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IMPROVING NUTRITION IN VULNERABLE POPULATION

INTRODUCTION

Nearly half of all deaths in children under 5 are attributable to undernutrition; undernutrition puts children at greater risk of dying from common infections, increases the frequency and severity of such infections, and delays recovery. The interaction between undernutrition and infection can create a potentially lethal cycle of worsening illness and deteriorating nutritional status (UNICEF, 2019). Malnutrition in all its forms remains unacceptably high across all regions of the world. Despite reductions in stunting, 150.8 million children (22.2%) under five years of age are stunted, 50.5 million children under five are wasted (Global Nutrition Report, 2018). Regionally, Asia has declined from 38.1% to 23.2% in terms of stunting but still South Asia is home to 38.9% of the world's stunted children, having the highest burden of the regions (Global Nutrition Report, 2018) Children who are moderately or severely wasted have a higher risk of mortality. Wasting still affects 50.5 million children under five with more than half of the world's wasted children, 26.9 million, living in South Asia (Global Nutrition Report, 2018). According to the Global Nutrition Report 2018, India is facing a major malnutrition crisis as it holds almost a third of world's burden for stunting with the highest prevalence, is a home to 38.7 % of stunted children (RSOC, 2014). The burden of wasting is also highest in India, which has more than 15.1 % wasted children (RSOC, 2014). Though India has made progress towards the international hunger targets but it still has the second-highest estimated number (194.6millions) of undernourished people in the world (FAO 2015) with Gujarat having more than 15 out of 33 districts with very high prevalence ($\geq$ 40%) of stunting with 41.8 % and 18.7% children under five years of age being stunted and wasted respectively.

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. It is implemented through a network of Anganwadi centres (AWCs) at the community level. Under the program, a trained female known as Anganwadi (Courtyard) Worker (AWW) along with an assistant (Anganwadi helper-AWH), worked in an Anganwadi Centre (AWC), each catering to fixed numbers of community members based on certain predetermined criteria (Sahoo et al, 2016). Together, they were responsible for bridging the service utilization

gap between the vulnerable groups and healthcare system. The main objective of the program was to improve the nutrition and health status of the children below 6 years, by providing supplementary nutrition & immunization; laying the foundation for proper psychological, physical and social development of the child through preschool education; reducing the incidence of disease burden through proper referral; and enhancing the capacity of mothers to take care of themselves as well as their children through health education (ICDS, 2014).

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 utilisation due to poor awareness about the program, faulty supervision and monitoring mechanisms and corruption in food supplies (PEO, 2011; Paul et al, 2017).

Given increasingly limited public resources, childhood malnutrition appears resistant to local or single-sector solutions (Hoddinott et al, 2016). Transformative approaches are needed to ensure deeper engagement by multisector stakeholders (Popkin et al, 2012). The United Nations has encouraged governments, health jurisdictions, and civil society to engage with the private sector through public–private partnerships (PPPs) to address malnutrition (Friere et al, 2014). The government is doing its bit to tackle the burning issue of malnutrition but the fact remains that malnutrition cannot be resolved by just the ongoing strategies, it needs a 360 degree approach. In recognition of the ambition of the nutrition goals and the high economic and human development costs of failure, several efforts have emerged to accelerate progress. These include advancing Public-Private Partnerships (PPP) which has also been proposed as one of the sustainable strategies to reduce the rates of malnutrition (Global Nutrition Report, 2017).

RATIONALE

Surat, being the 2nd largest city of Gujarat, has a population of 4,467,797 (Census 2011). Recent available NFHS data on the prevalence of malnutrition among children reveal that among 6.58 lakh undernourished children (under 5 years) in Gujarat, Surat ranks second with 54,696 children (NFHS III). Considering the paucity of data, the present study was planned on request by Surat Municipal Corporation. The study was carried out with an objective to identify the gaps in the

services delivered by ICDS and plan to enhance the capacities of those involved in ICDS functioning to improve the nutritional status of the beneficiaries.

HYPOTHESIS

Null Hypothesis – Strategies to improve nutritional status and behavior change communications using PPP in Surat city may reduce the burden of under nutrition.

Alternate Hypothesis – strategies to improve nutritional status and behavior change communication using PPP in Surat city may not reduce the burden of under nutrition.

BROAD OBJECTIVE:

1. To Strengthen ICDS in Surat and improve nutritional status of the children using public-private partnership (PPP).

SPECIFIC OBJECTIVES:

1. To carry out situational analysis of Anganwadi functionaries and to map their KAP, assess the status of Anganwadi and the services delivered
2. To assess the nutritional status of children under five years of age attending Anganwadi Centers (AWCs)
3. To study the impact of Public Private Partnership (PPP) Model on nutritional status of children under five years of age and associated Infant and Young Child Feeding (IYCF) Practices of their mothers

REVIEW OF LITERATURE

This chapter will focus on the available literature under the following heads:

1. **Infant and Child Health and Nutrition**
2. **The Burden of Malnutrition**
   - Global scenario
   - National scenario
   - Regional scenario
   - Local scenario
3. **Policies and Programs for Improving Child Health and Nutritional Status**
   - Global Programs and Policies

- National Programs and Policies
- State Policies

4. Integrated Child Development Service (ICDS) Scheme

- History and its Functioning
- Studies on Evaluation of ICDS
- Strengths and Weaknesses of ICDS
- Operational challenges and Obstacles Faced
- Studies conducted for strengthening ICDS through:
    - Behavior Change Communication (BCC)
    - Nutrition Health Education (NHE)
    - Training of the Trainers (TOT) and capacity building of the workers
    - Improving IYCF practices by capacity building
    - 10 key interventions

5. Public Private Partnership (PPP)

- PPP in Health and Nutrition
- Global, National and Local success stories

6. Summary of Review of Literature

METHODS & MATERIALS

Site of the Study

Surat is the second largest city in the state of Gujarat, western India. Urban Surat is home to 4,462,002 million people (Census, 2011). It is divided into 7 zones across 5 Ghataks and it serves through 1004 Anganwadi Centers (AWCs) (SMC records, 2014).

Twenty AWCs across 3 Ghataks, Urban Surat, Gujarat, Western India were selected

Stakeholders

Department of Health – SMC, Department of WCD – ICDS, Rotary Club, Department of Foods & Nutrition, M. S. University and Department of Food, Science & Nutrition, SPTMC.

Permissions and Consent

As part of the project was SMC funded, we received SMC orders to carry out the sanctioned study. For the part of the study which wasn't funded, a prior consent to carry out the ongoing study was obtained.

Informed consent: For each phase of the study and for each beneficiary group, informed consent was taken prior to initiating data collection.

Methodology

Twenty AWCs were purposively selected from 3 Ghataks of Urban Surat. All mother-child pair of registered children beneficiary < 5 years of age were enrolled in the study. Grass root level workers (AWW and AWH) n = 1738 and Mother Child pair (n = 970) were interviewed using semi-structured questionnaire, focused group discussion and spot observations. Nutritional status of children was assessed. Detail methods are described below in separate phases.

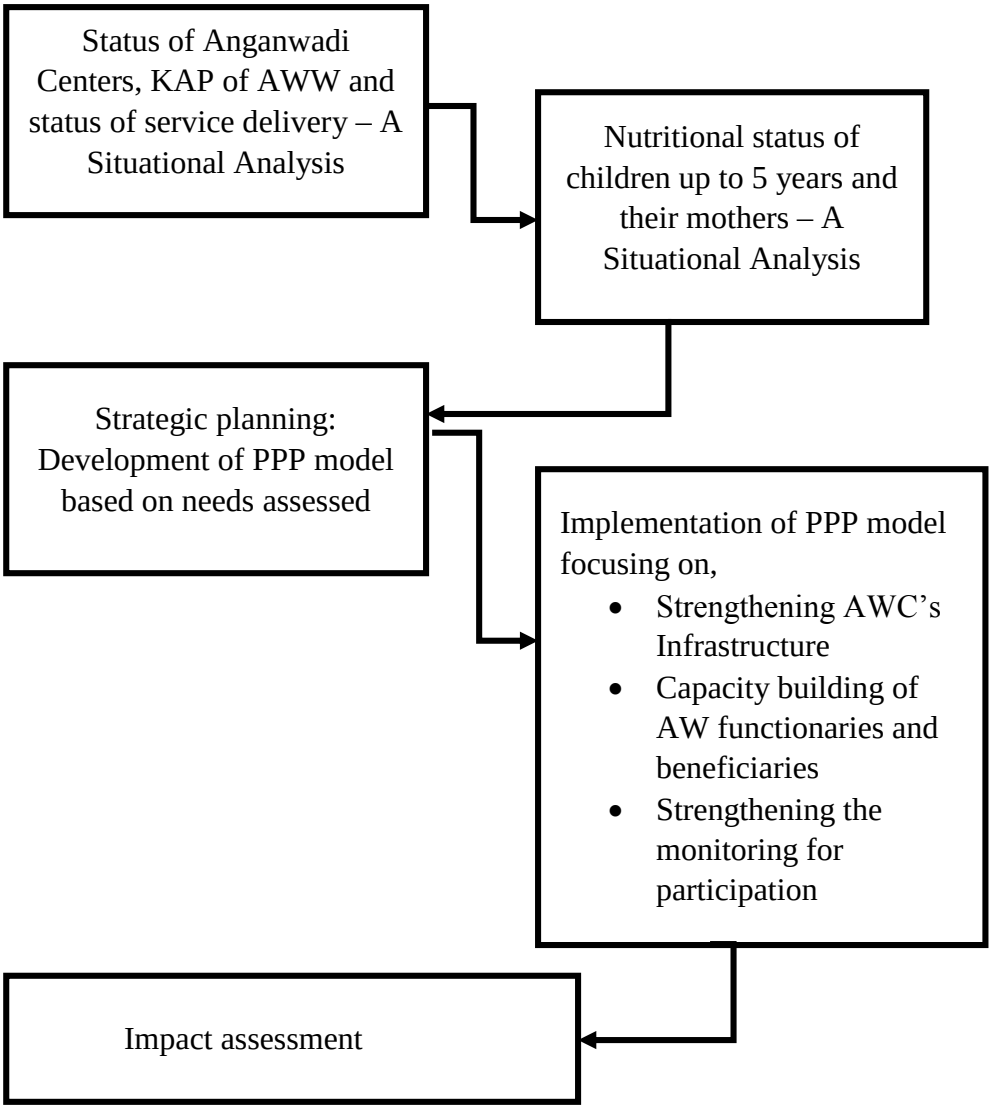
Data Analysis

All data were entered in MS excel 2010 and analyzed using statistical software (IBM Statistics SPSS 20) whereas anthropometric data were calculated using WHO Anthro software for prevalence of stunting, wasting and underweight prevalence.

Ethical approval

Ethical approval was granted by the ethical committee of the Foods and Nutrition Department of the university. Ethical approval No. IECHR/2015/2017

Fig. 1.1 An Overview of the Study



Detailed methodology has been described under the following phases.

Phase I: Situational analysis of Anganwadi functionaries to map their KAP, assess the status of Anganwadi and the services delivered

Research Design

The present phase is a cross sectional study with blanket coverage of all 1004 anganwadi functionaries.

Target Group

The target population was Anganwadi workers (AWW) and Anganwadi Helpers (AWH),

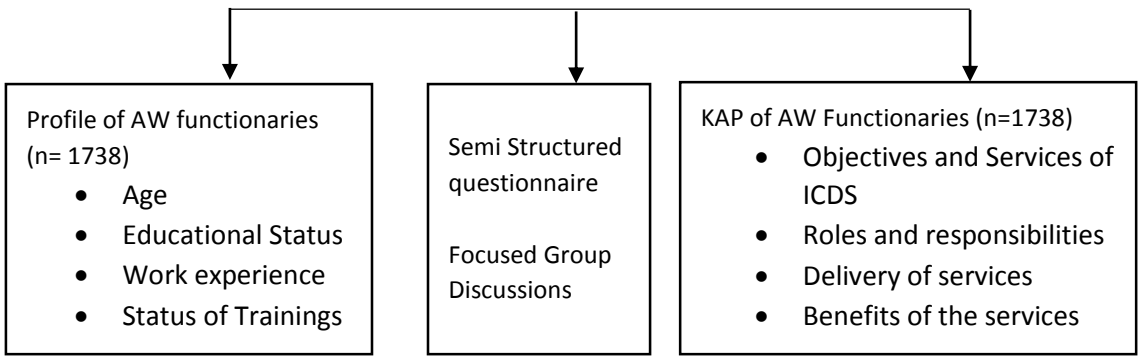
Primary Outcome

- Status of AW infrastructure and the quality of services delivered at AW
- Implementation and feedback for the services delivered in ICDS

Secondary Outcome

- Status of AW with focus on availability of Supplementary Nutrition, toilet, health and hand wash.
- Suggestions by the grass root level workers for strengthening ICDS in SMC

Fig. 1.2 Study Design of Phase I



Phase II Assessment of Nutritional status of children up to 5 years of age attending AWC in ICDS

Research Design

The present phase was a cross sectional study.

Target group

Four AWCs were selected from each Ghatak to give us a total of 970 mother child pair. All the children < 5 years who were available and whose mother consented to participate were enrolled for the baseline study.

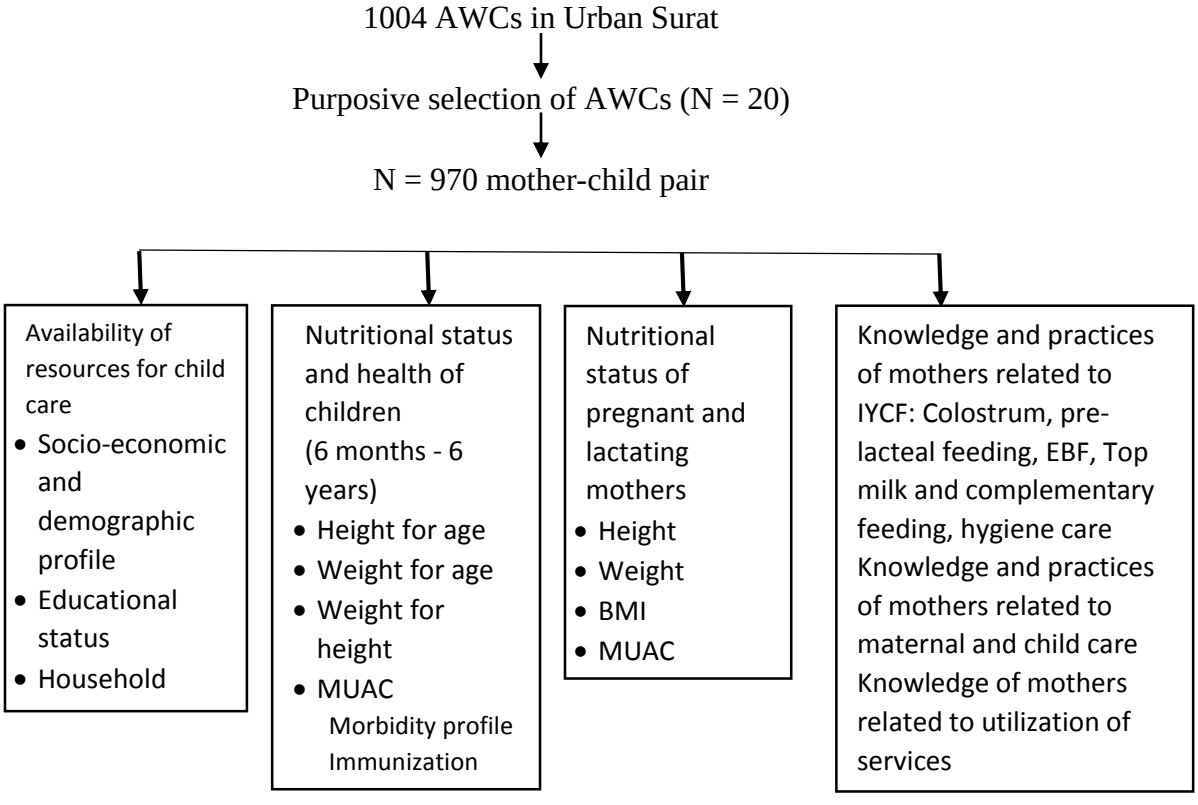
Primary Outcome

- Prevalence of malnutrition
- IYCF practices

Secondary Outcome

- Immunization
- Utilization of services

Fig. 1.3: Study Design of Phase II



Phase III: Strengthening SMC-ICDS using Public Private Partnership model

Research Design

The present phase was a Community Intervention study.

Target Group

20 AWCs were purposively selected from 3 Ghataks and categorized randomly into control arm and experimental arm each with a sub sample of 10 AWC. Each AWC from the experimental arm was adopted by Rotary Club whereas the 10 AWCs from control arm were functioning conventionally. The intervention was carried on for a duration of 1.5 years. All the children < 5 years whose mother consented to participate were enrolled. Phase III was further divided into 2 parts;

Part A 1: Intervention-Improving the infrastructure of all the adopted Anganwadi Centers

Part A 2: Intervention - Capacity building and training intervention for ICDS Functionaries and mother beneficiaries of ICDS towards better implementation of ICDS

Part B: Impact assessment of the intervention

Impact Assessment with focus on the status of AWC was done using post intervention accreditation tool to evaluate AWC in terms of cleanliness, availability of water, availability of child friendly toilets, growth monitoring practices of AWW, IFA consumption by ante natal mothers and their home visits, post natal visits and home visits by AWW, grade shift of undernourished children, immunization status and vitamin A administration.

Impact Assessment with focus on the AWW Knowledge, attitude and Practices was carried out using a semi structured similar assessment tool which was used pre intervention to evaluate the KAP on supplementary nutrition, IYCF practices, growth monitoring, food and nutrition supplementation and nutrition and health education. The study assessed the impact in both experimental and control arm.

Impact Assessment with focus on the Beneficiaries: Study carried out included pre and post evaluation of knowledge and perceptions of the mothers of enrolled children up to 5 years of age.

For comparison, similar assessment was made in both the groups, i.e. experimental arm and control arm.

Nutritional status was assessed in enrolled children 6 months to 5 years of age using Height for age, Weight for age and Weight for height and MUAC to study the change in the pre and post intervention changes.

RESULTS

Phase I: Situational analysis of Anganwadi functionaries to map their KAP, assess the status of Anganwadi and the services delivered

Profile of the Anganwadi Functionaries

Majority of the AWWs and AWHs belonged to the age groups ranging from 26 – 35 years (43.1%) and 36 – 45 years (36%). Also, majority (68.9%) were educated up to secondary level (Metric) and had more than 5 years of work experience (60.9%). Training was imparted to majority (90.1%) of the anganwadi functionaries but only 12.8% functionaries received training prior to joining their jobs.

Practice & Perceptions of the Anganwadi Workers Regarding Various ICDS Services and Its Delivery

Majority (80%) participants scored excellent with respect to defining management of MAM and SAM children as their basic role and responsibility followed by counseling pregnant and lactating women, ECE, SN, home visits, IYCF practices and counseling regarding nutrition and hygiene

Nutrition and Health Education (NHE)

Majority (94.5% and 93.8%) anganwadi functionaries of Surat city have reported imparting Nutrition and Health Education to pregnant and lactating women respectively. 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 importance of breast feeding and its initiation (89.2%) and importance of colostrum (89.9%) among all the topics covered.

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. Most (96.8%) of the AWWs were found practicing GM once 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.

Supplementary Nutrition (SN)

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 instead of THR. It was observed that Balbhog was reported to be unacceptable. As regards the objectives of SN service, majority (92.2%) stated that child received SN at AWC which might not be available at home. Only 15.8% AWW reported that SN helped to improve nutritional status and few (5%) believed that children attended AWCs as SN was distributed to them. Majority (73.2%) reported timely initiation of complementary feeding that was end of 5th month but quarter of the sample (26.8%) had misconception regarding timely initiation of complementary feeding.

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 AWWs 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% of AWWs not responding.

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. It was seen 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.

Health Check-up and Referrals

Out of 1738 anganwadi functionaries, 1603 (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.

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 Raab. SMC owned AWC also lacked gas, stove and water supply timings didn't match the AWWs timings and thus they had to rely on neighbors 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 centres have aluminium roof which face major functional issues during monsoon and witness decreased attendance during summer.

MAJOR FINDINGS:

- Nutrition and Health Education was poorly covered due to lack of time and other responsibilities.
- Home Visits were carried out but its purpose of imparting counseling wasn't met.
- Growth monitoring was regularly carried out once every month as indicated but the procedure practiced by majority was faulty leading to erroneous weights.
- Registration of pregnancies among majority was seen after 12 weeks.
- AWWs encountered problems in referrals due to unavailability of referral slips
- Many of the AWCs lacked basic amenities especially the rented centers and there was lack of space and inadequate infrastructure for conducting ECE.
- All AWCs lacked child friendly toilets.

Phase II: Nutritional Status Assessment of Children under 5 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.

Underweight: Weight-for-Age (WAZ) Score

More than one fourth of the children (242) were underweight (<-2 Z score.) and 10.6% (103) 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 girls were found to be higher in severely underweight category (11.6%) as compared to boys (9.6%).

Stunting: Height-for-Age (HAZ) Score

The results reveal, almost 39% (378) children are stunted (< - 2 Z score) and one fourth of the study population is severely stunted. The prevalence and severity of stunting increased significantly ($p < 0.05$) as age increased. No significant gender differences were obtained. However more boys suffered from stunting whereas, higher proportion of girls fell in severe stunting category.

Wasting: Weight-for-Height (WHZ) Score

Nearly one fifth of the children (194) 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.

MAJOR FINDING:

- Underweight prevalence was found to be 35.6 %, stunting was 39% and prevalence of wasting was 20% among subjects enrolled for the study.

Phase III: Strengthening SMC-ICDS using Public Private Partnership model and its impact assessment

Part A: Framing and Implementation of Public – Private Partnership Model

To address the issue of malnutrition and in order to strengthen the ICDS, we based our strategies on the evidence generated by our study and conducted a brainstorming session with the medical officers of the Surat Municipal Corporation, ICDS officials and CDPOs. Several meetings with various private NGOs like Lion's Club, Surat Round Table and Rotary Clubs were called and collaboration for implementation of developed Public Private Partnership (PPP) Model was proposed. The PPP model was based on the following principles of targeting the most vulnerable, flexibility, evidence and outcome based participatory planning, stronger convergence and stronger monitoring.

The strategies adopted under the PPP model were;

- Strengthen infrastructure of the AWC for improved access and utilization of ICDS services.
- Need based planning identifying anganwadi center priorities.
- Building the capacities of the front line workers by imparting training to strengthen service delivery.
- Result based Monitoring and Evaluation.
- Integrated Behaviour Change Communication.

A partnership MOU was signed by the AWC adopting NGO (Rotary Club) and Surat Municipal Corporation. Every club adopted one AWC to implement the PPP model as designed. A unit of club members was set up to provide assistance to SMC. This PPP model was developed based on the findings of Situational analysis carried out in phase I and II, need assessment and reviews of other initiatives in nutrition based studies.

The PPP model gave SMC, the flexibility to address the real needs of the AWCs in order to address the issue of maternal and child health and nutrition.

Part B: Impact Assessment

B.1 **Change in Prevalence of Undernutrition**

Post intervention, although there was an overall decline in the rates of undernutrition across all the indicators, the decline was statistically significant for all indicators in EG. In CG, there was a mild increase seen in rates of undernutrition with regards to WAZ status by 2.7% and mild (1%) reduction was seen in MUACZ status which was non-significant at 95% CI. There was a non-significant increase seen with regards to WHZ status. Also it was seen that the rates of stunting in CG which was found to be statistically significant. The table 1.1 shows the pre and post prevalence of undernutrition (Underweight, Stunting, Wasting and SAM) and the respective mean Z-scores for children under 5 years of age.

Table 1.1: % Change in Level of Undernutrition Among Children 0-60 Months After Intervention

Nutritional Status (TOTAL)	**Experimental Group (EG)**		**Control Group (CG)**	
	Pre	**Post**	**Pre**	**Post**
% Weight-for-age (WAZ Scores)				
N	367		309	
Normal (-1 to +1 SD)	19.9 (73)	29.7(109)	29.4 (91)	30.1 (93)
Mild Underweight (<-1 SD to -2SD)	33.2 (122)	38.7 (142)	37.9 (117)	35.9 (111)
Moderate Underweight (<-2 SD to – 3SD)	31.9 (117)	23.7(87)	23.9 (74)	27.5 (85)
Severe Underweight (< - 3 SD)	14.4 (53)	6.8 (25)	5.8 (18)	4.9 (15)
> 1 SD	0.5 (2)	1.1 (4)	2.9 (9)	1.6 (5)
Mean $\pm$ SD	-1.87 $\pm$ 1.04	-1.44 $\pm$ 0.98	-1.38 $\pm$ 1.15	-1.51 $\pm$ 1.05
Mean $\pm$ SD (Paired difference)	-0.42 + 0.66		0.12 + 0.6	
T values (Sig. 2 tailed) within Groups)	-12.3 (0.00)*		3.63 (0.00)*	
% Length/Height – for age (HAZ Scores)				
N	367		309	
Normal (-1 to +1 SD)	22.9 (84)	26.7 (98)	30.1 (93)	28.2 (87)
Mild Stunting (<-1 SD to -2SD)	26.7 (98)	34.9(128)	31.7 (98)	34.6(107)
Moderate Stunting (<-2 SD to – 3SD)	32.2 (118)	25.1(92)	22.0 (68)	22(68)
Severe Stunting (< - 3 SD)	15.5 (57)	10.6 (39)	12.3 (38)	12.6(39)
>1 SD	2.8 (10)	2.7 (10)	3.8 (12)	2.5(8)
Mean $\pm$ SD	-1.8 + 1.28	-1.57 + 1.21	-1.49 + 1.41	-1.61 + 1.18

Mean ± SD (Paired difference)	-0.23 + 0.72		0.12 + 0.66	
T values	-6.09 (0.00)*		3.20 (0.02)**	
% Weight-for-length/height (WHZ Scores)				
N	367		309	
Normal (-1 to +1 SD)	36 (132)	49.3 (181)	48.5 (150)	39.8 (123)
Mild Wasting (<-1 SD to -2SD)	36.2 (133)	28.3 (104)	27.2 (84)	31.1 (96)
Moderate Wasting (<-2 SD to – 3SD)	20.2 (74)	12.5 (46)	12.9 (40)	14.2 (44)
Severe Wasting (< - 3 SD)	4.9 (18)	3 (11)	3.2 (10)	5.5 (17)
> 1 SD	2.8 (10)	5.2(19)	8.1 (25)	8.6 (29)
Mean ± SD	-1.2 + 1.06	-0.82 + 1.22	-0.79 +1.26	-0.89 + 1.33
Mean ± SD (Paired difference)	-0.43 + 1.04		0.09 + 0.87	
T values	-7.89 (0.00)*		1.97 (0.049)**	
% Mid-upper arm circumference- for- age (MUACZ Scores)				
N	367		309	
Normal (-1 to +1 SD)	41.1 (151)	49.6 (182)	55.3(171)	55.3 (171)
% <-1 SD to -2SD	39.0 (143)	41.1 (151)	28.8 (89)	32.0 (99)
% <-2 SD to – 3SD	15.5 (57)	7.1 (26)	9.7 (30)	9.4 (29)
% < - 3 SD (SAM)	1.6 (6)	0.3 (1)	1.0 (3)	0.3(1)
> 1 SD	2.7 (10)	1.9 (7)	5.2 (16)	2.9(9)
Mean ± SD	-1.10 + 0.94	-0.86 + 0.84	-0.75 + 1.00	-0.83 + 0.86
Mean ± SD (Paired difference)	-0.24 + 0.72		0.08 + 0.7	
T values	-6.53 (0.00)*		2.19 (0.029)**	

Cluster-wise impact of the PPP model

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 mean rates of wasting among EG which was 16.5% as compared to mean % reduction in underweight (10.3) and stunting (3) towards lower grades (<-1SD) and normal category (+1 to -1 SD) within the cluster which. The overall trend showed that there was a positive impact of intervention as more number of AWCs (7)

from EG showed improvement as compared to improvement in only three AWCs from CG with the help of array of interventions for a duration of 1 year 6 months.

Major reasons for improvement in the malnutrition status across different indicators within the experimental group can be attributed to regular health checkups and treatment with availability of private pediatrician every month where the compliance was noted to be the highest, followed by attendance of mothers in various NHE sessions with regular consultations with a nutritionist. Also an overall improvement in the attendance of enrolled children was seen during the period of intervention which could have been due to improvement in AWC infrastructure, monthly goodies distribution and birthday celebrations which might have served as an attraction for children.

B.2. Changes in Knowledge, attitude and practices of mothers

Breastfeeding Practices

The knowledge and perceptions of mothers on early Breast Feeding (BF) practices in terms of initiation of BF and colostrum feeding was seen to have improved by 8% and 9% respectively. The improvement in knowledge related to initiation of breast feeding, pre-lacteal feeding and colostrum feeding was 7.4 (64.8 v/s 57.4), 9.1 (19.9 v/s 29.0) and 7.9 (81.4 v/s 73.5) times better in EG as compared to CG. The improvement reported in EG on all three breast feeding practices was statistically significant at $p<0.05$

Post intervention, more (19.9%) mothers showed readiness to continue feeding till 1.5 years of child's age which was only 8.2% pre-intervention which was statistically significant at $p<0.05$. There was no change seen in number of respondents for > 2 years in EG but there was 2 % decrease in respondents opting to feed only for 6 months. Also, there was significant ($p < 0.05$) increase seen among respondents opting for 1 and 1.5 years respectively in EG group.

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. The change was statistically significant at $p<0.05$ among EG and CG post intervention at 95 % level of CI.

Mother's perceived the correct technique of breast feeding as feeding from both the breast pre intervention, after the intervention there was significant ($p < 0.01$) change in the perception and method of breast feeding.

Complementary Feeding Practices

Majority (83.1%) mothers from EG stated initiating Complementary Feeds (CF) at the completion of 6th month as compared to 59.5% from CG group. The change was statistically significant. Majority mothers perceived the correct reason behind initiating CF across EG and CG which was increased needs. Benefits behind initiating CF at the 6th month completion were also correctly perceived by many. Among both the groups around 81% of the mothers were engaged in preparing special foods for CF.

Morbidity Status of children

Morbidity trends showed reduction in both the groups 24.1% (EG) compared to 13.6 % (CG) which was statistically significant at 95% CI in EG. Majority (88.8%) sought medical help across EG as compared to only 19.2% going to a medical practitioner in CG.

DISCUSSION

The current study showed a positive impact of Public Private Partnership on nutritional status of children (U-5 Years) in experimental group. Although the prevalence of undernutrition decreased in experimental group, the reduction in stunting levels was not significant. A study conducted by Daxini and Kanani (2009) showed a similar impact on Nutritional status, change in Severe underweight among females (- 9.8%), Severe stunting (- 6.4) and severe wasting among females (-11.2) was seen in intervention group as compared to increase in these parameters in control group.

The Knowledge and perception regarding key breast feeding practices improved among experimental group who received NHE sessions, as compared to control group in present study. Guldan et al (2000) in a year - long community based pilot nutrition education intervention (in congruent with 250 infants each in Education and Control groups) in China, including training and mobilization of village educators showed significantly higher nutrition knowledge and better reported IYCF practices than control group.

The present study has shown significant reduction in morbidity and there was significant increase seen among mothers from EG seeking health care as compared to CG. A study by Mangala et al (2001) presented the impact of educational intervention on Knowledge of 223 mothers regarding management of diarrhea, results showed there was significant improvement after intervention in knowledge of mothers regarding understanding of diarrhea , signs of dehydration and awareness of ORS and seeking health care and rational drug therapy during diarrhoea

Limitations

- The present study did not include all the beneficiaries of the ICDS program (pregnant and lactating mothers and adolescent girls).
- Dietary aspects and household parameters of food security and dietary habits could not be assessed.
- Due to large sample size, the drop-out rate was high which could not be controlled.
- The association of AWWs with the researcher could have affected the motivation and performance between both the groups.

Way Forward:

This pilot study can be replicated in the entire nation to improve the status of the ICDS centres along with its beneficiaries' nutritional status.

This NGO-academia and Government partnerships can be a model which can be an integral part of all CSR activities and the protocol for enhancing the status of workers as well as beneficiaries of ICDS should be followed.

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Papers Published

1. Vakilna, R., Nambiar, V. and Desai, R. Understanding the Knowledge Attitude and Practices of Grass Root Level workers of ICDS in Surat City. National Journal of Community Medicine, 2018; 9 (3): 148 -152.

Papers Presented

1. Paper presented on Understanding the Knowledge Attitude and Practices of Grass Root Level workers of ICDS in Surat City at 12th SEA Regional Scientific Meeting of the International Epidemiological Association held at Bangkok, Thailand on 24-26 November, 2015.

Awards and Fellowships

1. Best Presentation award during the International Course in Nutrition Research Methods from 4th – 15th January, 2016 at St. John's Research Institute, Bangalore.
2. Awarded a scholarship for participation in the IEA Thailand, 2015from IEA Thailand, 2015 and World Health Organization.
3. Recipient of Rotary International Fellowship to attend training under Dr. Able Albino at CONIN, Argentina in May, 2018.