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Original Research Article

Safe drinking water and sanitary facilities utilization in households of Belagavi urban slums, Karnataka, India

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ABSTRACT

Background: Safe water and adequate sanitation are basic to the health of every person, yet many people throughout the world do not have access to these needs. Access to these basic services is not only a fundamental right, but also a steppingstone to sustainable development of the country. Objective of this study was conducted to measure the proportion of slum households using improved drinking water and sanitation facilities.
Methods: Study was conducted among 620 slum households in Belagavi from by interviewing one member from each household using WHO/UNICEF joint monitoring program core questions on drinking water and sanitation for household surveys.
Results: All the slum households (100%) used improved drinking water source; piped water in yard or plot (68.22%) being the primary source. 94.35% of households used improved water source for cooking and/or hand washing purpose. 49.03% of households used improved sanitation facilities and 55.97% used unimproved sanitation facilities. Proportion of households with no latrine facilities and practicing open defecation were 13.06%. About 27.69% households had reported diarrheal events in children in the previous month. Type of latrine used by households was found significantly associated with the diarrheal events in children.
Conclusions: Utilization of safe drinking water in Belagavi slums has increased when compared to global and national levels but households with piped water supply are still low. Access to improved sanitation facilities is still lacking in many households. Increasing access to basic sanitation at the household level and behavior change awareness programs could help in achieving universal sanitation coverage.

Keywords: Improved drinking water, Improved sanitation, Urban slums, WHO/UNICEF JMP

INTRODUCTION

Safe water and adequate sanitation are basic to the health of every person, yet many people throughout the world do not have access to these needs.[1] Every citizen has the right to safe drinking water, adequate sanitation, electricity, safe transport system, waste collection, education and health care. Access to these basic services is not only a fundamental right, but also a steppingstone to sustainable development of the country. Provision of these basic services goes hand-in-hand with economic growth, social inclusion, poverty reduction and equality.[2] According to joint monitoring programme (JMP) WHO/UNICEF 2015,

91% of the global population uses an improved drinking water source and the total population without access to improved drinking water globally is now 663 million. 68% of the global population now uses an improved sanitation facility which is 9% below the Millennium Development Goal (MDG) target. 2.4 billion people globally have no access to improved sanitation facilities. Of them, 946 million still practice open defecation.[3] The rapid expansion of urban population is a major challenge for the provision of safe water and basic sanitation, especially in slums. Globally, water and sanitation hygiene practice are responsible for 90% of diarrhea-related mortality.[4]

In India according to National Family Health Survey 4, the proportion of population using improved drinking-water sources was 89.9% and the proportion of population using improved sanitation facilities was 48.4%.[5] Belagavi is a city in the state of Karnataka located in its northern part along the Western Ghats. The city has 58 wards and 52 slums in the city, of which 39 are notified slums and 13 are non-notified slums. The total population of slums is about 42,202 persons (notified slums) which accounts for about 10 per cent of the total population of the city.[6]

This study was conducted to measure the proportion of slum households using improved drinking water and sanitation facilities and to determine the association between diarrhea in under-five children with the water and sanitation facilities.

METHODS

Study type and setting is the community-based, descriptive, cross-sectional study was conducted in the urban slums that comes under the Urban Health Centre [UHC] Ashok nagar and Rukmini nagar which is the field practice areas of Jawaharlal Nehru Medical College, Belagavi, Karnataka, India.

Study population was all households in the slums of UHC Ashok nagar and Rukmini nagar for which consent could be obtained from the head of the household.

Sample size was calculated using the formula $Z\alpha_2P$ (1-P)/ d^2, taking proportion of improved sanitation facilities in urban households in Karnataka as 77.3%, 95% level of confidence, 5% absolute precision and design effect of 2. Considering 10% non-response rate, total sample size finally became 620.[7]

Sampling there are total 5 slums in the study area. Out of total 5 slums 620 households were selected by probability proportion to size (Table 1). Each household were selected using systematic random sampling.

Selection criteria is minimum eligibility criteria were that the households should be located within the study area. Households that were locked at the time of the survey or members of the households who refuse to give consent were excluded from the study.

Table 1: Number of households selected from each urban slum using population proportion sampling.

Slums	Total no. of households	No. of households selected using population proportion
Gangawadi	392	30
Rukmini Nagar	1600	118
Old Gandhi Nagar	1880	139
Kasai Galli	1300	96
New Gandhi Nagar	3200	237
Total	8372	620

Data collection tools and techniques

A predesigned, pretested questionnaire based on the WHO/ UNICEF Joint Monitoring Program core questions on drinking water and sanitation for household surveys was the data collection tool.[1]

Drinking water sources were defined as "improved" and "not improved" based on definitions used by the WHO. Improved sources included a piped water supply into the dwelling, piped water to a yard/plot, a public tap/standpipe, a tube well/borehole, and a protected dug well. Sanitary facility was considered "improved" if it hygienically separated excreta from human contact like flush to piped sewer system, flush to septic tank, flush/pour flush to pit, composting toilet, ventilated improved pit latrine, and pit latrine with a slab.[1] Diarrhea was defined as three or more loose or watery stools in 24 hr period.

One adult member of each household who is usually engaged in water collection was interviewed. Systematic random sampling method was used to select the household and households that could not be accessed for interview then next immediate household was selected. Data from each household were recorded about the main water source for drinking, cooking and hand washing, time of water collection on a single occasion, person collecting water, methods of water disinfection, type of sanitation facilities used by the households, use of shared toilet, and disposal of young children's feces. Each household respondent was asked about diarrheal events in the past 1 month among the youngest child.

Statistical analysis

Data were checked and analyzed by SPSS version 20. The proportion of improved and unimproved drinking and cooking water sources and sanitation facilities were

calculated. Binary logistic regression was applied to find out the water and sanitation related factors associated with diarrhea in under-five children, the dependent variable being the presence of at least one event of diarrhea in the previous 1 month; denoted as 1 and absence of diarrhea as 0. Crude odds ratio (OR) and confidence interval (CI) were measured for the identified variables. Significant independent variables at univariate analysis were included in the multivariable model for avoiding confounding. Step-wise logistic regression was done, and the adjusted OR was calculated to identify the associated factors.

Ethical considerations

This study was approved by the Institutional Ethics Committee of Jawaharlal Nehru Medical College. The study participants were explained about the purpose of the study and informed consent was taken.

RESULTS

A total of 620 households were included in the study. This study revealed 20.48% of the households were headed by females. About 31.48% of the study participants were unskilled, 24.34% businessman, 9.19% skilled worker, 29.67% semi-skilled and 5.32% were semi-professional. Most of the study participants (33.23%) belonged to the lower middle socio-economic class according to the modified B. G. Prasad scale, followed by 26.13% in middle class, 24.03% lower class, 7.25% and 9.35% in upper and upper-middle class, respectively. Most of the study participants (56.94%) belong to Muslim community and 43.06% belong to Hindu religion. 31.61% of the study participants were illiterates. Among the study households, 213 (34.35%) had under-five children, of which 56 (35.67%) households had reported at least one episode of diarrhea in the previous month.

Table 2: Drinking and cooking and/or hand washing water sources in the households (n=620).

Water drinking sources	Households (%)	Cooking/hand washing	Households (%)
Improved	620 (100)	**Improved**	585 (94.35)
Piped water in premises	104 (16.78)	Piped water in premises	103 (16.61)
Piped water in yard or plot	425 (68.22)	Piped water in yard or plot	332 (53.55)
Public tap	93 (15)	Public tap	34 (5.48)
		Tube/bore well	104 (16.77)
		Protected dug well	12 (1.94)
		Unimproved	35 (5.65)
		Unprotected dug well	35 (5.65)

Table 3: Sanitation facilities in the slum households according to toilet facilities.

	Households (%)
Latrine facilities used by the adults (n=620)	
Improved	304 (49.03)
Flush/poor flush to piped sewer system	94 (15.16)
Flush/pour flush to septic tank	140 (22.58)
Flush pour to pit latrine	70 (11.29)
Unimproved	316 (50.97)
Poor flush else where	56 (9.04)
Open field	81(13.06)
Shared latrine*	179 (28.87)
Disposal of children's faces (n=213)	
Sanitary disposal	116 (54.46)
Child used toilet/latrine	78 (36.62)
Put/rinsed into toilet or latrine	38 (17.84)
Unsanitary disposal	97 (45.54)
Put/rinsed into drain or ditch	20 (9.39)
Thrown into garbage/surface water	25 (11.74)
Buried	9 (4.23)
Open field	43 (20.19)

This study revealed, all the slum households (100%) used improved drinking water source, piped water in yard or plot (68.22%) being the primary source. 16.78% of the households had piped drinking water supply inside the house premises and 15% of the household used public tap.

In this study, we observed 94.35% of households used improved, whereas 5.17% of used unimproved water sources for cooking and/or hand washing purpose. Most of the households (53.55%) used piped water in yard or plot, 16.61% used piped water in premises, 16.77% used tube/bore well, 5.48% used public tap and 5.65% used unprotected dug well (Table 2).

In major percentage of the households (81.2%), adult women were tasked with collection of water and they spent on average 22 minutes for water collection daily. About 14.51% of the households who did not have water sources inside the house premises had to spend >30 min daily for water collection.

A considerable proportion of households, 303 (48.87%) did not use any method for disinfecting drinking water. Households using some method of water disinfection

were 317 (51.13%), out of then most of the households 57.09% used to strain water with cloths, 28.08% used boiling method, 7.26% had water filters, while 7.57% allowed water to stand and settle.

Among the study households (49.03%) used improved sanitation facilities, of which 37.74% had flush/pour flush facility and 11.29% had flush pour to pit latrine. 55.97% used unimproved sanitation facilities.9.04% used poor flush to elsewhere, 28.87% used shared latrines. Proportion of households with no latrine facilities and practicing open defecation were 13.06%. Proportion of households with under five children were 34.35%. Out of them about 36.62% of the household children used toilet or latrine, 17.84% of the households disposed children's feces into latrine, 9.39% disposed into drains, 11.74% into garbage or surface water, 4.23% buried and 20.19% used open field (Table 3).

Table 4: Relationship of water and sanitation facilities according to sociodemographic profile of the slum households.

Socio-demographic profile	Cooking/hand washing		χ^2 P	Sanitation facility		χ^2 P
	Improved (%)	Unimproved (%)		Improved (%)	Unimproved (%)	
Socioeconomic status						
Upper	45 (100)	0	40.745 <0.001	34 (75.56)	11 (24.44)	114.856 <0.001
Upper-middle	58 (100)	0		36 (62.07)	22 (37.93)	
Middle	162 (100)	0		117 (72.22)	45 (27.78)	
Lower-middle	194 (94.17)	12 (5.83)		46 (22.33)	160 (77.67)	
Lower	126 (84.56)	23 (15.44)		71 (47.65)	78 (52.35)	
Education						
No formal	172 (87.76)	24 (12.24)	37.770 <0.001	105 (53.57)	91 (46.43)	65.002 <0.001
Education	137 (92.57)	11(7.43)		35 (23.65)	113 (76.35)	
Primary	220 (100)	0		119 (54.09)	101 (45.91)	
Secondary	45 (100)	0		34 (75.56)	11 (24.44)	
College/degree	11 (100)	0		11 (100)	0	
Occupation						
Semi professional	33 (100)	0	41.678 <0.001	33 (100)	0	69.621 <0.001
Business	128 (84.77)	23 (15.23)		84 (55.63)	67 (44.37)	
Skilled	57 (100)	0		35 (61.40)	22 (38.60)	
Semi-skilled	184 (100)	0		83 (45.11)	101 (54.89)	
Unskilled	183 (93.85)	12 (6.15)		69 (35.38)	126 (64.62)	

Table 5: Multinomial logistic regression showing factors associated with diarrhea in under-five children and water and sanitation facilities of slum households.

	Odds ratio (95% CI)	P value
Drinking water source in the house premises		
Yes	Reference	0.986
No	0.992 (0.414-2.380)	
Cooking water source		
Improved	Reference	0.406
Unimproved	0.559 (0.142-2.203)	
Disinfection of drinking water		
Yes	Reference	0.099
No	1.702 (0.905-2.203)	
Sanitation facility for disposing children faeces		
Improved	Reference	0.454
Unimproved	1.298 (0.656-2.567)	
Type of latrine used by households		
Improved	Reference	0.035
Unimproved	2.046 (1.053-3.975)	

Table 4 shows the relationship of the sociodemographic characteristics of the households and the use of cooking water and sanitation facilities. Socioeconomic status, education status and occupation of the head of the households were found to be significantly associated with the cooking water facility types and sanitation facility used by the households.

DISCUSSION

Good quality reliable drinking water supply and sanitation are essential basic needs of every citizen. It has been the endeavor of successive government to satisfy this need to all its citizens. Urban population of India is on the rise from 27.81% in 2001 to 31.16% in 2011. According to census of India 2011, 17.4% of urban households in India live in slums. This increase in urbanization has resulted in greater pressure on the existing urban water supply and sanitation systems.[8]

The present study showed that all the households (100%) had provision of improved drinking water facility.

According to WHO/UNICEF Joint Monitoring Program report 2015, National drinking water estimates in India was 88% and in urban 93%. The proportion of piped water supply inside the premises was lesser than the urban national average (73%) in our study.[9] The difference in the usage of improved drinking water source and usage of water for cooking or hand washing purposes was noted in the study. This can be due to availability of water supply only once in three or four days. According to NFHS 4 data, the proportion of urban households in India with improved drinking water source was 91.1%.[5] In Karnataka, the proportion of urban households with improved drinking water source was reported as 89.8%.[7] Lesser proportion of improved water source use was noted in a study done in periurban community in Myanmar (42%) with 77% piper water supply to the households.[10] Our study revealed that in majority of the households (81.2%) women were tasked with collection of water. In 2012, Surveys conducted in 25 countries in sub-Saharan Africa reported that in 71 per cent of all households without water on the premises women or girls are mainly responsible for water collection.[11]

UN's Sustainable Development Goal 6 calls for universal and equitable access to safe and affordable drinking water by 2030. The first step in achieving that is providing everyone with a basic service within a 30-minute round trip. However, in sub-saharan Africa, UN estimates that 14% of the urban population had improved drinking water sources with distance 30 minutes or more. In Asia it was estimated as 19% of the urban population.[12] In our current study, 14.51% of the households had to spend >30 min daily for water collection daily. For women, such long water collection trip time considerably shortens the time they have available to spend with their families, on childcare, other household tasks, or even in leisure activities. For both boys and girls, water collection can take time away from their education and sometimes even prevent their attending school altogether. There is also an increased risk of faecal contamination during transportation.[12]

Safe storage and household water treatment interventions may improve water quality. In our study most of the households (48.87%) used no method of drinking water purification. Among households using drinking-water purification, most reported use of a cloth filter (57.09%), followed by 28.08% reported boiling the water. Use of drinking-water purification filters was rare (7.26%). Our findings were on par with NFHS 4 data which reported 47.1% of urban households used no treatment prior to drinking water. Similar findings were reported in a study conducted in Myanmar with 82% reported use of cloth as filter and 33.3% boiling method.[10]

Basic sanitation coverage is generally lower than basic water service coverage, and no SDG region is on track to achieve universal basic sanitation by 2030. Globally only 39% of the population have access to safely managed sanitation facilities.[9] In India, proportion of households using improved sanitation facilities was 48.4% (NFHS 4) and 38.9% practice open defecation (10% urban households).[5] Our current study, the proportion of households using improved sanitation facilities was found to be 49.03% which is similar to the national levels. Households with shared latrine facilities were 28.87% and open defecation was practiced by 13.6%. Most of the households with shared latrines or with no facilities are tenants who pay housing rents to a landlord which explains the demotivation in constructing safe toilet facilities. To accelerate the efforts to achieve universal sanitation coverage and to put focus on sanitation, the Prime Minister of India, Shri Narendra Modi, launched the Swachh Bharat Mission on 2nd October, 2014. In the current study improved sanitary disposal of children faeces was 54.46% and the remaining 45.54% of children faeces were disposed of unsafely. Our findings was consistent with the study conducted by Bhar et al.[4] A study conducted by Bawankule et al reported the stool of 79% of children below five years of age was disposed of unsafely.[14] Other low income countries such as Ethiopia, Madagascar, Nepal and Bangladesh reported low prevalence of safe child stool disposal.[15-18] Evidence have shown that unsanitary child faeces disposal, type of latrines used in the households, unsafe drinking water, piped water connection are associated with diarrhea in under five children.[19- 22]

CONCLUSION

Utilization of safe drinking water in Belagavi slums has increased when compared to global and national levels but households with piped water supply are still lacking. Access to improved sanitation facilities is still lacking in many households. Increasing the access to basic sanitation at the household level is important in achieving universal sanitation coverage. Building of new sanitation infrastructure alone is not sufficient to bring about improvements in health, rather the ways in which sanitation is adopted within households and across communities is critical. In households where adequate improved latrines already exist, behavior change programmes should be initiated to achieve universal sanitation coverage. Strategies to reduce unsafe disposal of children can go a long way in reducing the risk of diarrhea in children below five years of age.

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