Original Article

A study to investigate the importance of purses as fomites

Susheela D Biranjia-Hurdoyal, Shailendra Deerpaul, G. Krishna Permal

Department of Health Sciences, University of Mauritius, Mauritius

Abstract

Background: Purses hardly get washed and are discarded, mostly, when they are no longer usable. This study aims to investigate whether women's and men's purses can serve as fomites.

Materials and Methods: A total of 145 purses from 80 women and 65 men were swabbed and cultured. The bacteria were identified by gram staining and with the standard biochemical tests.

Results: A total of 138 purses (95.2%) showed bacterial contamination, out of which 49.4% had a single growth and 50.7% had mixed growth. The material of the purse was found to affect bacterial growth. Synthetic purses showed higher mean colony-forming unit (CFU) counts ($P < 0.05$). *Micrococcus* (64.8%) and coagulase-negative *Staphylococcus* (64.1%) were the most common bacteria isolated, followed by *Bacillus* spp. (13.8%). *Micrococcus* was found with a higher prevalence on men's purses, while *Bacillus* spp. were more prominent on women's purses ($P < 0.05$). The difference between the rates of bacterial growth from the purses of women and of men was found to be statistically significant (57.2% and 44.7%; $P < 0.05$). Furthermore, the mean CFU count was higher for men's purses than for women's purses ($P < 0.05$).

Conclusion: Purses from both men and women are potential vectors for transmission of diseases across the community. The use of synthetic purses should be discouraged, as they contribute to increased bacterial colonization.

Key Words: Bacteria, community, infections, purse

Address for correspondence:
Mrs. Susheela D Biranjia-Hurdoyal, Department of Health Sciences, University of Mauritius, Reduit, Mauritius. E-mail: s.biranjia@uom.ac.mu
Received: 20.03.2014, **Accepted:** 14.09.2014

INTRODUCTION

The risk of transmission of diseases by inanimate objects has often been investigated in both community and medical settings. Currency notes, mobile phones, and playground equipment from the community, and computers, keyboards, and medical equipment from healthcare settings have been reported to be colonized with opportunistic bacteria.[1-4] Commensals as well as opportunistic pathogenic organisms have been isolated from fomites, which have included mostly *Staphylococcus* spp., *Enterococcus* spp., *Escherichia coli*, *Pseudomonas* spp., and *Micrococcus* spp.[3-5]

Purses have been considered as status symbols by some people and key accessories by others. The use of purses has not been limited to storing money, as individuals also use them to store valuables, keys, credit cards, mobile phones, and receipts. The majority of purses hardly get washed and are discarded after years of use. Purses are often kept in environments laden with bacteria, such as, kitchen tables, handbags, restroom countertops, and fast food counters. Therefore, purses can be easily contaminated with infectious agents and may serve as vehicles for the transmission of diseases from one place to another. In the healthcare settings, purses and handbags of the medical staff have been

Access this article online	
Quick Response Code:	Website: www.advbiores.net
	DOI: 10.4103/2277-9175.156652

How to cite this article: Biranjia-Hurdoyal SD, Deerpaul S, Permal GK. A study to investigate the importance of purses as fomites. Adv Biomed Res 2015;4:102.

found to be colonized with bacteria.[6,7] Purses from the community settings have not been studied as potential sources of infectious agents. This study aims to isolate and identify potential pathogens from the volunteers' purses from the community, and investigate other factors that may affect bacterial contamination.

MATERIALS AND METHODS

The first part of the study included a questionnaire designed to gather maximum information relevant to the study. A total of 145 volunteers, aged 18 to 60 years, including 80 women and 65 men were randomly selected from the population. The participants were recruited from their homes and workplaces, such as colleges, offices, and factories. Participants who satisfied the inclusion criteria provided information concerning the materials of their purses, their working environment, and the frequency of washing their purses. The second part of the study consisted of a collection of samples and laboratory investigations. After the participants had consented to participate in the study, sterile swabs moistened with sterile peptone water were rolled over the outer surfaces of their purses. The swabs were immediately taken to the laboratory for streaking on sterile nutrient agar, MacConkey agar, and Salmonella Shigella agar. The bacterial growth was read after incubation at 37°C for 24 hours and the isolates were confirmed by gram staining and the conventional biochemical tests. The gram-positive, catalase-positive cocci were differentiated into coagulase-negative *Staphylococci* and *Micrococcus* spp. by the oxidase test, the tube coagulase test, and the bacitracin sensitivity test.[8] A pilot study was carried out to determine the average number of bacteria present on the surfaces of the purses, and consequently, the load was categorized as scanty, moderate or heavy. The bacterial load was also read as mean colony-forming units (CFU), and the presence of fewer than 20 colonies was read as scanty growth, 20 to 50 colonies as moderate growth, and more than 50 colonies as a heavy growth. SPSS v. 16.0 (SPSS Inc, California, USA) was used for statistical analysis and a P value < 0.05 was established as significant. The relationships and comparisons between the variables were determined using the Pearson correlation, the Pearson Chi-square test, and the Student's t-test.

RESULTS

A total of 63 (43.4%) participants used leather, 56 (38.6%) synthetic, and 26 (17.9%) cloth purses. Among the women, it was noted that three (2.1%) cleaned their purses once a month, nine (11.3%) often placed them on kitchen tables, twelve (17.5%) placed them on dining tables, fourteen (17.5%) allowed their children to handle their purses, and sixty-five (81.5%) never emptied their purses. A majority of the women kept their purses in their handbags during the day, while most men used their pant pockets. The use of synthetic purses had a higher prevalence among women than men (62.5% vs. 9.2%; $P < 0.05$). Leather and cloth purses were used more by men than by women (58.5% vs 30.0%; $P < 0.05$ and 32.3% vs 7.5%; $P < 0.05$ respectively).

Bacterial contamination was observed in 138 (95.2%) purses, out of which 101 (73.1%) showed scanty growth, 18 (13.0%) showed moderate growth, and 19 (13.8%) showed heavy growth; (68) 49.3% showed a single type of bacterial growth and (70) 50.7% showed a mixed type of bacterial growth. It was noted that *Micrococcus* spp. (64.8%) and coagulase-negative *Staphylococcus* (64.1%) were the most common bacteria isolated, followed by *Bacillus* spp. (13.8%). Men's purses showed a higher prevalence of *Micrococcus* than women's purses (80.0% vs. 52.5%; odds ratio [OR] =3.6, 95% confidence interval [CI] 1.7 – 7.6), while *Bacillus* spp. was observed only in women's purses (100%; likelihood ratio [LR] =26.3; $P < 0.05$). A statistically significant difference was found between the rates of bacterial growth in the purses of women and of men (57.2% vs. 44.7%; LR = 5.3, $P < 0.05$). An independent sample t-test revealed that the mean CFU count was higher for men's purses than for women's purses (25 CFU vs. 19 CFU; $P < 0.05$).

The relationships between the material of the purses and the bacterial contamination were also investigated. It was noted that the synthetic purses showed a higher prevalence of bacterial contamination (LR = 7.1; $P < 0.05$) and a higher mean CFU count ($P < 0.05$) compared to purses made of the other materials.

Furthermore, it was found that as the age of the participant increased, the probability of bacterial contamination of the purse and the mean CFU count also increased ($P < 0.05$). No statistically significant association was found between the bacterial load and factors, such as, age of the purse or occupation and level of education of the participant.

DISCUSSION

This is the first study to demonstrate that the purses of both women and men from the community could be contaminated with microorganisms. It was found that 95.2% of the purses from the community setting were colonized by bacteria, which was higher than the 69.2% reported for purses from the medical setting.[6]

Bacterial growth was higher on the purses of women than on those of men (LR = 5.3; $P < 0.05$). It should be

noted that the women in the study were more likely to place their purses on kitchen tables, never emptied their purses, and more frequently stored them in their bags. A previous study reported that the insides of women's handbags and shopping bags were laden with bacteria.[9,10] The bacterial load on the women's purses could possibly increase due to the storage inside the bags.

Coagulase-negative *Staphylococcus* was among the most common organisms isolated, which corroborated with findings from the previous studies in the community.[1,2] Given that coagulase-negative *Staphylococcus* is a constituent of normal skin microflora, its detection from the samples was expected. However, *Bacillus* and *Micrococcus* spp. might have contaminated the purses from the environment, as they were ubiquitous in nature.

Although this study has not found any pathogenic bacteria from the purses, it must be noted that coagulase-negative *Staphylococcus*, *Bacillus,* and *Micrococcus* spp. have been reported as opportunistic pathogens in both healthy and immunocompromised individuals in the community. Coagulase-negative *Staphylococcus* has been increasingly associated with infectious disease in immunocompetent individuals with otitis media, a common pediatric infectious disease.[11,12] The involvement of *Bacillus* spp. in disease is rare, but has recently been increasingly reported.[13,14] *Micrococcus* can cause an opportunistic infection in immunocompromised patients.[15,16]

Several studies reported that the microbial colonization on the currency notes in circulation[1,17] could eventually contaminate the purses. It was reported that 43.6% of the Polish banknotes and coins were contaminated with coagulase-negative *Staphylococcus*, 14.1% with *Bacillus* spp., and 4.3% with *Micrococcus* spp., among others.[1] Furthermore, no enteric bacterium was isolated in this study, which could indicate the absence of fecal contamination and a good level of hygienic practices among the participants.

In this study, the material of the purses was found to statistically affect the bacterial contamination rates. Previous studies had concluded that the adhesion and survival of bacteria could be affected by the nature of a surface. Rough surfaces and grooved materials increased the surface area and provided hidden sites, which could favor bacterial adhesions, compared to smooth surfaces. Furthermore, microorganisms adhered more to braided materials than to flat ones.[18] The smooth surface of the leather purses could have limited the colonization by bacteria, while the increased bacterial growth on the synthetic purses could be due to their rough and grooved surfaces.

CONCLUSION

In conclusion, purses from the community could carry potential pathogens. They should be cleaned regularly, and the use of synthetic purses should be discouraged.

REFERENCES

1. Kalita M, Palusińska-Szysz M, Turska-Szewczuk A, Wdowiak-Wróbel S, Urbanik-Sypniewska T. Isolation of cultivable microorganisms from Polish notes and coins. Pol J Microbiol 2013;62:281-6.
2. Bhoonderowa A, Gookool S, Biranjia-Hurdoyal SD. The importance of mobile phones in the possible transmission of bacterial infections in the community. J Community Health 2014. [Epub ahead of print].
3. Reynolds KA, Watt PM, Boone SA, Gerba CP. Occurrence of bacteria and biochemical markers on public surfaces. Int J Environ Health Res 2005;15:225-34.
4. Messina G, Ceriale E, Lenzi D, Burgassi S, Azzolini E, Manzi P. Environmental contaminants in hospital settings and progress in disinfecting techniques. Biomed Res Int 2013;2013:429780.
5. Bures S, Fishbain JT, Uyehara CF, Parker JM, Berg BW. Computer keyboards and faucet handles as reservoirs of nosocomial pathogens in the intensive care unit. Am J Infect Control 2000;28:465-71.
6. Feldman J, Feldman J, Feldman M. Women doctors' purses as an unrecognized fomite. Del Med J 2012;84:277-80.
7. Dotan J, Somin M, Basevitz A, Beilinson N, Bardenstein R, Zimhony O, *et al*. Pathogenic bacteria on personal handbags of hospital staff. J Hosp Infect 2009;72:90-2.
8. Hébert GA, Crowder CG, Hancock GA, Jarvis WR, Thornsberry C. Characteristics of coagulase-negative *Staphylococci* that help differentiate these species and other members of the family *Micrococcaceae*. J Clin Microbiol 1988;26;1939-49.
9. Williams DL, Gerba CP, Maxwell S, Sinclair RG. Assessment of the potential for cross-contamination of food products by reusable shopping bags. Food Prot Trends 2011;31:508-13.
10. Bakunas-Kenneley I, Madigan EA. Infection prevention and control in home health care: The nurse's bag. Am J Infect Control 2009;37;687-8.
11. Paluch-Oleś J, Magryś A, Kozioł-Montewka M, Niedzielski A, Niedźwiadek J, Niedzielska G, *et al*. The phenotypic and genetic biofilm formation characteristics of coagulase-negative *Staphylococci* isolates in children with otitis media. Int J Pediatr Otorhinolaryngol 2011;75:126-30.
12. Arias M, Tena D, Apellániz M, Asensio MP, Caballero P, Hernández C, *et al*. Skin and soft tissue infections caused by *Staphylococcus lugdunensis*: Report 20 cases. Scand J Infect Dis 2010;42:879-84.
13. Stevens MP, Elam K, Bearman G. Meningitis due to *Bacillus cereus*: A case report and revie w of the literature. Can J Infect Dis Med Microbiol 2012;23:e16-9.
14. Oda M, Hashimoto M, Takahashi M, Ohmae Y, Seike S, Kato R, *et al*. Role of sphingomyelinase in infectious diseases caused by *Bacillus cereus*. PLoS One 2012;7:e38054.
15. Payne JH, Welch JC, Vora AJ. Fatal pulmonary haemorrhage associated with micrococcal infection in two children with acute lymphoblastic leukemia. J Pediatr Hematol Oncol 2003;25:969-74.
16. Kao CC, Chiang CK, Huang JW. *Micrococcus* species-related peritonitis in patients receiving peritoneal dialysis. Int Urol Nephrol 2014;46:261-4.
17. Kuria JK, Wahome RG, Jobalamin M, Kariuki SM. Profile of bacteria and fungi on money coins. East Afr Med J 2009;86:151-5.
18. Katsikogianni M, Missirlis YF. Concise review of mechanisms of bacterial adhesion to biomaterials and of techniques used in estimating bacteria-material interactions. Eur Cell Mater 2004;8:37-57.

Source of Support: Nil, **Conflict of Interest:** None declared.