Original Article

Effect of access to sanitation on Urinary Tract Infections in urban women, Maharashtra, India

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Abstract

Background: Women and girls have restricted access to sanitation in India. This leads to various health issues, especially for women and girls living in slums/settlements. This study aims assessment of urinary tract infections among women and girls who have restricted access to sanitation and compares the prevalence after the installation of household toilets. Along with the prevalence this study also examines the alterations in behaviors associated with access to sanitation. **Materials and Methods:** A pre and post-intervention study was conducted among women (n=1711) residing in slums across four cities in Maharashtra. The intervention included the installation of household toilets. Data on the individual characteristics of women, housing area/conditions, access to sanitation facilities, behaviors adopted by the women/girls that could be associated with UTI symptoms, and reported symptomatic UTI in the previous one month were gathered through a structured tool using the mobile application. **Results:** The prevalence of UTI among women and adolescent girls living in slums was 12.8% pre-intervention and 2.9% post-intervention. In the unavailability of the individual toilets, women and girls have altered their routine habits related to taking dinner, toilet use after dark (24.9%) and avoiding drinking water and liquid intakes (12.15%) to avoid frequent toilet visits. All these behavioral adaptations were found significantly associated with the presence of UTI. **Conclusion:** The study demonstrates that the installation of toilets in households improve sanitation-related behavior and menstrual and vaginal hygiene.

Keywords: UTI, Sanitation, adolescent girls, installation of toilets

Introduction

Poor access to sanitation remains an huge problem in India. Although a nationwide program, Swacch Bharat Mission (SBM), is in place to improve access to sanitation by building toilets at the household level, 355 million women and adolescent girls do not have basic toilet facilities in the country[(1)]. Inadequate access to individual toilets forces women to utilize the unclean, not maintained, and overcrowded/overused Community Toilet Blocks (CTBs) or practice open defecation.

Evidence from Indian studies suggests that women and adolescent girls are particularly at risk of adverse health effects due to restricted access to sanitation facilities[(2)]. This vulnerability arises from the additional safety and privacy concerns that women face while accessing sanitation. Not only women are unsafe while approaching and using the public toilets[(3)], but inadequate access to sanitation also has long-term ill effects on women in terms of their psychological, and social well-being. It may lead to a compromised quality of life[(4)]. It is challenging for women to find privacy at the available place of defecation in compactly populated areas such as urban slums. This forces them to hold themselves back from urinating and defecating for long hours, which may lead to Urinary Tract Infections (UTIs) or other health problems. Although UTI is usually not life-threatening, it can cause serious ill effects on the health and social well-being of women.

Research on the effect of sanitation on UTI among women and adolescent girls is lacking. Studies from India report that 18-20% of women have UTI symptoms[(5,6)]. An earlier study by Vyas et al.[(7)] suggests the association between the use of shared toilets and the presence of UTI among girls and women. Evidence also suggests that in-house toilet access is protective against developing UTIs[(6)]. Based on this evidence, a deeper understanding of the impact of sanitation on UTI prevalence in urban women is needed. This study attempts to provide evidence for women's UTI status before and after delivering household sanitation facilities by Shelter Associates, a Maharashtra-based Non-Governmental Organization (NGO).

Shelter Associate's NGO implemented the 'One Home One Toilet (OHOT)' program in 5531households across 39 slums. These settlements were spread across four cities: Kolhapur, Pimpri-Chinchwad, Thane, and Navi Mumbai—in

Maharashtra, India. The program comprised data collection, mapping, community mobilization, and delivery of the household Toilets. This study is a part of the project being implemented.

Objectives

1. To measure the impact of access to sanitation facilities on symptoms of urinary tract infections among women residing in settlements across various urban areas across Maharashtra

2. To observe hygiene management amongst adolescent girls and women pre and post-installation of sanitation facility

Methods

A pre-and post-intervention study was carried out in 2019-20.

In this study, we included 682 households (12.3%) of the total number of intervention households (5544) from 45 slums in four cities. No sampling was done. All households that tenants occupied at the time of intervention and households without menstruating women were excluded from the study population. Remaining permanent-resident households with at least one menstruating woman were included in the study.

The structured survey tools used in this study were administered before the start of the intervention and after a sustainability period of six months to one year of the intervention. The data was collected through these two surveys using the KOBO collect tool.

The purpose and intention of the study were explained to each participant and data security measures were thoroughly informed to each participant. The survey questions included background characteristics, housing area and conditions, type of availability sanitation facilities (shared / common toilet block / public toilet), and behaviors which were specially adopted by women and adolescent girls that could lead to UTI, as well as symptoms of UTI in the last one month. UTI was defined as symptomatic UTI with three of the following symptoms, such as burning sensation, pain during urination, frequent urination, and vaginal itching. In the study setting, the *mori* is a small, semiconstructed structure, semi-covered either inside or outside the house.

Statistical analysis

Women residing in the house were primary respondents and provided data for other menstruating girls in the house. Data of 1729 women and adolescent girls was collected in the pre-intervention survey. While the post-intervention survey collected data on 1711 women and adolescent girls due to drop-outs. For comparison, the total number of women considered is 1711. The data entry and analysis were carried out in IBM SPSS 21.0. The main dependent variable was binary; suffering from UTI or not suffering from UTI. Women reporting at least one symptom of UTI were categorized as women suffering, or else not suffering from UTI (reference group). Pearson's Chi-square test was used to check the differences between pre and post-intervention settings and women suffering from UTI and those who did not suffer from UTI for selected characteristics. The level of significance was set at 0.05.

Results

The study included 682 households. The majority of women were from the reproductive age group (55%), and none of the households had an individual toilet before the intervention (Table 1).

Table 1: Characteristics of Household and characteristics of participants (N=682)

Characteristics	**n (%)**
Characteristics of Household (N=682)	
Standard of Living Index	
High	124 (18)
Low	192 (28)
Middle	366 (54)
Total Number of rooms	
One room	243 (36)
Two rooms	330 (48)
Three or more rooms	69 (10)
Access to the bathroom (*Mori*)	
Exclusive access	655 (96)
No exclusive access	27 (4)
Characteristics of the participants (N=1711)	
Characteristics	**Women in the household n (%)**
Age (in years)	
<10	274 (16)
10-17	294 (17.20)
18-24	296 (17.30)
25-34	324 (18.90)
35-49	337 (19.70)
50 and above	186 (10.90)

Across our data, we found that around 9% of the respondents confirmed suffering from pain during urination and a burning sensation at the time of urination. In all 8% of the respondents reported frequent urination and itching around the vagina. And overall, UTI symptoms were reported by 13% of the girls and women.

In all, 12.5% of women and adolescent girls practiced avoiding liquid intake, and 24.9% restricted dinner. Respondents reported that these behavior trends were to

control their toilet visits. Factors such as access to the bathroom, area of the house, and number of rooms were significantly different (p>0.05).

UTI increased with increasing age till 25-34 years and thereafter decreased. A similar trend was also observed post-intervention (Figure 1).

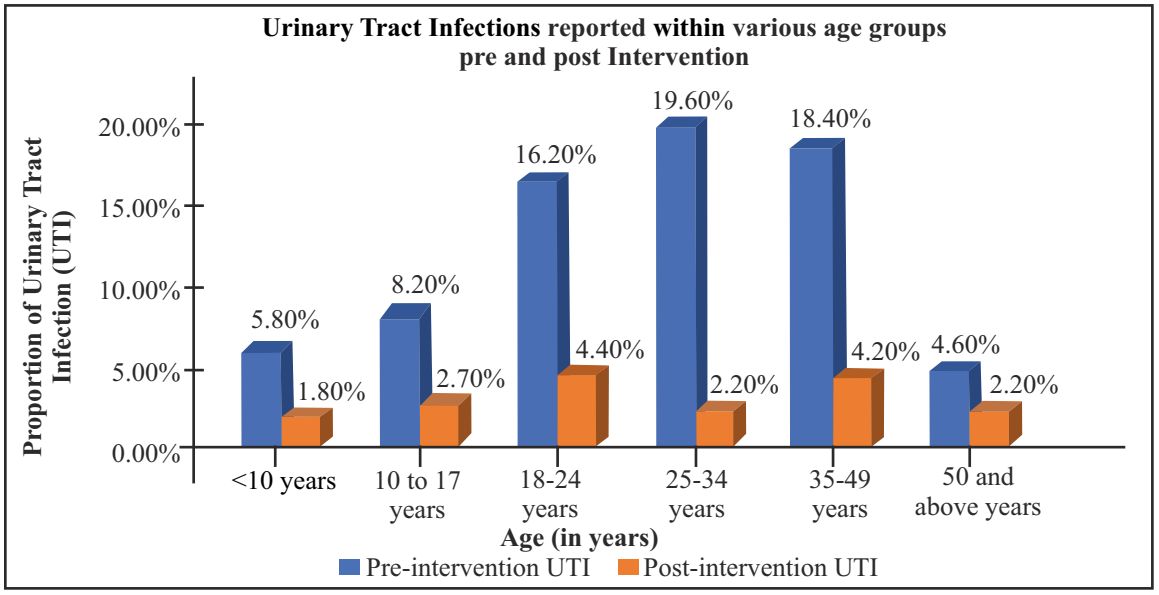

Figure 1: Urinary Tract Infections (UTIs) reported by various age groups in Pre- and post-intervention study

Table 2 describes factors affecting the prevalence of UTI in women pre-intervention at household level. The factors like marital status, avoiding visiting toilet and restricting dinner to avoid visiting the toilet were significant.

Table 1: Factors affecting the prevalence of Urinary Tract Infections (UTIs) in women pre-intervention

Factors	UTI Present n (%)	UTI Absent n (%)	Chi-square ($\chi 2$) p-value
Total no of rooms (N=1712)			
One room	81 (14.0)	499 (86.6)	$\chi 2$ =1.657 p>0.001
Two rooms	102 (12.2)	735 (87.8)	
More than Three rooms	38 (12.9)	257 (87.1)	
Area of the house (N=1712)			
Less than 100 sq. ft	141 (83.9)	27 (16.1)	$\chi 2$ =0.965 p>0.001
More than 100 sq. ft	194 (12.6)	1350 (87.4)	
Marital status (N=1730)			
Married	141 (63)	621 (41.23)	$\chi 2$=47.801 p<0.001*
Unmarried/separated/widower	81 (36)	887 (58.8)	
Menstruation status (N=1711)			
Menstruating	185 (83.3)	893 (59.2)	$\chi 2$=48.108 p<0.001*
Non-menstruating	37 (16)	615 (40.83)	
Avoiding visiting Toilet (N=1712)			
Yes	10 (18.4)	76 (5.04)	$\chi 2$=0.371 p>0.001
No	211 (81.08)	1415 (93.9)	
Restricting dinner to avoid visiting the toilet (N=1712)			
Yes	88 (20.4)	343 (79.6)	$\chi 2$=29.633 p<0.001*
No	133 (59.9)	1148 (76.22)	
Avoid drinking water/taking liquid after dark (N=1712)			
Yes	41 (18.4)	169 (80.5)	$\chi 2$=9.982 p>0.001
No	180 (81.08)	1322 (87.7)	

*p<0.001: Statistically significant

Table 3 shows that the prevalence of UTI reduced from 12.8% to 3% after installation and use of household toilets (p<0.001). Factors that significantly improved after toilet installation were lesser number of participants avoiding toilet visits, restricting dinner, and restricting their liquid intake after dark.

Table 3: Changes in prevalence of Urinary Tract Infection and practices affecting Urinary Tract Infection after toilet installation

Characteristics	Pre-intervention	Post-intervention	p-value
Urinary Tract Infection present	222 (12.8%)(N=1729)	51 (2.9%)(N=1711)	p<0.001*
Avoid visiting toilet	86 (4.9%)(N=1728)	23 (1.3%)(N=1711)	p<0.001*
Women restrict dinner to avoid going for defecation	431 (24.9%)(N= 1728)	73 (4.2%)(N=1711)	p<0.001*
Women avoid liquid intake after dark to avoid urination	210 (12.15%)(N=1728)	26 (1.5)(N=1711)	p<0.001*

*p<0.001 statistically significant

Besides directly impacting UTI prevalence and causes, the installation of household toilets had shown a significant impact on menstrual hygiene behavior, as shown in Table 4. The frequency of changing pads three or more times increased significantly by (8%), and washing the vaginal area more than three times a day during menstruation has significantly increased, as shown in Table 4.

Table 4: Impact of in-house Toilets on Menstrual Hygienic practices of Women and adolescent girls

Parameters for Menstrual Hygiene	Pre-intervention [Number of menstruating women (N=1068)]	Post-intervention [Number of menstruating women (N=1059)]	Chi-square ($\chi 2$) p-value
Frequency of changing sanitary napkins/clothes per day			
One time	86	66	$\chi 2$=12.829 p<0.001*
Two times	601	537	
Three or more times	379	456	
Wash vaginal area			
One time	491	480	$\chi 2$=42.287 p<0.001*
Two times	399	151	
Three or more times	174	420	

p<0.001 Statistically significant

Discussion

This study estimates the prevalence of symptoms based UTI among women from slums in four cities: Kolhapur, Pimpri-Chinchwad, Thane, and Navi-Mumbai from Maharashtra of Maharashtra, India. No household had individual toilets before the intervention (i.e installation of toilets), while most had exclusive access to a bathroom *(mori)*. However, the bathrooms/*moris* were available in most households (96%), the respondents did not use it as a place of urination. During the interaction with women and adolescent girls in the study area, it was discussed that the *moris* could not be used as they are just beside the cooking area and have no walls and hence no privacy .

This study shared evidence that the installation of household toilets may significantly reduce the prevalence of UTIs from 12.8% to 2.9% in women and adolescent girls living in urban settlements. This may be due to increased frequent visits to the toilet due to exclusive access post-installation of the toilet facility. A study by Panchang et al.[8] showed that the holding-it-up behavior was due to the non availability of the the toilet. The present study similarly supports the significant drop in this practice post-availability of toilets.

Women represented in the study were from low-income groups with restricted access to sanitation facilities i.e mainly public /shared. In the pre-intervention study 12.8% of the study participants reported symptoms of UTI. Earlier evidence have reported a significant association between the use of shared sanitation facility and UTI among women[7], as these toilets act as epicenters of germ transmission. The analysis indicated that menstruation, less intake of liquids to reduce the frequency of toilet visits, restrictions on dinner, and marital status are associated with the prevalence of UTI. Previous research done at the Gokhale Institute of Politics and Economics mentioned that UTI was independently and

strongly associated with the age of the women, lack of access to an inhouse *mori*/bathroom, and avoiding liquid intake[6]. Another article by by Das et al. reported the protective effect of access to a latrine/*mori* inside the house on UTIs[9]. As mentioned by Kawade et al.,[6] the occurrence of UTI was nearly two-fold in women who evaded the intake of liquid as compared to other women. Various studies share the The relationship between limited liquid intake and UTI , especially among women in work settings[10,11].

The present study supports the practice of avoiding dinner, visiting toilets, and avoiding drinking water after dark among women, being followed by vulnerable urban residence without access to safe sanitation. These factors directly affect the quality of life of women by affecting their nutritional status and adding stress[12,13]. UTIs are known to be the most common forms of infection in adolescent girls and women of menstruating age, and unhygienic menstrual practices are a major contributor. Only 36% of women and adolescent girls changed their pads three or more times a day, and only 25% cleaned the vaginal area three or more times a day during the pre-intervention period i.e., before the installation of household toilets. These practices affect UTIs, creating abnormally moist conditions in the genital area that promote opportunistic infections. The results show that availability of household toilets leads to improvement in hygienic practices among women and adolescent girls where the frequency of changing sanitary pads/cloths and frequency in cleaning up the vaginal area have significantly improved and hence reduce the risk of UTI.

Limitations

The elderly women in the household were primary respondents and reported about the symptoms of the other women or adolescent girls in the household. Hence the information could be underreported. UTI was classified based on the symptoms and laboratory investigations were not performed.

Conclusion

Installation of toilets improves their sanitation-related behavior and may impact on improving menstrual and vaginal hygiene. Intervention and behavior change communications, along with access to sanitation facilities, need more focus from the policy level to improve the health and hygiene of the women and adolescent girls residing in Urban settlements.

Sanitation-related adaptive behaviors suggest the need to inform context-specific, gender-sensitive sanitation interventions.

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Ethical consideration

Before conducting the interview, informed written consent was obtained, and participation in the study was voluntary.

Authors' Contribution

AD: Conceptualization, Design, Data analysis, Manuscript writing and revision; SK: Data monitoring and managing; PJ: Supervision of project

Data availability statement

Data will be available with the corresponding author on request.

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