Various studies reveal that coins contain opportunistic deadly pathogens that can cause severe health related problems in immunologically weak people.

Money, in the coin form, do not appear unhygienic but it is home of disease-causing pathogens such as *Staphylococcus* species, *Klebsiella* species, *Corynebacterium* species etc. that can cause diseases like Lung infection, Food Poisoning, Endocarditis, Urinary tract infection, Meningitis, Septicemia and Diphtheria. About 48 million cases of foodborne illness caused by more than 30 pathogens, occur annually and each year these illness result in estimated 1,28,000 hospitalization and 3,000 deaths among children (CDC,2011). As Modern Medical science is getting advanced, the resisting power of pathogens has been steadily increasing i.e., *Klebsiella* Spp. contaminated coins contribute to the transmission of multi drugs resistant microorganism (Gedik et al., 2010). Therefore, the objective of this research work is to isolate various microorganisms present on Indian coins as well as pathogenicity of microorganisms.

Materials and Methods:

The present study was performed between December, 2020-January, 2020 at Central Research Laboratory, Patna Women's College, Patna. Coins were collected from eight different sources – vegetable seller, fruit seller, fish market, egg seller, food vendor, shopping mall, pharmacy and auto rickshaw. Bacterial culture was done by standard techniques (Gilchrist 1993 and Singh et al., 2002).7 grams Nutrient Agar was added in 250 milliliters of distilled water and 10 grams Potato Dextrose Agar was added in 250 milliliters of distilled water and the solution was stirred well. Both the flasks containing agar solution and petri dishes were autoclaved at 121°C for 15 minutes. After autoclaving, the solution was poured in the petri dishes and were kept aside for solidification. For culturing bacteria, both the surfaces of the coins were swabbed and the swabs were streaked on the petri-dishes containing Nutrient Agar medium. The petri-dishes were incubated at 37°C for 48 hours. For culturing fungi, the coins were swabbed and inoculated in Potato Dextrose Agar and were kept aside for 7 days at room temperature for fungal growth. The grown colonies of bacteria were counted and were identified by Gram – staining method and biochemical tests – Indole test, Methyl –Red test, Voges Proskauer and Citrate test. The fungal growth was identified under microscope at 40X magnification using Lactophenol Blue stain.

Results and Discussion :

The microbial test of Indian coins showed that more contamination was present on the coins collected from six sources out of eight sources.

Bacterial colonies were identified by colony count, Gram-staining and different biochemical tests. Highest numbers of colonies were found on the coins collected from vegetable sellers, pharmacy food vendor, autorickshaw and shopping mall and least number of bacterial colonies were found on the coins collected from egg sellers (Table-1).

Table 1. Showing Colonies Count

SOURCES	INDIAN COINS	COINS COLONIES COUNT (IN NUMBERS)
VEGETABLE SELLER	**10**	**3**
FRUIT SELLER	**5**	**2**
FOOD VENDOR	**2**	**3**
EGG SELLER	**1**	**1**
SHOPPING MALL	**10**	**3**
AUTO RICKSHAW	**2**	**3**
FISH MARKET	**5**	**0**
PHARMACY	**10**	**0**

In this study, total 15 bacterial colonies were isolated from 8 samples of coins out of which 14 colonies were Gram-positive and only one colony was found Gram-negative (Table-2). In this study, it was found that 93% of the bacterial isolation were Gram-positive and 7% were Gram-negative. Many pathogenic bacteria such as *Bacillus* spp., *Staphylococcus* spp., *Klebsiella* spp. and *Corynebacterium* spp. were found.

Table 2. Showing Colour of Colonies of Bacteria and Gram –Reaction Result

SOURCE	COLOUR OF COLONIES	GRAM-REACTION
VEGETABLE SELLER	YELLOW	NEGATIVE
	ORANGE	POSITIVE
	WHITE	POSITIVE
SHOPPING MALL	YELLOW	POSITIVE
	ORANGE	POSITIVE
	WHITE	POSITIVE
FRUIT SELLER	WHITE (SMOOTH)	POSITIVE
	WHITE (ROUGH)	POSITIVE
EGG SELLER	WHITE	POSITIVE
AUTO RICKSHAW	WHITE	POSITIVE
	YELLOW	POSITIVE
	ORANGE	POSITIVE
FOOD VENDOR	WHITE	POSITIVE
	YELLOW	POSITIVE
	ORANGE	POSITIVE

The biochemical testing shows the presence of *Staphylococcus* Species (20%), *Bacillus* species (66%), *Klebsiella* species (6%) and *Corynebacterium* Species (6%) (Table-3). These bacteria are present on skin and they may get spread through coins. The fungal growth was found only on one coin that was collected from a vegetable seller. The fungal growth was identified as *Aspergillus* species due to presence of hyphae network, phialide and conidia. *Staphylococcus* is a Gram-positive bacteria, which commonly leads to skin infections, pneumonia, endocarditis and osteomyelitis. *Bacillus* is a Gram-positive bacteria and it causes serious infections such as ocular infection, endocarditis, pneumonia, meningitis and musculoskeletal infections. *Klebsiella* is a type of Gram-negative bacteria and it causes infections such as pneumonia, meningitis and urinary tract infections. *Corynebacterium* is a Gram-positive bacteria and it causes severe infection like diphtheria. The fungal genus *Aspergillus* causes lung infections such as Aspergillosis and pneumonia (Ozcan et al.,2004).

Table 3. Showing Results of Biochemical Tests and Bacterial Species

SOURCES	COLOUR OF COLONIES	IND-OLE TEST	METH-YL RED TEST	VOG-ESPO-RKU-ER TEST	CITR-ATE TEST	BACTERIAL GENUS
VEGETABLE SELLER	YELLOW	-ve	-ve	+ve	+ve	*KLEBSIELLA SPP.*
	ORANGE	-ve	-ve	+ve	+ve	*BACILLUS SPP.*
	WHITE	+ve	-ve	+ve	-ve	*BACILLUS SPP.*
FRUIT SELLER	WHITE (ROUGH)	-ve	-ve	+ve	+ve	*BACILLUS SPP.*
	WHITE (SMOOTH)	-ve	-ve	+ve	+ve	*BACILLUS SPP.*
FOOD VENDOR	WHITE	-ve	-ve	-ve	-ve	*BACILLUS SPP.*
	YELLOW	*-ve*	*-ve*	*+ve*	*-ve*	*STAPHYLOCOCCUS SPP.*
	ORANGE	-ve	+ve	+ve	+ve	*STAPHYLOCOCCUS SPP.*
EGG SELLER	*WHITE*	*-ve*	*+ve*	*-ve*	*-ve*	*CORYNEBACTERIUM SPP.*
SHOPPING MALL	YELLOW	-ve	-ve	+ve	+ve	*BACILLUS SPP.*
	ORANGE	-ve	-ve	+ve	+ve	*BACILLUS SPP.*
	WHITE	-ve	-ve	+ve	+ve	*BACILLUS SPP.*
AUTO RIKSHAW	WHITE	-ve	-ve	+ve	-ve	*BACILLUS SPP.*
	YELLOW	-ve	+ve	-ve	+ve	*STAPHYLOCOCCUS SPP.*
	ORANGE	-ve	-ve	+ve	-ve	*BACILLUS SPP.*

Human hands may contain various disease-causing microorganisms and coins can act as vehicles for those disease-causing microorganisms (Michaels, 2002; Pope et al., 2002). In this study many pathogenic bacteria such as *Klebsiella* spp.,

Bacillus spp., *Staphylococcus* spp. and *Corynebacterium* spp. were found (Table-3). A similar study was done by Thiruvengadam et al., (2014) in Chennai India on bacterial profiling on coins and currencies. They found different species of *Staphylococcus* (19%), *Bacillus*, *Klebsiella*, *Micrococcus*, *Corynebacterium and Escherichia.* A recent study done by Abdelhakam et al., (2020) shows that they isolated common pathogenic bacterial species of *Staphylococcus aureus* (17%), *Klebsiella pneumoniae* (8%) and *Bacillus* species (20%) etc. Barro et al., (2006) performed similar research. They collected coins from different sources to find out bacterial profiling of circulating coins and found high frequencies of *Staphylococcus* aureus and *Klebsiella pneumoniae* and lower frequencies of *Escherichia coli.*

Conclusion:

From this study, it can be concluded that coins in circulation are contaminated with potential pathogens such as *Klebsiella* spp., *Staphylococcus* spp., *Staphylococcus* spp., *Bacillus* species and *Corynebacterium* species. These species can cause harmful infection and disease such as endocarditis, urinary tract infection, diphtheria lung infections, pneumonia etc. So, there should be proper handling of coins.

As we know that coins are one of the items that goes on continuous circulation. It passes from hand to hand and also transmits potent pathogens in this exchange. Therefore, it should be handled properly and personal hygiene should be improved.

Whenever we eat something, like in a restaurant or street food, we should wash or sanitize our hands, prior to eating, because contaminated hands can pass pathogens to the gastrointestinal tract that will lead to infection and disease. Coins should be disinfected prior to circulation.

Nowadays we are washing and sanitizing our hands at a regular interval of time due to COVID -19. This practice should be maintained.

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