SYNOPSIS

IMPROVING FOOD AND NUTRITION SECURITY BY PUBLIC PRIVATE PARTNERSHIP IN RURAL HOUSEHOLDS

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Table of Contents

Introduction

The global health expert states that India constitutes 40 percent of the world's malnourished population and the highest rate of underweight children due to improper implementation of government policies (1) The ICDS (Integrated Child Development Services) has been established in India since 40 years. However, its objectives of raising health and nutritional level of poor Indian children (< 6 years) remain unmet as high prevalence of child undernutrition and food and nutrition insecurity exists, especially in rural India (2). This staggering number amounts to over 28% of the 8 crore children who attend anganwadis across India indicating an urgent need to strengthen it using integrated strategies (3).

In Gujarat, nearly 6.13 lakh children in 14 districts are moderately or extremely malnourished (4). In spite of food and nutritional supplementation through anganwadis, food and nutrition insecurity at households may have a direct effect on child undernutrition.

Thus, assessing and improving the services under ICDS programme as well as Food and Nutrition Security at household level can reduce the prevalence of malnutrition among children and ensure healthy birth outcomes. Considering the limitations of the government policies and their implementations, applying strategies such as Positive Deviance approach (PDA) can prove to be sustainable both, at anganwadi as well as household level to combat child undernutrition (5). ***Positive deviance (PD)*** refers to a phenomenon that exists in many resource-poor communities (6). PD behaviors are likely to be affordable, acceptable, and sustainable by the wider community because their peers are already practicing them (7).

Moreover ***Public-Private Partnership (PPP)*** is a mode of implementing government programmes/schemes in partnership with the private sector. The term private in PPP encompasses all non-government agencies such as the corporate sector, voluntary organizations, self-help groups, partnership firms, individuals and community based organizations *(8).* So Under the right conditions, private-sector investment can contribute to pro-poor development that raises incomes and strengthens food security *(9).*

Rationale

Populations involved in agriculture, especially women and their children, need to be addressed for improvement of Food and nutrition security (FNS) using an integrated approach. Simple strategies such as PDA can be effective in behaviour change as well as Nutrition sensitive agriculture *(10)* and need to be promoted where there are limited resources. PPP (working in tandem with goals of CSR of industry, academicians and ongoing government programmes) can be effectively integrated for improving food and nutrition status of populations. *(11)*

Broad Objective

To create "enabling environments" for improving FNS among mother-child pairs in a rural setup using Public-private partnerships (goals CSR of industry, academicians and ongoing government programmes)

Specific Objectives

- Situational analysis of the functioning of the government scheme (ICDS)
- Situational analysis of the health and nutrition indicators of the mother-child pairs in a rural setup
- Identification of the positive deviant behavior for health, nutrition, food handling practices and IYCF practices
- Promotion of "Agri-Nutri-Health" concept using PDA

Review of literature

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

- ICDS
    - What is ICDS
    - Goals and targets
    - Stakeholders
    - Different services of ICDS
    - Functioning and implementation
    - Awareness regarding ICDS
    - Obstacles and gaps identified previously
    - How ICDS implementation can affect food security and undernutrition
    - Need for strengthening ICDS
- Socio-economic status
- IYCF practices
    - Breastfeeding practices
    - Complementary feeding practices
    - 10 key intervention
- Essential nutrition action
- Food security
    - Food and nutrition security
    - Household food and nutrition security
    - Nutritional insecurity in India
- Hygiene and sanitation
- Dietary diversity
- MDGs and SDGs
- Mother child data
- Nutrition sensitive agriculture
- Nutritional status of children and mothers (UNICEF, WHO, CMAM, CRY, DLHS, FAO, LANCET, NFHS, RSOC, NNMB, SUN, CMTC)
    - Global
    - National
    - State

    - Local
- Agri-Nutri Health
- Positive deviance practices
    - Previous implementation
    - Outcome
    - Obstacles
    - Recommendation
- Public private partnership
- Corporate Social Responsibility
- Summary of ROL

Methods and Materials

Study Site: Four village clusters of Padra Taluka, rural Vadodara, Gujarat, western India

Stakeholders: Department of WCD-ICDS, Collectorate office, rural Vadodara, Department of health, Department of agriculture, CSR cell- TSIPL, Vadodara, FN Department, M.S.U

Target Group: Grass root level workers (AWW, ASHA, ANM), Village heads, Mother-child (<5 y) pairs

Permissions and consent: At first rapport building with the Department of women and child development (ICDS, CDPOs, *AWWs*), Department of Health (ASHA workers), village heads (gram Panchayat and Sarpanch) and local community leaders and grass-root level workers (AWWs and ASHAs) was done to ensure their co-operation and support for the study. Their permissions were taken formally through permission letters and consent form. After that Home visits were made to all Households with <5y children along with the *AWWs*, wherein they were introduced about the study, its objectives, procedures and expected outcomes in simple understandable local language. Based on their written consent, mothers were enrolled for the study.

Methodology: Four clusters with similar cultural backgrounds were purposively selected from a block of rural Vadodara, Western India. All households with children <5y were enrolled with the help of the local Government's ICDS (Integrated Child Development Services) run *anganwadi centre* (n=160). Grass root level workers (AWW, ASHA, ANM) and mothers were interviewed using semi structured questionnaire and nutritional status of mothers and children were assessed. Detail methods are described below in separate phases.

Data analysis: All data were entered in MS excel 2010 and analysed using statistical software (SPSS23) (12) whereas anthropometric data were calculated at WHO Anthro software for weight for age analysis.

Ethical approval: Ethical approval (Approval No: IECHR/2015/16). was granted by the ethical committee of the Food and Nutrition Department of the university, and all participants provided informed consent.

Detailed methodology has been discussed under the following phases

Phase 1: SITUATIONAL ANALYSIS OF THE FUNCTIONING OF THE GOVERNMENT SCHEME (ICDS)

Study Design: Observational Descriptive Study

ICDS implementation assessment from functionary's perspective:

Profile of the functionaries and infrastructure of the anganwadi centre (AWC), current implementation of ICDS services, Knowledge and perception of ICDS functionaries and their opinion regarding ICDS services were collected and assessed by personal interview using semi structured questionnaire (based on MWCD guidelines) (13) and direct observation. Meetings and discussion were also carried out with the village heads, and other supervisors.

ICDS implementation assessment from beneficiaries' perspective:

Data regarding accessibility and utilization of the government scheme (ICDS) were elicited from all mothers with children <5y enrolled in ICDS through personal interview using semi structured questionnaire and direct observation using observation checklist and focus group discussion as well.

Phase 2: SITUATIONAL ANALYSIS OF THE HEALTH AND NUTRITION INDICATORS OF THE MOTHER-CHILD PAIRS IN A RURAL SETUP

Study Design: Cross sectional study

Formative assessments

Background information was elicited by personal interviews on gender and age of the children, type and size of the family, educational status of parents, father's profession, family income, main source of income, type of house, presence of electricity as well as obstetric history of the mothers.

Child feeding practices

Details of age-specific Infant and Young Child Feeding (IYCF) practices as per the guidelines by World Health Organization, recorded with the help of a checklist (WHO, 2010).

Household dietary pattern

Household dietary pattern was elicited by personal interviews on intra-household food distribution consumption of breakfast and number of meals consumed each day.

Household dietary diversity

Household dietary diversity was estimated by a food frequency questionnaire which included a list of common Western Indian foods in groups of 11 (cereals; pulses and legumes; roots and tubers; green leafy vegetables; other vegetables; fruits; nuts and oilseeds; milk and milk products; non vegetarian foods; fats and oil; and sugar). Consumption patterns were recorded based on their intakes (daily, weekly, fortnightly, monthly, occasional or seasonal). Based on the data, Household Dietary Diversity Score (HDDS) was calculated for each mother-child pair using a revised version of FAO guidelines (14) wherein the households which consumed half or more than half of the foods frequently in each food group scored as 1 and others scored as 0. The HHS which had a HDDS ≥4 (i.e., consumption of 4 or more food groups per day) was considered positive and HHs with a score <4 were grouped as negative.

Hygiene and sanitation practices

Observations and personal interviews (semi-structured questionnaire) were also recorded to understand their hygiene and sanitation practices to overcome the discrepancies between the answers provided by the mothers as compared to their actual practice.

Assessment of agricultural Practices

Data regarding agricultural practices in the households were elicited through Key informant Interviews with the HH heads using a semi structured questionnaire for nutrition sensitive agricultural practices and FGDs with the farmers and women involved in farming.

Anthropometric assessments

Anthropometric measurement was taken for both mothers (height, weight, waist and hip circumference) and children (Height and weight and MUAC). BMI of mothers were calculated and categorized using standard methods (WHO global database on BMI) and in case of children z-scores were calculated for weight/age, height/age, weight/height, BMI/age, MUAC/age using WHO Anthro software (15).

Morbidity profile, Clinical and biochemical assessment:

i) Morbidity profile of the mother child pairs as well as whole household was taken
ii) Clinical signs and symptoms were observed in the mothers and children.
iii) Biochemical assessment was done for both mothers and children by trained technicians from a reputed laboratory of Baroda. All necessary safety measures were taken during blood collection.

Enrollment of mothers with positive deviant behaviour

Weight for age of the children was determined (WHO 2010) using the WHO Anthro software and based on their Z –scores, they were categorized into two groups: Group I with HHs having normal children (WAZ>-2SD), named as *positively deviant* group (PDG) and Group II with HHs having undernourished children (WAZ ≤-2SD), named as *negatively deviant* group(NDG).

Phase 3: PROMOTION OF AGRI-NUTRI-HEALTH PRACTICES USING POSITIVE DEVIANT APPROACH (PDA)

Study Design: Case-Control Study

Two clusters (Valipura and Mota Ekalbara) were selected as case and other two (Hynapura and Nana Ekalbara) were selected as control. Intervention carried out in the case group.

Intervention (Promotion of AGRI-NUTRI-HEALTH practices using Positive Deviance Approach)

Intervention activities were carried out in Valipura and Mota Ekalbara region through community mobilization. Cultivation and consumption of drumstick leaves and other positive agricultural practices, child care and feeding practices, proper household dietary pattern and

household dietary diversity were promoted. Positive health care practices, hygiene and sanitation practices and proper utilization of ICDS services were promoted as well.

Impact Assessment: Impact of the intervention was assessed using semi structured questionnaire and anthropometric measurement

Results

Phase I

Profile of the functionaries and infrastructure of the AWC

There were total 3 anganwadi centres in the study area, each having one anganwadi worker, one anganwadi helper and one NCV. They were all married and hindu, Anganwadi workers were all educated upto secondary level (10^{th} std) or more, and had more than 5 years of work experience.

All AWCs had pakka roofs. Drinking water was provided to the children. Electricity, drainage facilities were present as well as utensils of cooking/ serving with separate kitchen. Though sanitary latrines were present in all three anganwadis, only one was functional but not child friendly.

Table 1: Current implementation of selected ICDS services

Daily Tasks (Expected job functions)	Activities conducted	Quality of service	Time spend (on average)
Pre-school education activities	Yes	PSE was not conducted for any fixed time duration; the AWWs had no pre decided sequence of activities for each day. younger children below 3 years were neglected (no motor development skills were taught)	½ hour
Preparation and distribution of supplementary food	Yes	Helper prepared the food, AWW did not have to spend time for this service. Standard	1hour

		measurements were not used (for measuring the raw ingredients and for distribution). No pregnant and lactating mothers came for supplementary food	
Treatment of common illness and minor ailments	No	Only at Valipura, where there was no separate health centre, during mamta day treatment of common illness was done by ASHA and ANM Otherwise there was no case where mother came for treatment of their ill child	-
Referral Services	No	No case observed	-
Conducting Home visits for NHE	No	During the whole study period, no home visits were made by the AWW for imparting NHE to the women. NCVs only paid home visits to call the children to participate in AWC programmes	
Record keeping	Yes	After the children left the AWC, and most of the time neglecting the children when they are in the AWC, the AWWs filled records and registers	1hour
Inspection of children for cleanliness (Personal hygiene, washing hands of children before and after taking supplementary food)	Yes	NCVs teach the children regarding good hygiene though inspection was not that strict in the time of practices of those hygiene behaviour	10min

Note: AWCs never started on the scheduled time and they always closed before time. hence instead of 4 and half hours AWCs functioned only for 2-3 hours. After appointment of NCVs in the ICDS, Preschool education and food distribution responsibilities were mostly carried out by them only and not by AWWs. They were only busy in record keeping in the AWC time.

Health check-up camp at the AWC was carried out only by our partner TSIPL and there was no fixed date for it. Hey use growth chart for monitoring of the children and they use separate growth charts for boys and girls. AWWs said, mothers were very reluctant to come to AWC due to lack of time, distance from household as well as awareness regarding its services and benefits. IFA tablets distribution and antenatal care programmes carried out at the health centre and AWC for all he pregnant mothers who come. Regarding adolescent girls, they said distribution is less as adolescent girls are not aware about IFA tablets and they are all very reluctant consuming it as they don't like the taste, suffer from nausea and don't understand the necessity of consuming it.

AWWs said they provide nutrition health education to mothers and pre-school education to children, but in very few cases nutrition health information were given to mothers, only when the mothers are interested.

Knowledge and perceptions of ICDS functionaries

AWWs had little knowledge about objectives of NHE service. They had proper knowledge regarding 3 basic IYCF practices, initiation of breastfeeding, exclusive breastfeeding for 1st 6 months and initiation of complementary feeding. But when it was about suggesting micronutrient rich foods to the beneficiaries or promoting progressive practices breaking the social stigma hey performed poor.

Opinion of ICDS functionaries regarding ICDS services

The AWWs were asked about ideas and suggestions and their opinion regarding how to improve the services and infrastructure ICDS. It was observed that though they were very enthusiastic regarding more nutrition study materials and games, they were all very reluctant to do any long term modifications in the programme for sustainable change. They were all satisfied with the space provided for AWC as well as the no of employers.

Opinions of the mothers regarding availability of the ICDS services

Majority of mothers in the study area were not very satisfied with the available service at ICDS and their implementation by community workers (AWWs, ASHA, ANM). Thoigh 70% mothers

said that AWWs come for home visits but that only for the purpose of calling children to the AWC. There were 65% mothers who said they didn't get any nutrition and health information from the AWC.

All mothers were admitted to get ANC services, IFA tablets during pregnancy and supplementary food at AWC

Utilization of the ICDS services by mothers

Iron-Folic acid Tablet Consumption

Among 160 mothers, though 55% said they received 60-90 IFA tablets, 15% complained they received less than 30. Even after receiving, 38% consumed less than 30 tablets due to various reasons. Nausea, vomiting and dark stool were main complain as majority (45%) of the mothers did not consume IFA for those problems. Among 160 mothers, 63% admitted that they receive counselling regarding how to consume IFA tablets and 76% received that counselling from anganwadi workers.

Ante-natal care

Among 160 mothers, only 27% received ANC more than 3 times. 37% mothers received ANC at Anganwadi Centre and 12% received at private hospital. 94% mothers did blood pressure check-up during pregnancy but only 28% did it more than 3 times. 85% mothers did abdominal examination during pregnancy but only 17% did more than 3 times. During pregnancy, 19% mothers took TT injection only once and there were 7.5% children whose complete course of immunization was not carried out.

Participation in ICDS programmes

There were 8% mothers who did not attend mamta diwas in last 3 months with their children and there were 56% mothers who do not generally attend health check-up camp organized in the anganwadi centre or health centre.

Supplementary food consumption

Among 160 mothers, 13% said they did not receive sheera and sukhadi from AWC. Mothers who received SS, among them only 25% received more than 4 packets in one month. Only 61% mothers consumed sheera and sukhadi regularly during pregnancy.

Among 160 mothers, 85% said that they receive balbhog packets from anganwadi as a supplementary nutrition for their 6months to 3 year old children but only 17% receive 7 or more than 7 packets per month. Only 57% children consume balbhog regularly in proper quantity.

There were various reasons came out as non-consumption of SS by pregnant mothers and balbhog by children. Sharing with family members was one of the main reasons of non-consumption of SS. Also many of them were not aware and did not receive it from AWC and did not even ask for it or went to collect it. Children sometimes don't like balbhog and they tend to share with their siblings which were main reason for their non-consumption.

Phase II:

Background information

Socio-economic status

Socio economic profile revealed that 52% of the children were boys while 48% were girls. Among them 38% had no siblings and rest had one or more than one siblings, 68.75% lived in a joint family setting, of which 46.2% fell in the range of 6-10 members in the family.

The majority of males were workers in various industries (48%) whereas majority of females were housewives (70%). In terms of education, 52.5% mothers received secondary education, 32.5% received only primary education, and 10% were illiterate. Whereas among fathers 7.5% were illiterate and 61% received secondary education. Among the families 55% had monthly family income less than or equal to 5000 rupees and only 8.75% mothers had their own individual income majorly working as agricultural labour. Main source of income for majority of the families was industry (49%).

Around 70% lived in semi pakka house and Firewood was still major fuel source (66%), 93% had access to electricity in their houses. Among the families, 40% possess one or more cycles, 54% possess two wheelers, 71% had television, 73% had refrigerators and 82.5% of the families

had mobile phones. On the other hand the consumption of liquor/tobacco was almost 50% in the families.

Obstetric history

The institutional delivery was 91.25% out of which majority took place in private hospitals. After birth 93% infants were examined at home. It was seen that majority of women had no records of significant weight gain during pregnancy. The women consumed lesser food during pregnancy; only 22.5% women consumed more foods than normal during their pregnancy.

The majority of mothers were married before 18 (53%) and even 23% had their 1st child before 18 years old. Incidence of miscarriage was 7%, low birth weight baby 20%, premature delivery 7%.

IYCF practices and dietary pattern

The initiation of breastfeeding within 1 hour was higher (52%), 65% children were fed colostrum after birth. Practice of prelacteals was abundant and patasha water was the most commonly administered prelacteals (36%). Within 1st 6 months of child, 61% were given water and 17.5% were given top milk. Exclusive breastfeeding rates in the first six months were found to be very less 33.75%). Complementary feeding after six months of age was initiated among 68.49% children. 59% children were breastfed upto 2 years of age or more and 85% continued breastfeeding during illness of mothers or children.

Majority of the population were vegetarian and only 6% consumed non veg food. 95% children were fed pulses, 51% were fed milk and milk products, 83% were fed fruits, 90% were fed vegetables. Majority of the children were fed 3 times a day (42%). Amount of food per feed was very less and irrespective of age; overall 44% children consumed only 30gm or less food per feeding. Packaged food consumption was very common as 55% children frequently consumed packaged food But 66% children did not consume fermented or sprouted foods. Feeding monitoring was done in case of 89% children and there were 56% mothers who got help in child care from other members of the family.

In case of intra household food distribution, only men and children were fed well n 41% families, in case of 51% families, meal composed of cereals, pulses and vegetables. At 38% households, only tea was consumed at breakfast. At 60% households, 3 meals were consumed by the members in a day.

Status of dietary diversity

Among 160 mothers, around 61% scored negative HDDS and only 38% scored positive which indicates majority of them did not frequently consume variety of foods from at least 4 food groups. Cereals (majorly bajra, rice and wheat), pulses (majorly tuver and mug) and some common vegetables (Potato, tomato, onion) were mostly consumed by the population. Majority of the population were vegetarian consuming only basic staple foods along with very low and unsatisfactory consumption of milk products, green leafy vegetables, fruits, nuts and oilseeds.

Frequent consumption of Green leafy vegetables recorded for only 34.4% households, frequent vegetable (other than GLVs) consumption was there at 68.8% households, and milk and milk products were frequently consumed by only 50% households. Therefore food availability in the form of quality and variety was not satisfactory in the area which needs to be improved through promotion of agriculture and dietary diversity.

Hygiene and sanitation practices

Use of soap, availability of water and food storage practices was good. But hand-wash practice with soap during food handling was not satisfactory as only 41% practiced it. Regarding water purification only 21% filtered or strained drinking water for purification. Open defecation was practiced by 37.5% households and 73% had separate kitchen with ventilation. 26% children had very dirty nails and 21% had very dirty clothes. Only 10.62% children always wore footwear while going out and only 10% mothers wore footwear while going far.

Agricultural practices

Situational analysis on agricultural practices revealed that very few target population were involved in agriculture due to existence of large number of industries in the study area which are main obstacles in the agricultural practices as they create air, soil and water pollution.

Among the fathers of the <5y old children, only 13.13% were farmers and 1.88% were agricultural labours. Among mothers 23.75% involved in farming in their own land and 5% were agricultural labour. Among the 160 households, food and agriculture was the main source of income for only 18.75% households.

Main cultivated crops in the study area were bajra, tindola and grass. Very little cultivation of brinjal, ladies finger, bottle gourd, drumstick, cauliflower, cluster beans, and methi were recoded.

Nutritional Status of the children

Anthropometric measurement (Height and weight) of mothers in the study area revealed that 87 out of 160 mothers (54%) were underweight (as per WHO global database on BMI). Whereas Among 160 children 36% were wasted, 60% were stunted and 59% were underweight (as per WHO new child growth standards, 2006 with z score <-2SD). Around 1.8% incidence of child mortality and almost 80% incidence of anaemia (among mothers) were recorded in the area (Hb <12g/dL, WHO standard).

Nutritional status of mothers

Anthropometric measurement of mothers revealed that among 160 mothers, more than half (54%) were underweight (BMI<18.5).

Morbidity profile of children and mothers

Data on morbidity profile in the past 15 days was taken to assess the presence of infections/morbidities among mothers and children. Majority of children were suffering from infectious morbidities such as fever, diarrhoea and cough and cold while mothers were more prone to headache, vomiting and stomach or abdominal pain.

Nutritional deficiencies among children under study as assessed by clinical signs and symptoms

Physical signs and symptoms of malnutrition can be valuable aids in detecting nutritional deficiencies. Pale conjunctiva, brittle hair, hair discoloration and pale skin as well as signs of

Vitamin A deficiency such as bitots spots, Angular stomatitis (Riboflavin deficiency) and spoon shaped nails (iron deficiency anaemia) were observed.

Status of anemia among mothers

Biochemical assessment of the mothers under study area revealed that 80% were anaemic and among the anaemic mothers, 12% were severely anaemic, 48% were moderately anaemic and 39% were mildly anaemic.

Enrollment of mothers using positive deviant behavours

The mean weight and height was 8.83kg and 77.42cm respectively. Among 160 children 40% (n=65) were normal (WAZ>-2SD) and categorized as *positive deviant* group (PD group) and 60% (n=95) undernourished children (WAZ<-2SD) were categorized as negative deviant group (ND group).

In the ND group, 54.73% were >2y vs 45.25% who were <2y, while 6.31% were <6months of age indicating the onset of undernourishment due to chronic energy deprivation. In the PD group, 40% were >2y and a majority of 60% were <2y (Table 1) which reveals that undernutrition rate is higher among older children who don't depend upon breastfeeding anymore and require diversified diet and healthy diet pattern.

Birth weight was a major predictor of PD children (only 12% were < 2.5kg at birth vs. 25% LBW in ND group) (Figure 2.55), which reveals chronic undernutrition during pregnancy and also emphasizes the need for promoting adequate child feeding practices, hygiene and sanitation practices and household dietary pattern to identify the *positive deviant behaviours* which are affecting the nutritional status of children after birth.

Phase III:

Impact of intervention on IYCF practices and dietary pattern

The knowledge, attitude and practices of mothers of the enrolled children were assessed before and after the intervention. The intervention brought about a considerable change in the knowledge and practices of mothers.

The knowledge and practice regarding initiation of breastfeeding within one hour increased 43.75% after intervention. The knowledge and practice regarding colostrum feeding increased by 14.58% and pre-lacteals increased by 28.13% after intervention. Knowledge and practice regarding providing water and top milk within 1st 6 months increased by 56.25% and 19.79% respectively. Knowledge and practice regarding exclusive breastfeeding for 1st 6 months increased by 51.04%. Knowledge and practice regarding continuation of breastfeeding up to two years or more increased from 36% to 78%. Initiation of complementary feeding increased markedly from 64% to 89%. Knowledge and practice regarding breastfeeding during illness also improved after intervention. There was significant improvement in sprouted and fermented food consumption by the children as well as reduction in packaged food consumption.

Consumption of variety of foods every day in the households increased from 1.04% to 12.5%

Before intervention, 57% households consumed only 3 meals a day and only 28% households consumed 4 meals a day, whereas after intervention consumption of 4 meals a day increased by 22%.

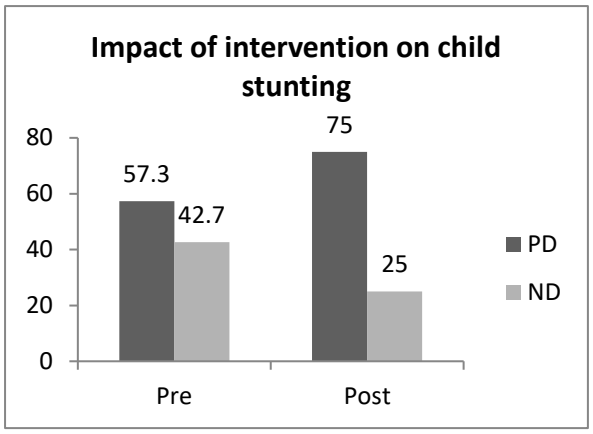
Consumption of proper breakfast increased from 14% to 34% after intervention. Before intervention only tea consumption in the morning was practiced in 37% households which decreased to 2.08% after intervention.

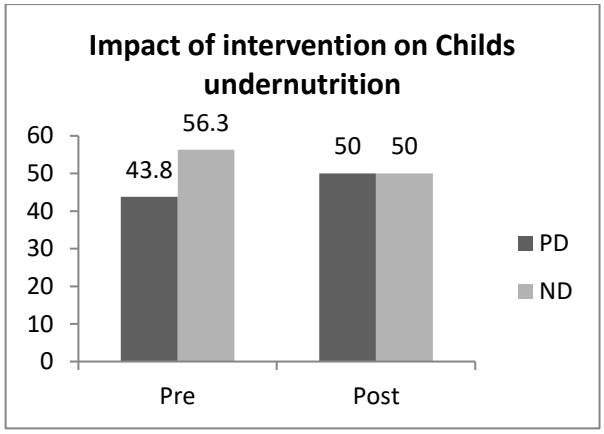
Impact of intervention on dietary diversity

After intervention dietary diversity of the household increased from 46% to 63%, as repeated counselling both individual and group was done regarding consumption of green leafy vegetables especially drumstick leaves, cauliflower leaves, radish leaves as well as fruits like banana, orange, guava, iron rich vegetables like spinach, beet, milk products like homemade curd, butter milk etc.

Impact of Intervention on nutritional status of children

Overall wasting reduced by 17.7%, stunting increased by 5.2% and underweight reduced by 6.3%.





Impact of intervention on child's nutritional status								
	PD				ND			
Percentage (%)	Normal(>-1SD)		Mild (<-1SD to >-2SD)		Moderate (<-2SD to >-3SD)		Severe (<-3SD)	
	Pre	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
Wasting (weight/ height)	38.5	59.4	18.8	15.6	25	16.7	17.7	8.3
Stunting (Height/age)	19.8	8.3	22.9	29.2	26	28.1	31.3	34.4
Underweight (weight/age)	16.7	25	27.1	25	22.9	29.2	33.3	20.8

Impact of intervention on health and hygiene

Practice of hand-wash with soap during food handling increased from 27% to 84% and practice of purification of drinking water increased from 12.5% to 81.25% after intervention.

After several session of intervention regarding ICDS utilization 59% children started to access AWC regularly, before intervention it was only 25% children who accessed AWC regularly. After intervention 100% enrolment in ICDS was achieved. Home visit by AWWs increased from77% to 85% and knowledge gain of mothers regarding foods and nutrition from ICDS increased from 42% to 68%. After intervention balbhog was received by 96% children, before intervention it was received by only 83%. Total 7 packets of balbhog are now received by 77% children, earlier it was only 10%. Balbhog consumption by children increased from 57% to 92%

after intervention. Knowledge and practice regarding ORS treatment during diarrhoea increased from 32% to 79%.

Discussion

Government has taken much effort to reduce the incidence of child undernutrition through ICDS programme. But in spite of the presence of ICDS and regular services by AWWs and ASHA workers under supervision of ministry of women and child development and health and family welfare, undernutrition scenario was much worse in the study area. Therefore the *positive deviance* approach has been undertaken in the present study to find out if there is any positive behaviour present in the PD group which is creating difference in the nutritional status outcome. Positive deviance approach proved to be beneficial as it helped in improving knowledge and practices regarding child feeding, healthy eating, dietary diversity which in turn resulted in decreased incidence of child undernutrition (Wasting and underweight) in the study area. Longer intervention period can reduce the incidence of stunting as well which did not occur in the study due to shorter time period, more weight gain than height and a huge difference in the emic and etic views in the community. For the sustainability of the programme positively deviant mothers and adolescent girls need to be employed as well as community workers need to be encouraged to continue the process. Implementation of ICDS scheme in the study area has been improved a lot by empowering the community workers and beneficiaries through PDA.

Conclusion

Positive deviance approach can be effective in improving the knowledge and practice of the community. Promotion of Agri-Nutri-Health by identified positive deviant mothers and adolescent girls as well as empowerment of community workers regarding service and delivery of the government programme in a continuous and consistent manner with the help of local industry's corporate social responsibility (CSR) cell can bring out sustainable change in the community.

Limitations of the study

- Biochemical assessment of majority of the children could not be carried out in village setting which may have given a clear picture of micronutrient deficiency and utilization of food
- As it was an industrial area, major agricultural intervention could not be carried out due to soil and water pollution
- All the mothers and children in the village could not be covered as they were not available in the village and in the intervention programs due to various issues.

Recommendations

- Soil testing and phytoremediation for restoration of heavy metal contaminated site to improve the scenario of agricultural practices in the village.
- Encouraging in cultivation of locally available low cost green leafy vegetables and monitoring the agricultural practices in the area
- Appointment of positive deviant mothers or adolescent girls in the village who will continue the individual house to house counselling and sensitization programme regarding healthy eating, care, feeding and hygiene practices and will make the programme sustainable.
- Operational research for all developmental government schemes and programs (functioning and gaps) need to be done (ICDS, MDM, PDS, MNREGA, JSY etc) and should be strengthened through various strategies.
- Promoting livelihood practices among women to empower them and make them self-sufficient.
- Improvement of infrastructure of village including road, drinking water services, health centre and schools as well as anganwadi centre
- Beautification of the village to attract tourism by creating gardens, parks as well as promoting hygiene by providing big dustbins in the strategic points.

Scope of future research

- PDS can be thoroughly assessed to determine food security.
- Adolescent girls, pregnant and lactating mothers as well as old population can be covered and positive deviance approach can be applied to them.

- Positive deviance approach can be applied by identifying positively deviant anganwadi workers and promoting them including more villages and anganwadi centers in a larger study area.

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