



A Study on Prevalence of Hand Flora of School Going Children from Eastern Part of India

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Abstract

Contaminated hands play a major role in transmission of diarrheal and acute respiratory illness. However, both the illness is self-limiting, but can be fatal in some of the cases if not treated properly on time. Normally human skin support the growth of commensal microbial flora, which helps to prevent the growth of pathogenic organism directly and indirectly mechanism. Many studies have suggested that hand washing before meal will reduce the risk of transmission of disease through fecal-oral route. Present study was laboratory based observational study, which were conducted in department of microbiology, PMCH, Dhanbad. Hand swab of school going children were collected just before the lunch. Swabs were inoculated in nutrient broth and subculture were done on blood agar and MacConkey agar. A total of 200 hands wabs were collected, which includes 100 male and 100 female children. It was observed that 41.5% of samples were positive for pathogenic organism. Most common pathogen, which were isolated was *Staphylococcus aureus* seen in 36% of children followed by *Escherichia coli*, *Pseudomonas aeruginosa*, *Enterococcus faecalis*, and *Klebsiella* species, which were seen in 17%, 14%, 13% and 8% respectively. Whereas among the commensal organism gram positive bacilli were isolated in 29% of samples followed by *Staphylococcus epidermidis* (24%), *Staphylococcus saprophyticus* (17%), *Micrococcus* species (12%), *Enterococcus* species (7%). Hand of male children were more contaminated compare to female children. It was found the hand of the most of the school going children was contaminated. Importance of hand washing and proper sanitation must be taught to school going children as well as community. School must ensure the availability of soap and water in school.

Keywords: Hand swabs, Children, Pathogen and Commensal.

Introduction

Unhygienic hands play a major role in fecal–oral transmission of diarrheal and acute respiratory diseases. Systemic reviews have indicated that proper hand washing can reduce diarrheal and acute respiratory illnesses^{[1],[2],[3],[4]}. Dr Ignaz

Semmelweis was a physician in Vienna, who was known as the “father of infection control”. He experimentally demonstrated that hand washing could prevent transmission of infections^[5]. Different study from India and other part of world have shown that contaminated hands carries

pathogenic microorganisms. Skin commensal bacteria protect the host from pathogenic bacteria by directly and indirectly mechanism of defence. Direct mechanism includes, bacteriocin production, depletion of essential nutrients, prevention of adherence of competing bacteria, production of toxic metabolites, induction of a low reduction oxidation potential, inhibition of translocation, and degradation of toxins. Whereas indirectly, bacteria can induce the host to enhance antibody production, stimulate phagocytosis and clearance mechanisms, and augment interferon and cytokine production. Normally host skin support the growth non-pathogenic gram-positive bacteria, which include *Staphylococcus epidermidis*, *S. hominis*, *Micrococcus luteus*, *M. varians*, *M. lylae*, *M. kristinae*, *Corynebacterium minutissimum*, *C. tenuis*, *C. xerosis*, whereas gram-negative organisms do not normally reside in the dry environment of normal skin^[6]. Hand washing with soap and water is believed to reduce infection transmission by washing off potential microorganisms and also by removing the dirt which could also harbour the microorganisms and allow their survival for longer period of time, and which is universally accepted^{[7],[8]}. As the practice of hand washing is poor among children, resulting pathogenic microorganisms has been reported in a number of studies. The common occurrence of microbial flora is *Staphylococcus aureus*, *Escherichia coli*, *Klebsiella* Spp, *Pseudomonas aeruginosa*, *Enterococcus* spp and some yeast have been reported from contaminated hand of children^[9]. Aim of this study was to know the prevalence of bacterial contamination of hands of school going children before taking mid-day meals.

Materials and Methods

Inclusion criteria: 1) Between 8 year and 15 year of age group individuals. 2) Both sexes.

Exclusion criteria: Were not willing to provide hand swabs.

This was a laboratory based observational study, which were conducted in department of

Microbiology, Patliputra Medical College & Hospital, Dhanbad, Jharkhand. Present study was approved by institutional ethical committee. A written consent were taken from the schools and parents of the students. The work were carried out between February 2018 and June 2018. We have collected samples from two different schools from urban area of Dhanbad district. The hand swab samples were collected just before the lunch. A station totake hand swabs were established, which includes doctor and paramedical staffs. A questionnaire was asked to all the students aboutuse of any antiseptic lotions or soap before lunch. Dominant hand of each child were swabbed, beginning from the flexor aspect of wrist, across palm and up all the five fingers including the creases and nail beds, ending in the dorsal aspect. Soon after collection samples were inoculated into nutrient broth. Within 2-4 hours tubes were transported to microbiology departmental laboratory, which were incubated at 37°C for overnight. Next morning subculture were made on 5% sheep blood agar and MacConkey agar plates, which were incubated at 37°C for 24 hours. Identification of organism were done using gram staining and standard biochemical tests, which includes, catalase, coagulase, novobiocin sensitivity for gram positive bacteria and TSI agar, ureas agar, citrate utilisation, indole production, motility using semisolid agar, oxidative and fermentative, oxidase, for gram negative bacteria.

Results

A total of 200 school going children were included in the presentstudy, among these 100 were male and 100 were female. Out of 200 children, 83 (41.5%) children were foundto have various pathogenic bacteria intheir hands. Among the pathogenic organism commonest were *Staphylococcus aureus*, which were seen in 36% of children followed by *Escherichiacoli*, *Pseudomonas aeruginosa*, *Enterococcus faecalis*, and *Klebsiella* species, which were seen in 17%, 14%, 13% and 8% respectively. Whereas in 11% of children two or more than two organism were

isolated. Rest of the children were found to be colonized with commensal organism in their hand, which were seen in 117 (58.5%) of children. Out of 117 hand swab, majority of clinical sample showed growth of gram positive bacilli, which were seen in 29% of sample. Other common bacteria among the commensal organism in order of frequency were, *Staphylococcus epidermidis* (24%), *Staphylococcus saprophyticus* (17%), *Micrococcus* species (12%), *Enterococcus* species (7%). Colonisation of hand with two commensal microorganisms were seen in 13 samples. It was noted that almost 83% of children washed their hands before eating lunch. Whereas it was also noted that 68% students never used any soap to wash their hands before lunch. Most of the pathogenic organism (92%) were isolated from those group of children who routinely not washing the hands before lunch and among those who wash their hand only using running tap water without using any soap [Table-1]. The major of pathogenic organism and commensal organism were isolated from hand of male children, which were 29% and 31.5% respectively. Whereas in female children pathogenic organism and commensal organism were isolated from, 12.5% and 27% respectively [Table- 2].

Table-1: Two by two contingency tables indicating identification of (a) Pathogenic organism (b) Commensal organism.

a)	
Pathogenic organism	Number of sample, n=83 (Percentage)
<i>Staphylococcus aureus</i> (SA)	30 (36)
<i>Escherichiacoli</i> (EC)	14 (17)
<i>Enterococcus faecalis</i> (EF)	11 (13)
<i>Klebsiella</i> species (KS)	07 (8)
<i>Pseudomonas aeruginosa</i> (PA)	12 (14)
SA + EC + PA	03 (4)
EF + EC	02 (2)
KS + SA	03 (4)
EC + PA	01 (1)
b)	
Commensal organism	Number of sample, n=117 (Percentage)
<i>Staphylococcus epidermidis</i> (SE)	28 (24)
<i>Staphylococcus saprophyticus</i> (SS)	20 (17)
<i>Micrococcus</i> species (MS)	14 (12)
<i>Enterococcus</i> species	8 (7)
Gram positive bacilli (GPB)	34 (29)
GPB + SE	8 (7)
GPB + MS	5 (4)

Table- 2: Gender wise distribution of pathogenic and commensal organism.

Gender	Pathogenic organism	Commensal organism	Total
Male	58 (29%)	63 (31.5%)	121
Female	25 (12.5%)	54 (27%)	79
Total	83	117	200

Discussion

Present study have shown that presence of pathogenic organism on the dominant hands of the children were 41.5%. A study from Tamil Nadu confirmed the existence of pathogenic microorganisms on the hands of 95% of the children^[10]. In comparison to present study they found higher percentage of pathogenic organism in children hand. In the current study, commonest pathogenic organism were *Staphylococcus aureus* (36%), followed by *Escherichiacoli* (17%), *Pseudomonas aeruginosa* (14%), *Enterococcus faecalis* (13%), and *Klebsiella* species (8%). A different study from Amravati, Maharashtra, isolated *Staphylococcus* species (23%), *E. coli* (20%), *Klebsiella* species (10%), *Micrococcus* species (9%), *Proteus* species (7%), *Citrobacter* species (7%), *Streptococcus* species (7%), *Enterobacter* species (6%), *Enterococcus* species (4%), *Pseudomonas* species (3%) and *Salmonella* species (2%). The authors also found that there was reduction in hand contamination after hand washing^[11]. Present study demonstrated that pathogenic organism were more commonly isolated from male children compare to female children. Similar type of result were also demonstrated by a researcher Gyanendra G, et al^[12]. The highest rate of prevalence among children might be due to lack of proper care of children by their parents, unhygienic behaviour, lack of public health awareness and lack of sanitation.

Conclusion

Finding of the present study conclude that among the school going children age group diarrheal and acute respiratory disease in more prone is due to carrying pathogenic organism in their unhygienic hands. It was found that the student's hands were

contaminated before taking food. Present study suggests that education regarding proper hand washing and cleanliness should be implemented both in the schools and at the community in collaboration with doctors. Improvement in habitation of hand washing, sanitation and access to health services are important factors for decreasing the prevalence of infections due to contaminated hands. And parents were advised to visit school time to time to inspect proper hygiene is maintained in school or not. The schools should ensure continue supply of water and soap for hand washing.

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