
ABSTRACT

Background and aim: Adopted in 2015 the SDGs call for major transformations in agriculture and food systems in order to end hunger, achieve food security and improve nutrition by 2030. While India achieved success in combating transient food insecurity caused by droughts or floods, it miserably failed to make much dent in chronic food insecurity as reflected in the low energy intake and high incidences of malnutrition reported by UNICEF, WHO, NFHS and RSOC (UNICEF 2018, WHO 2018, NFHS 2015-16, RSOC 2013-14). The present study aimed at improving Food and Nutrition Security (FNS) in rural households with mother-child pairs using multisectoral planning with the help of positive deviance approach (PDA) and public-private partnership (PPP). The *specific objectives* of the study were: 1) Situational analysis of the food and nutrition security of the mother-child pairs in a rural setup. 2). Identification of the positive deviant behaviors depending on 4 attributes (weight for age score of children, Household dietary diversity score, IYCN score and Hygiene and sanitation score) and capacity building and infrastructure development to improve food and nutrition security through interventions as a part of public-private partnership.

Methods and Materials: Based on the objectives, the study was conducted in two phases among 4 clusters selected purposively in rural Vadodara after necessary ethical clearance (IECHR/2015/16) with Department of Foods and Nutrition, The Maharaja Sayajirao University of Baroda, Gujarat; Department of Women and Child Development, Department of Health and Department of Agriculture, Government of Gujarat; Collectorate office, rural Vadodara and CSR cell of TSIPL (Transpek Silox Industries Private Limited), Vadodara. *Phase I:* In this cross-sectional study, all households (HHs) in the study area with mother-child (<5y) pairs (n=160) registered in ICDS and all ICDS workers (n=3) were enrolled. Situational analysis of the food and nutrition security was done following IFPRI (2015) guidelines. Qualitative and quantitative tools such as semi-structured questionnaires, direct observations, food frequency questionnaire, anthropometric

measurement and biochemical assessment were used for data collection using the indicators of availability, accessibility, affordability, utilization and stability. Major predictors of undernutrition were calculated using linear regression analysis. *Phase II:* In this case-control interventional community trial positive deviant behaviours (PDBs) were identified and mothers who scored positive in all four attributes a). Household Dietary Diversity (HDD) score (FAO, 2010), b) Infant and Young Child Nutrition (IYCN) score (UNICEF, 2013), c) Hygiene and Sanitation (H&S) score (UNICEF, 2013) and d) weight for age z score (WHO, 2006) of children, were used as change agents to sensitize the community regarding the identified PDBs in experimental group (n=96, 2 clusters). In control group (n=64, 2 clusters) no intervention carried out only existing government services were provided. One-year intervention trial included promoting Positive deviant Behaviors (PDB) by mothers for capacity building of ND mothers at micro and meso level using techniques such as personal counseling or group counselling, group discussions and reinforced using electronic and print media, quiz and extempore competitions. At the macro and exo levels intervention was done by the project partners (village level upgradation of roads, water, electricity, nutrition sensitive agriculture, sensitization of local community workers, plantation program, brainstorming session with local leaders, improving food aid through ICDS and skill development programs for empowering mothers). All data collected before and after intervention were entered in MS Excel and statistically analyzed using SPSS 23 software.

Results: *Results of Phase I* highlighted gross food insecurity including 100% below poverty line (<\$1.90/d/person) families, poor status of agriculture and food aid as well as poor utilization of food in the study area. Among 160 mother-child pairs, 60% Stunted (HAZ<-2SD), 36% wasted (WHZ<-2SD), 59% underweight (WAZ<-2SD), 20% MAM (WHZ<-2SD and >-3SD) and 16.88% SAM (WHZ <-3SD) children, 54% underweight (BMI<18.9) and 80% anemic (Hb <12g/dL) mothers; poor HDD, IYCN and H&S practices were recorded. Significant association was found between IYCN practices, HDD, Hygiene sanitation and child's and mother's nutritional status.

Results of Phase II indicated that several positive deviant behaviors (PDB) existed among the rural mothers in both case and control group- 43.1% (n=69) using Household Dietary

Diversity (HDD) scores, 48.8%(n=78) using Infant and Young Child Nutrition (IYCN) scores, 31.9%(n=51) using Hygiene and Sanitation (H&S) scores and 40.6% (n=65) using weight for age z score ($<-2SD$) for children. Overall, in 4 clusters, total 15 mothers were identified with PDB who scored positive in all the four attributes assessed. Only 13 mothers with PDBs were available in experimental group for positive deviant behavior promotion as change agents. Exclusive breastfeeding for 1st 6 months, colostrum feeding, no use of pre-lacteals, pulses, legumes, vegetables, milk and milk products consumption, cleanliness of clothes of children were determined as most followed positive behaviors present in the study area with highest OR values among the mother child pairs. Post 1-year interventions at micro and meso level using PDA, there was significant ($p<0.001^{***}$) improvement in parameters of food utilization such as breakfast consumption (21.7%), drumstick leaves consumption (76%), intra household food distribution (33.3%), overall IYCN(43.7%) and hygiene and sanitation practices(45.8%) as well as significant ($p<0.01^{**}$) reduction in wasted children (13.3%), underweight children (13.3%), and underweight mothers (20.4%) in experimental ND group (n=83). At macro and exo level large scale intervention using public-private partnership improved agricultural practices, utilization of food aid, roads and drinking water access. After intervention in the experimental group wasting reduced by 17.7% ($p<0.01^{**}$) as compared to only 5.8% ($p<0.05^{*}$) reduction in control group, underweight reduced by 6.25% ($p<0.01^{**}$) in experimental group whereas in control group it increased by 7.69%. Stunting though increased by 5.21% in the experimental group, the increase rate was much higher in the control group (11.54%). All the severely undernourished children were provided referral services. Mothers' undernutrition reduced by 17.7% in experimental group ($p<0.01^{**}$) whereas in control group it even increased.

Conclusions: Inequalities represented by gross food and nutrition insecurity despite abundance of agricultural produce in the rural area calls for urgent measures at multiple stakeholder levels. Community resource mobilization using positive deviance approach (PDA) under public-private partnership (PPP) on a continuous basis along with social-security nets may lead to enhanced food and nutrition security (FNS) and can help in achieving sustainable development goals.