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## **Water, hygiene and sanitation practices amongst medical students in Moi University Eldoret, Kenya**

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### **Abstract**

**Background:** Hand washing with soap and water is one of the most effective and inexpensive means of preventing infections. Rates of hand washing are low worldwide even amongst health care workers who should know about its importance. The aim of the study was to evaluate the knowledge, attitudes and hand washing practices both in and outside the hospital amongst medical students in Moi University.

**Method:** This was a descriptive cross sectional survey carried out amongst randomly selected fourth to sixth year medical students of the of Moi University. A simple questionnaire exploring perceptions, attitudes and self reported behavior was used. Information obtained included biodata, awareness information and practice. Data were analyzed using descriptive statistics.

**Results:** Two hundred and sixty one students participated in the study with an M: F of 1.5:1. Diarrhea diseases were most commonly recognized as being associated with contaminated hands. 37.6% washed their hands regularly after interacting with their patients while 33.9% did so only after the days work. 58.3% and 58.9% washed hands before meals and after defecating respectively. Use of soap was generally low. The greatest motivation for hand washing was fear of contracting disease, whilst constraints included lack of soap, forgetfulness and inconveniently located sinks.

**Conclusion:** Hand washing rates are low amongst medical students in Moi University.

**Recommendation:** There is need for regular education and re-education of students on hand washing practices.

**Keywords:** Hand washing practices; medical students; Moi University School of medicine.

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### **1.Introduction**

Hands often act as vectors that carry disease-causing pathogens from person to person, either through direct contact or indirectly via surfaces [1, 2]. Humans can spread bacteria by touching other people's hand, hair, nose, and face. Hands that have been in contact with human or animal feces, bodily fluids like nasal excretions, and contaminated foods or water can transport bacteria, viruses and parasites to unsuspecting hosts [1, 2].

Hand washing with soap and water is one of the most effective and low-cost means of preventing infections.

The value of hand washing for the prevention of cross-infection was first observed in the middle of the nineteenth century [4]. This practice especially when done with soap can remove agents of infection both at the time they were emitted from the primary host and prevent them from reaching the secondary host. Regular hand washing is thus a brilliant way of preventing the transmission of microbes from one person to another and has been

described as a modest measure with big effects [5]. Hand washing is particularly important where people gather (schools, offices), where ill or vulnerable people are concentrated (hospitals, nursing homes), where food is prepared and shared and in homes, especially where there are young children and vulnerable adults.

As simple as hand washing appears to be, it has been found not to be common practice. Many studies have shown that doctors decontaminating their hands between seeing patients can reduce hospital infection rates, however rates of hand washing are low worldwide amongst health care workers who are supposed to know about its importance [6,7]. The objective of this study was to determine the perceptions, attitudes and hand washing practices amongst medical students in Moi University, Kenya.

## 2. Methodology

This was a descriptive cross sectional survey carried out amongst 4<sup>th</sup> to 6<sup>th</sup> year medical students of Moi University, Eldoret. Students go through six years of medical school; three years in the basic medical sciences and three in the clinical sciences. During their last 3 years they do rotations in pathology and pharmacology in the first year (i.e. 4<sup>th</sup> year), Pediatrics and Obstetrics and Gynecology in the second year (i.e. 5<sup>th</sup> year) and Preventive and Social Medicine and Internal Medicine and Surgery in the final year (i.e. 6<sup>th</sup> year). They also do rotations in internal medicine and surgery in the first and second clinical years. These rotations are all done in the Moi Teaching and Referral Hospital, except for the block rotation in Community Based Education Service where they spend 6 weeks living and working in a rural community in various Counties. All students reside in hostels located very close to the hospital.

The Moi Teaching and Referral Hospital is the largest tertiary hospital in the North Rift Region of Kenya. It functions as both a general and a tertiary hospital and also teaching center for both undergraduate and postgraduate medicine. It caters for patients within the County and serves as a referral Centre for neighboring Counties. It is a large hospital, with each of the clinical specialties having wards for in-patient management. Each ward is provided with at least two wash hand basins, running water, soap (liquid and bar) and cloth towels for hand drying. These towels are changed at least three times a day. Large vessels are also provided in each ward to store water for hand washing when due to fluctuations in supply, running water may not be available.

Students were randomly selected for the study while seated for lectures in their various classrooms. The number of questionnaires given in each class was directly proportional to the total

number of students per class. Informed consent was obtained from the students and only those who gave consent participated in the study.

A simple structured questionnaire was used for data collection. Information obtained included biodata, perceptions, attitudes and self reported behaviors concerning hand washing techniques, and actual hand washing practices in and outside the hospital. Where appropriate, participants were allowed to tick more than one option. Questionnaires were retrieved immediately after filling to avoid bias.

Data were entered into a Microsoft excel spread sheet and analyzed using SPSS version 15.0. Chi square test was used to test for significance. Level of significance was set at  $p < 0.05$ .

## 3. Results

Two hundred and sixty one (261) students participated in the study. There were 150 males and 101 females giving a male female ratio of 1.5: 1

Students were aged 19 -40 years with a mean age of  $25.12 \pm 2.96$  years.

**Table I: General characteristics of the participants.**

Participant Characteristic	Number	Percent %
<b>Sex</b>		
Male	160	61.3
Female	101	38.7
Total	261	100
<b>Grade</b>		
4 <sup>th</sup> year	70	26.8
5 <sup>th</sup> year	111	42.5
6 <sup>th</sup> year	80	30.7
Total	261	100

**Table 1** shows the general characteristics of the participants. Majority (42.5%) of them were 5<sup>th</sup> year students. The most easily recognized disease which can be transmitted by contaminated hands was diarrhea (88.9%). This was followed by hepatitis (46.7%) and respiratory infections (39.5%). (**Table 2**)

**Table II: Diseases recognized as transmitted via contaminated hands**

Disease	Frequency 4 <sup>th</sup> Year (%) N= 70	Frequency 5 <sup>th</sup> Year (%) N= 111	Frequency 6 <sup>th</sup> Year (%) N= 80	Total	Percent%
Diarrheal diseases	56(80.0)	103(92.8)	73(91.3)	232	88.9
Respiratory Infections	8(11.4)	51(45.9)	44(55.0)	103	39.5
Skin Infections	8(11.4)	56(50.5)	32(40.0)	96	36.8
Hepatitis	3(4.2)	73(65.8)	46(57.5)	122	46.7
Others	0(0.0)	3(2.7)	0(0.0)	3	1.1

Identified components of good hand washing included: rubbing soap on wet hands for about 20 seconds before rinsing (42.6%) and washing of the front and back of hands including under the nails (59.4%). The most practiced

techniques of hand washing were rubbing soap on wet hands for about 20 seconds before rinsing (44.1%), washing of the front and back of hands including under the nails (18.9%) and use of soapy water in a basin (18.6%). (**Table 3**)

**Table 3: Identified techniques of good hand washing and self reported hand washing practices**

Technique	Frequency	Percentage %
Use of warm running water	76	29.1
Use of cold running water	53	20.3
Use of soapy water in a basin	98	37.5
Rubbing soap on wet hands for about 20 seconds before rinsing	111	42.6
Washing front and back of hands before rinsing	155	59.4
Rinsing under cold running water	45	17.2
Rinsing under warm running water	31	11.9
<b>Hand washing practices</b>		
Use of warm running water	18	6.9
Use of cold running water	84	32.2
Use of soapy water in a basin	82	31.4
Rubbing soap on wet hands for about 20 seconds before rinsing	83	31.8
Washing front and back of hands before rinsing	115	44.1
Rinsing under cold running water	49	17.6
Rinsing under warm running water	9	3.5

**Table 4: Frequency of hand washing after clerking patients and after simple procedures**

After clerking patients	Frequency	Percentage %
Always	98	37.6
Never	7	2.7
Occasionally	58	21.2
Sometimes	98	38.4
No response	6	2.3
Total	261	100.0
<b>After simple procedures</b>		
Always	49	18.8
Never	40	15.3
Occasionally	73	28.0
Sometimes	83	31.8
No response	16	6.1
TOTAL	261	100.0
<b>After Days work</b>		
Yes	160	61.3
No	80	30.7
No Response	21	8.0
Total	261	100.0

**Table 4** shows how often students washed their hands after interacting with their patients. 96 (37.6%) and 38.4% would always and sometimes (respectively) wash their hands after clerking their patients, while 83 (31.8%) would sometimes wash hands after simple procedures on their patients.

Eighty (33.3%) would wash their hands after the days work.

There was no significant difference when frequency of hand washing after the days work between males and females was compared ( $p = 0.84$ ).

**Table 5: Hand washing practices in the clinics and rest rooms**

Hand washing in clinic/ward	Frequency	Percentage %
Use of running water alone	50	19.2
Soap and running water	174	66.7
Soapy water in a basin	9	3.5
Only water in a basin	8	3.1
No response	20	7.7
Total	261	100.0
<b>Hand drying techniques</b>		
Allows hands to dry on their own	71	27.2
Use of common towels	72	27.6
Use of disposable paper towels	18	6.9
Use of personal handkerchiefs	91	34.9
No Response	9	3.5
Total	261	100.0
<b>Hand washing after visiting the toilet</b>		
Always	148	56.7
Never	18	6.9
Occasionally	30	11.5
Sometimes	58	22.2
No Response	7	2.7
Total	261	100.0
<b>Technique after visiting the toilet</b>		
Use of running water alone	57	21.8
Soap and running water	173	66.3
Soapy water in a basin	15	5.7
Only water in a basin	12	4.6
No response	4	1.5
Total	261	100.0

**Table 5** shows hand washing practices in the clinics and after using the rest rooms. 174 (66.7%) washed hands with soap and running water in the clinics, while 20.7% used water alone. 91 (36.1%) of the students used personal handkerchiefs to dry hands after washing while 28.6% used the common towels provided on the wards. Males were

more likely to use personal handkerchiefs than females but this difference was not statistically significant ( $p = 0.06$ )

After defecating, 148 (56.7%) reported washing their hands always. 173 (66.3%) used soap and running water while 57 (21.8%) used running water alone.

**Table 6: Hand washing practices before and after meals**

	Before meals	%	After meals	%	Before snacks	%	After snacks	%
Always	154	59.0	138	52.8	10	3.8	24	9.2
Never	2	0.8	3	1.2	58	22.2	54	20.7
Occasionally	30	11.5	41	15.7	97	37.2	93	35.6
Sometimes	74	28.4	74	28.4	79	30.3	73	27.9
No response	3	1.2	5	1.9	17	6.5	17	6.5
Total	261	100	261	100	261	100	261	100
Running water alone	91	34.9	70					
Soap and running water	67	25.7	87					
Soapy water in a basin	12	4.5	27					
Only water in a basin	79	30.3	62					
No response	12	4.5	15					
Total	261	100	261					

**Table 6** shows hand washing practices before and after meals and snacks.

152 (58.2%) and 138 (52.9%) of students would always wash their hands before and after meals respectively. Use of soap and running water was more frequent after meals than before meals. Hand washing was done less often before snacks than before meals.

The greatest motivating factor for washing hands was the fear of contracting disease (58.1%), while the greatest constraint to hand washing both at home and in the clinics was lack of water. Other factors were laziness and forgetfulness (**Table 7**).

**Table 7: Motivating factors and constraints to handwashing in the clinics and in the hostels**

Motivation to wash hands	Frequency	Percentage %
Culture/Habit	61	23.4
Disgust of feces	7	2.7
Disgust of filthy environment	22	8.4
Enhance social status	11	4.2
Fear of contracting disease	143	54.8
Filthy latrines	2	0.7
No response	15	5.7
Total	261	100
<b>Limitations in the clinic</b>		
Forgetfulness	37	14.2
Inconveniently located sinks	16	6.1
Lack of motivation	17	6.5
Lack of soap	71	27.2
Lack of time	6	2.3
Lack of water	95	36.4
No response	19	7.3
Total	261	100
<b>Limitations in the hostels</b>		
Lack of soap	26	10
Lack of time	11	4.2
Lack of water	96	36.8
Laziness	78	29.9
No response	30	19.1
<b>TOTAL</b>	<b>261</b>	<b>100</b>

#### 4. Discussion

Diarrhea was the most easily recognized disease associated with contaminated hands. This is probably because diarrhea is a common killer of children in our environment and all the 5<sup>th</sup> and 6<sup>th</sup> year students had passed through the diarrhea training unit as part of their curriculum while doing a posting in the Pediatrics Department. Incidence of diarrhea, respiratory infections, skin and eye infections have all been reported to reduce with effective hand washing with soap and water [1, 2]. The most acknowledged techniques of good hand washing in the study were rubbing soap on wet hands for about 20 seconds before rinsing and washing front and back of hands including under the nails. Washing hands with water alone is significantly less effective than washing hands with soap in terms of removing germs[8]. Although using soap in hand washing breaks down the grease and dirt that carry most germs, using soap also means additional time consumed during the massaging,

rubbing, and friction to dislodge them from fingertips, and between the fingers, in comparison with just using water for hand washing. Effective hand-washing with soap takes 8-15 seconds, followed by thorough rinsing with running water [9].

In this study the use of running water either warm or cold for washing or rinsing hands was not readily mentioned. This is not surprising because running water is sometimes not available and stored water is readily seen on the wards to be used when running water is not available.

In the actual practice of hand washing, the rates of use of any of the recognized components of good hand washing techniques were generally low except for washing of front and back of hands including under the nails before rinsing which was on the high side. Self reporting may account for this high rate. Self reporting has been documented to overestimate compliance in hand washing when compared with actual observation [10]. The use of soapy water in a basin was practiced almost as much

as use of running water. This again may be for the same reasons mentioned earlier.

Over a third of the students reported that they always washed their hands after clerking their patients, but less often after simple procedures such as vene-puncture or blood sugar checks. These rates, though low, are higher than rates in some other studies where hand washing was actually observed [10, 11]. Again, self reporting could account for this. Most responses in this study were between ‘‘sometimes’’ and ‘‘occasionally’’. There were students who reported never washing their hands, although these were in the minority. There was also no difference in hand washing rates between males and females after the day's work. This means that pathogens could easily be transported from the hospital to their homes or hostels. Across the globe, hand washing rates among doctors and health care workers in between patient visits are low for various reasons. This trend among health workers who are expected to be role models for medical students will certainly be reflected among students as observed in this study [11-13].

The study also shows that a large percentage of students use either personal handkerchiefs or common cloth towels to dry their hands, while a few simply allowed their hands to dry on their own. Although the difference was not statistically significant, males were more likely to use personal handkerchiefs to dry their hands than females. This is probably because their handkerchiefs are often in their pockets and so are easily within reach. Experts argue that hand drying is as important as hand washing in maintaining hand hygiene [14, 15]. Despite conflicting findings, the general opinion seems to be that single-use paper towels are the most appropriate hand drying method. They are said to rub away transient organisms and dead skin cells and remove bacteria from deeper layers due to associated friction from rubbing [15]. They also lack the potential electric hazards associated with electric hand dryers. Common cloth towels and handkerchiefs which become damp and contaminated can act as reservoirs for bacteria and therefore have the potential to become significant sources of infection [15-18].

However hand dryers and disposable paper towels are expensive and were not available in most of the wards at the time of this study. The easy availability of personal handkerchiefs and cloth towels provided on the wards would explain their use by the students. One study reported that one of the barriers to hand washing among health care workers was lack of clean towels, where like in this study; staff had to share common cloth towels [19].

Although this possibility was not explored, it is possible that this may also be a barrier to hand washing by the students in this study.

Critical times recognized in hand washing with soap include after defecation, and before and after meals and snacks. Around the world, the observed rates of hand washing with soap at critical moments range from zero percent to 34.3 percent. Rates of hand washing with soap and running water after defecating were low in this study if self reporting is taken into cognizance. About 20% of students reported use of running water alone. The belief that washing with water alone to remove visible dirt is sufficient to make hands clean is commonplace in most countries. The study shows that hand washing rates are higher before and after meals than before and after snacks. Indeed hand washing in relation to snacks was negligible. This general trend is worrying. If medical students who are in training and more informed do not wash hands at critical times then rates in the general population are expected to be much lower.

The highest motivating factor for hand washing among the medical students was dread of contracting disease. This has been recorded in other studies among health personnel. This finding could be attributed to their knowledge of disease transmission and a personal need for self protection. Culture/habit was another motivating factor. Studies done amongst mothers of young children in HWWS shows that, they ascribed hand washing habits to what they were taught when they were young. Similarly, in a survey of what motivates hand washing in Ghana, the strongest motivators for hand washing with soap were related to nurturance, social acceptance and disgust of feces. Protection from disease was mentioned as a driving force but was not a key motivator of hand washing. This further buttresses the point that knowledge of disease transmission is an important motivating factor for hand washing amongst health personnel.

Constraints to hand washing in this study included inaccessible supplies of materials such as soap and water, absent-mindedness and laziness. Others were lack of time, inconveniently located sinks, and lack of motivation. These factors and many others have been reported in other studies as 11-13, 21 barriers to hand washing among health workers. These findings also support suggestions by authors that factors associated with noncompliance with hand hygiene recommendations are related not only to the individual worker but also to the group to which he or she belongs and, by extension, to the parent institution. Such factors include lack of appropriate hand hygiene agents and lack of hand

hygiene facilities e.g. paper towels as observed in this study.

## 5. Conclusion

Hand washing rates are low among medical students at Moi University in between patient visits, after simple clinic procedures and at critical times. Hand drying procedures are also largely inappropriate as some of the needed facilities are not readily available. There is need for regular education, provision of hand washing reminders e.g. posters at strategic locations around the hospital and provision of basic facilities for hand washing and hand drying.

## 6. Recommendations

There is need for Moi University to mount strong education awareness training for students on the need to practice proper hand washing while undertaking their clinical practice at the institution. The Moi Teaching and referral Hospital Management should be engaged to ensure sufficient and convenient availability of hand washing facilities in the clinical areas. The University should consider working in collaboration with the private sector to ensure that there are poster reminders on hand washing in all the clinical areas as this will enhance the adherence to the best hand washing practices.

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