ORIGINAL RESEARCH ARTICLE

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

Nancy S[1*], Gayathri S[2], Udhayakumar U[3], Thirumeni S[4], Govindarajan PK[5], Mujibur Rahman K[6]

[1-6]Vinayaka Mission's Medical College and Hospital, Vinayaka Mission's Research Foundation – Deemed to be University (VMRF-DU), Karaikal, Puducherry, India

DOI: 10.55489/njcm.140920233237

ABSTRACT

Background: Unsafe disposal of child's faeces plays a crucial role in disease transmission and environmental pollution. These areas are overlooked by many sanitation promotion interventions**.** The objective was to determine the effect of Positive Deviance (PD) approach on safe disposal of child's faeces among households who owned a toilet.

Methodology: A community-based quasi-experimental study was carried out in the four field practice villages of UHTC, Villupuram for 18 months. Households who owned a toilet and had a child <5 years 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 six months to promote safe disposal practices. Data was analyzed in SPSS 24 software. Chi square test and Effect size (Cramer's V) were employed.

Results: Before intervention, only 3% households disposed the faeces into a toilet. While, after intervention, almost 38% households disposed in the toilet (χ^2=37.39; df=1; p=0.001). Effect size was found to be 0.43.

Conclusion: PD approach demonstrated considerable improvements in safe disposal of child's faeces in rural settings. Further, in order to sustain the behaviour, change frequent reinforcement of key messages at frequent intervals need to emphasized.

Keywords: child's faeces, safe disposal, toilet usage, positive deviance, quasi-experimental

ARTICLE INFO

Financial Support: None declared

Conflict of Interest: None declared

Received: 14-07-2023, **Accepted**: 06-08-2023, **Published**: 01-09-2023

***Correspondence:** Dr. S. Nancy (Email: sngoovi@gmail.com)

How to cite this article: Nancy S, Gayathri S, Udhayakumar U, Thirumeni S, Govindarajan PK, Rahman KM. Effect of Positive Deviance Approach on Promotion of Safe Disposal of Child's Faeces in Rural Tamil Nadu: A Community-Based Quasi-Experimental Study. Natl J Community Med 2023;14(9):563-567. DOI: 10.55489/njcm.140920233237

www.njcmindia.com | pISSN09763325 | eISSN22296816 | Published by Medsci Publications

INTRODUCTION

Safe disposal of faeces is ensured when the child uses a toilet or when the faeces is deposited into a toilet.[1] Whereas, unsafe disposal occurs when the child's faeces is thrown into a drain, ditch or garbage or left open.[1] Unsafe disposal of child's faeces leads to disease transmission and environmental pollution.[2] Child's faeces 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 faeces 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 paediatric population.[2,4,5] The interventions put forward to improve child faeces disposal practices were only marginally effective [6] because they were not culturally-sensitive and socially-acceptable in rural areas. In order to surpass the psycho-social barriers and make the intervention context-specific, newer approaches in Behaviour Change Communication (BCC) like Positive Deviance (PD) can be employed at the community level. PD approach is based on the 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] General primary care providers and family physicians would adopt this cost-effective PD approach in sanitation promotion interventions and other public health interventions.

The present study was conducted to determine the effect of PD approach on safe disposal of child's faeces among households who owned a toilet.

METHODOLOGY

This community-based quasi-experimental study (Baseline Survey → Intervention → Endline Survey) was carried out in the four field practice villages of Urban Health Training Centre (UHTC), Villupuram, Tamil Nadu. We had a good rapport with the villagers through UHTC's community-based primary health care services for the past seven 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 five years old.

Considering 10% households with safe disposal of child's faeces [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 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 carrying out 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 semi-structured questionnaire after obtaining a written informed consent from the mothers. In order 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 faeces and reasons for safe/ unsafe disposal methods were obtained. Along with the interview, direct observation of the toilets was also done 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 six months. The intervention was delivered to all 320 households who owned a toilet and had a child less than five years old. Principle of 'reversal of learning' in Participatory Rural Appraisal (PRA)[9] was applied by learning from the positive deviants in the community.

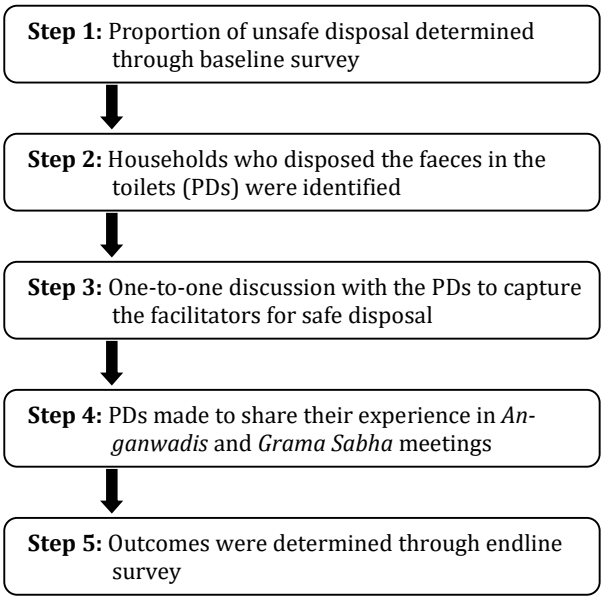

Figure 1: Steps in employing Positive Deviance approach in the study villages

To begin with, through baseline survey the households who disposed the child's faeces in the toilets (Positive De-

viants) were identified and door-to-door visits were made to the PDs houses to facilitate a one-to-one discussion with them. The psycho-social facilitators in safe disposal practices were captured from the positive deviants to develop locally relevant key messages for intervention. We observed that all the PDs disposed their child's faeces in a toilet and trained the older children to use the toilets (uncommon behaviours). PDs believed that their safe disposal practices reduced diarrohea and malnutrition in their children. 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 faeces 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 behaviour.

Phase III: (Endline Survey)

After six months of intervention, in order to assess the outcome of the PD approach, an endline survey was put forward. Another sample of 100 households (independent sample) were 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 EpiInfo 7.1.5.0 software (Centre for Disease Control and Prevention; Atlanta, Georgia, US) and analyzed using Statistical Package for Social Sciences 24 software (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, 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 2 x 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. Confidence Interval (95% CI) was calculated for the primary outcomes such as improvements in the safe disposal practices. Effect size (Cramer's V) [10] was calculated to estimate the magnitude of difference between the baseline and the endline data. Effect size of 0.1 represented small size of difference whereas effect size of 0.5 represented large size of difference.

RESULTS

Majority 76% mothers before intervention and 73% mothers after intervention were below 30 years old. Almost 72% children in the baseline survey and 69% children in the endline survey were under three years old. About 64% children before survey and 69% children after survey were first order births. Almost 82% mothers before intervention and 78% mothers after intervention were homemakers and 79% mothers in the baseline survey and 83% mothers in the endline survey received formal education. Majority of the households, 95% pre-intervention and 94% post-intervention practised Hinduism. Nearly 68% households before survey and 72% households after survey belonged to scheduled castes. About 62% households and 65% households were living as a nuclear family before and after intervention respectively and 67% households in the pre-intervention phase and 68% households in the post-intervention phase had less than five members in the family. About 52% households in the baseline survey and 51% households in the endline survey were above poverty line. Majority 64% households and 58% households had a government subsidized toilet without further improvements before and after intervention respectively and almost 75% toilets before survey and 70% toilets after 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.

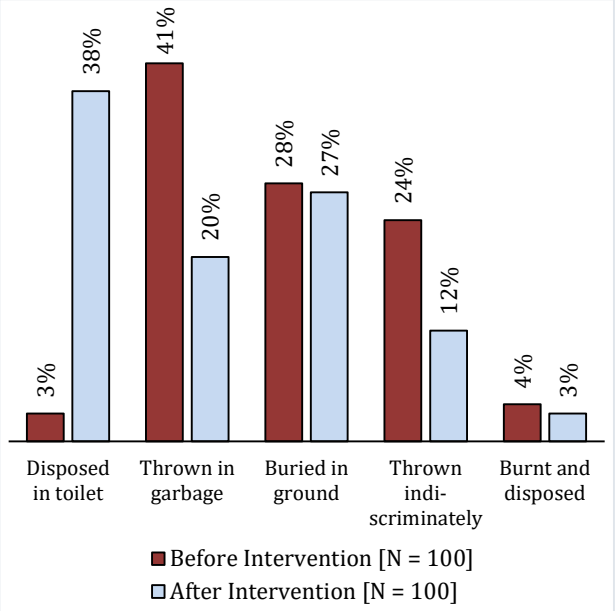

Figure 2: Method of disposal of child's faeces by the households who owned a toilet before and after intervention

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 faeces. Before intervention, 3% households disposed in the toilet while after intervention almost 38% households disposed in the toilet. Majority 41% 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 faeces indiscriminately.

Table 1 illustrates the reasons given by the households for safe/ unsafe disposal of child's faeces. Harmfulness of child's faeces, healthcare worker's advice, environmental pollution, unsightliness and foul smell and other children's exposure to faeces were the leading reasons for disposing the child's faeces into a toilet. Whereas, lack of awareness, harmlessness of child's faeces, 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 3% (95% CI; 0.6 - 8.5%) households collected the faeces in a paper, cloth or potty and disposed in the toilet. After intervention, almost 38% (95% CI; 28.5 - 48.2%) households practiced safe disposal of faeces. Notably, 35% (95% CI; 24.6 -

45.0%) improvement in the safe disposal of faeces 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 faeces before and after intervention. In the endline survey, only 20% households disposed their child's faeces in the garbage (χ^2 = 10.35; df=1; p= 0.001) and 12% 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.

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

Self-reported reasons	Before Intervention	After Intervention
Reasons for disposing the child's faeces into a toilet	**[n = 3] (%)**	**[n = 38] (%)**
Child's faeces 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 faeces	1 (33.3)	33 (86.8)
Reasons for disposing the child's faeces by other methods	**[n = 97] (%)**	**[n = 62] (%)**
Unawareness	82 (84.5)	32 (51.6)
Child's faeces are 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)

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

Method of Disposal	Before Intervention [n = 100] (%; 95% CI)	After Intervention [n = 100] (%; 95% CI)	χ^2; df; p value
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 value < 0.05, **Fisher's exact test employed; CI = Confidence Interval; χ^2 = Pearson's Chi square value; df = degree of freedom

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 faeces. Harmfulness of child's faeces, healthcare worker's advice and environmental pollution were the self-perceived reasons for safe disposal and ignorance, harmlessness of child's faeces 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 faeces. There were substantial improvements in other methods of disposal such as garbage disposal and indiscriminate disposal.

In the baseline survey, about 97% households unsafely disposed their child's faeces. In a community-based study in rural West Bengal, about 72% villagers exhibited unsafe disposal practices.[11] In urban slums of Odisha, a cross-sectional study found 95% households with reported unsafe disposal of child's faeces.[12] Almost 80% households with latrine access reported unsafe disposal in a cross-sectional study in rural Bangladesh.[13] Aliyu AA et al in a demographic and health survey revealed that the prevalence of unsafe disposal was 41% in Nigeria.[14] Thus, unsafe management of child's faeces 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 methods. Bawankule R et al 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.[2] Similarly, in Odisha, a cross-sectional study found that lack of formal education, religion, large family size, lower wealth index, open defecation by adults negatively influenced the safe disposal practices.[12] Nigerian Demographic and Health Survey data found older and educated women, rich households, Muslims, urban residents, 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 the present study, PD approach was effective in renouncing unsafe disposal of child's faeces in a rural area. While, a cluster randomized trial in Odisha which evaluated the effect of Indian Government's Total Sanitation Campaign (TSC) on child's faeces 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 behaviours. Another intervention study in Odisha which adhered to low-cost behaviour-change interventions like community sensitization activities were effective in producing 15% improvement in safe disposal of child's faeces.[16] Further, in order to be more persuasive and context-specific, PD approach would be adopted for promoting sustainable sanitation practices.[17] Besides, General primary care providers and family physicians would adopt this cost-effective PD approach in sanitation promotion interventions and other public health interventions.

This was the first intervention study to address the issue of unsafe disposal of child's faeces 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 done along with the survey. Nevertheless, the present 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 *Swachh Bharat* Mission[18] (Clean India Movement) were unavoidable. So, 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, the present 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 faeces surpassing the psycho-social barriers through cost-effective PD approach in rural areas. Besides, PD approach was culturally-sensitive and socially-acceptable in remodelling the accustomed behaviours of the villagers. Further, frequent reiteration of key messages to the target audience would sustain the behaviour change. Hardware activities like provision of subsidies for toilet construction along with software activities like community mobilization and PD approach would improve both toilet coverage as well as safe disposal of child's faeces in resource poor settings.

ACKNOWLEDGEMENT

We express our sincere gratitude to the key community members in the study villages and Block Development Officers (BDO) for their support and co-operation in executing this valuable research work.

References

1. World Health Organization and United Nations Children's Fund. Core Questions on Drinking-Water and Sanitation for Household Surveys. Geneva, Switzerland; 2006. Available from: http://www.who.int/water_sanitation_health/monitoring/oms_brochure_core_questionsfinal24608.pdf. [Last accessed on 2023 Jun 15].
2. Bawankule R, Singh A, Kumar K, Pedgaonkar S. Disposal of children's stools and its association with childhood diarrhea in India. BMC Public Health 2017;17:12.
3. International Institute for Population Sciences (IIPS) and ICF. National Family Health Survey (NFHS-4). Mumbai; 2016. Available from: http://rchiips.org/nfhs/NFHS-4Report.shtml. [Last accessed on 2023 Jun 15].
4. Brown J, Cairncross S, Ensink JH. Water, sanitation, hygiene and enteric infections in children. Arch Dis Child. 2013;98(8):629–34.
5. WSP, UNICEF. Part 1 of 2: Child Feces Disposal in Bangladesh: World Sanitation Program; 2014:1 - 4. Available from: http://www.wsp.org/sites/wsp.org/files/publications/WSP-Child-Feces-Disposal-Bangladesh-Part1.pdf. [Last accessed on 2023 Jun 15].
6. Majorin F, Torondel B, Chan GKS, Clasen T. Interventions to improve disposal of child faeces for preventing diarrhea and soil-transmitted helminth infection. Cochrane Database Syst Rev 2019;9(9):CD011055.
7. Tufts University. Basic field guide to the Positive Deviance Approach; 2010. Available from: https://static1.squarespace.com/static/5a1eeb26fe54ef288246a688/t/5a6eca16c83025f9bac2eeff/1517210135326/FINALguide10072010.pdf. [Last accessed on 2023 Jun 15].
8. Baxter R, Taylor N, Kellar I, Lawton R. Learnings from positively deviant wards to improve patient safety: an observational study protocol. BMJ Open 2015;5:1-7.
9. Chamber R. Rapid Appraisal: rapid, relaxed and participatory. Patna: Institute for Participatory Practices (PRAXIS); 2001. p.17-23.
10. Saha I, Paul B. Essentials of Biostatistics. 2nd ed. Kolkata: Academic Publishers; 2017.p.63-74.
11. Preeti PS, Sahoo SK, Biswas D, Dasgupta A. Unsafe disposal of child faeces: a community-based study in a rural block in West Bengal, India. J Prev Med Public Health 2016;49(5):323-8.
12. Majorin F, Nagel CL, Torondel B, Routray P, Rout M, Clasen TF. Determinants of disposal of child faeces in latrines in urban slums of Odisha, India: a cross-sectional study. Trans R Soc Trop Med Hyg 2019;113(5):263-72.
13. Islam M, Ercumen A, Ashraf S, Rahman M, Shoab AK, Luby SP et al. unsafe disposal of feces of children < 3 years among households with latrine access in rural Bangladesh: Association with household characteristics, fly presence and child diarrhea. Plos One 2018;13(4):e0195218.
14. Aliyu AA, Dahiru T. Factors associated with safe disposal practices of child's faeces in Nigeria: Evidence from 2013 Nigeria demographic and health survey. Niger Med J 2019;60(4):198-204.
15. Freeman MC, Majorin F, Boisson S, Routray P, Torondel B, Clasen T. The impact of a rural sanitation programme on safe disposal of child faeces: a cluster randomized trial in Orissa, India. Trans R Soc Trop Med Hyg 2016;110:386-92.
16. Caruso BA, Sclar GD, Routray P, Nagel CL, Majorin F, Sola S et al. Effect of a low-cost, behaviour-change intervention on latrine use and safe disposal of child faeces in rural Odisha, India: a cluster-randomised controlled trial. Lancet Planet 2022;6(2):110-21.
17. Abalo J. The positive deviance approach as a behavior change strategy for promoting sustainable sanitation practices including eliminating open defecation. In: Handbook of Research on Urban Governance and Management in the Developing World. 1st ed. Uganda: University of Begen; 2018.p.13.
18. Swachh Bharat Mission – Gramin. Department of Drinking Water and Sanitation. Ministry of Jal Shakti; 2017. Available on: http://swachhbharatmission.gov.in/sbmcms/index.htm. [Last accessed on 2023 Jun 15].