CHAPTER 6: SUMMARY AND CONCLUSIONS

An estimated 3,564 of the world’s children under 5 years die each day (1,301,000 each year) from causes that are preventable by optimal breastfeeding. In addition, for every child who dies, hundreds of others are sick and miserable from illnesses preventable with optimal breastfeeding - Jones et al. 2003

Although, approximately 20% of the world’s children are in India, India contributes to disproportionate share of human development problems including a very high maternal and under 5 mortality (UNICEF 2007a). Among the key causes of mortality in children under 5 years, undernutrition contributes more than one-third child deaths (Black et al. 2008).

Undernutrition patterns are similar globally. Most undernutrition happens in the first two years of life, after that it tracks at the same level. Much of this early damage is irreversible, thus targeting children either before birth, or in the first two years of life, and this period could serve as the “Window of Opportunity” (Shrimpton et al. 2001). According to the lancet series of child survival, optimal breastfeeding and complementary feeding (CF) practices can prevent 19% of child deaths below 5 years in India (Jones et al. 2003).

The National Family Health Survey (NHFS) – 3 conducted in 2005-06 shows very high levels of malnutrition (40.4% children below 3 years as underweight) in India, with prevalence even higher in Gujarat. In Gujarat 49.2% children below 3 years are stunted reflecting failure to receive adequate nutrition over a long period of time and also recurrent and chronic illnesses (NFHS-3 Gujarat 2008). As per the District Level Household and Facility Survey (DLHS) – 3 conducted in 2007-08 for Gujarat, only 19.5% children (6-24 mo.) met all the three criteria of optimal Infant and Young Child Feeding (IYCF) practices i.e. children of 6-24 months of age who were, breastfed within 1 hour of birth, exclusively breastfed for first six months, and after six month presently receiving solid and semi-solid food along with continued breastfeeding (DLHS-3 2010).

In India Integrated Child Development Services (ICDS) is a well-designed intervention and well-placed to address many of the underlying causes of undernutrition in India. For its services to be effective in combating undernutrition, however, the programme needs to be implemented in an efficient and equitable manner (Gragnolati et al. 2006).
Educating mothers on correct breastfeeding practices and child nutrition in the community is one of the components of the ICDS programme in India, in which the ICDS Anganwadi workers (AWWs) and their Supervisors can play a vital role for the promotion of community based optimal IYCF practices.

Globally and especially in India, Growth Monitoring and Promotion (GMP) is widely recommended as a community based tool for child survival. The use of growth monitoring extends beyond problem detection; it has been used to provide a basis for communicating with mothers on child health and nutrition by stimulating caregivers’ thinking about the causes of poor growth and malnutrition (ACC/SCN 1990a).

To be effective in reducing child malnutrition and mortality, GMP (Ashworth et al. 2008)

- Must be accompanied by community-based health and nutrition interventions
- Prioritize infants and children aged 0–18 months
- Utilize all child health contacts for nutrition counseling
- Improve training, supervision and support for health workers

Nevertheless, over the years, various studies have reported weaknesses in ICDS programme delivery, including incorrect weighing and plotting (Kapil et al. 1996), failure to identify children with growth faltering and lack of nutrition counselling (Lalitha and Standley 1988; Gopaldas et al. 1990) and might explain the programme’s lack of impact. Also, the studies of various GMP programs have shown that inadequate training of health workers, especially in equipping and enabling them to provide effective counseling has been identified as a very important factor contributing to the poor quality of implementation (Marek et al. 1999 and Kapil et al. 1996)

Too often, the performance of the AWWs is constrained by poor quality training and the pressure of a large and disparate workload. Survey data show that pre-service training is scarce with most AWWs undergoing short-term in-service training (Bredenkamp and Akin 2004). More resources have been directed towards strengthening capacity at the central, state and block levels to provide high quality support and training to functionaries of ICDS programmes (Gragnolati et al. 2006).

In Gujarat the major focus of MAMTA DAY (Village Health and Nutrition Day) is growth monitoring and promotion, and counseling on IYCF practices, which are expected to bring about change in the IYCF practices of parents and caregivers and eventually reduction in malnutrition. For this, it is very important that the AWW is perceived and treated as the core input for ICDS service delivery on MAMTA DAY and given the right tools and trainings in this effort to prevent and reduce
undernutrition.

The proposed trial aimed to measure the impact of the above child-nutrition educational interventions implemented through ICDS services answering the following research question:

Whether capacity building of ICDS functionaries, on growth monitoring and promotion, and infant and young child feeding practices can bring about a required change in the infant and young child feeding practices of parents and care providers, and eventually a reduction in undernutrition among children under two years?

The broad objective of the study was: “To build the capacity of Anganwadi workers of ICDS scheme on growth monitoring and promotion, and infant and young child feeding, and to assess its impact on infant and young child feeding practices and nutritional status of children under two years.”

For the present study, two ICDS Seja (group of approximately 20 AWCs) with similar nutrition profile (27% and 28%), and weighing efficiency (90% and 92%) for children under three years as per the Monthly Progress Report (MPR), April 2008 were purposively selected as Intervention Group (IG, 19 AWCs) and Control Group (CG, 17 AWCs) respectively.

The capacity building of IG AWWs, on GMP and IYCF practices, was conducted over a span of 6 months, which included group and hands-on capacity building (individual on-the-job). The techniques used for capacity building were lectures, discussions and practical sessions, demonstrations and on-the-job training. The focus was to enhance the counseling skills of AWWs and prioritize the GMP and IYCF counseling on MAMTA DAY and during home visits.

All the AWWs (17+19), from intervention and control group, and their Supervisors (2) were assessed pre and post capacity building, regarding their knowledge and perceptions on IYCF and GMP. The in-depth interview of AWWs and Supervisors was scored 1 point (score) per AWW for each preferred response. Mean score for 24 key areas (including IYCF, GMP and Interpersonal counselling i.e. IPC skills) were calculated taking mean of all the responses of all AWWs. Negative marking was done only in CF section while assessing knowledge and perceptions about the type and consistency of food. This was only when AWWs listed thin liquid foods as CF. Independent T-test was applied for pre and post mean scores between IG and CG, whereas paired T-test was applied within IG and CG mean score, pre and post capacity building.

In each group, all children below 2 years (~600 in each group) were studied for anthropometric measurements (Health, Weight and MUAC). Further, to measure 20% improvement in EBF (47.8% to 67.8%) and 15% improvement in IYCF practices.
(20.1% to 35.1%) at 80 power, 95% CI, 120 children U-6 months and 170 children between 6 to 23 months i.e. a total 290 children between 0 to 2 years (NHFS-3 and Epi Info 6.04d) were randomly selected, using a random number table generated through Epi info .04. This included additional 10% to take care of possible dropouts (incomplete information) from the study. The summary of the major study findings and learning is presented and discussed as under;

I. Knowledge and Perceptions of the Anganwadi Workers and Supervisors

The AWWs (19 IG + 17 CG) and ICDS-Supervisors (n=2) were aware of key IYCF practices; however, their perceptions and knowledge with regard to the rationale applicable to the appropriate recommended IYCF and GMP practices being promoted was rather poor. This is noted to be a critical gap and needs to be addressed for equipping the ICDS frontline workers in effective promotion and successful adoption of IYCF practices by the community, further reiterating the need for strengthening the knowledge, attitude and practices of frontline workers, for enhancing community based IYCF practices.

Key IYCF Practices
Correct knowledge and perceptions of Supervisors and AWWs, with reference to each of the IYCF practices is very important, for formulation of simple, understandable, logical messages and for convincing communities to adapt to optimal IYCF practices. However, baseline assessment showed that only 3/36 AWWs stated correctly all three key IYCF practices i.e. Early Initiation of Breastfeeding (EIBF) within one hour of birth of birth, Exclusive Breast Feeding (EBF) for the first six months and introduction of complementary food (CF) with breastfeeding from 7 months onwards, correctly. The major gap was with respect to the knowledge related to CF practices. Many AWWs referred to starting CF with thin liquid diet and while emphasizing on initiating CF from 7th month onwards, most of the AWWs missed out referring to continue breastfeeding till 2 years and beyond.

Breastfeeding
Although 86% AWWs were aware of EIBF within one hour of birth, none of the AWWs and ICDS Supervisors listed mother and child survival as one of the key benefits of EIBF. Similarly, the AWWs were aware that prelacteals can be infectious (78%) and unhygienic (31%); however, none of the AWWs and ICDS Supervisors knew that prelacteals may contain medications which may be harmful for the baby; in
fact, such message may be useful to encourage caregivers to avoid giving prelacteal feeds.

Also, none of the AWWs gave complete definition of EBF, which might be very critical for mothers to understand and practice EBF. The AWWs missed listing some very important benefits like “EBF baby doesn’t require water even during hot seasons” etc, which could be critical to convince and inspire community to ensure EBF.

For ensuring EBF, mothers need to be educated and supported from time to time on frequency, duration and adequacy of breastfeeding, as well as about various breastfeeding methods. Only 31% AWWs recommended on demand feeding, only 3/36 AWWs and 1/2 ICDS Supervisors mentioned frequency as “minimum 8 to 12 times”. On an average AWWs could list only 4-5, whereas the ICDS Supervisors listed 10 out of 11 signs of attachment, positioning and sucking, essential to ensure successful breastfeeding.

Only 19% AWWs recommended checking weight to resolve mothers’ complain of ‘Not Enough Breast Milk’ and none of the AWWs and Supervisors recommended checking frequency of urination despite IMNCI training, reflecting very poor knowledge of AWWs regarding assessing the adequacy of breast milk. Also, only around one third AWWs and one Supervisor had complete knowledge about reasons for breastfeeding at night, breastfeeding in side-lying position and use of both breasts. This poor knowledge and perceptions of AWWs would have a direct impact on mothers’ failure to EBF the child.

The perceptions of AWWs and their Supervisors on breastfeeding baby during pregnancy were also based on their field learning, reemphasizing the need for enhancing the capacity of frontline workers, so as to offer appropriate guidance to mothers, during such circumstances.

With reference to the knowledge of AWWs about continuation of breastfeeding during sickness of the mother, although 94% agreed that breastfeeding should be continued in sickness, discussing further, mentioning some major sickness, the percent of AWWs agreeing to the need for continued breastfeeding reduces further. Also, the knowledge of AWWs and their Supervisors regarding breastfeeding during breast problems was very poor with only 42%, 39% and 19% AWWs recommending continuing breastfeeding during conditions like cracked nipples, breast engorgement and breast abscess respectively. This revealed a huge gap in the knowledge of AWWs and their Supervisors. In the community where such situations exist, without proper guidance, these would lead to failure in EBF and breastfeeding in such cases.
Summary and Conclusions

Complementary Feeding
Almost all AWWs (97%) and both Supervisors stated the correct age of initiation of CF; however, only 14% AWWs were aware of continuation of breastfeeding till two years. Also, none of the AWWs knew the complete rationale for promoting breastfeeding till 2 years and beyond, representing poor capacity to convince community for the same.

Although the knowledge of AWWs about the consistency of CF was adequate, with 78% AWWs recommending mashed food from 7th month onwards, there was a wide gap between the knowledge and perceptions of AWWs; with only 44% AWWs further recommending foods with thick consistency and 67% recommending liquid diet for children. These practices, in fact, are one of the primary reasons which can be attributed to low energy and protein intake during complementary feeding.

With reference to CF during illness, only 6% AWWs advised on continuing breastfeeding and 22% advised on giving small frequent feeds. Only 22% AWWs and 1/2 Supervisors advised giving additional meal after illness. None of the AWWs recommended persistence in feeding the child with required quantity of food.

Care during Feeding
The knowledge of AWWs and their Supervisors on care during feeding was poor; only 2-4 of 11 care practices were identified. Also, the perception of AWWs on early signs of hunger and poor appetite in children were limited to crying and sickness.

Growth Monitoring and Promotion
Around 81% AWWs recommended weighing child every month, only 64% AWWs listed growth monitoring as an important tool for measuring growth and or detecting growth faltering and only 33% AWWs related it as a tool for giving appropriate advice based on the child’s nutritional status. None of the Supervisors could enumerate all key actions that follow by weighing. This finding, calls for a need to address the gaps in knowledge of AWWs and Supervisors and to enhance their capacity in GMP, which is an important tool for addressing undernutrition.

Inter Personal Counseling
The AWWs and their Supervisors could identify two to three of the five key steps in effective counseling which included listening, praising the mother wherever appropriate and asking checking questions. This again showed a below average knowledge of AWWs and their Supervisors, which could be one of the principal barriers in bringing about behavior change, while promoting community based optimal IYCF practices, as well as, various other interventions requiring IPC.
II. Undernutrition prevalence, and associated infant and young child practices of the care providers of the children under two years

A. Background characteristics of Households

Among the sampled households, a majority of the households were Hindus (99%), belonging to OBC, SC and ST category (89%) and falling in the upper lower status (71%) according to the Kuppuswamy’s SES scale – 2007. Further, 97% households had protected source of drinking water, however, the household sanitation condition was poor, with only 23.9% households having toilet facility and 78% families practicing defecation in the open.

Around 27% women in the study population (having children U-2 or pregnant women) had no prior schooling or education, and 5% mothers of children (U-2) and 3.4% pregnant women were engaged in semi-skilled work like farming on daily wages.

With reference to birth weight and immunization, the status of current study area was better as compared to previous studies; in the current study 19.3% children U-2 years were LBW, and 86.6% children (12-23 mo.) were vaccinated upto measles vaccine, whereas NFHS-3 2005-06 showed 22% children born as LBW (NFHS-3 Gujarat 2008) and DLHS-3 2007-08 showed 73.4% children in rural Vadodara vaccinated upto measles (DLHS-3 2010).

The MCH services particularly ANC checkup were availed of by a larger number of mothers with children below 2 years (85.2% 3 or more ANC checkup) during pregnancy. As a result, not only the full ANC coverage, but 73.3% institutional delivery rates in the present study area were better than the DLHS 2007-08 institutional delivery rates for Gujarat state 56.4% and Vadodara district 54.4% (DLHS-3 2010).

B. Infant and Young Child Feeding Practices

Breastfeeding

Knowledge and Perceptions on Breast Feeding Practices

The knowledge and perceptions related to optimal breastfeeding practices was 40% among Pregnant Women (PW) and 45% among Lactating Mothers (LM). Further, the knowledge about early breastfeeding practice ranged from 39-40% (EIBF and colostrum feeding) to 20% (avoiding prelacteals). Around 44% lactating mothers and 23% pregnant women knew about EBF and, most of them 47.2% and 53.7%
recommended continued breastfeeding for around 12-23 months, whereas only 13% pregnant women and 16.8% lactating mothers were aware of continuing breastfeeding till 2 years and beyond.

Breastfeeding on a time schedule and on demand breastfeeding was recommended by 46.3% and 42.6% pregnant women and 71.9% and 25.6% lactating mothers respectively, whereas, only 25% women (pregnant and lactating) had correct knowledge about the minimum frequency and duration of breastfeeding, and around 30% of them had an incorrect perception that, child should be breastfed for around 5 to 10 minutes only. The perception of women about offering second breast when one breast gets empty, during each breastfeed (PW 85% and LM 90%) and initiating breastfeeding from alternate breast (PW 69% and LM 79%) during every new feed was satisfactory.

Lastly, the correct knowledge about indicators for “Not Enough Breast Milk” was negligible, with majority of the mothers relating crying (24.1%) as an indicator of “Not Enough Breast Milk”.

Not many women were aware of the benefits of breastfeeding. Around 25% women were aware that breastfeeding enhances baby’s immunity, whereas, 14% lactating mothers perceived breast milk as good for baby.

The outcome of knowledge and perceptions of women about the impact of breastfeeding on mother’s health and pregnancy were also very poor, while 51.9% pregnant women and 78.4% lactating mothers recommended taking extra diet during pregnancy and lactation, only 9.9% lactating mothers and 12% pregnant women knew that breastfeeding helps in delaying next pregnancy, 25% pregnant women and lactating mothers recommended continuing breastfeeding during pregnancy, and 38.1% lactating mothers and 47.2% pregnant women knew that breastfeeding can help mothers to reduce weight.

**Counseling on Breastfeeding Practices**

Overall, 71% lactating mothers had received breastfeeding counselling during the last pregnancy. The association between ANC checkup visits and breastfeeding counseling was statistically significant (p<0.01) among those mothers who had more than 3 ANC visits.

Even though around 50% (colostrum feeding, no prelacteal feed etc) to 70% (EIBF) women were counseled about early and optimal breastfeeding practices, during *MAMTA DAY* (Village Health and Nutrition Day), the counseling by AWWs was low: 10% (no prelacteal feed) to 15% (EIBF) during pregnancy, and 8% (EBF) to 12% (BF attachment, positioning) post natal.
**Summary and Conclusions**

**Status of Breastfeeding Practices**

As presented in Figure IV-1, EIBF within one hour of birth was 73.4% among normal delivered infants and 54.8% among infants delivered through C-section, initiated within four hours. The study also reported prelacteal feeding immediately after birth as 36.5%, which commonly included “Patasa water” or Jaggery. Colostrum was fed in, around 60% neonates and additionally 29% reported having fed colostrum, after discarding first few drops, owing to family rituals and false beliefs.

Overall, the EBF rate among the children below 6 months was only 31.9%; this also correlated with the finding that only around 47% mothers fed a minimum of 8 to 12 breastfeeds in 24 hours preceding the survey and thus followed the correct feeding practices.

The continued breastfeeding rate dropped from 89% at 1 year (12-15 mo.) to 68% at two years (20-23 mo.) indicating that a total of 11% of the mothers were not offering breast milk to their children at one year, and around a third of mothers stopped breastfeeding by two years of age.

Among children below 6 months, the problems in breastfeeding were reported by 8.6% mothers, with majority of the mothers experiencing problems such as insufficient milk (57.9%) and breast engorgement (36.8%), of which, around 42% of mothers, discontinued breastfeeding, as a result of problems in breastfeeding. Findings also revealed 8.4% use of bottle-feeding among children (0-12 mo.) and the current bottle feeding rate was lower, 5.6%.

**Figure IV-1: Status of Breastfeeding Indicators (%)**
Complementary Feeding

Knowledge and Perceptions on Complementary Feeding Practices

Only 30.9% mothers (children 0-6 mo.) were aware of the correct age of introduction of CF and 15.5% recommended introduction of top milk before 6 mo and only 18.8%, mothers of children below 1 year perceived that the child can eat food from family pot by 1 year of age.

Besides poor knowledge about optimal CF practices, a majority of the mothers were also not aware of the consistency and frequency of CF. Most of the mothers recommended very thin liquid like consistency, and only 5.7% and 19.6% mothers recommended thick and solid foods (mainly biscuits). The correct feeding frequency was recommended by 30% (3 times for children 7-11 mo.) and 12% (5 times for children above 12 mo.) mothers of children below 1 year, respectively. Also, only 24.5% mothers were aware of increasing the number of meals and/quantity of food during illness.

The knowledge and perceptions assessment, regarding responsive feeding showed that only 22.8% mothers of children below 1 year knew that the child can eat on its own at around 2 years and 83% mothers of children below 2 years believed that the caregiver should sit and monitor how much a child eats.

Inquiring about mother’s response to child’s refusal to complete the given food, a majority of the mothers advised to leave the child (34.3%) following the laissez-faire style, 30.3% believed in encouraging the child (responsive feeding style), 10.3% recommended offering alternate foods to the child and 4.5% recommended force feeding.

Thus, overall the knowledge and perceptions of mother’s about optimal CF practices was below average (below 50%), again reemphasizing the need for enhancing the capacity of frontline workers to improve the KAP of caregivers of below 2 years about optimal CF practices, and eventually bring about reduction in undernutrition.

Status of Complementary Feeding Practices

The CF practices of mothers/caregivers of children 6-23 months, were analysed based on the Guiding Principles for Complementary Feeding of the Breastfed Child (WHO/PAOH 2003); and using the WHO 2010 indicators for assessing IYCF practices.

The status of CF practices showed that although 92.2% children (6-23 mo.) were receiving CF, only 37.9% children 6-23 months and 69.2% children 6-8 months initiated CF on completion of 6 months. Early introduction of CF before 6 months and delayed introduction of CF beyond 8 months were reported in 11.9% and 24.8%
children (12-23 mo.) respectively.
The mean age of introduction of CF (12-23 mo.) and top milk (6-23 mo.) was 7.6 months and 7.9 months respectively. Overall, 40.5% children received top milk, and, 11% were introduced top milk before 6 months of age.
More importantly, the quantity of CF given to breastfed and non-breastfed children was very less, as compared to the recommended IMNCI/MAMTA card guidelines. A majority of children were given as little as 50 to 80 ml per serving. Only 1.6% breastfed children (9-11 mo.) consumed recommended quantity of CF (200 ml) per serving, whereas none of the children above 1 year consumed the recommended quantity of CF (>200ml) per serving. Further, only 40% and 74% children 6-8 months and 9-23 months, respectively consumed the CF with appropriate consistency, which is very important to ensure adequate energy density of CF.
The dietary diversity in CF, was even poorer, with only around one quarter of children (6-23 mo.) consuming food from at least 4/7 major food groups listed to ensure proper dietary diversity in CF (Figure IV-2). The dietary diversity improved as the age advanced, the dietary diversity was the least among 6-11 months breastfed children (16.5%) and the maximum among 18-23 months non-breastfed children (63%). Also, the median number of food groups consumed by children (6-23 mo.) was only 2 in 24 hours preceding survey, which was less than the minimum dietary diversity, whereas with increase in age the median number of food groups consumed increased from 2 to 4.
Around 56% children (6-23 mo.) were fed as per the recommended norms of minimum feeding frequency (Figure IV-2). Among the breastfed, the minimum meal frequency was better among children in the younger age group (6-8 mo., 66.7%) as compared to the older age group (9-23 mo., 57.8%). Also, the minimum meal frequency among breastfed was better than among non-breastfed.
The minimum acceptable diet was received by only 15.8% children, in the 24 hours preceding the survey, presenting a very poor picture (Figure IV-2). The milk feeding frequency of non-breastfed children (6-23 mo.) showed that around 72% consumed more than one milk item; only 21% consumed at least 2 milk items in the 24 hours preceding the survey (Figure IV-2). Around 81% children were breastfed in 24 hours preceding the survey. The consumption of all the seven food groups was below 50%, except for the consumption of cereal grains, roots and tubers (87%). Less than half of the children were fed legumes and nuts, and over three-fourths were fed dairy products. The consumption of other fruits and vegetables was only 24%. Non-vegetarian food and egg was consumed by only 1% to 2% children respectively.
Other than the routine homemade food, around 72% children (6-23 mo.) consumed
outside snacks including beverages, packaged snacks, ice creams and chocolates. The consumption of all food groups was better among non-breastfed, as compared to the breastfed children, except for ‘Balbhog’ and biscuits which was surprisingly consumed more among breastfed children as compared to non-breastfed. Even though the use of at least one energy dense food like oil, ghee, sugar and jaggery in cooking was universal (92%) only 35% families’ practised top addition of these items for children to enhance the energy density of CF.

The consumption of iron-rich foods (i.e. fortified Balbhog, GLV, egg and flesh foods) excluding any supplement was around 36%; also, the consumption was better among non-breastfed (43.9%) as compared to breastfed (38.6%) children. The major source was ICDS fortified Balbhog (32.7%), whereas flesh foods and egg contributed to only around 0.9%. The consumption of IFA tables at least once was reported by only 7% children.

Assessing the breastfeeding practices of children during diarrhea, it was found that only 83% children were breastfed among those who suffered from diarrhoea. The hand-washing of children (6-23 mo.) before eating was practised by 82.4% mothers; however only 33.5% washed their hands using soap and water.

**Figure IV-2: Status of Complementary Feeding Indicators 6-23 months (%)**

<table>
<thead>
<tr>
<th>Complementary Feeding Indicators</th>
<th>Percentage of Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction of solid, semi-solid or soft foods at 6-8 mo.</td>
<td>69.2</td>
</tr>
<tr>
<td>Minimum dietary diversity</td>
<td>25.8</td>
</tr>
<tr>
<td>Minimum meal frequency</td>
<td>55.7</td>
</tr>
<tr>
<td>Minimum acceptable diet</td>
<td>15.8</td>
</tr>
<tr>
<td>Consumption of iron-rich or iron-fortified foods</td>
<td>36.1</td>
</tr>
<tr>
<td>Milkfeeding frequency for non-breastfed children</td>
<td>20.5</td>
</tr>
</tbody>
</table>

**IYCF Practices**

The detailed age-wise analysis of IYCF practices shows that the EBF rate reduced to as low as 3.1% among children 6-8 months of age (Figure IV-3). Also, the introduction of plain water in the study area was as high as 16.7% among children below 2 months and peaked at 4-5 months to 63.4%. Only around 69.2% children were introduced CF, along with breast milk, at around 6-8 months. The percent children not receiving breast milk increased from 1.6% at around 9-11 months to 24.1% by 18-23 months of age.
C. Utilization of Integrated Child Development Services for Children Under Two Years

Growth Monitoring and Promotion (GMP)
There was an incomplete implementation of the GMP activity in the field. Although 91.4% children were weighed at the AWC on MAMTA DAY or during home visits, only 68.5% reported being weighed regularly every month. Although 30.6% had plotting on MAMTA card, only 16.6% reported plotting on MAMTA card following the weight measurements. Overall, only 7.2% children had 100% or more plotting on MAMTA card, while only 5.1% reported plotting on MAMTA card by AWW. Such poor implementation of GMP has a direct impact on the parent’s awareness of their child’s nutritional status. As a result, only 18.4% parents were aware of their index child’s correct nutritional status (healthy/malnourished), weight and color on growth chart. Thus, it can be concluded that there was a minimal use of GMP as an IPC tool, by the AWWs for educating mothers about their child’s nutritional status and related IYCF practices.

Village Health and Nutrition Day (MAMTA DAY)
Although 98% respondents (mothers of children below 2 years and pregnant women) attended MAMTA DAY, only around half of the respondents reported having attended the last MAMTA DAY celebration in their respective area. Further, only around 13% mothers of children below two year and 22% pregnant women knew it as “MAMTA DAY”. Importantly, the MAMTA DAY venue was within 10 minutes reach for 80-90% participants; however, only 13% to 14% were correctly and 22% to 23% were partially aware of the MAMTA DAY schedule.
Summary and Conclusions

Awareness and Utilization of MAMTA Card
The use of MAMTA card by AWWs as a tool for IPC and behavior change communication (BCC), especially on child care practices, was low, with only 31% mothers counseled from the MAMTA card and only 9% explained by AWWs. Among those who were counseled, the MAMTA card was used least for counseling about GMP (<4%) and IYCF messages (<20%). As a result, less than 20% mothers reported having referred the MAMTA card and only around 12% mothers could understand the growth chart colors and or IYCF messages from MAMTA card.

Balbhog Supplementation
Around 84% mothers received Balbhog for their children and 72% reported having received in the previous 1 month. The contribution of AWWs in counseling and demand generation for Balbhog, for enhancing the feeding practices of children below 3 years, was only around 55%. The Balbhog distribution, as reported by mothers, was mostly as and when the stock arrived (60.5%). Only 28.3% reported receiving Balbhog every month, and 3.2% reported having received Balbhog on MAMTA DAY. The monthly supply of 7 packets was normally distributed in parts with a majority of mothers (59.7%) receiving two packets at a time, and not a single mother reported having received all 7 packets during her last receipt. The end use of Balbhog was 69%, whereas the positive impact of Balbhog on child’s health was perceived by less than 50% mothers of children 6-23 months.

D. Nutritional Status of Children Under Two Years
Among the survey population, the prevalence of underweight was the highest (48.8%), followed by almost a similar prevalence of wasting (36.3%) and stunting (36.2%). The prevalence of SAM among children 6-23 months of age was 3% by MUACZ<−3SD criteria and 11.7% by WHZ<−3SD criteria respectively.
Sex-wise, the prevalence of undernutrition and severe undernutrition was higher in males, as compared to females, except for severe wasting. The prevalence of underweight (p<0.05), stunting (p<0.01) and severe stunting (p<0.05) was significantly higher in males, as compared to females. The mean WAZ and HAZ scores was significantly higher (p<0.05 and p<0.01) among females by 0.18 and 0.05 z-score respectively as compared to males.

Between the age groups, the difference in prevalence and mean z-score was significant for all anthropometric indices. The prevalence of undernutrition was the highest among children in the age group of 12-23 months (underweight 58.8%, stunting 48.3%, wasting 40.9%, SAM by MUACZ<−3SD 4.1%), as compared to other age groups and as compared to the overall prevalence and sex-wise prevalence undernutrition.

E. Factors Affecting the Nutritional Status of the Children under Two Years

The prevalence and odds of wasting was significantly higher among children belonging to lower SES (OR 1.70, CI 1.10-2.62, p<0.05), drawing unsafe drinking water from the container (OR 1.72, CI 1.20-2.48, p<0.01), males (OR1.30, CI 1.00-1.68, p<0.05), age group of 12-23 months (OR 2.52, CI 1.83-3.48, p<0.001), LBW (OR 1.97, CI 1.03–3.80 , p<0.05) and with history of diarrhea 15 days preceding the survey (OR 1.85, CI 1.15-2.97, p<0.05).

The prevalence and odds of stunting was significantly higher among children belonging to ST (OR 5.71, CI 2.48-13.12, p<0.001), OBC (OR 3.66, CI 1.60-8.39, p<0.01), not having access household toilets (OR 1.73, CI 1.07-2.78, p<0.05), going for defecation in the open (1.84, CI 1.14-2.98, p<0.05), born to illiterate mothers (OR 1.64, CI 1.00-2.68, p<0.05), male (OR 1.49, CI 1.14-1.96, p<0.05), age group of 6-11 months (OR 2.30, CI 1.55-3.66, p<0.001), age group of 12-23 months (OR 4.51, CI 3.07-6.63, p<0.001), history of cough 15 days preceding the survey (OR 0.64, CI 0.42-0.97, p<0.05), GMP done 2 months back (OR 2.23, CI 1.00-4.96, p<0.05), GMP done>=3 months back (OR 2.10, CI 1.02-4.20, p<0.05) or not attended last MAMTA DAY (OR 1.73, CI 1.21-2.48, p<0.01).

The prevalence and odds of undernutrition was significantly higher among children belonging to lower SES (OR 1.88, CI 1.22-2.90, p<0.01), ST (OR 4.92, CI 2.59-9.45, p<0.001), OBC (OR 3.15, CI 1.66-5.98, p<0.001), not having access or using household toilet (OR 1.64, CI 1.07-2.51, p<0.05), defecation in the open (OR 1.66, CI 1.08-2.55, p<0.05), illiterate (OR 2.12, CI 1.32-3.39, p<0.01) or LBW (OR 2.83, CI
The children who were not initiated on EIBF within 1 hour of birth of birth had comparatively higher prevalence and odds of wasting (OR 1.18, CI 0.69-2.00) and underweight (OR 1.59, CI 0.94-2.58) as compared to children who had EIBF (Figure IV-4). As presented in Figure IV-5, EBF did not show any strong association with undernutrition, whereas the age of introduction of CF between 9-18 months showed a marginally higher prevalence and odds of undernutrition as compared to those who were introduced CF between 6-8 months (Figure IV-6 and Figure IV-7).

**Figure IV-4: Association of Early Initiation of Breastfeeding with undernutrition (0-12 months)**

<table>
<thead>
<tr>
<th>WHZ&lt;-2SD</th>
<th>HAZ&lt;-2SD</th>
<th>WAZ&lt;-2SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes (RC)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>No</td>
<td>31.3</td>
<td>47.6</td>
</tr>
<tr>
<td></td>
<td>1.18</td>
<td>1.59</td>
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<td></td>
<td>34.9</td>
<td>47.6</td>
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<td></td>
<td>24.6</td>
<td>36.8</td>
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<td>21.7</td>
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<td>1.05</td>
</tr>
<tr>
<td></td>
<td>47.6</td>
<td>36.2</td>
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</tbody>
</table>

**Percentage of Children**

<table>
<thead>
<tr>
<th>% &lt; -2SD</th>
<th>OR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes (RC)</td>
<td>1</td>
</tr>
<tr>
<td>No</td>
<td>1</td>
</tr>
</tbody>
</table>

**Note:** RC = Reference Category with OR=1.00

**Figure IV-5: Association of Exclusive Breastfeeding with undernutrition (0-6 months)**

<table>
<thead>
<tr>
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<th>HAZ&lt;-2SD</th>
<th>WAZ&lt;-2SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes (RC)</td>
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<td>1</td>
</tr>
<tr>
<td>No</td>
<td>18.6</td>
<td>35.2</td>
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<tr>
<td></td>
<td>0.38</td>
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<td></td>
<td>26.4</td>
<td>36.2</td>
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<td>17.6</td>
<td>17.7</td>
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<tr>
<td></td>
<td>17.6</td>
<td>17.7</td>
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</table>

**Percentage of Children**

<table>
<thead>
<tr>
<th>% &lt; -2SD</th>
<th>OR</th>
</tr>
</thead>
<tbody>
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<td>Yes (RC)</td>
<td>1</td>
</tr>
<tr>
<td>No</td>
<td>1</td>
</tr>
</tbody>
</table>

**Note:** RC = Reference Category with OR=1.00; ** Significant at p<0.01
Out of the total 26 factors tested in univariate analysis, around 10-11 factors were found to be significantly related with the WAZ, HAZ, WHZ and MUACZ score of the children (Annexure 12).

Multiple regression analysis was done taking the 4 z-scores (WAZ, WHZ, HAZ and MUACZ) as dependent variables, in 3 groups i.e. 1st including children 0-6 mo and EBF as one of the independent variable, 2nd including children 0-12 months and EIBF as one of the independent variable and 3rd including children 6-23 months and initiation of CF from 6th months and Balbhog compliance as one of the independent variable.

Of the 26 independent factors assessed, 6 to 8 factors were found to exert an...
independent effect at different stages for respective z-scores. Overall, 13/26 factors had independent effect at various stage of which 7 factors entered at 1st place among the 12 regression performed. The highest variation noted was with LBW 23.1% and 15.8% with WAZ and HAZ as dependent variable among children 0-6 months, including EBF as one of the independent variables. Also, LBW was the variable that entered highest number of times (4/12) on the 1st step during the regression, followed by age of child in months (2/12), safety of drawing drinking water from the container (2/12), whereas history of diarrhoea, caste, storage of drinking water and mother’s age entered one time each.

To conclude, with reference to three IYCF core indicators, the differences in prevalence of undernutrition were statistically non-significant for all three undernutrition indicators. No association of undernutrition with consumption of Balbhog (fortified ready-to-eat food) was noted, among children 6-23 months. The participation of children in monthly GMP showed a positive association with the prevalence of undernutrition.

### III. Process Evaluation by Concurrent Assessment

Post capacity building, the process evaluation of field practices related to GMP and IYCF was planned through concurrent assessment for a period of 6 months (November 2009 to April 2010). Overall, 43 IG AWCs visits were made (24 routine days and 19 MAMTA DAYS) covering all 19 AWCs, and 35 CG AWCs visits were made (19 routine day and 16 MAMTA DAYS) covering all 17 AWCs. The major differences reported between the groups were related to the quality of implementation of services pertaining to IYCF counseling and GMP. The key observations and findings of process evaluations are as follows;

**Preparation of Village Micro plan**

Post capacity building, village micro plans were available at 66.7% IG-AWC during MAMTA DAY, as against 77.8% reported by IG-AWWs, whereas, in CG, except for one AWC (as reported by AWW), the village micro plan was not available in any of the AWCs.

**Growth monitoring and Promotion**

Weighing of children below 2 years on MAMTA DAY in addition to those who came for routine vaccination was observed in 94.4% IG-AWCs, as against 56.3% CG-AWCs.

The actual observations on MAMTA DAY, showed, that more children were weighed
in IG (36.8%), as compared to CG (26.0%). Also plotting on MAMTA card (23.6% vs. 16.7%) and counseling was noted better in IG (11.1% vs. 5.7%) as compared to CG, which can be attributed to the capacity building.

**Status of IYCF Counselling on MAMTA DAY**
Post capacity building, though, all AWWs reported counseling on IYCF on MAMTA DAY, when crosschecked by observations, more AWWs from IG were observed counseling on IYCF (88.9% vs. 37.5%). Also the use of MAMTA card for IYCF counselling (55.6% vs. 25%) was better in IG as compared to CG. Similarly, the exit interview of children below 2 years on MAMTA DAY also reported better counselling on IYCF in IG (55.6%, n=225) as compared to CG (21.3%, n=150), as well as the use of IYCF guidelines from MAMTA card/flip chart/key messages/IEC material (26.6% vs. 20.0%) for counseling on IYCF.

**Counselling of Pregnant Women on EIBF**
Post capacity building, the counseling of pregnant women on EIBF during MAMTA DAY, was reported better by IG-AWWs (88.9%) as compared to CG-AWWs (83.3%). Even though field observations reported less counselling in both groups as compared to that reported by AWWs, the counselling was better among IG-AWWs (26.7%) as compared to CG-AWWs (0%) respectively.

To assess the quality of counseling, the AWWs were assessed on 10 key messages provided during capacity building (Annexure 6), which were to be discussed during the counseling of pregnant women on EIBF. It was noted that only 50% AWWs from IG counseled on EIBF using 10 key messages provided during capacity building, whereas in CG where no such guidelines were issued, even then 57.9% AWWs counsel pregnant women on EIBF, the information shared was not adequate.

Further, the actual observation of pregnant women in the last trimester attending MAMTA DAY showed that 37.6% pregnant women attending MAMTA DAY in IG were counseled on EIBF (including 18.8% using key messages) as compared to 26.1% pregnant women in CG, which may be attributed to capacity building.

**Balbhog Distribution on MAMTA DAY**
No major conclusions could be drawn regarding distribution and utilization of Balbhog on MAMTA DAY, since at the time of evaluation; the availability of Balbhog at the AWCs was inconsistent.

However, as a result of capacity building, the distribution of Balbhog on MAMTA DAY, preferably after GMP, was reported among all IG-AWC as compared to only 36.8% AWCs in CG. Similarly, field observations showed that among the AWCs
where *Balbhog* was available, 21.4% children 6-23 months in IG as compared to only 5.4% in CG were receiving *Balbhog* on *MAMTA DAY*. Also the distribution of *Balbhog* to the children completing 6 months along with counseling about initiation of CF was observed among 83.3% IG children completing 6 months as compared to only 45.5% in CG.

**Use of Flip Charts**

Post capacity building, the IEC material related to IYCF was available with all IG-AWWs as compared to only 32% among CG-AWWs. The use of IEC material on *MAMTA DAY* and during home visits was better among IG-AWWs (66.7%) as compared to the CG-AWWs (15.7%) and as emphasized during capacity building, the IG-AWWs used the material for all groups of beneficiaries, especially the pregnant and lactating mothers.

**Home visits by AWWs**

Post capacity building, home visits were conducted in a more planned and effective way by IG as compared to CG AWWs. Both groups mainly covered children below 6 months (IG-36%, CG-50%), pregnant women (IG-36%, CG-25%) and children 6-23 months (IG-28%, CG-15%) during home visits.

Importantly, the IG-AWWs visited households with essential items for recording (such as IMNCI registers), counselling (IYCF flip charts and *MAMTA* card) and distribution (such as *Balbhog*). Also, as a result of capacity building, the IG-AWWs used *MAMTA* card as a counselling and follow-up tool during home visits. They also utilized the opportunity of home visits to advocate and ensured complete and correct use of *Balbhog* with personalized counselling on the same during home visits.

Similar to overall home visits, though, quantitatively home visits of new born were better by CG than IG AWWs, the positive impact of visits on components such as EIBF was observed among all newborns in IG as compared to CG, showing a more focused and organised home visits by IG-AWWs, with good quality inputs, all attributed to the capacity building.

Further, in CG, counseling message regarding EBF till 6 months was predominantly observed being given by AWWs as compared to IG-AWWs who, as a result of capacity building, while counseling on EBF, addressed possible issues which could lead to failure in EBF, ensuring that more mothers who plan to EBF succeed in doing so.

Thus, it can be concluded that, post capacity building, the quality of implementation of services improved among IG-AWWs, as compared to CG-AWWs which could be instrumental in achieving the required behaviour changes in IYCF and GMP.
IV. Impact of Capacity Building of Anganwadi Workers on the Knowledge, Perceptions and Practices of the Anganwadi Workers and the Supervisors

As a result of capacity building, the overall knowledge score of AWWs in IG improved significantly (p<0.001) by 35.3%, whereas in CG, the pre and post knowledge score improved by only 3.6% (Table IV-1). Also, the difference between the knowledge score of IG and CG post intervention was statistically significant (p<0.001).

The mean knowledge score of IG-AWWs improved significantly for 15/24 indicators as compared to CG-AWWs, where significant improvement was recorded only for 2/24 indicators. Also, among the CG-AWWs the mean knowledge score significantly reduced with reference to knowledge regarding CF frequency, consistency and quantity. The post capacity building mean knowledge score (including IYCF, GMP and IPC skills) of IG-AWWs was better than CG for 21/24 indicators and significantly better for 11/24 indicators. The major improvement was noted among IG-AWWs regarding addressing mothers’ query of “Not Enough Breast Milk”, IPC skills, EIBF, type of CF and continuation of breastfeeding till 2 years and beyond along with CF, which were also some of the major issues/challenges identified at baseline.

Among the ICDS Supervisors, post capacity building, the major change in IG-Supervisor was regarding her awareness of the importance of recommended practices. The IG-Supervisor was able to articulate the correct reasons behind adopting these recommended practices, which was the key focus of capacity building, so that these reasons percolated to AWWs, and benefit greatly in IPC with women and their families to bring about the desired impact.

Although the improvement in knowledge of IG-Supervisor was satisfactory in 7/12 areas, further improvement is required for the prevention of undernutrition, which can be achieved by similar on job capacity building. Also, some changes in the work load such as duplicate reporting of data which has already been collected once reduced the participation of supervisors in non-ICDS programs, so as to give the ICDS Supervisors more space to work on the focused area.

Lastly from this entire exercise one more conclusion which may be drawn was that the knowledge and perceptions of field Supervisors depends on their area of priority which may keep changing year after it. A good programming should ensure a holistic approach, ensuring their field staff to be focused on all key areas rather than one parallel intervention, as can be see with the CG-Supervisor who was more focused on “Annaprashan day” and in turn only CF.
Table IV-1: Knowledge and Perception Scores of AWWs

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Pre (Mean ± SD)</th>
<th>Post (Mean ± SD)</th>
<th>Paired T-test</th>
<th>Independent T-test #</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IG</td>
<td>CG</td>
<td>IG</td>
<td>CG</td>
</tr>
<tr>
<td>1. Key IYCF Practices</td>
<td>2.53±0.977</td>
<td>2.35±0.843</td>
<td>3.39±0.676</td>
<td>2.79±0.73</td>
</tr>
<tr>
<td>3. EIBF</td>
<td>2.28±0.826</td>
<td>2.53±0.717</td>
<td>4.00±1.372</td>
<td>2.65±0.702</td>
</tr>
<tr>
<td>4. Colostrum Feeding</td>
<td>2.39±0.608</td>
<td>2.53±0.874</td>
<td>3.22±1.166</td>
<td>3.18±2.651</td>
</tr>
<tr>
<td>5. EIBF- Caesarean Section</td>
<td>1.00±0.907</td>
<td>1.00±0.866</td>
<td>1.83±0.857</td>
<td>1.35±0.786</td>
</tr>
<tr>
<td>6. Prelacteal feeding</td>
<td>2.28±0.669</td>
<td>2.00±0.612</td>
<td>2.17±0.707</td>
<td>2.12±0.781</td>
</tr>
<tr>
<td>7. EBF</td>
<td>5.89±1.323</td>
<td>5.41±1.278</td>
<td>8.22±1.592</td>
<td>6.29±1.572</td>
</tr>
<tr>
<td>8. Frequency and Duration of BF</td>
<td>1.44±0.856</td>
<td>1.53±0.83</td>
<td>1.94±0.873</td>
<td>1.82±0.728</td>
</tr>
<tr>
<td>9. Not enough milk</td>
<td>0.39±0.608</td>
<td>0.88±0.928</td>
<td>2.72±2.191</td>
<td>0.59±0.939</td>
</tr>
<tr>
<td>11. Bottle Feeding</td>
<td>1.22±0.732</td>
<td>1.29±0.588</td>
<td>1.89±0.758</td>
<td>1.35±0.702</td>
</tr>
<tr>
<td>12. BF during Pregnancy and Illness</td>
<td>4.00±1.609</td>
<td>3.59±1.839</td>
<td>5.28±1.994</td>
<td>3.82±1.741</td>
</tr>
<tr>
<td>13. BF during Breast problems</td>
<td>2.89±1.079</td>
<td>3.12±1.495</td>
<td>4.06±1.434</td>
<td>3.24±0.903</td>
</tr>
<tr>
<td>14. Age of Initiation of CF</td>
<td>1.89±0.471</td>
<td>2.12±0.6</td>
<td>2.39±0.698</td>
<td>2.24±0.752</td>
</tr>
<tr>
<td>15. Continuation of BF with CF</td>
<td>1±0.907</td>
<td>0.82±0.728</td>
<td>1.67±1.029</td>
<td>1.12±0.697</td>
</tr>
<tr>
<td>16. List of CF Items and Reason</td>
<td>7.44±3.072</td>
<td>7.59±3.572</td>
<td>13.28±1.873</td>
<td>7.06±2.331</td>
</tr>
<tr>
<td>17. Freq., Qty and Consistency of CF</td>
<td>5.89±2.494</td>
<td>5.29±1.16</td>
<td>6.33±1.283</td>
<td>3.76±1.348</td>
</tr>
<tr>
<td>Indicators</td>
<td>Pre (Mean ± SD)</td>
<td>Post (Mean ± SD)</td>
<td>Paired T-test</td>
<td>Independent T-test #</td>
</tr>
<tr>
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</tr>
<tr>
<td></td>
<td>IG</td>
<td>CG</td>
<td>IG</td>
<td>CG</td>
</tr>
<tr>
<td>18. Feeding during illness</td>
<td>1.83±1.150</td>
<td>1.76±0.97</td>
<td>2.17±1.15</td>
<td>2.29±1.263</td>
</tr>
<tr>
<td>19. Feeding after illness</td>
<td>1.39±0.850</td>
<td>0.94±0.899</td>
<td>1.83±0.924</td>
<td>1.29±0.920</td>
</tr>
<tr>
<td>20. Promote/Encourage CF</td>
<td>6.28±1.320</td>
<td>6.65±1.115</td>
<td>7.22±1.665</td>
<td>6.35±0.996</td>
</tr>
<tr>
<td>21. Care during feeding</td>
<td>4.06±1.589</td>
<td>3.76±1.091</td>
<td>4.33±1.414</td>
<td>3.71±1.160</td>
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<tr>
<td>22. GMP</td>
<td>6.67±1.970</td>
<td>6.12±1.111</td>
<td>7.56±2.093</td>
<td>6.53±2.004</td>
</tr>
<tr>
<td>23. Diet during Preg. and Lactation</td>
<td>7±2.722</td>
<td>6.59±1.417</td>
<td>7.44±2.175</td>
<td>5.94±2.045</td>
</tr>
<tr>
<td>24. IPC skills</td>
<td>0.50±0.707</td>
<td>0.24±0.437</td>
<td>1.61±1.092</td>
<td>0.47±0.514</td>
</tr>
</tbody>
</table>

*p<0.05, **p<0.01, ***p<0.001, all others statistically non-significant * Equal variation assumed
V. Impact of capacity building on undernutrition prevalence, and associated infant and young child practices of the care providers of the children under two years

A. Infant and Young Child Feeding Practices

Breastfeeding

Status of Breastfeeding Practices

In both the groups breastfeeding was universal (99-100%) pre and post intervention. The capacity building showed a significant improvement in EIBF (↑35.6% vs. ↑16.9%, p<0.001), EBF (↑50% vs. ↓16.4%, p<0.001) and age appropriate breastfeeding rates (↑16.7% Vs ↑12.5%, p<0.05) in IG as compared to CG, where the changes were statistically non-significant (Table IV-2). Improvement was observed in all 9 breastfeeding indicators in IG (Avg. ↑32.9%, excluding bottle feeding) as compared to 6 indicators in CG (Avg. ↑1.9%, excluding bottle feeding) respectively. Also, the bottle feeding rates dropped in IG by 39.1% (8.7% to 5.3%) as compared to a nominal drop in CG by 2.4% (8.3% to 8.1%).

Table IV-2: Impact of Capacity Building on Breastfeeding Indicators

<table>
<thead>
<tr>
<th>BF Indicators (WHO 2008)</th>
<th>IG</th>
<th></th>
<th>CG</th>
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<th>χ2</th>
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<th>IG</th>
<th></th>
<th>CG</th>
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<td></td>
<td>Pre</td>
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<td>Pre</td>
<td>Post</td>
<td></td>
<td>Pre</td>
<td>Post</td>
<td></td>
</tr>
<tr>
<td>EIBF (Normal delivery)</td>
<td>65.4 (100/153)</td>
<td>88.7 (157/177)</td>
<td>24.61** *</td>
<td>80.8 (135/167)</td>
<td>86.4 (133/154)</td>
<td>1.39 NS</td>
<td></td>
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<tr>
<td>EIBF (C-section Delivery)</td>
<td>47.4 (9/19)</td>
<td>56.3 (9/15)</td>
<td>0.01 NS</td>
<td>33.3 (4/12)</td>
<td>44.4 (8/18)</td>
<td>0.05 NS</td>
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<tr>
<td>EBF</td>
<td>25.2 (27/107)</td>
<td>64.0 (73/114)</td>
<td>31.9***</td>
<td>37.8 (45/119)</td>
<td>31.6 (30/95)</td>
<td>0.65 NS</td>
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<tr>
<td>BF till 1 yr</td>
<td>85.3 (29/34)</td>
<td>95.1 (39/41)</td>
<td>1.12 NS</td>
<td>93.3 (28/30)</td>
<td>82.8 (24/29)</td>
<td>0.73 NS</td>
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<tr>
<td>Ever BF</td>
<td>98.3 (173/176)</td>
<td>100 (193/193)</td>
<td>1.54 NS</td>
<td>99.4 (180/181)</td>
<td>100 (172/172)</td>
<td>0.00 NS</td>
<td></td>
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<tr>
<td>BF till 2 yr</td>
<td>67.6 (25/37)</td>
<td>75.9 (22/29)</td>
<td>0.22 NS</td>
<td>67.6 (23/34)</td>
<td>62.8 (27/43)</td>
<td>0.04 NS</td>
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<tr>
<td>Age appropriate BF (0-23 mo.)</td>
<td>53.4 (140/262)</td>
<td>62.3 (165/265)</td>
<td>3.86*</td>
<td>62.3 (165/265)</td>
<td>70.1 (185/264)</td>
<td>3.26 NS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• &lt;6 mo. (EBF)</td>
<td>25.2 (27/107)</td>
<td>37.8 (45/119)</td>
<td>64 (73/114)</td>
<td>31.6 (30/95)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 6 to 23 mo. (BF+CF)</td>
<td>72.9 (113/155)</td>
<td>82.2 (120/146)</td>
<td>85.8 (145/169)</td>
<td>91.7 (155/169)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Predominant BF U-6 mo.</td>
<td>83.2 (89/107)</td>
<td>89.5 (102/114)</td>
<td>1.37 NS</td>
<td>84.9 (101/119)</td>
<td>82.1 (78/95)</td>
<td>0.13 NS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duration of BF</td>
<td>9.2±6.68</td>
<td>9.0±6.47</td>
<td>8.6±6.80</td>
<td>8.9±6.60</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bottle feeding</td>
<td>5.1 (9/177)</td>
<td>4.7 (9/193)</td>
<td>1.00 NS</td>
<td>6.1 (11/181)</td>
<td>7.6 (13/172)</td>
<td>0.15 NS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Significant at p<0.05 ** Significant at p<0.01 *** Significant at p<0.001
**Knowledge and Perceptions on Breast Feeding Practices**

In the current study, the pre and post knowledge score of IG pregnant women improved significantly for all 3 early breastfeeding practices. The improvement in knowledge related to EIBF, colostrum feeding and prelacteals feeding was 35.7% (67.1 vs. 31.3%), 21.3% (63.9% vs. 42.6%) and 0.6 times (1.3 times vs. 0.7 times) better in IG as compared to, CG respectively. Further, although the knowledge about EBF improved in both groups, among pregnant and lactating women, the improvement was more significant for IG lactating mothers (p<0.001) as compared to CG (p<0.01). Among pregnant women, significant improvement was only in CG (p<0.01). On the other hand, the knowledge regarding duration of breastfeeding with CF improved only among IG pregnant and CG lactating mothers. The appropriate response related to breastfeeding frequency, duration and adequacy improved in IG pregnant and lactating women by 4.1% (12.9% vs. 8.8%) and 10.5% (13% vs. 2.5%) more than CG. The mean feeding frequency recommended by pregnant women improved more among IG (8.98±3.76 to 9.59±3.42) as compared to CG (9.67±3.70 to 9.72±4.37). Post intervention, the knowledge of pregnant women regarding benefits of breastfeeding was better in IG as compared to CG, whereas among lactating women, although the knowledge of IG women improved, as compared to baseline, the overall score remained better for CG. Finally, the knowledge score regarding breastfeeding and mother’s health, improved better in IG by 17% (32.4% vs. 15.4%).

Overall, it can be concluded that the impact of capacity building was mainly noted with reference to IG mother’s knowledge regarding key breastfeeding practices like early breastfeeding practice (EIBF, colostrum feeding, no prelacteal feeding), EBF and continued breastfeeding till 2 years and beyond.

Further, the translation of mothers’ knowledge into practice was better noted among IG mothers, as compared to CG, as observed in further results. This may be attributed to the quality of messages and support provided by IG AWWs during counseling as against IG, as a result of the capacity building.

**Complementary Feeding**

**Status of Complementary Feeding Practices**

Among the CF indicators, the initiation of CF between 6-8 months and minimum meal frequency (MMF) improved significantly (p<0.05) in IG as compared to no such impact in CG. Regarding the Minimum Dietary Diversity (MDD), although marginal
Summary and Conclusions

The baseline assessment showed that among all iron rich foods the major source was ICDS fortified *Balbhog* (84.7% i.e. 32.7% out of 38.6%). Thus during the post capacity building survey due to supply issues related to *Balbhog*, there was a significant reduction (p<0.001) in the consumption of iron-rich food in both the groups. Also, there was a decline in Milk Feeding Frequency of non-breastfed children; this was mainly as a result of reduction in non-breastfed children in IG from 11.8% (18/153) to 7.2% (13/180), whereas in CG it increased from 12.9% (21/163) to 17.5% (30/171).

**Table IV-3: Impact of Capacity Building on Complementary Feeding Indicators**

| CF Indicators (WHO 2008) | IG Pre | IG Post | *χ²* | CG Pre | CG Post | *χ²*
|--------------------------|--------|--------|------|--------|--------|------
| Complementary feeding at 6-8 mo. | 50 (18/36) | 75 (33/44) | 4.33* | 86.2 (25/29) | 67.4 (29/43) | 0.24 NS
| Min Diet diversity # (MDD) | 23.6 (42/178) | 22.1 (42/190) | 0.05 NS | 27.4 (46/168) | 25.4 (49/183) | 0.00 NS
| Min Meal Frequency (MMF) | 51.0 (78/153) | 63.9 (115/180) | 5.14* | 60.1 (98/163) | 64.9 (111/171) | 0.63 NS
| Min Acceptable Diet | 15.0 (23/153) | 15.0 (27/180) | 0.02 NS | 16.6 (27/163) | 13.5 (23/171) | 0.41 NS
| Consumption of Iron Rich food | 30.9 (55/178) | 11.1 (21/190) | 20.89*** | 41.7 (70/168) | 24.6 (45/183) | 10.83***
| Milk Freq. for Non-breastfed | 66.7 (12/18) | 53.8 (7/13) | 0.12 NS | 76.2 (16/21) | 80 (24/30) | 0.00 NS

; Corrected *χ²* used

* Significant at p<0.05  ** Significant at p<0.01  *** Significant at p<0.001

**Knowledge and Perception of Complementary Feeding Practices**

The knowledge of mothers of children below 1 year from both groups showed improvement regarding three aspects of complementary feeding with reference to the age of introduction of CF i.e. age of introduction of top milk, introduction of solid and semi-solid foods and introduction of food from family pot or meal. Also, the improvement was statistically significant among IG regarding introduction of top milk (p<0.01) and introduction of food from family pot (p<0.05) and among CG, regarding age of introduction of CF (p<0.01) and food from family pot (p<0.01). There was a significant (p<0.01, t-value-2.612) shift in the knowledge regarding the mean age of
introduction of top milk in IG from $9.56 \pm 9.18$ to $6.57 \pm 4.90$.
The knowledge and perceptions of mothers (below 6 mo.) about the consistency of CF improved in IG with more mothers recommending medium (53%) to thick (67.4%) consistency of CF, whereas in CG, mothers recommending thin liquid type CF increased by 1.4 times.

Further, the knowledge of mothers on optimal feeding frequency (one bowl 3 times a day) of children (7-11 mo.) also improved in IG by 8% more (IG ↑23.7% vs. ↑15.7% CG), as compared to CG; whereas, among older children (12-23 mo., 1½ bowl 5 times daily), the knowledge of CG mothers’ remained better.

With reference to feeding during and after illness, the knowledge and perceptions of mothers of children below 2 years, regarding feeding the child with increased number of meals/quantity of food while recovering from illness improved by 74.2% in IG, and 96.9% (p<0.001) in CG. Also, breastfeeding during diarrhea improved in IG by 5.1%, whereas in CG there was a decline by 6.3%. Among those having diarrhea, however, the differences were not statistically significant.

Post capacity building, more mothers (below 1 year) from IG (↑23.1%, 7.6 % and 2 times p<0.01) as compared to CG (↓36.5% p<0.01, 3.6% and 1.7 times p<0.05), showed improved knowledge regarding responsive feeding behaviour. As more mothers from IG believed that a child can eat by himself/herself around 2-3 years (↑23% vs. ↓32.6%), it is important to sit and monitor the child while eating (↑7.6% vs. ↑3.6 %) and mothers should encourage and feed the child, when the child refuses to complete the given food (↑12 times p<0.01 vs. ↑1.7 times p<0.05).

The knowledge of mothers (6-23 mo.) regarding hand-washing with soap and water before complementary feeding improved significantly (p<0.001) in both groups, but the improvement was better in IG by 87% as compared to 78% improvement in CG.

**IYCF Practices**

As presented in Figure IV-8 to Figure IV-11, overall age-wise trend analysis of infant feeding practices showed that compared to baseline, in IG there was a decline in the use of plain water (p<0.01) and other milk before 6 months and a concomitant increase in EBF rates, whereas in CG the age-wise trends in infant feeding practices continued to remain similar to baseline, in fact there was a marginal increase in the use of prelacteals, plain water and other milk items.

To conclude, as presented in Figure IV-12, the IYCF core and optional indicators improved in IG by 34.7% and 7.2% respectively as a result of capacity building, whereas in CG a reduction of around 6.4% was noted.
Summary and Conclusions

Figure IV-8: Infant and Young Child Feeding Practices by Age (%) - IG Pre

![Chart showing feeding practices for IG Pre]

Figure IV-9: Infant and Young Child Feeding Practices by Age (%) - IG Post

![Chart showing feeding practices for IG Post]

Figure IV-10: Infant and Young Child Feeding Practices by Age (%) - CG Pre

![Chart showing feeding practices for CG Pre]
B. Utilization of Integrated Child Development Services for Children under Two Years

Growth Monitoring and Promotion

Post capacity building although the improvement in knowledge of mothers about GMP was marginally better in IG as compared to CG, the overall status of GMP was significantly better in IG. Significant improvement was observed in IG, related to the important activities of GMP, such as recent weighing in last 30 days (↑21%, p<0.01), plotting on MAMTA card after GMP (↑4.3 times, p<0.001), mother’s awareness about child’s nutritional status, weight, nutritional grade and colour (p<0.001, ↑5, ↑2.6, ↑5.1 and ↑11.3 times) as compared to non-significant changes in CG, except about the mother’s awareness of child’s nutritional status (p<0.001, ↑2.2 times).

The overall weighing of children, other than those who came for immunization/health
checkup, also increased by 5.5% in IG as compared to reduction in CG by 5.9%, and the difference between the two groups (73.7% vs. 63.8%) was statistically significant p<0.001.

**Village Health and Nutrition Day (MAMTA DAY)**

Post capacity building, the awareness of MAMTA DAY and its schedule increased by 70% and 55% more in IG as compared to CG. Importantly, the participation of mothers on the MAMTA DAY (preceding the survey) improved by 17.7% in IG as compared to reduction in CG by 1.2%.

The overall counseling by AWWs using MAMTA card, as well as counseling by AWWs on key IYCF and GMP messages using MAMTA card which is essential to ensure that consistent and precise messages are given to mothers and care givers, improved significantly (p<0.001) in IG by 7 to 7.5 times whereas among the CG-AWWs the improvement was only 1.2 times (Table IV-4).

Also, post capacity building mothers’ understanding of growth chart and IYCF guidelines on MAMTA card improved by 7.6 (p<0.001) and 3.5 (p<0.001) times in IG as compared to 1.8 (p<0.001) and 1.4 times in CG respectively.

**Table IV-4: Change in Status of Counseling on Key Messages / Services after Capacity Building Intervention**

<table>
<thead>
<tr>
<th>Percent Beneficiary Counseled</th>
<th>Pre</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IG (N=285)</td>
<td>CG (N=286)</td>
</tr>
<tr>
<td><strong>Child Care Component of MATMA Card</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Explained</td>
<td>24 (69)</td>
<td>36.7 (105)</td>
</tr>
<tr>
<td>Explained by AWW</td>
<td>5.6 (16)</td>
<td>12.6 (36)</td>
</tr>
<tr>
<td><strong>Counseling by AWWs on MATMA card growth chart</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Growth chart, color</td>
<td>-</td>
<td>0.7 (2)</td>
</tr>
<tr>
<td>Growth chart, grade</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Growth chart, change in weight/grade</td>
<td>-</td>
<td>0.4 (1)</td>
</tr>
<tr>
<td>Growth chart, curve</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Mother’s Understanding of MAMTA Card</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Growth chart - colors</td>
<td>5.6 (16)</td>
<td>18.9 (54)</td>
</tr>
<tr>
<td>Growth chart - grades</td>
<td>1.4 (4)</td>
<td>1.4 (4)</td>
</tr>
<tr>
<td>Growth chart - curves</td>
<td>3.5 (10)</td>
<td>10.8 (31)</td>
</tr>
<tr>
<td>IYCF message</td>
<td>9.4 (27)</td>
<td>15.4 (44)</td>
</tr>
</tbody>
</table>

**Note:** Statistically significant (p<0.001) improvement in IG - mothers’ understanding of IYCF messages and growth chart colour and curves of IG and CG-mothers

**Awareness and Utilization of Balbhog Supplementation**

The major impact of capacity building was regarding distribution of Balbhog on
Summary and Conclusions

*MAMTA DAY*, which increased significantly (p<0.001) among IG children (6-23 mo.) by 4.6 times as compared to only 1.2 times increase in CG.

Due to reduction in supply of *Balbhog*, no major conclusion could be drawn regarding frequency and household utilization of *Balbhog* in IG and CG, respectively. Also, the type and number of recipes prepared from *Balbhog* remained similar to baseline in both the groups.

However, despite supply issue, the statistically significant reduction in end use and utilization of *Balbhog* among children (6-23 mo.) was lower in IG by 4.6% (IG ↓22.1 vs. CG ↓26.7%) and 4.8% (IG↓0.3 vs. CG↓5.1) as compared to, CG, which may be attributable to capacity building. Also, the perceived benefits of *Balbhog* for children improved significantly in IG (26.8%, p<0.05) and CG (28.6%, p<0.01) respectively.

C. **Nutritional Status of the Children under Two Years**

**Change in Prevalence of Undernutrition**

Post capacity building, the prevalence of undernutrition increased across all indices in CG by 8.2% (stunting) to 56.5% (MUACZ <-2SD) as compared to the IG by -10.1% (MUACZ <-2SD) to 13.2% (underweight). The increase in the prevalence of undernutrition (underweight, wasting and MUACZ<=2SD) and reduction in the respective mean z-score was statistically significant for CG as compared to a significant increase only in the prevalence of underweight in IG. The impact of capacity building was mainly observed on the prevalence of SAM (MUACZ < -3SD), with 1.6 times (4.2% to 2.7%) reduction in the prevalence of SAM in IG, as against 2.2 times (2% to 4.4%) increase in prevalence of SAM in CG (Figure IV-13). Furthermore, post capacity building, the prevalence of severe stunting reduced in IG by 6.5%, whereas the prevalence increased in CG by 9.7%. Finally, the risk ratio (RR) estimates showed that IG had 9%(1.15 vs. 1.24), 3% (1.04 vs. 1.07) and 13% (1.06 vs. 1.19) less risk of developing underweight, stunting and wasting, as compared to CG and the risk difference (RD) analysis showed that IG had 3.4% (6.92 vs. 10.32), 0.89% (2.11 vs. 3.00), 4.51% (3.18 vs. 7.69) and 3.71% (-1.29 vs. 2.42) less underweight, stunted, and wasted and SAM children as compared to CG. Also, a protective effect of capacity building on the prevalence of SAM was observed in IG with RR<1, as against a 41% risk of developing SAM among CG. Thus, it can be concluded that the risk of developing undernutrition and undernourished children including SAM was lower in IG as compared to CG. This impact may be as a result of capacity building, resulting into improved feeding practices and less undernutrition.
Statistically significant reduction in prevalence of underweight (CG $p<0.01$, IG $p<0.05$), wasting (CG $p<0.05$) and MUACZ<-2SD (CG $p<0.05$)

**Sex-wise Impact of Capacity Building**

Sex-wise, except for stunting (non-significant increase), undernutrition increased significantly with regard to all the anthropometric indices among CG males as compared to less and non-significant increase among IG males. The prevalence of severe stunting (HAZ<-3SD) and SAM (MUACZ<-3SD) reduced among IG males post capacity building, whereas no such reduction was noted among CG males. The risk estimates showed a protective effect of capacity building on IG males with SAM (MUACZ<-3SD), whereas no such effect was seen among the CG males.

Post capacity building, the mean WHZ and MUACZ score reduced significantly within CG females as compared to non-significant reduction in IG. More importantly, severe underweight, wasting and SAM (MUACZ<-3SD) reduced among IG females, as contrast to an increase in prevalence among CG females. The risk ratio estimates showed a protective effect of capacity building on SAM within IG females, whereas no such effect was seen among CG females.

**Age-wise Impact of Capacity Building**

Age-wise, among children 0-5 months, the protective impact of capacity building was only observed on the prevalence of severe wasting among the IG.

Among the children 6-11 months, the prevalence of wasting and MUAC<-2SD increased significantly among CG, contrary to the reduction in the prevalence of MUACZ<-2SD in IG. The mean WAZ, WHZ and MUACZ score reduced significantly within CG as compared to the IG. Except for the prevalence of stunting, the risk difference estimates showed a less undernutrition post capacity building among IG as compared to CG children in the same age group (6-11 mo.). Thus, lower undernutrition in IG children 6-11 months as compared to CG may be as a result of improved counselling on IYCF by AWWs, and the capacity building of AWWs.
resulting into improved complementary feeding practices in the study population and better nutritional status of children 6-11 months. The impact of capacity building, among the children in the age group of 12-23 months, was seen mainly on the MUACZ scores. Not only was there a reduction in the prevalence of MUACZ<-2SD and SAM (MUACZ<-3SD), but the mean MUACZ values also increased significantly among IG. Overall, the risk difference analysis showed a less risk of undernutrition among IG, as compared to CG children 12-23 months. The RR estimates showed a protective effect of capacity building on stunting and SAM in the IG (RR<0) as compared to a 12% and 24% increase risk of stunting and SAM among CG.

**Cluster-wise Impact of Capacity Building**

Cluster-wise, as presented in Figure IV-14, a total of 20% more clusters showed a protective effect of capacity building on at least one indicator of undernutrition among IG (79%, 15/19) as compared to CG (59%, 10/17). Almost double the number of clusters (29% more) showed a protective effect of capacity building on at least two indicators of undernutrition in IG (58%, 11/19) as compared to CG (29%, 5/17). Among the clusters showing protective effect of capacity building on at least three of four indicators of undernutrition, IG (32%, 6/19) had 20% more clusters as compared to CG (12%, 2/17). Overall, both the groups had one cluster each showing a protective effect on undernutrition on all four indicators.

**Figure IV-14: Percent Clusters Showing Protective Effect of Capacity Building**

![Chart showing percentage of clusters with protective effect of capacity building](chart.png)

Post capacity building, the IG’s had more percent clusters showing improvement in nutritional indices. Among all indices, the major difference between the IG and CG was in cluster-wise prevalence of SAM (MUACZ<-3SD, 29%) and MUACZ<-2SD (18%), followed by wasting (17%), stunting (12%) and least difference was with reference to clusters improvement in underweight by 8% (Figure IV-15).
Change in Prevalence of Undernutrition – Paired Cohort

As the age of the paired cohort increased, the prevalence of undernutrition increased in both the groups. However, as a result of the capacity building of IG-AWWs, resulting into improved counselling and feeding practices of mothers related to IYCF, the increase in prevalence of wasting (↑38.8% vs. ↑60.4%) and MUACZ<-2SD (4 times vs. 1.8 times) was comparatively lower in IG as compared to CG paired cohort.

Change in Prevalence of Undernutrition – In Pregnant Women Cohort

The mean age of children during the 1st and 2nd follow-up was around 8.5 months and 13 months in both the groups respectively. Post capacity building, during both the follow-ups, the prevalence of underweight (7.1% to 8.3%), wasting (15.6% to 9.4%) and SAM (8.3% to 0.4%) was more among CG as compared to IG (Figure IV-16). Between the two follow-ups, the difference in prevalence between IG and CG increased with regard to underweight, whereas the difference between two groups reduced with reference to other three parameters.

The prevalence of underweight, wasting and SAM was less among IG males and females (except for SAM 2nd follow-up in females) as compared to CG.
VI. Conclusions

In the current study, the two major issues identified behind failure in adaptation of optimal IYCF practices were:

- The incomplete knowledge and perceptions of ICDS workers in understanding optimal IYCF practices and importance of GMP.
- Lack of IPC skills and practices of the workers, resulting in their inability to understand issue faced by the community and addressing them effectively.

As a result of all these, the knowledge, attitude and practices of mothers of children below 2 years on IYCF practices and GMP were poor, contributing to a higher prevalence of undernutrition among children below two years.

The AWWs failed to understand and address the reasons, issues and challenges faced by the community while making an attempt to follow optimal IYCF practices. The capacity building of the functionaries dealt with these issues, resulting into improvement in community based IYCF practices, as well as the prevention of undernutrition and reduction of SAM in the community.

The major conclusions that can be drawn from the current study are:

- ICDS AWWs and Supervisors, have the fullest potential to bring about the required behaviour change in the community, in their limited capacity and time.
  What is required is to provide them with the state-of-art guidelines and realistic
Summary and Conclusions

- Long term, sustained capacity building of AWWs with continued hand-holding and monitoring and assessment of the existing issues, behind failure in adaptation of a particular behaviour could bring about the required behaviour change related to optimal IYCF practices and eventually prevention of undernutrition.

Limitations

Although designed as an operational research, where in the role of researcher was limited to the capacity building of AWWs, followed by project implementation through the existing system (ICDS Supervisors and AWWs), the association of ICDS Supervisors, and AWWs with the researcher could have affected the motivation and performance, in both intervention and control area.

Also, the researcher believes that the true impact of the intervention has the potential to be more than what was obtained, since many constraints, such as prolonged monsoon, problems in supply of SNP and problems in health services (immunization) also could have had an impact on the nutritional status of the children.

Future Score of Investigation

The study recommends planned operational research studies with longer duration, so as to systematically review the existing and upcoming public health nutrition interventions, and continued assessment of the actual impact of such interventions on field. The operational research with continued systematic evaluation/assessment would not only help in identifying the limitations of interventions, but also bring to the forefront the areas for improvement in existing program, so as to bring about faster and quicker results.