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Why Villagers Use Toilets Only During Specific Time and Season? A Mixed-Methods Study in Rural Tamil Nadu

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ABSTRACT

Background: Due to the efforts of sanitation promotion interventions in India, majority of the villagers started using toilets. But there is an inconsistency in toilet usage with regard to time and season.

Objectives: The objectives were to determine the time and seasonal variations in toilet usage among villagers who use toilets and to identify the reasons for time and seasonal variations in toilet usage.

Methodology: A community-based mixed-methods study was executed in the four field practice villages of UHTC, Villupuram. After IEC clearance, 405 individuals who were using an owned toilet were selected by Simple Random Sampling. Qualitative component (free listing) was used for questionnaire development and quantitative component (survey + observation) was used for data collection.

Results: Majority, 52% villagers used toilets only in the night and 64% villagers used toilets during rainy season. Fear of darkness and snakes, emergency and large family size were the common reasons for night time toilet usage. While, non-availability of open space, illness on exposure to rain and quick filling of toilet pit contributed to toilet usage in the rainy season.

Conclusion: The study findings would help in the development of culturally-sensitive and socially-acceptable key messages for future sanitation promotion interventions.

Keywords: toilet usage, time, season, rural, psycho-social, mixed-methods

BACKGROUND

Improved sanitation facility is "*one that hygienically separates human excreta from human contact* (pp:5)"[1] and it effectively counteracts the adverse public health impacts of Open Defecation (OD). Improved sanitation hampers diarrhoea, polio, cholera and hookworm infestation leading to reduction in malnutrition and under-five deaths.[2] Besides, better sanitation promotes water hygiene and renders renewable sources of nutrients from faecal waste.[3] In addition, toilet usage lowers the health expenditure, increases productivity, reduces premature deaths and upholds the dignity and status of females.[3,4]

Due to the persistent efforts of many sanitation promotion interventions in India like Total Sanitation Campaign (TSC)[5] and Community Led Total Sanitation (CLTS)[6], majority of the villagers started using toilets. According to National Family Health Survey (NFHS), open defecation reduced from 39% in 2015 – 16 to 19% in 2019 – 21.[7] Despite considerable improvements in toilet construction and utilization, there is an inconsistency in toilet usage with regard to time and season.[8,9] In rural areas, men and women preferred separate open defecation sites which varied with time, season and need of the individual.[8] Villagers preferred toilet usage during heavy monsoons, winter months and rice growing season.[8,9] On the other hand, dry season with availability of open space and water favoured OD.[9]

Promotion of consistent toilet usage is an effective

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strategy to achieve the Sustainable Development Goal (SDG) on "*ensuring availability and sustainable management of water and sanitation for all*"[10] by 2030. In order to promote consistent toilet utilization among rural masses, the psycho-social reasons for time and seasonal variations in toilet usage should be explored.

OBJECTIVES

The objectives of the present study were to determine the time and seasonal variations in toilet usage among villagers who use toilets and to identify the reasons for time and seasonal variations in toilet usage.

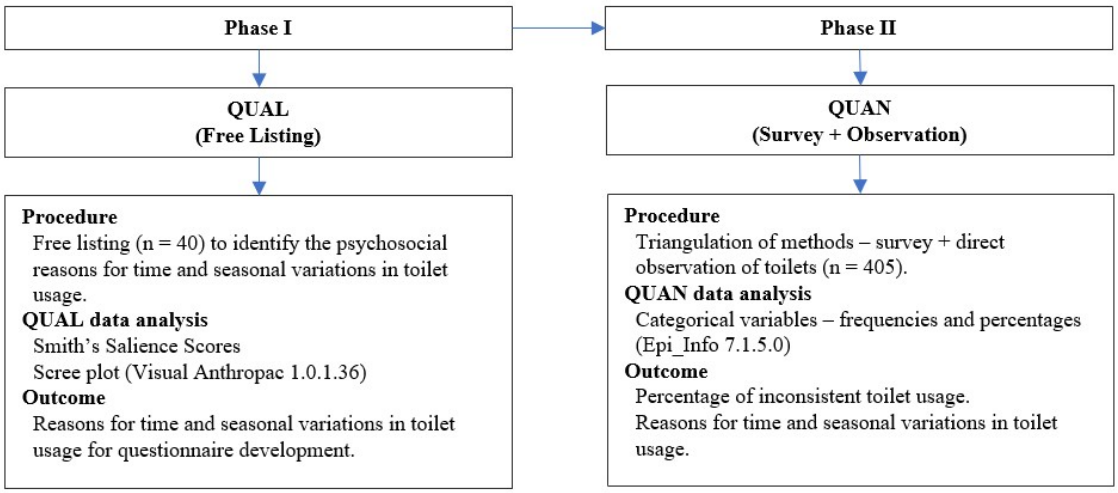
MATERIALS AND METHODS

Study setting and duration: The present study was carried out in the four field practice villages of Urban Health Training Centre (UHTC) in Villupuram for a period of six months (September 2019 to February 2020). The field practice villages namely, Ayyur Agaram, Pidagam, Kappur and Anangoor were located around two to ten kilometres from Villupuram bus stand. The villages belonged to Vikkiravandi and Kolianur blocks of Villupuram district and covered 4,409 households. UHTC caters to the needs of the villagers by means of weekly mobile health clinics, school health screening, primary care services to adolescents and self-help group women, food and water sample testing, family adoption programme and community-based palliative care services for the past seven years. The major occupation of the people residing in these four villages were agriculture and dairy farming with 71% literacy rate.[11] Water and sewerage were under the control of Villupuram Municipality. In Villupuram, majority of the rural inhabitants had access to improved drinking water facility by means of a public tap.[11] In spite of owning government subsidized toilets, the regularity in toilet usage in the four study villages were unsatisfactory.

Study participants: This study included adults (more than 18 years old) who were having an individual household toilet and using it.

Study design: It was a community-based exploratory sequential mixed methods study[12] where qualitative phase (Free listing exercise) was followed by a quantitative phase (Survey + Observation). **[Figure 1]**

Figure 1: Visual diagram showing exploratory sequential mixed methods design



Phase I (QUAL – Free listing exercise): Free listing[13] was used to capture the psycho-social reasons for time and seasonal variations in toilet usage. In order to develop a questionnaire as per the socio-cultural context of our study area, this exercise was preferably carried out in the same four study villages. The respondents were selected purposively[14] based on their knowledge, availability and willingness to participate in the process. A sample of 40 respondents was obtained till the point of saturation where no new information was added with successive interviews. After obtaining an informed consent, Principal Investigator trained in qualitative research methods conducted the free listing exercise at the place and time convenient for the respondents. Factors in the cultural domain were addressed by asking the respondents to recall and list out the probable reasons for inconsistent toilet usage in their community with regard to time and seasonal variations. In order to encourage the respondents to recall the salient points, silent probes or echo probes were used during the process. The responses were note taken in English and debriefing was done at the end to ensure respondents' validation.

QUAL Data analysis: Visual Anthropac 1.0.1.36 software (Analytical Technologies, Inc; Lexington, USA) was used to compute the Smith's Salience Scores. Then, the scores were arranged in the descending order and plotted in a scree plot.[15] The point at which the curve gets flattened was taken as the cut off for retaining the salient items. Thus, from

the extensive list of items, about 11 to 15 salient items were retained. The prominent items obtained from this free listing exercise were incorporated in the questionnaire for further quantitative interviews.

Phase II (QUAN – Survey):

Sample size and sampling: Initially, a sampling frame was developed by paying house-to-house visits in all the four study villages with a team consisting of the Principal Investigator, Interns and Medical Social Workers. In the present study, sampling frame consisted of 1200 individuals who were using an owned toilet. Considering 60% inconsistent toilet usage in rural India,[16] sample size of 369 was calculated using Open_Epi 3.01 software (Dean AG, Sullivan KM, Soe MM. Open-Source Epidemiologic Statistics in Public Health; Atlanta, GA, USA) with 95% confidence interval and 5% absolute precision. Assuming 10% non-response, the final sample size was 405 individuals. Each individual in the sampling frame was assigned with a number. Then, 405 sample individuals were selected from the sampling frame by Simple Random Sampling without replacement[17] using random numbers generated through Open_Epi software (version 3.01). If a particular house was locked on three consecutive visits, then the next individual was selected.

Tool for data collection: At first, the information required to satisfy the objectives of the study were determined based on the previous literature and a rough list of all the questions that could be used in the questionnaire was prepared. Then, the questions were contextualized based on the standard guidelines and free listing data. The questionnaire comprised the socio-demographic profile and details regarding the toilet usage. The checklist used to assess the infrastructure of the toilet facility by direct observation was based on *Swachh Bharat* Mission - *Gramin* (SBM-G) questionnaire[18] and Water Sanitation and Hygiene (WASH) guidelines.[1] The psychosocial reasons for inconsistent toilet usage were based on the findings derived from the free listing exercise.

Further, the questions were arranged in a logical sequence. The responses for each question were coded and skip options were given wherever necessary. The formatted layout of the questionnaire was pretested with 45 households in Thennamadevi which was a field practice village similar to our study villages. Participatory pre-test[19] was conducted among 20 households in an interview format to assess the comprehension, acceptability and appropriate usage of words and undeclared pre-test[19] was conducted among 25 households as a real survey to check for the flow, skip patterns and timing. Two pre-tests were conducted with an interval of one week among the same group of 25 households and then the responses were compared to determine the reliability[19] of the questionnaire. Further, in order to improve the face validity[19] of the questionnaire, feedback was obtained from the experts regarding the suitability of the content in capturing the study objectives. After the pre-test, necessary revisions were made and a final structured questionnaire was prepared.

Data collection: 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 key persons in the community and service providers in *Swachh Bharat* Mission were met and after explaining them the purpose of the study we requested their support and cooperation. The households were visited during the morning hours and at least three visits were made to increase the coverage. After an initial brief introduction, the Principal Investigator obtained a written informed consent for both the interview and observation. The respondents were ensured that their participation in the study was voluntary and their unwillingness would not affect the community-based services provided to them. The participants were also informed that the collected data would be kept confidential and used only for academic or research purpose. 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.

A pre-tested structured questionnaire was used to collect information about the toilet usage. Direct observation of the toilets using a checklist was employed along with surveys in order to confirm the self-reported toilet ownership. 'Observer as a participant stance' was used for direct observation "*where observer was not a member of the community under observation and participants were aware of the observations* (pp: 217)."[20] This triangulation of surveys and observations were used to improve the validity of the study findings. The questions were put forward in Tamil and the responses were noted in English. Sensitive questions like reasons for inconsistent toilet usage were asked at the end after development of initial rapport through general socio-demographic questions. In order to minimize reporting bias, the questions used to capture the psycho-social reasons for time and seasonal variations in toilet usage were put forward as open-ended questions and probes were not used. The interview lasted for about 10 to 15 minutes. During house-to-house visits, the ancillary care needed by the households was also provided.

QUAN Data Analysis: The quantitative data were entered and analyzed in Epi_Info software (version 7.1.5.0) developed by Centres for Disease Control and Prevention disease control, Atlanta, Georgia. Each variable was assigned a code and skip options were utilized wherever needed. A uniform number '99' was assigned for 'not applicable' option and number '88' was assigned for 'others' option. The 'yes/ present' option was coded with number '1'

while the 'no/ absent' option was coded with number '2'. The responses obtained for the socio-demographic variables such as age, occupation, education, monthly income and total number of family members was grouped in a specific order. 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. Categorical variables such as socio-demographic profile, toilet utilization and reasons for inconsistent toilet usage were expressed as frequencies and percentages.

Ethical consideration: The study was carried out after obtaining approval from the Research Committee and Institutional Ethics Committee (EC approval number: 40/2019), Puducherry.

RESULTS

Table 1 describes that majority of the respondents, 365 (90.1%) were between the age group of 20 to 60 years and 245 (60.5%) were females. Among 405 individuals interviewed, nearly half 188 (46.4%) of them were unskilled workers and about 200 (49.4%) received primary education. More than half of the respondents, 241 (59.5%) were above poverty line. Almost 400 (98.8%) respondents practiced Hinduism and 282 (69.6%) respondents belonged to scheduled castes. Nearly 158 (39%) villagers lived in a pucca house. Majority 281 (69.4%) villagers hailed from a nuclear family and 323 (79.8%) villagers had only one to five members in their family.

Out of 405 villagers, almost 287 (70.9%) reported time variations in toilet usage and 276 (68.2%) reported seasonal variations in toilet usage. About 118 (29.1%) villagers always used a toilet consistently and 129 (31.8%) villagers used a toilet regularly on all seasons.

Table 1: Socio-demographic characteristics of the respondents [N = 405]

Socio-demographic characteristics	Respondents (%)
Age in years	
20 – 60	365 (90.1)
>60	40 (9.9)
Gender	
Male	160 (39.5)
Female	245 (60.5)
Occupation	
Professionall/ Semi-professional	3 (0.7)
Clerical/ shop-owner/ farm-owner	44 (10.9)
Skilled worker/ Semi-skilled worker	110 (27.2)
Unskilled worker	188 (46.4)
Housewife	40 (9.9)
Retired/ Unemployed	20 (4.9)
Education	
Illiterate	131 (32.3)
Primary/ Middle/ High school	200 (49.4)
Higher secondary	53 (13.1)
Graduate	21 (5.2)
Socioeconomic status	
Above poverty line	241 (59.5)
Below poverty line	164 (40.5
Religion	
Hindu	400 (98.8)
Christian	2 (0.5)
Muslim	3 (0.7)
Caste	
Backward caste	123 (30.4)
Scheduled caste	282 (69.6)
Type of house	
Pucca	158 (39.0)
Semi-pucca	153 (37.8)
Kutcha	94 (23.2)
Type of family	
Nuclear	281 (69.4)
Joint	69 (17.0)
Three-generation	55 (13.6)
Total number of family members	
1 – 5	323 (79.8)
6 – 10	79 (19.5)
>10	3 (0.7)

Figure 2: Proportion of time and seasonal variations in toilet usage among the toilet owners [N = 405]

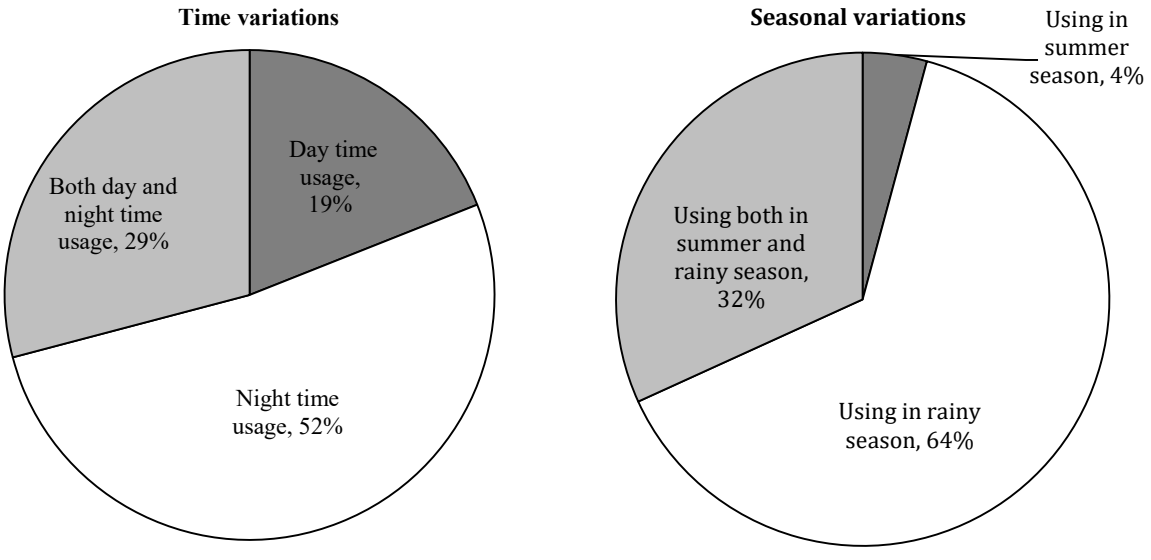


Table 2: Free listing on psycho-social reasons for time and seasonal variations in toilet usage [N = 40]

Item	Respondent (%)	Average Rank	Salience
Psychosocial reasons for time variations			
Reasons for using toilet in the day time			
Shame/ disgust in OD due to lack of privacy	35 (87.5)	1.50	0.293
Toilet usage saves time while going for work in the morning	22 (55.0)	2.18	0.181
Increased human activity in the open fields and river banks	20 (50.0)	1.91	0.202
Reasons for using toilet in the night time			
For emergency purpose	32 (80.0)	2.50	0.126
Fear of darkness and ghosts	28 (70.0)	2.17	0.105
Fear of snakes and insects	27 (67.5)	2.71	0.107
Fear of thefts and harassment	25 (62.5)	1.93	0.200
Large family size hinders toilet usage in the morning	19 (47.5)	2.10	0.115
Reasons for using toilet at all times			
Toilet usage provides safety and protection	32 (80.0)	2.50	0.125
Toilet usage was convenient	30 (75.0)	2.31	0.117
Education and occupation related	15 (37.5)	1.42	0.180
Waste from toilets used as manure for crops	12 (30.0)	1.01	0.100
Psychosocial reasons for seasonal variations			
Reasons for using toilet in the summer season			
Increased human activity in the open fields and river banks	27 (67.5)	2.71	0.105
Harvesting in the fields	15 (37.5)	1.42	0.170
Reasons for using toilet in the rainy season			
Reduced open space for defecation	33 (82.5)	2.60	0.150
Quick filling of the toilet pit if used in all seasons	21 (52.5)	1.93	0.210
Availability of water for toilet usage	19 (47.5)	1.86	0.201
Prone for diseases while going out in the rain	19 (47.5)	1.86	0.203
Foul smell in the defecating areas	10 (25.0)	1.20	0.101
Reasons for using toilet on all seasons			
Prevents diseases	30 (75.0)	2.31	0.116
Toilet usage ensured privacy	28 (70.0)	2.17	0.110
Upholds the dignity and status of women	23 (57.5)	1.88	0.245
OD is disgusting	17 (42.5)	1.67	0.236
Cleanliness and hygienic	12 (30.0)	1.32	0.122

Notably, 210 (51.9%) respondents preferred night time toilet usage and 259 (64%) respondents used a toilet during rainy season. The remaining 77 (19%) and 17 (4.2%) respondents used toilets during day time and summer season respectively**. [Figure 2]**

Table 2 shows the average rank and salience for each self-reported reason given for time and seasonal variations in toilet usage.

Table 3 depicts that lack of privacy in OD (88.3%), increased human activities in the fields (79.2%) and saving time in toilet usage (50.6%) were the prime psycho-social reasons facilitating toilet usage during daytime. While, fear of darkness (87.1%), fear of snakes (75.2%), emergency (69.1%), large family size (58.1%) and fear of thefts (39.1%) hindered OD in the night-time. Notably, convenience (83.9%), safety and protection (60.2%), education and occupation (48.3%) and bio-farming (28%) always influenced regular toilet usage.

Increased human activities (100%) and harvesting (70.1%) hindered OD in the fields in summer. Whereas, non-availability of open space (88.8%), illness on exposure to rain (77.6%), quick filling of toilet pit (59.8), availability of water for cleansing (44.0%) and foul smell in defecating areas (35.9%) were the self-perceived reasons for toilet usage during wet season. Interestingly, some positive deviants voiced out that privacy (69%), cleanliness (62%), dignity of women (50.4%), disease prevention (34.1%) and inconvenient OD practices (24.8%) made them use toilets consistently irrespective of seasonal changes. **[Table 3]**

DISCUSSION

In the present study, almost two-thirds of the villagers reported time and seasonal variations in toilet usage. Most of the villagers preferred using toilets during night and in the wet season. Psycho-social factors like privacy, increased human activities and saving time for morning chores made the villagers to use the toilets during daytime. While, fear of darkness and snakes, emergency, large family size and fear of thefts facilitated night-time toilet usage. Besides, increased human activity and harvest hindered OD in dry season and space constraints, diseases, filling up of toilet pit, availability of water and foul smell hindered OD in wet season. Furthermore, psycho-social aspects like convenience, safety, education and occupation, bio-farming, privacy, cleanliness, dignity of women and health benefits always influenced consistent toilet usage at all times and on all seasons.

Distinctively, 71% villagers and 69% villagers exhibited time and seasonal variations in toilet usage respectively. Similarly, a cross-sectional study conducted in five major states of India showed inconsistent toilet usage in terms of time and seasonal variations.[9]

Table 3: Self-reported reasons for time and seasonal variations in toilet usage (multiple options)

Reasons for time variations	Respondents (%)
Reasons for using toilet in the day time [N=77]	
Shame/ disgust in OD due to lack of privacy	68 (88.3)
Increased human activity in the open fields and river banks	61 (79.2)
Toilet usage saves time while going for work in the morning	39 (50.6)
Reasons for using toilet in the night time [N=210]	
Fear of darkness and ghosts	183 (87.1)
Fear of snakes and insects	158 (75.2)
For emergency purpose	145 (69.1)
Large family size hinders toilet usage in the morning	122 (58.1)
Fear of thefts and harassment	82 (39.1)
Reasons for using toilet at all times [N = 118]	
Toilet usage was convenient	99 (83.9)
Toilet usage provides safety and protection	71 (60.2)
Education and occupation related	57 (48.3)
Waste from toilets used as manure for crops	33 (28.0)
Reasons for seasonal variations	**n (%)**
Reasons for using toilet in the summer season [N=17]	
Increased human activity in the open fields and river banks	17 (100)
Harvesting in the fields	12 (70.1)
Reasons for using toilet in the rainy season [N=259]	
Reduced open space for defecation	230 (88.8)
Prone for diseases while going out in the rain	201 (77.6)
Quick filling of the toilet pit if used in all seasons	155 (59.8)
Availability of water for toilet usage	114 (44.0)
Foul smell in the defecating areas	93 (35.9)
Reasons for using toilet on all seasons [N=129]	
Toilet usage ensured privacy	89 (69.0)
Cleanliness and hygienic	80 (62.0)
Upholds the dignity and status of women	65 (50.4)
Prevents diseases	44 (34.1)
OD is disgusting	32 (24.8)

Another exploratory qualitative study by *Routray P et al* in rural Odisha showed similar findings.[8] *Sinha A et al* demonstrated significant association between toilet usage and seasonal change.[16] A review of toilet usage in India highlighted inconsistent toilet usage in rural areas on account of seasonal changes.[3] Despite owning an individual household toilet, villagers were not using it regularly and time and seasonal changes play a substantial role in inconsistent toilet usage.

Our study showed that majority of the villagers preferred night time toilet usage due to fear of darkness and snakes, emergency, large family size and fear of thefts. A qualitative study explored that adult men and farmers preferred OD in the morning.[8] A process evaluation in Orissa showed that toilet usage was convenient at night.[21] In rural Mali, *Pickering AJ et al* found that women feel safe at night owing to toilet usage.[22] In a barrier analysis study in six geographical areas of India, mothers of under-5 children narrated the safety aspects of toilet usage during night.[23] In the present study, some of the villagers reported daytime toilet usage owing to privacy, increased human activities and time saving while going for work. *Routray P et al* stated that women preferred OD during night as they were not visible to others under the cover of darkness.[8]

Notably, rainy season forced majority of the rural masses to use toilets on account of space constraints in OD, diseases on exposure to rain, filling up of toilet pit, availability of water and foul smell in OD areas. People found it cumbersome to defecate outside during monsoons as the land was inundated with water in open space.[8] In consistent to our study findings, a study by *Boisson P et al* in Orissa found that toilet usage was convenient during rains and floods.[21] Likewise, a longitudinal study in Odisha exhibited increased toilet use during winter and rainy season due to water stagnation in low lying lands and fear of insects and snakes.[16] *Barnard S et al* highlighted that toilet usage was comfortable during wet climate.[23] In wet season regardless of the functioning status of the toilets people preferred to use it.[9] In our study, a few respondents voiced out that toilet usage was preferred in the summer months due to increased human activity and harvesting in the fields. During rice growing season people renounced OD in the fields on account of impurity.[8] In summer months toilet usage was governed by availability of functional toilets, age of the toilets and type of toilet facility.[9]

In the present study, it was found that consistent toilet usage at all times and on all seasons was influenced by convenience, safety, education and occupation, bio-farming, privacy, cleanliness, dignity of women and disease prevention. Comparable to the present study, other studies done across India reported that psycho-social aspects like convenience, privacy, status, safety, hygiene, environmental protection and health benefits were essential drivers for consistent toilet usage.[9,21,23,24,25] Consequently, irre-

spective of structural factors like toilet infrastructure and functionality, psycho-social factors play a crucial role in sustainable sanitation.

In this study, mixed methods were adopted to improve the validity of the questionnaire and outcomes. Errors due to self-reported findings were minimized by direct observation of the toilets. Non-response was minimal owing to good rapport with the villagers through our community-based primary care services. Nevertheless, limitations like social desirability bias in the self-reported toilet usage would occur in the study. This study did not include gender variations in toilet usage along with time and seasonal variations.

CONCLUSION

Time and seasonal variations in toilet usage like preference for OD during day time and summer season were influenced by various psycho-social factors. In order to surpass these psycho-social barriers, multi-faceted context-specific Behaviour Change Communication strategies should be implemented. Further, the findings of the study would help in the development of culturally-sensitive and socially-acceptable key messages for the promotion of consistent toilet usage in rural areas.

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