ORIGINAL ARTICLE

Effectiveness of hand hygiene education among a random sample of women from the community

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Keywords

Hand hygiene • Education • Awareness • Bacteria • Practice

Summary

Objective. *The effectiveness of hand hygiene education was investigated by studying the hand hygiene awareness and bacterial hand contamination among a random sample of 170 women in the community.*
Methods. *Questionnaire was used to assess the hand hygiene awareness score, followed by swabbing of the dominant hand. Bacterial identification was done by conventional biochemical tests.*
Results. *Better hand hygiene awareness score was significantly associated with age, scarce bacterial growth and absence of potential pathogen ($p < 0.05$). Out of the 170 hand samples, bacterial growth was noted in 155 (91.2%), which included 91 (53.5%) heavy growth, 53 (31.2%) moderate growth and 11 (6.47%) scanty growth. The presence of enteric bacteria was associated with long nails (49.4% vs 29.2%; p = 0.007; OR = 2.3; 95% CI: 1.25-4.44) while finger rings were associated with higher bacterial load ($p = 0.003$). Coliforms was significantly higher among women who had a lower hand hygiene awareness score, washed their hands at lower frequency (59.0% vs 32.8%; p = 0.003; OR = 2.9; 95% CI: 1.41-6.13) and used common soap as compared to antiseptic soaps (69.7% vs 30.3%, p = 0.000; OR = 4.11; 95% CI: 1.67-10.12).*
Conclusions. *Level of hand hygiene awareness among the participants was satisfactory but not the compliance of hand washing practice, especially among the elders.*

Introduction

Lack of hand hygiene such as omitting hand washing after defeacation, changing baby nappies, and before handling food, could increase human contact with faecal matter [1]. The International Scientific Forum on Home hygiene has reported that hands could probably be the single most important route of transmission of large numbers of gastrointestinal, skin and respiratory tract infections. Bio-materials from the nose, eyes and skin during infections could contaminate the hands, which in turn could contaminate other fomites [2]. Hence, facilitating the spread of the infectious diseases. Proper hand washing could significantly reduce the transmission of pathogens from hands to food and other objects [3].
Hand hygiene promotion campaigns and practices has been reported to effectively reduce gastrointestinal infections by 31% and respiratory illnesses by 21% [2, 4]. In some countries, despite good quality of water, soaps and sanitary infrastructure are available, contagious infections associated with hygiene were found to be high in number. The reasons reported were lack of compliance and motivation to perform good hygiene practices [5-7]. This study was carried out in 2013 after a rigorous national hand hygiene awareness campaign by the Ministry of Health and Quality of life of Mauritius, using mass media to curb the transmission of influenza virus in the community. It would have been most appropriate to determine the effectiveness of the hand hygiene promotion campaigns by quantifying influenza virus using molecular methods from the hands of participants. However, it was not possible due to financial restraint. Therefore, we studied the effect of hand hygiene promotion campaign by measuring the hand hygiene awareness score and the presence of faecal bacteria as indicator from the hands of a random sample of female participants in the community.

Methods

The study was conducted among a random sample of 170 female volunteers aged 12-60 years. Handicapped, elderly persons and individuals having occupations which could promote bacterial contaminations of hands, such as cleaners and healthcare workers were excluded. The participants who satisfied the inclusion criteria were asked to fill a self- administered questionnaire and a hand swab was taken by rolling a sterile swab moistened with peptone water, over the participant's palm, fingers and in-between the fingers of the dominant hand. Informed consent was obtained from the parent of the respondents who were less than 18 years of age. The study was approved by the Department of Health Sciences Research Ethics Committee of the University of Mauritius.

The questionnaire was designed to gather maximum information regarding the study such as age, socioeconomic status, occupations, frequency of hand-washing, whether they wash their hands with soap, length of nails and hand hygiene behaviours. The samples were immediately streaked on Blood agar, Mc Conkey agar and Salmonella Shigella agar. Bacterial growth and load was read after an incubation period of 24 hours at 37°C. The bacteria were identified by conventional gram staining, morphological and biochemical properties. Bacterial load was read as mean number of colony forming units (CFU). The presence of less than 20 CFU was read as scarce growth, 21-50 CFU as moderate growth and more than 50 CFU as heavy growth. Hand hygiene awareness score was based on questions such as whether hand washing was important, should hands be washed before handling food and if hand washing could prevent transmission of communicable diseases. The participant could score a minimum of 0 and a maximum score of 4. Data analysis was done using the statistical software SPSS v.16.0 (SPSS Inc, Chicago, IL, USA) and the level of significance was read as $p < 0.05$ for all analyses. Pearson correlation was used to determine relationship between the quantitative variables such as age of participant, length of nails, hand hygiene awareness score and microbial load. Pearson's chi-squared was used to determine any significant difference between hand hygiene behaviours and microbial load.

Results

Out of the 170 women, 65.3% were aged 12-35 years and 34.7% between 36-60 years. The effect of age and other factors which could affect hand hygiene have been detailed in Table I. Bacterial growth was noted in 155 (91.2%) of the hand samples, with 91 (53.5%) heavy growth, 53 (31.2%) moderate growth and 11 (6.47%) scanty growth. The most common bacterium isolated was *Coagulase negative Staphylococcus* (45%), followed by *Streptococcus* spp. (37%), *Klebsiella* spp. (8%), *E. coli* (6%), *Bacillus* spp. (3%) and *Micrococcus* spp. (3%). A total of 100 (58.8%) of the respondents had a hand hygiene awareness score of four, 31 (18.2%) a score of three, 34 (20%) a score of two and 5 (2.9%) had a score of one. A higher hand hygiene awareness score was noted among the younger group ($p = 0.01$). Furthermore, scarce bacterial growth and absence of pathogenic bacteria were significantly associated with high hand hygiene awareness score.

The participants who reported to wash their hands more frequently, > 6 times/day, had higher hand hygiene awareness score ($p = 0.001$), scarce bacterial growth ($p = 0.004$) and coliforms (*E. coli* and *Klebsiella* spp.) were not detected from their hands. It was also noted that participants who were wearing rings at the time of sample collection, had heavier bacterial load ($p = 0.003$). Women who reported hand washing as a very important component of hand hygiene, were more likely to use antiseptic soap as compared to those who reported hand washing as less important (42.1% vs 6.1%; $p = 0.000$; OR = 2.55: 95% CI: 1.44-4.50).

The presence of coliforms was noted at higher prevalence among the women who had a lower hand hygiene awareness score ($p = 0.002$), washed their hands at lower frequency (59.0% vs 32.8%; $p = 0.003$; OR = 2.9; 95% CI: 1.41-6.13), used common soap as compared to antiseptic soaps (69.7% vs 30.3%, $p = 0.000$: OR = 4.11; 95% CI: 1.67-10.12) and had long nails (49.4% vs 29.2%; $p = 0.007$; OR = 2.3; 95% CI: 1.25-4.44). The younger group of participants had lower prevalence of coliforms, although the difference was not statistically significant (35.1% vs 45.8%; $p = 0.17$). Furthermore, coliforms were found from samples which had heavy bacterial load ($p = 0.000$).

Discussion

Our results showed that hand hygiene awareness had a very important role among the participants. The younger participants were more knowledgeable on the matter and had lower prevalence of coliforms. It could be that the younger participants watched television or listened to the radio for longer period of time and therefore, they were more exposed to the hand hygiene campaigns than

Tab. I. Effect of age and other factors affecting hand hygiene.

Factors affecting hand hygiene	12-35 years (n = 111) %	36-60 years (n = 59) %	p value	OR	95% CI
Type of soap used					
Normal	90.1	78.0	0.03	2.57	1.07-6.17
Antiseptic	9.9	22.0			
Wear rings	76.6	79.7	0.65	0.83	0.39-1.80
Presence of long nails	47.7	47.5	0.97	1.01	0.54-1.90
Awareness of hand washing importance	76.6	79.7	0.65	0.84	0.39-1.80
Influence of hand washing campaign	87.4	93.2	0.24	0.50	0.16-1.61
Wash hands before handling foods	71.2	88.1	0.01	2.43	1.14-5.17
Hand type					
Normal	78.4	64.4	0.04	2.00	1.01-4.03
Sweaty	21.6	35.6			
Hand washing frequency					
Times	23.4	22.0			
> 6 times	76.6	78.0	0.84	1.08	0.51-2.31

the elderly group. It has been previously reported that the lack of hygienic behaviours among adults (32-52 year) from developed countries could be because of their very busy lifestyle, false sense of health security due to high standard of water or sanitary facilities and incorrect belief that infectious diseases such as diarrhoea affected mostly children [5]. Furthermore, it has been suggested that positive outcome from hand hygiene promotion could be better achieved when people would practice hand hygiene not only more frequently but also at the right time [2].
Majority of the bacteria isolated were normal flora. *E. coli* and *Klebsiella* spp. have been increasingly reported to be associated with poor hygienic practices [8]. Previous studies have also reported that rings could contribute to hand contamination [9, 10]. In this study, the presence of long nails was associated with presence of coliforms. Various types of bacteria and parasites have also been isolated from the fingernail contents of food handlers [11].
The presence of coliforms from some samples indicated that the level of hand hygiene was below standard. In a similar manner, other highly infectious pathogenic microorganisms such as influenza viruses, rotaviruses and those responsible for foodborne illnesses could be present on the hands of people from community and transmitted. It should be noted that a high percentage of the participants had reported that their hand hygiene awareness and behaviours were positively improved after the hand hygiene campaigns. These findings indicated that the participants were not effectively translating their knowledge into practice. Previous studies have also reported similar behaviour [12]).

Limitations

This study focused on bacterial contamination and not viruses, which are also very important in hygiene related infectious diseases. The hand hygiene behaviour reported by the participants might have been over-reported as some people might feel ashamed to disclose that they do not wash their hands whenever required.

Conclusions

The participants had an overall acceptable hand hygiene score but compliance of hand washing practice was not always good. The population should be educated and reminded oftenly of the importance of hand hygiene in curbing incidence of infectious diseases, such as influenza, gastro-enteritis and conjunctivitis. It might be helpful to get NGO and university students on board to advocate for good basic hand hygiene practices in the community by adopting a door to door approach.

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Authors' contribution

SBH supervised the study and UJ performed experimental work. SBH and UJ performed statistical analyses and wrote the manuscript. All authors read and approved the manuscript.

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