

A STUDY OF BACTERIOLOGICAL PROFILE OF CURRENCIES UNDER CIRCULATION AMONG HOSPITAL WORKERS.

Dr.G.Sasikala¹ . Dr. Reena Rajan²

Department(s) and institution(s)

1.Consultant Microbiologist,

Vinayaka Institute of Medical Sciences hospital , Salem-636308 Tamil Nadu.

2.Assistant Professor,Department of Microbiology Vinayaka Mission's Kirupananda Variyar
Medical College Salem-636308 Tamil Nadu.

Corresponding Author : Dr. G.Sasikala

Phone numbers : 09443621850

Facsimile numbers : 09443621850

E-mail address : reenarajan83@gmail.com

ABSTRACT:

Background: Microbial contamination of currency notes may act as fomites in the transmission of pathogenic organisms in the community. **Aims & Objectives:** The present study was done to isolate and identify bacterial pathogens from currency notes among hospital workers **Materials & Methods:** A sterile cotton swab soaked in sterile normal saline rubbed thoroughly on both surfaces of currency notes were inoculated on blood agar and Mac Conkeys agar and incubated aerobically at 37°C for 24 hrs .Isolates were identified by standard biochemical methods. **Results & Discussion:** A total of 50 currency notes were included .72% notes showed polymicrobial contamination. Gram negative bacilli was the common isolate obtained followed by gram positive cocci. The most common gram negative isolate was *Klebsiella spp* (25.64%).The predominant gram positive cocci isolated was *staphylococcus epidermidis* (19.23%) **Conclusion:** Education on proper money handling practices should be done in order to raise awareness among health care workers to prevent the transmission of drug resistant nosocomial pathogens in the community.This study recommends safe hand hygiene practices after handling currency notes as contamination of currency notes poses risk of infection .

KEY WORDS: Health care workers, Currency notes, Cross contamination, *Klebsiella spp*, *Staphylococcus epidermidis*.

INTRODUCTION:

Currency notes and coins are often handled by various groups of individual during transaction.⁽¹⁾ Paper currency have been identified as one of the vehicle through which pathogen could be transmitted and could constitute a major health hazard. Paper currency get contaminated by droplets during coughing, sneezing, contact with previously contaminated hands and placement on dirty hands. Contamination of currency notes can also be detected through dust, soil, water and skin microflora of food handlers, saliva often used when counting the notes and wounds.^(2,3)

Currency notes provides a fibrous surface which aids for bacterial attachment and their prolonged stay in circulation increases the chance of contamination. Storage of currency notes in polythene, cotton and leather bags in humid and dark condition also favours the growth of microorganisms.⁽⁴⁾

Various bacteria such as *Escherichia coli*, *Citrobacter sp*, *Mycobacterium leprae*, *Salmonella sps*, *Shigella sps*, *Staphylococcus aureus* and *Pseudomonas aeruginosa* have been isolated from currencies. Currency notes are commonly contaminated with enteric pathogens and can act as reservoir of enteric diseases.⁽⁵⁾ Multidrug resistant bacteria prevalent in notes include Methicillin Resistant *Staphylococcus Aureus*(MRSA),Methicillin Resistant Coagulase Negative *Staphylococcus* (MRCONS) ,multidrug resistant strains of *E.coli* and *Klebsiella species*.⁽⁶⁾

Various yeast and fungi such as *Candida*, *Aspergillus niger*, *Aspergillus flavus* ,*Penicillium* and *Rhizopus* were detected from currency notes collected from laboratory personnel .Parasitic contamination with *Ascaris lumbricoides*, *Enterobius vermicularis*,*Trichuris trichiura* and *Taenia spp* are prevalent on mutilated and dirty paper and polythene notes.⁽⁷⁾

Shortage of information on the contamination of currencies with microorganisms may contribute to the absence of public health policies regarding the usage,handling and circulation of currencies from person to person.⁽⁸⁾

AIMS & OBJECTIVES:

1. To isolates and identify bacterial pathogens from currency notes
2. To know the prevalence of bacterial contamination of currency in circulation among hospital workers.

MATERIALS & METHODS

This prospective cross sectional study was conducted in Department of microbiology, Vinayaka Institute of Medical Sciences hospital,Salem. Institutional Ethical Committee clearance was obtained prior to this study .

Collection of Samples

A total of fifty currency notes in frequent circulation, with denominations of Rs.10, 20, 50,100 ,500 and 1000 were collected randomly from hospital workers in a sterile polythene

bag. The collected currency notes were transported to the lab immediately for culture. From the local bank, five new currency notes of each denomination were obtained and used as control, to check the possible contamination of notes while handling.

Bacteriological Analysis:

A sterile cotton swab soaked in sterile normal saline was rubbed thoroughly on both surfaces of currency notes and inoculated on blood agar and Mac Conkey's agar. ⁽⁹⁾ The plates were incubated aerobically at 37°C for 24 hrs and observed for growth of bacteria. The colonies were identified phenotypically by colony characteristics, Gram staining and motility.

For the identification of gram positive cocci, the following biochemical parameters were used viz catalase test, oxidase test, coagulase test, mannitol fermentation, bile esculin agar, sorbitol and arginine. Gram negative bacilli were identified by catalase test, oxidase test, triple sugar iron agar, indole test, citrate utilization test and urease test.

RESULTS: A total of 78 organisms were isolated from 50 currency notes. This includes gram positive cocci, gram positive bacilli and gram negative bacilli. **(Fig 1)** Out of 50 notes, 36 (72%) showed polymicrobial contamination. **(Fig 2)** Out of 40 gram negative bacilli, the most predominant isolate obtained was *Klebsiella* species, 20(50%) followed by *E.coli* 15 (37.5%), *Pseudomonas*, 3(7.5%) and *Proteus* sp, 2(5%). Out of 23 gram positive cocci, the most common isolate was *Staphylococcus epidermidis* 15 (65.22%), followed by *Micrococci* 4 (17.39%), *Staphylococcus aureus* and *Enterococcus* species 2(8.70%). **(Table :1)**

The bank notes which were used as control showed growth of *Micrococci*.

Fig:1: Distribution of microorganism on currency notes

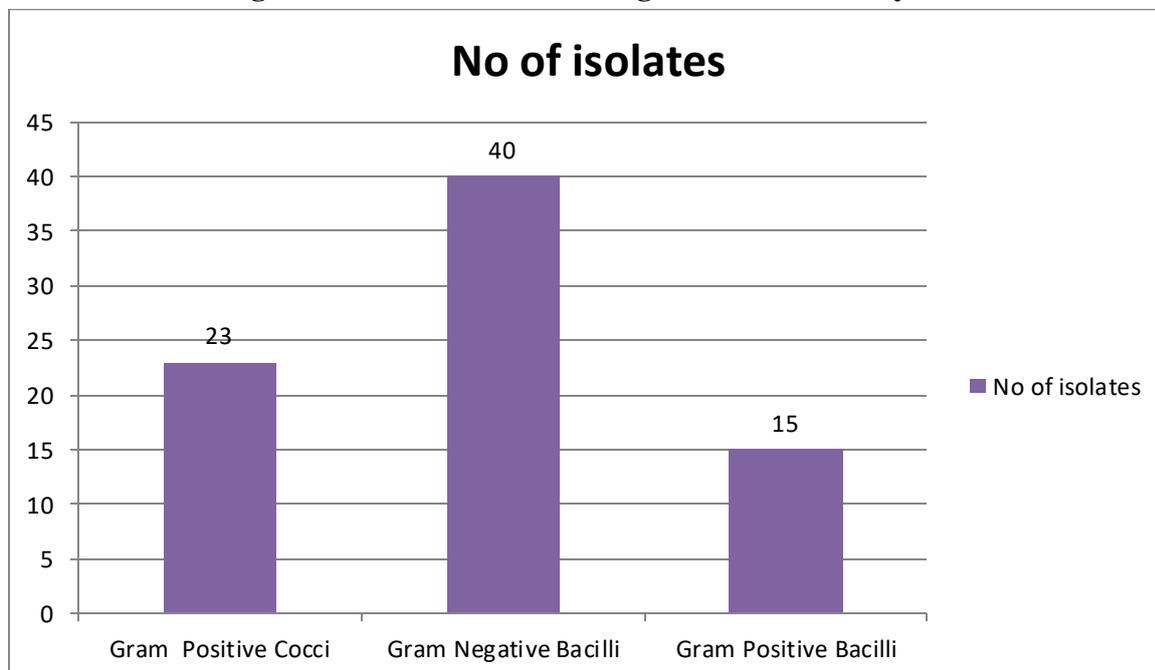
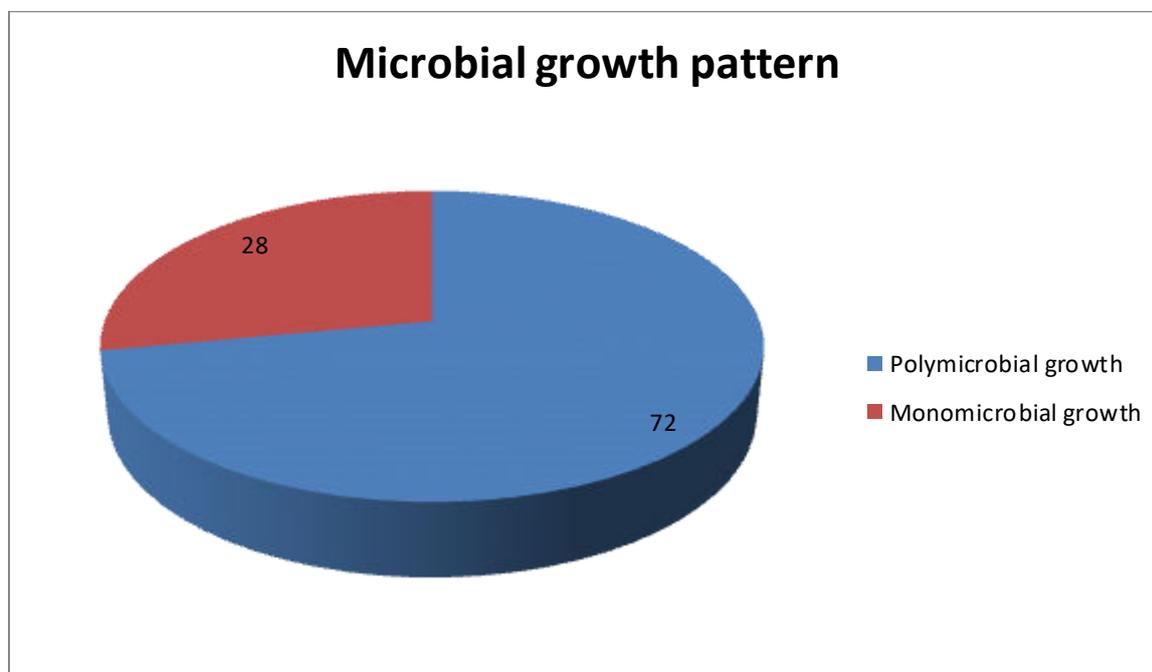


Fig 2: Pattern of microbial growth on currency notes**Table 1:Percentage distribution of bacterial isolates from currency notes**

Organism isolated	No of isolates	Percentage
Micrococci	4	5.13
Staphylococcus aureus	2	2.56
Staphylococcus epidermidis	15	19.23
Enterococcus species	2	2.56
Escherichia coli	15	19.23
Klebsiella species	20	25.64
Proteus species	2	2.56
Pseudomonas	3	3.85
Diphtheroids	15	19.23
Total	78	100

DISCUSSION:

In the present study, 50 old and 5 new currency notes were examined for microbial contamination. Old notes were found to be contaminated with variety of pathogenic microorganisms when compared to new currency notes. This may be due to frequent handling of old notes by individuals. Currency notes are susceptible to bacterial contamination while handing from person to person. Notes also acts as vehicle to deliver the

bacteria to contaminate the hands of next user. 78 isolates were obtained from old currency notes, whereas new currency notes were found to be contaminated with Micrococci.

A direct correlation between age of currency notes and their rate of contamination have been reported by Dilip S Gedam et al where 91.5% old notes and 28 % new notes were contaminated with pathogenic microorganism.⁽¹⁰⁾ In another study, Lamichhane J et al have reported absence of microbial contamination on new currency notes.⁽¹¹⁾

Out of 50 notes, 36 (72%) showed polymicrobial contamination in our study. A similar study reported 51.9 % tested currency notes with polymicrobial growth which revealed gram negative bacteria belong to Enterobacteriaceae as predominant isolate along with *Pseudomonas* spp.⁽¹²⁾

In the present study, gram negative bacilli were the common microbial contaminant on currency notes followed by gram positive cocci. In contrast to our study, Agarwal G et al have reported gram positive cocci as predominant isolate from currency notes.⁽¹³⁾

The most common gram negative bacilli isolated was *Klebsiella* species, 20/40 (50%), followed by *E. coli*, *Pseudomonas* and *Proteus*. In concordance with the present study Dilip S Gedam et al have reported *Klebsiella* spp (15.22%) as common gram negative isolate from currency notes.⁽¹⁰⁾ In a similar study from Tamil Nadu, G Sucilathangam et al have reported 31.7% *Klebsiella* isolates from currencies.⁽¹⁴⁾ In a similar study, Asra Qayyam and Hira Batool have reported *E. coli* (66.66%) as predominant gram negative isolate from currency notes.⁽⁹⁾ Pradeep et al have reported microbial contamination of Indian currencies with *Staphylococcus aureus*, *Klebsiella pneumoniae*, *E. coli* and *Pseudomonas aeruginosa*.⁽¹⁵⁾

Staphylococcus epidermidis 15/23 (65.22%) was the predominant gram positive cocci obtained, followed by Micrococci, *Staphylococcus aureus* and Enterococci. Asra Qayyam and Hira Batool have reported *Staphylococcus aureus* (100%) as predominant microbial contaminant on currency notes.⁽⁹⁾

Of the total 78 isolates from currency notes, 15 (19.23%) were gram positive bacilli (diphtheroids). Microbial contamination of currencies with aerobic spore bearers such as *Bacillus* have been reported.⁽¹⁶⁾ Bacterial and fungal contamination of currency notes was reported by Igumbor et al.⁽¹⁷⁾

The present study among health care workers have revealed that currencies may be a vector for transmission of nosocomial pathogens such as *Staphylococcus aureus*, *Klebsiella* spp, *E. coli*, *Pseudomonas* and *Proteus*. Antibiotic resistant pathogenic bacteria have been isolated from various coins and currencies from medical staff⁽¹⁸⁾. This study emphasis on hand hygiene practices after handling currency notes as exchange of contaminated notes could lead to infection.

CONCLUSION: The present study showed the predominance of gram negative bacterial isolates from currency notes. Contamination of currency notes with pathogenic microorganisms in the hospital environment is a major cause of concern to human health. The isolation of the bacterial agents from currency notes confirms that currency might be a vector playing an important role in the transmission of pathogenic microorganisms in the community.

REFERENCES:

1. Umeh E U, Juluku J U, Ichor T. Microbial Contamination Of Naira(Nigerian currency) Notes in Circulation. *Res J Environ Sci* 2007;1:336-339.
2. Sushil Kumar Barolia, Sheetal Verma, Bhoopendra Kumar. Coliform contamination on different Paper Currency in Ajmer, Rajasthan, India. *Univers J Environl Res Tech* 2011;1(4):552-556.
3. Sharma A, Dhanashree B. Screening of Currency in Circulation for Bacterial Contamination. *Current sciences* ,2011;100(6).
4. Vriesekoop F, Russell C, Alvarez Mayorga B. Dirty Money : An investigation into the hygiene status of some of the world currencies as obtained from food outlets. *Food borne Pathogens and Diseases* 2010;7(12):1497-1502.
5. Abrams B.L. and Waterman N.G., Dirty money. *Journal of American Medical Association*, 1972; 219: 1202-1203 .
6. Neel R. Multidrug resistance of isolates of Methicillin Resistant Staphylococcus aureus (MRSA) in paper currency notes from restaurants and hotels in Lusaka in Zambia. *International Journal of Pharmaceutical Sciences* ,2012;5(1):363-366.
7. Agersew Alemu. Microbial contamination of currency notes and coins in circulation :A potential health hazard .*Biomedicine and Biotechnology* ,2014;2(3):46-53.
8. Gosa Girma. Health risk associated with handling of contaminated paper currencies in circulation .*International Journal of Food and Nutritional Sciences* 2015;2(1):49-54.
9. Asra Qayyum , Hira Batool. A study of Bacterial profiling on currency notes and coins. *RADS Journal of Biological Research and Applied Sciences*,2017;8(1):1-5.
10. Dilip S Gedam, Ashwini S Pisey, Poonam Chandrakant Sayare, Nithin A Ambhore, Rajesh P Karyakarte , Divya Shekokar. Bacterial Contamination of Old and New Indian Currency Notes. *Journal of Contemporary Medicine and Dentistry* ,2018;6(2):23-27.
11. Lamichhane J, Adhikary S, Gautam P, Maharjan R, Dhakal B . Risk of Handling Paper Currency in Circulation Chances of Potential Bacterial Transmittance. *Nepal Journal of Science and Technology*,2009; 10: 161–166.
12. Noha Ahmed Abd Alfadil, Malik Suliman Mohamed , Manal M Ali, El Amin Ibrahim El Nima. Characterisation of pathogenic bacteria isolated from Sudanese bank notes and determination of their resistant profile .*International Journal of Microbiology*,2018.
13. Agarwal G, Ingle N A , Kaur N, Ingle E, charania Z, Assessment of microbial contamination of Indian currency notes in Mathura city ,India. A cross sectional study .*Journal of Advanced Oral Research* ,2015;6(2):43-48.
14. G. Sucilathangam, Ajay Mal Reventh, G Velvizhi and C Revathy . Assessment of Microbial Contamination of Paper Currency Notes in Circulation in Tamil Nadu, India. *International Journal of Current Microbiology and Applied Sciences* ,2016;5(2):735-741.
15. Pradeep NV, Anupama, Marulasiddarah B S, Chitana M, Gayathri P, Maduri S N. Microbial contamination of Indian currency notes in circulation .*Journal of Research in Biology* , 2012;2(4):377-382.
16. Basavrajappa KG, Rao PN, Suresh K. Study of bacterial, fungal and parasitic contamination of currency notes in circulation. *Indian Journal of Pathology and Microbiology* , 2005; 48: 278- 279.

17.Igumbor Eo, Obi CL,Bessong PO,Potgieter N Mkasi TC, Microbial analysis of bank notes circulating in the venda region of Limpopo province ,South Africa. South African Journal of science ,2007; 103:356-365.

18.Tolba O, Loughrey A, Goldsmith CE,Millar BC,Rooney PJ,Moore JE.Survival of Epidemic strains of nosocomial and community acquired Methicillin Resistant Staphylococcus aureus on coins. American .Journal of Infection Control ,2007;35(5):342-346.