Original Article

Effect of Positive Deviance Approach on Promotion of Safe Disposal of Child's Feces in Rural Tamil Nadu: A Community-Based Quasi-Experimental Study

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Abstract

Introduction: Safe disposal of feces is ensured when it is deposited into a toilet, whereas unsafe disposal of child's feces plays a crucial role in disease transmission and environmental pollution. These areas are overlooked by many sanitation promotion interventions. **Objective:** To determine the effect of positive deviance (PD) approach on safe disposal of child's feces among households who owned a toilet. **Materials and Methods:** A community-based quasi-experimental study was conducted in the four field practice villages of the Urban Health Training Center, Villupuram, for 18 months. Households who owned a toilet and had a child less than 5 years old were included. After IEC clearance, information was collected from a representative sample of 100 households before intervention and another 100 households after intervention. PD approach was applied for 6 months to promote safe disposal practices in the study villages. Data were analyzed using the Statistical Package for the Social Sciences (SPSS) software (version 24). The Chi-square test was used to determine the significance of difference between baseline and endline data. The effect size was calculated to estimate the magnitude of difference between baseline and endline data. **Results:** Before intervention, only 3% of households disposed the feces into a toilet, while after intervention, almost 38% of households disposed in the toilet ($\chi^2 = 37.39$; df = 1; $P = 0.001$). The effect size (Cramer's V) was found to be 0.43. **Conclusion:** PD approach demonstrated considerable improvements in safe disposal of child's feces in rural settings. Further, to sustain the behavior change, frequent reinforcement of key messages at frequent intervals needs to be emphasized.

Keywords: Child's feces, positive deviance, quasi-experimental, safe disposal, toilet usage

Introduction

Safe disposal of feces is ensured when the child uses a toilet or when the feces is deposited into a toilet,[1] whereas unsafe disposal occurs when the child's feces is thrown into a drain, ditch, or garbage or left open.[1] Unsafe disposal of child's feces leads to disease transmission and environmental pollution.[2] Child's feces contain more harmful pathogens and play a crucial role in the occurrence of acute diarrheal disorders associated with life-threatening dehydration.[2] Despite the negative health outcomes, more than two-thirds of the mothers in rural India are unsafely managing their child's feces owing to ignorance and lack of access to improved sanitary facilities.[3]

In resource-poor settings, more thrust is given to toilet construction and utilization neglecting safe disposal practices among the pediatric population.[2,4,5] The interventions put forward to improve child feces disposal practices were only marginally effective[6] because they were not culturally sensitive and socially acceptable in rural areas. To surpass the psycho-social barriers and make the intervention context-specific, newer approaches in behavior change communication (BCC) such as positive deviance (PD) can be employed at the community level. PD approach is based on the

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observation that *"in every community or organization, there are few individuals or groups whose uncommon but successful behaviours and strategies have enabled them to find better solutions to problems than their neighbours who face the same challenges and barriers and have access to same resources."*[7] It proves to be a cost-effective approach because it identifies solutions for unsafe disposal practices that are already existing in the system.[8]

Objective

To determine the effect of PD approach on safe disposal of child's feces among households who owned a toilet.

Materials and Methods

This community-based quasi-experimental study (baseline survey → intervention → endline survey) was conducted in the four field practice villages of the Urban Health Training Center (UHTC), Villupuram, namely, Ayyur Agaram, Pidagam, Kappur, and Anangoor. We had a good rapport with the villagers through UHTC's community-based primary healthcare services for the past 7 years. Besides, the sanitary conditions in these four study villages were unsatisfactory.

The study was conducted for a period of 18 months (July 2018 to January 2020) after obtaining approval from the Research Committee and Institutional Human Ethics Committee (EC approval number: 40/2018), Puducherry.

Phase 1: (Baseline survey)

Initially, a sampling frame of 320 households was developed by paying house-to-house visits in all the four study villages by a team consisting of the principal investigator, medical interns, and medical social workers. The sampling frame included households who owned a toilet and had a child less than 5 years old.

Considering 10% of households with safe disposal of child's feces[3] and 25% improvement, a sample of 88 was calculated using OpenEpi 3.01 software (AG Dean, KM Sullivan, MM Soe. Open Source Epidemiologic Statistics for Public Health; Atlanta, GA, USA) with 95% confidence interval (95% CI) and 80% power. Assuming non-response in 10 to 12 houses, the final sample size was 100 households. Then, 100 representative households from the sampling frame were selected by simple random sampling without replacement using computer-generated random numbers. In the selected house, mothers were interviewed to obtain information regarding the disposal methods.

Before conducting the baseline survey, for the initial few months, the principal investigator took part in all the community-based services of UHTC in order to build rapport with the villagers and to minimize the social desirability bias. Then, the principal investigator collected the data using a pre-tested structured questionnaire after obtaining a written informed consent from the mothers. To ensure autonomy, only the respondents who gave consent for both the interview and observation of the toilets were included. The households were visited during the morning hours, and if a particular house was locked on three consecutive visits, then the next house was selected. Information regarding the socio-demographic profile, toilet ownership, method of disposal of child's feces, and reasons for safe/unsafe disposal methods was obtained. Along with the interview, direct observation of the toilets was also performed to verify the self-reported toilet ownership. In order to minimize interviewer's bias and to maintain transparency in data collection, an independent faculty and a medical social worker accompanied the principal investigator during the survey.

Phase II: (intervention)

PD approach in BCC was employed to promote safe disposal practices in the study villages for 6 months. The intervention was delivered to all 320 households who owned a toilet and had a child less than 5 years old. The principle of "reversal of learning" in participatory rural appraisal (PRA)[9] was applied by learning from the positive deviants in the community.

To begin with, through baseline survey the households who disposed the child's feces in the toilets (positive deviants) were identified and door-to-door visits were made to the PD houses to facilitate a one-to-one discussion with them. The psycho-social facilitators in safe disposal practices [Table 1] were captured from the positive deviants to develop locally relevant key messages for intervention. Then, PDs were made to share their experiences to other villagers in *Anganwadis* and *Grama Sabha* meetings. They also demonstrated how to collect the child's feces in a paper, cloth, or potty and dispose it safely into a toilet and how to train the older children to use the toilets [Figure 1]. The key messages were reinforced in *Anganwadis* at frequent intervals to sustain the changed behavior.

Phase III: (endline survey)

After 6 months of intervention, to assess the outcome of the PD approach, an endline survey was put forward. Another sample of 100 households (independent sample) was selected from the same sampling frame using the same sampling technique. The same principal investigator collected the information from the mothers using the same questionnaire.

Data analysis

The baseline and the endline data were entered in Epi Info 7.1.5.0 software (Center for Disease Control and Prevention; Atlanta, Georgia, USA) and analyzed using the Statistical Package for the Social Sciences software version 24 (SPSS Inc., Chicago, Illinois, USA). Before analysis, the entered data set was checked for abnormal values, missing values, outliers, and typographical errors. In case of discrepancies, the respected forms were traced by the unique identification numbers and cross-checked, and necessary corrections were made in the data entry. With the assumption of adequate sample, categorical, and mutually exclusive data, the significance of difference between the baseline and endline data was determined using Pearson's Chi-square test. In a

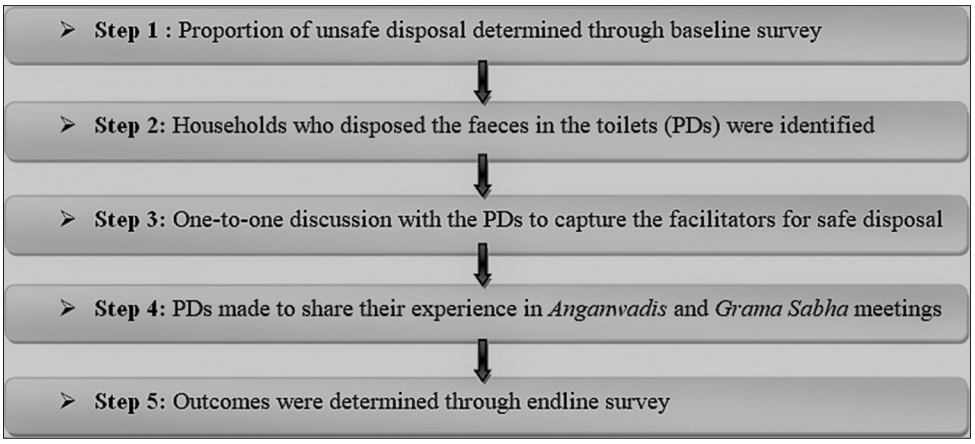

Figure 1: Steps in employing positive deviance approach in the study villages

Table 1: Households' self-reported reasons for safe/unsafe disposal of their child's feces before and after intervention (multiple options)

Self-reported reasons	Before intervention [*n*=3] *n* (%)	After intervention [*n*=38] *n* (%)
Reasons for disposing the child's feces into a toilet		
Child's feces contain harmful pathogens	3 (100)	35 (92.1)
Advice from healthcare workers	3 (100)	32 (84.2)
Environmental pollution	2 (66.7)	28 (73.7)
Unsightliness and foul smell	2 (66.7)	30 (78.9)
Other children exposed to feces	1 (33.3)	33 (86.8)
Self-reported reasons	**Before intervention [*n*=97] *n* (%)**	**After intervention [*n*=62] *n* (%)**
Reasons for disposing the child's feces by other methods		
Unawareness	82 (84.5)	32 (51.6)
Child's feces is harmless	76 (78.3)	29 (46.8)
Households not using toilet	42 (43.3)	24 (38.7)
Scarcity of water supply in the toilet	38 (39.2)	28 (45.2)
Damaged toilet	27 (27.8)	20 (32.3)
Toilet pit fills up quickly	22 (22.7)	11 (17.7)
Toilet situated away from the house/unapproachable	6 (6.2)	8 (12.9)

2 × 2 contingency table, if the expected value in any cell was less than five, then Fisher's exact test[10] was applied. The differences observed between the baseline and the endline data were considered statistically significant if the *P* value was < 0.05. The 95% CI was calculated for the primary outcomes such as improvements in the safe disposal practices. The effect size (Cramer's V)[10] was calculated to estimate the magnitude of difference between the baseline and the endline data. The effect size of 0.1 represented small size of difference, whereas the effect size of 0.5 represented large size of difference.

Results

A majority of 76 (76%) mothers before intervention and 73 (73%) mothers after intervention were below 30 years old. Almost 72 (72%) children in the baseline survey and 69 (69%) children in the endline survey were under 3 years old. Sixty-four (64%) children before the survey and 69 (69%) children after the survey were first-order births. Eighty-two (82%) mothers before intervention and 78 (78%) mothers after intervention were homemakers, and 79 (79%) mothers in the baseline survey and 83 (83%) mothers in the endline survey received formal education. A majority of the households, 95 (95%) pre-intervention, and 94 (94%) post-intervention practiced Hinduism. Sixty-eight (68%) households before the survey and 72 (72%) households after the survey belonged to scheduled castes. Sixty-two (62%) households and 65 (65%) households were living as a nuclear family before and after intervention, respectively, and 67 (67%) households in the pre-intervention phase and 68 (68%) households in the post-intervention phase had less than five members in the family. Fifty-two (52%) households in the baseline survey and 51 (51%) households in the endline survey were above the poverty line. A majority of 64 (64%) households and 58 (58%) households had a government-subsidized toilet without further improvements before and after intervention, respectively, and almost 75 (75%) toilets before the survey and 70 (70%) toilets after the survey were situated outside the house. There was no statistically significant difference

observed in the households' socio-demographic characteristics in the baseline and the endline survey.

Figure 2 depicts that disposal in the toilet, disposal in the garbage, burial in the ground, indiscriminate disposal, and burnt disposal were the common methods followed by the villagers to dispose their child's feces. Before intervention, 3% of households disposed in the toilet, while after intervention, almost 38% of households disposed in the toilet. A majority of 41% of households disposed in the garbage in the baseline survey, whereas only 20% disposed in the garbage in the endline survey. Notably, there was 12% reduction in the proportion of households who threw their child's feces indiscriminately.

Table 1 illustrates the reasons given by the households for safe/unsafe disposal of child's feces. Harmfulness of child's feces, healthcare worker's advice, environmental pollution, unsightliness and foul smell, and other children's exposure to feces were the leading reasons for disposing the child's feces into a toilet, whereas lack of awareness, harmlessness of child's feces, toilet non-usage by adults, scarcity of water, damaged/poor functioning toilets, quick fill up of toilet pits, and unapproachable toilets were the prime reasons for disposal by other unsafe methods.

Table 2 reveals that before intervention, only three (3%; 95% CI; 0.6-8.5%) households collected the feces in a paper, cloth, or potty and disposed in the toilet. After intervention, almost 38 (38%; 95% CI; 28.5-48.2%) households practiced safe disposal of feces. Notably, 35% (35%; 95% CI; 24.6-45.0%) improvement in the safe disposal of feces after intervention was statistically significant (χ^2 = 37.39; df = 1; P = 0.001). The effect size (Cramer's V) was 0.43, which implies a medium size of difference in the safe disposal of feces before and after intervention. In the endline survey, only 20% of households disposed their child's feces in the garbage (χ^2 = 10.35; df = 1; P = 0.001) and 12% of households disposed indiscriminately (χ^2 = 4.85; df = 1; P = 0.028). There were no considerable differences in the other methods of disposal such as burning and burial in the ground before and after intervention.

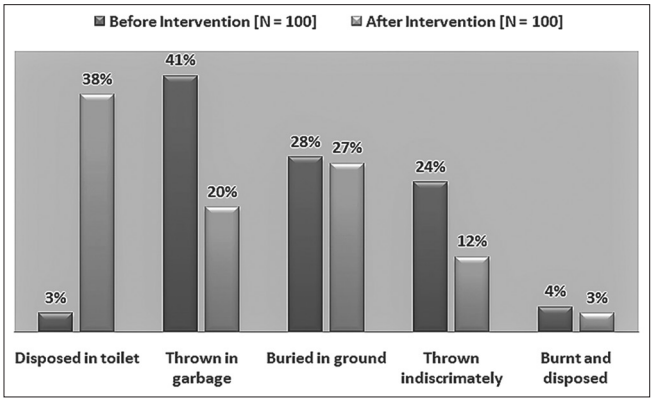

Figure 2: Method of disposal of child's feces by the households who owned a toilet before and after intervention

Discussion

In the study villages, disposal in the toilet, disposal in the garbage, burial in the ground, indiscriminate disposal, and burnt disposal were the common methods followed to manage the child's feces. Harmfulness of child's feces, healthcare worker's advice, and environmental pollution were the self-perceived reasons for safe disposal, and ignorance, harmlessness of child's feces, and toilet non-usage by adults were the self-reported reasons for unsafe disposal. As a result of the PD approach, there were considerable improvements in the practice of safe disposal of child's feces. There were substantial improvements in other methods of disposal such as garbage disposal and indiscriminate disposal.

In the baseline survey, about 97% of households unsafely disposed their child's feces. In a community-based study in rural West Bengal, about 72% of villagers exhibited unsafe disposal practices.[11] In urban slums of Odisha, a cross-sectional study found 95% of households with reported unsafe disposal of child's feces.[12] Almost 80% of households with latrine access reported unsafe disposal in a cross-sectional study in rural Bangladesh.[13] Aliyu AA *et al*.[14] in a demographic and health survey revealed that the prevalence of unsafe disposal was 41% in Nigeria. Thus, unsafe management of child's feces is a common public health menace in rural areas across India and other developing countries, and compared to other studies, more proportion of households in this study reported unsafe methods of disposal owing to negligence in toilet usage by adults.

This study revealed that health and sanitation consciousness and health worker's motivation induced safe disposal practices in positive deviants, whereas ignorance, toilet non-utilization by adults, water scarcity, poor functioning, and unapproachable toilets made the villagers resort to other unsafe disposal

Table 2: Status of household's disposal methods before and after intervention

Method of disposal	Before intervention [n=100] n (%; 95% CI)	After intervention [n=100] n (%; 95% CI)	χ^2; df; P
Disposal in the toilet	3 (3; 0.6-8.5) **	38 (38; 28.5-48.2)	37.39; 1; 0.001*
Thrown in the garbage	41 (41; 31.3–51.3)	20 (20; 12.7–29.2)	10.35; 1; 0.001*
Buried in the ground	28 (28; 19.5–37.9)	27 (27; 18.6–36.8)	0.02; 1; 0.874
Thrown indiscriminately	24 (24; 16.0–33.6)	12 (12; 6.4–20.0)	4.85; 1; 0.028*
Burnt and disposed	4 (4; 1.1–9.9) **	3 (3; 0.6–8.5) **	0.15; 1; 0.701

*P<0.05, **Fisher's exact test employed. CI=confidence interval; χ^2=Pearson's Chi-square value; df=degree of freedom

methods. Bawankule R *et al*.[2] analyzed National Family Health Survey (NFHS-3) data and showed that mother's illiteracy, scheduled caste/tribes, lower socio-economic status, and toilet inaccessibility facilitated unsafe disposal practices in rural India. Similarly, in Odisha, a cross-sectional study found that lack of formal education, religion, large family size, lower wealth index, and open defecation by adults negatively influenced the safe disposal practices.[12] Nigeria Demographic and Health Survey data found older and educated women, rich households, Muslims, urban residents, and improved latrine facilities as significant predictors for safe disposal practices.[14] Thus, various psycho-social and structural factors served a good platform for unsafe disposal practices in resource-poor settings.

In this study, PD approach was effective in renouncing unsafe disposal of child's feces in a rural area, while a cluster randomized trial in Odisha which evaluated the effect of the Indian government's Total Sanitation Campaign (TSC) on child's feces disposal practices demonstrated a marginal 9% improvement in safe disposal practices attributed to increased toilet ownership in the intervention communities.[15] This highlighted that hardware interventions focusing on toilet construction without community mobilization would have only limited effect on changing the sanitary behaviors. Another intervention study in Odisha which adhered to low-cost behavior change interventions such as community sensitization activities was effective in producing 15% improvement in safe disposal of child's feces.[16] Further, to be more persuasive and context-specific, PD approach would be adopted for promoting sustainable sanitation practices.[17]

This was the first intervention study to address the issue of unsafe disposal of child's feces through PD approach to the best of the researchers' knowledge. Before and after study design was feasible to evaluate the effectiveness of our short-term intervention. Certain misconceptions in the community were effectively tackled through reversal of learning from the positive deviants in the villages. Non-response rate was minimal owing to good rapport development through the existing community-based services in the study areas. Misclassification bias on account of self-reported toilet ownership was minimized by employing triangulation in data collection where direct observation of the toilet facility was performed along with the survey. Nevertheless, this study also had certain limitations which were undeniable. Being an uncontrolled before and after study (quasi-experimental study), biases that were connected with extraneous events such as the *Swachh Bharat* Mission[18] (Clean India Movement) were unavoidable. So, the effect size was calculated to mitigate the effect of confounding variables. Social desirability bias in the self-reported safe disposal practices would occur despite having a good rapport with the villagers. Unlike other studies, this study did not emphasize on the health outcomes related to safe disposal practices. Besides, it was beyond the scope of this study to promote safe disposal practices among toilet non-owners.

Conclusion

This community-based intervention study successfully addressed the issue of unsafe disposal of child's feces surpassing the psycho-social barriers through cost-effective PD approach in rural areas. Besides, PD approach was culturally sensitive and socially acceptable in remodeling the accustomed behaviors of the villagers. Further, frequent reiteration of key messages to the target audience would sustain the behavior change. Hardware activities such as provision of subsidies for toilet construction along with software activities such as community mobilization and PD approach would improve both toilet coverage and safe disposal of child's feces in resource-poor settings.

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Conflicts of interest

There are no conflicts of interest.

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