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Research Article

A cross sectional descriptive study of hand washing knowledge and practices among primary school children in Mumbai, Maharashtra, India

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ABSTRACT

Background: Hand washing has been widely accepted worldwide as a cost effective intervention to prevent the spread of communicable diseases. However, despite proven effectiveness, practices of hand washing have found to be poor in developing nations. As children are vulnerable to communicable diseases, the present study aims to assess hand washing knowledge and practices among primary school children in municipal schools in Mumbai.
Methods: A cross sectional descriptive study was carried out among randomly selected primary school children of municipal corporation schools in Mumbai, India. Two thousand two hundred and eighty three students were interviewed using a structured interview schedule regarding socio-demographic characteristics, history of illness and hand washing knowledge and practices.
Results: More than half (54%)of the study population reported a history of illnesses in the past one month, out of which 81.4% reported absenteeism due to illness. Around 34% children were unaware about health related consequences of not washing hands. When asked about the important times when hands ought to be washed, only 18% mentioned after toilet use. Of the 2283 students, a very small percentage of respondents (0.7%) reportedly practiced five steps of hand washing; only 1% practiced four steps of hand washing. Forgetfulness was cited as the primary reason for missing washing hands before eating food (88%) and after toilet use (84%).
Conclusions: Knowledge regarding hand washing was found to be inadequate while practices were not up to the recommended standard. This suggests that both behaviour change education and infrastructure improvements are equally important to improve hand washing practices in the long run.

Keywords: Hand washing, Primary school children, Mumbai

INTRODUCTION

Hand washing has been globally acknowledged and accepted as a low cost & effective technique in preventing communicable diseases by countries all over the world, including WASH programme by UNICEF (United Nations Children's Emergency Fund, 2012). Hand washing before and after certain activities (e.g. before eating food and after going to the toilet) is considered as most effective in removing germs thus protecting one against infectious diseases like diarrhoea and pneumonia and also in preventing transmitting disease causing germs to others.[1,2] The importance of hand washing has been emphasised by the findings from systemic review conducted by Curtis et al in 2003 and Rabie et al in 2006 which revealed that washing hands with soap reduces diarrhoea by up to 43% and pneumonia by 23%.[3,4]

Hand washing is predominantly important for children as the prevalence of diarrhoea and pneumonia is high among them. Nearly 90% of child deaths due to diarrhoea and pneumonia occur in the 5 most populous and poor countries: India, Nigeria, Democratic republic of Congo, Pakistan and Ethiopia.[5,6] This underlines the importance of hand washing particularly in country like India.

Though the need of hand washing is more in developing countries, the practices were found to be poor due to lack of either infrastructure or awareness or combination of both.[3,7,8] In Odisha, India it was found that only 15% urban school children had availability of soaps in schools.[9] In Amravati district of Maharashtra the presence of bacterial pathogens was found to be present in all 400 primary school children which reflects the poor hand washing practices among children.[10] Although there have been number of hand washing studies conducted in India, no study on hand washing knowledge and practices among schoolchildren in Mumbai has been conducted on large scale.

Mumbai is the capital and the most populous city in Maharashtra state of India. It is also considered as the "commercial capital of India".[11] The employment opportunities in the city attract large number of migrants every year which puts lot of strain on various basic amenities like housing, drinking water supply, drainage, sanitation and giving rise to slums.[12,13] As of 2011 census, around 42% of Mumbai's population is living in the slums (5.20 million out of 12.42 million.[14] The health status of the slum inhabitant is affected due to lack of adequate infrastructure and health related aminities.[13] Due to lack of sanitation, improper provision of water, drainage and garbage collection, many disease vectors tend to thrive in these areas.[15,16] It was in this context that the present study was undertaken in Municipal schools of Mumbai, India.

The objectives of the present study were to assess the knowledge and practices regarding hand washing among primary school children in municipal schools, Mumbai and to compare the findings across the three geographical parts of Mumbai.

METHODS

This was a cross sectional study undertaken from July 2015 to November 2015 using quantitative method of data collection in Mumbai. As students studying in the municipal corporation schools come from low socioeconomic families and the majority are slum dwellers, schools thus gave an excellent opportunity to study hand washing knowledge and practices of the children from this background assuming their vulnerability to diseases.

Since Mumbai is divided geographically into city, eastern suburbs and western suburbs as shown in Figure 1 we decided to study and compare hand washing knowledge and practices according to the geographic distribution. Initially, 1st to 4th standard children were the part of target population but during the pre-testing of the interview schedule it was found that the 3rd and 4th students were able to comprehend and respond better to the questions than the 1st and 2nd standard students. So it was decided to include only 3rd and 4th standard children. The list of municipal corporation schools was obtained from the Education department, MCGM (Municipal Corporation of Greater Mumbai). According to the list, there were 1160 primary schools in 2013-2014. The schools were selected using stratified random sampling method according to the three parts of Mumbai. Around 10% schools were selected within the three strata, 36 schools were selected out of 357 from the city, 42 schools were selected from 425 schools in the western suburbs and 41 schools were selected out of 378 from the eastern suburbs as shown in Figure 1. From each standard, children were selected by simple random sampling method. The final sample size (n) consisted of 119 schools and 2283 students.

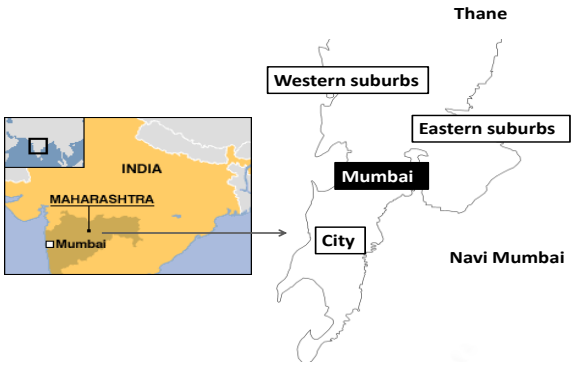

Figure 1: Mumbai with three parts (City, Western suburbs and Eastern suburbs).

Study schools were initially contacted via telephone for permission. Few schools were found to be shut; in such cases the next school that was available was selected. In the selected schools, students were then targeted from 3rd and 4th standard. Over the past years, the admission to municipal schools have found to be dwindling gradually, the reasons for which are not known.[17]

To prevent contamination of data, children selected for the study were either taken to different classrooms whenever possible or separated from the other students of the class. The children were explained the nature and purpose of survey. Face-to-face interviews were conducted with each respondent. Those who were non-responsive and not willing to participate were excluded from the study. Children's participation was voluntary and hence only who willingly agreed was included in the study. Also those who wanted to quit at any point of study were allowed to do so without any restriction. A pre-designed structured interview schedule was used to conduct the interviews. Pre-testing of all the questions

were done before finalising the interview schedule. Translation of the interview schedule was done in two languages, Hindi and Marathi. All the field staffs recruited were at least educated up to graduation. Training was provided to the field staff regarding overview / purpose of the study, the importance of each question and how the questions need to be asked/ interpreted to the students. The quality of data collection was supervised by the field supervisors. The interview schedule was divided in two parts; Part 1 focussed on socio-demographic characteristics student's history of illness and related absenteeism, while part 2 had questions on hand washing knowledge and practices. The interview schedule was validated by an outside expert from the field. The number and nature of questions were structured according to the age of the study population and the school settings. Two observations were done individually; nails were examined and children were asked to enact the hand washing steps they practice.

A written permission was obtained from the education department of MCGM prior to contacting schools for conducting the study. A written consent was also obtained from the school authorities prior to data collection. Informed consent was taken from teachers before conducting the study and only students who were willing to participate voluntarily were included in the study. As an ethical concern, educational awareness sessions on hand washing were imparted to the study participants after data collection.

Statistical analysis

All the responses were checked, coded and entered in SPSS (Statistical Package for the Social Sciences) version 20. After data entry, it was cleaned and checked for missing values and other errors. A simple frequency distribution was used to tabulate and interpret the variables and compare across 3 parts of Mumbai. For further analysis, a chi-square (χ^2) test was used to determine the statistical significance wherever possible. The statistical significance was defined at p value of less than 0.05.

RESULTS

The data was collected from 2,283 children of the 3rd and 4th grades from 119 schools. Table 1 presents an overview of the demographic details of the respondents. In the present study, the age group ranged from 6 to 14 years. Around 70% respondents's father belonged either to unskilled or semi-skilled category. As for the mother's occupational status, majority (59.9%) of the children's mother were found to be not working, and those working belonged to unskilled category (29.7%). With respect to mother tongue, majority of the children had Hindi (57%) as their mother tongue, followed by Marathi (32%).

As seen in Table 2, history of illness and absenteeism in the past one month was observed in more than half (54%) children from the date of interview. Out of those who remained absent, 81.6% reported absenteeism due to illness. From the Table 3, it is also seen that out of those who had health problems, majority (75%) had fever, followed by respiratory symptoms like cold/cough (32.9%) and gastrointestinal symptoms (16.8%). Knowledge of hand washing for the children was presented in Table 4. 34.2% children were unaware about health related consequences of not practicing hand washing like sickness and germs. When asked about when to wash hands, 75.5% respondents mentioned before eating food, after eating (51.1%), after toilet use (18.1%) and after playing (11.7%). Other reasons like, after touching garbage and dirt, after coming from outdoors were mentioned by very few children (9.5%). Hand washing practices of the children were demonstrated in Table 5 and shows that the majority of children (91.5%) reported using soap for hand washing. Hand washing before eating food was reportedly always practiced by around 59% children in overall Mumbai.

Among those who missed or never washed hands (40.7% out of total), vast majority (88%) mentioned forgetfulness, followed by laziness (44%) as the main reason (88%) for not adhering to hand washing practices. Hand washing after toilet use was reported by 76% students. Out of 24% students who missed hand washing, forgetfulness again (83.6%) was the primary reason, followed by laziness (35.7%). A minor percentage of children mentioned lack of water and soap as reasons for not washing hands. The children were asked to demonstrate the steps practiced by them during the hand washing.

It was found that majority of the children rubbed the palms of hands together (94.2%), followed by back of hands (58.6%) but the space between fingers (6.5%)and cleaning the nails (2.4%) was found to be practiced by very few children across Mumbai. Around 61% children all over Mumbai had visible dirt in their finger nails at the time of interview. Further assessment of nails shows that 39% had grown nails. Majority of the children across Mumbai reportedly had access to public (75.3%) and private toilet (19%) while 5.7% mentioned open defecation.

DISCUSSION

The mean age of the study population in the present study was 8.67 years (Standard Deviation [SD] 1.2). It is seen that the most of the children's father belonged to either unskilled or semi- skilled category. More than half (59.9%) children's mother were found to be not working, most of those who were in the unskilled category were working as maids. These findings were expected as the children in Municipal Corporation schools generally come from low socio-economic status. As for history of illness, half of the respondents (53.8) mentioned history of illness in past one month. Out of those who mentioned history of illness, 81.6% reportedly missed school due to illness. These findings are in concurrence to the findings

by White et al. in which absenteeism due to illness was found to be a major issue in educational institutions.[18] Illness related absenteeism have been found to be reduced by hand washing interventions.[19] In a school based study conducted by Lopez-Quintero, 2009, it was found that few children reported gastrointestinal symptoms in the preceding month and absenteeism in last year.[20] An intervention based study needs to be carried out to study the implication of proper hand washing behaviour on illness and related absenteeism in the present study population.

Table 1: Socio-demographic characteristics.

Characteristics	City (N =562)	%	Eastern Suburbs (N = 866)	%	Western Suburbs (N = 855)	%	Total (N = 2283)	%	p-Value
School medium									
Hindi	248	44.1	301	34.8	370	43.3	919	40.3	
Marathi	146	26.0	326	37.6	274	32.0	746	32.7	0.001
Urdu	148	26.3	195	22.5	151	17.7	494	21.6	
English	20	3.6	44	5.1	60	7.0	124	5.4	
Standard									
3rd	270	48.0	429	49.5	417	48.8	1116	48.9	0.856
4th	292	52.0	437	50.0	438	51.2	1167	51.1	
Age									
6-8	280	49.8	469	54.2	379	44.3	1128	49.4	0.001
9-11	262	46.6	378	43.6	454	53.1	1094	47.9	
12-14	20	3.6	19	2.2	22	2.6	61	2.7	
Gender									
Male	298	53.0	414	47.8	417	48.8	1129	49.5	0.138
Female	264	47.0	452	52.2	438	51.2	1154	50.5	
Father's occupational status*									
Expired	22	3.9	26	3.0	26	3.0	74	3.2	
Unskilled	217	38.6	347	40.1	320	37.4	884	38.7	
Semi-skilled	195	34.7	347	40.1	295	34.5	837	36.7	0.000
Skilled/highly skilled	33	5.9	41	4.7	10	1.2	84	3.7	
Don't know	85	15.1	91	10.5	190	22.2	366	16	
Stay at home	10	1.8	14	1.6	14	1.6	38	1.7	
Mother's occupational status*									
Expired	5	0.9	14	1.6	8	0.9	27	1.2	
Unskilled	163	29.0	266	30.7	250	29.2	679	29.7	
Semi-skilled/skilled	21	4.1	48	5.5	24	2.8	86	3.8	0.000
Don't know	27	4.8	35	4.0	53	6.2	115	5.4	
Stay at home	344	61.2	503	58.1	520	60.8	1367	59.9	
Mother tongue									
Hindi	283	50.4	476	55.0	534	62.5	1293	56.6	
Marathi	188	33.5	294	33.9	245	28.7	727	31.8	
Urdu	28	5.0	45	5.2	20	2.3	93	4.1	0.001
Gujrati	10	1.8	10	1.2	11	1.3	31	1.4	
Other	53	9.4	41	4.7	45	5.3	139	6.1	

*Occupational status were categorised according to minimum wages act (excluding expired). The occupational status of the parents were categorised as per minimum wages act, India into Unskilled, skilled, semi-skilled, highly skilled.

Table 2: History of illness in past one month.

History of illness in past one month	City (N =562)	%	Eastern Suburbs (N = 866)	%	Western Suburbs (N = 855)	%	Total (N= 2283)	%	p-Value
Yes	296	52.7	458	52.9	475	55.6	1229	53.8	0.441
No	266	47.3	408	47.1	380	44.4	1054	46.2	

Table 3: Causes of illness and effect of missing school.

Characteristics	City (N=296)	%	Eastern Suburbs (N = 458)	%	Western Suburbs (N = 475)	%	Total (N=1229)	%	p-Value
Causes of illness									
Fever	211	74.8	332	77.9	331	72.3	874	75.0	NA*
Cold/cough	86	30.5	132	31.0	166	36.2	384	32.9	
Stomach ache	38	13.5	39	9.2	20	4.4	97	4.5	
Vomiting	25	8.9	27	6.3	39	8.5	91	7.8	
Loose motions	8	2.8	19	4.5	25	5.5	52	4.5	
Other causes	7	2.5	17	4.0	18	3.9	42	3.6	
Missed school because of illness									
Yes	219	73.9	357	77.9	427	89.8	1003	81.6	0.000
No	83	26.1	102	22.1	51	10.2	236	18.4	

* -Multiple answers so statistical test was not done and there is no p value.

Table 4: Knowledge of hand washing.

Characteristics	City (N =562)	%	Eastern Suburbs (N = 866)	%	Western Suburbs (N = 855)	%	Total (N=2283)	%	*p*-Value
Why is it essential to wash hands?									
We may fall sick	184	33.2	207	24.2	208	24.6	599	26.6	NA*
Germs	191	34.5	401	46.8	291	34.4	883	39.2	
To remove Dirt	188	33.9	328	38.3	476	56.3	992	44	
Don't know	70	12.6	88	10.3	74	8.8	232	10.3	
When is it essential to wash hands?									
Before eating	415	75.2	573	67.9	706	83.2	1694	75.5	NA*
After eating	167	30.3	429	50.8	551	64.9	1147	51.1	
After toilet use	74	13.4	115	13.6	218	25.7	407	18.1	
After playing	53	9.6	85	10.1	125	14.7	263	11.7	
After touching garbage/dirt	16	2.9	41	4.9	22	2.6	79	3.5	
After coming from outdoors	19	3.4	35	4.1	12	1.4	66	0.4	
Other reasons	2	0.4	0	0.0	4	0.5	6	0.3	
Don't know	24	4.3	30	3.6	13	1.5	67	3.0	

* - Multiple answers so statistical test was not done and there is no p value.

According to UNICEF, hands washing before eating food and after toilet use are two most critical moments of handwashing.[21] When the children were asked to mention the most important times of hand washing, 75.5 % mentioned hand washing before eating food but very few children mentioned after toilet use (18.1%). Around 34% respondents were not aware about the consequences of improper hand washing.

Findings of hand washing reveal that though 75.5% knew that hand washing before eating food is important, only 59.9% reportedly washed hands before eating food consistently. Only 18% answered hand washing after toilet use when asked about important times of hand washing, which was incoherent with findings on practices that reveal 76% reportedly always washed their hands after toilet use. This gap between knowledge and practice could be due to the social desirability effect, in which respondents have tendency to over report behaviour that they perceive as socially desirable.[22] Out of those students who reportedly missed hand washing before eating food and after going to the toilet, more than 80% mentioned forgetfulness as the main reasons followed by laziness. Forgetfulness as the main reason for not washing hands was also found in the study conducted by Setyautami et al, 2012 and Merenu et al, 2015.[23,24]

Forgetfulness and laziness reflects the behavioural problems towards hand washing. As a reminder schools should display posters to increase hand washing compliance. In contrast, lack of water and soap has been mentioned by very few students. All over the world, the main reason for low rates of handwashing is simply because it has not been a habit.[25] Therefore the intervention must not only focus on the infrastructure but also on the behavioural aspect of it so as to make hand

washing a habit, a social norm. The findings regarding hand washing before eating food and after toilet in the present study are quite similar to a study conducted in school children aged between 6 to 14 years in Ghana, where 88.3% children washed hands after toilet use.[26] The findings regarding hand washing practices in the present study were higher than the study conducted by Lopez et al., 2009 in Colombia which showed that only 33.6% of primary students "always" or "very often" washed their hands with soap and clean water before eating and after using a toilet.[19] In an interventional study conducted in Kolkata in primary school children it was found that 85.4% children washed their hands before eating food while 55.2% washed hands after going to the toilet.[27] Hand washing after going to the toilet was practiced by 55.2% of the respondents in a study conducted in south India.[28]

Table 5: Hand washing practices.

Characteristics	City (N =562)	%	Eastern Suburbs (N = 866)	%	Western Suburbs (N = 855)	%	Total (N = 2283)	%	p-Value
Hand washing method									
Water only/ don't know	75	13.3	63	7.3	56	6.5	194	8.5	0.000
Soap and water	487	86.7	803	92.7	799	93.5	2089	91.5	
Number of hand washing steps performed									
Only one step	516	91.8	802	92.6	833	97.4	2151	94.2	NA*
Two steps	308	54.8	464	53.6	566	66.2	1338	58.6	
Three steps	59	10.5	49	5.7	41	4.8	149	6.5	
Four steps	19	3.4	26	3.0	10	1.2	55	2.4	
All five steps	10	1.8	2	0.2	3	0.4	15	0.7	
Hand washing before eating food									
Always	358	63.7	487	56.2	510	59.6	1355	59.4	0.034
Sometimes	195	34.7	371	42.8	333	38.9	899	39.4	
Never	9	1.6	8	0.9	12	1.4	29	1.3	
Reasons for not washing hands before eating food (sometimes or never)									
Forgetfulness	179	87.7	346	91.2	293	84.9	818	88.1	NA*
Laziness	69	33.8	171	45.1	166	48.1	406	43.7	
Lack of water	10	4.9	8	2.1	10	2.9	28	3.0	
Lack of soap	6	3.0	8	2.1	8	2.3	22	2.4	
Hand washing after toilet									
Always	418	74.4	625	72.2	698	81.6	1741	76.3	0.000
Sometimes/ Never	144	25.6	241	27.9	157	18.4	542	23.7	
Reasons for not washing hands after toilet (sometimes or never)									
Forgetfulness	119	82.6	206	85.8	129	80.6	454	83.6	NA*
Laziness	50	34.7	94	39.2	50	31.3	194	35.7	
Lack of water	11	7.6	10	4.2	11	6.9	32	5.9	
Lack of soap	11	7.6	13	5.4	8	5.0	32	5.9	
When at home where do you go for toilet?									
Toilet at home	150	26.7	150	17.3	135	15.8	435	19.0	0.000
Public toilet	380	66.6	666	76.9	672	78.6	1718	75.3	
In open	32	5.7	50	5.8	48	5.6	130	5.7	
Dirtiness of nails									
Very dirty nails	74	13.2	140	16.2	107	12.5	321	14.1	0.026
Somewhat dirty nails	246	43.8	380	43.9	425	49.7	1051	46.0	
Clean nails	238	42.3	342	39.5	315	36.8	895	39.2	
Growth of nails									
Trimmed nails	378	67.3	514	59.4	501	58.6	1393	61.0	0.000
Grown nails	184	32.7	352	40.6	354	41.4	890	39.0	

* - Multiple answers so statistical test was not done and there is no p value.

As this is self-reported study, the actual findings may be different. A study in Kenya found that out of roughly 4,900 children who responded, more than half reported washing their hands in school on the previous day. However, in the observation of almost 1,000 children using the toilet, less than a quarter were observed to actually wash their hands after toilet use.[29] A study in Bangladesh about hand washing behaviour in 2008 suggests that the study subjects washed their hands less frequently than they claimed. These findings demonstrate that asking people about their hand washing behaviour may not provide an accurate assessment of actual behaviour.[30]

The children were asked to demonstrate the steps practiced by them during the hand washing. it was found that majority of the children rubbed the palms of hands together (94.2%), followed by back of hands (58.6%) but the space between fingers (6.5%) and cleaning the nails (2.4%) was found to be practiced by very few children across all the study schools in Mumbai. These findings were similar to study conducted by Ray & Majumdar, 2011 and Shreshtha & Angolkar, 2015.[28,31] For effective hand washing, lathering and scrubbing of hands is recommended as it creates a friction thereby removing dirt, grease and disease causing microbes from the skin. Microbes are present on all the surfaces of the hand, particularly in high concentration under the nails.[32,33] Around 61% children all over Mumbai had visible dirt in their finger nails and 39% had grown nails at the time of interview. For effective rubbing of all the surfaces of hands, particularly the nails and space between the fingers for at least 20 seconds is recommended which were found to be practiced by very small percentage of children. Considering that children are more vulnerable to communicable diseases, it is important to teach children the most essential steps of hand washing.

Majority of the children across the three parts of Mumbai reportedly had access to public (75%) and private toilet (19%). This was similar to findings by Nicolson et al reported in 2014.[34] While around 6% children were reportedly practicing open defecation. Open defecation poses a serious threat to children's health and is the leading cause of diarrhoea related mortality in children. Despite rapid economic growth and the efforts of the total sanitation campaign, around 6% children reported to defecate in open which is significant considering the urban settings. This number could be even greater considering the socially desirable responses that may have been generated. There is a need to intensify the sanitation efforts through facilitation of adequate infrastructure and behaviour change communication to accomplish the target of SDG 6 i.e. to end open defecation by 2030.

Statistically the p value is significant in the three phases of Mumbai. But on looking at the percentages closely it is seen that knowledge and practices do not vary much across the three phases of Mumbai.

CONCLUSION

Overall, absenteeism from the school due to illness was found to be very high. Further research is needed to study the implications of hand washing programme on absenteeism due to illness. The above findings also suggest that though hand washing after toilet and use of soap was mentioned by majority of the respondents, the quality of hand washing is not up to the recommended standard. Mere infrastructure alone should not be targeted, efforts must be directed to promote hand washing behavioural change program. Through reinforcement of hand washing via advertising campaigns, creative ideas, government programmes, NGO'S, and teachers, there is a scope of improving hand washing during critical times, thus reducing forgetfulness and indirectly delivering this message to parents that will in turn take the hand washing communication to the community level. Hand washing promotion and availability of infrastructure like water, wash basin and soap should be improved both at home and school. It is challenging and need long term efforts from multi stakeholders like Government, Corporate, and NGOs.

Strengths and limitations

This study assesses the current level of hand washing knowledge and practices among school-attending children in municipal schools in Mumbai and provides evidence based findings for policy development. The results should be viewed with the necessary degree of caution associated with self-reported behaviours. Since this study was respondent driven it is possible to assume that there might be over reporting of "proper behaviour". The findings may not generalize to all the children in Mumbai as the study did not include children attending non- government schools.

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