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A COMPARISON OF EFFECT OF THREE HAND DRYING METHODS ON WASHED HANDS

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ABSTRACT

In this study the ability of warm air driers to dry hands hygienically was evaluated by measuring the number of micro-organisms on hands after washing and drying with warm air hand driers and comparing the results with the same protocol but drying with tissue paper and towels. The aim of the present study was to evaluate hygienic efficacy of the three different hand-drying methods (paper towels, cloth towels, warm air dryers). Fingerprint samples were collected by contact plate method before hand washing and after washing and drying. Percentage reduction in colony count by each method is analyzed. Maximum reduction in average colony was count observe after using tissue paper (97.51%) as a drying method which is followed by air dryer (91.57%). There was less reduction in colony count seen with use of towel (27.14%) as a drying method, possibly due to reuse of towels. It is concluded that tissue paper and air dryer are hygienic methods of drying whereas it is advisable to avoid reusable towel for hand drying.

KEYWORDS :

Introduction:

Hand hygiene has long been recognized as one of the simplest and most effective tools available to reduce the risk of transmission of infection. However, it has become increasingly apparent that proper drying of hands after washing is of vital importance for best infection control results. In particular, it has been demonstrated that damp hands are more likely to acquire microbes from a contaminated object as well as to transfer microbes to a clean object (1, 2).

There are a number of different methods available for hand drying such as paper towels, cloth towels, warm air dryers and jet air dryers. There are many studies on different aspects of hand hygiene but relatively few studies have been done to evaluate the effect of different hand-drying methods on in view of microbial contamination which are having conflicting results.

The aim of the present study to evaluate the ability of warm air driers to dry hands hygienically by measuring the number of micro-organisms on hands after washing and drying with warm air hand driers and compare the results with the same (protocol) but drying with tissue papers and towels.

Material and methods

The present study is a prospective study. Total 48 samples were collected, 16 for each drying method. Sixteen volunteers were asked to wash the hands properly as per WHO guidelines **(3)** (Wash hands with disinfectant soap and water for 60 seconds by 11 step hand hygiene method) and dry their hands using each method, and fingerprint samples were collected before hand washing and after drying. The plate was placed on a steady surface and HCW (Health care worker) were asked to firmly press the fingerpads of their ring, middle and index fingers onto the surface of Nutrient agar plate in a nearly horizontal angle for 2 seconds. Contact plate method (4) was used to assess changes in the number of bacteria present on the hands before and after washing and drying.

The inoculated Nutrient agar plates were incubated at 37°C for 24 hours. Plates were examined for the number of colony forming units (cfu's), before and after washing and drying of hands.

Results were recorded, tabulated and statistically analysed. The percentage (%) changes in bacterial numbers (as colony-forming units) on the hands were calculated as follows:

$$\frac{\text{Number after drying} - \text{number before washing}}{\text{Number before washing}} \times 100$$

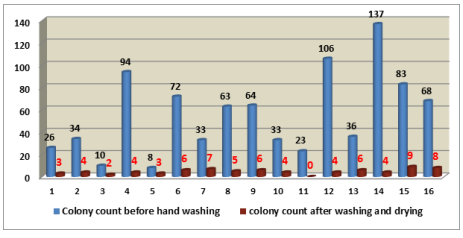
Approval taken from medical research society and ethics committee of the Bhatia Hospital.

Results

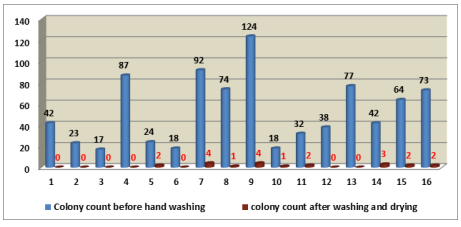
The colony count before hand washing and after washing and drying were recorded. Graphs 1, 2 and 3 show the difference in colony count before hand washing and after washing and drying with Air dryer, tissue paper and towel respectively. Graph 3 also shows that in 6 subjects (40%), the colony count was increased after washing and drying by towel as compared to before hand washing. This could be because of use of same towel by many health care workers (same towel used for 8 hours).

Percentage change in colony count with each drying method is shown in graph 4. Statistical analysis showed that the results for the warm air driers were not significantly different when compared with the tissue papers. Maximum reduction in average colony count after using tissue paper as a drying method was 97.51% which was followed by warm air dryer (91.57%). Very less average reduction in colony count was seen (27.14%) with use of towel as a drying method.

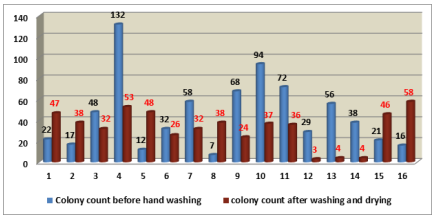
Graph 1-Colony count before and after intervention- Air dryer



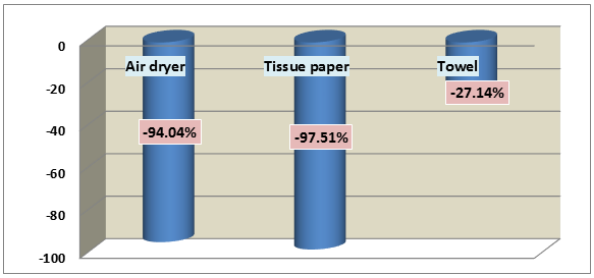
Graph 2-Colony count before and after intervention- Tissue paper



Graph 3-Colony count before and after intervention-Towel



Graph 4- Percentage change in colony count with each drying method



Discussion

Transmission of bacteria is more likely to occur from wet skin than from dry skin, therefore proper drying of hands after washing is an essential component of hand hygiene procedures. In present study three methods of hand drying were compared and it was observed that tissue paper followed by air dryer are hygienically efficient drying techniques. There was no significant difference between tissue paper and air dryer methods where as towel method was not found effective for hand drying.

Some studies have found no significant difference among hand-drying methods for removing bacteria from washed hands. Study by J.H. Taylor et al (2000) (5) stated that results for the air driers were not significantly different when compared with the paper towels. Gustafson et al (6) examined the hygiene performance of paper towels, cloth towels, hot air dryers, and spontaneous evaporation and found no significant difference among hand-drying methods. Matheus et al (7) examined four units of air dryer by comparing the bacterial aerosols released from hands during use with those released by paper towels and also included hand imprints on agar plates for detection of residual bacteria. No significant difference between aerosols liberated by towels and driers were observed for two units. Impression plates revealed similar number of bacteria on the hands after drying by either method. It was concluded in that study that hot air hand driers appear safe from a bacteriological viewpoint.

Ansari et al. (1991) (8) reported that hot air dryers are superior to paper and cloth towels. Study compared cloth, paper and warm air drying for eliminating viruses and bacteria from washed hands. They found warm air to be the most effective in reducing bacterial numbers. However, the authors had not included any friction component (Hand rubbing) in hand drying so study was not representative of real life hand drying. Friction is often applied when hands are dried with paper or cloth towels due to which there is further reduction in colony count.

In contrast Redway and Fawdar (4) assessed changes in the number of bacteria on the hands before and after the use of paper towels, hot air dryer, or jet air dryer. They found that paper towels reduced the number of all types of bacteria on the hands. However, interestingly the hot air dryer increased all types of bacteria on the hands. The jet air dryer also increased most types of bacteria, but the increase was less than with the hot air dryer.

Hanna et al (1996) (9) compared the number of bacteria remaining on hands after drying with paper towels, cloth towels, or hot air dryers. Contact plate method was used but in this study, hands were inoculated with Serratia m. and bacterial removal from the hands after washing and drying was analyzed.

The study by Knights et al. (1993) (10) observed higher counts after warm air drying using a contact method, but the drying time was only 25 seconds which was less than the recommended cycle time of driers which is 30 seconds (11).

The variability in results of above mentioned studies may be due to different methodology used, some studies having fixed duration of hand drying, hands were not completely dried when samples were collected, especially for the warm air driers. Some studies have inoculated hands with nonharmful bacterial strains before taking samples. Washing specifications were also not controlled.

This study supports the use of tissue paper and air dryer as a drying method after hand washing. Reusable towels can increase bacterial colony count on washed hands, increasing risk of infection transmission. It is advisable to avoid reusable towel or change the towel frequently.

Conclusion

This study shows that warm air hand driers, of the type used in this study, are a hygienic method of drying hands and therefore appropriate for use in the healthcare. Both warm air driers and paper towels gave acceptable and comparable results.

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