



Evaluation of bacteria transmissible through shake hand

*¹ Madan Mohan Gunda, ² Sujana Kariveda

¹ Department of Industrial Microbiology, S.R.R. Govt. Arts & Science College, Karimnagar, Telangana, India

² Department of Chemistry, Anurag Group of Institutions, Hyderabad, Telangana, India

Abstract

Bacteria can be easily spread through families and communities due to poor hygiene. Bacteria transmissible through shake hand were experimentally isolated from samples collected from undergraduates students and staff of S.R.R. Govt. Arts & Science College, Karimnagar. The isolated colonies were then sub cultured in nutrient agar slants in order to obtain pure culture of all colonies. All students (100%) found to harbour bacteria on their hands. Bacterial pathogens isolated from the hands of students include *Escherichia coli*, *Streptococcus faecalis*, *Staphylococcus aureus*, *Bacillus spp.*, *Klebsiella spp.*, *Pseudomonas spp.*, *Acinetobacter spp.* Highest contamination of *Bacillus spp* was isolated. Showed Percentage of bacterial isolates from the samples collected from hands after calculating the total percentage of each isolate *Escherichia coli* 30% *Streptococcus faecalis* 20%, *Staphylococcus aureus* 26%, *Bacillus spp.* 30%, *Klebsiella spp.* 26% *Pseudomonas spp.* 13%, *Acinetobacter spp.* 13%. The highest prevalence was found in male students than in female students and least prevalence in staff.

Keywords: bacteria, hygiene, transmission, shake hand, pure culture

1. Introduction

Bacteria are ubiquitous in nature (Holding and Collee, 1971) [7]. They grow profusely under suitable conditions of temperature, moisture and relative humidity (Akinoyemi *et al.*, 2009) [2]. Bacteria have so many beneficial and harmful effects. Some of their beneficial effects include in the cycle of elements, food source for man and other animals (Prescott *et al.*, 2005) [11] and transformation of organic materials to mineral and modification of substances for use by other organisms. On the other hand, their harmful effects are seen in the destruction of plantation, decay of food, and agents of diseases and epidemics (Campbell *et al.*, 1998) [3].

All living organism are endowed with a large and varied bacterial biota (Ekrakene and Igeleke, 2007) [4]. These bacterial population may be dense as in the mouth or large intestine, of moderate size as on the skin or virtually absent as in deep tissues. Although most of these organisms are harmless commensals, or even participate in symbiotic relationship, many of them can turn on the host and cause diseases (Prescott *et al.*, 2005) [11]. The present study is a preliminary survey carried out to identify bacteria associated with the hands and possibly transmissible through shake hand in other to view its public health importance among staff and students of S.R.R. Govt. Arts & Science College, Karimnagar. Food borne diseases are known to contribute to both human morbidity and mortality as well as health care costs. Besides outbreaks of food borne disease, health care costs associated with these outbreaks are enormous (Campbell *et al.*, 1998) [3]. The human body surface is constantly in contact with environmental microorganisms and become readily colonized by certain microbial species, Gram-negative and Gram-positive pathogens in clinical specimens. It can cause a variety

of community- or hospital-acquired infections, including those of the urinary tract, respiratory tract, wounds and burns bacteriaemia, neonatal meningococcal meningitis, empyema and osteomyelitis. The hand serves as a major vehicle of transmission of various bacteria, including the enteric species (Prescott *et al.*, 2005) [11]. Various infections via hands and fingernails. Contaminated of hands play a major role in faecal-oral transmission of diseases (Ray *et al.*, 2011) [13]. The unhygienic habits of most of the people lead to the various infections via hands and fingernails. 80% of the diseases are associated with the poor domestic and personal hygiene (Langford, 2009) [8]. One of the ways of healthy living is hand hygiene (Ramos, 2004) [12]. Faecal contamination of hands is one of the important route by which children are exposed to pathogenic organisms (Langford, 2009) [8]. Wachukwu *et al.*, (2007) [17]. Finding that hands could serve as means for transmission of pathogens to foods and causing nosocomial infections in patients. Four genera of bacteria were isolated and identified, such as *Staphylococcus sp.*, *Escherichia coli*, *Proteus sp.* and *Pseudomonas sp.* Hedderwick *et al.*, (2000) [6] Concluded in a study that artificial fingernails were more likely to harbor pathogens, especially gram-negative bacilli and yeasts, than native nails. Schools and Universities are an ideal environment for the spread of infection and infectious diseases (Tambekar and Shrisat, 2012) [15]. Transmission of bacterial enteric infections via hands has important consequences for students, as they are more likely to take meal and water without washing hands; therefore they are posed to risk of infection. (Lau *et al.*, 2012) [9]. This study was conducted to isolate and identify bacteria, contaminants transmissible through shake hand.

2. Material and Methods

2.1 Collection of samples

A total of 60 swab samples were collected randomly from 30 people each sample before and after shake hand. This study was conducted at S.R.R Govt. Arts & Science College,

Karimnagar. Sampling was done using sterile cotton swab sticks. The swab sticks were rubbed all over the surface of hand before and after shake hand. The cotton swabs were transferred immediately to the laboratory to prevent dryness.



Fig 1: Swab samples in sterile tubes

2.2 Isolation and enumeration of bacteria

The nutrient agar was prepared in 500ml flask and was sterilized by autoclaving at 121°C at 15 psi for 20 minutes. 20 ml of the media was poured in the petri plates before getting solidified. The swab was immediately streaked on the plates of Nutrient agar. The plates were incubated at 37°C for 24 hours. The plates were then observed for growth and a colonial description of the isolates.

The nutrient agar medium was used in the study for isolation of the bacteria. The detail information was collected based on age and sex during collection of samples. The cultures were incubated at 37°C and checked for bacterial growth at 24 hours. Separate colonies were sub cultured onto nutrient agar to obtain pure culture. Morphological Characteristics of colonies and gram stain tests and biochemical tests were, according (Ramos, 2004; Ekrakene and Igeleke 2009) [12, 4] that used for bacterial identification.

2.3 Maintenance of pure cultures

Selected colonies were again sub-cultured on nutrient agar in petri-plates to isolate pure culture. After isolating pure cultures, bacterial isolates were further identified and characterized by size and shape and Gram staining of colonies. The bacterial colonies that appeared on the agar are transferred on to the slants of the same composition and incubated at the same optimized conditions.

2.4 Characterization of bacterial isolates

The isolates were characterized based on their morphological, biochemical, cultural and physiological features.

2.5 Biochemical characterization

Biochemical characterization of bioactive actinomycetes was done by conducting different biochemical tests including IMV₁C, H₂S production, casein hydrolysis, starch hydrolysis,

gelatin hydrolysis, lipid hydrolysis, melanin production and nitrate reduction were performed.

3. Results

In the present investigation, a total of 60 samples were collected from 30 students and staff before giving shake hand and after giving shake hand and were examined. All the samples were collected using sterile swabs and brought to the laboratory. The isolates were characterized based on their morphological, biochemical, cultural and physiological features and presented in table 2. Among the samples tested, most of the samples revealed pathogenic contamination with fecal coliforms and *Bacilli* sps. Enumeration of bacteria revealed (Table 1) a high count of fecal coliforms and *Bacilli* in all the tested samples indicating bacteriological transmission through shake hand.

Bacteria isolated include *Escherichia coli*, *Streptococcus faecalis*, *Staphylococcus aureus*, *Bacillus* spp., *Klebsiella* spp., *Pseudomonas* spp., *Acinetobacter* spp. (Table 2). The bacterial load was generally higher in samples collected before shake hand than in samples collected after shake hand (Table 1) in all categories of subjects, with the highest load recorded in the boy students than in girl students (Fig 4). Highest contamination of *Bacillus* spp was isolated (Fig 3). Showed Percentage of bacterial isolates from the samples collected from hands after calculating the total percentage of each isolate *Escherichia coli* 30% *Streptococcus faecalis* 20%, *Staphylococcus aureus* 26%, *Bacillus* spp.30%, *Klebsiella* spp.26% *Pseudomonas* spp.13%, *Acinetobacter* spp.13%. The highest prevalence were found in male students than in female students and least prevalence in staff.

The results showed a drastic increase in the bacterial counts in samples collected after shake hand compared to samples collected before shake hand. This should be due to the transmission of bacteria due to shake hand. The bacterial

count in A of Table 1 exceeds the bacterial counts in B of Tables 1. This corresponds with the reports of Gupta (2012) [5], who stated that students are more liable to bacterial load due to their restlessness than the adults. Prescott *et al.* (2005) [11] have also observed the incidence of *S.aureus*, *B. subtilis*, *E. coli*, *Lactobacillus* and *Actinobacillus* in human palms. Of all species of microorganisms isolated, *S. aureus*, *E. coli*, and *S.*

epididimidis are capable of assuming allergenic/pathogenic roles if swallowed in considerable amounts (Abdulkadir *et al.*, 2012) [1]. Among the samples tested, majority of them revealed pathogenic contamination with bacteria. The presence of such bacteria indicates poor hygienic practices and aerial contamination.

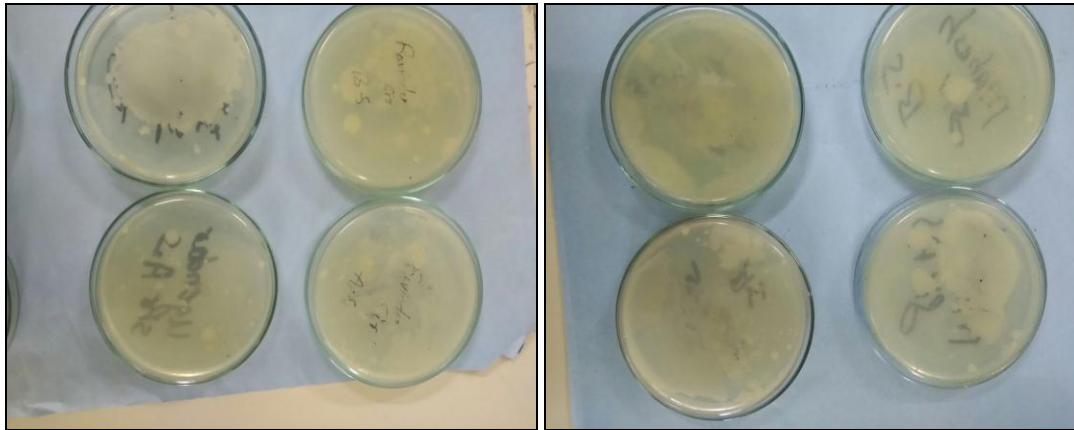


Fig 2: NAM plates showing the growth of bacteria before and after shake hand

Table 1: Enumeration of bacterial isolates from selected street foods

S. NO	ID	A (Before shake hand) (cfu/ml)	B (After shake hand) (cfu/ml)
1	BS1	4X10 ³	7X10 ³
2	BS2	8X10 ²	1X10 ³
3	BS3	2X10 ³	4X10 ³
4	BS4	3X10 ³	5X10 ³
5	BS5	6X10 ³	6X10 ³
6	BS6	4X10 ³	7X10 ³
7	BS7	2X10 ³	3X10 ³
8	BS8	5X10 ³	8X10 ³
9	BS9	6X10 ³	7X10 ³
10	BS10	8X10 ³	9X10 ³
11	GS1	1X10 ²	3X10 ³
12	GS2	1X10 ³	2X10 ³
13	GS3	3X10 ¹	4X10 ¹
14	GS4	5X10 ²	7X10 ²
15	GS5	6X10 ²	4X10 ³
16	GS6	3X10 ²	4X10 ²
17	GS7	2X10 ²	4X10 ²
18	GS8	2X10 ²	4X10 ³
19	GS9	4X10 ¹	4X10 ²
20	GS10	4X10 ¹	3X10 ²
21	MF1	7X10 ¹	5X10 ²
22	MF2	2X10 ²	6X10 ³
23	MF3	5X10 ²	1X10 ²
24	MF4	1X10 ²	2X10 ²
25	FF1	1X10 ¹	2X10 ¹
26	FF2	2X10 ²	4X10 ²
27	FF3	5X10 ¹	4X10 ²
28	FF4	4X10 ¹	2X10 ²
29	FF5	2X10 ¹	1X10 ²
30	FF6	7X10 ¹	3X10 ²

Legends:

A= before shake hand B= After shake hand

BS= Boy student GS= Girl Student

MF= Male faculty FF= Female faculty

Table 2: Morphological and biochemical characteristics of Bacterial isolates from samples before and after shake hand

Bacterial Isolates	Grams Nature	Shape	Ind.	Oxid	Cat	Cit.	Ure.	Coag	Nit.	Glu.	Lac
<i>Escherichia coli</i>	-	Rod	+ve	-ve	+ve	-ve	-ve	v	+ve	+ve	+ve
<i>Streptococcus faecalis</i>	+	Cocci	-ve	-ve	-ve	-ve	-ve	+ve	-ve	+ve	+ve
<i>Staphylococcus aureus</i>	+	Cocci	-ve	-ve	+ve	+ve	+ve	+ve	+ve	+ve	+ve
<i>Bacillus spp.</i>	+	Bacilli	-ve	-ve	+ve	+ve	-ve	-ve	+ve	+ve	v.
<i>Klebsiella spp.</i>	-	Bacilli	-ve	-ve	+ve	+ve	+ve	-ve	+ve	+ve	+ve
<i>Pseudomonas spp.</i>	-	Bacilli	-ve	-ve	+ve		v.	-ve	-ve	+ve	+ve
<i>Acenetobacter spp.</i>	-	Bacilli	-ve	-ve	+ve	-ve	-ve	-ve	-ve	+ve	-ve

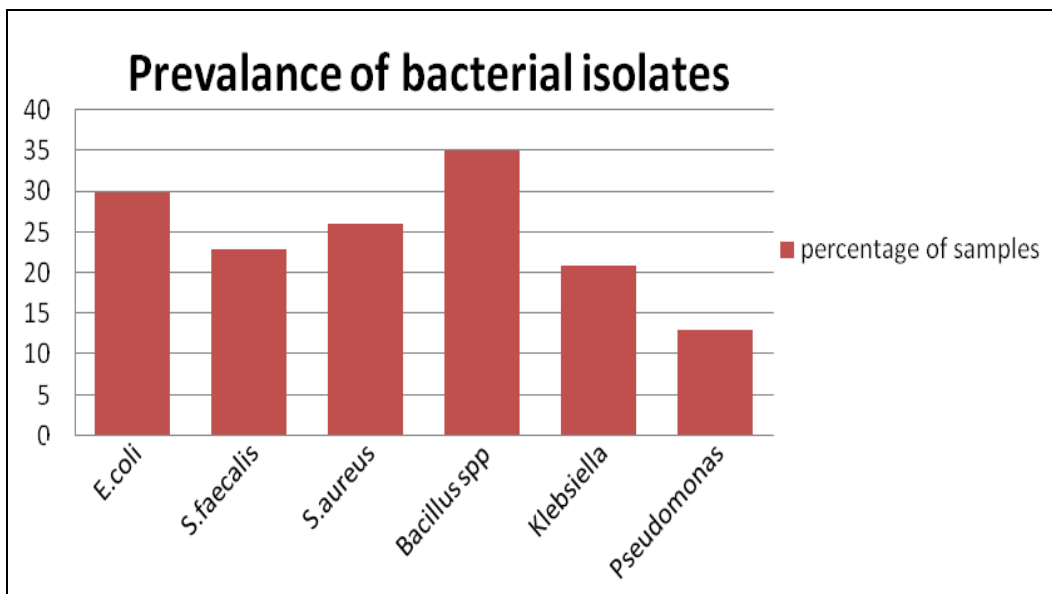


Fig 3: Prevalance of bacterial isolates in tested samples

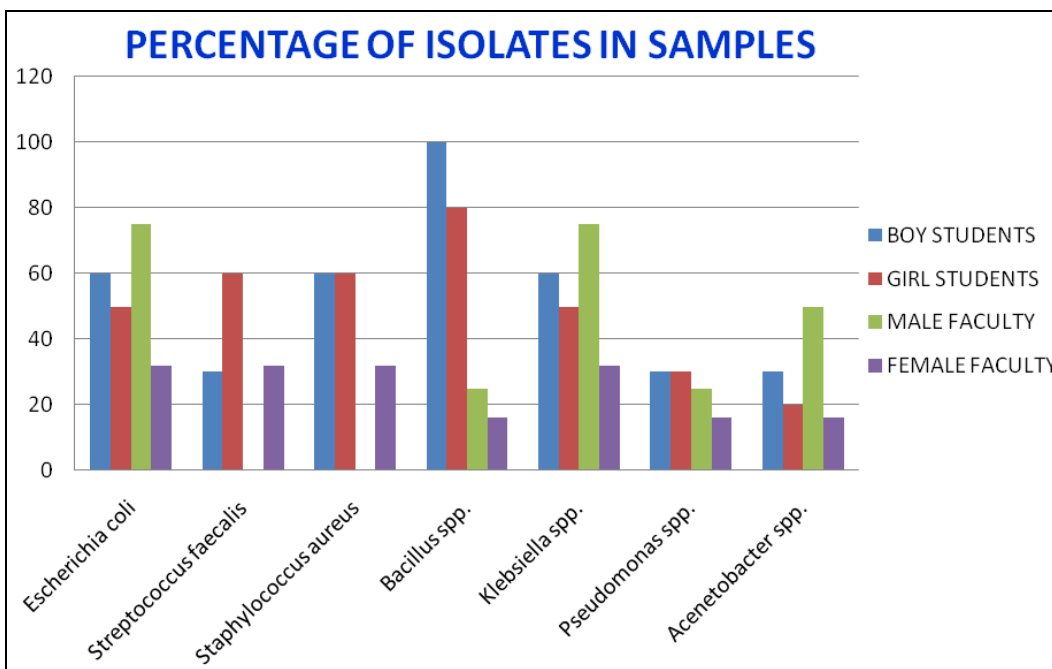


Fig 4: Percentage of bacterial isolates in collected from samples

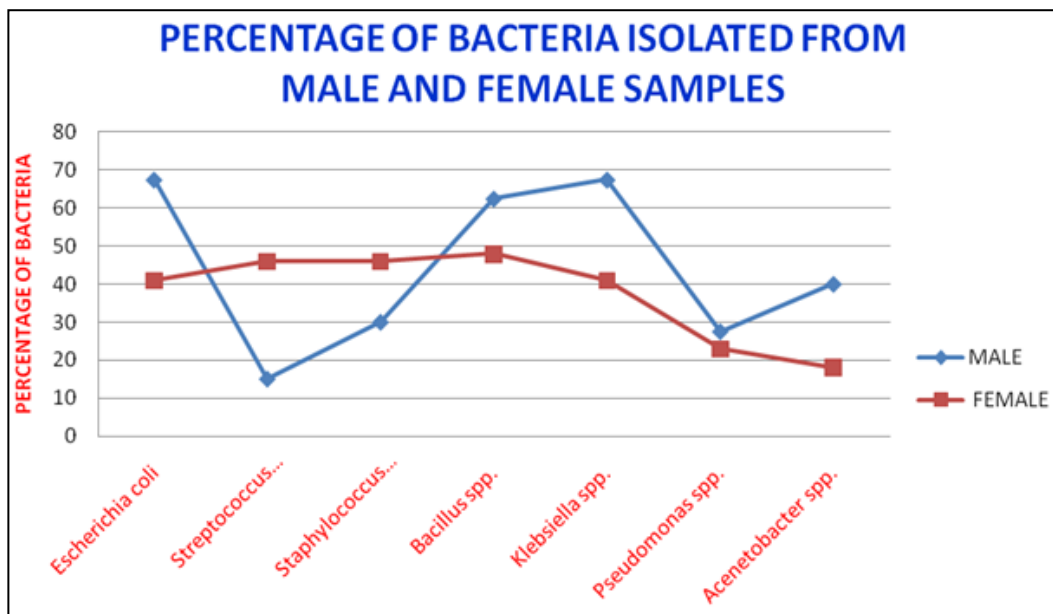


Fig 5: Percentage of bacteria isolated form male and female samples

4. Discussion and Conclusion

Many pathogenic bacteria were isolated from swab samples collected before and after shake hand from staff and students of S.R.R. Govt. Arts & Science College, Karimngar. Poor hygienic habits of students favour the growth of bacteria thus increasing the possibility of transmission. In the present investigation, all the samples showed the presence of high bacterial loads consisting of faecal coliforms and faecal streptococci. The presence of pathogenic bacteria is because of not having washing of hands, lack of hygienic habits.

Among the isolates, *E.coli* and *Bacillus spp.* showed the highest counts followed by *Staphylococcus aureus* and *Pseudomonas*. The high counts of *E.coli* and *Bacillus spp.* which are fecal and non faecal indicators of water pollution respectively indicated fecal contamination of hands. Our findings are in perfect correlation with the previous reports of high incidence of total coliform counts encountered in school children (Ray *et al.*, 2009) [14]. Previous study performed by Mahale and co-workers also reported the same. The results of the present study are in correlation with others previous reports also, which revealed the presence of high mesophilic count in samples of students than the staff. Previous studies suggested that more than 50% of the samples found to have high bacterial loads (Oniya *et al.*, 2006) [10]. The presence of pathogens like *Klebsiella* in might be due to the aerosols generated during sneezing and coughing in public places. In most of the people, bacterial isolates were found due to lack knowledge about hygienic conditions. (Tambekar *et al.*, 2009) [16]. The bacterial isolates might cause diseases like cold, diarrhea,

Bacterial contamination of the hands has become a global health problem. This study reveals that bacteria easily transmissible from person to person through shake hand. All students found to harbor bacteria in their hands which can spread from person to person and may cause diseases. Opportunistic pathogens such as bacteria, viruses and fungi can survive on inanimate surfaces for long periods of time and

items such as watches, pens, and mobile phones are permanent surfaces for transmission of these types of bacterial infections. Possibility of bacterial transmission is much more in tight shake hand than in loose shake hand.

Although results from the present study revealed that it is not possible to attain a complete depletion of bacterial load from the palms, it is important raise the consciousness of college students to the effects of these bacteria, so that care should be taken when eating. Apart from this, these bacteria may easily transmit through hand shaking there by making them endemic also on the human palms. To prevent the transmission of these bacteria from person to person, it is always better to hand bump or namaskar way of greeting than hand shake. This study is conducted to bring awareness among the public to avoid shake hand and to promote the traditional way of greeting i.e. namaskar.

5. Acknowledgements

Authors are thankful to the Principal, S.R.R Government Arts & Science College, Karimnagar, T.S. India, for providing laboratory facilities.

6. References

1. Abdulkadir M, Waliyu S. Screening and Isolation of the Soil Bacteria for Ability to Produce Antibiotics, European Journal of Applied Sciences, 2012; 4:211-215.
2. Akinyemi KO, Atapu AD, Adetona O, Coker AO. The potential role of mobile phones in the spread of bacterial infections, J Infect Dev Ctries. 2009; 3(8):628-632.
3. Campbell ME, Gardner CE, Dwyer JJ, Isaacs SM, Kruegger PD, Ying JY *et al.* Effectiveness of public health interventions in food safety. A systematic review. Can. J Public Health, 1998; 89:197-202.
4. Ekrakene T, Igeleke CL. Micro-organisms Associated with Public Mobile Phones along Benin-sapele Express Way, Benin City, Edo State of Nigeria. J Appl. Sci. Res. 2007; 3(12):2009-2012.

5. Gupta RS. Hand hygiene instruction decreases illness-related absenteeism in elementary schools: a prospective cohort study. *BMC Pediatrics*, 2012; 12:52.
6. Hedderwick SA, McNeil SA, Lyons MJ, Kauffman CA. Pathogenic organisms associated with artificial fingernails worn by healthcare workers. *Infect Control Hosp. Epidemiol.* 2000; 21(8):505-9.
7. Holding AJ, Collee JG. Routine biochemical tests, In *Methods in Microbiology*, Norris JR and Ribbons DW, eds, Academic Press Inc. Ltd, London., 1971, 1-32.
8. Langford RM. Hand-washing and its impact on child health in Kathmandu, Nepal. Doctoral thesis, Durham University, 2009.
9. Lau CH, Springston EE, Sohn M, Mason I, Gadola E, Damitz M *et al.* Removal of *Escherichia coli* on hands with natural or artificial fingernails. *International J. Epidemiol*, 2002; 1:1157-1164.
10. Oniya MO, Obajuluwa SE, Alade ET, Oyewole OA. Evaluation of microorganisms transmissible through handshake. *African J Biotechnol*, 2006; 5(11):118-112.
11. Prescott LM, Harley JP, Klein DA. *Microbiology*. 6th ed. Tim McGraw-Hill co. New Delhi. 2005, 675.
12. Ramos JL. *Pseudomonas*. New York: Kluwer Academic/Plenum Publishers, 2004, 2132.
13. Ray SK, Amarchand R, Srikanth J, Majumdar KK. A study on prevalence of bacteria in the hands of children and their perception on hand washing in two schools of Bangalore and Kolkata. *Indian Journal of Public Health*. 2011; 55(4):293-297.
14. Ray SK, Dobe M, Lahiri A, Basu SS. Hand washing practices in urban and rural communities in and around Kolkata, West Bengal. *Indian J Public Health*, 2009; 53:1192-1195.
15. Tambekar DH, Shirsat SD. Minimization of illness absenteeism in primary students using low-cost hygiene interventions. *Journal of Health and Allied Sciences*. 2012; 11(2):1-4.
16. Tambekar DH, Shirsat SD, Kakde SR, Ambekar KB. Hand hygiene and health: An epidemiological study of students in Amravati. *Afr. J Infect Dis*. 2009; 3(1):26-30.
17. Wachukwu CK, Abbey SD, Ollor AO, Obilor NL. Public Health Implication of Artificial Finger Nails Used by Health Workers and Food Handlers in Port Harcourt, Nigeria, 2007.