groups or not. As indicted in table 5.2.5 statistically significant differences were observed in the improvement of z scores between the EG and CG groups for WAZ and HAZ.

Chi square analysis revealed that no significant differences were observed in the number of children classified under various grades of undernutrition in terms of weight for age and weight for height amongst different age group post intervention in the EG(Table 5.2.6).

Table 5.2.6: Nutritional status of children before and after the intervention in different age groups in the experimental group.						
Weight for age						
		-3	**-2**	**-1**	**N**	**Chi square value**
6-12	Before	4	6	11	8	$\chi^2=5.78^{NS}$; p value= 0.123
	After	2	4	6	17	
13-24	Before	5	15	8	10	$\chi^2=7.12^{NS}$; p value= 0.068
	After	8	6	6	18	
25-36	Before	7	6	8	1	$\chi^2=112^{*}$.; p value= 0.012
	After	3	2	7	10	
Weight for height						
		-3	**-2**	**-1**	**N**	
6-12	Before	0	0	7	22	$\chi^2=7.46$; p value= 0.006
	After	0	0	1	28	
13-24	Before	0	3	13	22	$\chi^2=10.1$; p value= 0.006
	After	0	5	2	31	
25-36	Before	4	1	6	11	$\chi^2=4.09$.; p value= 0.252
	After	1	1	3	17	

^{NS}: Not significant *: p< 0.05 **: p<0.01 ***: p<0.001

Table 5.2.7 shows that the mean z scores improved significantly by higher percentages in all age groups post intervention in the EG as compared to CG. Maximum improvements were found in the age group of 6 to 12 months. The HAZ scores in the CG decreased significantly after a follow up period of 5 months.

Table 5.2.7: Mean z scores of the children in EG and CG before and after the intervention								
Age in months	Experimental group				Control Group			
	Before	After	% ↑ or ↓	"t" value	Before	After	%	"t" value
WAZ								
6-12	- 1.55± 1.35	- 0.55 ± 1.74	64.52 (↑)	**-4.16*****	-1.10 ± 1.07	-0.76 ± 1.47	30.91 (↑)	**-1.422**^{NS}
13-24	-1.92 ± 1.44	-1.08 ± 2.06	43.75 (↑)	**-4.50*****	-1.48 ± 1.09	-0.93 ± 1.41	37.16 (↑)	**-4.21*****
25-30	-2.39 ± 0.91	-1.39± 1.37	41.84 (↑)	**-5.28*****	-2.15 ± 1.03	-1.81 ± 1.05	15.81 (↑)	**-2.36***
HAZ								
6-12	-3.30 ± 1.50	-2.26 ± 1.63	31.52 (↑)	**12.52*****	-1.85 ± 1.64	-2.94 ± 1.31	58.92 (↓)	**5.35*****
13-24	-3.14 ± 1.84	-2.91 ± 1.88	7.32 (↑)	**3.78*****	-2.34 ± 1.97	-2.47 ± 1.55	5.56 (↓)	**0.59**^{NS}
25-30	-2.81 ± 1.35	-2.80 ± 1.25	0.36 (↑)	**-0.80**^{NS}	-2.92 ± 1.27	-2.83 ± 1.20	3.08 (↑)	**-0.79**^{NS}
WHZ								
6-12	-0.23 ± 1.11	1.58 ± 1.81	786.96 (↑)	**-6.54*****	0.67 ± 1.28	0.99 ± 1.97	47.76 (↑)	**-2.85****
13-24	-0.52 ± 1.20	0.83 ± 2.02	259.61 (↑)	**-5.77*****	-0.42 ± 1.42	0.47 ± 1.67	211.9 (↑)	**-4.27*****
25-30	-1.22 ± 1.33	0.30 ± 1,66	124.59 (↑)	**-5.68*****	-0.76 ± 1.37	-0.27 ± 1.63	64.47 (↑)	**-3.04****

^{NS}: Not significant *: p< 0.05 **: p<0.01 ***: p<0.001

ANOVA was performed to observe the monthly difference in the nutritional status of the children over a period of 5 months after imparting NHFSE. As observed in table 5.2.8 the nutritional status of the children in the experimental group improved significantly every month in terms of WAZ. Though there was a slight improvement in the NS from first month to the second month, but significant changes occurred only after 3 months. In contrast no monthly significant changes were observed in the CG in terms of WAZ and HAZ.

Table 5.2.8: Change in the nutritional status of the children over five months of intervention in EG and CG

	WAZ		WHZ		HAZ	
Month	**EG**	**CG**	**EG**	**CG**	**EG**	**CG**
1st	-1.92 ± 1.33^{abc}	-1.55 ± 1.13	-0.60 ± 1.25^{a}	-0.37 ± 1.39^{ab}	-3.12 ± 1.60	-2.36 ± 1.75
2nd	-1.80 ± 1.40^{abc}	-1.49 ± 1.13	-0.34 ± 1.33^{ab}	-0.19 ± 1.52^{abcd}	-3.06 ± 1.60	-2.52 ± 1.50
3rd	-1.62 ± 1.52^{bcd}	-1.38 ± 1.19	-0.06 ±1.45^{bc}	-0.003 ± 1.61^{bcde}	-2.99 ± 1.62	-2.60 ± 1.47
4th	-1.46 ± 1.65^{cd}	-1.28 ± 1.22	0.21 ± 1.63^{cd}	0.16 ± 1.64^{cde}	-2.90 ± 1.64	-2.64 ± 1.43
5th	-1.24 ± 1.75^{df}	-1.21± 1.31	0.60 ± 1.76^{de}	0.27 ± 1.73^{de}	-2.80 ±1.65	-2.66 ± 1.42
6th	-.99 ± 1.82^{ef}	-1.12 ± 1.40	0.94 ± 1.91^{e}	0.42 ± 1.79^{e}	-2.67 ± 1.68	-2.69 ± 1.40
* % difference*	48.44 (↑)	27.74 (↑)	256.90 (↑)	213.51 (↑)	14.42 (↑)	13.98 (↓)
F value	**4.24*****	**1.77^{NS}**	**11.8*****	**3.1****	**0.63^{NS}**	**0.63^{NS}**

% difference*: between first and fifth month mean scores,

Level of significance:* p- value <0.0001; NS = Not Significant; abcde: the non identical letters in any two rows within the column denotes a significant difference at minimum 5% level.**

5.2.3 Diarrheal morbidity profile of the children before and after the NH and FSE.

The average number of days for which a child suffered from diarrhea in the CG was significantly higher than in EG (Table 5.2.9). More percent reduction was found in the no. of diarrheal episodes and the no. of days for which the child suffered in the EG as compared to CG.

Table 5.2.9: Difference in month wise occurrence of diarrhea among children in experimental and control group

Month	No. Of Episodes per month		t value	No. Of days per month		
	EG	CG	t value	EG	CG	"t" value
1st	0.85 ± 0.67[a]	1.06 ± 0.70[a]	t= -2.074, p=0.039	1.56 ± 1.54[a]	2.2 ± 1.63[a]	t=-2.824, p=0.005
2nd	0.91 ± 0.56[a]	0.857 ± 0.61[b]	t=0.438 p= 0.662	1.61 ± 1.18[a]	1.72 ± 1.52[bc]	t=-0.577, p=0.565
3rd	0.65 ± 0.55[be]	0.77 ±0.66[cb]	t= -1.27, p=0.206	1.02 ± 1.03[be]	1.73± 1.77[c]	t=-3.34, p=0.001
4th	0.60 ± 0.54[ce]	0.60± 0.64[dce]	t=-0.076 p= 0.94	1.01 ± 1.09[ce]	1.11± 1.29[de]	T=-0.478, p=0.634
5th	0.29 ± 0.05[d]	0.44 ± 0.63[e]	t= -1.903 p=0.059	0.48 ± 0.83[d]	0.87 ± 1.31[e]	T=-2.422, p=0.017
Total	3.3 ± 1.57	3.67 ± 2.00	t= -1.411 p= 0.16	5.71 ± 5.59	7.67 ± 7.17	t= -3.54 p= 0.001
% Decreases	65.88	58.49		69.23	60.45	
F value	**17.20**[***]	**5.06**[**]		**14.137**[***]	**5.16**[***]	

Level of significance:* p- value <0.0001; NS = Not Significant;**
abcde: the non identical letters in any two rows within the column denotes a significant difference at minimum 5% level

Table 5.2.10and figure 5.2.3 shows that number of children with no diarrheal episodes increased significantly to 63 at the end of 5 months from 26 in the first month after intervention in the EG. Moreover the no. of children who had more than 6 episodes of diarrhoea were only 5 in the EG as compared to 17 in the CG (Table 5.2.11).

Table 5.2.10: Number of children with no diarrhoeal episodes over a period of five months.		
Months	**EG**	**CG**
1st	26 (29.21%)	27 (28.72%)
2nd	15 (16.85%)	24 (25.53%)
3rd	34 (38.20%)	33 (35.11%)
4th	38 (42.70%)	35 (37.23%)
5th	63 (70.79%)	40 (42.55%)
	χ^2= 59.9; p=0.000	**χ^2= 7.74; p=0.102**

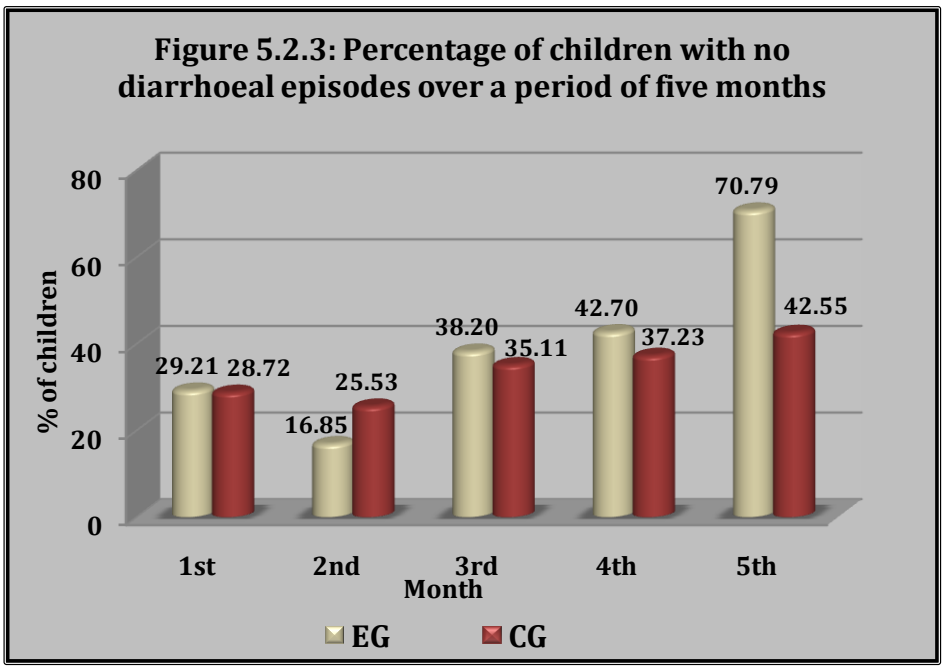


Table 5.2.11: No. of children with varying frequency of diarrhoeal episodes over a period of 5 months		
No. of episodes	**EG**	**CG**
0	5	8
1	4	5
2	14	10
3	28	18
4	22	25
5	11	11
6	2	10
7	1	5
8	2	2

Correlations were derived to predict the dependence of nutritional status of the children with the number of diarrheal episodes and days of suffering. A negative and highly significant correlation was observed in the experimental group indicating children with better nutritional status in terms of all the three parameters studies had

lower incidences of diarrheal episodes in EG as compared to CG. Similarly children with better nutritional status in the EG suffered for lesser number of days with diarrhea as compared to children in CG (Table 5.2.12).

Table 5.2.12: Effect of diarrhoeal diseases on nutritional status of the children

Parameter	Group	"r" value	
		No. of episodes	No. of days
WAZ	EG	r= -0.191; p=0.000	r= -0.170; p=0.000
	CG	r= -0.50; p=0.0279	r=0.031; p=0.507
HAZ	EG	r= -0.109; p=0.022	r= -0.11; p=0.020
	CG	r= -0.009; p=0.848	r= 0.036; p=0.431
WHZ	EG	r= -0.164; p=0.001	r= -0.136; p=0.004
	CG	r= -0.047; p=0.305	r= -0.004; p=0.931

5.2.5 Environmental hygiene knowledge and practices before and after the NH and FSE intervention

As shown in table 5.2.13 the mean composite score for KEH increased significantly for the EG. Mothers became more aware that knowledge on EH is vital for determining their child's health. They knew that presence accumulated water outside the house and pets inside the house is harmful and can affect their child's health. Percentage of mothers ranked as excellent for KEH increased from 69.99% to 96.63% and none of the mothers were ranked as poor or fair after the intervention in the EG. (Table 5.2.14 and Fig 5.2.4).

The overall EH practice scores of the mothers in EG also improved significantly by 3.27%. Maximum improvement was observed in the way the child's stools should be disposed. Before intervention mothers disposed off their child's stools in open however after the intervention their practice improved significantly wherein a few mothers started practising proper disposal of child's excreta. However intervention did not bring about any improvement in the defecation practices of the adults as they continued to defecate in open and dispose solid household waste in open. Slight improvement was observed in the number of mothers having good EH practices from 28 to 35 post intervention (Table 5.2.15 and Fig 5.2.5). In the control group no difference was observed in the mean EH practice score after the follow up period.

Table 5.2.13: Mean knowledge and practice scores of the mothers on environmental hygiene before and after the intervention.											
Knowledge on environmental hygiene											
Sr. No.	**Question**	**Experimental Group**					**Control Group**				
		Max Score	**Before**	**After**	**% ↑ or ↓**	**Paired "t" value**	**Before**	**After**	**% ↑ or ↓**	**Paired "t" value**
			Mean ±S.D.				**Mean ±S.D.**			
1.	Does the environmental sanitation of and around the house affects the child's heath?	2	1.81 ± 0.40	1.97 ± 0.18	8.84 (↑)	4.05***	1.74 ± 0.44	1.78 ± 0.42	2.3 (↑)	1.75NS
2.	What according to you is the best way to dispose of the solid waste	2	1.79 ± 0.41	2.0 ± 0.0	11.73 (↑)	4.89***	1.81 ± 0.40	1.87 ± 0.34	3.3 (↑)	1.75NS
3.	Do you think that water accumulation outside house can affect child health	2	1.49 ± 0.50	1.91 ± 0.29	28.13 (↑)	7.9***	1.54 ± 0.50	1.57 ± 0.50	1.95 (↑)	1.00NS
4.	Can presence of flies outside house affect your child's health	2	1.79 ± 0.41	2.0 ± 0.0	11.73 (↑)	4.89***	1.80 ± 0.40	1.95 ± 0.23	8.33 (↑)	4.03NS
5.	Can presence of fecal matter outside the house affect your child's health	2	1.74 ± 0.44	1.94 ± 0.23	11.49 (↑)	4.23***	1.77 ± 0.43	1.93 ± 0.26	9.04 (↑)	3.66NS
6.	Can presence of animals (goat/ dogs etc) inside the house affect your child's health	2	1.72 ± 0.45	1.97 ± 0.18	14.53 (↑)	5.38***	1.75 ± 0.44	1.77± 0.43	1.14 (↑)	0.82NS
7.	Can presence of flies inside the house affect your child's health	2	1.8 ± 0.40	2.0 ± 0.0	10.50 (↑)	4.72***	1.79 ± 0.41	1.85 ± 0.36	3.35 (↑)	1.92NS
8	Does mopping and sweeping affect child's health?	2	1.88 ± 0.33	1.98 ± 0.15	5.32 (↑)	3.1***	1.84 ± 0.37	1.90 ± 0.30	3.26 (↑)	2.51*
Composite scores of mothers for knowledge on EH		**16**	**14.01 ± 2.63**	**15.76 ± 0.54**	**12.49** (↑)	**6.7*****	**14.03 ± 2.62**	**14.62 ± 1.64**	**4.02 (↑)**	**4.21*****

Table continued.....

Practices on environmental hygiene										
Sr. No.	Question	Experimental Group					Control Group			
		Max Score	Before	After	% ↑ or ↓	Paired "t" value	Before	After	% ↑ or ↓	Paired "t" value
			Mean ±S.D.				Mean ±S.D.			
1.	Toilet facility used by the household	2	1.73 ± 0.47	1.73 ± 0.47	0	0	1.73 ± 0.47	1.73 ± 0.47	0	0
2.	How are stools of young children (6-30 months) disposed?	2	1.51 ± 0.50	1.62 ± 0.49	7.28(↑)	3.34***	1.73 ± 0.47	1.73 ± 0.47	0	0
3.	Where do you collect the solid household garbage	2	1.22 ± 0.42	1.29 ± 0.46	5.74(↑)	2.17***	1.73 ± 0.47	1.73 ± 0.47	0	0
4.	How is the solid household waste disposed?	2	1.29 ± 0.46	1.31 ± 0.47	1.55(↑)	1.42NS	1.73 ± 0.47	1.73 ± 0.47	0	0
5.	Do you use any disinfectant to mop the floor	2	1.58 ± 0.50	1.64 ± 0.48	3.80(↑)	2.29*	1.73 ± 0.47	1.73 ± 0.47	0	0
Composite scores of mothers for practices on EH		**10**	**7.34 ± 1.65**	**7.58 ± 1.62**	**3.27**(↑)	**5.08*** **	**6.36 ± 1.27**	**6.36 ± 1.27**	**0**	**0**

NS: Not significant *: p< 0.05 **: p<0.01 ***: p<0.001

Table 5.2.14: Ranking of the mother for EH Knowledge scores before and after the intervention									
% score	Grade	Experimental				Control			
		Before		After		Before		After	
		No.	%	No.	%	No.	%	No.	%
≤ 60%	Poor	10	11.24	0	0	10	10.64	9	9.57
61-75%	Fair	10	11.24	0	0	11	11.70	9	9.57
76-90%	Good	7	7.87	3	3.37	9	9.57	11	11.70
91-100%	Excellent	62	69.66	86	96.63	64	68.09	65	69.15

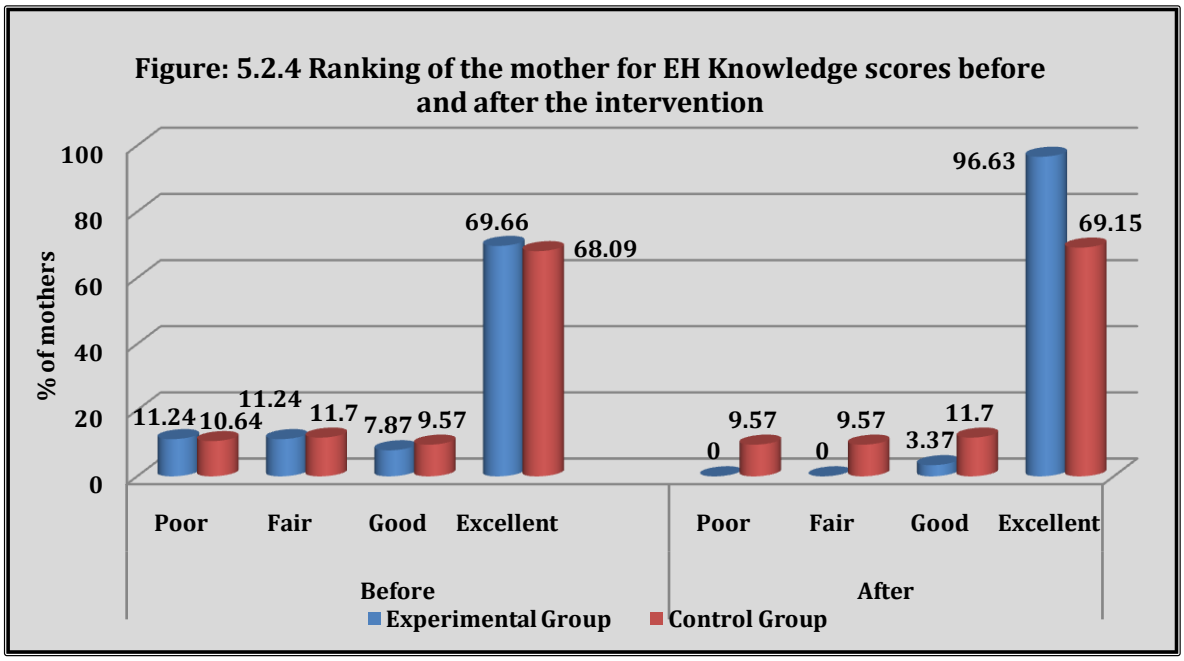
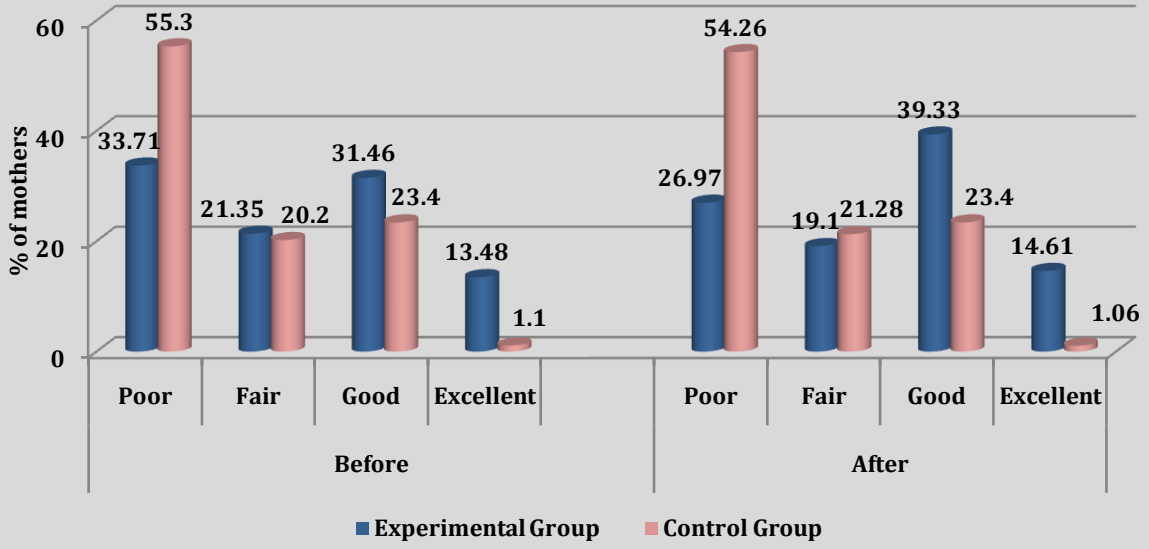


Table 5.2.15: Ranking of the mother for EH practice scores before and after the intervention									
% score	Grade	Experimental				Control			
		Before		After		Before		After	
		No.	%	No.	%	No.	%	No.	%
≤ 60%	Poor	30	33.71	24	26.97	52	55.3	51	54.26
61-75%	Fair	19	21.35	17	19.10	19	20.2	20	21.28
76-90%	Good	28	31.46	35	39.33	22	23.4	22	23.40
91-100%	Excellent	12	13.48	13	14.61	1	1.1	1	1.06

Figure: 5.2.5 Ranking of the mothers for knowledge on EH before and after the intervention



5.2.6 Food hygiene knowledge and practices before and after the NH and FSE intervention

Table 5.2.16summarizes the mean knowledge and practice scores of the mothers before and after the intervention for different aspects of food hygiene. Overall knowledge scores of the mothers on FH increased significantly ($p < 0.001$) after the intervention by 20.7% which was twice as much as observed in the control group. Maximum improvement was observed in the knowledge on safe temperatures of heating milk and other weaning foods before feeding the child. Mothers got aware that all the leftover foods should be thoroughly heated and liquids should be boiled so as to kill all the microorganisms. As depicted in table 5.2.17 and figure 5.2.6 almost 70% mothers were ranked as excellent after intervention in the experimental group

Table 5.2.16: Mean knowledge and practice scores of the mothers on food hygiene before and after the intervention.										
Knowledge on food hygiene										
Sr. No	**Question**	**Max Score**	**Before**	**After**	**% ↑ or ↓**	**Paired "t" value**	**Before**	**After**	**% ↑ or ↓**	**Paired "t" value**
			Mean ±S.D.				**Mean ±S.D.**			
1.	What can be done to make water safe for drinking?	2	2.40 ± 0.72	2.88 ± 0.45	20.0 (↑)	6.43***	2.46 ± 0.67	2.73 ± 0.72	10.98 (↑)	3.78***
2.	How can we use the leftover food from one meal to another	2	1.48 ± 0.5	1.91 ± 0.29	29.05 (↑)	8.29***	1.34 ± 0.48	1.51 ± 0.50	12.69 (↑)	4.37***
3.	What is the safe duration of storage of cooked moist food stored at room temperature before consumption	2	1.35 ± 0.48	1.82 ± 0.39	3.48 (↑)	8.87***	1.46 ± 0.50	1.50 ± 0.50	2.74 (↑)	2.03*
4.	How should you wash fruits and vegetables	2	1.18 ± 0.39	1.22 ± 0.42	3.39 (↑)	2.03***	1.09 ± 0.28	1.17 ± 0.38	7.34 (↑)	2.94**
5.	Is it necessary to wash knife before and after use	2	2.0 ± 0.0	2.0 ± 0.0	0.0	-	1.99 ± 0.10	2.00± 0.0	0.5 (↑)	1.00NS
6.	What are the safe temperatures of heating milk/other weaning foods before use	2	1.33 ± 0.47	1.91 ± 0.29	43.61 (↑)	11.12***	1.18 ± 0.39	1.21 ± 0.41	2.5 (↑)	1.14NS
Composite scores of mothers for knowledge on food hygiene		**12**	**9.71 ± 1.48**	**11.72 ± 0.92**	**20.7 (↑)**	**13.77*** **	**9.51 ± 1.36**	**10.31 ± 1.26**	**10.30 (↑)**	**6.36*** **
Practices on food hygiene										
1.	How do you remove water from the drinking water container	2	1.45 ± 0.5	1.62 ± 0.49	11.72 (↑)	2.80***	1.48 ± 0.50	1.48 ± 0.50	0.0	0
2.	Do you consume moist leftover food after through heating	2	1.34 ± 0.47	1.34 ± 0.47	00	0.0	1.24 ± 0.43	1.17 ± 0.38	5.65 (↓)	2.74*
3.	Do you wash fruits and vegetables before cooking/consuming	2	2.0 ± 0.0	2.0 ± 0.0	00	0.0	2.0 ± 0.0	2.0 ± 0.0	0.0	0
4.	What do you use to wash your utensils?	2	1.99 ± 0.11	2.0 ± 0.0	0.5 (↑)	1.00NS	2.0 ± 0.0	2.0 ± 0.0	0.0	0
5.	How do you dry the utensils after washing	2	1.70 ± 0.46	1.82 ± 0.39	7.06 (↑)	2.61*	1.67 ± 0.47	1.66 ± 0.48	0.60 (↓)	0.30NS
Composite scores of mothers for practices on food hygiene		10	8.46 ± 0.79	8.79 ± 0.70	3.53 (↑)	3.33***	8.40 ± 0.82	8.31 ± 0.83	1.07 (↓)	1.91NS

Similarly the overall practice scores for FH also improved significantly ($p < 0.001$). Many mothers started using a pot with tap or a vessel with handle to remove water from drinking water containers as they got aware that if hands come in contact with water it can lead to cross contamination. However there was no improvement in the practice for consumption of moist leftover food as the mothers continued to serve leftover food without thorough heating. In contrast the mean score on food hygiene practices decreased by 1.07% for the control group.

Ranking of the mothers with respect to FH practices showed a slight improvement with number of mothers ranked as excellent increased from 8 to 11 after the intervention and none of the mothers were classified as poor. However the number of women having excellent scores decreased from 10 to 9 in the control group (Table 5.2.18 and fig 5.2.7).

Table 5.2.17: Ranking of the mother for FH Knowledge scores before and after the intervention

% score	Grade	Experimental				Control			
		Before		After		Before		After	
		No.	%	No.	%	No.	%	No.	%
≤ 60%	Poor	6	6.74	0	0	4	4.3	3	3.19
61-75%	Fair	31	34.83	1	1.12	45	47.9	44	46.81
76-90%	Good	44	49.44	25	28.09	38	40.4	38	40.43
91-100%	Excellent	8	8.99	63	70.79	7	7.4	9	9.57

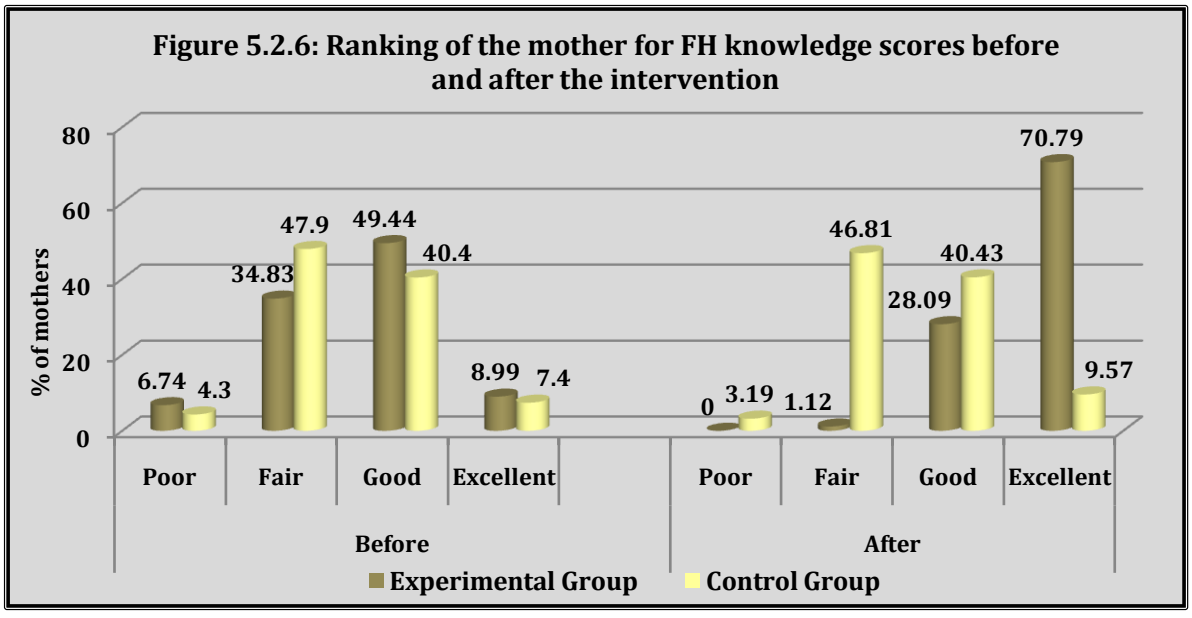
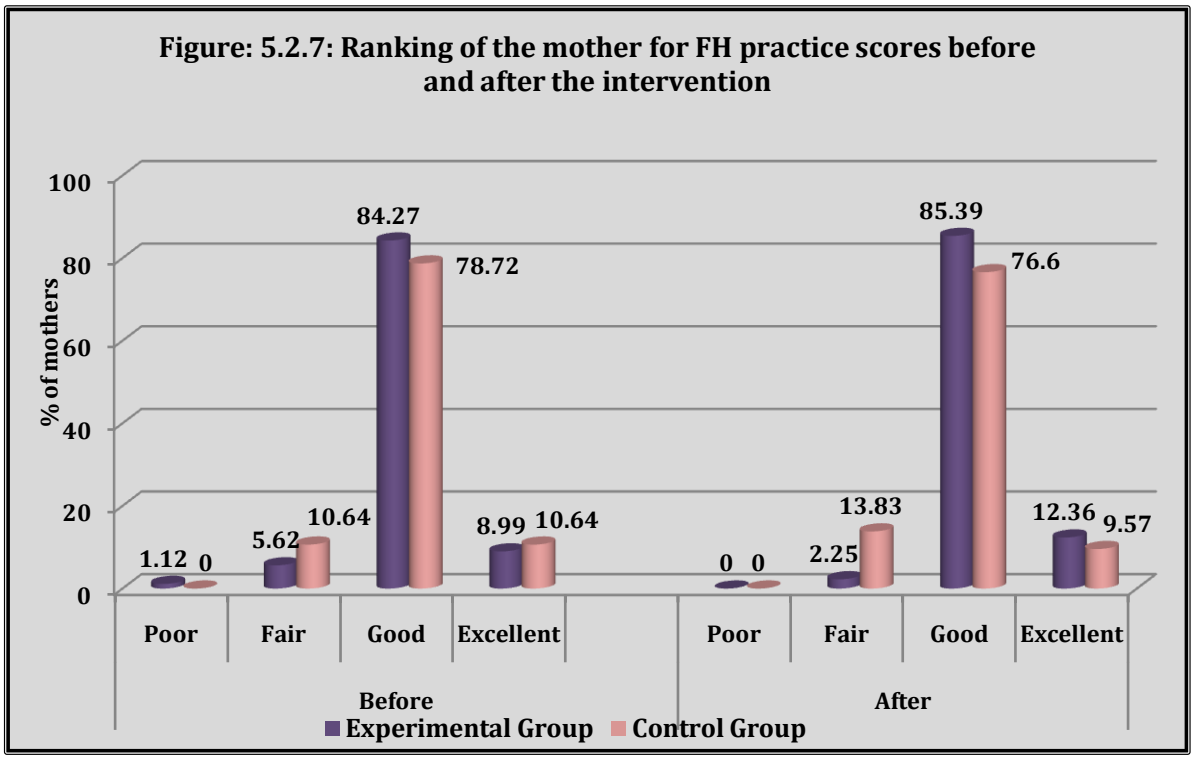


Table 5.2.18: Ranking of the mother for FH practice scores before and after the intervention

% score	Grade	Experimental				Control			
		Before		After		Before		After	
		No.	%	No.	%	No.	%	No.	%
≤ 60%	Poor	1	1.12	0	0	0	0	0	0.00
61-75%	Fair	5	5.62	2	2.25	10	10.64	13	13.83
76-90%	Good	75	84.27	76	85.39	74	78.72	72	76.60
91-100%	Excellent	8	8.99	11	12.36	10	10.64	9	9.57



5.2.7 Personal hygiene knowledge and practices before and after the NH and FSE intervention

As shown in table 5.2.19 the mean knowledge scores for personal hygiene of the mothers significantly ($p<0.001$) increased from 18.56 to 19.63 after the education. After the intervention mothers knew that washing hands with soap was more important than washing with water alone as it helps removing dirt and germs and in turn prevents diseases. Mothers also knew that it was important to wash hands after touching animals. As stated by one of the mothers *"hu maari saasu ne kai didu ki jamwanu banawata pehla haath saabu thi kaayam dhowana, satish na papa pan kaam thi aaya pachi potana haath saabu thi dhoye"* (I have told my mother-in-law to wash

her hands before cooking everytime, my husband also washes his hands with soap as soon as he comes back from work). In contrast to experimental group, the control group also showed a slight increase in the mean score during the follow up period but it was not statistically significant. Mothers having excellent knowledge scores for personal hygiene increased from 67.42% to 87.04% post intervention (Table 5.2.20 and figure: 5.2.8)

The practice scores of the mothers also improved post intervention. Maximum improvement was observed in the practice of washing hands before feeding the child. An increase from 30.34% to 44.94% was observed in the percentage of mothers having excellent PH practice scores post intervention (Table 5.2.21 and figure: 5.2.9).

Table 5.2.19: Mean knowledge and practice scores of the mothers on personal hygiene before and after the intervention.

Knowledge on personal hygiene

Sr. No	Question	Max Score	Experimental Group				Control Group			
			Before	After	% ↑ or ↓	Paired "t" value	Before	After	% ↑ or ↓	Paired "t" value
			Mean ± S.D.				Mean ± S.D.			
1.	Do you think wearing clean clothes is necessary for child's health	2	1.88 ± 0.33	2.0 ± 0.0	6.38 (↑)	3.52***	1.73 ± 0.44	1.83 ± 0.38	5.78 (↑)	3.14**
2.	Is it necessary to wash your hands before feeding your child?	2	1.97 ± 0.18	2.0 ± 0.0	1.52 (↑)	1.7NS	1.95 ± 0.23	1.99 ± 0.10	2.05 (↑)	2.03NS
3.	If yes Why?	2	1.96 ± 0.21	2.0 ± 0.0	2.04 (↑)	2.04*	1.91 ± 0.28	1.92 ± 0.28	0.52 (↑)	1.00NS
4.	Do you think washing your child's hands is necessary before feeding your child?	2	1.88 ± 0.33	2.0 ± 0.0	6.38 (↑)	3.52***	1.94 ± 0.25	1.96 ± 0.20	1.03 (↑)	2.74**
5.	If yes Why?	2	1.85 ± 0.36	2.0 ± 0.0	8.11 (↑)	3.88***	1.89 ± 0.41	1.92 ± 0.28	1.59 (↑)	1.00NS
6.	Do you think washing hands with soap is better than washing with water alone	2	1.74 ± 0.44	1.92 ± 0.27	10.34 (↑)	4.39***	1.69 ± 0.46	1.77 ± 0.43	4.73 (↑)	2.74**
7.	If yes Why?	2	1.85 ± 0.36	1.98 ± 0.15	7.03 (↑)	3.52***	1.83 ± 0.38	1.88 ± 0.32	2.73 (↑)	2.29*
8.	Should you tie your hair while cooking	2	1.97 ± 0.18	2.0 ± 0.0	1.52 (↑)	1.75NS	2.0 ± 0.0	2.0 ± 0.0	0.0	-
9.	Should a wound on finger be covered before feeding / cooking	2	1.65 ± 0.48	1.73 ± 0.45	4.85 (↑)	2.15*	1.83 ± 0.38	1.76 ± 0.43	3.83 (↑)	2.74**
10.	Should we wash our hands after touching animals	2	1.86 ± 0.34	2.0 ± 0.0	7.53 (↑)	3.70***	1.95 ± 0.23	1.95 ± 0.23	0.0	-
Composite scores of mothers for knowledge on personal hygiene		**20**	**18.56 ± 2.12**	**19.63 ± 0.61**	**5.77 (↑)**	**5.30*** **	**18.72 ± 2.19**	**18.90 ± 1.88**	**0.96 (↑)**	**1.73NS**

Practices on personal hygiene										
Is the mother washing hands before/after these activities										
1.	Before cooking food	3	2.38 ± 0.57	2.84 ± 0.42	19.33 (↑)	7.98***	2.35 ± 0.48	2.27 ± 0.51	3.4 (↓)	2.6*
2.	Before feeding a child	3	2.34 ± 0.69	3.0 ± 0.0	28.21 (↑)	9.01***	2.36 ± 0.60	2.44 ± 0.56	3.39 (↑)	3.21*
3.	Before breastfeeding a child	3	1.43 ± 0.67	1.48 ± 0.68	3.50 (↑)	1.09NS	1.55 ± 0.70	1.52 ± 0.69	1.94 (↓)	4.87*
4.	Before eating	3	2.33 ± 0.81	2.64 ± 0.53	13.30 (↑)	4.99***	2.34 ± 0.73	2.34 ± 0.73	0	-
5.	After attending a child who has defecated	3	3.0 ± 0.0	3.0 ± 0.0	0.0	-	3.0 ± 0.0	3.0 ± 0.0	0	-
6.	After changing nappies	3	2.44 ± 0.78	2.57 ± 0.64	5.33 (↑)	3.39***	2.49 ± 0.64	2.49 ± 0.64	0	-
7.	After visiting a toilet	3	3.0 ± 0.0	3.0 ± 0.0	0.0	-	3.0 ± 0.0	3.0 ± 0.0	0	-
8.	Do you wash our child's hands after s/he has defecated	3	2.43 ± 0.81	2.51 ± 0.77	3.29 (↑)	2.40*	2.63 ± 0.60	2.63 ± 0.60	0	-
9.	After touching raw foods	3	1.87 ± 0.94	2.16 ± 0.92	15.51 (↑)	4.41***	1.96 ± 0.85	1.96 ± 0.85	0	-
10.	Do you take bath every day in the morning before starting days work	3	3.0 ± 0.0	3.0 ± 0.0	0.0	-	3.0 ± 0.0	3.0 ± 0.0	0	-
11.	Do you change clothes every day	3	3.0 ± 0.0	3.0 ± 0.0	0.0	-	3.0 ± 0.0	3.0 ± 0.0	0	-
12.	Do you cut your nails at least once in a week	3	2.69 ± 0.54	2.72 ± 0.52	1.12 (↑)	1.35NS	2.66 ± 0.48	2.66 ± 0.48	0	-
Composite scores of mothers for knowledge on personal hygiene		36	29.9 ± 3.93	31.92 ± 2.66	6.76 (↑)	10.59***	30.3 ± 3.13	30.18 ± 4.28	0.39 (↓)	2.51*

NS: Not significant ***: p< 0.05** ****: p<0.01** *****: p<0.001**

Table 5.2.20: Ranking of the mother for PH Knowledge scores before and after the intervention									
% score	Grade	Experimental				Control			
		Before		After		Before		After	
		No.	%	No.	%	No.	%	No.	%
≤ 60%	Poor	3	3.37	0	0	5	5.32	3	3.19
61-75%	Fair	5	5.62	0	0	2	2.13	2	2.13
76-90%	Good	21	23.6	11	12.36	17	18.09	17	18.09
91-100%	Excellent	60	67.42	78	87.64	70	74.47	72	76.60

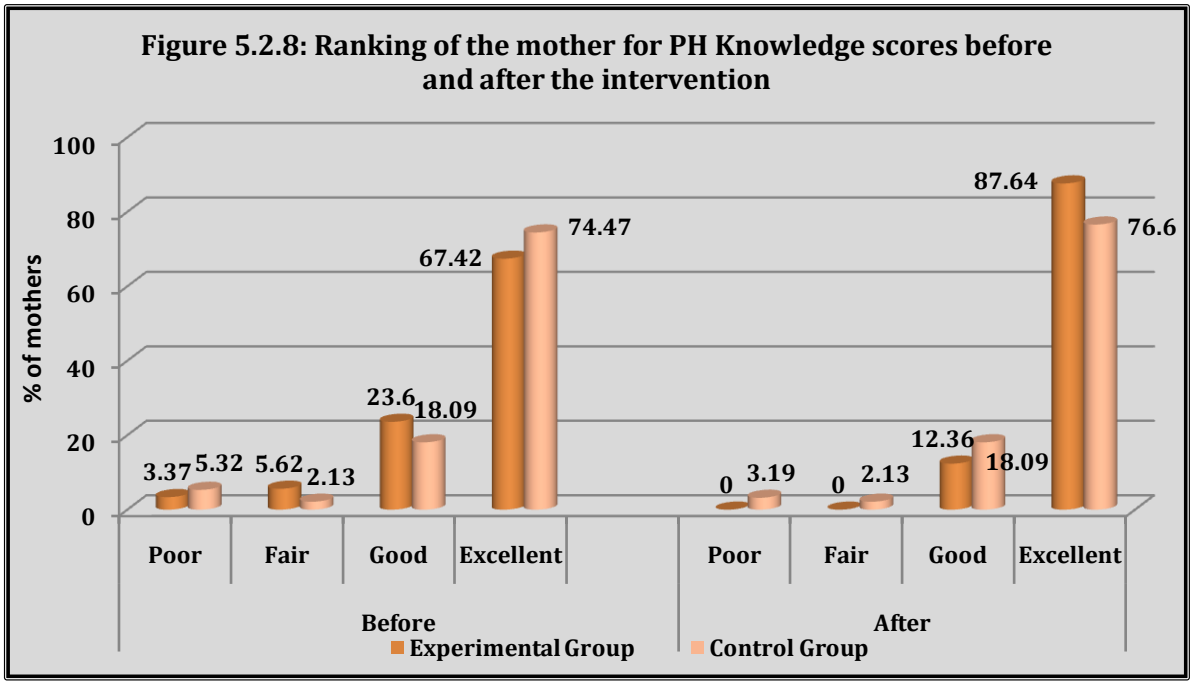
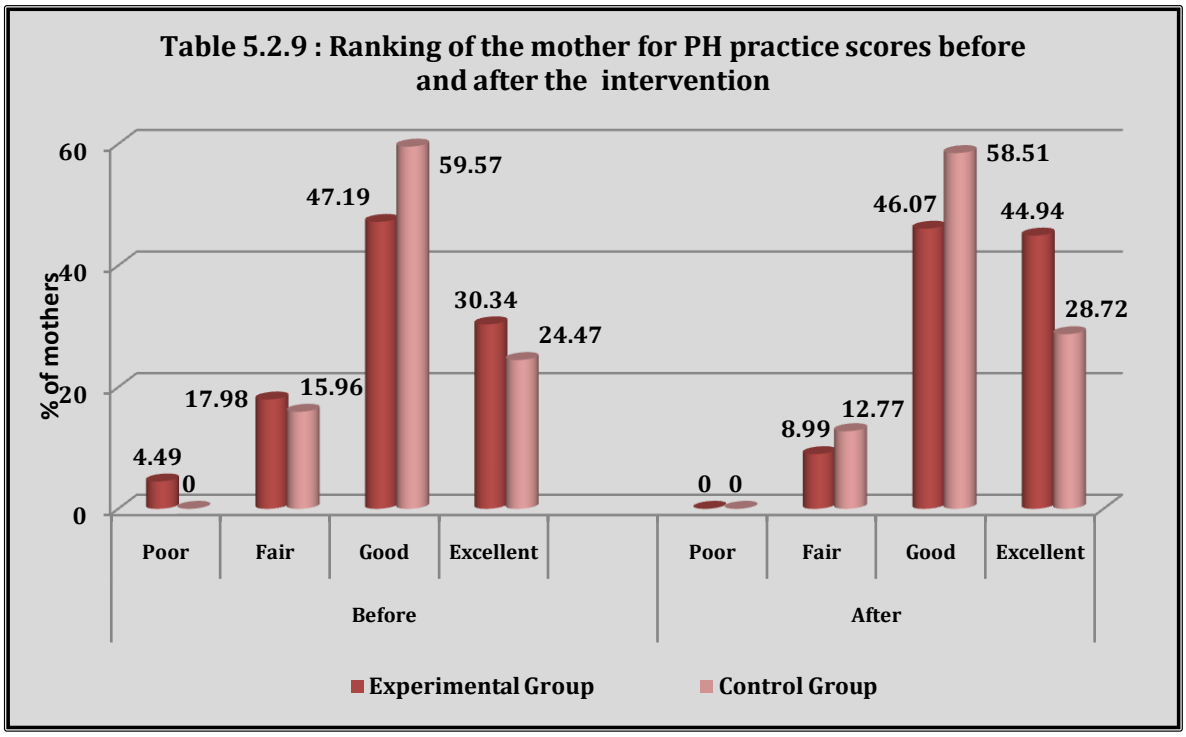


Table 5.2.21 : Ranking of the mother for PH practice scores before and after the intervention									
% score	Grade	Experimental				Control			
		Before		After		Before		After	
		No.	%	No.	%	No.	%	No.	%
≤ 60%	Poor	4	4.49	0	0	0	0.00	0	0
61-75%	Fair	16	17.98	8	8.99	15	15.96	12	12.77
76-90%	Good	42	47.19	41	46.07	56	59.57	55	58.51
91-100%	Excellent	27	30.34	40	44.94	23	24.47	26	28.72



5.2.8 Mean observation scores for household environmental hygiene and mother and child's personal hygiene before and after the intervention

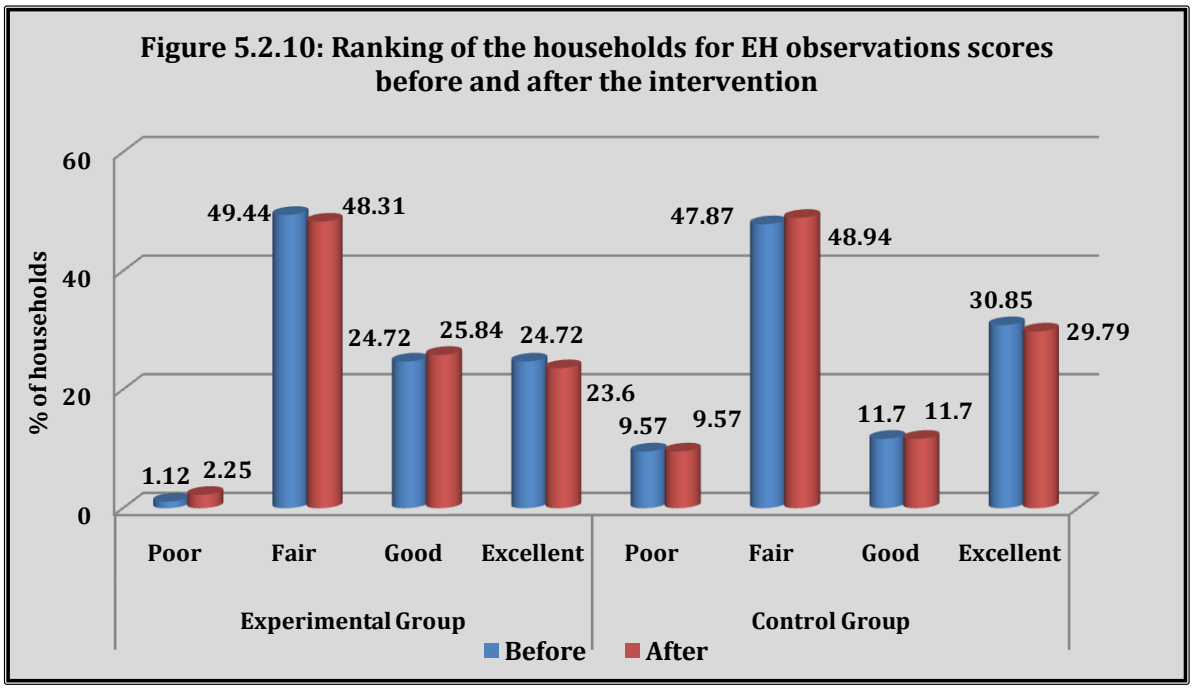
Household environmental hygiene (HEH)

The mean observation scores for HEH increased by 1.25% in the experimental group however it was not statistically significant (p> 0.05). Improvement were seen in the mean scores for observation with regards to more number of households having soap at the handwashing area, clean cooking area and restricted entry of pets inside the house (Table 5.2.22). One of the mothers stated *"maroh mahina no saanu noh karcho vadhi gayu karan ki hun have vadhare vaar saabu thi haath dhounchu"* (My monthly expenses for soap has increased as I use soap more often to wash my hands). However more number of household were found to have stagnant pool of water and garbage near the house post intervention. Two mothers in the same locality stated *"panchyat ni gaadi kaayam nathi aawati, atle badhha loko ahiyanj ghar no kachro naakhe che"* (The garbage collecting van does not come regularly so everyone dumps their household waste here only). The control group also showed a non significant increase of 0.21% in the mean scores after the intervention. No considerable changes were observed in the ranking of the households based on HEH. (Table 5.2.23 and figure: 5.2.10).

Table 5.2.22: Mean scores of the hygiene observations in the experimental and control group before and after the intervention										
Household environmental hygiene										
S.No	**Observation**	**Max Score**	**Experimental Group**				**Control Group**			
			Before	**After**	**% ↑ or ↓**	**Paired "t" value**	**Before**	**After**	**% ↑ or ↓**	**Paired "t" value**
			Mean ± S.D.				**Mean ± S.D.**			
1.	Availability of soap and water at handwashing area	2	1.92 ± 0.27	1.98 ± 0.15	3.31 (↑)	3.52^{***}	1.93 ± 0.27	1.94 ± 0.25	0.52 (↑)	1.00^{NS}
2.	House swept	2	1.69 ± 0.46	1.74 ± 0.44	2.96 (↑)	1.7^{NS}	1.59 ± 0.49	1.68 ± 0.47	5.67 (↑)	2.57^{NS}
3.	House mopped	2	1.60 ± 0.49	1.61 ± 0.49	0.63 (↑)	2.04^{*}	1.50 ± 0.50	1.49 ± 0.50	0.67 (↓)	0.58^{NS}
4.	Are the drinking water containers covered?	2	2.0 ± 0.0	2.0 ± 0.0	0.0	3.52^{***}	1.99 ± 0.11	2.0 ± 0.0	0.50 (↑)	1.00^{NS}
5.	Flies inside the house	2	1.49 ± 0.50	1.51 ± 0.51	1.34 (↑)	3.88^{***}	1.25 ± 0.44	1.32 ± 0.47	5.6 (↑)	1.75^{NS}
6.	Flies outside the house	2	1.47 ± 0.52	1.47 ± 0.52	0.0	4.39^{***}	1.19 ± 0.40	1.20 ± 0.40	0.84 (↑)	0.58^{NS}
7.	Stagnant pool of water just outside the house	2	1.75 ± 0.43	1.72 ± 0.45	1.71 (↓)	3.52^{***}	1.48 ± 0.50	1.47 ± 0.50	7.4 (↑)	0.19^{NS}
8.	Garbage dumped near the house	2	1.70 ± 0.46	1.64 ± 0.48	3.53 (↓)	1.75^{NS}	1.36 ± 0.48	1.35 ± 0.48	0.74 (↑)	0.30^{NS}
9.	Open sewage close to the house	2	1.76 ± 0.43	1.76 ± 0.43	0.0	2.15^{*}	1.59 ± 0.50	1.59 ± 0.50	0.0	-
10.	Pets inside the house	2	1.84 ± 0.37	1.89 ± 0.32	2.72 (↑)	3.70^{***}	1.86 ± 0.35	1.86 ± 0.35	0.0	-
11.	Cooking area clean	2	1.81 ± 0.44	1.84 ± 0.44	1.65 (↑)	9.01^{***}	1.72 ± 0.45	1.72 ± 0.45	2.33 (↑)	0.90^{NS}
12.	Utensils containing food covered	2	1.87 ± 0.34	1.90 ± 0.30	1.60 (↑)	1.09^{NS}	1.81 ± 0.40	1.81 ± 0.40	8.29 (↓)	2.74^{**}
Composite scores of households for EH observations		24	20.83 ± 3.23	21.09 ± 2.33	1.25 (↑)	1.04^{NS}	19.27 ± 3.20	19.31 ± 2.53	0.21(↑)	0.28^{NS}
Personal hygiene observation scores of mother and child										
Mother		10	7.99 ± 1.96	8.42 ± 1.62	5.38 (↑)	3.75^{***}	8.27 ± 1.66	8.19 ± 1.45	0.97 (↓)	0.63^{NS}
Child		10	7.52 ± 2.16	8.16 ± 1.72	8.51 (↑)	3.94^{***}	7.46 ± 1.86	7.59 ± 1.64	1.74 (↑)	0.94^{NS}

^{NS}: Not significant *: p< 0.05 **: p<0.01 ***: p<0.001

Table 5.2.23: Ranking of the households for EH observations scores before and after the intervention									
% score	Grade	Experimental				Control			
		Before		After		Before		After	
		No.	%	No.	%	No.	%	No.	%
≤ 60%	Poor	1	1.12	2	2.25	9	9.57	9	9.57
61-75%	Fair	44	49.44	43	48.31	45	47.87	46	48.94
76-90%	Good	22	24.72	23	25.84	11	11.70	11	11.70
91-100%	Excellent	22	24.72	21	23.60	29	30.85	28	29.79



Personal hygiene of mother and child

Personal hygiene scores of mother and child increased significantly ($p < 0.001$) by 5.38 and 8.51% (Table 5.2.24) respectively post intervention. Mothers were aware about the importance of personal hygiene and took care of keeping child's and their nails short and tidy, hands clean and wearing clean clothes. However no significant change was observed in the PH scores of both mother and child in the control group.

None of the mothers were categorized to have poor personal hygiene observation scores in the experimental group post intervention (Table 5.2.25 and figure: 5.2.11). . Similarly the number of children categorized as poor decreased from 12.36% to 3.37% (Table 5.2.26 and figure: 5.2.12). In contrast more number of mothers were categorized as poor in the control group after the follow up period.

Table 5.2.24: Personal hygiene observation scores of mother and child									
	Max Score	Experimental Group				Control Group			
		Before	After	% ↑ or ↓	Paired "t" value	Before	After	% ↑ or ↓	Paired "t" value
		Mean ± S.D.				Mean ± S.D.			
Mother	10	7.99 ± 1.96	8.42 ± 1.62	5.38 (↑)	3.75^{***}	8.27 ± 1.66	8.19 ± 1.45	0.97 (↓)	0.63^{NS}
Child	10	7.52 ± 2.16	8.16 ± 1.72	8.51 (↑)	3.94^{***}	7.46 ± 1.86	7.59 ± 1.64	1.74 (↑)	0.94^{NS}

Table 5.2.25 : Ranking of the mothers for PH observations scores before and after the intervention									
Score	Grade	Experimental Group				Control group			
		Before		After		Before		After	
		No.	%	No.	%	No.	%	No.	%
10	Excellent	34	38.20	35	39.33	26	27.66	23	24.47
7-9	Good	29	32.58	41	46.07	49	52.13	48	51.06
5-6	Fair	22	24.72	13	14.61	17	18.09	19	20.21
4	Poor	4	4.49	0	0.0	2	2.13	4	4.26

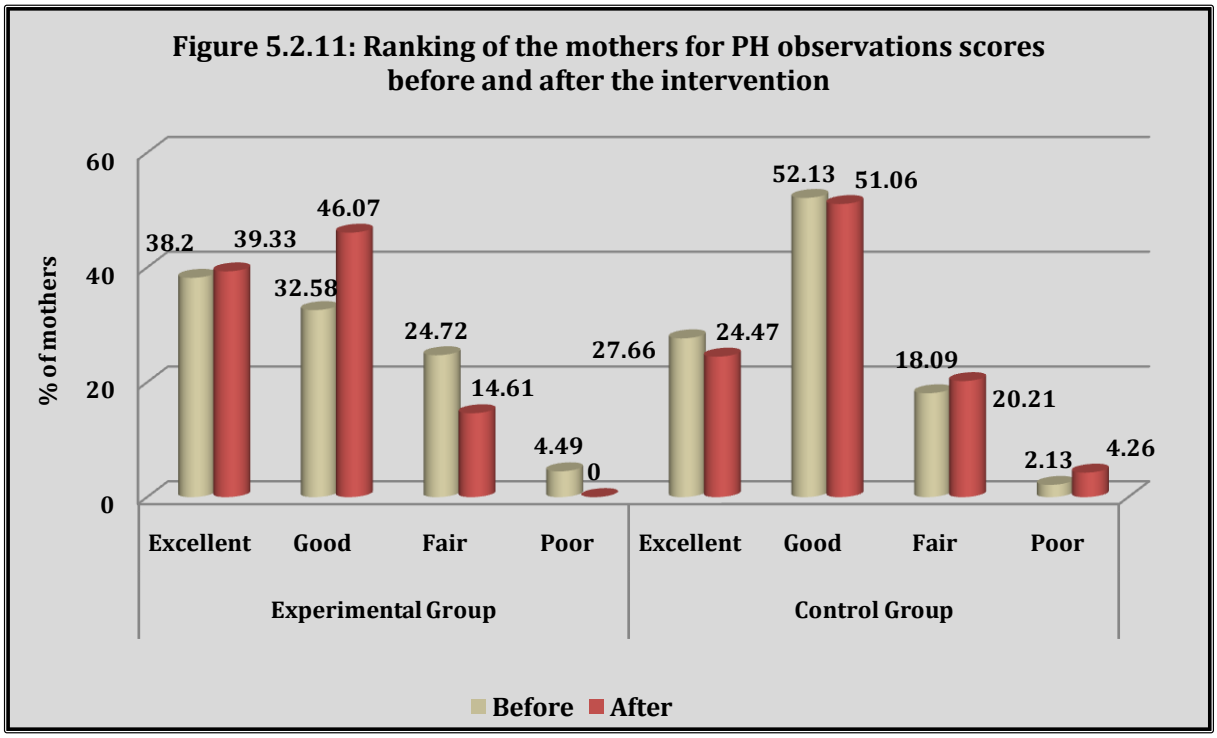
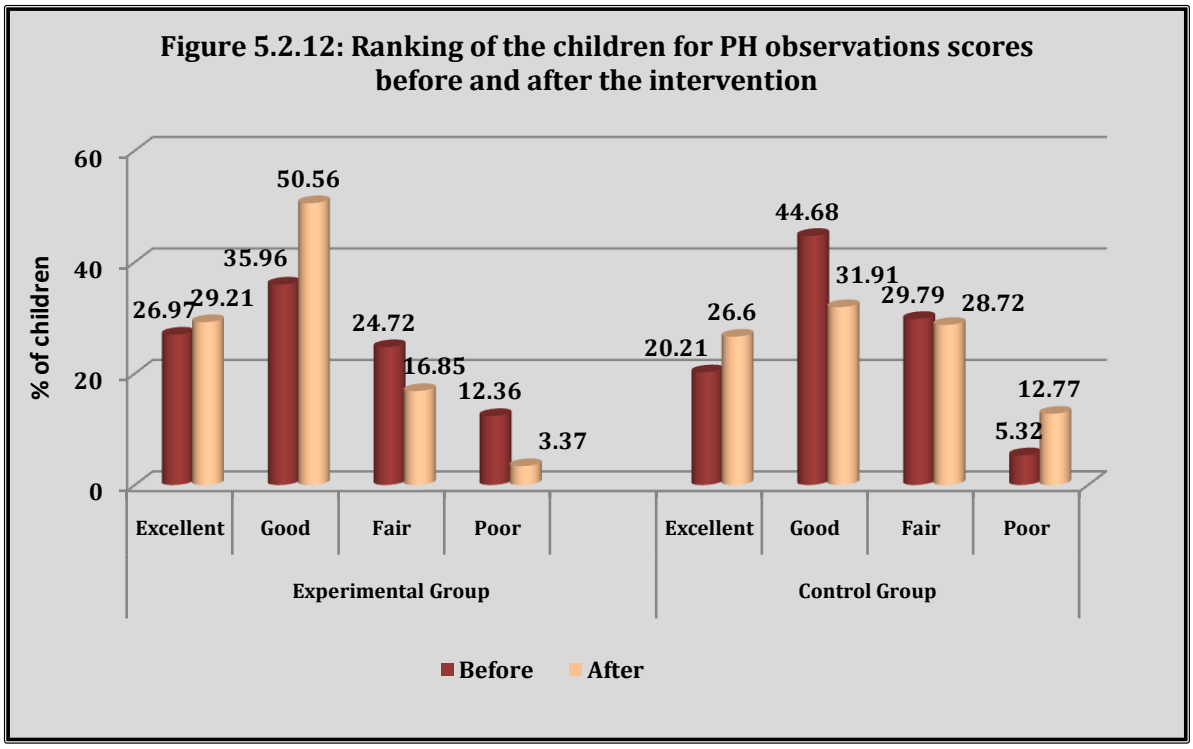


Table 5.2.26 : Ranking of the children for PH observations scores before and after the intervention									
		Experimental Group				Control group			
		Before		After		Before		After	
Score	Grade	No.	%	No.	%	No.	%	No.	%
10	Excellent	24	26.97	26	29.21	19	20.21	25	26.60
7-9	Good	32	35.96	45	50.56	42	44.68	30	31.91
5-6	Fair	22	24.72	15	16.85	28	29.79	27	28.72
4	Poor	11	12.36	3	3.37	5	5.32	12	12.77



5.2.9 Mean breastfeeding knowledge scores before and after the intervention

The knowledge levels of the mothers on BF increased significantly by almost 100% in the experimental group (Table 5.2.27). . After the intervention mothers knew the importance of colostrum and that it was undesirable to give prelacteals to the child after birth. One of the mothers stated "*aatyare maari ben ni delivery thai to main maari ben ne pan kahyu ki peedu dhavan baadak maate bahut saras hoe che. Main emne madh nahi aapvani pan salah aapi par emni sasu nathi sambharti anebadak ne aapi didu"(I informed my sister, who delivered recently that yellow milk is very good for the child, I also told her that one should not give honey also to the child but her mother in law gave)* Number of mothers categorized to have excellent BF knowledge increased from 2.25% to 24.72% after the intervention in the experimental group (Table

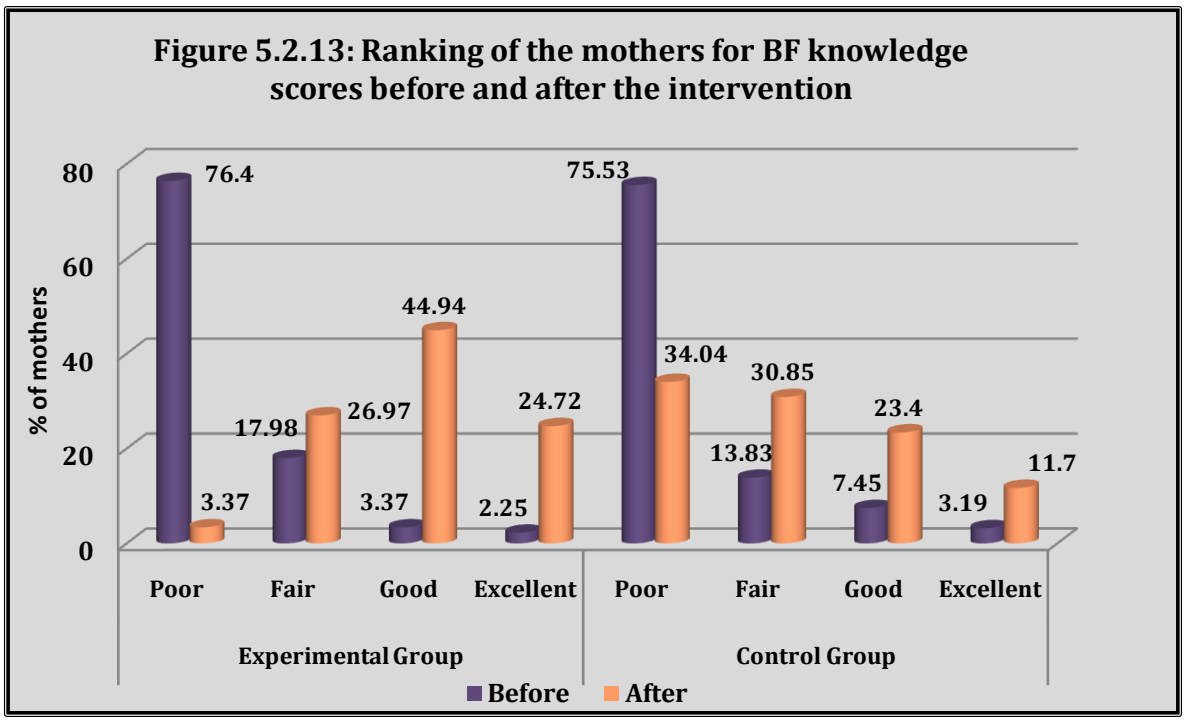
5.2.28and figure 5.2.13). The control group also showed a significant 17% increase after the follow up period.

Table 5.2.27: Mean scores of breastfeeding knowledge before and after the intervention

S.No	Questions	Max Score	Experimental Group				Control Group			
			Before	After	% ↑ or ↓	Paired "t" value	Before	After	% ↑ or ↓	Paired "t" value
			Mean ± S.D.				Mean ± S.D.			
1.	Aware about colostrum	1	0.73 ± 0.45	1.0 ± 0.0	36.97 (↑)	5.7***	0.88 ± 0.34	0.96 ± 0.20	9.09 (↑)	2.94***
2.	What is this milk called	1	0.11 ± 0.32	0.82 ± 0.39	645.45 (↑)	14.6***	0.17 ± 0.38	0.24 ± 0.43	41.18 (↑)	2.74***
3.	Is colostrum good for the child	1	0.60 ± 0.50	0.93 ± 0.25	55.0 (↑)	6.69***	0.63 ± 0.49	0.88 ± 0.32	39.68 (↑)	4.84***
4.	If good why?	1	0.14 ± 0.34	0.34 ± 0.48	142.85 (↑)	4.43***	0.11 ± 0.32	0.17 ± 0.38	54.55 (↑)	2.29*
5.	Till how many months should one exclusively breast feed the child	1	0.63 ± 0.49	0.98 ± 0.15	55.55 (↑)	6.68***	0.70 ± 0.46	0.69 ± 0.46	1.43 (↑)	1.42NS
6.	Are prelacteals good for the child	1	0.26± 0.44	0.84 ± 0.37	223.08 (↑)	11.12***	0.17 ± 0.38	0.19 ± 0.42	11.76 (↑)	1.21NS
Composite scores of mothers for knowledge on BF		6	2.46 ± 1.43	4.91 ± 0.81	99.59 (↑)	15.64***	2.68 ± 1.44	3.14 ± 1.21	17.16 (↑)	5.65***

NS: Not significant *: p< 0.05 **: p<0.01 ***: p<0.001

Table 5.2.28: Ranking of the mothers for BF knowledge scores before and after the intervention									
% score	Grade	Experimental				Control			
		Before		After		Before		After	
		No.	%	No.	%	No.	%	No.	%
≤ 60%	Poor	68	76.4	3	3.37	71	75.53	32	34.04
61-75%	Fair	16	17.98	24	26.97	13	13.83	19	30.85
76-90%	Good	3	3.37	40	44.94	7	7.45	15	23.40
91-100%	Excellent	2	2.25	22	24.72	3	3.19	8	11.70



5.2.10 Mean complementary knowledge and practice scores before and after the intervention

Scores obtained by the mothers for knowledge and practices on CF are summarized in table 5.2.29. The knowledge levels of mothers increased significantly by 44.78%. After the NH and FSE mothers knew the correct age of initiating complementary feeds. Mothers got aware about the benefits of CF and knew what all should be fed in the initial months to the child. In contrast mothers in the control group showed no significant increase in the knowledge levels. Mothers categorized to have excellent knowledge on CF increased from 14.61% to 42.7% post intervention in the experimental group. (Table 5.2.30 and figure: 5.2.14).

Table 5.2.29: Mean scores on complementary feeding (CF) before and after the intervention										
CF knowledge										
			Experimental Group				**Control Group**			
S.No	**Question**	**Max Score**	**Before**	**After**	**% ↑ or ↓**	**Paired "t" value**	**Before**	**After**	**% ↑ or ↓**	**Paired "t" value**
			Mean ± S.D.				**Mean ± S.D.**			
1.	When should one start with complementary feeds	1	0.58 ± 0. 50	1.0 ± 0.0	72.41 (↑)	7.91***	0.61 ± 0. 49	0.65 ± 0.48	6.56 (↑)	2.03*
2.	Why should we start with complementary feeds	1	0.77 ± 0.43	0.93 ± 0.25	20.78 (↑)	4.05***	0.70 ± 0.48	0.71± 0.48	1.43 (↑)	1.0NS
3.	What all foods should be fed to the child in the initial months	3	1.61 ± 0.91	2.37 ± 0.59	47.20 (↑)	7.97***	1.46 ± 0.88	1.45 ± 0.90	0.68 (↓)	0.58NS
Composite scores of mothers for knowledge on CF		5	2.97 ± 1.33	4.30 ± 0.68	44.78 (↑)	10.63***	2.77 ± 1.28	2.81 ± 1.24	1.44 (↑)	1.65NS
CF practices										
1.	Who feeds the child	1	0.85 ± 0.36	0.92 ± 0.27	8.23 (↑)	64.23***	0.83 ± 0.38	0.70 ± 0.46	15.66 (↓)	3.38**
2.	How do you ensure that the child eats his/her food	1	0.46 ± 0.50	0.81 ± 0.40	76.09 (↑)	58.89***	0.55 ± 0.50	0.47 ± 0.50	14.54 (↓)	2.74**
3.	How is the child fed	1	0.87 ± 0.34	0.92 ± 0.27	5.75 (↑)	67.65***	0.90 ± 0.30	0.95 ± 0.23	5.56 (↑)	2.03*
4.	What all foods do you feed your child	2	1.80 ± 0.50	1.92 ± 0.27	6.67 (↑)	65.12***	1.84 ± 0.53	1.85 ± 0.51	0.54 (↑)	1.0NS
5.	Do you prepare any special foods for your child	1	0.47 ± 0.50	0.98 ± 0.15	108.51 (↑)	27.89***	0.61 ± 0.49	0.61 ± 0.49	0	0
Composite scores of mothers for CF practices		6	4.44 ± 1.17	5.55 ± 0.74	25.00 (↑)	10.91***	4.71 ± 1.28	4.56 ± 1.18	3.8 (↓)	2.4**

NS: Not significant ***: p< 0.05** ****: p<0.01** *****: p<0.001**

The practices of the mothers improved significantly by 25% post intervention. After the intervention mothers made sure that the child is fed by an elder and monitored how much the child ate. Mothers started preparing special foods for their children like *balbhog, sheera, upma* etc ensuring that they include all the seven food groups in their daily diet. Mothers categorized to have poor practices decreased from 19.1% to 2.25% after the intervention in the experimental group (Table 5.2.31 and fig: 5.2.15)

Table 5.2.30: Ranking of the mothers for CF knowledge scores before and after the intervention

% score	Grade	Experimental				Control			
		Before		After		Before		After	
		No.	%	No.	%	No.	%	No.	%
≤ 60%	Poor	30	33.71	6	6.74	69	73.40	66	70.21
61-75%	Fair	26	29.21	17	19.10	0	0.00	4	4.26
76-90%	Good	24	26.97	31	34.83	16	17.02	18	19.15
91-100%	Excellent	9	10.11	35	39.33	9	9.57	6	6.38

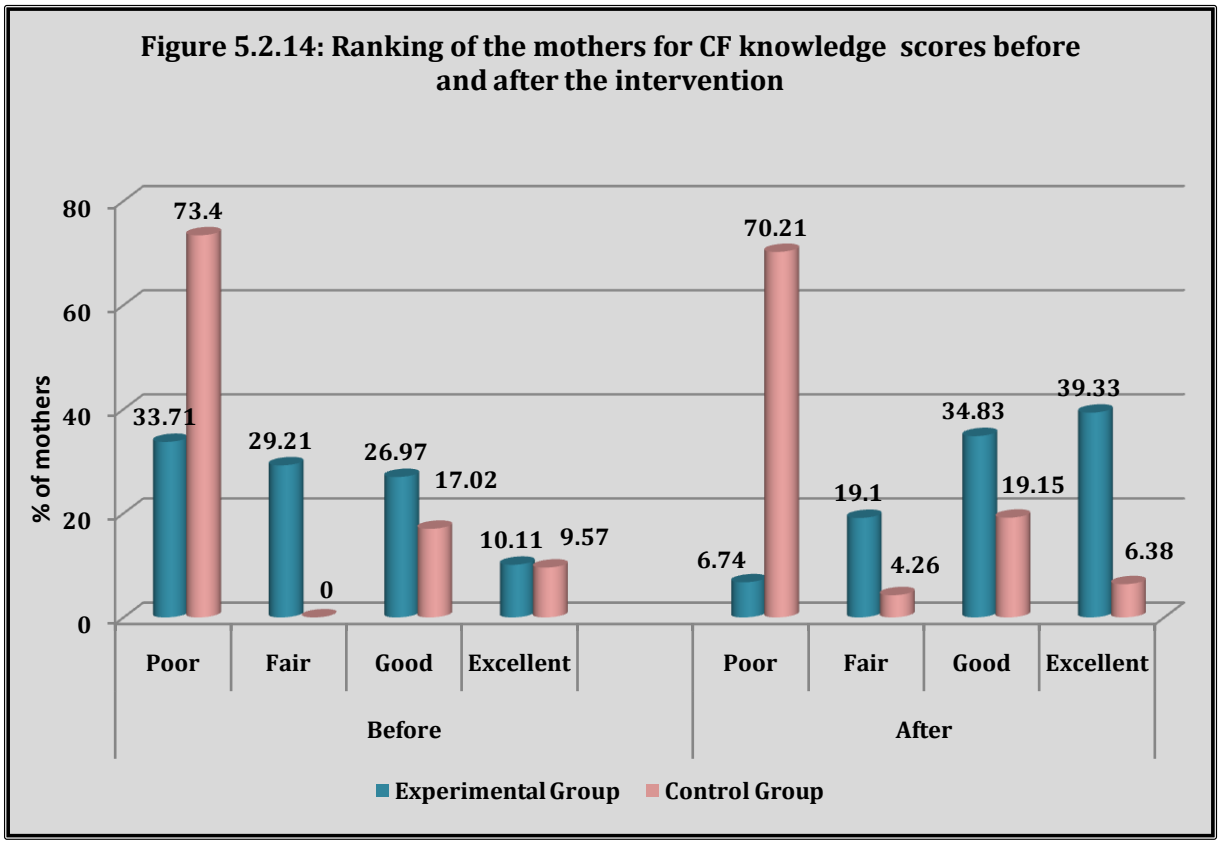
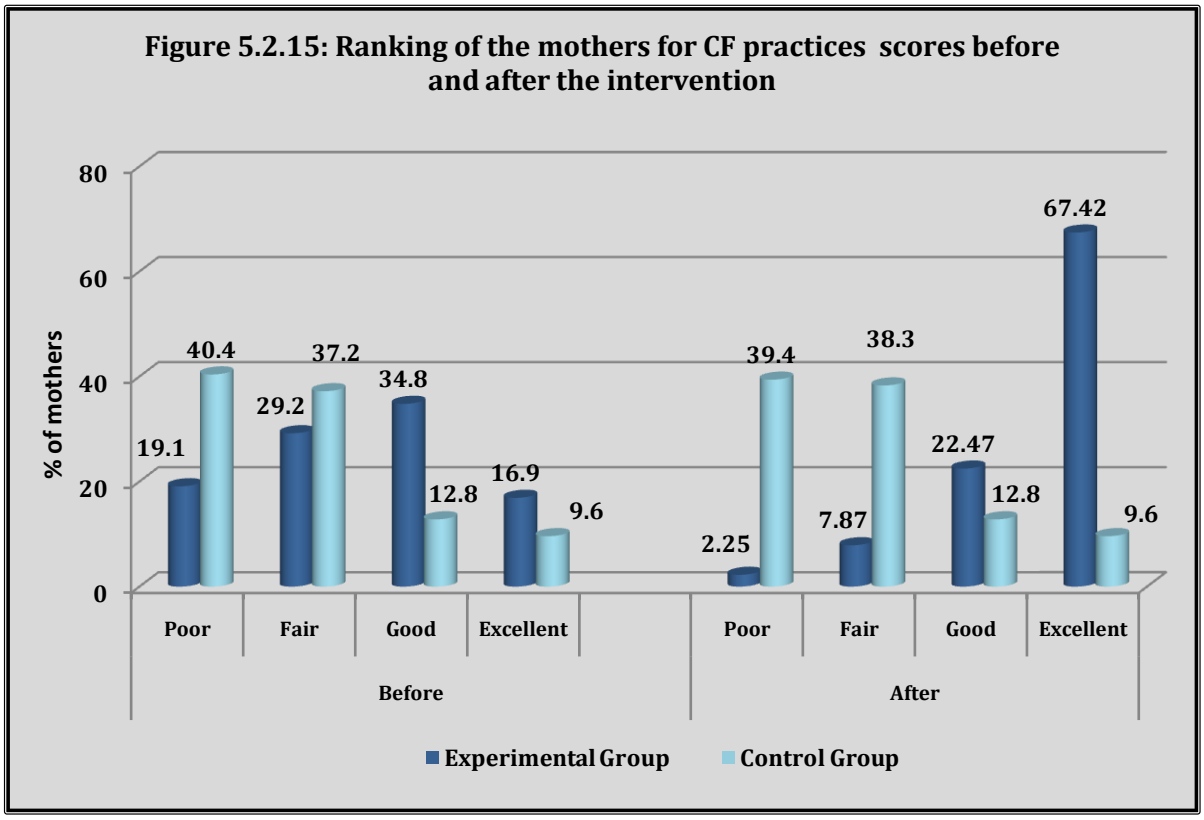


Table 5.2.31 : Ranking of the mothers for CF practices scores before and after the intervention									
% score	Grade	Experimental				Control			
		Before		After		Before		After	
		No.	%	No.	%	No.	%	No.	%
≤ 60%	Poor	17	19.1	2	2.25	38	40.4	37	39.4
61-75%	Fair	26	29.2	7	7.87	35	37.2	36	38.3
76-90%	Good	31	34.8	20	22.47	12	12.8	12	12.8
91-100%	Excellent	15	16.9	60	67.42	9	9.6	9	9.6



5.2.11 Mean childhood diarrhea cause and management knowledge and practice scores before and after the intervention.

As shown in table 5.2.32 the knowledge levels of the mothers improved significantly after the intervention in the experimental group. Maximum improvement was observed in the knowledge for prevention of childhood diarrhea and the foods that should be avoided when the child suffers from diarrhea. The practices of the experimental group also improved significantly by 156.82% after the intervention. Almost all the mothers gave ORS to their children during the diarrheal episodes along with BF and CF. Mothers also followed good hygiene practices that helped

prevent future diarrheal episodes in children. In contrast to the control group also showed a significant increase of 6.51% in the mean knowledge scores.

Table 5.2.32: Mean scores of the mothers for diarrhoea cause and management before and after the intervention

Knowledge on diarrhoea cause and management

S.No	Question	Max Score	Experimental Group				Control Group			
			Before	After	% ↑ or ↓	Paired "t" value	Before	After	% ↑ or ↓	Paired "t" value
			Mean ± S.D.				Mean ± S.D.			
1.	What causes diarrhoea	1	0.16 ± 0.37	0.64 ± 0.49	300 (↑)	9.07***	0.26 ± 0.44	0.28 ± 0.245	7.69 (↑)	1.42NS
2.	What are the symptoms of diarrhoea	2	0.54 ± 0.54	1.10 ± 0.48	103.70 (↑)	8.08***	0.63 ± 0.53	0.63 ± 0.53	00	-
3.	Should we breastfeed a child suffering from diarrhoea.	1	0.89 ± 0.32	1.0 ± 0.0	12.35 (↑)	3.34***	0.83 ± 0.38	0.88 ± 0.33	6.02 (↑)	2.03*
4.	Should we continue complementary feeding during diarrhoea	1	0.85 ± 0.36	1.0 ± 0.0	17.65 (↑)	3.88***	0.65 ± 0.48	0.70 ± 0.46	7.69 (↑)	1.27NS
5.	What all should be fed when the child is suffering from diarrhoea	3	0.75 ± 0.66	1.22 ± 0.49	62.67 (↑)	8.05***	0.73 ± 0.67	0.73 ± 0.67	00	-
6.	What all should be avoided when the child is suffering from diarrhoea		0.38 ± 0.49	0.81 ± 0.40	113.16 (↑)	8.10***	0.33 ± 0.47	0.33 ± 0.47	00	-
7.	Are you aware about ORS	1	0.76 ± 0.43	1.00 ± 0.0	31.58 (↑)	5.08***	0.76 ± 0.43	0.90 ± 0.30	18.42 (↑)	3.69***
8.	How can we prevent diarrhoea	1	0.13 ± 0.33	0.63 ± 0.49	384.62 (↑)	9.33***	0.11 ± 0.32	0.14 ± 0.35	27.27 (↑)	1.75NS
Composite scores of mothers for knowledge on diarrhoea cause and management		10	4.43 ± 1.59	8.03 ± 1.26	81.26 (↑)	23.69***	4.3 ± 1.83	4.58 ± 1.64	6.51 (↑)	4.24***

Practices for diarrhoea cause and management										
S.No	Question	Max Score	Before	After	% ↑ or ↓	Paired "t" value	Before	After	% ↑ or ↓	Paired "t" value
			Mean ± S.D.				Mean ± S.D.			
1.	Were complementary feeds given when the child suffered from diarrhoea?	1	0.80 ± 0.40	1.00 ± 0.0	25.00 (↑)	3.99***	0.90 ± 0.30	0.91 ± 0.29	1.11 (↑)	0.15NS
2.	Were any special foods given when the child suffered from diarrhoea?	1	0.47 ± 0.50	4.43 ± 1.59	100.00 (↑)	6.30***	0.65 ± 0.48	0.65 ± 0.48	00	-
3.	Which special foods were given?	1	0.39 ± 0.52	4.43 ± 1.59	141.03 (↑)	7.33***	0.61 ± 0.49	0.61 ± 0.49	00	-
4.	Was ORS given?	1	0.80 ± 0.27	4.43 ± 1.59	1137.5 (↑)	28.16***	0.10 ± 0.30	0.19 ± 0.40	90.00 (↑)	1.77NS
5.	How can you prevent diarrhoea	1	0.02 ± 0.12	4.43 ± 1.59	3150 (↑)	9.52***	0.12 ± 0.33	0.13 ± 0.34	8.33 (↑)	0.28NS
Composite scores of mothers for practices on diarrhoea cause and management		5	1.76 ± 1.27	4.52 ± 0.69	156.82 (↑)	14.06***	2.49 ± 1.12	2.49 ± 1.24	3.75 (↑)	0.59NS

NS: Not significant ***: p< 0.05** ****: p<0.01** *****: p<0.001**

As indicated in table 5.2.33 and figure 5.2.16 the number of mothers having poor knowledge decreased from 89.89 to 11.24% post intervention in the experimental group. None of the mothers were categorized to have excellent knowledge before intervention, but post intervention 11.24% had excellent knowledge levels for diarrhea cause and management. Only 1.52% mothers were categorized to have excellent diarrheal management practices which increased to 59.52% post intervention (Table 5.2.34 and figure 5.2.17).

Table 5.2.33: Ranking of the mothers for knowledge on diarrhea cause and management scores before and after the intervention

% score	Grade	Experimental				Control			
		Before		After		Before		After	
		No.	%	No.	%	No.	%	No.	%
≤ 60%	Poor	80	89.89	10	11.24	83	88.30	76	80.85
61-75%	Fair	5	5.62	21	23.60	7	7.45	11	11.70
76-90%	Good	4	4.49	48	53.93	3	3.19	4	4.26
91-100%	Excellent	0	0	10	11.24	1	1.06	3	3.19

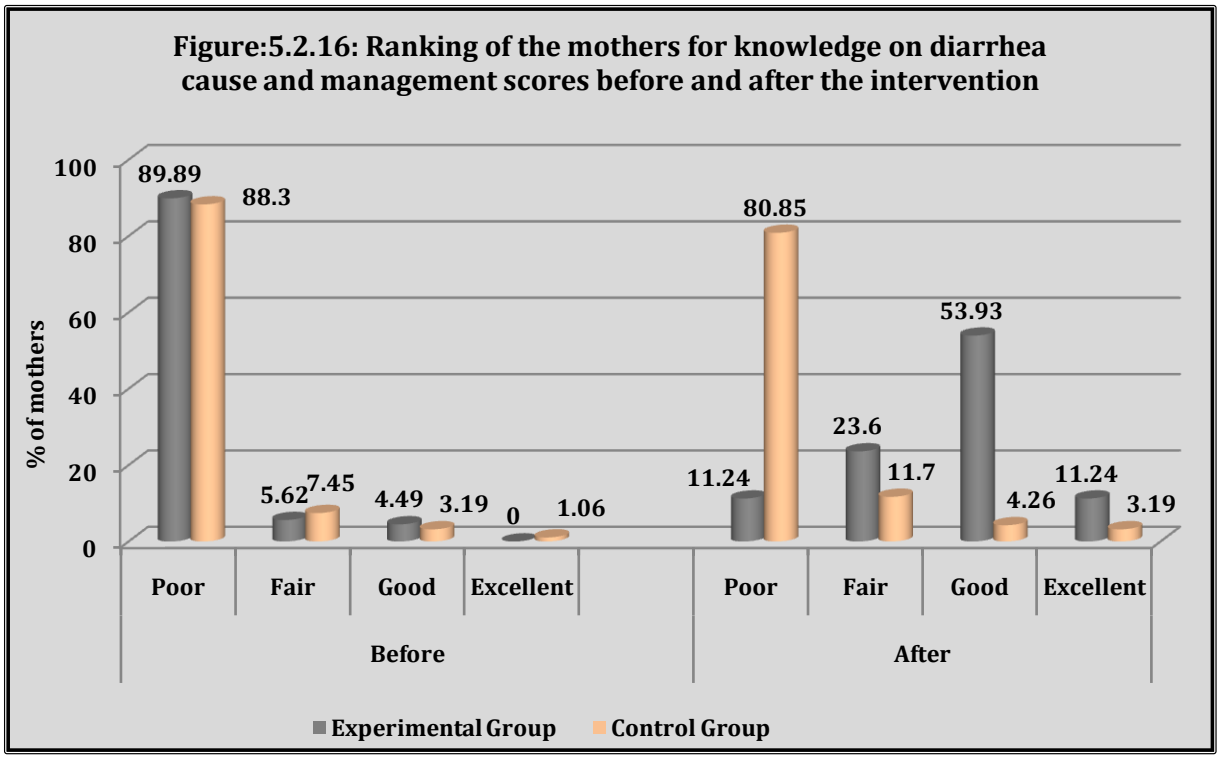
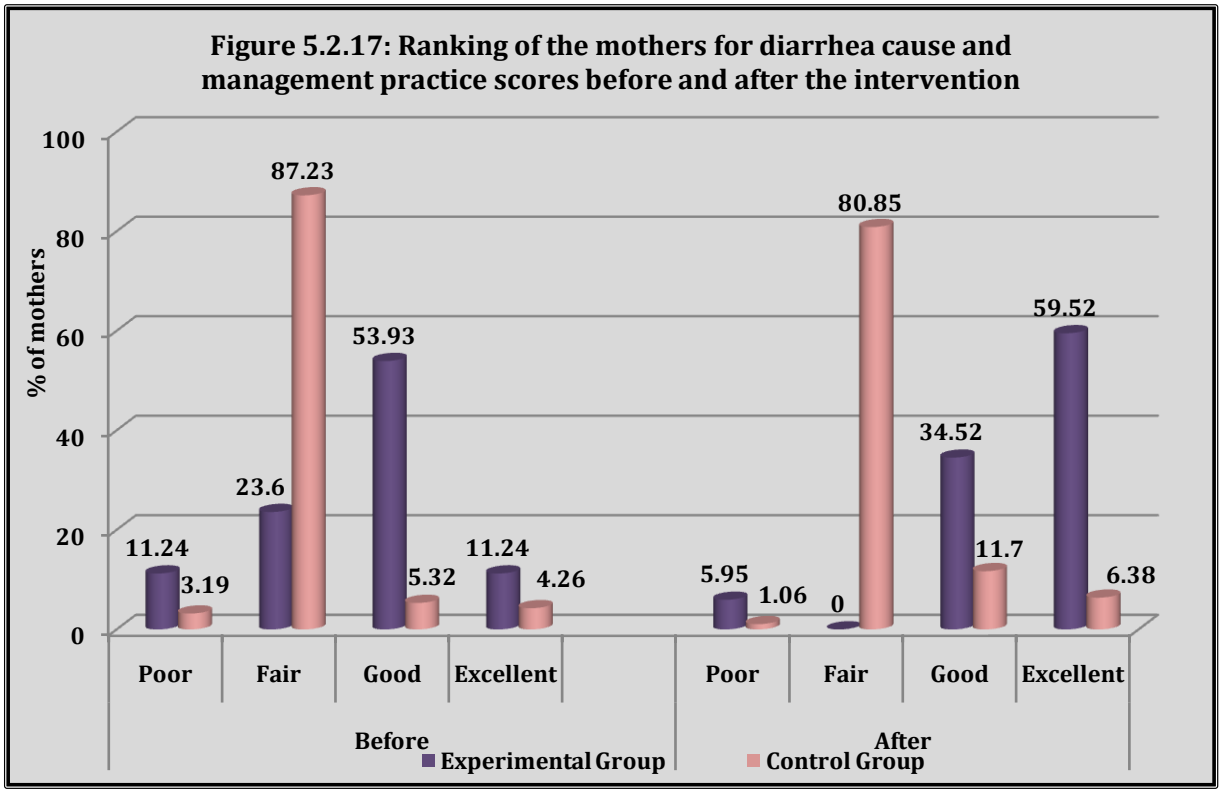


Table 5.2.34: Ranking of the mothers for diarrhea cause and management practice scores before and after the intervention									
% score	Grade	Experimental				Control			
		Before		After		Before		After	
		No.	%	No.	%	No.	%	No.	%
≤ 60%	Poor	1	11.24	5	5.95	3	3.19	1	1.06
61-75%	Fair	84	23.6	0	0	82	87.23	76	80.85
76-90%	Good	3	53.93	31	34.52	5	5.32	11	11.70
91-100%	Excellent	1	11.24	53	59.52	4	4.26	6	6.38



HIGHLIGHTS OF PHASE 1

- Most children (47.6%) were in the age group of 13-24 months.
- 88.2% families were Hindus. Maximum families (43.7%) were from lower middle group.
- Most of the parents (60.8% mothers and 67.7% fathers) were educated till higher secondary, with only 16% mothers and 7% fathers being illiterate.
- 60.6% families resided in semi *pakka* houses and 64.4% households had open drainage system.
- Safe source of water was used by almost all the households for all the activities.
- 43.09 % children were moderate to severely underweight, 50.93% were stunted and 25.38% wasted.
- 35.3% children suffered from diarrhea in the past one month of survey of which majority, (90.5%) had watery diarrhea, 9.5% had bloody diarrhea and 10 children were admitted to hospital.
- 71.3% mothers had excellent KEH scores. 50% mothers had ≤60% score for environmental hygiene practices. Open defecation (44.6%), open collection (79.4%) and disposal of solid waste (61.4%) were the most undesirable practices followed.
- 47.8% mothers scored fairly on KFH. 59% mothers were unaware about the safe temperatures for heating leftover moist food for consumption, 50% didn't know about the safe duration of storage of cooked moist food stored at room temperature before consumption, 88.8% regarded "bulk washing only once" asthe ideal way of washing fruits and vegetables and 67% believed that "warming" the stored moist weaning foods is sufficient before feeding the baby.

HIGHLIGHTS OF PHASE 1 (continued)

- 79% mothers were ranked as "very good" for PFH. Desirable practices followed included use of soap for washing utensils, washing fruits and vegetables before use and air drying of utensils after washing. Undesirable practices included dipping a container in stored water vessel for drawing water and consuming moist leftover food without sufficient heating.
- 76.5% mothers had excellent scores for KPH. Almost all mothers knew that washing their hands and child's hands before feeding the child is necessary. Many knew that washing hands with soap is much better than water alone as it facilitates efficient removal of dirt and germs and helps prevent diseases.
- Only 29.7% mother had excellent scores for personal hygiene practices. All the mothers used soap after visiting toilet and also after attending the child who has defecated. Only 50% mothers used soap for washing hands before feeding the child and before eating food. Insufficient use of soap was found before cooking, before breastfeeding the child and after touching raw foods.
- 49% households were graded as good for EH observations. More than 90% households had soap or ash at the hand washing place and had all the drinking water containers covered.
- 67% mothers had excellent to good scores for personal hygiene observations as compared to 56.8% children.
- 70% mothers had poor BF knowledge scores. 68% mothers knew that colostrum is good for the child but only 10.6% could mention its correct advantage. Only 73.9% mothers knew that the child should be exclusively breastfed till 6 months and only 30.2% knew that giving prelactals is not good for the child. Only 45% mothers breastfed their babies within 1 hour after the birth, 77% fed colostrum and prelactels were given by 13.7% mothers.

HIGHLIGHTS OF PHASE 1 (continued)

- 58.2% mothers had excellent CF knowledge scores. Almost 67% mothers knew that complementary feeds should be initiated after 6 months of age and stated the correct reason for initiating the same.
- Only 5.2% mothers had excellent complementary feeding practices. 74% mothers had not started CF at the right age, 95% children were fed foods from more than four food groups. More than 50% mothers prepared special foods for their children like *balbhog, sheera, raab*, etc.
- Only 1.87% mothers were graded as excellent and 64.37% as poor for knowledge on diarrhea cause and management knowledge. 68% did not know what all foods should be avoided during diarrhea but 83.2% mothers knew about ORS. Only (9.5% could correctly state the preventive measures for diarrhea.
- 90% mothers had poor diarrhea management practices. Only 43 mothers gave ORS to their child during diarrhea.
- WAZ of the child were affected by age of the child, SES of the family, personal hygiene observation scores of the child, health seeking behavior of the mothers, PH knowledge scores of the mothers and age of the father.
- HAZ was affected by age of the child, environmental hygiene practice scores of the mother, health seeking behavior of the mothers, diarrheal morbidity in children, sex of the child and personal hygiene score of the mother.
- Age of the child, SES of the family, PH knowledge scores of the mothers were the main determinants of WHZ.
- SES of the family, religion of the family, diarrhea management practices of the mothers, age of the child, child's PH observation scores, HFA z scores of the child and PH practice scores of the mothers emerged as the major determinants of diarrheal morbidities in children .

HIGHLIGHTS OF PHASE 2

- After 5 months the z scores improved significantly all the three parameters. WAZ improved by 48.44%, HAZ by 14.42% and WHZ by 256.67% in the EG.
- Children in the age group of 6-12 months showed the maximum improvement for all the three parameters.
- Statistically significant differences were found in the z scores of the EG and CG for WAZ and WHZ before and after the intervention.
- The average number of days for which a child suffered from diarrhea in theCG was significantly higher (7.67) than in EG (5.71).
- More percent reduction was found in the number of diarrheal episodes (65.88% vs 58.69%) and the number of days (69.23% vs 60.45%) for which the child suffered in the EG as compared to CG.
- The average number of days for which a child suffered from diarrhea in the control group was significantly higher than in experimental group.
- Number of diarrheal episodes and days of suffering was negatively and significantly correlated with the nutritional status of the child in the experimental group.
- The knowledge scores of the mothers improved significantly by high percentages in the EG.
- The practice scores showed slight improvements but not as high as the knowledge scores. Percentage improvements in the knowledge scores in the EG included EH by 12.49%; FH by 20.7%; PH by 5.77%; BF by 99.59%; CF by 44.78% and CD by 348.62%.
- Household EH observation scores showed no significant changes post intervention. Personal hygiene scores of mothers and child improved significantly by 5.38% and 8.51% respectively.

Discussion

Adequate and safe nutrition is the key to proper growth and development during the initial years of life. Since childhood is the most vulnerable phase in the life of human being, nutritional inadequacies and infections during this period can result in hampering of the development of the body. The present study addressed undernutrition and food safety issues amongst the tribal young children of Gujarat using a package of nutrition, health and food safety intervention.

Baseline survey for the present study indicated a high prevalence of undernutrition amongst the children of tribal district of Gujarat with 43.09 % being moderately to severely underweight, 50.93% being stunted and 25.38% being wasted. These figures were almost comparable to the state figures of 2007-08 which categorized 46.9% children as underweight, 53.8% stunted and 23.8% were wasted (www.gujhealth.gov.in/pdf/PresentationofGSN*MmadetoHon_bleCM.ppt*). Laxmaiah et al who conducted a similar study in the tribal areas of Khammam District of Andhra Pradesh found that 65.4% children between 1-5 years of age were underweight. Another study conducted by Sukhdas et al in 2013 in 1,013 tribal children of Andhra Pradesh reported 48.27 % stunting, 23.59% wasting and 48.37% underweight using the criteria laid down by WHO (2007). Karkar and Sharma in 2013 conducted a study in semi tribal regions of Gujarat reported 48.8% prevalence of underweight, 36.3% wasting and 36.2% stunting amongst children under two years of age. Findings of the present study on the epidemiology of growth faltering are consistent with the literature. Previous studies have reported higher prevalence of stunting than wasting within populations (Olusanya 2010; Singh et al 2006 and Victor et al 1992). Similarly rural and tribal children of Rajasthan and West Bengal had high levels of undernutrition (Bisla et al 2012, Mittal and Srivastava 2006 and Rao et al 2006).

Results of the present study show that the nutritional status of the children deteriorated with increasing age from 6 months to 36 months with about 70% children being underweight, 67% stunted and 33.3% wasted at 36 months of age. Daxini and Kanani 2009 also showed that in rural Vadodara the prevelance of undernutrition increasedsignificantly with the increase in age from 6 to 35 months. Similarly Bhavsar et al 2012, in their study in conducted in urban slums of Mumbai

and other researchers (Goel et al 2007; Chakraborty et al 2006 and Kumar et al 2006) also observed the same pattern in the nutritional status of children. Li et al (2007) in their study conducted in China also observed the same pattern that with increasing age, the prevalence of undernutrtion increased, peaking at 12-15 months.

Male subjects in the present study were found to have lower z scores that females in the present study for the all the three indices used to assess the nutritional status. Karkar and Sharma 2013 in their study in semi tribal regions of Gujarat, Ratnu 2013 in their study in Junagadh District of Gujarat and Meshram et al 2012 who surveyed tribal villages of nine states of India also reported similar findings. The cause of this discrepancy is not well established, but there is a belief that boys are more influenced by environmental stress than girls (Wamami 2007 and Wells 2000).

Under nutrition is a complex problem generated by factors operating at several levels and cannot be attributed only to lack of food (Jayatissa 2012). According to UNICEF 1990, socio economic status of the family affects the nutritional status of the child to a very great extent. In the present study regression analysis indicated SES of the family one of the factors influencing WFA and WFH of the child. It has been well established that better family income translates into improved purchasing power in turn enhancing the nutritional intake and better living conditions. All these factors are closely related to the nutritional status of a child in a family. Osei et al 2010; Nandy et al 2005 and Bhattacharya and co workers 2004 have also reported that household-level poverty is predictive of undernutrition among children. Study conducted in Brazil by Silveira et al (2015) also mentioned that poverty and lower human capital are still key factors associated with poor postnatal weight gain.

The NFHS-3 data have revealed that, mother's education has a direct impact on the nutritional status of the children. High undernutrition of all types prevailed among children in the group of illiterate mothers and mothers with less than 5 year's education (Social Statistics Division 2012). This finding is in contrast with the results of the present study since in spite of high literacy rates among the mothers, high degree of undernutrition prevailed amongst the children. Tigga et al 2015, Bhavsar et al 2012

and Kumar and Singh 2005also emphasised the importance of maternal education on child's nutritional status. Kavosi et al 2014, conducted a study in Iran mentioned that maternal education is an important factor determining child's nutritional status along with others.

Meshram et al 2012 in their study discussed that factors like breastfeeding and child feeding practices, hygienic practices and maternal knowledge about feeding and care during illness are all important determinants of undernutrition. In the present study health seeking behaviour of the mothers, hygiene knowledge and practices of the mothers and diarrhoeal morbidities were also found to be the predictors of undernutrition among children however infant and child feeding practices did not reveal any correlation with undernutrition.

According to UNICEF 2013 report, a child who is severely underweight is 9.5 times more likely to die of diarrhoea than a child who is not. In the present study also HFA z scores (stunting) were positively correlated to diarrhoeal morbidities in children. Nandy et al 2005 in their study also mentioned that the odds of children having one or more anthropometric failures were more likely to have diarrhoea.

As per WHO 2008 estimates 81%, cases of diarrhoea worldwide are attributable to unsafe water, inadequate sanitation or insufficient hygiene. These cases result in 1.5 million deaths each year, most being the deaths of children. Additionally the total number of deaths per year caused among children under five years of age directly and indirectly by malnutrition induced by unsafe water, inadequate sanitation and insufficient hygiene are as high as 860 000. Bartram and Cairncross 2010 also mentioned that globally, around 2.4 million deaths (4.2% of all deaths) could be prevented annually if everyone practised appropriate hygiene and had good, reliable sanitation and drinking water. These deaths are mostly of children in developing countries from diarrhoea and subsequent malnutrition, and from other diseases attributable to malnutrition. In the present study almost all the households had safe source of water for all the purposes therefore it is required that emphasis should be laid on improving the hygiene and sanitation in the area under study.

Diarrhoeal morbidities were associated with SES of the family, personal hygiene scores of the child and mother, and diarrhoea prevention and management practices of the mother along with other factors like religion of the family, age of the child and HAZ scores of the child. Children from the *muslim* families were more likely to suffer from diarrhoea as compared to hindu families. In similar a study by Bbaal 2011 in Uganda it was reported that children from muslim families had 5-10% higher incidences of diarrhoea than the children from other ethnic groups. Elizabeth and Raj 2012, conducted a study in Odisha (India) reported that *muslim* children had higher (12.5%) prevalence of diarrhoea as compared to their *hindu* counterparts (11.4%). that children in the *muslim* families are more likely to suffer from diarrhoea as compared to children from other rat muslim families had 5-10% higher chances eligious groups. Similar findings were also reported by Singh 2014, who analyzed information on a sample of 2687 under-5 children living in urban slums located in eight selected India cities. Bbaal 2011 attributed it to differences in traits and beliefs in different religions where Muslims are more likely to have larger families which are associated difficulties of providing proper sanitation and feeding compared to their counterparts. A study conducted in the city of Lucknow have found that a Hindu dominated urban slum has better quality roads, drainage system, sanitation, water supply and sewage disposal compared to another slum inhabited mainly by Muslims (Sachar 2013).

Household information of the families revealed that 64.4% households had open drainage system, garbage was observed to be dumped outside 49% households and almost 30% had stagnant pool of water in their vicinity. High percentage (44.6 and 61.4) of families practiced open defecation and open disposal of solid waste, which were the most common undesirable environmental hygiene practices followed. All these factors indicate poor environmental hygiene which is one of the prime causative factor of diarrhoea. Similar observations were made by surveyors in a study conducted at Democratic Republic of the Congo (MDF Afrique Centrale 2008). Other researchers also emphasised environmental hygiene as a determinate of diarrhoeal diseases (Strina et al 2003; Shamebo et al 1993; Kolsky et al 1993; Daniels et al 1990).

Poor practice of solid waste disposal was commonly practiced in the present area of study. Though the area had a local *gram panchayat* that was suppose to take care of waste disposal from the streets but the facility was found to be inadequate. Household garbage collection van was made available in only some areas of the study area and that too was not regular. No dustbins were installed at community levels hence the local population developed the habit of throwing household waste on roads or on open plots. Apart from this, most of the families who were surveyed resided in government allotted houses (under the scheme of *Indira Aaawas Yojna*) but the houses were without any toilet facility. Hence the people had no other option and practiced open defecation. In India, approximately 53% of households and 624 million people defecate in the open. Open defecation is more pervasive in rural (74%) versus urban areas (17%) (IIPS 2007). Another important observation as reported by Banda et al 2007 and Clasen et al 2014 in their studies in rural Tamilnadu and Odisha was that even though the household were having toilet facilities, people were not using it. Hence it is required that the people are sensitized about the drawbacks of open defecation and encouraged to use toilets.

Since past three decades Indian government has been working towards improving the hygiene and sanitation facilities in the communities. Central Rural Sanitation Programme was launched in 1986, which was redefined as Total Sanitation Campaign (TSC) in 1999, lead to an increase in the household coverage of toilets in rural areas from 1% in 1981 to 22% in 2001 and 32.7% in 2011. Subsequently, the Nirmal Bharat Abhiyan (NBA) in 2012, which succeeded TSC, aimed to accelerate sanitation coverage in rural areas to achieve the vision of 'Nirmal' Bharat by 2022 with all Village Panchayats in the country attaining 'Nirmal' status. The Swachh Bharat Abhiyan, launched on 2nd of October this year, marks the beginning of the largest programme on sanitation by the Government in India till date. The programme aims to ensure access to sanitation facilities (including toilets, solid and liquid waste disposal systems and village cleanliness) and safe and adequate drinking water supply to every person by 2019.
(http://www.cbgaindia.org/files/featured_articles/Swachh%20Bharat%20Abhiyan,%20Prospects%20and%20Challenges.pdf). If the targets as set by the government are achieved partly also it can help tackle the problem of diarrhoea to some extent. Clasen

et al 2014 also mentioned that interventions to improve excreta disposal are effective for prevention of diarrhoeal disease to some extent.

In the present study handwashing practices of the mothers were found to be considerably good. All mothers washed hands with soap after self and child defecation which is a desirable practice. Insufficient handwashing was observed before cooking and feeding the child which can be a source of contamination. In a similar study in India, Ray et al 2010 pointed out that mothers were washing hands with soap after defecation but not after activities like changing babies nappies, before preparing food, immediately after handling raw vegetables and after handling pets and domestic animals. Wilson et al 1991 reported a reduction in diarrhoea incidence in an Indonesian village by 89% when handwashing was promoted after four different circumstances, including after defaecation. Studies in Nicaragua and Salvador have shown that diarrhoeal episodes increased with poor hand washing practices (Gorter et al 1998 and Strina et al 2003). Moshoto et al 2014, in a similar study also concluded that there is a need to provide WASH education to improve caregivers knowledge on causes of diarrhea and hand washing practice. Observations of the study conducted in rural Bangladesh (Luby et al 2011) suggested that handwashing before preparing food was particularly important opportunity to prevent childhood diarrhea. Hence it was required that the mothers who participated in the study should be sensitized about the importance of handwashing before cooking and feeding the child.

Apart from hygiene and sanitation another important aspect is management of diarrhoeal diseases for which the mothers should have some knowledge about the causative and the preventive measures. Survey of the mothers in the present study revealed that 64% had poor knowledge levels on this aspect. Mothers believed that seasonal variations, eating spicy food, drinking more milk etc were the causes of diarrhoea. A similar study conducted in villages of Punjab and Haryana by Nielsen et al in 2001 stated that majority of the mothers considered excess food intake by the children as major cause for diarrhea. Only 34.14% mothers in the present study could state the correct causative factors for diarrhoea. In contrast, another study conducted in urban slums of Delhi reported that 80% perceived contaminated food and drinking water as causes of diarrhoea and 83% considered drinking clean water important for

prevention of diarrhoea (Dzeyie 2012).

Another important aspect determining poor nutritional status of the child is child feeding practices of the mothers. World health Organization (2003) laid down certain guidelines for optimal child feeding practices to be followed routinely and during days of illness which have proved effective in maintaining the child's nutritional status. Almost 69.4% mothers of *Chikhli taluka* had poor breastfeeding knowledge. Initiation of breastfeeding immediately after childbirth, preferably within one hour is a recommended IYCF practice. In the present study only 45% children were breastfed within one hour after birth. These results are slightly higher than the ones reported by DLHS 2007-08 (http://mospi.nic.in/mospi_new/upload/ Children_in_India_2012.pdf) which gave a figure of 40.5%. In the present study children above 6 months who started receiving complementary foods was quite low 21.64% as compared to the results revealed by DLHS 2007-08 (54.8%).

Health workers at the grassroot levels can serve as an effective change agents. Sunguya et al 2013 in their review suggested that nutrition training for health workers can improve feeding frequency, energy intake, and dietary diversity of children aged six months to two years. Hence scaling up of nutrition training for health workers presents a potential entry point to improve nutrition status among children. Indian government is spending large amounts on services like ICDS which has a huge work force. But this work force lacks training to effectively disseminate the messages so that they are adopted by the community. A study was conducted by Chaturvedi et al 2014 to assess the knowledge levels of *anangwadi* workers in four districts of Gujarat. As reported *anganwadi* workers possessed more knowledge about IYCF practices like initiation of breastfeeding, pre-lacteal feeding and colostrum, age of introduction of complementary foods, portion size and feeding frequency than about domains which appear to have a direct bearing on practices. A huge contrast existed between the anganwadi workers' knowledge and their ability to apply this in formal counselling sessions with caregivers. They were unable to empathetically engage with caregivers, unskilled to take the feeding history of children, had poor active listening skills and were unable to provide need-based advice during counselling. Hence to ensure enhanced interaction between the Anganwadi Workers

and caregivers on infant and young child feeding practices, a paradigm shift in training is required, making communication processes and counselling skills central to the training so that the messages are aptly understood and adopted.

Colostrum was fed to almost 77% children and a higher percentage (86.38%) were not given any prelacteals after birth indicating that the mothers were aware about the benefits and harms related to these two practices. In a similar study conducted in Ahmedabad, Gujarat mothers were reported to have good IYCF practices with 96% knowing about exclusive breast feeding up to 6 months; 90.67% being aware that colostrum is good for baby and 65.33% avoiding prelacteal feeds (Sriram et al 2013). Another study conducted in the tribal areas of Andhra Pradesh reported that only about 25% mothers followed the malpractice of discarding colostrums and feeding prelacteals (Girdhar et al 2012). Comparing the knowledge scores with practice scores it is observed that though the mothers had poor knowledge levels, they were following the desirable practices for breastfeeding. It might be possible that they were asked by the doctor or the nurses where they delivered their babies to feed colostrum and avoid prelectals but were lacking knowledge for its benefits and negative aspects.

Results of the present study indicated that infant-feeding practices were not significantly related to undernutrition among children as defined by all the three indicators. These results are in contrast to the findings of the studies conducted in the urban areas of Allahabad and tribal areas of Orissa which suggested that poor IYCF practices greatly affects child's nutritional status (Kumar et al 2006; Chakrabarty et al 2006). As per the latest data of WHO (2015), developed nations like United States and Europe reported undernutrition among children below 5 years in the range of 0.5% to 10% for all the three indicators. Also the breastfeeding practices data of the mothers in these nations reveal that the percentage of children who were breastfed within one hour birth ranged between 14 to 51% and the ones who were exclusively breastfed for 6 months ranged between 13 to 19%. This indicates that breastfeeding practices may not be related to the nutritional status of children and there may be other factors that are instrumental in low prevalence of undernutrition amongst children in these countries. In the present study hygiene (personal hygiene scores of mother and child) has emerged out to be an important determinant of nutritional status of children. Poor

hygiene and sanitation status of developing nations is well established. So can we attribute a greater contribution of poor hygiene and sanitation practices on the poor nutritional status of the children in developing countries than IYCF practices? As mentioned by Dongour et al 2013, nutrition- sensitive interventions should be multisectoral and include education for girls, improvement in water, sanitation and hygiene, poverty reduction and agriculture development. Research on cash crop production schemes in Africa and Asia in the 1980s showed that income generated from cash crops does not bring significant decreases in malnutrition among preschoolers. Even when household incomes increase, the income gains did not have a direct or large effect (nor an adverse effect) on child health and nutrition. For the most part, crop schemes remained largely ineffective until they were combined with country investments in community health and sanitation, nutrition education and adequate childcare practices (Acosta and Fanzo 2012).

Many authors have associated poor hygiene and sanitation with undernutrition amongst children. Wong et al 2014, associated low socio-economic status, household food insecurity, and poor child caring practices with childhood undernutrition. They emphasised implementation of community level programs that focuses on poverty reduction, community based nutrition and hygiene education to tackle the problem undernutrition amongst children. Islam et al (2013) in their paper to recognise the various predictors of undernutrition among children under 5 years of age mentioned that increasing access to the safe drinking water and hygienic sanitation are important to improve the nutritional status among under-five children. Shamshir et al (2011) and Wamani et al (2006) also mentioned that children with unhygienic toilets were significant with under two stunting.

Nutrition Health And Food Safety Module was developed with the holistic approach to educate the mothers on topics of childhood diarrhoea management and improvement of nutritional status amongst children. After a period of 5 months a higher statistically improvement were observed in the z scores of the children from the EG as compared to CG with respect to WAZ and HAZ as compared to the CG. Results of other studies in different developing countries have also shown that CF education to mothers can bring about significant changes in the nutritional status of the children. Sethi et al

2003 conducted a similar study in slums of Delhi using a communication mix of channels with repeated reinforcement wherein messages were imparted with a follow up of 2 months that showed a reduction of 9.1% in the number of children having WAZ below -2SD along with improvement of the IYCF practices of the mothers by 60%. Roy et al 2005, conducted a study in Bangladesh to study the effect of NHE alone along with a combined effect of NHE and provision of foods on NS of children. They observed that a 37% children moved to mild or normal grade of undernutrition after a nutrition education intervention of 3 months. They also found almost similar weight gains in both the groups and concluded that intensive nutrition education significantly improves the status of moderately-malnourished children with or without supplementary feeding. Saleem et al 2014, conducted a study in peri urban settings of Karachi to evaluate the impact of maternal education messages regarding appropriate CF on the nutritional status of their infants. After a 10 week educational intervention, 6% and 12% reduction was observed in the percentage of children classified as underweight and wasted respectively. They concluded that for relatively food-insecure populations, educational interventions about appropriate CF to mothers had a direct positive impact on linear growth of their infants. Bhutta et al 2013 also mentioned that nutrition education in food insecure populations showed significant affect on HAZ and WAZ of the children. In a study conducted by Saaka 2014, in Ghana it was concluded that increase in maternal childcare knowledge may contribute significantly to child's nutritional status if there is concurrent improvement in socioeconomic circumstances of women living in deprived rural communities. The study involved messages on IYCF, and lacked messages on diarrhoea prevention and hygiene. Similar study by Bhandari et al in 2004 had followed up for a period of 18 months after imparting NHE (messages on exclusive BF for 6 months, initiating CF at 6 months, washing child's and own hand before feeding and continued feeding during sickness) but showed limited improvements in weight gain of the children. Another study by Pahwa et al 2010 that involved imparting message on management of diarrhoea (ORS formulation and administration, continued CF and BF during illness) but preventive messages were not included. None of the mentioned studies reported data on diarrhoeal morbidities.

A one year long nutrition health education intervention study by Ghoneim 2004, in Alexandria, improved the WAZ by 76%, HAZ by 41.67% and WHZ by 91.54%. Another

intervention study in Iran by Malekafzali et al, 2000 involved a combination of different routes of interventions like practical instruction on feeding methods, deworming, environmental sanitation, the promotion of home-grown vegetables and reinforcement of the growth monitoring programme reported a 72.3% improvement in the WHZ scores after a year. A three year long study in Iran by Sheikholeslam, 2004. brought about 33% improvement in the WAZ along with 54% in HAZ and 37% in WHZ. Another 18 month long intervention program in the Senegal reported that the decrease in wasting was higher in the control group as compared to intervention group (from 13.7% to 8.6% versus 11.3% to 10.8%, $p = 0.042$).

In the present study the knowledge and practice scores of the mothers regarding complementary feeding improved significantly in the intervention group as compared to the control group. Similarly Sule et al, 2009 in their nutrition education study conducted in Nigeria reported that after six months of intervention, mothers from EG demonstrated better knowledge and attitudes to key infant and young children feeding recommendations. But the study reported limited improvements in feeding practices and no statistically significant weight gains in children.

Significant improvements were observed in the child feeding practices of the mothers both in terms of quality and quantity, as more mothers started preparing special foods like *sheera, balbhog* etc for their children. These findings support the results of other studies that there is a significant scope for improving feeding practices and nutritional status of children through counselling (Sunguya et al 2013, Lassi et al 2013, Vir 2012). Another 3 year long intervention program in rural Laos (Coghlan et al 2014) which involved capacity building of the health workers reduced the percentage of moderate to severely wasted children from 16.9% to 7.1% (57.98% reduction). Another similar intervention study by Vazir et al 2013 which involved detailed NHE messages on CF in rural Andhra Pradesh found no significant changes in stunting between children of CG and EG even after 12 months of intervention. In another intervention study by Roy et al 2007 the CF practices of the mothers improved after the intervention of 6 months, but the LAZ and WLZ scores decreased post intervention. Negash et al 2014 also reported no changes in heights and weights of 200 Ethiopian children whose mothers

attended nutrition education sessions to improve the complementary feeding practices, continuously for an intervention period of 6 months.

According to the DLHS -4 data stunting amongst children has reduced by 15% over the past 6 years in few sates of India. Sankar and Briel 2014, in their paper titled "Prospects for better nutrition in India", credited this to state government's commitment, focus on the 'window of opportunity', improved status and education of women, a lowered fertility rate, and combinations of nutrition-specific and nutrition-sensitive interventions. They also mentioned that apart from the government many other agencies play a role in driving improvements in nutrition. Since 2006 the Global Alliance for Improved Nutrition (GAIN) has worked with a range of partners to improve access to nutritious foods for large parts of the population, through public and private delivery channels.

In spite of Gujarat governments various initiatives like Chiranjeevi Yojana, Bal Bhog Yojana, Vitamin Yukta Poshan Ahar, Nirogi Balak Yojna which are aimed at improving children's nutritional status, high prevalence of undernutrition prevails in Chikhli taluka. Poor socio economic status has emerged as an important predictor of high undernutrition in children of *Chikhli taluka* of Gujart. Senbanjo et al 2013, mentioned that there is a need to increase women education as this will make them receptive to health interventions that will improve nutritional status of their child. In addition it will also improve their earning power and hence good food purchasing power for the household. Odunayo and Oyewole 2006, conducted a study on Nigerian children with the aim of determining the nutritional status and the influence of feeding practices and family characteristics on the nutritional status of under-five rural Nigerian children. They pointed out that improved living standard of families, empowerment of mothers with the aim of augmenting family income and parental education on appropriate feeding practices may help in reducing the incidence of under-five malnutrition in communities.

Kristjansson E et al (2015) in their review of 32 studies on complementary feeding from low and middle income countries suggested that CF programs can be effective in these countries provided that they are implemented properly. Turley et al 2013,

mentioned that slum upgrading can reduce diarrhoeal episodes to a great extent. Ratnu 2013, mentioned that any nutritional program should have four integral components that is antenatal care, immunization, infection control and nutritional supplementation for reducing undernutrition. As stated by Wadhwani et al 2005, in their project report "the root cause of many health problems in India is poverty, not diarrhoea, dirty water, or lack of information. These more direct causes stem always from a lack of economic resources among the disadvantaged populations, and a lack of basic needs such as toilets, clean water, and sufficient food. Without food and water, an undernourished population is far more susceptible to disease, which further cripples the economy, leaving marginalised groups stuck in a cycle of poverty, malnutrition, and illness". Rah et al 2015, also concluded that improved conditions of sanitation and hygiene practices are associated with reduced prevalence of stunting in rural India. Policies and programs aiming to address child stunting should encompass WASH (water, sanitation and hygiene) interventions, thus shifting the emphasis from nutrition-specific to nutrition-sensitive programming. Piwoz et al 2012 also mentioned that Nutrition-sensitive interventions are those aimed at improving nutritional status through other (nondietary) means, including improvements in health, environment, or social and economic conditions. These interventions may improve nutrition through reduced disease exposure, better healthcare, or greater purchasing power. Nutrition-sensitive interventions span multiple sectors and may include economic, agricultural, social protection, and water, sanitation and hygiene (WSH) programs.

In a literature review on interventions to improve nutritional status of children by USAID (2011) it was mentioned that individual counselling with messages tailored to the specific situation coupled with adequate support leads to behavior change and is more effective than group education. The present study involved one to one interaction of the mothers with the investigator during the monthly home visits which helped the mother solve their queries regarding their child's health and hence resulted in adoption of certain desirable practices.

The above discussion indicates that the module developed in the present study has given significant results in terms of improvement in the nutritional status of the children, along with knowledge and practices of the mothers with respect to child

feeding and care in a short period of 5 months. Studies in other areas with similar period of intervention have either reported to have shown no improvements or limited percent reductions in undernutrition. Studies with higher improvements involved longer period of intervention and follow up. Moreover the module was a designed with a holistic approach for prevention and management of undernutrition among young children involving nutrition health, food safety and diarrhoea prevention and management aspects. Preventive aspect for diarrhoea was lacking in almost all the studies. Hygiene and sanitation was limited to hand washing and use of toilets for defecation and was not as detailed as the NHFSE module used in the present study. The preventive and management aspect of diarrhoea resulted in significant reductions in the number of days for which a child suffered from diarrhoea and was statistically correlated to the improvement in nutritional status of the children indicating the effectiveness of the module.

As discussed above hygiene and sanitation has emerged out to be an important determinant of nutritional status amongst these children. Hence it is required that the local government should be sensitised to improve and make available the basic sanitation facilities like clean toilets and proper garbage disposal facility to the population under study, then only the effectiveness and sustainability of such modules can the efficiently studied. Asgary et al 2015 also concluded that health and nutritional education to improve health literacy and address misconceptions, and improvement in social services, are warranted. A multilateral approach with involvement of health and social service agencies and non-governmental organizations to plan effective preventative strategies, along with broader national and transnational strategies which are instrumental to address the fundamental causes of lack of access to proper nutrition. Also there is a need to develop a model village with all basic facilities like clean functional toilets, adequate garbage disposal facility long with availability of clean drinking water, which can go a long way in improving the health scenario of the Indian children and can be further replicated at other places.

Hence we propose that this model can be scaled up at state and national level to have sustainable improvements in NS of the children in developing countries that have high

prevalence of undernourished children below 3 years. Also there is a need to develop a model village with all basic facilities like clean functional toilets, adequate garbage disposal facility long with availability of clean drinking water, which can go a long way in improving the health scenario of the Indian children and can be further replicated at other places.