CHAPTER IV

RESULTS AND DISCUSSION

PHASE I: UNDERSTANDING THE SITUATIONAL ANALYSIS OF ANGANWADI FUNCTIONARIES AND ANGANWADI CENTERS OF ICDS IN SURAT CITY

The overall objective of Phase I in brief was to assess the knowledge, attitude and practices (KAP) of anganwadi functionaries pertaining to the objectives of ICDS, the service delivery and the status of the Anganwadi center (AWC) in Surat city.

PROFILE OF THE ANGANWADI FUNCTIONARIES

As the Table 4.1.1 indicates, a majority of the Anganwadi workers (AWWs) and Anganwadi Helpers (AWHs) belonged to the age groups ranging from 26 – 35 years (37.74% and 47.41% respectively) and 36 – 45 years (41.29% and 31.40% respectively).

Table 4.1.1: Demographic Profile of Anganwadi Functionaries (n = 1738)

Profile		Total (n = 1730) % (n)	AWW (n =930) % (n)	AWH (n = 656) % (n)	Link Workers (n = 144) % (n)
Age (n = 1730)	18 – 25 years	4.10 (71)	1.72 (16)	5.95 (39)	11.11 (16)
	26 – 35 years	43.30 (749)	37.74 (351)	47.41 (311)	60.41 (87)
	36 – 45 years	36.19 (626)	41.29 (384)	31.40 (206)	25.00 (36)
	46 – 60 years	16.24 (281)	19.14 (178)	15.09 (99)	2.78 (04)
	No Reply	0.17 (3)	0.11 (1)	0.15 (1)	0.70 (1)
Mean Age		38 Years	39 years	37 years	34 years
Pearson Chi-square		**0.000***			
Profile		Total (n = 1738) % (n)	AWW (n =931) % (n)	AWH (n = 662) % (n)	Link Workers (n = 145) % (n)
Qualification (n = 1738)	Metric	68.93 (1198)	94.31 (878)	27.95 (185)	93.11 (135)
	Non-Metric	28.25 (491)	4.51 (42)	66.92 (443)	4.13 (06)
	No Reply	2.82 (49)	1.18 (11)	5.13 (34)	2.76 (04)
Pearson Chi-square		**0.000***			

Profile		Total (n = 1710) % (n)	AWW (n = 927) % (n)	AWH (n = 642) % (n)	Link Workers (n = 141) % (n)
Experience (n = 1710)	< 1 year	3.33 (57)	0.76 (07)	5.91 (38)	8.51 (12)
	1 – 5 years	34.73 (594)	27.29 (253)	34.27 (220)	85.81 (121)
	6 – 10 years	25.38 (434)	26.00 (241)	29.59 (190)	2.13 (03)
	11 – 15 years	19.82 (339)	24.16 (224)	17.76 (114)	0.71 (01)
	16 – 25 years	14.15 (242)	17.91 (166)	11.68 (75)	0.71 (01)
	26 – 35 years	2.57 (44)	3.88 (36)	0.79 (05)	2.13 (03)
Mean experience		9 years	11 years	8 years	4 years
Refreshers Training of AWW (n = 931)	Yes	0 (0)	93.98 (875)	0 (0)	0 (0)
	No	0 (0)	5.80 (54)	0 (0)	0 (0)
	No reply	0 (0)	0.22 (2)	0 (0)	0 (0)
Pearson Chi-square		**0.003****			
* Significant at *p<0.01* ** Significant at p< 0.05 NS Non significant					
Values in the parenthesis indicates number count of sample (n)					

As seen in table 4.1.1, majority AWWs (94.31%) were educated up to secondary level (Metric) and had more than 5 years of work experience (71.95%).

Refresher training (In Service) was received by 93.98 % AWWs, apart from the refresher training the workers reported having received other one day trainings on ECE and growth monitoring, maintenance of records and IGMSY.

Thus, for profile of anganwadi functionaries;

Total 1738 anganwadi functionaries were covered, out of them there were 931 AWWs, 662 AWHs and 145 Link workers.

Mean age of AWWs covered was 39 years and their mean experience was 11 years and 93.98% AWWs had received their Refresher training

PRACTICE AND PERCEPTIONS OF THE ANGANWADI WORKERS REGARDING VARIOUS ICDS SERVICES:

Awareness about Objectives and Beneficiaries of ICDS among all anganwadi functionaries:

Awareness pertaining to the objectives of ICDS and its beneficiaries forms the basis of the job responsibilities of AWW and AWH. It is anticipated that every functionary is aware about these basic facts of this national service scheme to facilitate the delivery of the services efficiently. Table 4.1.2 indicates awareness regarding the objectives and beneficiaries of ICDS. Majority (96.6% and 95.1%) functionaries were aware regarding two objectives of ICDS namely improvement in the nutritional status and imparting nutrition health education to the mothers. The awareness regarding other objectives like reducing the rates of mental retardation, mortality and morbidity, malnutrition and school drop outs and encouraging the child development were also found to be good as 84.3% and 88.9 % functionaries could mention them. The perception of 'building the foundation for psychological development of children' as one of ICDS's objective was fair as it was mentioned only by 76.6% subjects. Most of the functionaries were aware about the beneficiaries of ICDS

Table 4.1.2: Awareness among Anganwadi Functionaries regarding the objectives and beneficiaries of ICDS (n =1738)

Objectives of ICDS	Frequency (n) Response		Percentage (%) Response	
	Yes	No	Yes	No
Improvement in the Nutritional status of children	1679	59	96.6	3.4
Building the foundation for psychological development of children	1332	406	76.6	23.4
Reducing the rates of mental retardation, mortality and morbidity, malnutrition and school drop outs	1466	272	84.3	15.7
Encouraging the child development	1545	193	88.9	11.1
Imparting Nutrition Health Education to the mothers	1652	86	95.1	4.9

Beneficiaries of ICDS	Frequency (n) Response			Percentage (%) Response		
	Yes	No	No reply	Yes	No	No reply
Pregnant women	1698	37	03	97.70	2.13	0.17
Lactating women	1685	50	03	96.95	2.88	0.17
Children below 3 years	1663	72	03	95.69	4.14	0.17
Children 3-6 years	1661	74	03	95.57	4.26	0.17
Adolescent girls	1685	50	03	96.95	2.88	0.17

Figure 4.1.1 reveals the scores for knowledge of AWWs on objectives and beneficiaries of ICDS. Scores achieved for acknowledging all i.e., 100% of the objectives and beneficiaries of ICDS correctly is marked as 'Excellent', scores between 99% to 80% and 79% to 60% were labelled as 'Good' and 'Average' respectively whereas 40% and below indicated 'Poor' knowledge on awareness of ICDS objectives. Only 66.8% AWWs scored excellent whereas 1/3rd of them were unable to enlist all the objectives. Majority (93%) AWWs scored excellent with respect to naming all the beneficiaries of ICDS whereas only 2.4% fell in the category of poor with a score of 40% and below.

Figure 4.1.1: Score for knowledge of Anganwadi Workers (AWWs) on objectives and beneficiaries of ICDS (n = 931)
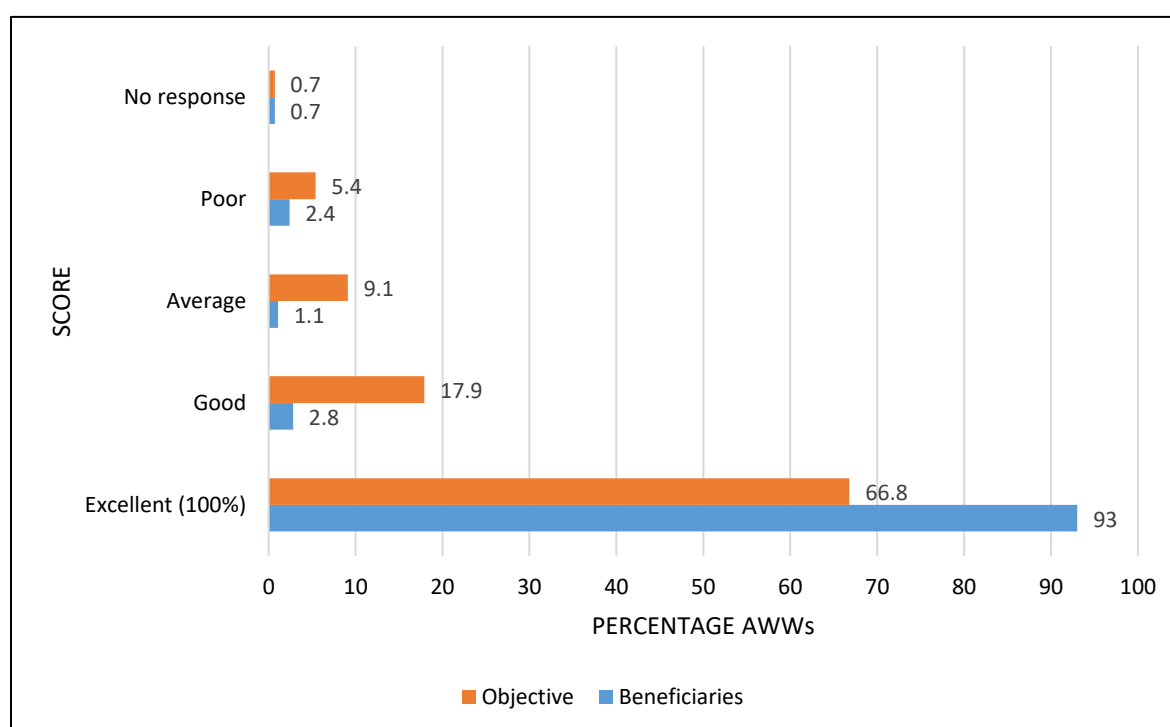
Practices and Perceptions of the AWWs regarding ICDS services and its delivery:

Nutrition and Health Education (NHE)

As Figure 4.1.2 reveals, majority (85%) anganwadi workers of Surat city have reported imparting Nutrition and Health Education to pregnant and lactating women. These sessions were taken in groups. At large, 91.75% mean Coverage of all the important topics was reported

under the group counseling sessions for pregnant women. Lowest coverage was found that of Vaccination (5.9%) and Referral services (7.4%). Importance of breast feeding and its initiation (89.2%) and importance of colostrum (89.9%) were among the well covered topics (Figure 4.1.2).

Majority (98.4%) AWWs perceived improving dietary practices of pregnant and lactating woman as the only importance of NHE followed by awareness regarding immunization (86.2%), improves nutritional status (62.3%) and increases utilization of ICDS services (54.4%) (Figure 4.1.3).

Figure 4.1.2: Practices of anganwadi workers regarding NHE and its delivery to pregnant woman (n = 931)
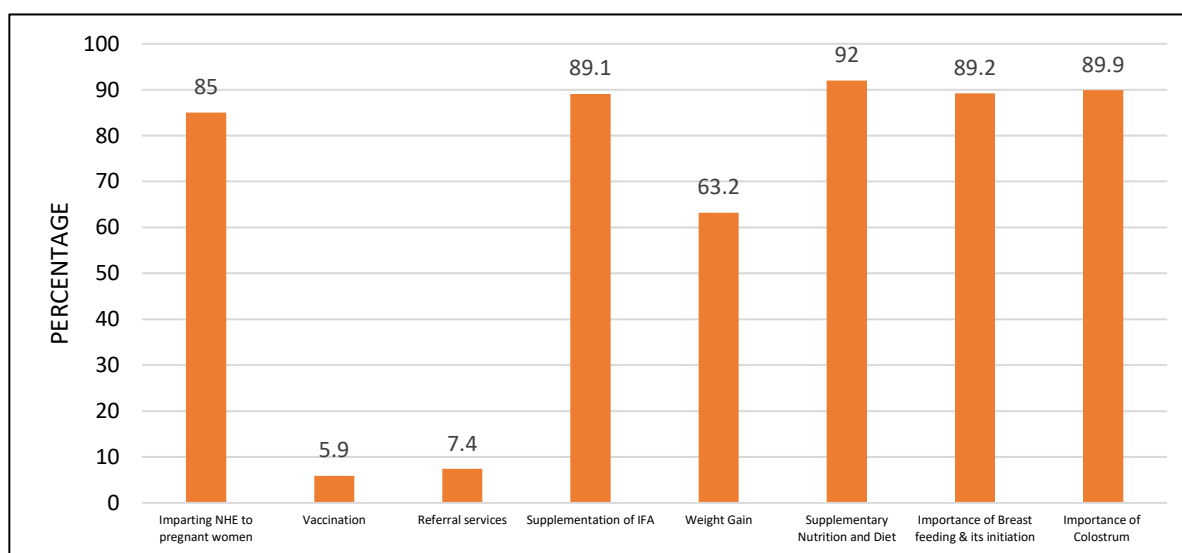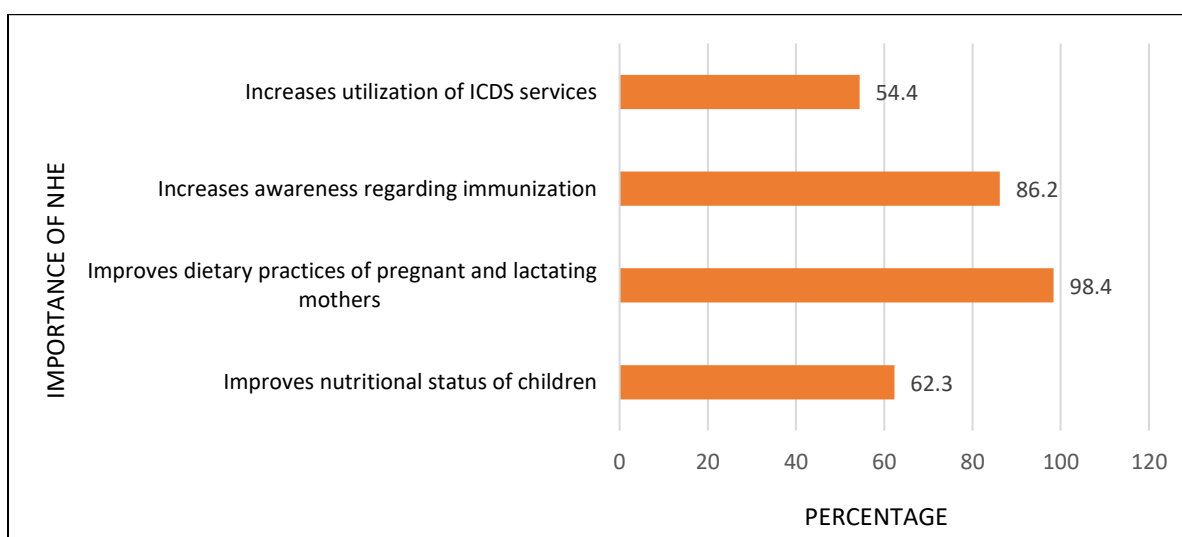

Figure 4.1.3: Knowledge among AWWs regarding importance of NHE (n = 931)

Growth Monitoring (GM)

Growth monitoring is one of the most important services provided by the ICDS through AWCs. The GM guidelines suggests regular monitoring of growth (weight for age) i.e., once every month on a fixed day which is Mamta Diwas. Only 39.8% AWWs reported practicing timely growth monitoring whereas majority (60.2%) reported doing it irregularly on any date in a month. During group discussions, it was also learnt that if the weight has been measured by a PHC representative, the same weights are carry forwarded by the functionaries in their registers (Figure 4.1.4).
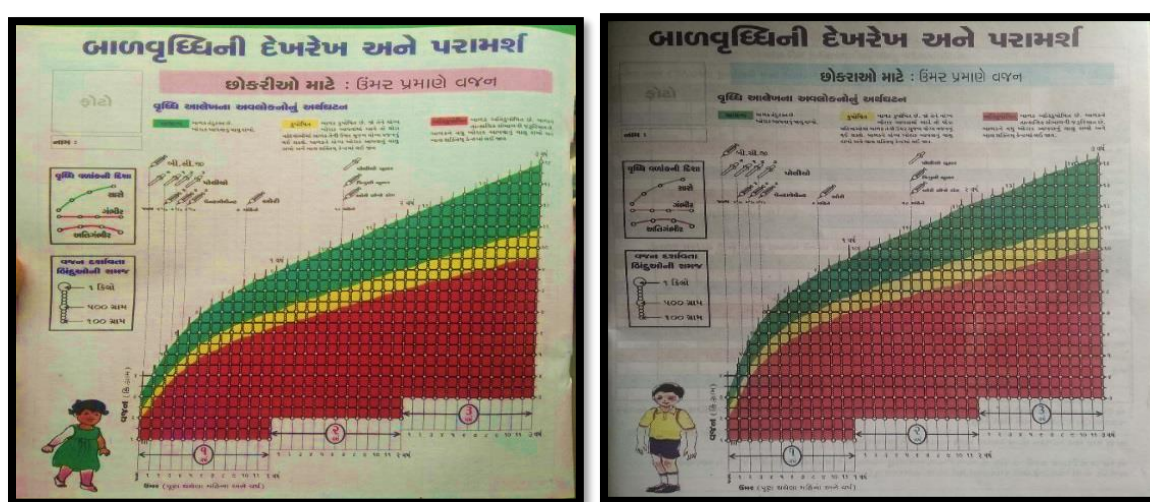
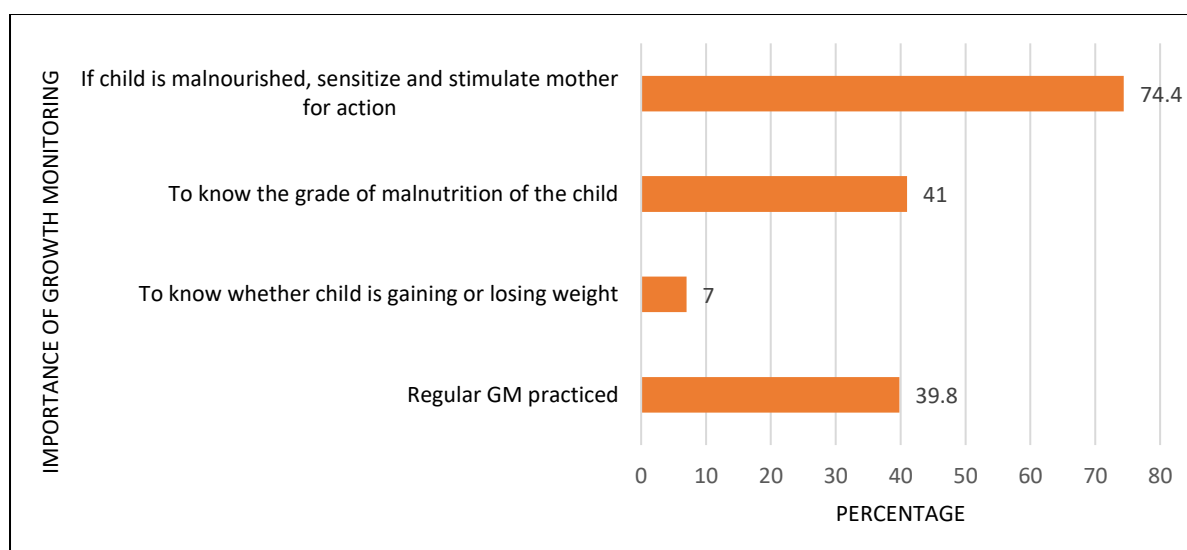**Image 4.1.1: Growth Charts used in ICDS at AWC**

Figure 4.1.4: Knowledge and Practices of AWWs related to Growth Monitoring (n = 931)

Supplementary Nutrition (SN)

The *Supplementary Nutrition* is one of the six services provided under the *ICDS* Scheme which is primarily designed to bridge the gap between the Recommended Dietary Allowance (RDA) and the Average Daily Intake (ADI). SN is given in the form of "Balbhog" is the nutrient fortified pre-mix which can be used to prepare several recipes. In Gujarat, "Balbhog" is given as THR. It was observed that Balbhog was reported to be unacceptable by 54.6% AWW and only 40.9% AWW said that their community accepts Balbhog. Near to quarter of the AWWs (26.8%) reported correct time for initiation of complementary feeding that was end of 5th month but majority had misconception regarding timely initiation of complementary feeding (Figure 4.1.5).

Figure 4.1.5: Perceptions and Practices of AWWs related to other ICDS services
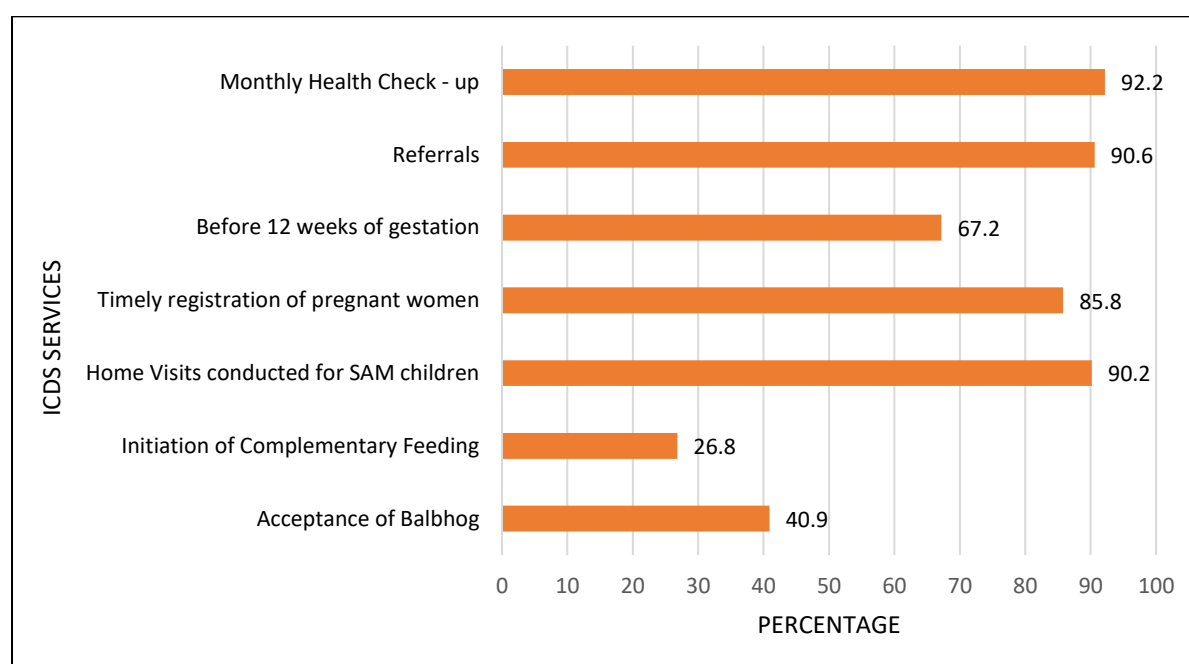
Home Visits

Anganwadi workers are responsible to conduct regular home visits for children up-to age 6 years, adolescent girls and pregnant and lactating mothers. Home visits for SAM children has been prioritized for improved nutritional outcomes. It was observed that majority (90.2%) of the AWW reported that they conducted regular home visits for SAM children but the frequency of home visits varied largely. Only 33.2% AWWs visited enrolled SAM children everyday 29.8% and 20.5% AWWs visited SAM children thrice a week and once a week respectively with 12% choosing not to reply (Figure 4.1.6).

Figure 4.1.6: Frequency of home visits conducted for SAM children by AWWs
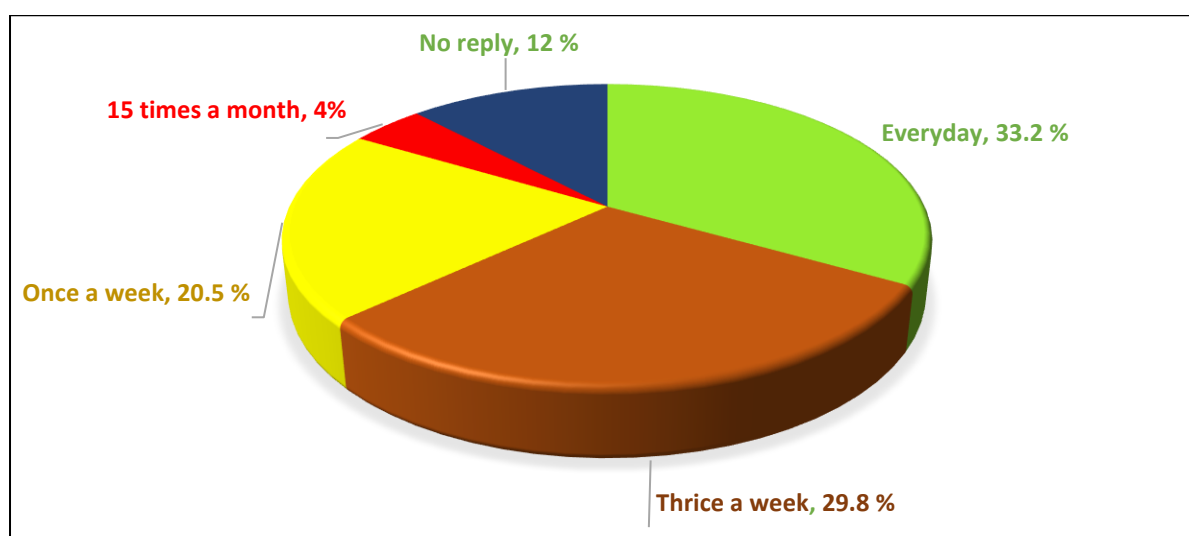
Registration of Pregnancy

Early registration to Antenatal Care (ANC) is imperative for the timely diagnosis and treatment of pregnancy related morbidities. Ideal gestational age for registration of pregnant woman for ANC is before 12th week. Figure 4.1.5 depicts that 85.8% AWWs reported that they practiced timely registration of pregnancy but only 67.2% AWWs reported that they registered pregnant woman before 12 weeks of gestation and 13.9 % AWWs registered pregnant woman after 12 weeks of gestation.

Figure 4.1.7: Knowledge and Perceptions among AWWs related to Early Registration of Preganancy
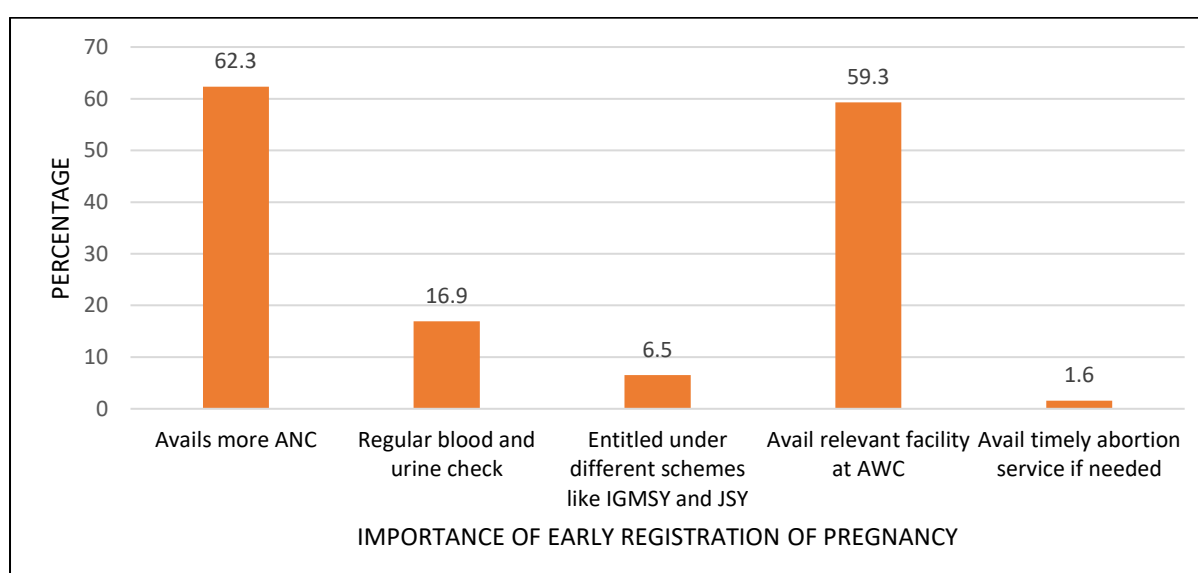
Awareness regarding importance of early and timely registration of pregnancy was found to be unsatisfactory as less than 1.6% AWWs could answer all the options correctly. Majority (62.3% and 59.3%) percieved that only availing more no. of ANC and availing relevant facility at AWC respectively was the only importance of early registration of pregnancy. Only few (16.9%) answered regular blood and urine check up as one of the importance of early registration of pregnant woman.

Health Check-up and Referrals

The perusal of data presented in table 4.1.5 reveals that out of 931 AWWs, 90.6% of them provided referral services to the beneficiaries when required. Majority (92.2 %) reported that regular monthly Health Check-ups were conducted by the doctors from PHC at AWCs (Figure 4.1.5)

Thus, for practices and perceptions of the anganwadi workers regarding various ICDS services, the overall results are;

The objectives of ICDS majorly perceived by > 95% AWWs were 'Improvement in the nutritional status of children' and 'Imparting NHE to mothers. Other objectives were poorly perceived.

More than 95% AWWs could list down all the beneficiaries of ICDS correctly

Well covered topics under NHE were Timely initiation of breast feeding' and 'Importance of colostrum feeding which was > 89%. Poorly (< 10%) covered topics were vaccination and referrals.

Only 39.8% AWWs practiced timely growth monitoring.

Poor acceptability of BALBHOG was reported by 54.6% AWWs

Only 15.8% AWWs believed that SN helped to improve nutritional status whereas only 5% agreed that SN encouraged children's attendance in AWC.

Regular monthly health check-ups were reported by 92.2%

Overall, 90.6% AWWs provided referrals

Two third (67.2%) AWWs could register pregnancy on time (i.e., before 12 weeks of gestation)

Regular home visits for SAM children were conducted by 90.2% AWWs but only 33% AWWs visited them daily and 30% visited them thrice a week. Others (40%) conducted home visits for SAM children less than thrice a week.

Importance of early registration was perceived as 'Availing ANCs' and 'Availing relevant facilities at AWCs' whereas 'Importance of regular blood and urine check-up', 'Entitlement under various Govt. schemes' and 'Availability of timely abortion if needed' were not perceived by more than 80% AWWs as important.

STATUS OF AWC AS REPORTED BY THE AWWS

Adequate and appropriate infrastructure for AWC including basic amenities is necessary for the effective implementation of the ICDS scheme. Restructuring ICDS guideline has proposed restructuring AWC into a vibrant ECE child friendly center with adequate infrastructure and facilities like kitchen, safe drinking water and child friendly toilets, painted walls, play space and joyful learning environment.

In a focused group discussion, it was reported by the functionaries that only 8 centers out of 1004 centers have been remodeled in accordance with the 2011 guidelines for restructuring ICDS, but none of the AWCs was reported to have a child friendly toilet. The infrastructure of SMC owned AWC was found to be satisfactory but major issues were seen in rented AWCs. These centers lacked basic amenities like toilet, potable water supply, electricity and stove & gas connection for preparation of Balbhog. SMC owned AWC also lacked gas, stove and water supply timings didn't match the AWWs timings and thus they had to rely on neighborhood for potable water. From a total of 1004 AWCs, 500 AWCs are owned by SMC and from 504, 90% are rented and rest are either owned by Trust or Mobile. Majority (97.5%) of the AWCs have concrete *'pucca'* roof and only 2.5% of the total owned centers have aluminum roof which face major functional issues during monsoon and witness decreased attendance during summer.

Figure 4.1.8 Operational challenges related to infrastructure faced by AWWs
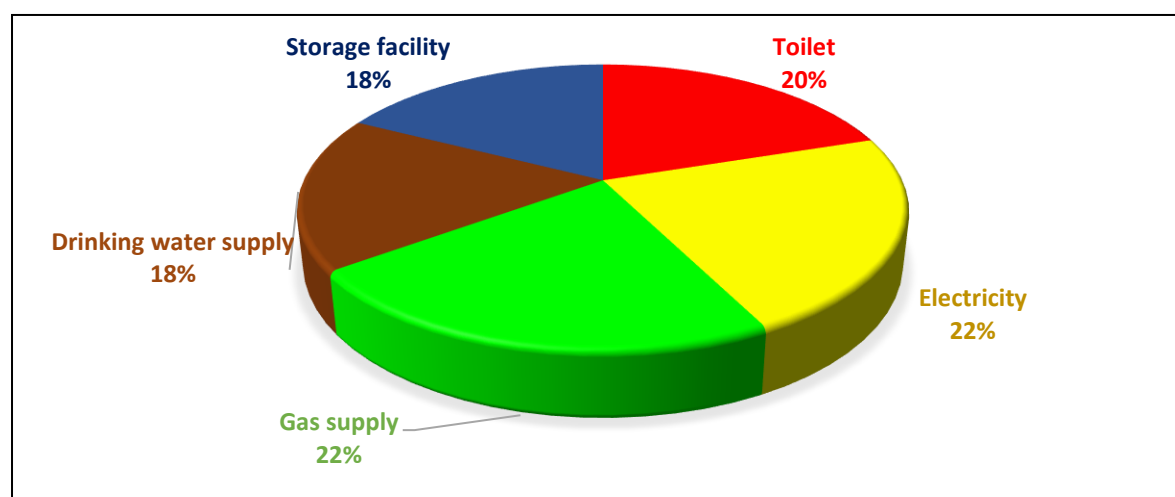
Problems faced by AWWs in ICDS service Delivery

Major problems faced by AWWs were delivery of NHE (39.6%), Coverage (34.5%) and Community support (27.5%). As reported by the AWWs in FGDs, they faced problems in delivery of NHE because of time constraints as they were either loaded with register completion work or busy with other campaigns and duties. Due to working mothers, it was reported that getting good attendance during MAMATA Diwas was challenging and thus community support was a problem. Coverage was raised as a concern by 34.5% AWWs due to the AWC's Location. Pre-school education suffered due to time constraints and limited infrastructure. Referral services were not addressed promptly due to lack of referral slips as reported by 14.4% AWWs (Figure 4.1.9).

Figure 4.1.9: Problems faced by Anganwadi Workers in service delivery (N = 931)
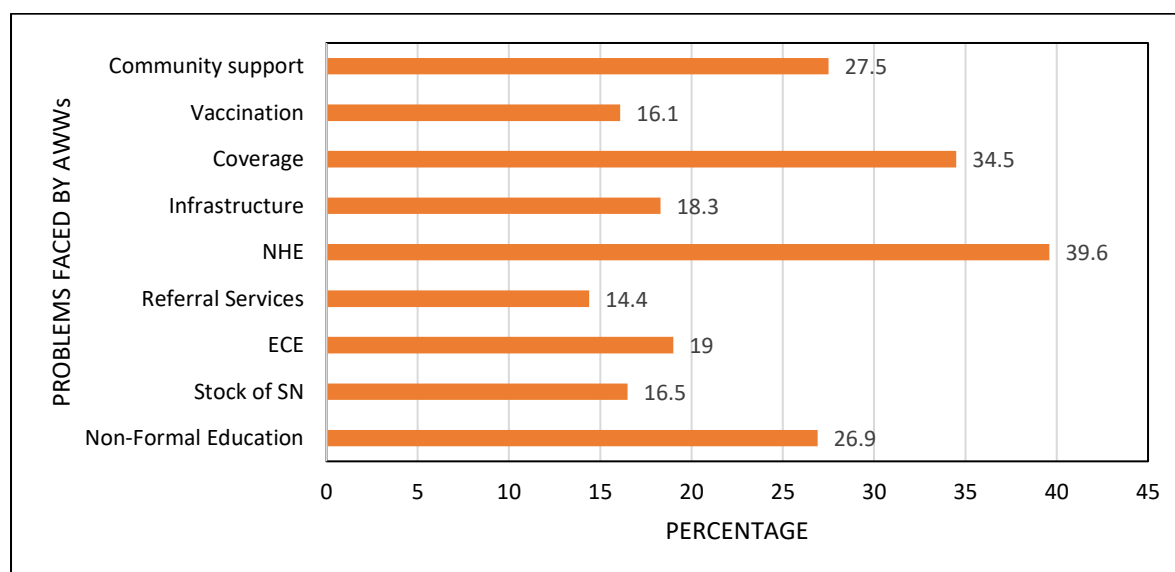
Thus, for status of AWCs, the results were;

Overall, 20% AWCs lacked toilet facility

Power supply problems were reported by 22% AWWs at their respective AWC

Stove facility was lacking in 22% AWCs thus they could not prepare RAAB at their centers.

Overall, 8% AWCs lacked supply of safe drinking water

Few AWWs (18%) raised concerns regarding storage facility at AWCs.

NHE could not be delivered due to lacks of time by 39.6% AWWs

More than one fourth (27.5%) workers complained of community support

Coverage could not be achieved optimally by 34.5% AWWs.

AWWs (16.1%) raised concerns regarding sound vaccination practices

Lack of proper infrastructure was reported by 18.3% AWWs

Many (26.9%) AWWs failed in delivering non-formal education to children

PHASE I HIGHLIGHTS

Total 1738 anganwadi functionaries were covered, out of them there were 931 AWWs, 662 AWHs and 145 Link workers.

Well covered topics under NHE were Timely initiation of breast feeding' and 'Importance of colostrum feeding which was > 89%. Poorly (< 10%) covered topics were vaccination and referrals.

Only 39.8% AWWs practiced timely growth monitoring.

Poor acceptability of BALBHOG was reported by 54.6% AWWs

Regular monthly health check-ups were reported by 92.2%

Overall, 90.6% AWWs provided referrals

Regular home visits for SAM children were conducted by 90.2% AWWs but only 33% AWWs visited them daily and 30% visited them thrice a week. Others (40%) conducted home visits for SAM children less than thrice a week.

Overall, 20% AWCs lacked toilet facility, 22% AWCs faced power supply problems, Stove facility lacked in 22% AWCs thus they could not prepare RAAB at their centers and 8% AWCs lacked supply of safe drinking water.

NHE could not be delivered due to lacks of time by 39.6% AWWs

More than one fourth (27.5%) workers complained of community support and coverage could not be achieved optimally by 34.5% AWWs.

AWWs (16.1%) raised concerns regarding sound vaccination practices

Lack of proper infrastructure was reported by 18.3% AWWs

Many (26.9%) AWWs failed in delivering non-formal education to children

PHASE II MAPPING THE PREVALENCE OF UNDERNUTRITION AMONG CHILDREN UNDER 5 YEARS ENROLLED IN ICDS IN SURAT CITY

NUTRITIONAL STATUS OF CHILDREN ENROLLED IN THE PRESENT STUDY

Data Quality Report

Figure 4.2.1 to 4.2.4 shows the quality of the sample studied in terms of completeness, sex ratio and age distribution.

Missing Data

There were 0% missing information for age, 4 (0.4%) missing information for weight and 4 (0.4%) for height. Thus, the completeness of the study sample was good and as the missing samples were negligible, they were eliminated from the study.

Figure 4.2.1: Percentage (Number of cases) of children missing information on variables used in analysis (n= 974)
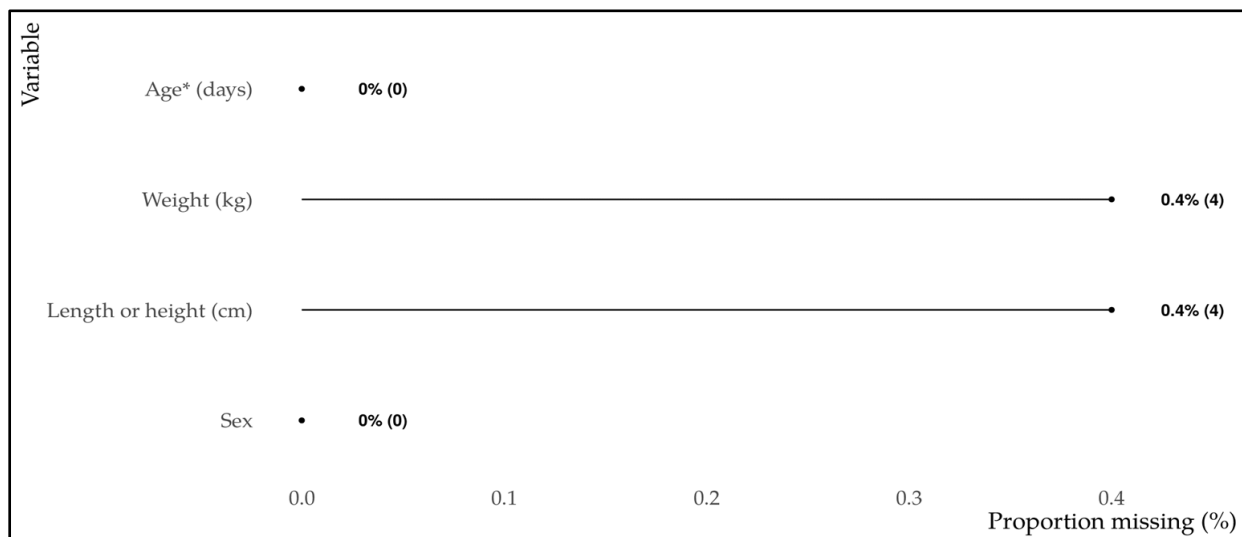
Sample Used in Analysis:

Though the total sample collected was 974 but due to lack of information on variables which were required for analysis, 6 samples were discarded and 968 samples were used to analyze, height for age Z scores, weight for age Z scores and weight for height Z scores.

Data Distribution

Figure 4.2.2 shows that the data was equally distributed with reference to sex internally in each age group but, the maximum study samples belonged to 24-35 months group. Almost

equal number of samples were distributed in age group 12-23 months and 36- 47 months. It is evident from the figure 4.2.2 that the lowest number of samples lied in 0-5 month's age group.

Figure 4.2.2.: Distribution by standard age and gender grouping
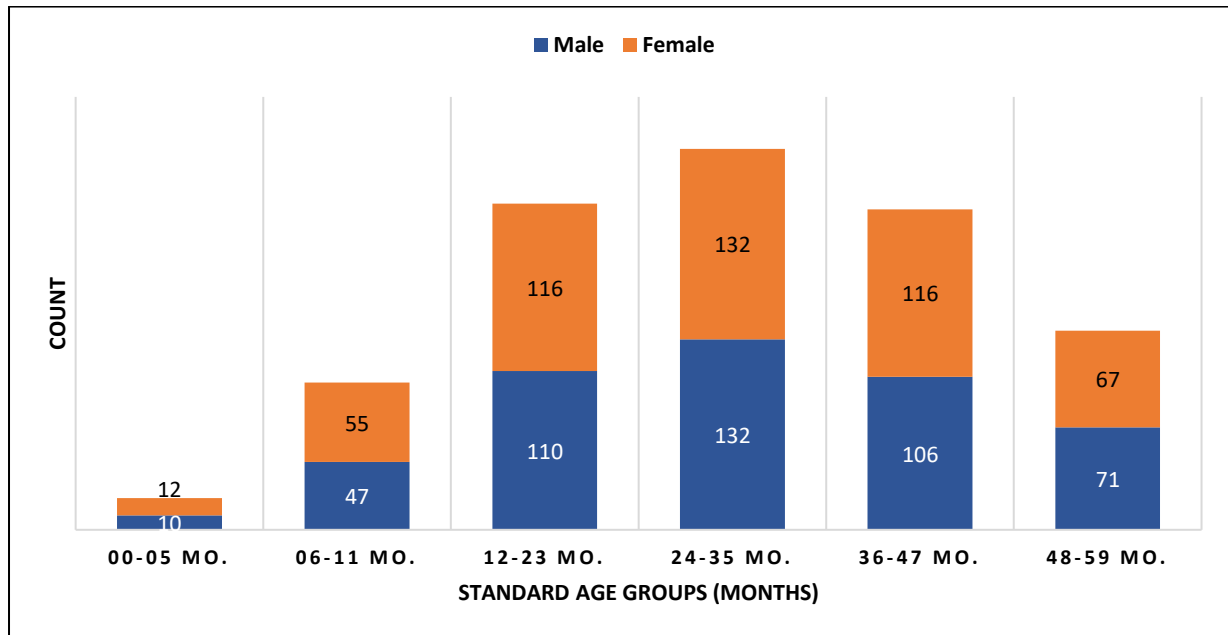
Sex Ratio: The sex ratio of the sample used in current study was 95.58. It was calculated using the following formula;

$$\frac{\text{Weighted number of Male in the present study under age 5 eligible for anthropometry}}{\text{Weighted number of female in the present study under age 5 eligible for anthropometry}} * 100$$

The present study had a sex ratio of 955 males per 1000 females. As compared with the expected sex ratio of India (census 2011), the ideal composition should be 943 females per 1000 males but it was seen that the composition of the study sample was inverse as compared to the expected.

Figure 4.2.3: Distribution of sample by age in months
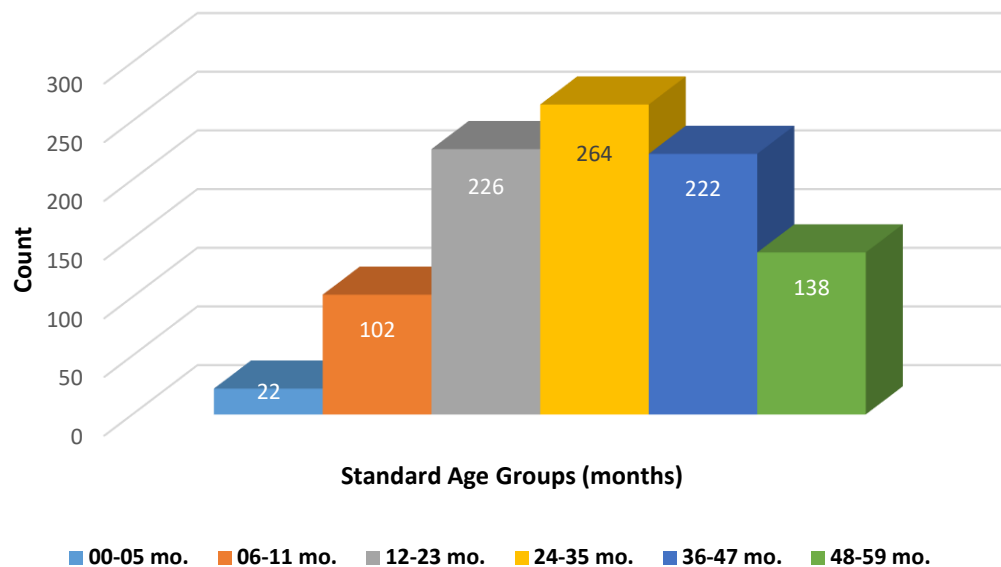
Figure 4.2.4: Scatter Plot Distribution of sample by age in months according to the geographical location
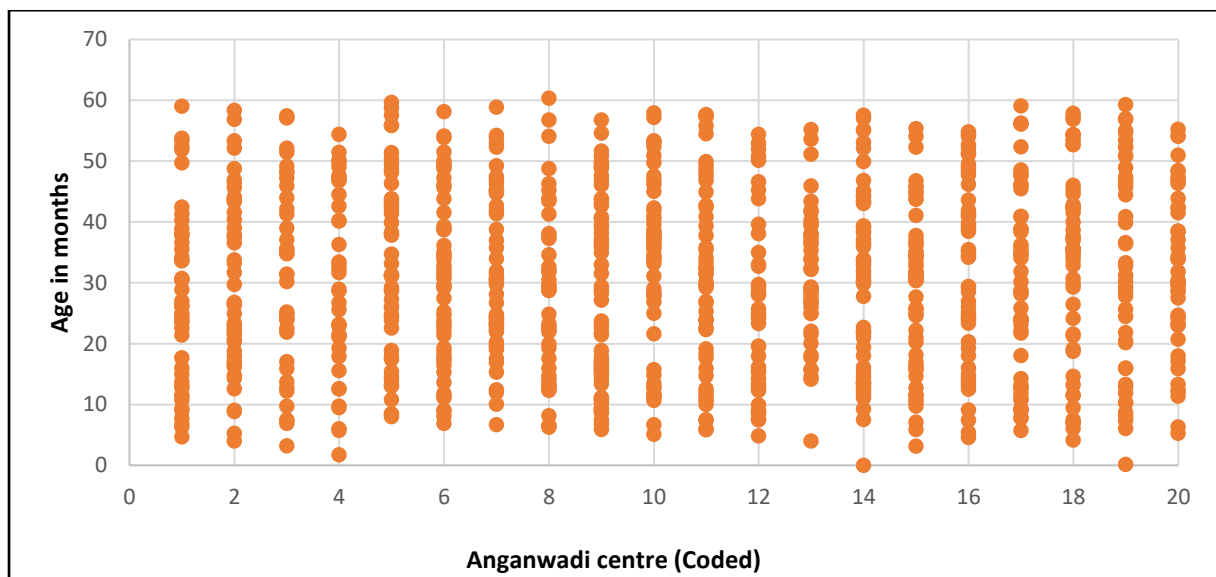
The following section presents the results of the socio demographic characteristics and baseline nutritional status of the study subjects.

2.1 Socio Demographic Characteristics of the study population

General information was elicited from the mothers regarding the socio demographic characteristics of the subjects with reference to the factors affecting hygiene and sanitation status of the households. According to Engle (1992), a mother requires minimal economic resources and social support from the family to be able to care for her child and practice optimal feeding behaviours.

An overview of the socio-economic profile of the families of ICDS beneficiaries of the study sample from 7 zones across the city of Surat is presented below (Table 4.2.1). The data was segregated and analyzed for gender. The response rate ranged from 85% to 97% for various questions asked related to socio-economic status and demographic profile.

Majority (60.33%) families were joint, with no significant difference (p > 0.05) between the genders. Further, more Male belonged to smaller families (< 4 members) and with a very small difference, 50.9% female belonged to larger families (> 7 members) reflecting perhaps a desire for 1-2 male children. Nearly 53.4% mothers were in the age group of 20-25 years and very few below 20 years. In case of fathers, about 78.3% were more than 25 years of age. As regards education, about 20.4% mothers were illiterate and more than one third of them attained only primary education. Very few with only 6.5% and 2.1% attained higher secondary and college respectively. Educational status of father was not significantly different as compared to mothers. It was found that, there was double the rate of graduates seen among fathers and only 12.9 % fathers were illiterate.

Table 4.2.1: Socio-Demographic characteristics of study population

Characteristics	Total (n = 970)		Male (n = 498)		Female (n = 476)	
	n	**%**	**n**	**%**	**n**	**%**
Type of family (n= 943)						
• Joint	569	60.33	283	49.70	286	50.30
• Nuclear	374	39.66	176	47.00	198	53.00
Total number of family members (n = 828)						
• <4	73	8.90	41	56.20	32	43.80
• 4 – 7	639	77.00	317	49.60	322	50.40
• >7	116	14.10	57	49.10	59	50.90
Age of the mother (years) (n =939)						
• < 20	16	1.70	6	37.50	10	62.50
• 20-25	501	53.40	249	49.70	252	50.30

• > 25	422	44.90	211	50.00	211	50.00
Education of the mother (n=935)						
• Illiterate	191	20.40	96	50.20	95	49.80
• Literate	222	23.70	102	45.90	120	54.10
• Primary	333	35.60	169	50.70	164	49.30
• Secondary	109	11.70	47	43.10	62	56.90
• Higher Secondary	61	6.50	33	54.00	28	46.00
• Graduate	19	2.10	11	57.90	8	42.10
Age of the father (years) (n=939)						
• < 20	1	0.10	1	100.00	0	0.00
• 20-25	203	21.60	97	47.80	106	52.20
• > 25	735	78.30	363	49.40	372	50.60
Education of the father (n=929)						
• Illiterate	120	12.91	56	46.70	64	53.30
• Literate	230	24.76	108	46.90	122	53.10
• Primary	313	33.69	166	53.00	147	47.00
• Secondary	165	17.76	76	46.00	89	54.00
• Higher Secondary	54	5.81	29	53.70	25	46.30
• Graduate	47	5.06	21	44.70	26	55.30
Type of House (n=932)						
• Pucca	553	59.33	270	48.80	283	51.20
• Semi-Pucca	183	19.64	101	55.10	82	44.90
• Semi-kuccha	85	9.12	42	49.40	43	50.60
• Kuccha	111	11.91	45	40.50	66	59.50
Source of drinking water (n = 930)						
• Well	6	0.65	3	50.00	3	50.00
• Common municipal tap	246	26.45	120	48.80	126	51.20
• Tap in house	666	71.61	331	49.70	335	50.30
• Common hand-pump	7	0.75	4	57.10	3	42.90
• Water Tanker	5	0.54	0	0.00	5	100.00
Toilet facility (n= 926)						
• Open defecation	17	1.80	8	47.00	9	53.00
• Toilet within the house	149	16.10	88	59.00	61	41.00
• Common toilet	760	82.10	359	47.20	401	52.80
Garbage disposal (n= 926)						
• Outside the house	62	6.70	30	48.30	32	51.70
• In a common dustbin	471	50.90	224	47.50	247	52.50
• By sweeper	371	40.00	193	52.00	178	48.00
• Open land	22	2.40	9	40.90	13	59.10
Total Family income per month (INR) (n = 924)						
• ≤ 5000	138	14.90	66	47.80	72	52.20
• ≤ 10,000	315	34.10	150	47.60	165	52.40
• 10,001 – 15,000	254	27.50	135	53.10	119	46.90
• > 15,000	217	23.50	103	47.50	114	52.50

Per capita income per month (INR) (n = 924)						
• < 250	119	12.90	48	40.30	71	59.70
• 250-1000	78	8.40	37	47.40	41	52.60
• > 1000	727	78.70	369	50.70	358	49.30
Per Capita income per day (INR) (n=970)						
• < $ 3.20 (BPL)	924	95.45	454	46.90	470	48.55
• No Reply	46	4.5	24	2.47	20	2.06

More than half (59.3%) of the families had *pucca* houses which were cemented and 19.6% had semi-*pucca* house with tinted shed roof and brick walls. Only about 11.9% of the study families resided in *kuccha* houses. Access to water was either through well, common municipal tap, tap in house, hand-pumps or through municipal water tankers. It was found that majority (71.6%) households had private taps in the house and one fourth of the families used the common municipal tap. Very few relied on other sources for procuring drinking water. Private toilet facility was available to only 16.1% households whereas majority depended on common toilets. Very few (6.7%) disposed garbage outside their houses whereas, almost half of the families used the common dustbin for garbage disposal.

The economic status of the families was found to be very poor. On calculating income per day, it was found that all the family who responded fell below poverty line with income less than $ 3.20 (International criteria). Thus, the availability of economic resources for child care was a challenge for these families.

Thus, to summarize, the socio demographic profile of the household is;

Overall, 60.33% respondents belonged to joint families ranging from 49.7% Male and 50.3% female

Among the study sample, 20.4% mothers were illiterate whereas only 12.9% fathers were found illiterate

It was seen that 59.3% study respondents resided in pucca houses

Procurement of drinking water by 71.6% households was through a tap in the house whereas 26.4% used common municipality tap

Majority (82.1%) households used common toilets, 16.1 % has a toilet in their houses whereas 1.8% reported resorting to open defecation

Per capita income/ month for 78.7% households was >1000 INR but according to the definition of BPL, all household's earnings were < $3.20 classifying them as BPL

NUTRITIONAL STATUS ASSESSMENT OF CHILDREN UNDER 5 YEARS BY VARIOUS INDICES OF SELECTED 20 AWC FROM URBAN SURAT

Nutritional status of the children (n=970)

The prevalence of under nutrition among the study subjects was assessed on the basis of five indices: Underweight (weight-for-age < -2 Z scores), stunting (height-for-age < -2 Z scores), wasting (weight-for-height < -2 Z scores), MUAC Z scores and BMI Z scores using the WHO (2006) growth standards analyzed using WHO Anthro software.

Mean Weight and Height of Children

The weight and height data of the children is presented below in Table 4.2.2. As age increased, the mean weight and height also increased. However, even the prevalence of malnutrition increased. Older children met lower percentages of the standards than younger children.

Table 4.2.2: Mean Weight and Height of children

Characteristics	n	Weight (Kgs)		Height (Cms)	
		Mean $\pm$ SE	Median	Mean $\pm$ SE	Median
Total	970				
Age (months)					
1) 0 – 5	22	8.1$\pm$0.5	8	73.3$\pm$3.2	66
2) 6 – 11	102	8.6$\pm$0.2	8.1	73.7$\pm$1.1	70
3) 12- 23	226	9.2$\pm$0.1	8.8	77.8$\pm$0.5	76.5
4) 24 – 35	264	10.7$\pm$0.1	10.6	85.3$\pm$0.4	85
5) 36 – 47	222	11.4$\pm$0.1	11.6	88.9$\pm$0.6	91
6) 48 – 59	138	12.6$\pm$0.2	12.5	94.2$\pm$0.7	96

The Figure 4.2.5 presents the Z score distribution by age groups indicating that initially when the child is breast fed and initiated with complementary foods, the weight of both male and female is near the WHO reference standard. However, later as age increases the gain in weight is not consistent.

Figure 4.2.5: Z score distribution of study sample by age groups
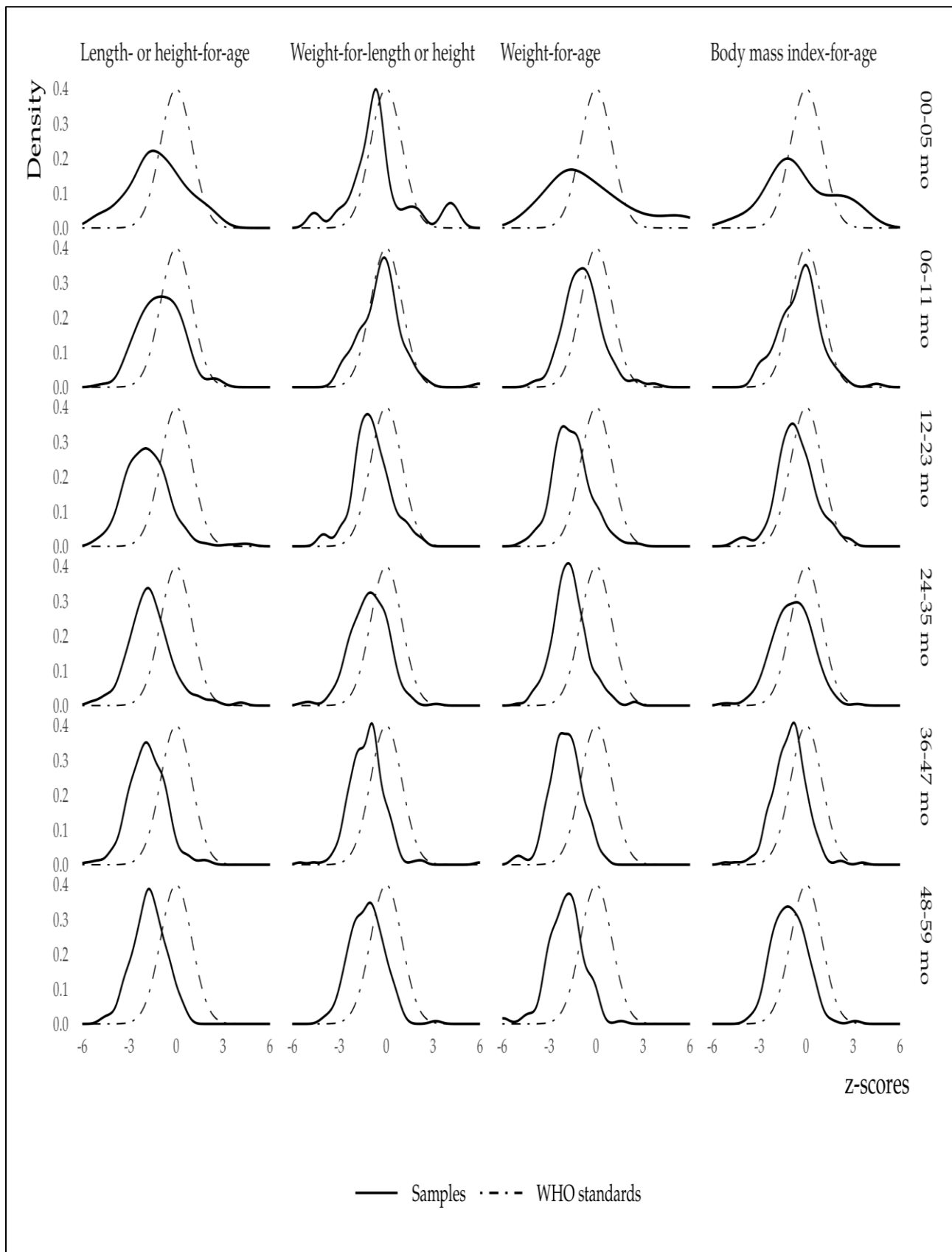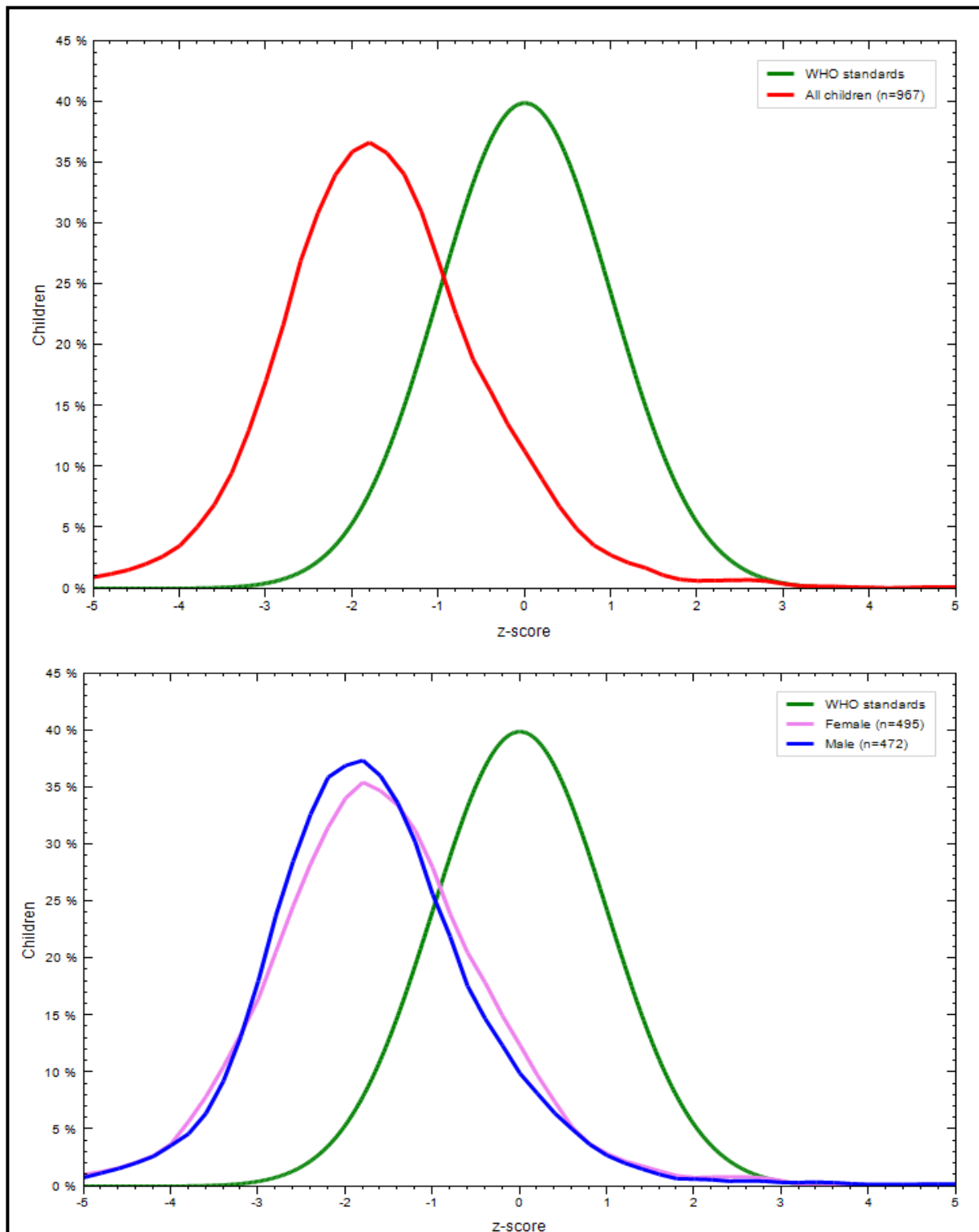
Underweight: Weight-for-Age (WAZ) Score

As Table 4.2.3 shows more than one fourth of the children were underweight (<-2 Z score.) and 10.64% were severely underweight (<-3 Z score). With increase in age, the prevalence of underweight increased significantly ($p<0.05$). No significant gender differences were obtained, the proportion of female were found to be higher in severely underweight category (11.6%) as compared to Male (9.61%).

Table 4.2.3: Nutritional status of Children by weight-for-age (WAZ) Score Values

Characteristic of the child	Moderately Underweight		Severely Underweight		Underweight		Normal	
Total (n = 968)	WAZ (< -2 Z scores)		WAZ (< -3 Z scores)		WAZ (-1Z to -2 Z score)		WAZ (-1 Z to 1 Z scores)	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Age (months)								
0 – 5 (n = 21)	**3**	**14.28**	**3**	**14.28**	**4**	**19.04**	**11**	**52.38**
6 – 11(n = 102)	**12**	**11.76**	**2**	**1.96**	**32**	**31.37**	**56**	**54.90**
12- 23(n = 223)	**67**	**30.00**	**19**	**8.52**	**77**	**34.53**	**60**	**26.91**
24 – 35(n = 263)	**77**	**29.27**	**28**	**10.65**	**95**	**36.12**	**63**	**23.95**
36 – 47 (n = 222)	**74**	**33.33**	**33**	**14.86**	**75**	**33.78**	**40**	**18.01**
48 – 59 (n= 137)	**45**	**32.85**	**18**	**13.13**	**50**	**36.50**	**24**	**17.52**
Total (n = 968)	**278**	**28.72**	**103**	**10.64**	**333**	**34.40**	**254**	**26.23**
Chi- square	**p= 0.000*S**							
Sex								
Male (n = 478)	**145**	**30.33**	**46**	**9.61**	**171**	**35.77**	**116**	**24.20**
Female (n = 490)	**133**	**27.14**	**57**	**11.60**	**162**	**33.06**	**138**	**28.11**
Chi-square	**p= 0.297 *NS**							
*p<0.05, S: Significant; NS: non-significance								

Figure 4.2.6 below depicts the comparision of weight for age Z score with WHO standards for our study sample of n = 968 and gender wise classification.

Figure 4.2.6: Weight for Age Z Score comparison with WHO

Stunting: Height-for-Age (HAZ) Score

Table 4.2.4 presents the results of prevalence of stunting age, age wise and gender wise. As the results reveal, almost 38.94% children are stunted (< - 2 Z score) and one fourth of the study population is severely stunted. The prevalence and severity of stunting increased significantly as age increased. No significant gender differences were obtained. However more male suffered from stunting whereas, higher proportion of female fell in severe stunting category.

Table 4.2.4: Nutritional status of Children by height-for-age (HAZ) Z Score Values

Characteristic of the child	Moderate Stunting		Severe Stunting		Stunting		Normal	
Total (n = 968)	HAZ (< -2 Z scores)		HAZ (< -3 Z scores)		HAZ (-1Z to -2Z scores)		HAZ (-1 Z to 1 Z scores)	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Age (months)								
0 – 5 (n = 21)	1	4.76	3	14.3	5	23.81	12	57.1
6 – 11(n = 102)	17	16.70	3	2.90	24	23.50	58	56.90
12- 23(n = 223)	58	26.00	34	15.25	57	25.56	74	33.19
24 – 35(n = 263)	70	26.61	37	14.07	84	31.94	72	27.38
36 – 47 (n = 222)	65	29.28	36	16.22	68	30.63	53	23.87
48 – 59 (n= 137)	32	23.35	21	15.33	51	37.23	33	24.09
Total	**243**	**25.10**	**134**	**13.84**	**289**	**29.86**	**302**	**31.20**
Chi- square	**p= 0.000 ^{S}< 0.05**							
Sex								
Male (n = 478)	134	28.03	65	13.60	140	29.29	139	29.08
Female (n = 490)	109	22.24	69	14.08	149	30.41	163	33.27
Chi-square	**p= 0.193 ^{NS}**							
*p<0.05, S: Significant; NS: non-significant								

Figure 4.2.7 below depicts the comparision of Height for age Z score with WHO standards for our study sample of n = 968 and gender wise classification.

Figure 4.2.7: Height for Age Z Score comparison with WHO
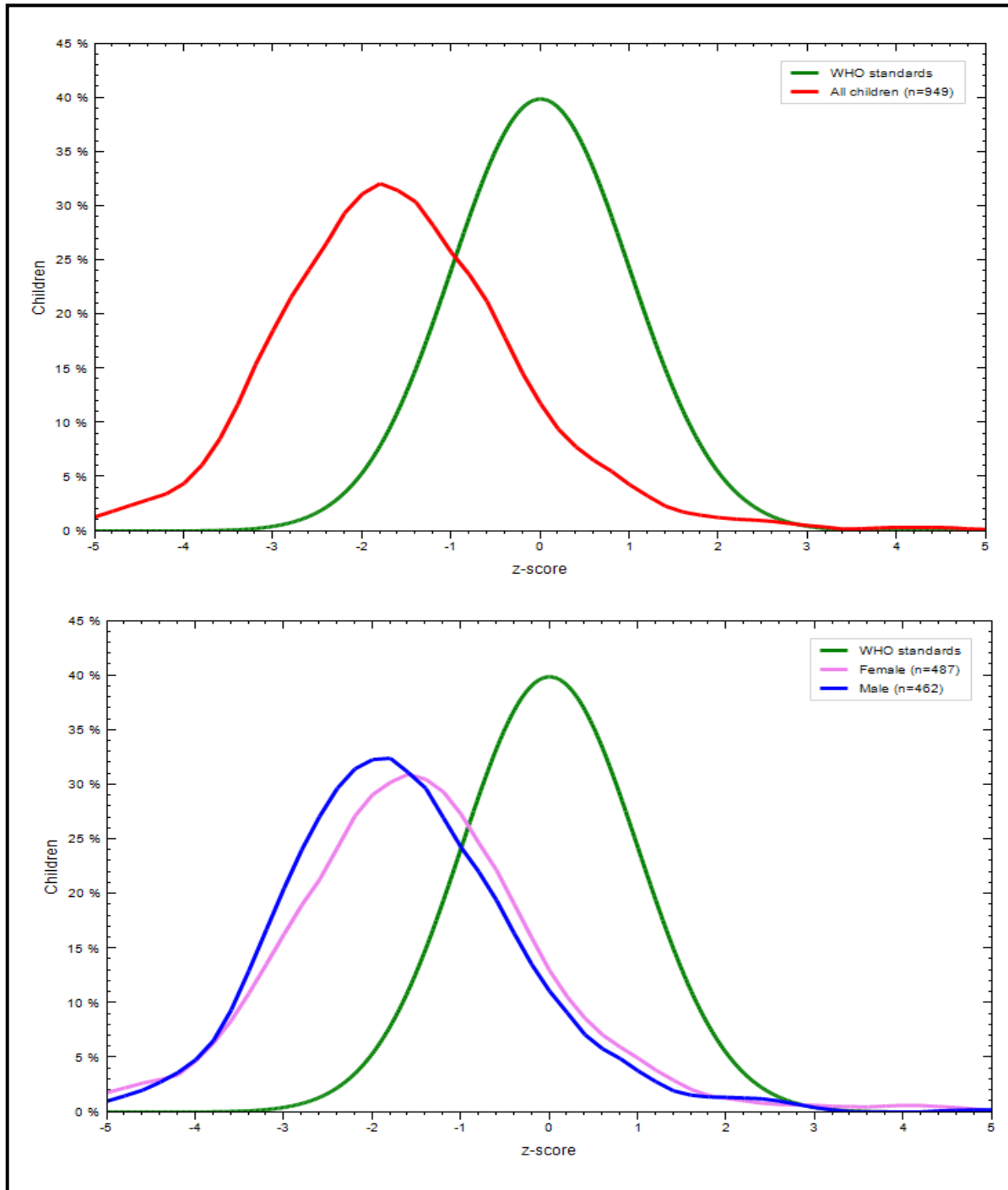
Wasting: Weight-for-Height (WHZ) Score

As seen in Table 4.2.5 nearly one fifth of the children in the study sample were wasted (WHZ <-2 Z score). It was seen that there was significant difference in prevalence of wasting age wise but the prevalence of severe wasting didn't significantly differ either age wise nor gender wise.

Table 4.2.5: Nutritional status of Children by Weight-for-Height (WHZ) Z Score Values

Characteristic of the child	Moderate Wasting		Severe Wasting		Wasting		Normal	
Total (n = 968)	WHZ (< -2 Z scores)		WHZ (< -3 Z scores)		WHZ (-1Z to -2Z scores)		WHZ (-1 Z to 1 Z scores)	
	n	%	n	%	n	%	n	%
Age (months)								
0 – 5 (n = 21)	2	9.52	2	9.52	11	52.38	6	28.57
6 – 11(n = 102)	10	9.80	4	3.92	29	28.43	59	57.84
12- 23(n = 223)	29	13.00	15	6.73	96	43.05	83	37.22
24 – 35(n = 263)	46	17.50	13	4.94	87	33.08	117	44.48
36 – 47 (n = 222)	41	18.47	10	4.50	80	36.04	91	41.00
48 – 59 (n= 137)	27	19.71	7	5.11	45	32.85	58	42.34
Total	**155**	**16.01**	**51**	**5.27**	**348**	**35.95**	**414**	**42.77**
Chi- square	p= 0.000 ^{S}< 0.05							
Sex								
Male (n = 478)	**84**	**17.57**	**27**	**5.65**	**167**	**34.94**	**200**	**41.84**
Female (n = 490)	**71**	**14.49**	**24**	**4.90**	**181**	**36.94**	**214**	**43.67**
Chi-square	p= 0.773 ^{NS} > 0.05							
*p<0.05, S: Significant; NS: non-significant								

Figure 4.2.8below depicts the comparision of Weight for Height Z score with WHO standards for our study sample of n = 968 and gender wise classification.

Figure 4.2.8: Weight for height Z score comparison with WHO
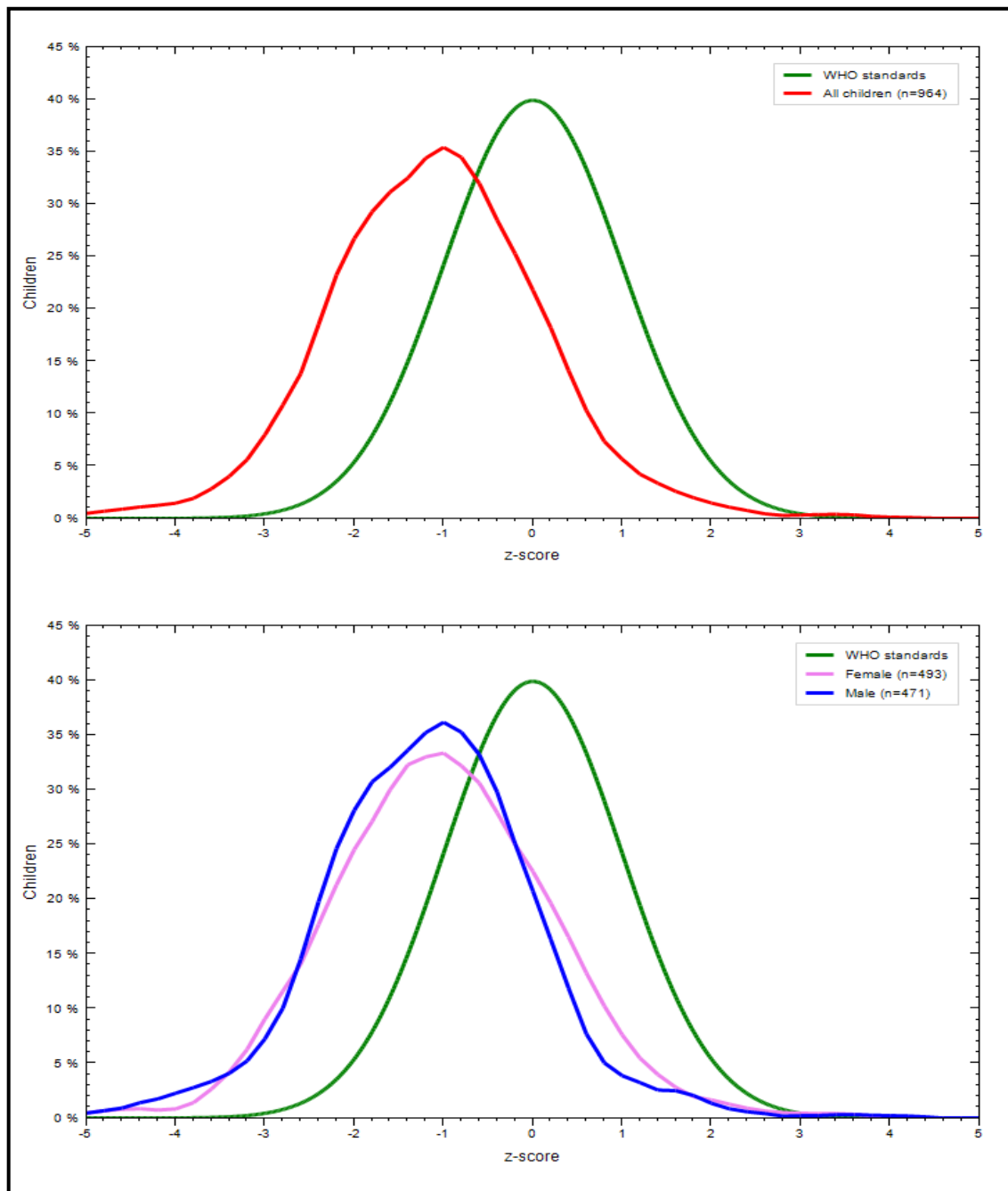
Cluster wise prevalence of undernutrition among the study subjects:

A total sample size of 968 subjects were assessed from 20 AWCs. AWcs were coded from 1-20 for the ease of analysis. This section presents the prevalence of undernutrition across these 20 selected AWCs. Figure 4.2.9 below, presents the mean Z scores for weight-for age, Height-for-age and weight-for-height for all 20 AWCs.

Figure 4.2.9: Cluster wise distribution of Undernutrition
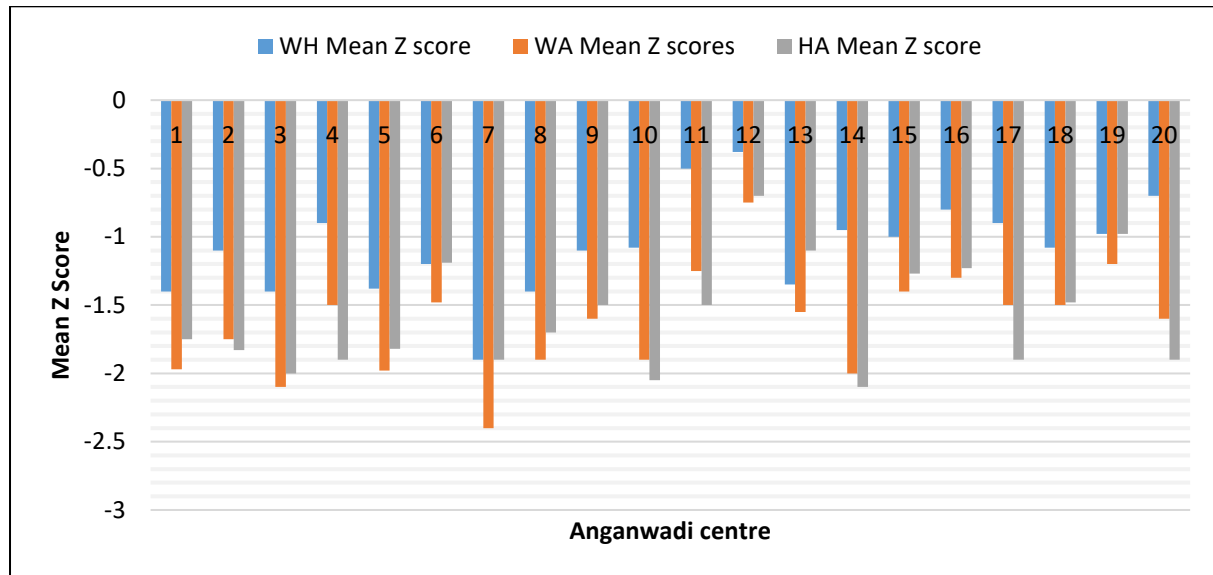
The mean Z score ranges from -0.38 to -1.9, -0.75 to -2.4 and -0.7 to -2.1 for wasting, underweight and stunting respectively. The highest prevalence of underweight and wasting was seen in AWC code no. 7 whereas the prevalence of stunting was in AWC code. no.14.

Figure 4.2.10: Mean Z Score Distribution Across Experimental Group

	1	2	3	4	5	6	7	8	9	10
WH Mean Z score	-1.4	-1.1	-1.4	-0.9	-1.38	-1.2	-1.9	-1.4	-1.1	-1.08
WA Mean Z scores	-1.97	-1.75	-2.1	-1.5	-1.98	-1.48	-2.4	-1.9	-1.6	-1.9
HA Mean Z score	-1.75	-1.83	-2	-1.9	-1.82	-1.19	-1.9	-1.7	-1.5	-2.05
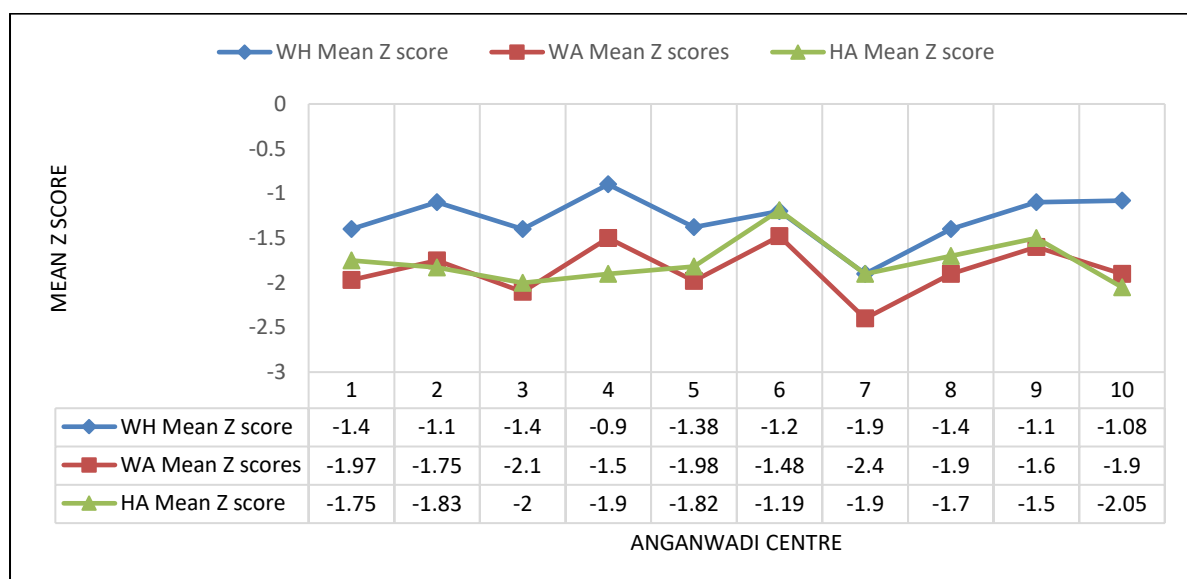
Figure 4.2.11: Mean Z Score Distribution Across Control Group

	11	12	13	14	15	16	17	18	19	20
WH Mean Z score	-0.5	-0.38	-1.35	-0.95	-1	-0.8	-0.9	-1.08	-0.98	-0.7
WA Mean Z scores	-1.25	-0.75	-1.55	-2	-1.4	-1.3	-1.5	-1.5	-1.2	-1.6
HA Mean Z score	-1.5	-0.7	-1.1	-2.1	-1.27	-1.23	-1.9	-1.48	-0.98	-1.9
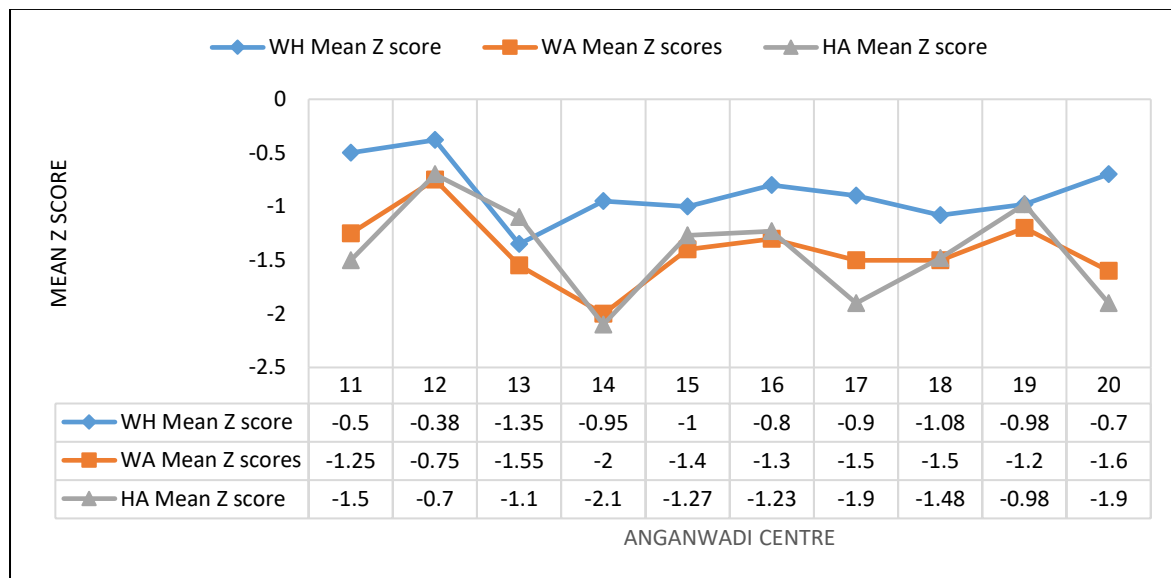
Figure 4.2.10 and 4.2.11 represents the prevalence of undernutrition as seen in experimental group and control group. It can be seen from the figures above that with regards to experimental group, the highest prevalence of stunting is seen in AWC 10 and the lowest is seen in AWC no. 6. Wasting and underweight were seen maximum in AWC 7 and lowest in AWC 4. Among Control group, the lowest prevalence of stunting, wasting and underweight was seen among chindern of AWC 12 and highest prevalence of undernutrition was seen in AWC 13 and 14.

Thus, for nutritional status assessment;

Total sample size was 974 children under 5 years of age registered at selected AWC in ICDS, Surat city out of which 968 children's nutritional status was assessed.

The sample constituted of 478 male and 490 female.

The age range of sample was 6.05 months to 59 months, with mean age of 30.54.

Mean stunting, wasting and underweight was -1.61, -1.05 and -1.63 respectively.

Stunting, wasting and underweight prevalence in the study sample was 38.94%, 21.28% and 39.36% respectively.

HIGHLIGHTS

Mean age of mothers was 28.9 years whereas that of fathers was 41.7%

Among the study sample, 20.4% mothers were illiterate whereas only 12.9% fathers were found illiterate

Majority (82.1%) households used common toilets, 16.1 % has a toilet in their houses whereas 1.8% reported resorting to open defecation

Per capita income/ month for 78.7% households was >1000 INR but according to the definition of BPL, all household's earnings were < $3.20 classifying them as BPL

The sample constituted of 478 male and 490 female, the age range of sample was 6.05 months to 60 months, with mean age of 30.54 months

Mean stunting, wasting and underweight was -1.61, -1.05 and -1.63 respectively.

Stunting, wasting and underweight prevalence in the study sample was 38.94%, 21.28% and 39.36% respectively.

PHASE III: STRENGTHENING THE FUNCTIONING AND INFRASTRUCTURE OF ICDS THROUGH PUBLIC-PRIVATE PARTNERSHIP (PPP) AND ASSESS ITS IMPACT ON NUTRITIONAL STATUS OF CHILDREN UNDER 5 YEARS ENROLLED IN THE ICDS IN SURAT CITY

SECTION A: STRENGTHENING ICDS SERVICE DELIVERY AND OUTCOME THROUGH BEHAVIOR CHANGE COMMUNICATION (BCC) AMONG MEDICAL OFFICERS AND CDPOS

A meeting with ICDS Officials, Surat city as a part of Phase 3 A was conducted followed by completion of phase I and Phase II. Based on the gaps identified in phase I and the nutritional status assessment performed in phase II; the 3rd Phase of the study was planned and conducted to improve service delivery and outcome at the anganwadi centers through Behavior Change Communication (BCC).

The ICDS in-charge, Medical Officers (MOs) and CDPO's were called for BCC session and 20 MOs and 7 CDPOs attended the meeting. The results of the same have been discussed here in following two levels:

1. **MESO LEVEL**: Assessing the Knowledge, Attitude and Practice of the officials, Brain storming session and Participatory discussion about sustainable strategies.

2. **EXO LEVEL:** During the brainstorming session, the medical officers and CDPO's expressed their Issues and Concerns which were further discussed with the commissioner in charge and a way forward to Public-Private Partnership was proposed.
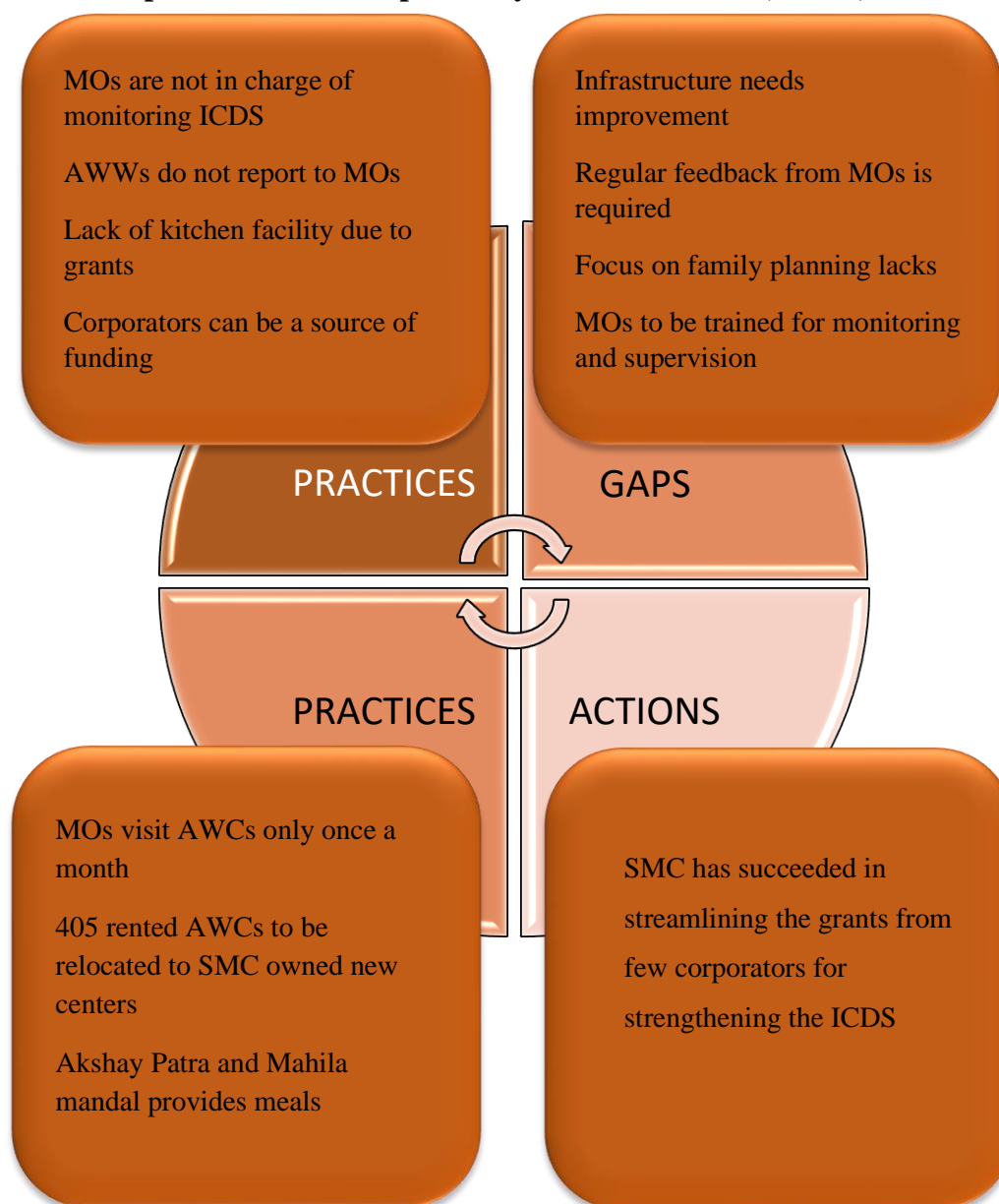
MESO LEVEL
Knowledge, Attitude and Practices of ICDS Medical Officials of Surat City
Outcome: The MO's and CDPO's that attended the session represented all the 5 Ghataks of Surat Municipal Corporation. The group was extremely active and attentive. They shared their views and all the desired information completely during

the discussions and BCC sessions. The information shared by the group members is given below.

Figure 4.3.1: Current practices, systemic gaps in ICDS functioning and immediate plan of action as reported by Medical Officials, ICDS, Surat
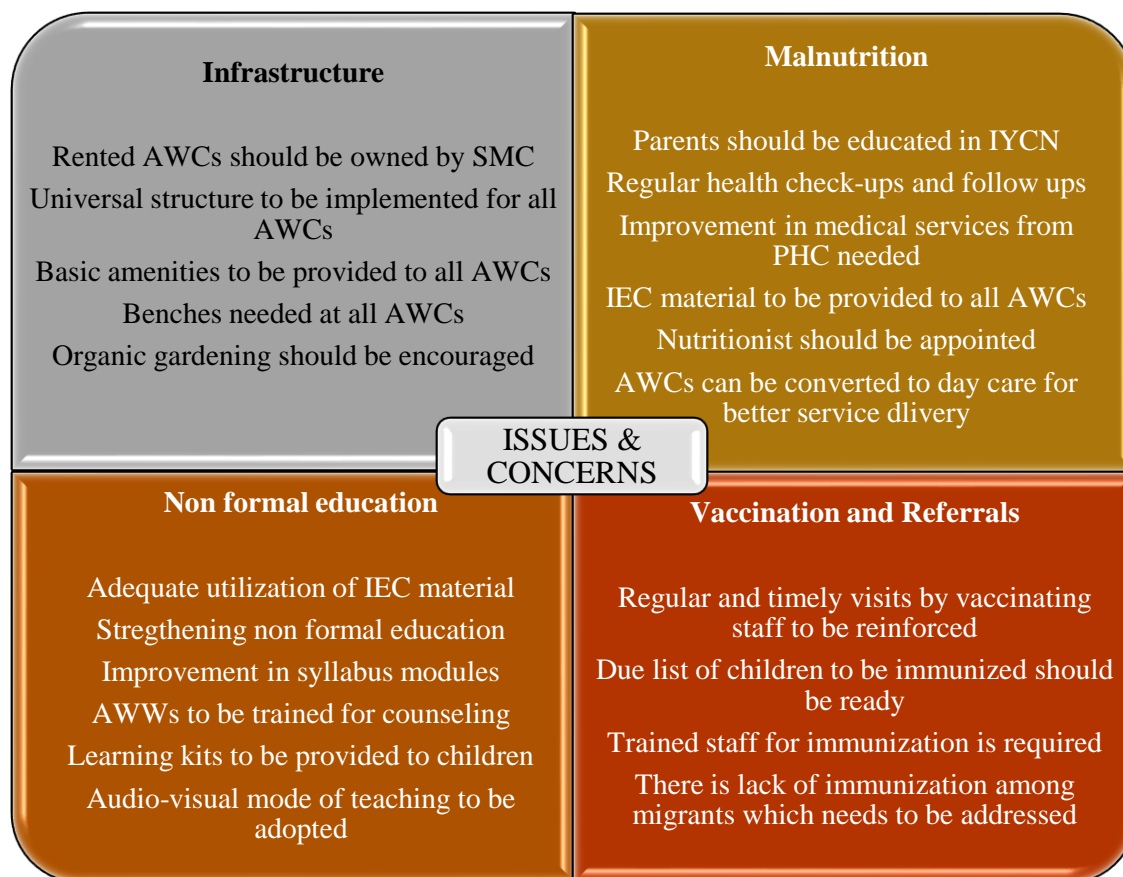
PRACTICES

- MOs are not in charge of monitoring ICDS
- AWWs do not report to MOs
- Lack of kitchen facility due to grants
- Corporators can be a source of funding

GAPS

- Infrastructure needs improvement
- Regular feedback from MOs is required
- Focus on family planning lacks
- MOs to be trained for monitoring and supervision

PRACTICES

- MOs visit AWCs only once a month
- 405 rented AWCs to be relocated to SMC owned new centers
- Akshay Patra and Mahila mandal provides meals

ACTIONS

- SMC has succeeded in streamlining the grants from few corporators for strengthening the ICDS

Brain storming session

Outcome: Following points were discussed by the group of officers:

- Major reasons listed for high prevalence of undernutrition could be limited time for supervision, poor coverage, poor infrastructure and lack of need-based training to AWW

- The group also commented on the supplementary nutrition, Balbhog stating that it is not well accepted by the community and needs to be modified

- Also, the nutritive quality and quantity of the supplementary nutrition needs improvement with a focus on its organoleptic qualities.

- Mothers also need to be motivated to ensure optimum utilization of the Balbhog

- Attendance of beneficiaries is very poor in AWCs which can be improved upon by strict monitoring and regular home visits

- The AWC can be kept open for extended time to support children whose both parents are working and can be converted into crèche

Participatory discussion about sustainable strategies

Outcome: The possible sustainable strategy that was proposed was public-private partnership where in the corporate sectors should adopt the anganwadi. This proposal was put forth for bringing following changes;

Figure 4.3.2: Issues and Concern of Medical Officials, ICDS, Surat City

Infrastructure

Rented AWCs should be owned by SMC

Universal structure to be implemented for all AWCs

Basic amenities to be provided to all AWCs

Benches needed at all AWCs

Organic gardening should be encouraged

Malnutrition

Parents should be educated in IYCN

Regular health check-ups and follow ups

Improvement in medical services from PHC needed

IEC material to be provided to all AWCs

Nutritionist should be appointed

AWCs can be converted to day care for better service dlivery

ISSUES & CONCERNS

Non formal education

Adequate utilization of IEC material

Stregthening non formal education

Improvement in syllabus modules

AWWs to be trained for counseling

Learning kits to be provided to children

Audio-visual mode of teaching to be adopted

Vaccination and Referrals

Regular and timely visits by vaccinating staff to be reinforced

Due list of children to be immunized should be ready

Trained staff for immunization is required

There is lack of immunization among migrants which needs to be addressed

EXO LEVEL

Difficulties: During the brainstorming session, the medical officers and CDPO's expressed their concern on "working in isolation" and stated that lack of integrated approach reduces their efficiency towards the services of ICDS. Therefore, it was proposed that the Department of WCD and Health should work in coordination. The suggestion of appointing a nutritionist was not well taken, instead it was proposed that the quality of training the service providers at anganwadi should improve followed by frequent monitoring to ensure quality implementation of the imparted training. Officers of SMC reported that a "PPP Model" was implemented in 2014, but it failed due to lack of commitment of private sectors.

The outcomes of brain storming session were discussed with Assistant I/C Commissioner, Dr. Gayatri Jariwala and Public Private Partnership (PPP) model was proposed. Several meetings were held with presidents and officials I/C of various NGOs like Surat Round Table, Lion's Club and different chapters of Rotary Club to invite private partners for the adoption of AWCs under PPP model. Ten Rotary Clubs were identified and the Memorandum of Understanding (MoU) was signed by Rotary Clubs under District 3060, RI and SMC and technical support from Foods and Nutrition Department, Faculty of Family and Community Sciences, The Maharaja Sayajirao University of Baroda and Department of Food Science and Nutrition, Sheth P. T. Mahila College of Arts and Home Science, Vanita Vishram, Surat. The MoU under Public-Private Partnership was signed by Rotary Clubs with an agreement to support SMC in the functioning of ICDS accepting the defined guidelines for 12 months intervention in 10 adopted AWCs.

Section B: Conceptualization, Planning, Development, and implementation of a Public-Private Partnership (PPP) Model and its Impact Assessment

This section of results and discussion addresses the following specific objectives of the study;

Assessing the impact of Public-Private Partnership on;

1. Knowledge, Attitude and Practices (KAP) of Anganwadi Workers (AWWs) and Anganwadi Center (AWC) infrastructure
2. KAP of mothers related to Infant and Young Child Nutrition (IYCN)
3. Nutritional status of children under 5 years enrolled in ICDS

During data collection it was learnt that one AWC from control group was shut down due to policy reasons, hence the impact was analyzed and reported considering 10 AWCs in Experimental Group (EG) and 9 AWCs in Control Group (CG).

Assessing the Impact of Behavior Change Communication (BCC) and Public-Private Partnership (PPP) on Knowledge, Attitude and Practices (KAP) of Anganwadi Workers (AWWs) and Impact of PPP on Infrastructure of the Anganwadi Center (AWC)

The details of intervention program are discussed in Table 4.3.1 below where in PPP model using BCC was applied to improve IYCN practices among mothers and infrastructure of the AWC.

Table 4.3.1.: Intervention Activities to Improve KAP of AWWs and Infrastructure of the AWC

| Interventions	Type of Sessions	No. of Sessions	Techniques/Remarks
Training to AWWs to improve knowledge and perceptions related to IYCN	Individual	1/AWC = 10	Lecture using PPT and solving questions Booklet
Training to AWWs to improve Growth Monitoring and Supplementary Nutrition Practices	Individual	1/AWC = 10	Live Demonstration
Distribution of standardized cups to all EG AWWs	-	1 cup/ AWW	-
Complete renovation of the adopted AWC and provision of basic amenities like water and electricity	-	-	It was done by the adopting NGO with government sector as a part of Public Private Partnership
Children friendly wall paintings	-	-	
Provision of induction stove and vessels for preparation of Balbhog	-	-	
Donation of clothes, raincoats, toys and stationery for ECE	-		NGO members voluntarily made donations
Monthly visits by NGO members along with provision of fruits, milk and some dry snacks for beneficiaries	Group Session	18 Visits/AWC	It was done by the adopting NGO as a part of Public Private Partnership
NGO member's birthdays, anniversaries and other special days' celebration at Anganwadi centers	Group session	18 Visits/AWC	

Results of Intervention using BCC on KAP of AWWs

A. Key Breast-Feeding Practices

Messages and NHE material like film had key IYCN Practices related to colostrum feeding, exclusive breast feeding and continuation of breast feeding which were repeatedly discussed with EG – AWWs during capacity building sessions. As presented in table 4.3.2, among all AWWs (EG and CG), pre intervention knowledge related to early breast-feeding practices was found to be good with minimum 80% AWWs giving correct response which showed 100% improvement post intervention among experimental group. Knowledge regarding benefits of Complementary foods showed a shift from 30% to 70% among EG group which was found significant at 95 % CI. The increase in knowledge for three practices was seen non-significant except for two which were, appropriate age to initiate water feeding and appropriate age to initiate complementary feeding with p value < 0.05 (Table 4.3.2).

Table 4.3.2.: Impact of PPP on Knowledge of AWWs on IYCN

| Responses of AWW	Pre-Intervention (N = 20)		Post- Intervention (N=19)	
	EG (10)	CG (10)	EG (10)	CG (9)
	(%)	(%)	(%)	(%)
Colostrum Feeding	80	90	100	88.9
Paired T-test	EG: 0.98^{NS}		CG: 2.50^{NS}	
Initiate breast feeding (Within 1 hour)	70	80	100	88.9
Paired T-test	EG: 0.76^{NS}		CG: 3.12^{NS}	
Age for Exclusive breast feeding (6 months)	80	90	100	77.8
Paired T-test	EG: 0.98 ^{NS}		CG: 2.04 ^{NS}	
Initiation of water feeding (After 6 months)	60	80	100	88.9
Paired T-test	EG: 0.48**		CG: 3.12^{NS}	
Initiation of Complementary feeding (After 6 months)	60	80	100	88.9
Paired T-test	EG: 0.48**		CG: 3.12^{NS}	
* Significant at *p<0.01* ** Significant at p< 0.05 ^{NS} Non significant				

Figure 4.3.3: Impact of BCC and PPP Intervention on IYCN Practices
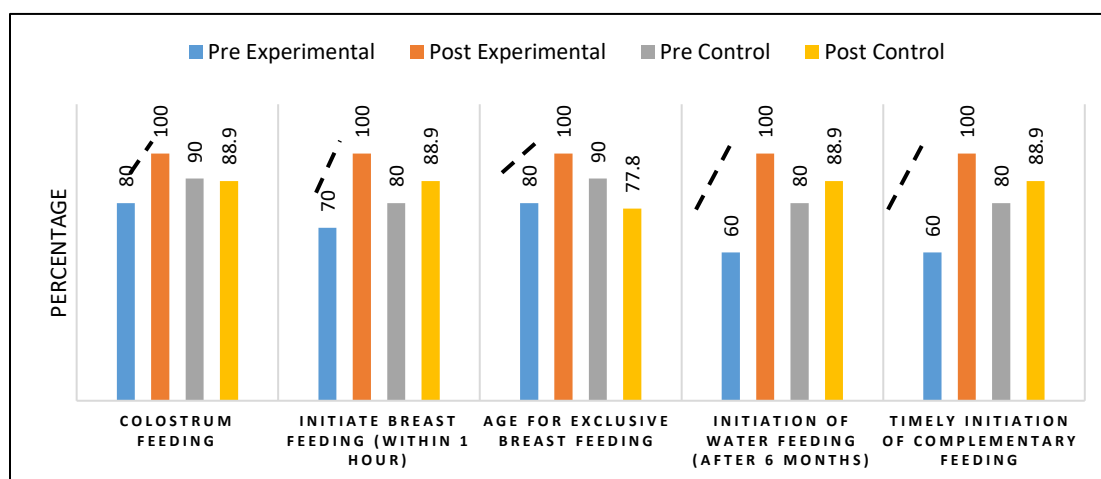
B. Benefits of Timely Initiation of Complementary Feeding (CF)

Introducing optimal CF practices is a very important window of opportunity to prevent undernutrition among all children. Improving knowledge about the optimal CF practices and its benefits was an important constituent of the training session, as correct knowledge about CF would help the AWW to impart the correct messages to the mother to ensure a smooth transition during weaning. During the capacity building, the EG AWWs were convinced to use standardized key messages on CF, printed in MAMTA card to ensure consistency and quality. Besides this, to fully prepare the EG AWW to address the field issues related to CF, PPT and demonstrations of recipe cooking were used to ensure optimum learning.

All the AWWs in both the groups were aware of the age of initiation of CF but the messages conveyed to the community by 4 AWWs in EG and 2 AWWs in CG were misleading as there was confusion whether CF had to be initiated in the 6th month or after completion of 6th month. Majority AWWs (EG – 60% and CG – 80%) pre intervention were accurate in dispensing the message, post capacity building, the clarity in message was seen among 100% EG AWWs which was found to be significant at 95% CI.

Figure 4.3.4: Changes in AWWs perception about benefits of timely initiation of Complementary Feeding post intervention
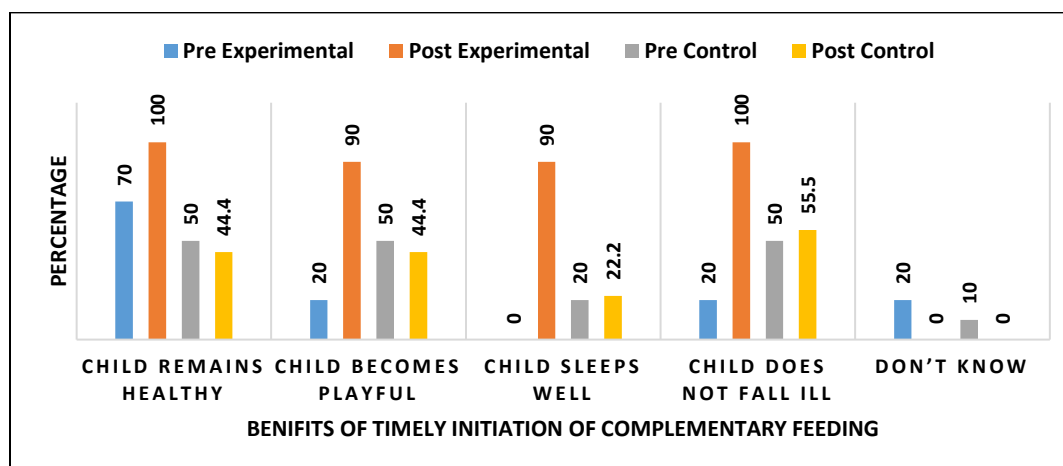
Majority (70% in EG and 50% CG) considered "child remains healthy" as the only benefit followed by "child becomes playful" and "child doesn't fall ill" (50% CG and 20% EG) as the benefits of timely initiation of CF pre intervention. Post intervention, all the benefits were well listed by 90 – 100% AWWs from EG.

C. Feeding During and After Illness

Guidelines on feeding during and after illness were emphasized and discussed during the capacity building sessions. The guidance specifically included continued breast-feeding during illness, on demand feeding and encouraging the child to consume small frequent meals. Improvement in perceptions of EG - AWWs related to feeding the child on demand during and after illness of the mother and the child post intervention were reported by 40%, whereas only a marginal increase was seen among Control Group workers (Table 4.3.3).

Table 4.3.3: Change in knowledge of AWWs regarding feeding during and after illness

Responses Of AWW	Pre-Intervention (N = 20)		Post – Intervention (N=19)	
	EG (10)	CG (10)	EG (10)	CG (9)
	%	%	%	%
Feeding During And After Illness				
If mother is ill, then mother should breast feed the child				
• Same as before	50	20	30	22.2
• Less than before	0	10	0	11.1
• Stop breast feeding	20	0	0	0
• The amount child demands	30	70	70	6.7
If child is ill, then mother should breast feed her child:				
• Same as before	70	20	20	22.2
• Less than before	0	10	0	0
• Stop breast feeding	0	0	0	0
• The amount child demands	30	70	80	77.8
If child is receiving CF, then mother should breast feed her child:				
• Same as before	50	30	0	22.2
• Less than before	20	10	0	11.1
• Stop breast feeding	0	10	0	11.1
• The amount child demands	30	50	100	55.5

D. Growth Monitoring (GM)

During the GM, persistent efforts were made to transform weighing exercise in the field into growth monitoring. The EG AWWs were explained the series of steps to be followed in growth monitoring. As presented in Table 4.3.3, the practices of EG-AWWs improved post capacity building. Growth monitoring practices were observed to be poorly followed. Information on growth charts were not used by AWWs (100% (EG) and 80% (CG)) to sensitize and counsel the parents during growth monitoring or later. The practices related to calibration of the scale to "0" mark before weighing each child followed by incorrect placement of the scale (not at eye level) were also found to be poor with only 80% and 60% respectively in EG and 70% and 30% in CG. Post intervention, an increase in all practices of growth monitoring were found to escalate to 100% among EG AWWs which was found to

be statistically significant with p value < 0.05, except sensitizing the parents using the information on growth chart among EG AWWs whereas no change was noted among CG AWWs which was statistically non-significant at 95% CI.

Table 4.3.4: Changes in KAP of AWWs with regards to ICDS Services

Responses of AWW	Pre-Intervention (N = 20)		Post – Intervention (N=19)	
	EG (10)	CG (10)	EG (10)	CG (9)
Growth Monitoring	%	%	%	%
Objectives of Growth Monitoring				
• To know the weight of child	70	60	90	66.7
• To know the grade of malnutrition	20	50	80	55.5
• If the child is malnourished, sensitize the mother and advice appropriate care	10	0	80	0
Growth Monitoring Practices (Observation)				
Scale correctly attached	60	80	100	77.8
Paired T Test	EG: 0.048**		CG: 3.50^{NS}	
Scale calibrated to "0" mark before weighing every child	20	30	100	33.3
Paired T Test	EG: 0.00*		CG:2.76^{NS}	
Scale placed at eye level	40	70	100	77.8
Paired T Test	EG: 0.00*		CG: 2.48^{NS}	
AWW Plots the GM Chart correctly	60	70	100	77.8
Paired T Test	EG: 0.048**		CG: 2.48^{NS}	
Uses the information on GM chart correctly to sensitize mothers	0	20	70	22.1
Paired T Test	EG: 0.00*		CG: 3.67^{NS}	
Food and Nutritional Supplementation				
Objective of Food supplementation				
• Child gets Nutritional supplementation which he/ she doesn't receive at home	100	30	80	22.2
• Child attends AWC for Supplementary food	0	0	70	0
• Improves health and nutritional status of the child/ Growth and development	50	60	90	55.5
Acceptance of Balbhog by beneficiaries	20	50	70	44.4
Paired T Test	EG: 0.034**		CG: 0.72^{NS}	
Acceptance of Breakfast from Mahila-Udhyog	100	100	100	100

Paired T Test	EG: 3.76[NS]		CG: 3.43[NS]	
Acceptance of cooked meals from Akshay-Patra	50	60	60	66.7
Paired T Test	EG: 0.73[NS]		CG:1.68[NS]	
Do children consume the entire food given to them at AWC itself	70	10	90	100
Paired T Test	EG: 0.025**		CG: 1.65[NS]	
Practices On Food and Nutrition Supplementation (Observation)				
Attendance during spot feeding	10	30	80	33.3
Paired T Test	EG: 0.00*		CG: 3.74[NS]	
Estimation of Nutritional Requirements	20	10	40	22.2
Paired T Test	EG: 0.047**		CG: 1.34[NS]	
Use of Standardized Cups	0	0	100	0
Paired T Test	EG: 0.00*		CG: 3.46[NS]	
Nutrition and Health Education				
Objectives of NHE • Improves Nutritional status of children through improvement in mothers' knowledge and IYCF practices • Improves the food intake • Increases the awareness regarding immunization	50 0 0	50 10 0	100 80 60	55.5 11.1 0
Home Visits (Observation)	20	40	50	40
Records kept for NHE • Yes • No	70 30	70 30	90 10	77.7 33.3
Paired T-Test	EG: 0.036**		CG: 3.65[NS]	
* Significant at *p<0.001* ** Significant at p< 0.05 [NS] Non significant				

E. Food and Nutrition Supplementation

At baseline, pre intervention data showed that supplementary food served at AWC with regards to lunch (Akshay Patra) and BALBHOG (Nutritious multi-nutrient premix) packets given to mothers to feed children were very poorly accepted. A sensitization towards importance of BALBHOG was carried out for AWWs and demonstration of various recipes out of Balbhog was done. Post intervention, it was reported that there was a positive shift of 50% in attitude of AWWs towards acceptance which was statistically significant at 95% CI. Pre-intervention, many AWWs complained of insufficient and poor-quality food from Akshay Patra, their concern was reported to the higher officials. It was observed that during meal hours,

the attendance showed a rise and there were >30 children seen in most centers. Following persistent efforts, it was observed that there was some improvement in the quality of food served but quantity remained the same as it was estimated to serve only 30 children at each AWC. EG-AWWs (10%) reported better quality, the improvement in acceptance as reported by AWWs was statistically non-significant. Observing unacceptable practices of feeding increased number of children (>6 years) during lunch due to which the intake of children beneficiaries (< 5 years) suffered, EG-AWWs were requested to take attendance during spot feeding which was seen being poorly (EG, 10% and CG 30% documented the attendance) followed pre intervention, so that such practices can be avoided. Also, AWWs could not estimate nutritional requirements of the child correctly (80% EG and 90% CG) at baseline. All the AWWs from both the groups used the spoon which was non-standardized to serve the meals, observing this the EG AWWs were made equipped with standardized measuring cups and trained to use it to estimate correct requirements and serve recommended quantity of 80 g. Post intervention, it was observed that all the EG AWWs used the standardized cups to serve, the change was statistically significant with p value < 0.01.

F. Home Visits

Home visits are an integral part of the stated objectives of ICDS, as inter personal counseling is well accomplished and the community is sensitized and mobilized. Pre intervention, it was observed that home visits were very irregularly made and the documentation maintained were erroneous. Efforts were made to sensitize the EG AWWs towards importance of home visits and on making inter personal counseling and BCC a two-way process. Post intervention it was observed that 90% EG AWWs started maintaining correct records of home visits (p < 0.05) and the counselling quality increased.

Thus, to summarize the impact of PPP and Capacity building on KAP of AWWs;

Significant impact was seen among EG workers with regards to initiation of water feeding and complementary feeding (P< 0.05)

Knowledge regarding early breast-feeding practices pre intervention, was found to be good among EG as well as CG AWWs being above 70% with regards to colostrum feeding, initiation of breast feeding and age of EBF. Capacity building for EG AWWs had a positive but not significant impact on the same.

AWWs perceived the only benefit of timely initiation of CF as 'Child remaining healthy' pre intervention. Positive impact of NHE was observed among EG AWWs with > 90% acknowledging all the benefits of timely initiation of CF

Knowledge regarding feeding practices during and after mothers and child's illness improved by 50%

Post capacity building, GM practices of EG AWWs significantly (p<0.05) in terms of scale attachment and plotting the growth chart whereas improved (p<0.001) in terms of scale placement at eye level, calibration and using GM chart information to sensitize mothers

AWWs attitude towards acceptance of Balbhog improved by 30% in EG (p< 0.05)

Practices of EG AWWs with regards to attendance during spot feeding and using standardized cups increased by 80% and 100% respectively (p < 0.001)

Estimation of nutritional requirements of children by EG AWWs showed an increase by 20% (p < 0.05)

Correct record maintenance of home visits was observed among EG which showed an improvement by 20% (p < 0.05). No significant change was observed among CG workers

Results of Intervention using PPP on infrastructure of AWC

Anganwadi center accreditation was carried out at baseline using a score card with the indicators concerning to its infrastructure, water availability, toilet, cleanliness, ICDS services like supplementation, growth monitoring, well utilized and delivered, IYCN practices followed, growth monitoring, breast feeding practices, shift in malnourishment grades, coverage of immunization and non-formal preschool education. As a part of intervention, the EG AWCs were equipped with

facilities that were lacking by our stakeholders, various efforts were made towards uplifting the center eliminating the reported gaps. Post intervention as presented in Figure 4.3.5 and 4.3.6 there were major shifts seen in accreditation scores of EG AWCs from maximum 9 to 1. The mean shift in score among EG AWCs was 5.5, whereas maximum score shift in CG AWCs was 2 with the mean score shift of 0.44.

Figure 4.3.5: Impact of PPP Intervention on Accreditation scores of Experimental AWCs
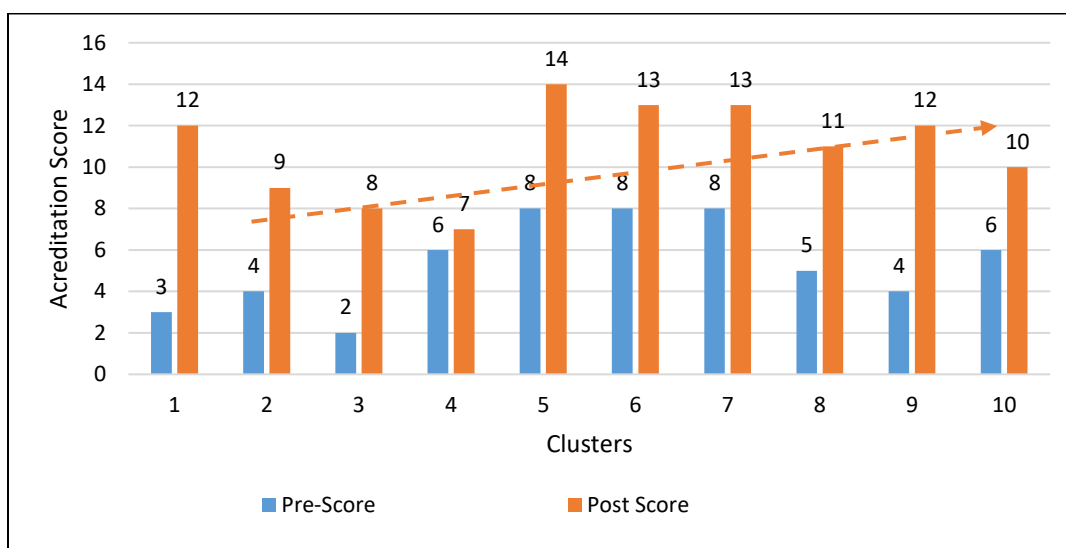
Impact on Utilization of ICDS Services for Children U-5 Years of Age

Regularity

Post PPP model implementation as seen in Figure 4.3.7, more children (96.7%) under 5 years of age in EG regularly attended AWC. The increase in attendance was found to be 11.7% (96.7% V/S 85.0%) more in EG as compared to 7.4% (94.5% V/S 87.1%) increase in CG. The increase was statistically significant at 95 % CI.

Figure 4.3.6: Impact of PPP Intervention on Accreditation scores of Control AWCs
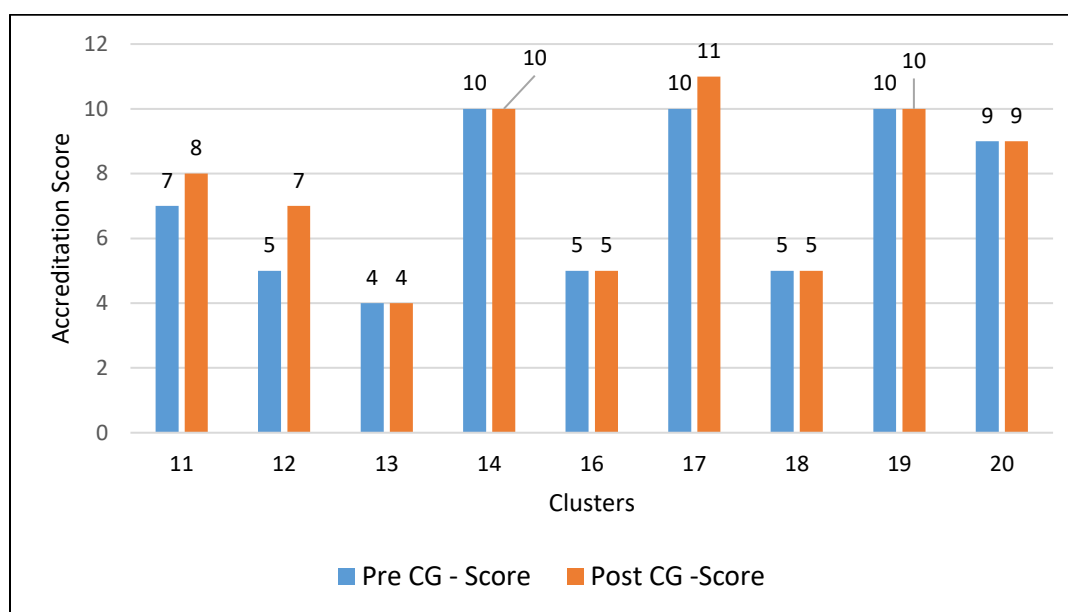
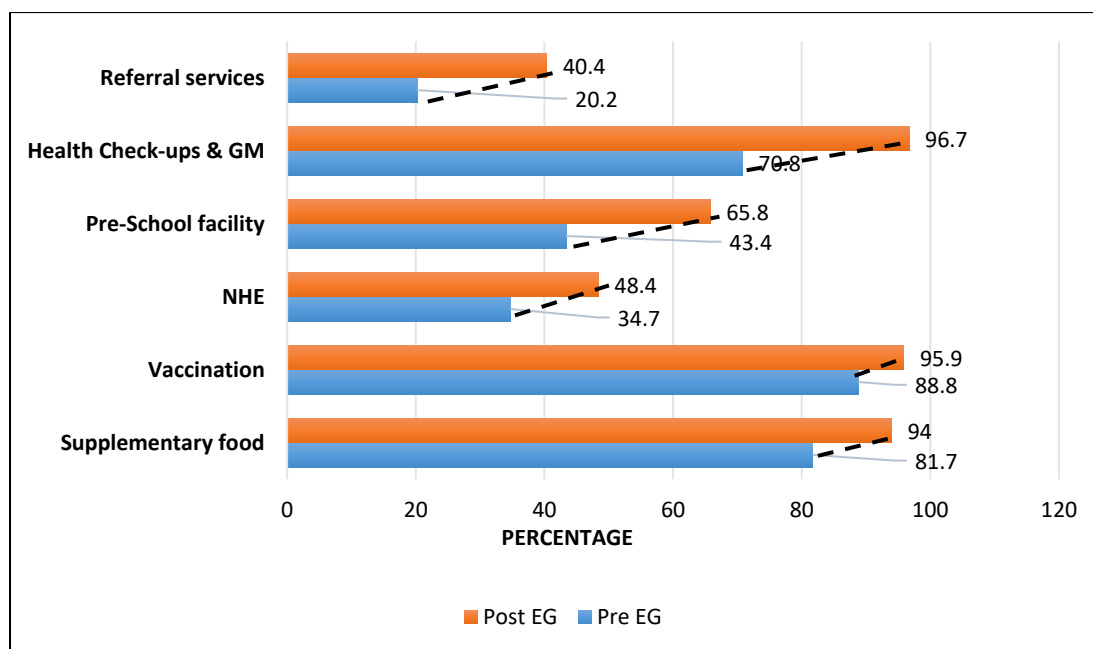**Figure 4.3.7: Attendance of children beneficiaries in EG AWCs**
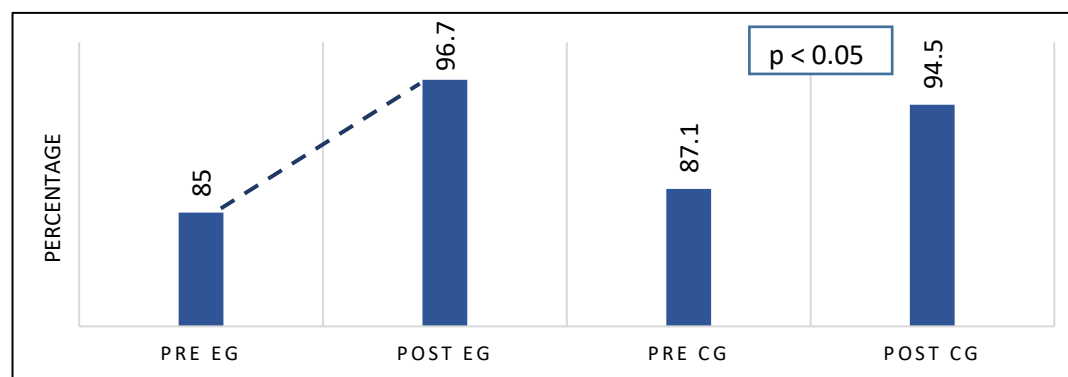
Service Utilization

As seen in Figure 4.3.8, the ICDS service utilization increased in EG post intervention. Health Check-ups and Growth monitoring showed maximum increase of 26% followed by 21 % increase in pre-school facility and 20 % increase in referrals. Utilization of NHE service increased by 13.7% and there was 12%

increase in consumption of Balbhog and supplementary nutrition post intervention among EG participants (Figure 4.3.8)

Figure 4.3.8: Service Utilization in EG AWCs

Thus, to summarize the impact of PPP on AWC;

Post intervention, the mean shift in accreditation score for AWCs among EG was 5.5 whereas that in CG was 0.44

Attendance at AWC of children beneficiaries enrolled in the study increased by 11.7% in EG and by 7.4% in CG

Service utilization by beneficiaries of EG increased ranging from 7.1% for vaccination to 25.9% for health check-up. All the services showed a mean rise of 16.9%

Assessing the Impact of BCC and PPP on Knowledge, Attitude and Practices pertaining to Infant and Young Child Nutrition (IYCN) among mothers of children under 5 years in experimental group

The following section shows the Impact of Public Private Partnership (PPP) intervention on Knowledge, Attitude and Practices (KAP) related to ICDS services and IYCN practices on the mothers of children under five years of age enrolled in the study.

The details of intervention program are discussed in Table 4.3.5 below where in PPP model was applied to improve IYCN practices among mothers. The indicators used to assess the impact were, categorized under three categories; breast feeding practices, complementary feeding practices and feeding during and after illness.

To assess the impact of capacity building through Nutrition and Health Education (NHE) on Infant and Young Child Nutrition (IYCN) related Knowledge, Attitude and Practices (KAP) of mothers of children under 5 years of age

Table 4.3.5: Intervention Activities to Improve KAP Pertaining to IYCN Practices among Mothers of Children Under 5 Years of Age

Activities	Type of Sessions	No. of Sessions	Remarks
Community Interaction and communication to increase utilization of services	Individual	-	Carried out by NGO members as a part of PPP model
NHE sessions: Group Discussions and lectures to sensitize regarding optimum IYCN practices	Group session	3 Sessions / Cluster (30 sessions)	
Film on breast feeding was made and shown followed by group discussion on optimal	Group session	1 session/ Cluster (10 Sessions)	Film made by academic and private partners under PPP model

breast-feeding practices and question and answer session			
Recipe demonstration from Balbhog premix	Group Demonstration	1 session/ Cluster (10 Sessions)	

Results of Intervention Using PPP on IYCN Practices of Mothers of Children Under 5 Years of Age

A. **Breast Feeding**

Early Breast-Feeding Practices

As presented in Figure 4.3.9-4.3.11 and Table 4.3.6, the knowledge and perceptions of mothers on early Breast Feeding (BF) practices improved. The improvement in knowledge related to initiation of breast feeding within 1 hour of birth, pre-lacteal feeding and colostrum feeding was 4.8 (61.2 v/s 57.4), 9.1 (19.9 v/s 29.0) and 7.9 (81.4 v/s 73.5) times better respectively in EG as compared to CG post intervention. The improvement reported in EG on all three breast feeding practices was statistically significant; initiation of BF $p < 0.01$, pre-lacteal feeding $p < 0.05$ and colostrum feeding at $p < 0.01$.

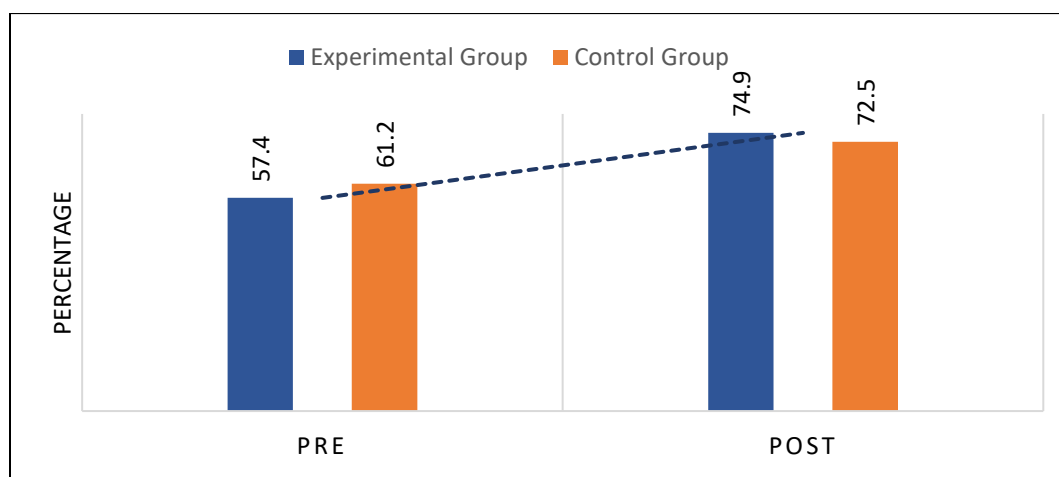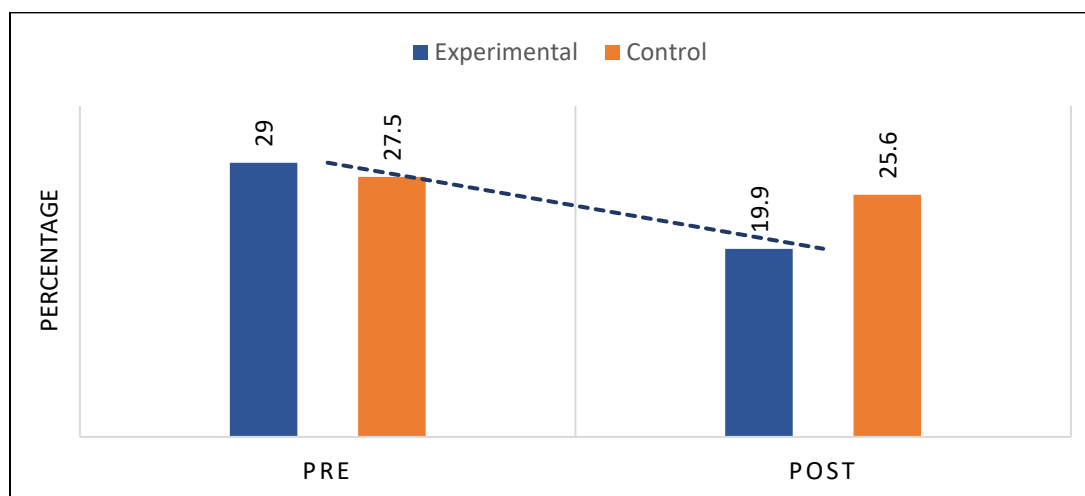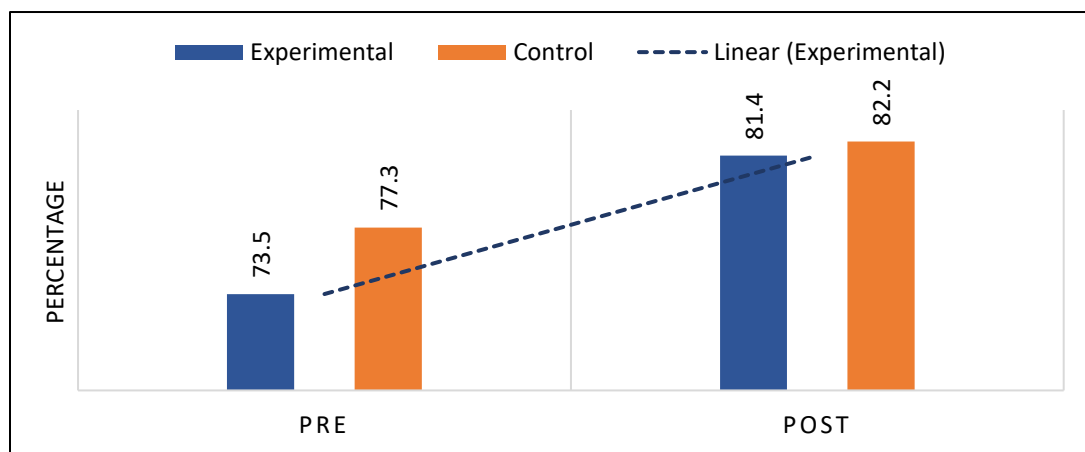**Figure 4.3.9.: Impact of Intervention on Initiation of Breast Feeding within 1 hour**

Figure 4.3.10.: Impact of Intervention on Pre-lacteal Feeding

Figure 4.3.11.: Impact of Intervention on Colostrum Feeding

Table 4.3.6: Changes in Breast Feeding Practices of Mothers Post Intervention

Responses	Pre-Intervention Experimental		Post-Intervention Experimental		Pre-Intervention Control		Post-Intervention Control	
	n = 366				n = 309			
	%	n	%	n	%	n	%	N
What should you give immediately after birth (1 hour)								
• Breast milk	57.9	212	76.0	278	63.1	195	66.0	204
• Water	1.4	5	0.8	3	10.0	31	12.3	38
• Pre-lacteals	29.0	106	19.9	73	27.5	85	25.6	79

• Top milk	4.4	16	5.5	17	6.5	20	5.5	17
• Nothing	6.6	24	1.6	6	10.7	33	10.4	32
Chi square (Breast Milk)	**Pre-Intervention**			0.11^{NS}	**Post Intervention**			0.02**
Colostrum Feeding								
Should Colostrum be fed:								
• Yes	73.5	269	81.4	298	77.3	239	82.2	254
• No	25.4	93	18.6	68	20.1	62	15.9	49
• Don't Know	1.1	4	-	-	2.6	8	1.9	6
Chi square	**Pre-Intervention**			0.10^{NS}	**Post Intervention**			0.02**
Benefits of colostrum feeding								
• Child becomes healthy	35.8	131	65.3	239	52.1	161	54.0	167
• colostrum is energy dense	9.3	34	26.5	97	10.1	31	9.7	30
• improves the immunity	12.8	47	27.3	100	14.6	45	17.5	54
• Don't know	12.6	46	7.9	29	21.7	67	19.4	60
Chi square	**Pre-Intervention**			0.00*	**Post Intervention**			0.00*
Initiation of breast feeding								
Appropriate time to initiate Breast feeding								
• within 1 hour	57.4	210	74.9	274	61.2	189	72.5	224
• 1st day	26.8	98	16.7	61	19.1	59	12.0	37
• 2nd day	7.7	28	2.2	8	5.5	17	3.6	11
• 3rd day	4.6	17	3.6	13	6.8	21	9.4	29
• No response	3.5	13	2.7	10	7.4	23	2.5	8
Chi square	**Pre-Intervention**			0.10^{NS}	**Post Intervention**			0.20*

* Significant at *p<0.01*
** Significant at p< 0.05
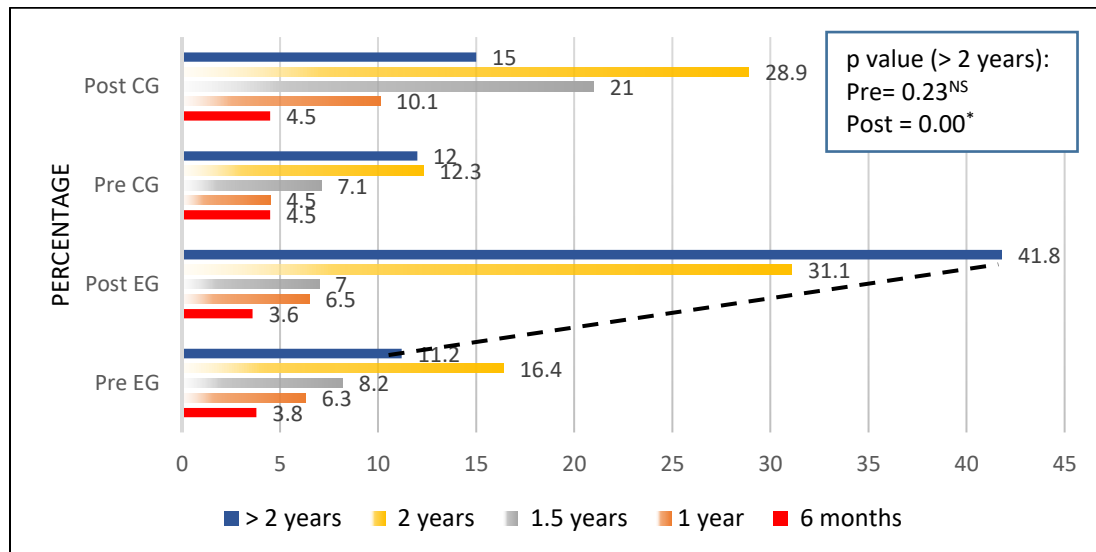^{NS} Non significant

Exclusive Breast-Feeding Practices and Continuation of Breast Feeding

Post intervention, there was improvement in KAP of mothers regarding continued breast feeding till 2 years and beyond, number of respondents for > 2 years in EG significantly (p < 0.00) increased by 30.6 % and but there was only a marginal (0.2 %) decrease in respondents opting to feed only for 6 months. Also, there was significant (p < 0.05) increase seen among respondents opting to continue breast feeding for 2 years in EG group (Figure 4.3.12).

Perception of water feeding before 6 months of age after birth reduced among EG by 11.4% which was statistically significant at 99.9% CI. Among CG group also, there was 9 % significant reduction (p<0.05) observed. There was improvement (p < 0.01) seen in perception of water feeding according to seasonal changed to infants < 6 months.

Significant (p value = 0.000) improvement in perception of top milk feeding before 6 months of age after birth was noted in EG whereas only marginal reduction of 2.3% observed in CG as compared to 19.1 % in EG.

Figure 4.3.12.: Changes in mother's attitude for continuation of breast feeding

* Significant at *p<0.01*
** Significant at p< 0.05
NS Non significant

Figure 4.3.13: Impact of intervention on water feeding practices in infants (< 6 months of age)
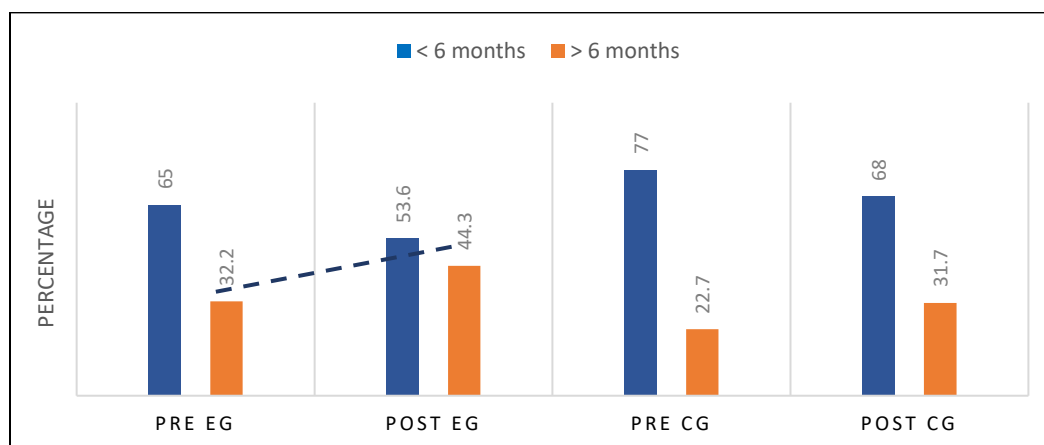

Table 4.3.7.: Changes in Perception of Water Feeding and Top Milk Feeding Practices of Mothers Post Intervention

Responses	Pre-Intervention Experimental		Post-Intervention Experimental		Pre-Intervention Control		Post-Intervention Control	
	n =366				n = 309			
WATER FEEDING	%	n	%	n	%	n	%	n
Appropriate age to initiate water feeding								
• < 6 months	65.0	238	53.6	196	77.0	238	68.0	210
• > 6 months	32.2	118	44.3	162	22.7	70	31.7	98
• Don't remember	2.7	10	2.2	8	0.3	1.0	0.3	1
Chi square	**Pre-Intervention**		**0.01****		**Post Intervention**		**0.00***	
Should water feeding vary according to the season before 6 months age:								
• Yes	83.9	307	60.1	220	92.2	285	75.1	232
• No	14.2	52	38.5	141	6.8	21	23.9	74
• Don't Know	1.9	7	1.4	5	1.0	3	1.0	3
Chi square	**Pre-Intervention**		**0.004****		**Post Intervention**		**0.000***	
Breast milk contains water:								
• Yes	44.0	161	61.7	226	53.1	164	60.2	186
• No	30.3	111	19.7	72	26.2	81	20.4	63
• Don't Know	25.7	94	18.6	68	20.7	64	19.4	60
Chi square	**Pre-Intervention**		**0.60**NS		**Post Intervention**		**0.918**NS	
TOP MILK FEEDING								

Appropriateness of feeding top milk in 1st 6 months								
• Yes	56.8	208	37.7	138	65.4	202	63.1	195
• No	42.9	157	62.3	228	30.1	93	32.4	100
• Don't Know	0.3	1	-	-	4.5	14	4.5	14
Chi square	**Pre-Intervention**			**0.00***	**Post Intervention**			**0.00***
Reason for feeding top milk in 1st 6 months:								
• Child becomes healthy	21.9	80	43.4	159	26.5	82	35.3	109
• Inadequate breast milk	18.3	67	27.0	99	17.2	53	18.4	57
• child learns to eat	1.9	7	0.8	3	4.5	14	3.6	11
• Preparing child to leave breast feeding	5.7	21	5.2	19	7.4	23	25.2	78
• Absence of mother	2.7	10	1.9	7	2.6	8	9.1	28
• Don't Know	4.1	15	1.9	7	4.2	13	1.0	3
• No response	43.2	158	42.6	156	16.2	50	15.5	48
Chi square	**Pre-Intervention**			**0.00***	**Post Intervention**			**0.00***

* Significant at *p<0.01*
** Significant at p< 0.05
NS Non significant

Breast Feeding on Demand and its Adequacy

Among the mothers of EG and CG, the improvement regarding their knowledge about on demand feeding was noted by 4.4% and 16.8 % respectively. The change was statistically significant among EG and CG post intervention at 95 % level of CI. There was reduction in percentage of mothers perceiving hunger or feeding the child at fixed time and increase in on demand feeding seen among both EG as well as CG.

As presented in Table 4.3.8, on assessing the knowledge and perception of mother's regarding use of both breasts during each feeding and offering other breast only after emptying first breast significantly (p < 0.01) improved in EG group.

Table 4.3.8.: Changes in Perception among mothers on Demand Feeding and Adequacy in terms of Quality Feeding Practices Post Intervention

Responses	Pre-Intervention Experimental		Post-Intervention Experimental		Pre-Intervention Control		Post-Intervention Control	
	n = 366				n = 309			
	%	n	%	n	%	n	%	N
When should the child be breast fed								
• when child cries	72.4	265	76.8	281	50.5	156	67.3	208
• some fixed time	12.6	46	5.5	20	26.9	222	36.9	114
• when breast is full	0.3	1	1.4	5	1.6	5	1.6	5
• when you think the child is hungry	10.9	40	2.5	9	14.6	45	12.9	40
• No response	1.1	4	-	-	1.3	4	1.1	3
Chi square (on demand)	**Pre-Intervention**		**0.00****		**Post Intervention**			**0.012****
Appropriate way to breast feed								
• empty one breast first before offering other	14.2	52	55.7	204	15.9	49	19.7	61
• Give little milk from both breasts at each time	84.7	310	44.3	162	83.8	259	79.9	247
Chi square	**Pre-Intervention**		**0.436**^NS		**Post Intervention**			**0.00****

* Significant at *p<0.01*

** Significant at p< 0.05

^NS Non significant

Thus, to summarize the results for impact of PPP, Capacity building and BCC on KAP of mothers related to breast feeding is;

Knowledge among EG V/S CG group increased by;

Initiating BF with 1 hour: 17.5% V/S 11.3%, Decrease in prelacteal feeding: 9.1 % V/S 1.9%, Colostrum feeding: 7.9% V/S 4.9%, continuation of BF above two years: 30.6% V/S 3% and Water feeding after 6th month: 12.1% V/S 9%

On demand feeding among EG post intervention increased by 4.4%

There was a prevalent misconception pre intervention of feeding some amount from each breast during every nursing episode which drastically decreased by 40.4% among EG

B. Complementary Feeding

Age of Introduction of Complementary Food (CF)

Pre and post capacity building, the knowledge of mothers of children under 5 years were assessed on aspects; age of initiation of CF, perceived reasons & benefits of CF, harmful effects of not initiating CF post 6th month of age and special foods prepared specially for CF.

As presented in figure 4.3.14, 56.5% (83.1 % V/S 29.5%, p < 0.01) mothers perceived the initiation of CF should start post 6th month among EG whereas, among CG, there was increase by 25% which was also found to be statistically significant at 99% CI. It was also noted that the training through NHE imparted increased the perception to initiate CF in the 6th month by 11.8% among EG group. Majority (83.3% (EG) and 84.5% (CG)) perceived **"grown up child"** and 89% (EG) perceived "**Increase in requirements**" as the major reasons to initiate CF. Most important benefit of initiating CF was reported to be better health of the child (92.6% and 89.6%) among EG and CG respectively. Overall, it was seen that the knowledge and perception increased among both EG and EG participants, the increase in EG being more in terms of percentage but it was found to be statistically non-significant (p > 0.05).

As observed in Table 3.3.9, an increase of 30.3% (81.7% V/S 51.4%) was observed in EG group as compared to 21% increase among CG group in terms of preparing special feeds as CF for the child. The increase was non-significant and can be

attributed to a shift in age group post intervention leading to increased number of participants being in the weaning age.

Figure 4.3.14: Impact of intervention on initiation of complementary feeding
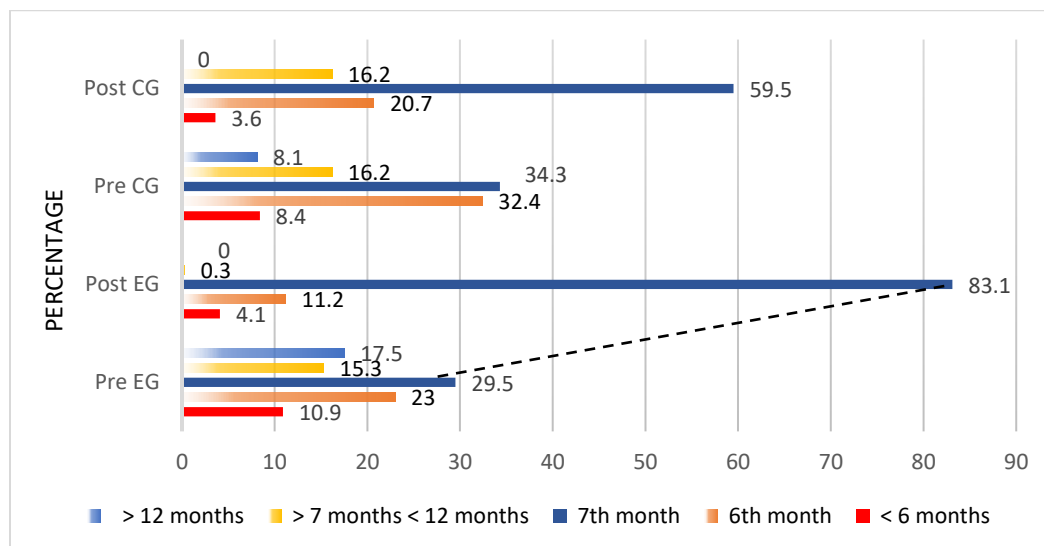

Table 4.3.9: Changes in Perception of Mothers Regarding Complementary Feeding Practices Post Intervention

Responses	Pre-Intervention Experimental		Post-Intervention Experimental		Pre-Intervention Control		Post-Intervention Control	
	n = 366				n = 309			
COMPLEMENTARY FEDDING	%	n	%	n	%	n	%	n
Do you feed anything else to your child except breast milk after 6 months of age?								
• Yes	96.2	352	98.1	359	99.0	306	99.4	307
• No	2.7	10	1.6	6	1.0	3	0.6	2
• No response	1.1	04	0.3	1	-	-	-	-
Chi square	**Pre-Intervention**		**0.045**[**]		**Post Intervention**		**0.323**[NS]	

	Pre-Intervention				Post Intervention			
Initiation of CF								
• < 6 months	10.9	40	4.1	15	8.4	26	3.6	11
• 6th month	23.0	84	11.2	41	32.4	100	20.7	64
• 7th month	29.5	108	83.1	304	34.3	106	59.5	184
• > 7 months < 12 months	15.3	56	0.3	1	16.2	50	16.2	50
• > 12 months	17.5	64	-	-	8.1	25	-	-
• Don't remember/Don't know	3.8	14	1.4	5	0.6	2	-	-
Chi square	**Pre-Intervention**			**0.00***	**Post Intervention**			**0.00***
Reason for initiating CF								
• Perceived breast milk insufficiency	16.9	62	7.7	28	20.1	62	12.9	40
• Child cries a lot	10.7	39	4.9	18	12.3	38	8.7	27
• Child is grown up now	64.8	237	83.3	305	78.0	241	84.5	261
• Eruption of teeth	3.0	11	2.2	8	1.9	6	2.6	8
• Child started sitting/walking	3.8	14	1.9	7	2.3	7	1.3	4
• child is not growing well	4.1	15	43.7	160	3.2	10	1.6	5
• absence of mother	1.9	7	1.6	6	0.6	2	3.2	10
• preparing child to leave breast milk	3.3	12	3.6	13	5.2	16	3.2	10
• child's requirements increase	3.3	12	89.5	364	3.2	10	16.5	51
• Don't Know	3.8	14	-	-	-	-	-	-
Benefits of feeding CF								
• Child remains healthy	79.8	292	92.6	339	91.9	284	89.0	275
• child becomes playful	25.4	93	44.3	162	26.5	82	32.0	99
• child sleeps well	2.7	10	22.1	81	9.4	29	16.2	50
	4.6	17	26.5	97	10.4	32	17.2	53

• child does not fall ill	11.2	41	-	-	9.1	28	5.2	16
• Don't Know	3.3	12	-	-	10.4	32	-	-
• No response								
Special foods prepared as CF for the child								
• Yes	51.4	188	81.7	299	58.3	180	81.2	251
• No	45.4	166	18.3	67	40.5	125	18.8	58
• No response	3.3	12	-	-	1.3	4	-	-
Chi square	**Pre-Intervention**		0.07^{NS}	**Post Intervention**			0.87^{NS}
Harmful effects of not feeding CF beyond 6 months								
• Child would become ill	41.0	150	56.0	205	61.8	191	77.0	238
• child would become malnourished	43.4	159	89.6	328	53.1	164	71.8	222
• Don't know	30.1	110	-	-	13.6	42	7.4	23
Chi square	**Pre-Intervention**		0.00*	**Post Intervention**			0.00*

* Significant at *p<0.01*

** Significant at p< 0.05

^{NS} Non significant

Active Feeding

The knowledge of mothers on active feeding practice showed an increase in encouraging the child to eat by 71.6% (83.1 V/S 11.5%) in EG and 44 % in CG group and an increase of 16.7 % (98 V/S 81.3%) EG and 9 % (73.5% V/S 64.3%) in CG in terms of feeding on demand. Also practice of feeding the child with the family increased by 3.4% in EG whereas there was a decrease seen in CG group by 1.3% which was statistically significant at $p < 0.01$ (Table 4.3.10)

Sanitation and hygiene practices in terms of hand washing before meal preparation showed significant (p<0.01) increase among EG participants by 27.3%.

Table 4.3.10: Changes in Perception of Mothers Regarding Active Feeding

Responses	Pre-Intervention Experimental		Post-Intervention Experimental		Pre-Intervention Control		Post-Intervention Control	
	n = 366				n = 309			
	%	n	%	n	%	n	%	n
Feeding behaviours								
• Force him/her to eat	25.7	94	9.3	34	25.2	78	-	-
• Encourage the child to finish the meal	11.5	42	83.1	304	22.7	70	68.6	212
• feed the child on demand	81.3	296	98	360	64.3	199	73.5	227
• Give food and leave him alone to finish	14.5	53	-	-	11.3	35	4.5	14
Child eats with family?								
• Yes	68.9	252	72.4	265	64.7	200	63.4	196
• No	17.8	65	7.7	28	20.1	62	12.9	40
• Sometimes	8.2	30	17.5	64	13.3	41	23.6	73
• No response	5.2	19	2.5	9	1.9	06	-	-
Chi square	**Pre-Intervention**		**0.021****		**Post Intervention**		**0.001***	
Child is fed in:								
• Family member's plate	13.9	51	4.4	16	23.9	74	15.2	47
• Separate vessel	82.2	301	94.5	346	74.1	229	84.8	262
• No response	3.8	14	1.1	4	1.9	6	-	-
Chi square	**Pre-Intervention**		**0.002***		**Post Intervention**		**0.000***	
Hygiene and Sanitation								
Do you always wash your hands before preparing food for the child								
• Yes, Always	51.1	187	78.4	287	46.3	143	63.1	195
• No	33.9	124	0.3	1	37.5	116	25.2	78
• Yes, sometimes	15.0	55	21.3	78	16.2	50	11.7	36
Chi square	**Pre-Intervention**		**0.456**NS		**Post Intervention**		**0.000***	

* Significant at *p<0.01*

** Significant at p< 0.05

NS Non significant

Thus, for impact of intervention on KAP of mothers related to CF is;

Attitude towards initiating complementary feeding after 6th month improved among EG mothers by 53.6% V/S 25.2% among CG mothers

Benefits of initiating CF was majorly perceived as 'child remaining healthy whereas other benefits were very poorly perceived. Post capacity building, the awareness of other benefits among EG mothers increased by 7 – 10%

Awareness regarding harmful effects of not initiating CF timely increased 15 to 40% respectively with respect to 'child falling ill' and 'child becoming malnourished'

Attitude of EG mothers towards encouraging the child to finish the meal increased by 71.6%

Hand washing practices improved among EG mothers by 27.3% as compared to 16.8% CG mothers.

C.   Feeding During and After Illness

Table 4.3.11: Changes in Feeding Practices during and After Illness Post Intervention

Responses	Pre-Intervention Experimental		Post-Intervention Experimental		Pre-Intervention Control		Post-Intervention Control	
	n = 366				n = 309			
	%	n	%	n	%	n	%	n
Feeding behaviors								
• **Force him/her to eat**	25.7	94	9.3	34	25.2	78	-	-
• **Encourage the child to finish the meal**	11.5	42	83.1	304	22.7	70	68.6	212
• **feed the child on demand**	81.3	296	98	360	64.3	199	73.5	227
• **Give food and leave him alone to finish**	14.5	53	-	-	11.3	35	4.5	14
Child eats with family?								
• **Yes**	68.9	252	72.4	265	64.7	200	63.4	196
• **No**	17.8	65	7.7	28	20.1	62	12.9	40
• **Sometimes**	8.2	30	17.5	64	13.3	41	23.6	73
• **No response**	5.2	19	2.5	9	1.9	06	-	-

Chi square	Pre-Intervention			0.021**	Post Intervention			0.001*
Child is fed in:								
• Family member's plate	13.9	51	4.4	16	23.9	74	15.2	47
• Separate vessel	82.2	301	94.5	346	74.1	229	84.8	262
• No response	3.8	14	1.1	4	1.9	6	-	-
Chi square	Pre-Intervention			0.002*	Post Intervention			0.000*
Hygiene and Sanitation								
Do you always wash your hands before preparing food for the child								
• Yes, Always	51.1	187	78.4	287	46.3	143	63.1	195
• No	33.9	124	0.3	1	37.5	116	25.2	78
• Yes, sometimes	15.0	55	21.3	78	16.2	50	11.7	36
Chi square	Pre-Intervention			0.456NS	Post Intervention			0.000*

Table 4.3.12: Impact of Intervention on Knowledge, Attitude and Practices regarding IYCN of mothers in Experimental Group

Criteria		Mean	SD	t	Df	Sig (2 tailed)
Initiation of breast feeding with 1 hour of birth	Pre	3.24	12.41	2.10	365	0.036
	Post	2.45	10.19			
Prelacteal feeding	Pre	2.24	7.196	1.875	365	0.062
	Post	1.80	0.402			
Colostrum feeding	Pre	2.33	10.185	2.135	365	0.033
	Post	1.19	0.389			
Appropriateness of water feeding in <6 months after birth	Pre	4.00	15.951	1.101	365	0.271
	Post	3.58	14.291			
Appropriateness of top milk feeding in <6 months after birth	Pre	1.70	5.12	0.276	365	0.783
	Post	1.62	0.485			
Initiation of CF	Pre	3.17	1.356	1.66	365	0.097
	Post	4.12	11.192			
On demand feeding	Pre	2.87	12.43	2.302	365	0.022
	Post	1.50	5.12			
Active feeding	Pre	5.07	17.32	4.295	365	0.000

	Post	1.17	0.37			
Hand washing before feeding	Pre	1.64	0.730	4.334	365	0.000
	Post	1.43	0.820			

Assessing Impact of Public Private Partnership on Nutritional Status of Children Under 5 Years of Age under ICDS

This section addresses the following specific objectives of the study,

To assess the impact of Public Private Partnership (PPP) on nutritional status of children under five years of age

To identify the most effective intervention in improving nutritional status of children under five years of age

Table 4.3.13: Overview of the Intervention Activities under PPP to Improve Nutritional Status of Children Under 5 Years of Age

Activities	Type of Sessions	No. of Sessions	Remarks
Milk Supplementation	Individual (200 ml/day)	18 months (all working days)	Distributed by Rotary club under PPP model
Pediatrician's Visit and Follow up	Individual	10 Sessions/ AWC	Pediatrician RI members undertook this responsibility under PPP
Goodies Distribution (Uniforms, books and other stationary and toys)	Individual For AWC	One time	Carried out successfully by Rotarian Anns
Birthday/anniversary celebration and	Group	>20 sessions/ AWC	

festival celebrations at adopted AWC			
Distribution of food items voluntarily	Individual	-	NGO

Compliance to Interventions under the PPP Model

A separate attendance register was maintained to record the attendance of children beneficiaries and/or their mothers on the day of the intervention activities. The compliance was recorded for the following intervention activities; additional milk supplementation, pediatrician's visit and NHE sessions. Figure 4.3.15 and 4.3.16 shows the AWC wise proportion of compliance to interventions and ranking of the AWCs based on percentage reduction in WAZ, HAZ and WHZ.

The compliance to additional milk supplementation intervention was maximum ranging from 78% to 86% across all the AWCs. Anganwadi coded 7 had highest compliance whereas AWC 1 had lowest compliance. It was noted that AWC 7 showed maximum reduction in WHZ scores whereas AWC 1 showed second highest reduction in WHZ scores.

The mother's compliance to NHE sessions under PPP ranged from 54% to 71% across ten intervention AWCs. The highest compliance was seen in AWC coded 5 and 10 whereas lowest was seen in the AWC coded 4. It was seen that AWC 4 which had lowest attendance in NHE sessions also ranked low across all malnutrition indicators in terms of stunting, wasting and underweight.

Figure 4.3.15: Proportion of mother-child compliance to interventions in experimental group - Anganwadi Center wise
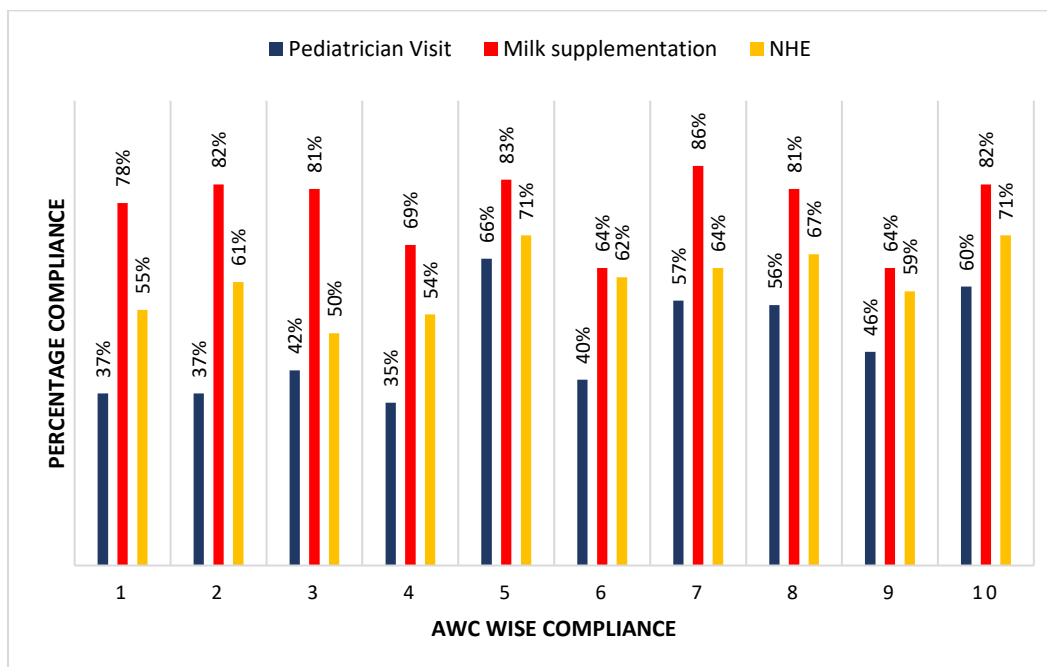
Figure 4.3.16: Ranking of the anganwadi centers based on percentage reductions in WAZ, WHZ and HAZ scores
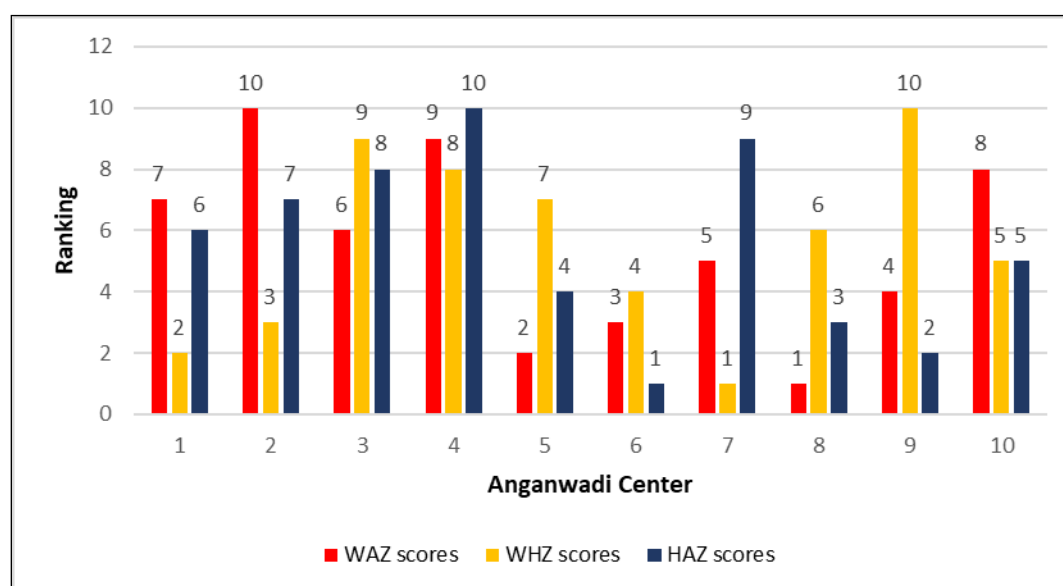
Compliance to pediatrician's visit and them attending to the enrolled children in the intervention group was measured based on these beneficiaries availing the health check-up services. The findings showed that the attendance ranged from 35% to 66%. The lowest compliance was found in AWC coded 4 whereas the highest compliance was seen in AWC coded 5 which also ranked 2nd in reduction in underweight.

The following section presents the research findings of the impact of PPP model implementation under following heads:

1.Impact of PPP Intervention on Nutritional Status of children 0 – 60 months of age
2.Impact of PPP Intervention on Morbidity Profile of children 0 – 60 months of age
3.Impact of PPP Intervention on Immunization Status of children 0 – 60 months of age
4.Intervention and Model efficacy and effect on Nutritional Status of children 0 - 60 months of age

Impact of PPP Intervention on Nutritional Status of Children 0 – 60 Months of Age

Changes in Underweight (Weight for Age) Status of Children 0 – 60 Months Post Intervention

Post intervention, there was a decline of 9.8% in the rates of underweight among EG as compared to increase in underweight observed in CG by 0.7%. Though there was an increase in mild underweight among EG by 5.5% and decrease of 2% in CG, there was a reduction seen among moderate (8.2%) and severe (7.6) underweight rates in EG and a slight increase by 3.6% and 0.9% moderate and severe underweight rates respectively among CG (Figure 3.3.17). Although there was a slight negative shift in the total sample mean among EG post intervention (Figure 3.3.15), there was a reduction observed in the sample means of underweight (<-2 SD) by 0.4 among EG whereas an increase of 0.12 in mean value of underweight (< - 2 SD) among CG post intervention. The paired difference of mean

within EG and CG post intervention were both found to be statistically with p< 0.01 (Table 3.3.14).

Figure 4.3.17: Underweight Status of Experimental and Control Group Pre and Post Intervention
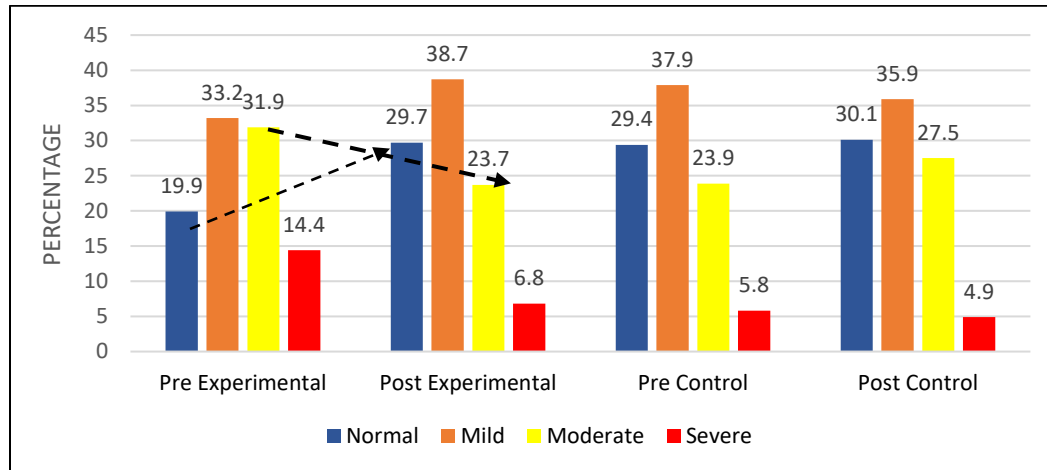
Figure 4.3.18: Shift in the Underweight Curve Post Intervention Compared to Standard WHO Curve of Experimental Group Children (0-60 Months)
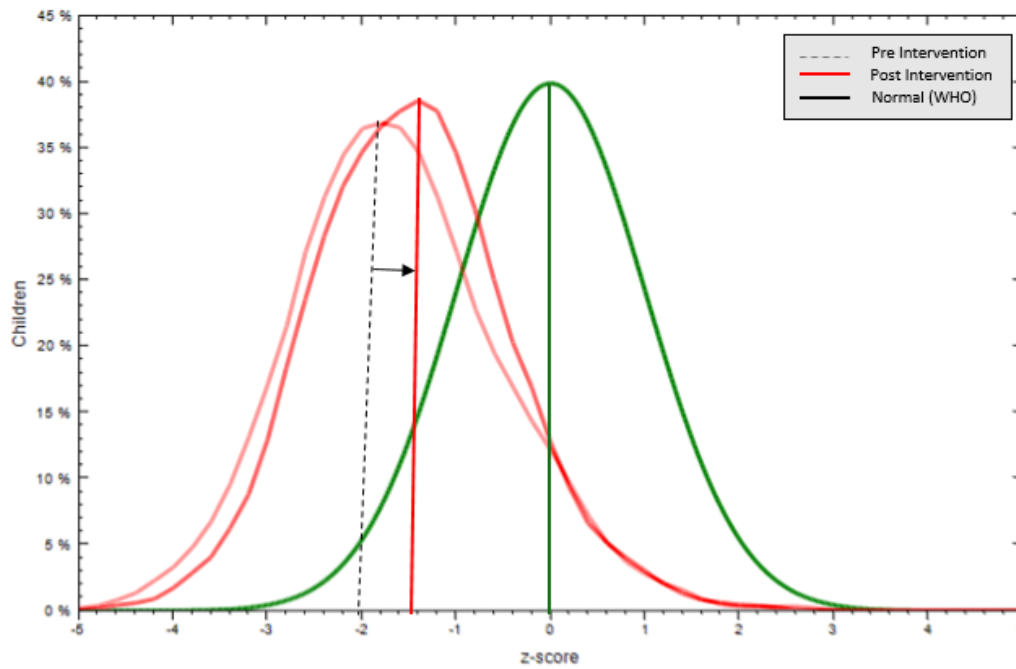
Impact of PPP intervention on underweight (WAZ) status of children 0-23 months and 24- 60 months

The present study included 162 and 122 children from 0-23 months in Experimental Group (EG) and Control Group (CG) respectively and number of participants from age group 24 – 60 months were 205 (EG) and 187 (CG).

Table 4.3.14 and Figures 4.3.17-4.3.20 shows the categories of the nutritional status (Z – Scores) before and after intervention across study groups, age and gender. The percentage reduction in underweight was seen across both the age groups viz. 0-23 months and 24-60 months. The percentage reduction in EG in underweight (<- 2 SD) was 13.14 % and 11.25 % among boys and girls of 0-23 months age group respectively whereas reduction in age group 24-60 months among EG participants was 15.1% and 22.22% boys and girls respectively.

Table: 4.3.14: Proportion (%) of children in underweight category pre and post intervention by study groups and gender

Weight-for-age Z score	Experimental Group		Control Group	
	Pre	Post	Pre	Post
Boys (0-23 m)	N = 82		N = 55	
Normal (+1 to -1 SD)	18.29	34.14	41.81	50.9
Mild underweight (-1 to -2 SD)	41.46	37.8	29.09	21.81
Moderate underweight (-2 to -3 SD)	30.48	18.29	21.81	25.45
Severe underweight (<-3 SD)	9.75	8.53	1.81	0
Girls (0-23 m)	N = 80		N = 67	
Normal (+1 to -1 SD)	30	38.75	4.47	40.29
Mild underweight (-1 to -2 SD)	32.5	33.75	31.34	29.85
Moderate underweight (-2 to -3 SD)	26.25	16.25	14.92	25.37
Severe underweight (<-3 SD)	8.75	7.5	4.47	1.49
Boys (24-60 m)	N = 106		N = 86	
Normal (+1 to -1 SD)	12.26	23.58	25.58	22.09
Mild underweight (-1 to -2 SD)	33.96	37.73	45.34	43.02
Moderate underweight (-2 to -3 SD)	39.62	31.13	24.41	27.9
Severe underweight (<-3 SD)	14.15	7.54	4.65	6.97
Girls (24-60 m)	N = 99		N = 101	
Normal (+1 to -1 SD)	21.21	25.25	15.84	18.81

Mild underweight (-1 to -2 SD)	26.26	44.44	40.59	41.58
Moderate underweight (-2 to -3 SD)	29.29	26.26	30.69	29.7
Severe underweight (<-3 SD)	23.23	4.04	9.9	7.92

Figure 4.3.19: Underweight Status of Experimental and Control Group Pre and Post Intervention (0 – 23 months Boys)
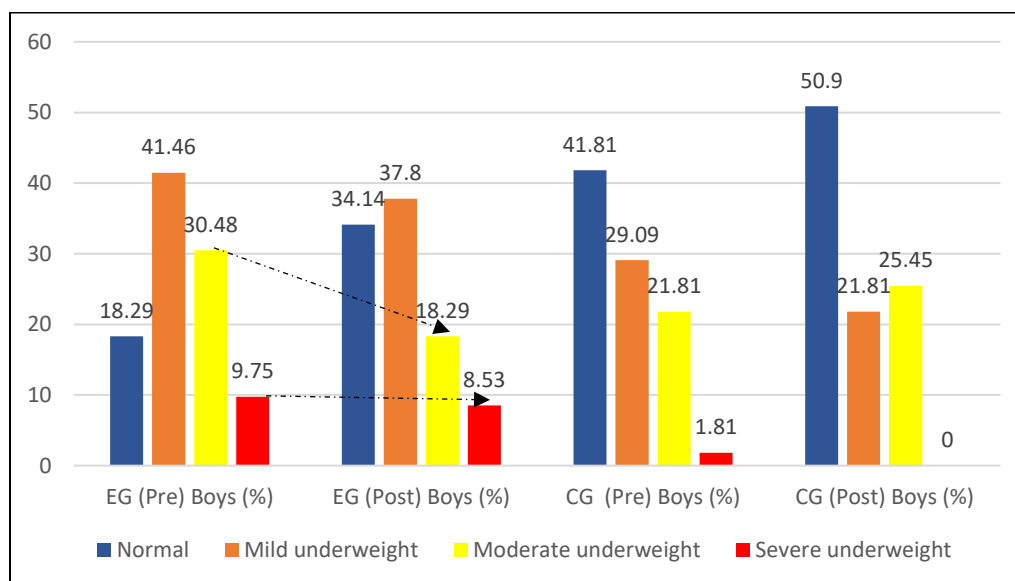
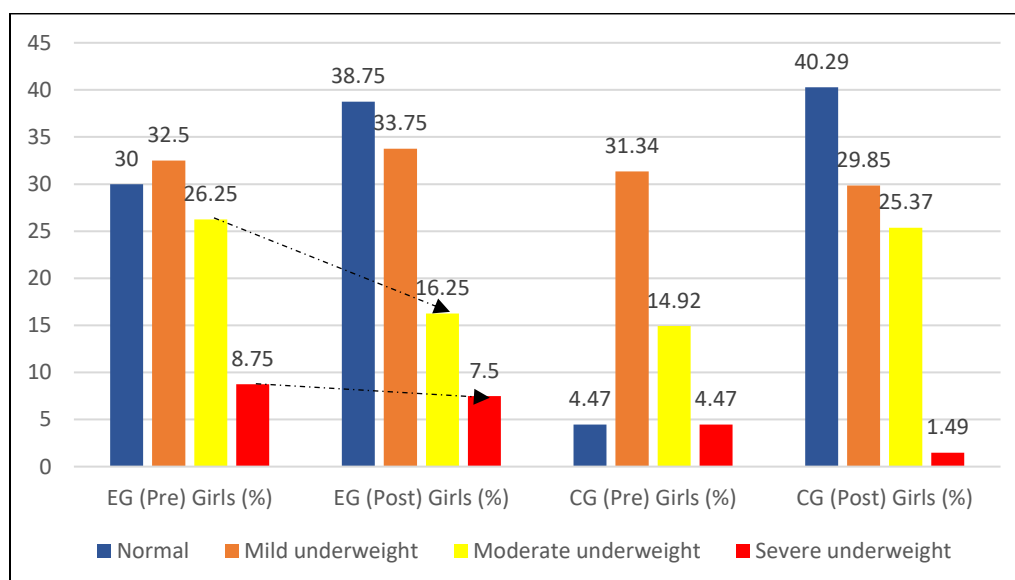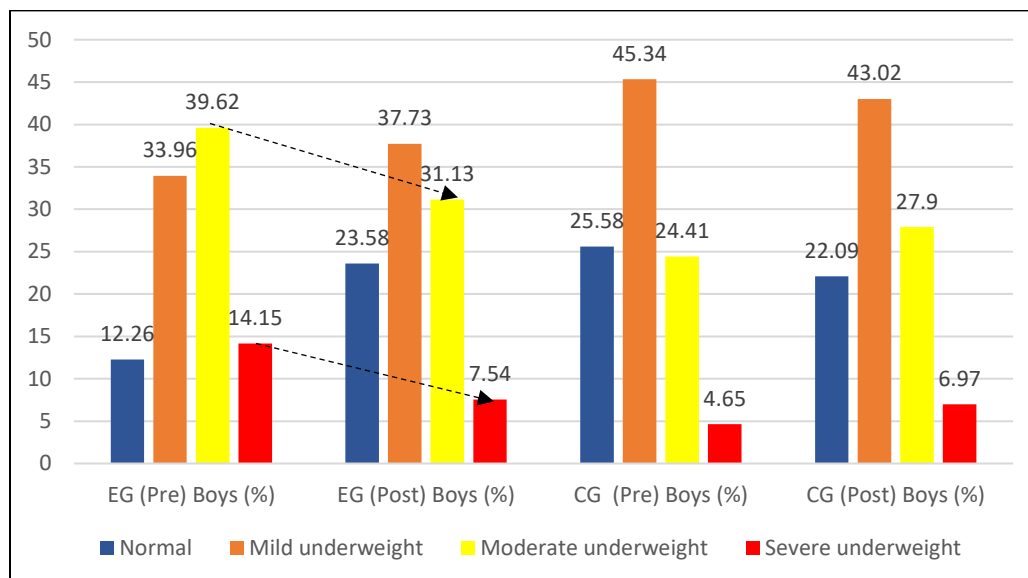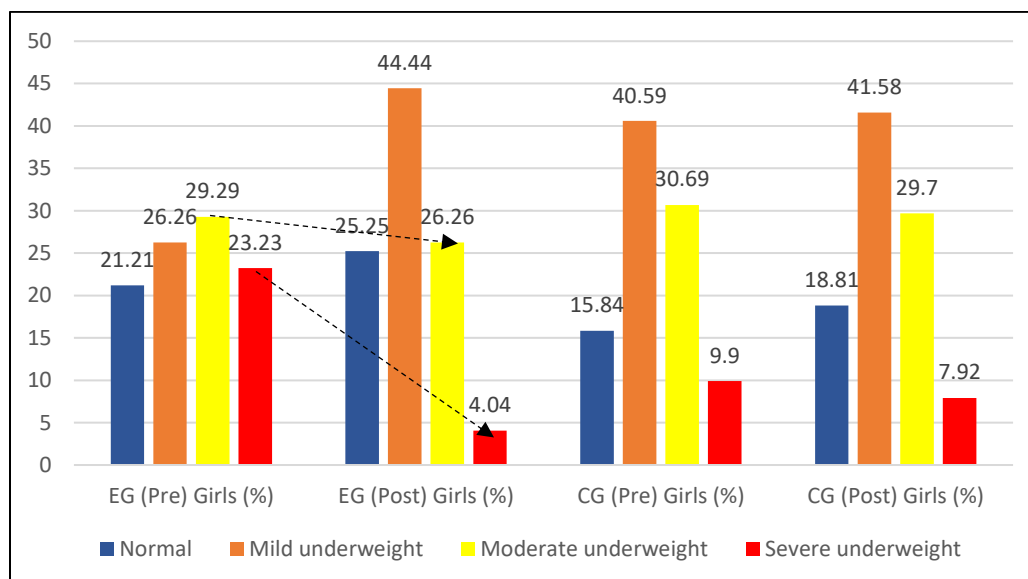**Figure 4.3.20: Underweight Status of Experimental and Control Group Pre and Post Intervention (0 – 23 months Girls)**

Figure 4.3.21: Underweight Status of Experimental and Control Group Pre and Post Intervention (24 - 60 months Boys)

Figure 4.3.22: Underweight Status of Experimental and Control Children Pre and Post Intervention (24 - 60 months Girls)

Table: 4.3.15: Intervention impact in terms of Absolute change in proportion of underweight (WAZ) category by age and gender

Age Groups	Experimental Group						Control Group					
	< - 2 SD (%)		< - 3 SD (%)		Absolute Change (%) < - 2 SD	Absolute Change (%) < - 3 SD	< - 2 SD (%)		< - 3 SD (%)		Absolute Change (%) < - 2 SD	Absolute Change (%) < - 3 SD
	Pre	Post	Pre	Post			Pre	Post	Pre	Post		
Boys: 12-23 months [n = E(23); C(20)]	17.39	13.04	0.00	4.30	4.34	-4.3	15.00	10.00	5.00	0.00	5.0	5.0
Girls: 12-23 months [n = E(26); C(22)]	23.07	11.53	3.80	7.69	11.54	- 3.89	0.00	18.18	13.63	4.54	-18.18	9.09
Boys: 24-35 months [n = E(58); C(32)]	36.2	20.68	12.06	8.62	15.52	3.44	21.87	31.25	0.00	0.00	-9.38	0.00
Girls: 24-35 months [n = E(54); C(43)]	27.77	18.51	11.11	7.40	9.26	3.71	23.25	30.23	0.00	0.00	-6.98	0.00
Boys: 36-60 months [n = E(107); C(90)]	41.12	30.84	14.95	8.41	10.28	6.54	25.55	30.00	4.44	6.66	-4.45	-2.22
Girls: 36 – 60 months [n = E(99); C(102)]	30.30	26.26	23.23	4.04	4.04	19.19	30.39	29.41	9.80	7.84	0.98	1.96

Table 4.3.15 shows the categories of nutritional status WAZ – scores (< - SD and < - 3 SD) before and after the intervention by age and gender across experimental group and control group and the absolute changes observed in both the groups. It was seen that the age group 24-35 months and 36 – 60 months showed notable improvement in terms of absolute changes in proportion. Girls responded better as compared to boys and there was a positive shift noted from <-2 SD category to > - 2 SD category. Six male participants and nineteen female participants made a shift from <-3SD to <- 2 SD in 36-60 months age group whereas two male child and 2 female child showed improvement and shifted from severe underweight category to moderate underweight category.

Changes in Stunting (Height for Age) Status of Children 0 – 60 Months Post Intervention

The Figure 4.3.23 shows that there was an overall decrease by 12% in the rates of stunting (< - 2 SD) in EG group whereas there was a slight (0.3%) increase observed in CG. There was also significant ($p < 0.05$) reduction in severe stunting which was 4.9% among EG as compared to an increase of 0.3% in CG (Figure 4.3.23). The bell curve compares the standard mean with the pre and post intervention means among EG (Figure 4.3.24) which shows reduction in the mean post intervention.

The paired mean difference (Table 4.3.17) was found to be statistically significant at 99% CI among EG and 95% CI among CG.

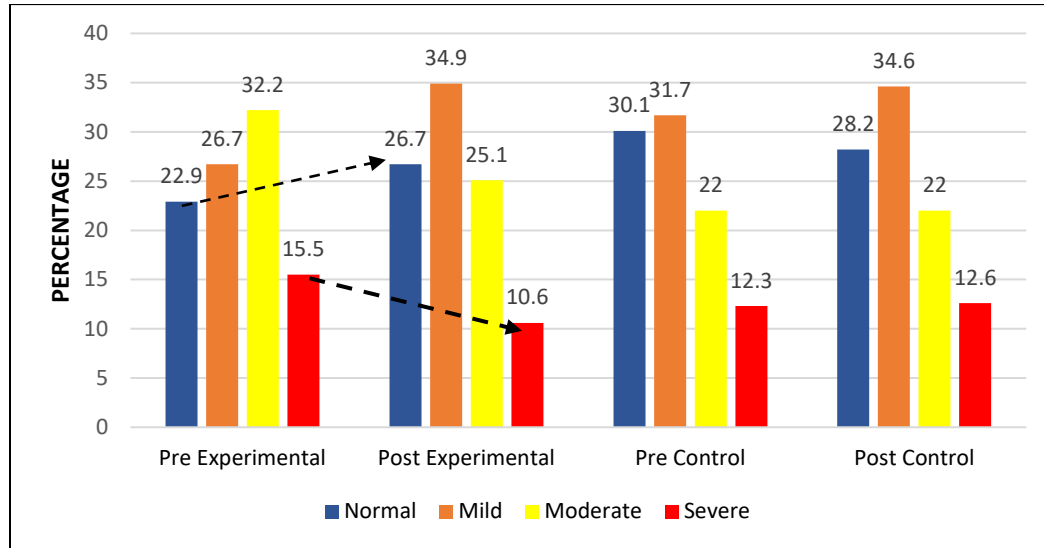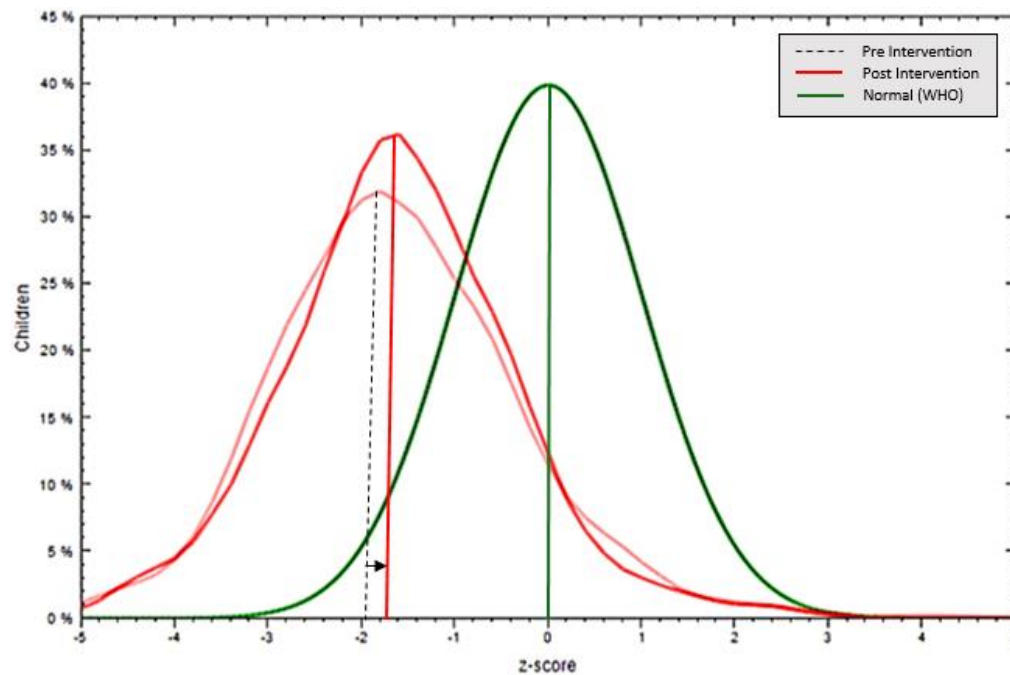**Figure 4.3.23: Stunting Status of Experimental and Control Group Pre and Post Intervention**

Figure 4.3.24.: Shift in the Stunting Curve Post Intervention Compared to Standard Curve of Experimental Group Children (0-60 Months)

Impact of PPP intervention on stunting (HAZ) status of children 0-23 months and 24-60 months

This section presents the disintegrated results of PPP intervention on stunting on two age groups, i. e. 0-23 months and 24-60 months children. Table 4.3.16 and Figures 4.3.25 - 4.3.28 shows the stunting category of the nutritional status (HAZ – Scores) before and after intervention across study groups, age and gender. As regards, the percentage of stunted boys and girls respectively from EG was 45.11% (0-23 m); 55.65% (24-60 m) and 36.25% (0-23 m); 50.50% (24-60 m) before the intervention compared to 37.74% (0-23 m); 37.73% (24-60 m) and 33.75% (0-23 m); 33.33% (24-60 m) after intervention. The percentage reduction in stunting was seen across both the age groups from EG viz. 0-23 months and 24-60 months. The percentage reduction in EG in stunting (<- 2 SD) was 7.37 % and 2.5 % among boys and girls of 0-23 months age group respectively whereas reduction in age group 24-60 months among EG participants was 17.92% and 17.17% boys and girls respectively. In the CG, there was an increase in the rates of stunting among 0-23 m age group across both genders whereas it was recorded that 24-60 m age children showed reduction across both the genders in CG.

Table: 4.3.16: Proportion (%) of children in stunting category pre and post intervention by study groups and gender

Height-for-age Z score	Experimental Group		Control Group	
	Pre	Post	Pre	Post
Boys (0-23 m)	N = 82		N = 55	
Normal (+1 to -1 SD)	28.04	20.73	34.54	27.27
Mild stunting (-1 to -2 SD)	24.39	37.8	27.27	32.72
Moderate stunting (-2 to -3 SD)	31.7	28.04	21.81	21.81
Severe stunting (<-3 SD)	13.41	9.7	10.9	12.72
Girls (0-23 m)	N = 80		N = 67	
Normal (+1 to -1 SD)	33.75	17.5	37.31	26.86
Mild stunting (-1 to -2 SD)	25	43.75	28.35	35.82
Moderate stunting (-2 to -3 SD)	23.75	23.75	17.91	20.89
Severe stunting (<-3 SD)	12.5	10	10.44	13.43
Boys (24-60 m)	N = 106		N = 86	
Normal (+1 to -1 SD)	15.09	31.13	25.58	36.04

Mild stunting (-1 to -2 SD)	27.35	29.24	33.72	27.9
Moderate stunting (-2 to -3 SD)	39.62	26.41	25.58	24.41
Severe stunting (<-3 SD)	16.03	11.32	10.46	9.3
Girls (24-60 m)	N = 99		N = 101	
Normal (+1 to -1 SD)	18.18	34.34	26.73	22.77
Mild stunting (-1 to -2 SD)	29.29	31.31	34.65	40.59
Moderate stunting (-2 to -3 SD)	31.31	22.22	21.78	20.79
Severe stunting (<-3 SD)	19.19	11.11	15.84	14.85

Figure 4.3.25: Stunting Status of Experimental and Control Group Pre and Post Intervention (0 - 23 months Boys)
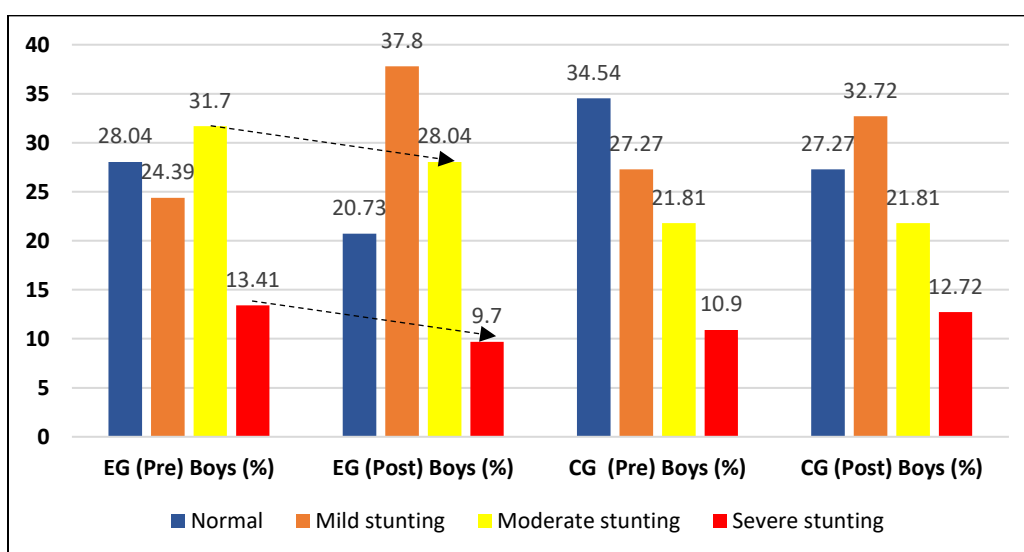
Figure 4.3.26: Stunting Status of Experimental and Control Group Pre and Post Intervention (0 - 23 months Girls)
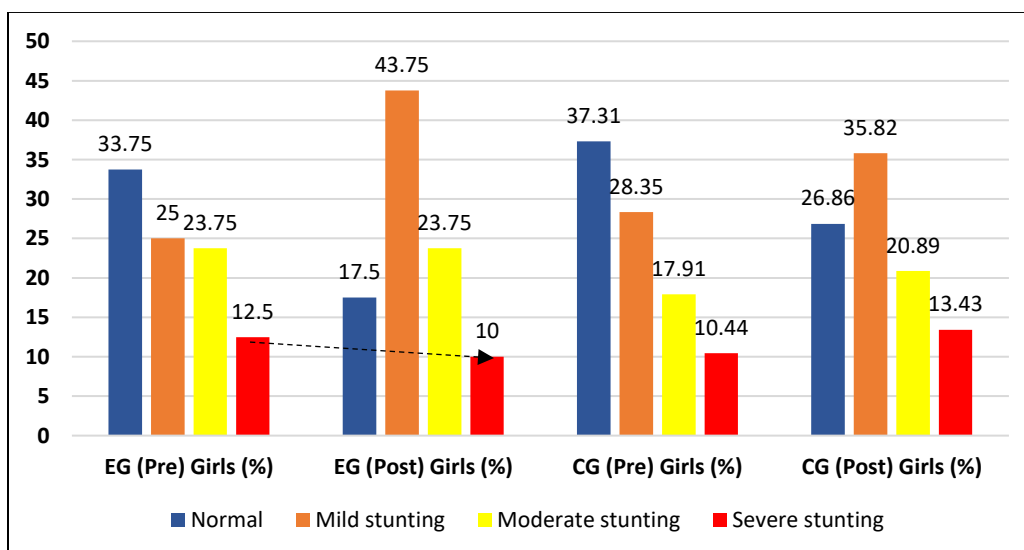
Figure 4.3.27: Stunting Status of Experimental and Control Children Pre and Post Intervention (24 - 60 months Boys)
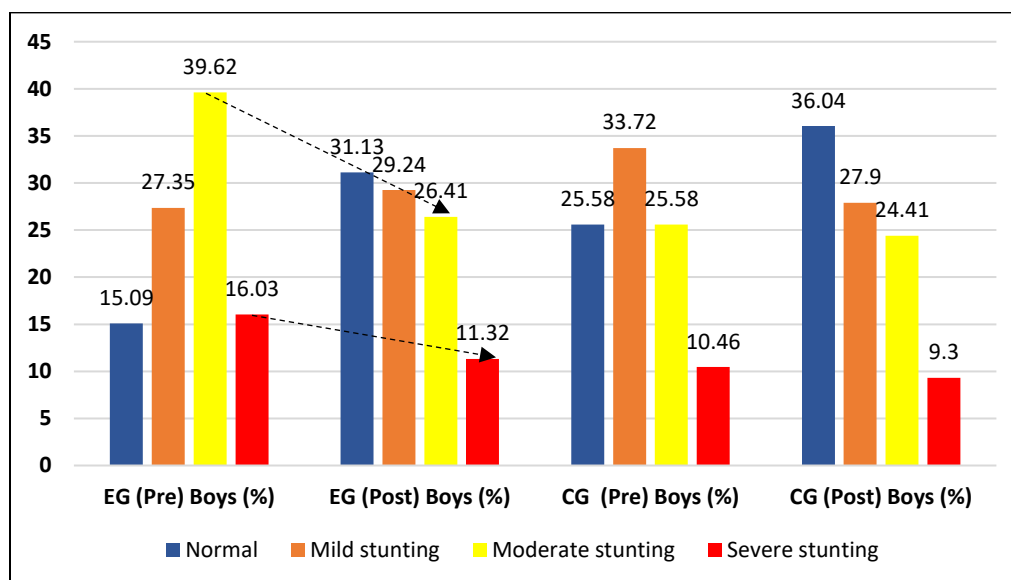
Figure 4.3.28: Stunting Status of Experimental and Control Children Pre and Post Intervention (24 - 60 months Girls)
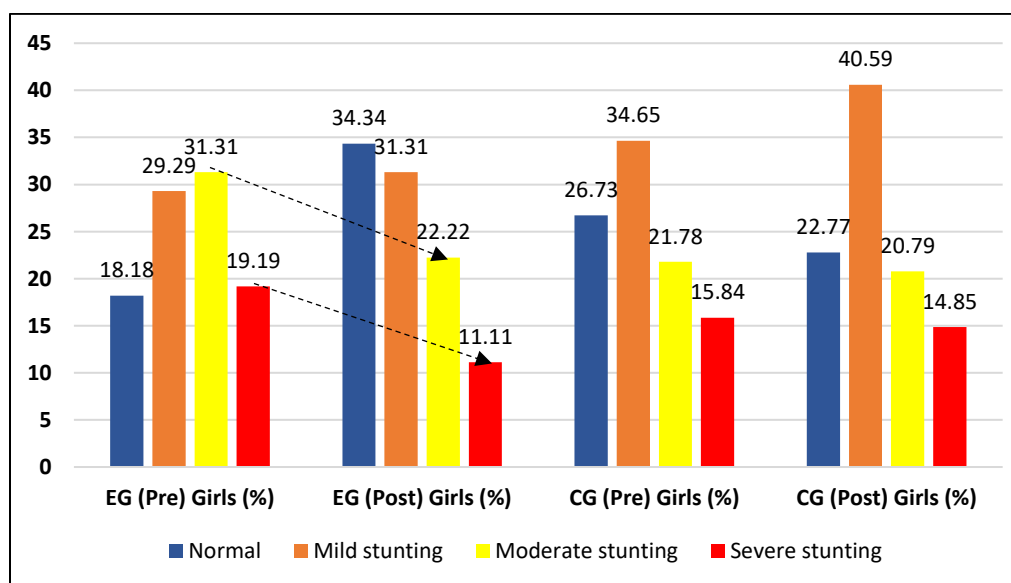
Table: 4.3.17: Intervention impact in terms of Absolute change in proportion of Stunting (HAZ) category by age and gender

Age Groups	Experimental Group						Control Group					
	< - 2 SD (%)		< - 3 SD (%)		Absolute Change (%) < - 2 SD	Absolute Change (%) < - 3 SD	< - 2 SD (%)		< - 3 SD (%)		Absolute Change (%) < - 2 SD	Absolute Change (%) < - 3 SD
	Pre	Post	Pre	Post			Pre	Post	Pre	Post		
Boys: 12-23 months [n = E(23); C(20)]	30.43	30.43	0.00	4.34	0.0	- 4.3	15.0	15.0	25.0	25.0	0.0	0.0
Girls: 12-23 months [n = E(26); C(22)]	7.69	19.23	3.84	11.53	-11.54	-7.69	13.63	27.27	4.54	13.63	-13.64	-9.09
Boys: 24-35 months [n = E(58); C(32)]	32.75	31.03	17.24	10.34	1.72	6.9	25.0	25.0	3.12	6.25	0.0	3.12
Girls: 24-35 months [n = E(54); C(43)]	31.58	25.92	16.66	9.25	5.66	7.41	18.60	16.27	13.95	13.95	2.33	0.0
Boys: 36-60 months [n = E(107); C(90)]	40.18	27.10	16.82	12.14	13.08	4.68	25.55	25.55	10.00	8.88	0.0	1.12
Girls: 36 – 60 months [n = E(99); C(102)]	31.31	23.23	19.19	11.11	8.08	8.08	22.54	21.56	15.68	14.70	0.98	0.98

Table 4.3.17 shows the categories of nutritional status HAZ – scores (< - 2 SD and < - 3 SD) before and after the intervention by age and gender across experimental group and control group and the absolute changes observed in both the groups. It was observed that among participants of both the groups, age group between 6 months to 23 months showed negative changes in moderate and severe stunting whereas as the children aged, the notable changes were seen in participants shifting from severe to moderate stunting category and from moderate to mild or normal category. Absolute change in experimental group was higher as compared to control group. Female participants showed better improvements as compared to male participants. Among the participants belonging to the age group between 36 – 60 months, 5 male children and 8 female children showed a positive shift from severe stunted category to moderately stunted category and 13% boys and 8% girls shifted from moderate category to mildly stunted category whereas only 1.12% boys and 0.98% severely stunted girls showed improvement in control group.

Changes in Wasting (Weight for Height) Status of Children 0 – 60 Months Post Intervention

Figure 4.3.29 shows the change prevalence of wasting (< - 2 SD) in EG and CG. Post intervention, the wasting (WHZ < - 2SD) children decreased significantly (p< 0.001) in EG by 9.6% as compared to an increase in CG by 3.6%. Severe stunting reduced in EG by 1.9% and there was a positive shift observed in the total sample mean in EG post intervention (Figure 4.3.30).

There was also a significant difference (p< 0.01) in paired sample means with t value -7.89 in EG and a significant increase observed in CG at 95 % CI (Table 4.3.18).

Figure 4.3.29.: Wasting Status of Experimental and Control Group Pre and Post Intervention
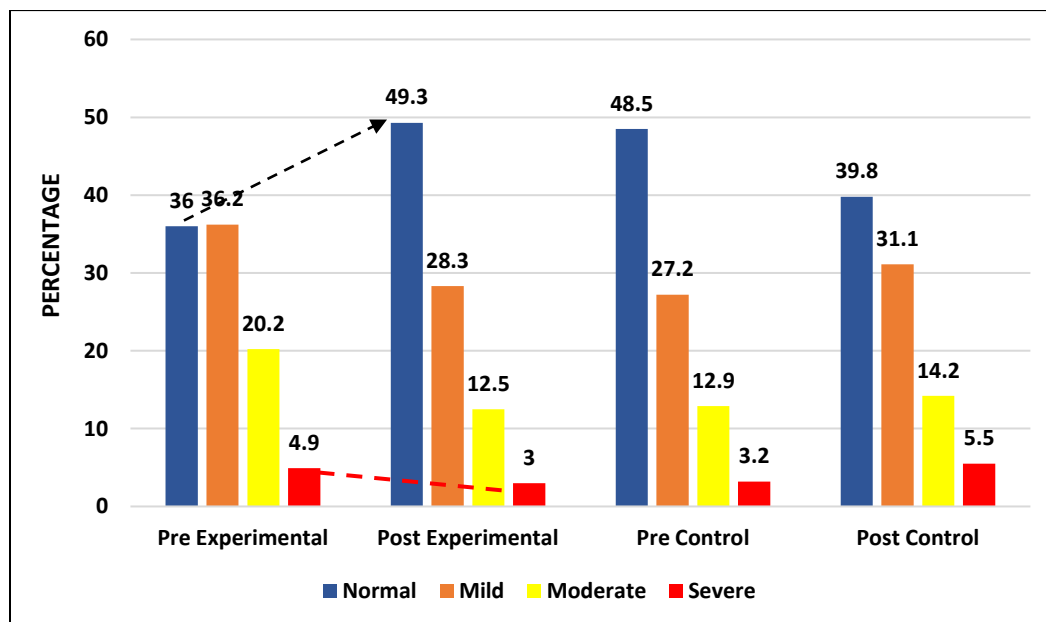
Figure 4.3.30: Shift in the Wasting Curve Post Intervention Compared to Standard Curve of Experimental Group Children (0-60 Months)
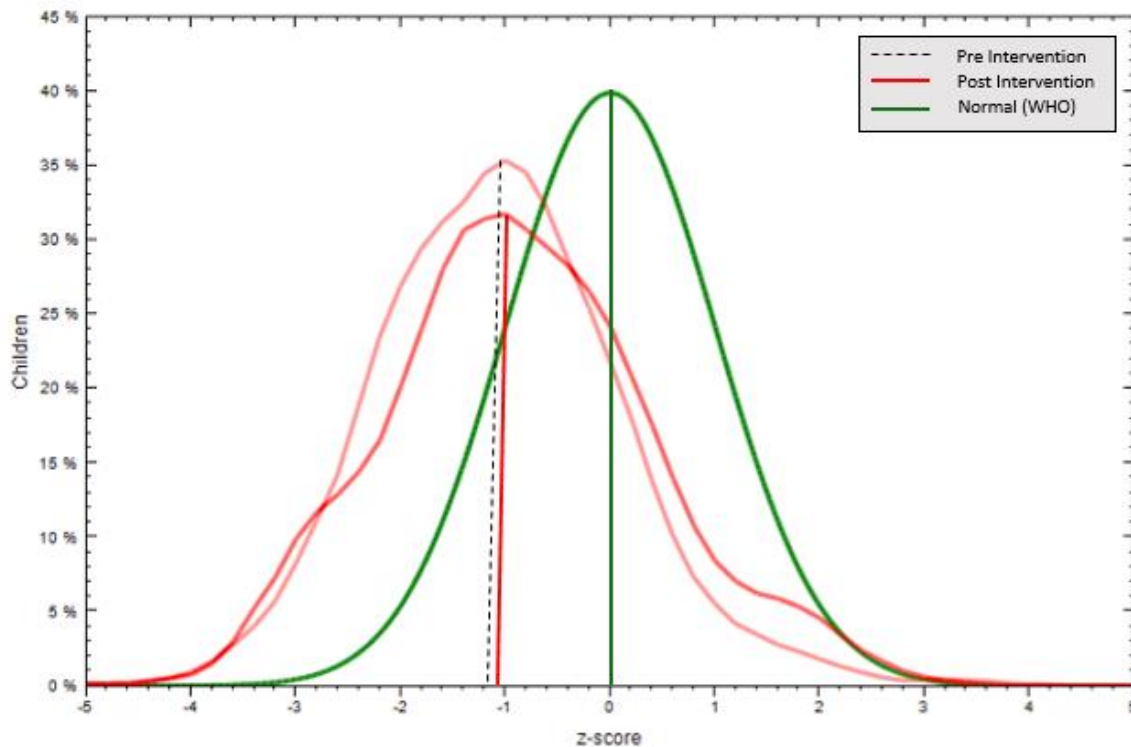
Impact of PPP intervention on wasting (WHZ) status of children 0-23 months and 24-60 months

Table 4.3.18 and Figures 4.3.31 - 4.3.34 shows the categories of the wasting status (Z – Scores) before and after intervention across study groups, age and gender. The percentage reduction in wasting was seen across both the age groups viz. 0-23 months and 24-60 months of participants from EG. The percentage reduction in wasting (<- 2 SD) was 3.66 and 16.25 among boys and girls of 0-23 months age group respectively whereas reduction in age group 24-60 months among EG participants was 13.2 and 5.05 among boys and girls respectively. There was an increase in the rates of stunting across both the age groups and genders observed among CG participants.

Table: 4.3.18: Proportion (%) of children in wasting category pre and post intervention by study groups and gender

Weight-for-height Z score	Experimental Group		Control Group	
	Pre	Post	Pre	Post
Boys (0-23 m)	N = 82		N = 55	
Normal (+1 to -1 SD)	37.8	47.56	45.45	40
Mild wasting (-1 to -2 SD)	40.24	26.82	27.27	27.27
Moderate wasting (-2 to -3 SD)	15.85	10.97	7.27	10.9
Severe wasting (<-3 SD)	4.87	6.09	1.81	3.63
Girls (0-23 m)	N = 80		N = 67	
Normal (+1 to -1 SD)	31.25	52.5	59.7	49.25
Mild wasting (-1 to -2 SD)	33.75	22.5	20.89	22.38
Moderate wasting (-2 to -3 SD)	18.75	6.25	7.46	10.44
Severe wasting (<-3 SD)	6.25	2.5	2.98	2.98
Boys (24-60 m)	N = 106		N = 86	
Normal (+1 to -1 SD)	32.07	41.5	48.83	33.72
Mild wasting (-1 to -2 SD)	36.79	38.67	25.58	34.88
Moderate wasting (-2 to -3 SD)	27.35	14.15	19.76	18.6
Severe wasting (<-3 SD)	2.83	2.83	3.48	5.81
Girls (24-60 m)	N = 99		N = 101	
Normal (+1 to -1 SD)	42.42	56.56	42.57	38.61
Mild wasting (-1 to -2 SD)	34.34	24.24	32.67	35.64
Moderate wasting (-2 to -3 SD)	17.17	17.17	13.86	14.85
Severe wasting (<-3 SD)	6.06	1.01	2.97	4.95

Figure 4.3.31: Wasting Status of Experimental and Control Children Pre and Post Intervention (0 - 23 months Boys)
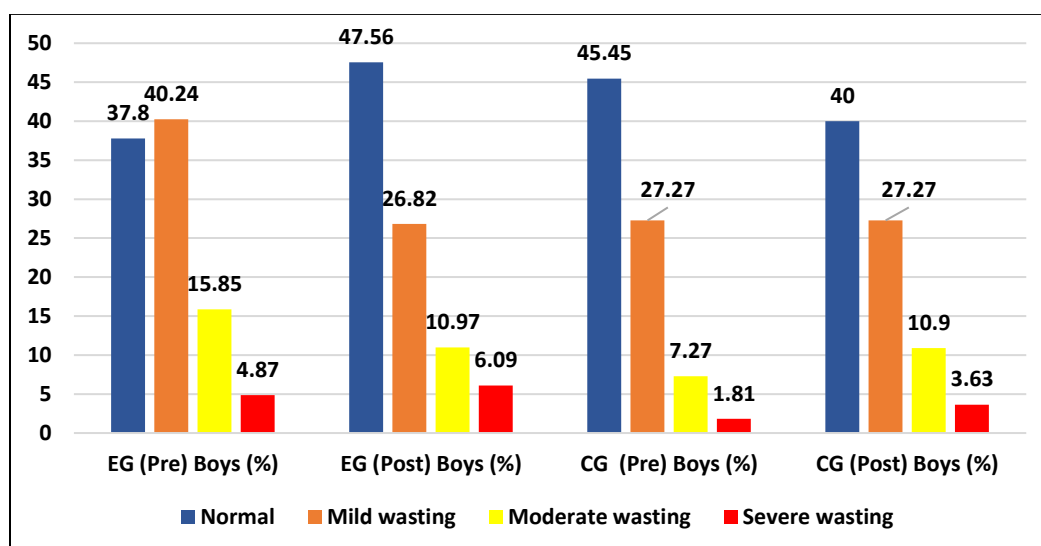
Figure 4.3.32: Wasting Status of Experimental and Control Children Pre and Post Intervention (0 - 23 months Girls)
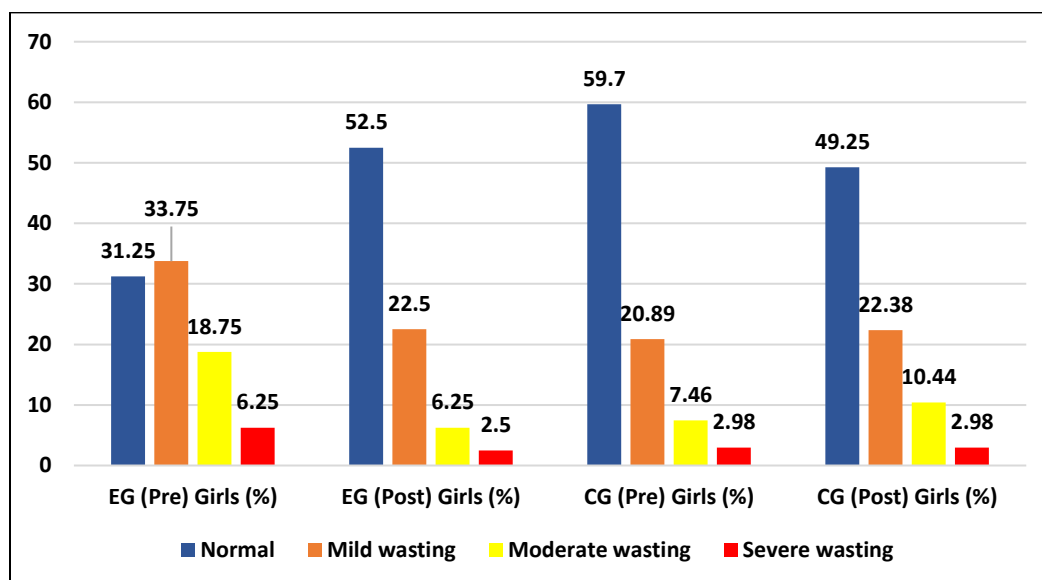

Figure 4.3.33: Wasting Status of Experimental and Control Children Pre and Post Intervention (24 - 60 months Boys)
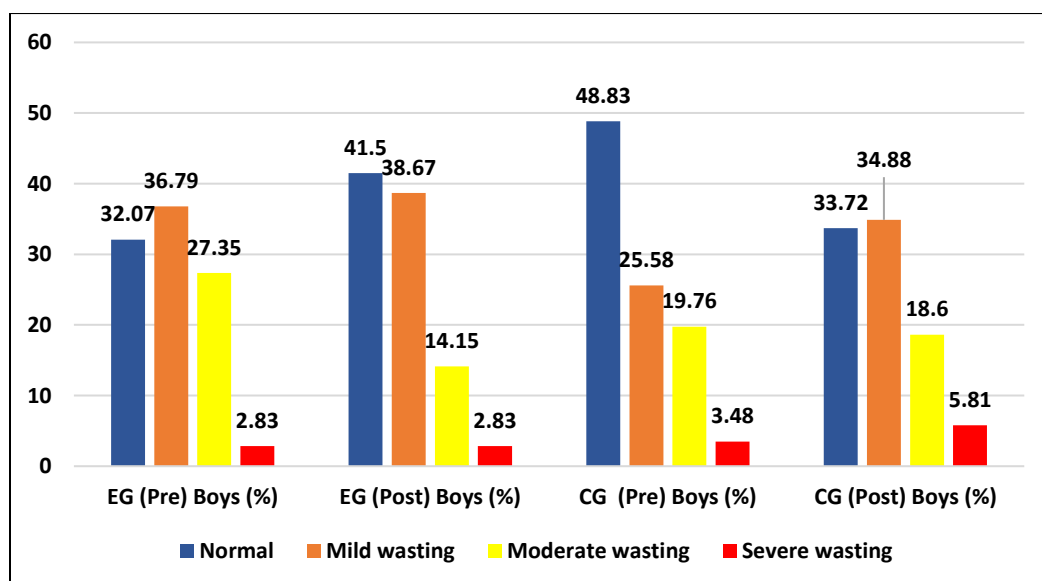
Figure 4.3.34: Wasting Status of Experimental and Control Children Pre and Post Intervention (24 - 60 months Girls)
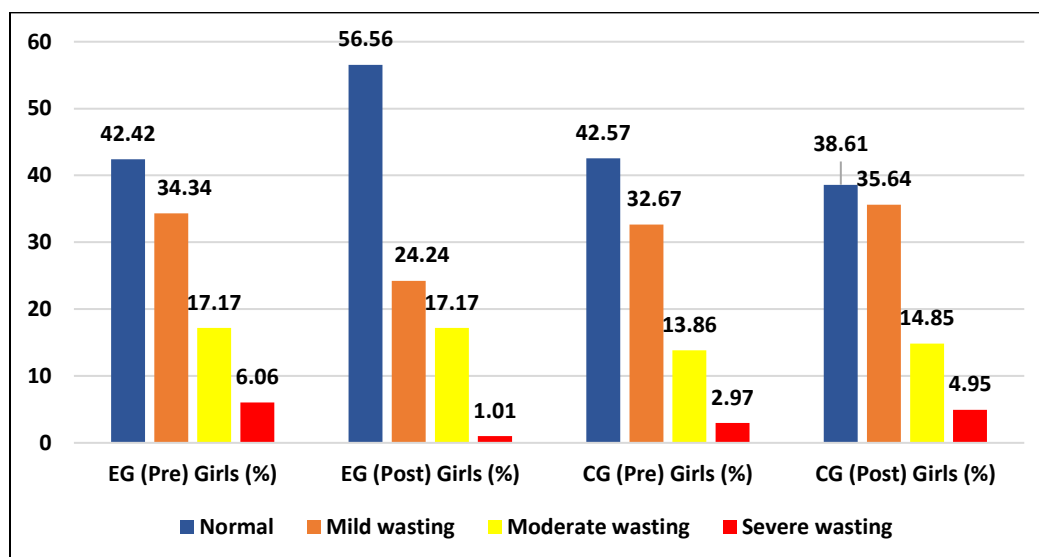

Table: 4.3.19: Intervention impact in terms of Absolute change in proportion of Wasting (WHZ) category by age and gender

Age Groups	Experimental Group						Control Group					
	< - 2 SD (%)		< - 3 SD (%)		Absolute Change (%) < - 2 SD	Absolute Change (%) < - 3 SD	< - 2 SD (%)		< - 3 SD (%)		Absolute Change (%) < - 2 SD	Absolute Change (%) < - 3 SD
	Pre	Post	Pre	Post			Pre	Post	Pre	Post		
Boys: 12-23 months [n = E(23); C(20)]	17.39	4.34	0.00	0.00	13.05	0.0	5.00	5.00	5.00	5.00	0.0	0.0
Girls: 12-23 months [n = E(26); C(22)]	19.23	11.53	7.69	0.00	7.7	7.69	4.54	9.09	9.09	4.54	-4.55	4.55
Boys: 24-35 months [n = E(58); C(32)]	13.79	13.79	6.89	6.89	0.0	0.0	9.37	12.5	0.00	6.25	-3.13	-6.25
Girls: 24-35 months [n = E(54); C(43)]	22.22	7.40	5.55	3.70	14.82	1.85	9.30	13.95	0.00	2.32	-4.65	-2.32
Boys: 36-60 months [n = E(107); C(90)]	28.03	14.01	2.80	3.73	14.02	-0.93	21.11	18.88	4.44	8.88	2.23	-4.44
Girls: 36 – 60 months [n = E(99); C(102)]	17.17	17.17	6.06	1.01	0.0	5.05	13.72	14.70	2.94	4.90	-0.98	-1.96

Table 4.3.19 shows the categories of nutritional status WHZ – scores (< - 2 SD and < - 3 SD) before and after the intervention by age and gender across experimental group and control group and the absolute changes observed in both the groups. It was found that one year of intervention had the potential to decrease wasting across all the age groups from 12 months to 60 months among both the genders. Highest shift was observed in experimental group in the age group 24-35 months and 36 –

60 months among moderately wasted children, 14% shift was observed among moderately wasted male children (36-60 months) moving to mild category but no change was noted among female participants of the same age group. Female children (24-35 months) showed 14% reduction in moderate wasting in terms of absolute change. On the contrary, Control group showed an increase of 2.3 to 4.5% moderate wasting and severe wasting across both the genders in all the age groups except among male child (36-60 months) moderate wasting category where an improvement of 2.23% was noted.

Table 4.3.20: Impact of PPP Intervention on Nutritional Status of Children 0 – 60 Months

Indicator		Mean $\pm$ S.D.		Paired Difference (Mean $\pm$ S.D.)		t Value		Sig. 2-tailed	
		EG	**CG**	**EG**	**CG**	**EG**	**CG**	**EG**	**CG**
WAZ	Pre	-1.8 $\pm$ 1.0	-1.38 $\pm$ 1.1	- 0.42 $\pm$ 0.6	0.12 $\pm$ 0.6	-12.3	3.63	0.000*	0.000*
	Post	-1.4 $\pm$ 0.6	-1.5 $\pm$ 1.0						
HAZ	Pre	-1.8 $\pm$ 1.2	-1.4 $\pm$ 1.4	-0.23 $\pm$ 0.7	0.12 $\pm$ 0.5	-6.09	3.20	0.000*	0.002**
	Post	-1.5 $\pm$ 1.2	-1.6 $\pm$ 1.1						
WHZ	Pre	-1.2 $\pm$ 1.0	-0.7 $\pm$ 1.2	-0.43 $\pm$ 1.0	0.09 $\pm$ 0.8	-7.89	1.97	0.000*	0.049**
	Post	-0.8 $\pm$ 1.2	-0.8 $\pm$ 1.3						
MUACZ	Pre	-1.1 $\pm$ 0.9	-0.7 $\pm$ 1.0	-0.24 $\pm$ 0.7	0.08 $\pm$ 0.7	-6.53	2.19	0.000*	0.030**
	Post	-0.8 $\pm$ 0.8	-0.8 $\pm$ 0.8						

* Significant at *p<0.01*
** Significant at p< 0.05
[NS] Non significant

Figure 4.3.35: Nutritional Status of Experimental and Control Group Children 0-60 months Pre and Post Intervention
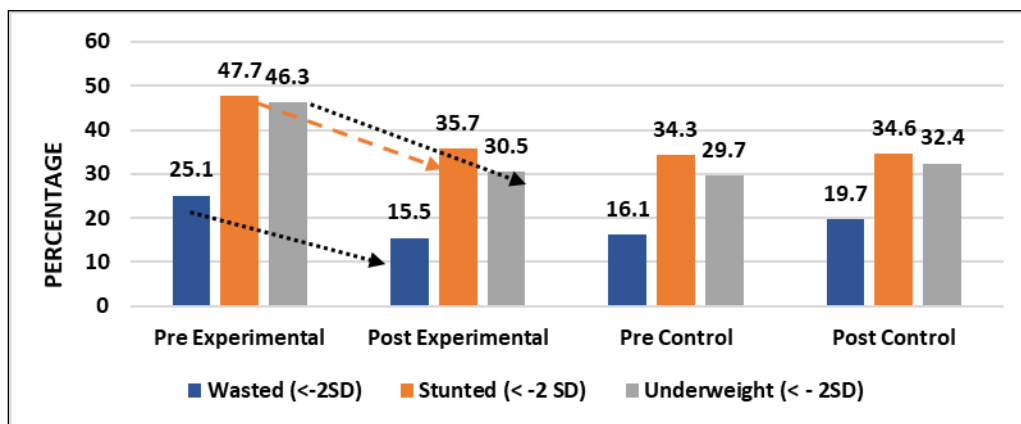
Gender-wise impact of Public Private Partnership on the Nutritional Status of Children 0 – 60 Months of Age

Figure 4.3.36: Change in level of underweight (WAZ score) gender wise among children 0 – 60 months of age after intervention
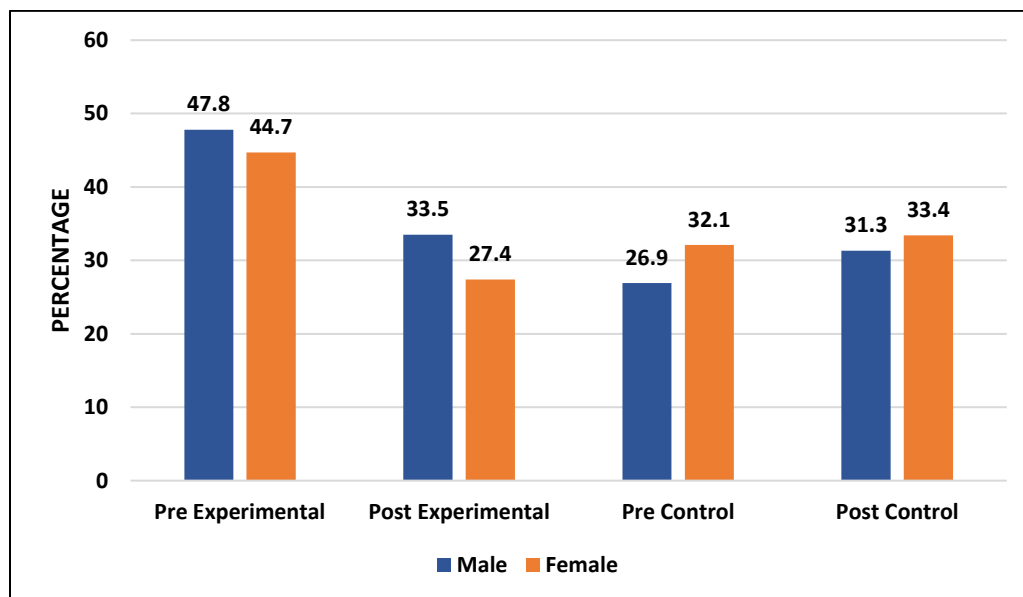
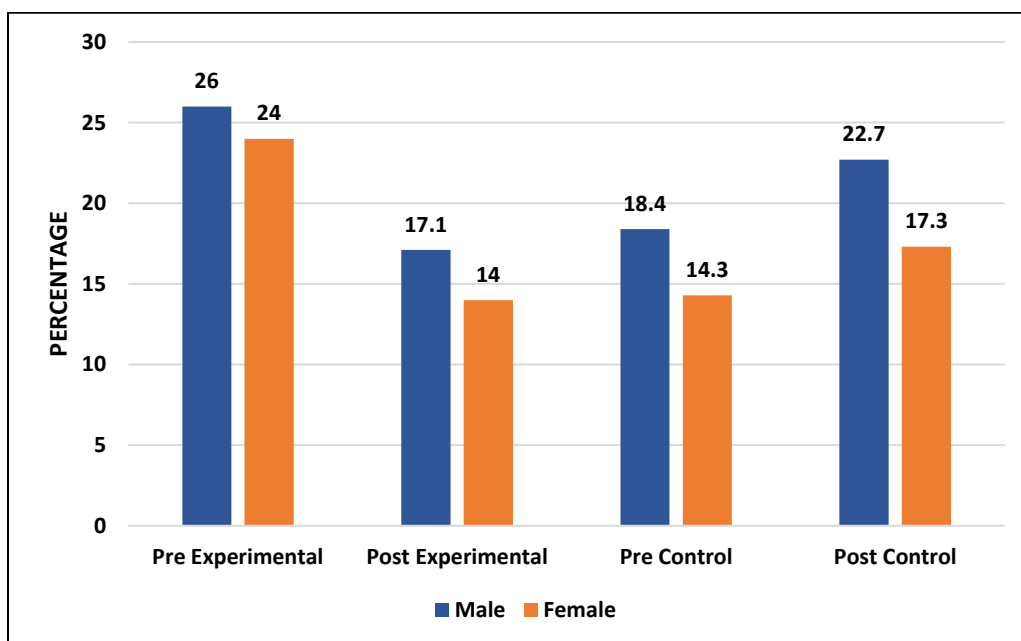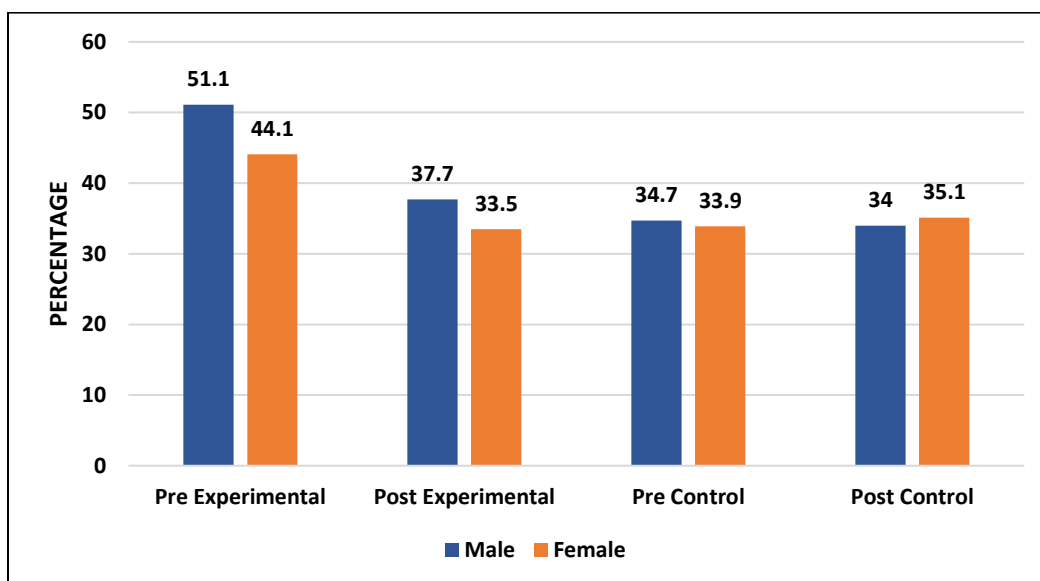**Figure 4.3.37: Change in level of Wasting (WHZ score) gender wise among children 0 – 60 months of age after intervention**

Figure 4.3.38: Change in level of Stunting (HAZ score) gender wise among children 0 – 60 months of age after intervention

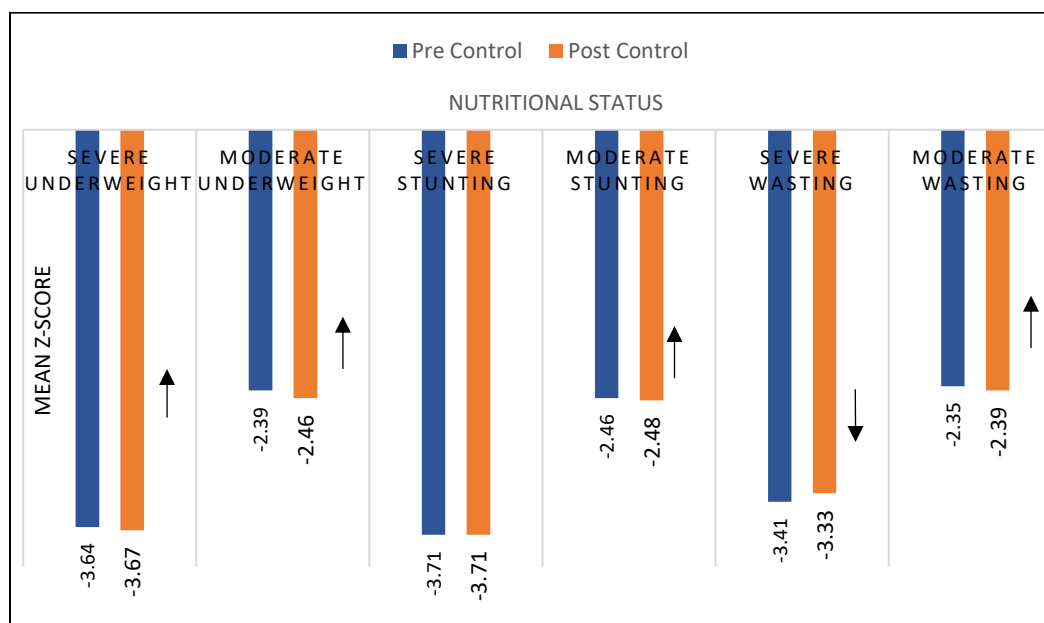**Figure 4.3.39: Impact of PPP Intervention on Mean Z-Score Shift of Nutritional Status Indicator's in Experimental Group**
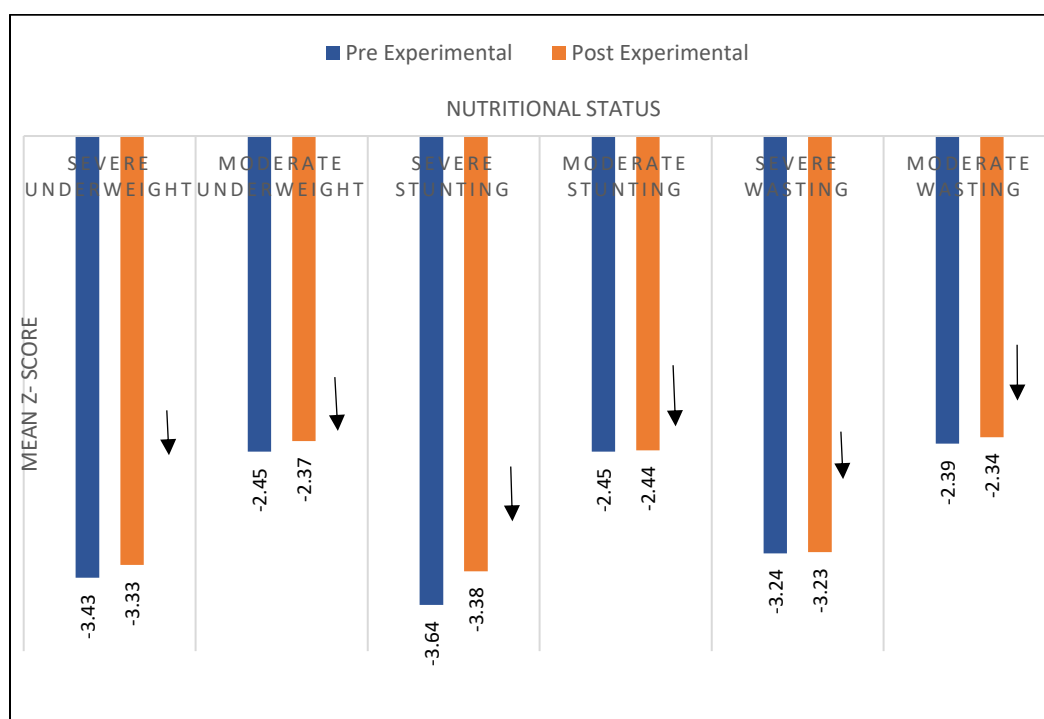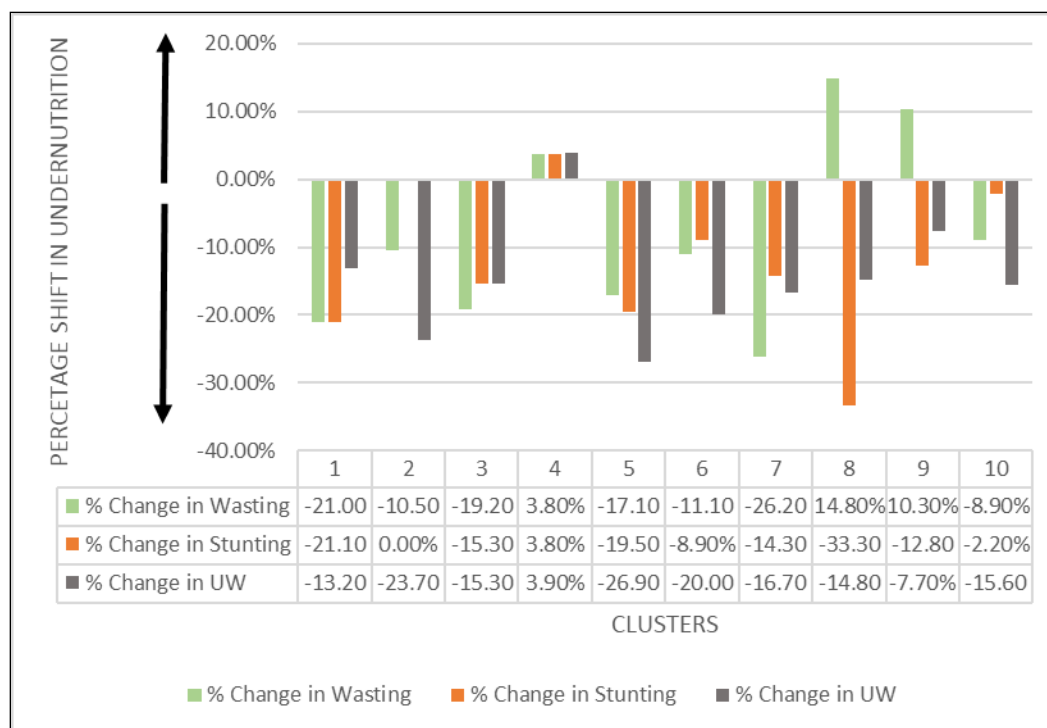

Figure 4.3.40: Mean Z-Score Shift of Nutritional Status Indicator's in Control Group

Cluster-wise impact of the PPP model on Nutritional Status in children 0 – 60 months

A cluster- wise variation was noted regarding the background characteristics of households as well as Anganwadi workers (AWWs) within the EG and CG. As a result, it was certain to see variation in impact among different clusters (Anganwadi Centers – AWCs)). Hence taking into consideration the variation, cluster –wise impact of PPP was assessed. The major impact of PPP intervention was seen in reducing the rates of underweight, stunting and wasting. Figure 4.3.39 presents % shift of children from < - 2 SD towards lower grades and normal category within the cluster. The overall trend showed that there was a positive impact of intervention as more number of AWCs from EG showed reduction in rates of wasting, underweight and stunting among enrolled children as compared to children enrolled in CG.

Figure 4.3.41: Impact of PPP Intervention on % Shift in Undernutrition (<-2 SD) in Children 0 – 60 Months of Age

	1	2	3	4	5	6	7	8	9	10
■ % Change in Wasting	-21.00	-10.50	-19.20	3.80%	-17.10	-11.10	-26.20	14.80%	10.30%	-8.90%
■ % Change in Stunting	-21.10	0.00%	-15.30	3.80%	-19.50	-8.90%	-14.30	-33.30	-12.80	-2.20%
■ % Change in UW	-13.20	-23.70	-15.30	3.90%	-26.90	-20.00	-16.70	-14.80	-7.70%	-15.60

CLUSTERS

■ % Change in Wasting ■ % Change in Stunting ■ % Change in UW

Thus for, Impact of intervention on nutritional status

Moderate Underweight (UW) decreased by 8.2% and severe UW decreased by 7.6% among EG compared to increase of 3.6% moderate UW and decrease of 0.9% severe UW among CG

Decrease in sample mean of Z scores for UW among EG was 0.4 SD whereas it increased among CG by 0.12 SD

Moderate stunting decreased by 7.1% and severe stunting by 4.9% among EG participants whereas in CG, there was no change observed in moderate stunting while there was an increase observed in severe stunting by 0.3%

Z score sample mean for stunting decreased from -1.75 to – 1.5 SD

Reduction in moderate wasting was 7.7% and severe wasting was by 1.9% in EG whereas there was an increase of 1.3% and 2.3% respectively seen among CG

Z score sample mean for wasting among EG shifted from -1.25 SD to 0.75 SD

Immunization Status

During Intervention term, Phase 3 of Indradhanush Mission was implemented by the GOI thus there was a dual intervention impact observed. Complete immunization was seen among 50.4% (EG) and 56 % (CG) children pre intervention which increased to 80.9% (EG) and 63.8 % (CG). The increase in complete immunization was more in EG (30%) group as compared to CG (7.8%) which was statistically significant at 99% CI.

Figure 4.3.42: Impact of intervention on immunization status
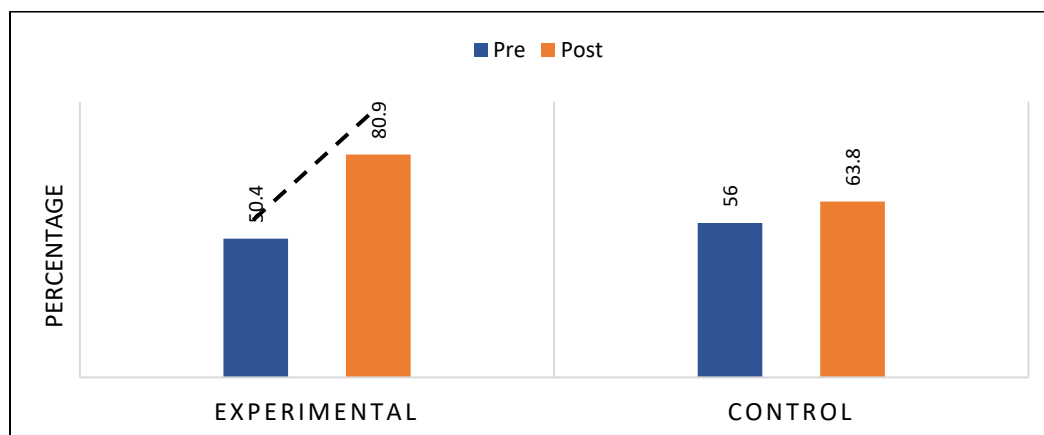
Morbidity Profile of Children U – 5 Years of Age

As presented in Table 4.3.21, the average morbidity in CG group was higher than in EG but the difference was not statistically significant (p>0.05) Morbidity due to diarrhea showed an increase in both EG and CG. Treatment from medical practitioner was sought by 88.8% EG participants as compared to only 19.2% in CG group.

Table 4.3.21: Changes in Morbidity Profile of the Children U-5 Post Intervention

Responses	Pre-Intervention Experimental	Post-Intervention Experimental	Pre-Intervention Control	Post-Intervention Control
	N =309			
	%	%	%	%
Prevalence of illness in children				
• **Yes**	55.5	31.4	55.7	42.1
• **No**	43.7	68.6	41.4	57.0
• **Don't Know**	0.0	-	0.3	1.0
• **No response**	0.8	-	2.6	-
Chi square	**Pre Intervention**	0.203[NS]	**Post Intervention**	0.002*
	N = 206	N = 116	N = 181	N = 133
Type of illness				
• **Fever**	36.9	37.1	42.0	25.6

RESULTS AND DISCUSSION

• Cold and Cough	78.2	67.0	75.7	78.9
• Diarrhoea	14.1	15.7	8.3	15.0
• Skin Infection	0.5	1.7	0.6	0.8
• Ear Infection	0.0	0.9	0.6	2.3
• Malaria	0.5	13.9	0.0	17.3
• Jaundice	0.0	2.6	0.0	5.3
• No response	1.0	0.0	3.9	3.0
Duration of illness				
• < 3 days	25.7	24.3	44.0	9.2
• 3-5 Days	16.7	70.4	16.7	74.8
• 6-10 Days	7.4	2.6	5.5	7.6
• > 10 Days	4.1	2.6	1.5	1.5
• Don't Know	0.8	0.0	2.2	6.9
• No response	1.6	-	0.0	-
Treatment Given:				
• Yes	22.8	88.8	17.1	19.2
• No	75.7	9.5	80.6	80.0
• No response	1.5	1.7	2.2	0.7

Figure 4.3.43: Impact of intervention on morbidity profile and treatment acquired

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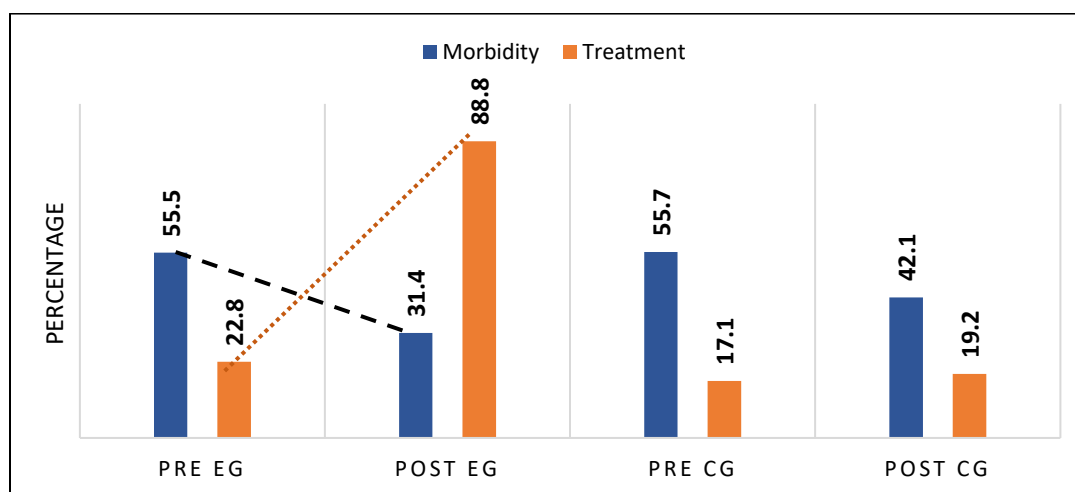
Table 4.3.22: Impact of Intervention on morbidity profile of the beneficiaries U – 5 in experimental group

Criteria		Mean	SD	t	Df	Sig (2 tailed)
Prevalence of illness in last 15 days	Pre	2.24	8.822	1.206	365	0.229
	Post	1.69	0.465			
Treatment given	Pre	1.68	7.232	1.736	365	0.83
	Post	1.03	0.163			

Thus for impact of intervention on Immunization and Morbidity profile;

There was an increase in complete immunization seen among both the groups due to ongoing INDRADHANUSH phase 3 campaign. Intervention group showed greater increase (by 30%) as compared to CG (7.8%)

Morbidity among EG children reduced by 24.1% and that among CG showed reduction by 13.6%

Practice towards procuring medical treatment from a doctor increased among EG by 66%

PHASE III HIGHLIGHTS

Significant impact was seen among EG workers with regards to early BF practices (p < 0.05), GM practices of EG AWWs significantly (p<0.05) in terms of scale attachment and plotting the growth chart whereas improved (p<0.001) in terms of scale placement at eye level, calibration and using GM chart information to sensitize mothers

Acceptance of BALBHOG improved by 30% in EG (p< 0.05), attendance during spot feeding and using standardized cups increased by 80% and 100% respectively (p < 0.001)

Correct record maintenance of home visits showed an improvement by 20% (p < 0.05) among EG. Post intervention, the mean shift in accreditation score for AWCs among EG was 5.5 whereas that in CG was 0.44.

Attendance at AWC of children beneficiaries enrolled in the study increased by 11.7% in EG and by 7.4% in CG. Initiating BF with 1 hour: 17.5% V/S 11.3%, Decrease in prelacteal feeding: 9.1 % V/S 1.9%, Colostrum feeding: 7.9% V/S 4.9%, continuation of BF above two years: 30.6% V/S 3% and Water feeding after 6th month: 12.1% V/S 9% was observed among EG V/S CG

Service utilization by beneficiaries of EG increased ranging from 7.1% for vaccination to 25.9% for health check-up. All the services showed a mean rise of 16.9%

Attitude towards initiating complementary feeding after 6th month improved among EG mothers by 53.6% V/S 25.2% among CG mothers

Awareness regarding harmful effects of not initiating CF timely increased 15 to 40% respectively with respect to 'child falling ill' and 'child becoming malnourished'

Hand washing practices improved among EG mothers by 27.3% as compared to 16.8% CG mothers.

Moderate Underweight (UW) decreased by 8.2% and severe UW decreased by 7.6% among EG compared to increase of 3.6% moderate UW and decrease of 0.9% severe UW among CG

Decrease in sample mean of Z scores for UW among EG was 0.4 SD whereas it increased among CG by 0.12 SD

Moderate stunting decreased by 7.1% and severe stunting by 4.9% among EG participants whereas in CG, there was no change observed in moderate stunting while there was an increase observed in severe stunting by 0.3%

Z score sample mean for stunting decreased from -1.75 to – 1.5 SD

Reduction in moderate wasting was 7.7% and severe wasting was by 1.9% in EG whereas there was an increase of 1.3% and 2.3% respectively seen among CG

Z score sample mean for wasting among EG shifted from -1.25 SD to 0.75 SD

There was an increase in complete immunization seen among both the groups due to ongoing INDRADHANUSH phase 3 campaign. Intervention group showed greater increase (by 30%) as compared to CG (7.8%)

Morbidity among EG children reduced by 24.1% and that among CG showed reduction by 13.6%

Practice towards procuring medical treatment from a doctor increased among EG by 66%

DISCUSSION

Anganwadi Functionaries

The discussion below this section compares the results of the present study with the findings of other studies with regards to the anganwadi functionaries' knowledge, attitude and practices, status of the AWC and services delivered. The elements studied were, profile of the AWWs and training received, their practices and perceptions about various ICDS services and the status of the AWC as reported by the AWW.

Majority of the AWWs in the present study belonged to the age group 26 – 35, educated up to secondary level, had more than 5 years of work experience but it was found that they are often poorly trained for the ICDS services. It was seen that only 12.8% had received pre-job (induction) training which is a six-days training but more than four fifth had received job orientation training after joining their duties. Refresher training was found to be received by more than three fourth of the AWWs. It is consistent with the results of research study conducted by Yangchan et al. (2017) which revealed that only 68% AWWs received training at induction. Similarly, a study conducted by Daxini and Kanani (2008) revealed that all of them in different randomly selected projects had undergone orientation for 3 months or job course training for a week or even a month. In contrast to the present results, a study conducted by Sujatha and Brunda (2020) showed that all the anganwadi workers had undergone basic training, while only 50.5% of them had undergone refresher training.

Majority of the AWWs imparted nutrition and health education (NHE) to pregnant and lactating woman but the coverage of topics like breast feeding initiation and its exclusivity and management of common illness was found to be the lowest. The only benefit of NHE as perceived by AWWs was the improvement of nutritional status. Majority showed satisfactory knowledge regarding NHE but the knowledge base on growth monitoring (GM) and supplementary nutrition (SN) was found to be inconsistent and unsatisfactory. Though many reported timely initiation of complementary feeding, more than one fourth of the respondents failed to do so. Growth monitoring was found to be inconsistent in practice with irregularity in timely practice on a fixed day of the month. The study also revealed that none of the AWWs weighed the child twice to take an average, also many skipped the GM if it was executed by the medical officers from PHC. Home visits were conducted but the objective of it was not met, also there was a gap

found in practice with regards to the guidelines and its execution. Only one third of the respondents were found to visit the SAM children as indicated. Awareness regarding importance of early and timely registration of pregnant woman was unsatisfactory because of which majority of them failed to register pregnancy before 12 weeks of gestation.

There have been extreme observations in different studies with regards to knowledge of AWWs on various activities conducted under ICDS in AWC. As per the findings of the study by Chowdhary& Sharma (2016), AWWs had high knowledge about breast feeding, complementary feeding and diarrhea management whereas for SN and GM had middle level of knowledge. Overall AWWs score investigate that they had best knowledge about the component of NHE (77.14%) while least about SN (29.46%). Whereas as per the findings of a study conducted in Purmandal block by Shahsi and Dogra (2012), the results showed that in spite of the fact that most (92.5%) of the anganwadi workers were trained, it was found that performance as well as awareness among AWW regarding the importance of growth charts and growth monitoring was not satisfactory. It was reported by Rathod and Dehmubed (2017) that AWWs work includes NHE on various aspects of mother and child health. It is thus of utmost importance that she has adequate scientific knowledge about breast feeding so that she can impart correct knowledge to mother.

The present study has tried to explain some reasons and operational challenges preventing ICDS reaching its potential. The study revealed that majority of the buildings were concrete and "pucca" thus basic infrastructure was not a big concern but few AWWs reported facing problems like lack of electricity, drinking water, toilet facility, storage facility and gas supply.

The major operational difficulty faced by the AWW was found to Lack of time to impart NHE, Coverage challenges due to lack of staff and community support. Many reported having to face problems related to ECE and Non-Formal Pre School Education due to lack of space and educational toys and materials. the other problems faced by AWWs were be their workload due to their multiple responsibilities Anganwadi workers were also found to be involved in various non ICDS activities compounding to already existing workload in the anganwadis.

Similar findings were reported by Tripathy et al (2014), where three fourth of the AWWs faced difficulties due to insufficient workspace, inadequate knowledge and inadequate staff. In a study conducted by Choudhary and Sharma 2017, problems felt by AWWs

were mainly work load (70%), Infrastructure (80%) and ration supply related (50%). A study was conducted by Sarkar (2018) had similar findings wherein 16.7% complained of lack of logistic supply related problems. About half of the AWWs complained that they have infrastructure related problems like inadequate space for displaying Non-Formal Pre-School Education Posters or other posters related to NHE. Space was reported to be unavailable for conducting recreational activities like outdoor activities. Many (43%) AWWs were not happy because of over work load and 40% complained about excessive record maintenance as they have to assist in other programs other than their anganwadi related work like Pulse Polio Programme, Vitamin A distribution Programme and many others.

Prevalence of Undernutrition Among Children Under 5 Years

Nutrition is central to the achievement of other National and Global Sustainable Development Goals. It is critical to prevent undernutrition, as early as possible, across the life cycle, to avert irreversible cumulative growth and development deficits that compromise maternal and child health and survival; and undermine the achievement of optimal learning outcomes in elementary education, impairing adult productivity and undermining gender equality (GNR, 2017). High levels of maternal and child undernutrition in India have persisted, despite strong Constitutional, legislative policy, plan and programme commitments (NNS, 2017)

Undernutrition prevailed amongst the children. The levels of undernutrition namely, stunting wasting and underweight in children (0-5 years) of urban Surat in the present study were 38.9%, 21.2% and 39.1% respectively. The situation of undernutrition in young children is alarming when compared to the WHO cut offs suggested for categorizing the severity of the undernutrition problem as given in Table 4.2.6. Based on WHO categorization, Surat city comes under High prevalence as far as stunting is concerned and very high prevalence of wasting can be reported based on study findings.

Table 4.2.6: Severity of Undernutrition Problem

Indicator	Severity of malnutrition by prevalence ranges (%)			
	Low	Medium	High	Very High
Stunting	**< 20**	**20-29**	**30-39**	**≥ 40**
Underweight	**< 10**	**10-19**	**20-29**	**≥ 30**
Wasting	**< 5**	**5-9**	**10-14**	**≥ 15**

Source: WHO 1995 – The cut-off values for Public Health Significance

The results of the present study corroborate with studies reported in literature demonstrating that undernutrition continues to remain alarming in almost all states of India.

NFHS IV data stated that in India, 38.4% of children under 5 years of age are stunted which is a sign of chronic undernutrition; 21% of children are wasted (too thin for their height), which is a sign of acute undernutrition while 35.7% children under 5 years of age are underweight. The Findings of present study are in accordance with all India data of NFHS 2015 and Gujarat data as presented in NFHS- 4 Factsheet (Figure 4.2.12). But present study reports high rates of prevalence with regards to stunting and underweight when compared across data recorded for Surat in NFHS 4 survey by 14.1 % and 6.6 % respectively for stunting and underweight.

Figure 4.2.12: Comparison of Study Data with NFHS (2015-16) Data
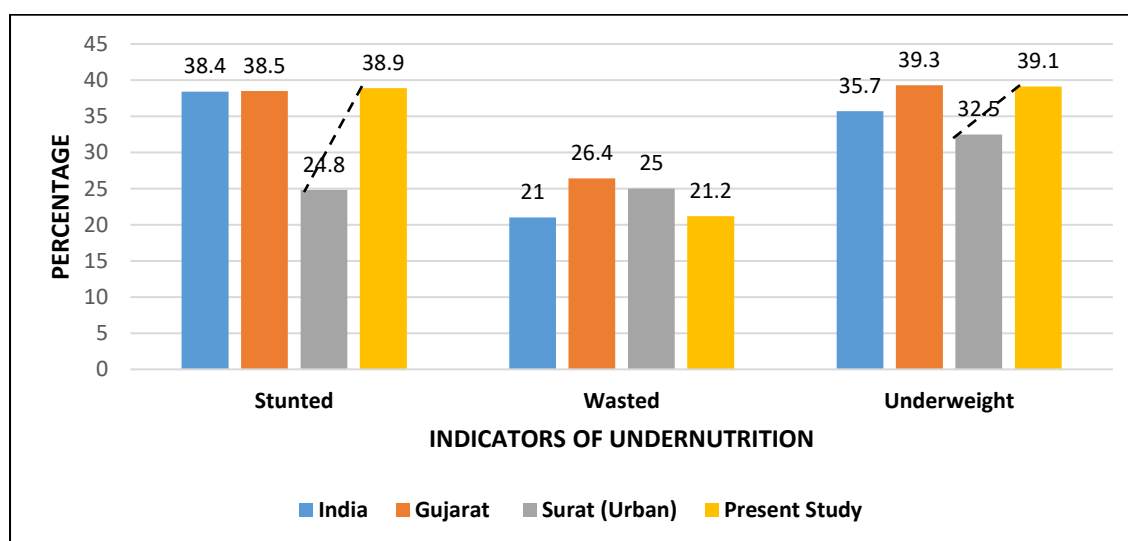
A similar community based cross-sectional study conducted by Sethy et al, 2017 in urban slums of Odisha revealed that 69% of 300 children were undernourished in the form of underweight (55.3%), wasting (75%) and stunting (42%).

Another study conducted by Huey et al, 2019 in urban slums of Maharashtra indicated that prevalence of stunting was 31.2%, underweight 25.1%, wasting (9.0%), and anemia (76%) among all children under 5 years of age.

A study conducted in children 6 months to 5 years of age in an urban slum in Mumbai by Purohit et al, 2017 revealed higher prevalence of underweight, stunting, and wasting which were 52.2%, 42.2%, and 50.4%, respectively.

Malnutrition is a multisectoral, multi-level problem that results from the complex interplay between household and individual decision-making, food, health and environmental systems that determine access to services and resources and related policy processes (Gillespie, 2017). According to UNICEF, socio economic status of the family affects the nutritional status of the child to a very great extent. Present study indicated that all the households belonged to BPL with <$3.20 per capita income. World Bank Group, 2017 also reported that household level poverty is predictive of undernutrition among children. A study conducted by Humbwavali et al, 2019 also mentioned that poverty and lower human capital are still key factors associated with poor postnatal weight gain.

PHASE III DISCUSSION

The rationale for investing in Nutrition is globally well recognized – both as a critical development imperative, as well as crucial for the fulfillment of human rights- especially of the most vulnerable children, girls and women. It constitutes the foundation for human development, by reducing susceptibility to infections, related morbidity, disability and mortality burden, enhancing cumulative lifelong learning capacities and adult productivity. Nutrition is acknowledged as one of the most effective entry points for human development, poverty reduction and economic development, with high economic returns.

A wide spectrum of national programmesfocus on improving nutrition outcomes. These include the Integrated Child Development Services, National Health Mission- including RMNCH + A, Janani Suraksha Yojana, Swachh Bharat including Sanitation and the National Rural Drinking Water Programme, MatritvaSahyog Yojana, SABLA for adolescent girls, Mid Day Meals Scheme, Targeted Public Distribution System, National Food Security Mission, Mahatma Gandhi National Rural Employment Guarantee Scheme and the National Rural Livelihood Mission among others.

The policy commitment to preventing and reducing undernutrition was reaffirmed by the Budget 2014-15 speech of the Finance Minister, which stated that - "A national programme in Mission Mode is urgently required to halt the deteriorating malnutrition situation in India, as present interventions are not adequate. Guided by this policy direction, the Ministry of Women and Child Development also formulated a proposal for a National Nutrition Mission, building on the recommendations from a National Consultation, an Expert Advisory Group was constituted in 2014. This policy direction was reinforced by the PMO, mandating NITI Aayog to examine the emerging data on undernutrition and prepare, in consultation with the Ministries of WCD and Health, a specific strategy for poor performing states/districts. This has brought Nutrition center-stage on the National

Development Agenda. In **Vision 2020**, the focus ison preventing and reducing undernutrition across the life cycle- as early as possible, especially in the first three years of life.

With strong government commitment and political will, the ICDS program has emerged from small beginnings in 1975 to become India's flagship nutrition program (ICDS-WCD, 2015). The program adopts a multi-sectoral approach to child well-being, incorporating health, education and nutrition interventions. Although, four decades have passed since the launch of this program, till today, the rates of malnourishment among children under five remains

alarmingly high (Sahoo et al., 2016). Beyond doubt, ICDS has not delivered the desired results. The underlying issues could be related to infrastructural problems, lack of utilization due to poor awareness about the program, faulty supervision and monitoring mechanisms and corruption in food supplies (PEO, 2011; Paul et al., 2017).

Child Undernutrition remains high, despite improvements over the last decade. Stunting, wasting and underweight, for children below five years of age remains high. While stunting and underweight prevalence has gone down, trends in wasting show an overall increase in the last decade. The decrease in stunting has been from 48% to 38.4%, that is, by 1 percentage point per year (NFHS -3, NFHS -4). Similarly, underweight prevalence has reduced by 0.68 percentage points from NFHS-3 to NFHS-4. Recent data, especially for challenging states is promising, suggestive of acceleration. However, the pace of reduction remains low and calls for focused interventions in the area for optimal results.

Nutrition policy making and program interventions in developing countries continue to bring together several sectors that contribute to nutrition improvement. Yet the progress toward reducing malnutrition in all forms has been extremely slow (Global Nutrition Report, 2017).

Developing multi-stakeholder partnerships especially public-private partnerships (PPPs) sharing knowledge, expertise, technology and financial support are critical for overall success of the SDGs (UNDP, 2018). UNICEF's approach to programming for children and young people aims to achieve sustained results at scale which means maintaining and expanding support from both the public and private sectors – as well as non-governmental organizations, civil society organizations, development agencies and United Nations partners (UNICEF, 2018).

In India also there were various PPP models developed such as Convergence of Agricultural Intervention in Maharashtra, where FieldFresh Foods Pvt .Ltd, an agribusiness company exporting fresh vegetables, linked a significant number of smallholder farmers to the global market for high-value produce (IFAD & PPP, 2013) .In the CAIM study, it was assumed that collaboration with the private sector in the form of Public-Private Partnership would improve equity, efficiency, accountability, quality and accessibility of the entire health system. Advocates argue that the public and private sectors can potentially gain from one another in the form of resources, technology, knowledge and skills, management practices, cost efficiency and even a make-over of their respective images (ADBI, 2000).

The debate over the effectiveness of Public-Private Partnerships (PPPs) as a procuring method to achieve development goals has been revived by the discussion about the post-2015

development agenda. One of the targets of the sustainable development goals is to "*Encourage and promote effective public,public-private, and civil society partnerships, building on the experience and resourcing strategies of partnerships.*"

In the current study, Public-private Partnership model was implemented and assess its impact on AWWs through capacity building, improving AWC infrastructure and improving nutritional status of children below 5 years in ICDS, Surat City.

The overall knowledge and perceptions of anganwadi workers in EG improved significantly (p < 0.05), whereas in CG, there was no notable increase seen in the knowledge and practices related to IYCN or other ICDS services. The major improvement was noted among EG AWWs in growth monitoring skills and practices and also estimation and of energy requirements and use of standardized cups to serve Supplementary Nutrition. There was a significant (p < 0.05) change noted in executing and maintaining correct record for home visits.

Although improvement in the EG AWWs' knowledge and practices was satisfactory in EG AWCs, there is more scope of improvement for prevention of undernutrition which can be achieved by similar on job capacity building on regular basis.

The findings of the extensive review available from various studies assessing impact of capacity building on knowledge, perceptions and practices of AWWs have shown positive and mostly significant impacts of training as discussed below,

A study conducted on the effectiveness of a culturally appropriate nutrition educational intervention delivered through health services to improve growth and complementary feeding of infants in Chandigarh, a quasi-experimental non-randomized trial showed that, community-based nutrition educational interventioncan effectively improve the complementary feeding and growth of children six months to one year among vulnerable populations.A significantly higher number of infants in the intervention group were started on complementary feeding at six months of age (72.6% versus45.5%, p<0.01) and received foods having thick consistency (82.1% versus 41.9%, p<-0.01). There was significant weight gain in intervention group infants (p<0.01) and length gain (p<0.01) from the baseline. Also, there was significant decline in the proportion of undernourished (10% versus18.8%, OR = 0.47, p = 0.01) and wasted infants (7.3% versus15.7%, OR = 0.42, p = 0.01) in the intervention group. (Sharma et al., 2020).

In Vadodara, a study conducted by Daxini and Kanani 2009 showed that, the capacity building was successful in improving the knowledge of the AWWs regarding ICDS services (including

GM and SN practices) with the messages being well retained even after one year after intervention.

In 2009, Taksande et al. assessed the knowledge of health care workers after IYCF training in Gondia, found significant difference in the post-test scores. The ICDS superior gained knowledge and skills regarding breast feeding and CF after the training. The study concluded that there is a need for in service training of the supervisors and other health workers for updating their knowledge.

A study conducted in Brazil (Santos, 2011) aiming to assess impact of IYCF related nutrition counseling component of the Integrated Management of Childhood Illness (IMCI) strategy showed, that the doctors in the EG with 12-13 patients < 18 months had better knowledge of child nutrition and improved assessment and counseling practices. Knowledge of child nutrition and improved assessment and counseling practices. After training, doctors in the EG (n = 17) on an average, correctly answered 83% questions related to nutritional counseling as compared to 68% doctors in CG (n = 16), statistically significant at p < 0.05.

A comprehensive systematic review assessed the effectiveness of infant and young child feeding (IYCF) interventions from 77 studies. Breastfeeding education interventions ($n = 38$) showed 20% increase in rates of early initiation of breastfeeding, 102% increase in exclusive breastfeeding (EBF) at 3 months and 53% increase in EBF at 6 months and 24% decreases in diarrheal diseases. Complementary feeding education intervention (n=12) showed a 0.41 standard deviation (SD) increase in WAZ, and 0.25 SD in HAZ in food secure setting. Complementary food provision with or without education (n=17) showed a 0.14 SD increase in HAZ and 36% decrease in stunting. Supplementary food interventions (n=12) showed a significant 0.15 SD increase in WHZ. Subgroup analyses showed healthcare professional led interventions were largely more effective (Lassi et al., 2020).

The findings of the present study on the effect of capacity building of AWWs on knowledge of IYCF is thus corroborated by that reported in other studies showing that appropriate education of health extension workers can contribute significantly towards their ability to promote optimal feeding practices. However, the actual impact on community feeding practices and nutritional status may be variable, depending upon other situations such as programmatic priority, nutritional status of population, etc.

Apart from training and capacity building, service availability and accessibility also needed to be improved in the present study. Infrastructure of the AWC could not just be improved by capacity building, therefore, public-private partnership investments had to be done.

In the present study it was observed that various AWCs lacked basic infrastructural amenities like, tube lights, water supply and toilets. It was perceived that due to lack of infrastructural facilities, attendance and utilization of the services are not up to mark.

There has been a significant number of case studies on PPPs that have documented improvement on efficiency gain in infrastructure assets and services. While these studies only compare the situation before and after a PPP project, they illustrate successful stories on how they have contributed to build efficient infrastructure. Case studies have shown that efficiency gains from PPI are common but vary with the type and size of the projects and with the context in terms of regulatory environment and governance.

Based on an empirical analysis using time series data (1995-2006) in 32 countries of LAC, Andres et al. (2013) conclude that there is positive and significant impact of private sector participation in the coverage, quality of service and labor productivity of the analyzed utilities, especially when regulation is strong.

In our study through ICDS, we have used public-private partnership investment to carry out intervention. Strengthening the ICDS AWCs, empowerment of ICDS workers through training and demonstration and sensitization of the mothers regarding its services and benefit of this food aid or supplementary nutrition program tried to improve. As a result, the infrastructure of AWC improved increasing the attendance by 11.7% and service utilization by 15% in Supplementary Nutrition to 20% in referrals. Service delivery also showed a significant increase and improvement. Access to Safe drinking water at the AWC improved 100% due to installation of RO water filters using PPP. Induction stoves were made available at each AWC under EG which facilitated easy preparation of RAAB.

In setups with meagre resources, a public private partnership (PPP) can be a choice as it contributes to ownership along with development. There were many successful PPP interventions carried out all over the world to improve food and nutrition security. In Ghana, Northern Rural Growth Program helped to set up contract farming arrangements between private partners and smallholder farmers (IFAD & PPP, 2013 .In Malawi, Rural Livelihoods and Economic Enhancement Program created to ensure that more farmers are able to produce groundnuts that meet required market standards and that there are buyers for their product. In

Uganda, Vegetable Oil Development Project was designed to alleviate Uganda's dependence on imported vegetable oils by supporting the domestic production and processing of palm oil. In Indonesia, Smallholder Livelihood Development Project in Eastern Indonesia, SOLID focuses on establishing links between farmers and the market and supports the development of smallholder farmers .Another project READ (Rural Empowerment and Agricultural Development) supports a public-private partnership whereby smallholder farmers are linked to a private company, in this case Mars in Indonesia, for cocoa production in Central Sulawesi (IFAD & PPP, 2013).

Overall in the present study the intervened group showed remarkable improvement in the perceptions and knowledge of mothers regarding: Timely initiation of breast feeding and exclusive breast feeding, initiation of CF at 6 months, harmful effects of delayed weaning and active feeding as compared to the control group. Mothers in the EG were able to recall many of the messages taught to them during NHE sessions.

Several studies appear in literature which have documented the significant and positive impact of a well-designed and well implemented NHE intervention to improve IYCN practices.

The Linkages Project, 2002 and 2006 trained community based volunteers of women's groups to disseminate messages related to breast feeding- child nutrition with the use of IEC materials through home visit. They conducted educational sessions at the community health center, participated in health/ nutrition events and promote Essential Nutrition Actions in their daily activities (n = 4300 representing 259 different groups in two province). The findings of this study showed that the volunteers were successful in reinforcing nutrition messages locally, there was improvement in IYCF practices and increased dietary diversity (p < 0.01).

Nambiar et al. in 2003 conducted a pilot investigation to evaluate compliance and impact of dehydrated drumstick leaves rich modified SF recipes. Comprehensive training sessions were organized for ICDS staff, CDPO, Supervisors and anganwadi functionaries. The study findings reported significant impact of the nutrition communication both on the children as well as the mothers, scores increased by 40% in a period of one month indicating effective nutrition communication strategies can be implemented to bring dietary improvement for combating the Vitamin A Deficiency.