

Original Research Article

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Bacteriological Profile of Car Steering and Interior of Cars of Health Care Workers of a Tertiary Care Hospital

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ABSTRACT

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Studies have shown that steering wheel is actually the breeding ground for bacteria 11 times more than a public toilet. A major source of bacteria come from food spills, through air and heating vents and from footwares of passengers. The top spots for germs are dashboards, change holders, cup holders and children's car seats. The commonest organisms isolated are *Bacillus species*, *Staphylococcus*, *Escherichia coli*, *Salmonella* and *Campylobacter*. This study was done to know the bacteriological profile of interior of cars of health care workers. A total of 200 swabs were collected from 50 cars of health care workers of our hospital from steering wheel, dashboard, cup holders and car seats. They were processed according to standard guidelines. The most common organisms isolated were *Bacillus species* followed by *Diphtheroids*, *Micrococci*, *E.coli*, *Klebsiella species* and *Staphylococcus species*. The maximum isolation was from dashboard followed by steering wheels. 32% of *Staphylococcus* isolates were methicillin resistant and 13% of gram-negative isolates were ESBL producers in our study. This study concludes that cars act as potential source of contamination with many commensals and harmful microorganisms. Hence it's important to constantly clean and disinfect the car surfaces.

Introduction

The cars are the major mode of transportation for majority of people in modern world. Cars have become an indispensable part of our lives and have become a daily necessity. Studies have shown that steering wheel is actually the breeding ground for bacteria 11 times more than a public toilet. A typical steering wheel had an average of 700 kinds of bacteria compared to the 60 types found on a public toilet seat. A major source of bacteria come

from food spills in various locations (Saxena *et al.*, 2013). Microbes can also enter the vehicle through the air and heating vents. The footwares of passengers also play an important role in contamination (Saxena *et al.*, 2013). Handling of contaminated money also introduce microbes causing infections (Mensah *et al.*, 2002; Food Safety and Hygiene, 2000). Obviously, the areas touched with the hands harbour most germs. The top spots for germs are dashboards, change holders, cup holders and children's

car seats (Saxena *et al.*, 2013). While most of the bacteria are unlikely to cause health problems, some cars harbour a number of potentially harmful bacterial species. *Staphylococcus* and *Propionibacterium* are the predominant organisms. *Staphylococcus* spp. are found ubiquitous in the environment (Gosa Girma *et al.*, 2014) and strains present in the nose often contaminate hands and fingers leading to skin carriers (Kumar *et al.*, 2009) and hence the car surfaces could serve as reservoirs for pathogenic *Staphylococci*. They play an important role in human colonisation and infection. Another commonest organism isolated from cars is *Bacillus cereus*, which is an important source of food poisoning. Harmful bacteria like *Escherichia coli*, *Salmonella* and *Campylobacter* all of which can cause illness are also isolated. Enteric pathogens are the most frequent cause of diarrhoea and account for an annual mortality rate of about five million people worldwide (Kosek *et al.*, 2003). Each of these has the capability to survive for as long as one month inside the car. These colonized micro-organisms may be transmitted to patients even if patients do not come in direct contact with the colonised sites (Kilic *et al.*, 2009). These organisms if pathogenic can pose a threat to the health of the patients especially those in intensive care units. The situation worsens if the organisms are drug-resistant because of limited treatment options (Angadi *et al.*, 2014). Multidrug-resistant (MDR) bacteria are commonly implicated in hospital acquired infections and can be challenging to eliminate (Sadat-Ali *et al.*, 2010). It is estimated that one third of these infections can be prevented by adhering to standard infection control guidelines (Elsevier health sciences, 2011). Among health care workers, it has been reported that medical devices like thermometers, stethoscopes (Brady *et al.*, 2006) and non-medical devices like

computer, key boards (Borer *et al.*, 2005; Bures *et al.*, 2000), ball point pens, files, books (Ekanem *et al.*, 1983) and mobile phone (Goldblatt *et al.*, 2007; Sepehri *et al.*, 2009) have an important role in the transmission and spread of microorganisms. Till now, no studies have been done to know the colonisation of interior of cars of health care personnel and their role in transmission of infection. Therefore, the present study was done to determine the possible role of cars as a reservoir of bacterial pathogens.

The aim and objectives of this study includes, to study the bacteriological profile of interior of cars of health care workers. To emphasize the importance of cleaning and disinfecting the car interiors to prevent transmission of infections. And also to emphasise the significance of proper hand washing among health care workers to prevent transmission of infections to the patients.

Materials and Methods

This cross-sectional study was done over a period of three months from June to August 2015 in Department of Microbiology, Vinayaka Mission's Kirupananda Variyar Medical College, Salem, India after obtaining institutional ethical clearance. A total of 50 cars were included in the study. Four swabs were collected from each car and a total of 200 swabs were included in the study. Swabs were collected from steering wheel, dashboard, cup holders and car seats from vehicles of health care workers of our hospital. The swabs were dipped in sterile peptone water before swabbing (Heba Sayed Selim, 2015). The swabs were then inoculated onto MacConkey agar and blood agar plates. The plates were incubated at 37°C for 24 hrs. Any growth on the plates were identified by colony morphology, gram staining and other

standard biochemical reactions. The organisms were then subjected to antibiotic susceptibility tests by Kirby-Bauer disc diffusion method according to CLSI guidelines (Bauer *et al.*, 1966). The staphylococcal isolates were tested for methicillin resistance and gram-negative bacilli were tested for ESBL production according to standard protocols (CLSI, 2014).

Results and Discussion

The most commonest organisms isolated were *Bacillus species* followed by *Diphtheroids*, *Micrococci*, *E.coli*, *Klebsiella species* and *Staphylococcus species*. The maximum contamination was found in dashboards (38.4%) followed by steering wheels (25%).

Bacillus species being ubiquitous in nature was the commonest organism isolated. Pathogenic bacteria like *E.coli*, *Klebsiella* and *S.aureus* were also isolated.

Dashboard was the site commonly contaminated with organisms followed by steering wheel. This could be due to frequent touching of these sites.

This study reveals that interior of cars are contaminated with microorganisms. Almost all the cars were loaded with contaminant organisms like *Bacillus species* and *Diphtheroids*. Our study also reveals the presence of many pathogenic bacteria like *E.coli*, *Klebsiella species* and *S.aureus* inside the cars which could be potential source of infection. The presence of drug resistant organisms also raises our concern as they cause infections with limited treatment options.

Bacillus species was isolated in 34.6% of samples in our study while in the study done by Saxena *et al.* (2013) it was 42.91%. Once considered as non-pathogenic, *Bacillus species* are associated with hospital infections and can cause nosocomial infections (Karabay *et al.*, 2007).

Table.1 Bacteriological Profile of Interior of Cars of Health Care Workers

S.No	Organisms	Total no of isolates
1.	<i>Bacillus species</i>	133(34.6%)
2.	<i>Diphtheroids</i>	97(25.2%)
3.	<i>Micrococci</i>	76(19.7%)
4.	<i>Escherichia coli</i>	32(8.3%)
5.	<i>Staphylococcus aureus</i>	22(5.7%)
6.	<i>Klebsiella species</i>	15(3.9%)
7.	Coagulase negative <i>Staphylococci</i>	10(2.6%)
	Total	385

Table.2 Distribution of Isolates in Various Sites

S.No	Site	Total no of isolates
1.	Dashboard	148 (38.44%)
2.	Steering wheel	96 (24.94%)
3.	Cupholders	79 (20.52%)
4.	Car seats	62 (16.10%)

Fig.1 Drug Resistance Pattern of *Staphylococcal* Isolates

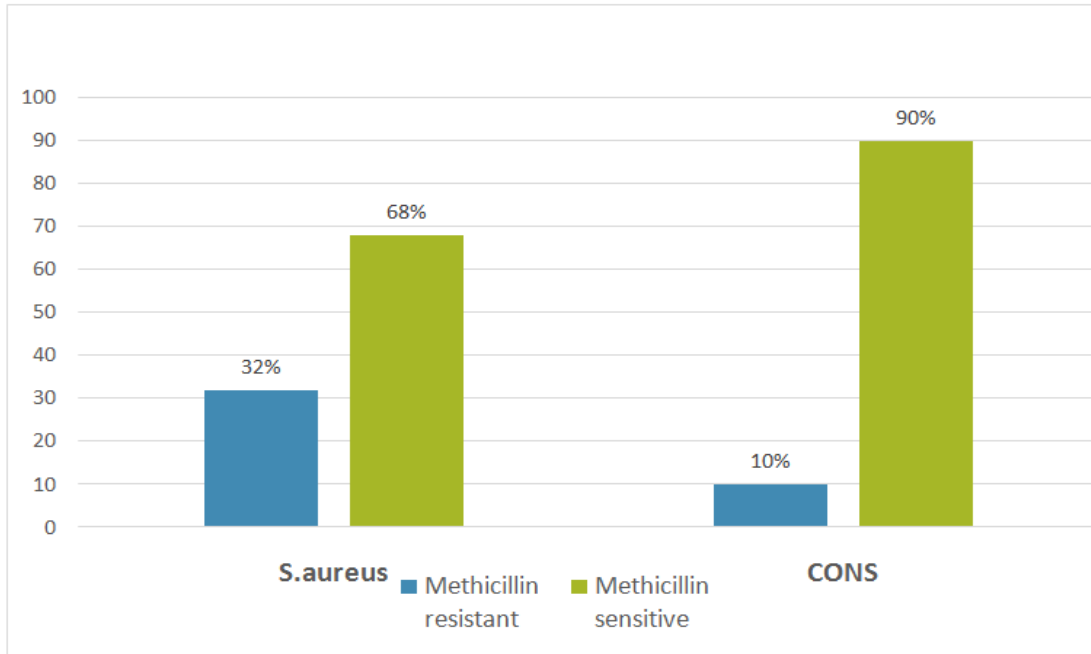
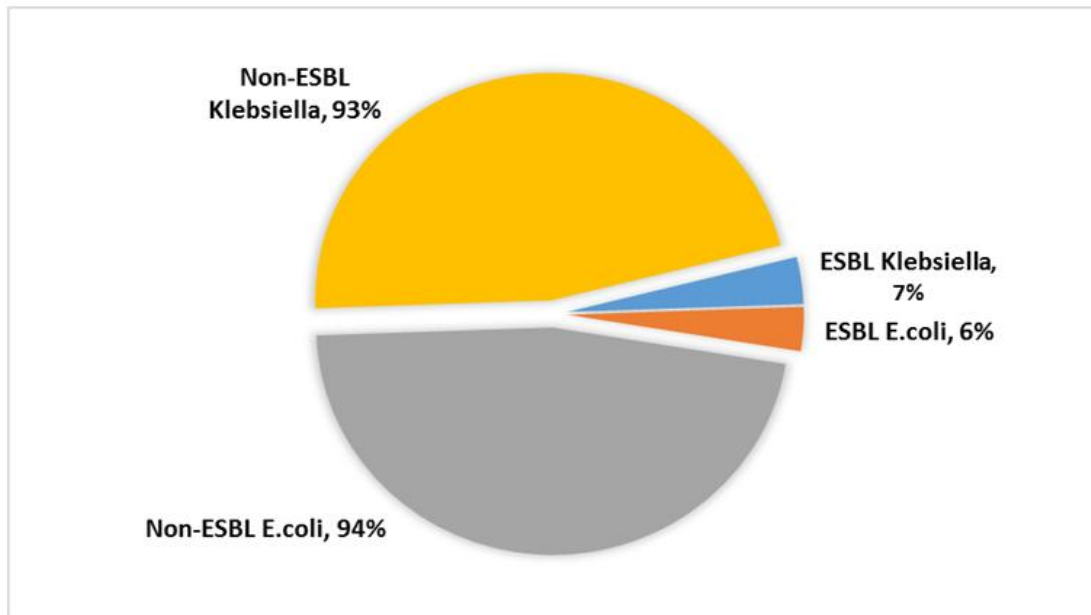


Fig.2 Drug Resistance Pattern of Gram-Negative Isolates



Isolation rate of *E.coli* in our study was 8.3% and *Klebsiella* species was 3.9%. This is in contrast to the study done by Saxena *et al.*(2013) which showed an isolation rate of 0.39% for both *E.coli* and *Klebsiella* species. *S.aureus* isolation rate was 5.7% in our study. This was very low when compared to isolation rate of 16.93% in the study conducted by Saxena *et al.* (2013). 32% of *Staphylococcus* isolates were methicillin resistant in our study in contrast to only 6.3% in the other study (Saxena *et al.*, 2013). This could be because only *S.aureus* were isolated in that study whereas our study had both *S.aureus* and *CONS*. 13% of gram-negative isolates were ESBL producers in our study accounting for a higher incidence of drug resistant isolates.

Coming into contact with different kinds of bacteria, there's a good chance of indirectly placing them in mouth or eyes. These organisms are well documented source of respiratory infections, gastroenteritis, wound infections and urinary tract infections (Saxena *et al.*, 2013). Of particular concern is *Staphylococci* especially MRSA which colonise the human skin and likely to be transmitted to inanimate surfaces in hospital environment and hence indirectly to the patients. They are capable of causing variety of nosocomial infections.

This study concludes that cars act as potential source of contamination with many commensal and harmful microorganisms. These colonized microorganisms act as source of infection both for the person travelling in it and as well as to the patients indirectly. Hence it is important to constantly clean and disinfect the car surfaces. We also emphasise on proper hand washing among the health care workers before coming in contact with the patients to prevent transmission of infections.

Limitation

In our knowledge only one study has been conducted in India to know the microorganisms of cars and hence not much references were available to compare. Hence more studies are needed to know the significance of such contamination and more research has to be done to know the effectiveness of use of disinfectants to clean the car surfaces.

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