

A STUDY ON SCREENING OF IRAQI CURRENCIES COLLECTED FROM DUHOK CITY, IRAQ FOR BACTERIAL CONTAMINATION

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ABSTRACT

Background: Paper currencies are largely exchanged and as of the high incidence varying from place to place, could help as ways for communication of multi-resistant bacterial pathogens. The purpose is to found out bacterial contaminations of Iraqi currencies collected from numerous communities and their susceptibility to antibiotics at Duhok city, Iraq.

Subject and Methods: A total of 302 currencies were collected from 8 community residents and examined by culturing on Blood, Mannitol salt, MacConkey and Chocolate agar. Identification of the growing isolates were done by regular conventional bacteriological approaches. Results of susceptibility testing to fourteen antibiotics were carried out as per Clinical and Laboratory Standards Institute (CLSI) guidelines.

Results: Out of 302 collected samples, 96% revealed bacterial contamination that 16 % had mixed bacterial isolates. An overall of 9 different bacterial species were isolated from six Iraqi currencies. Of them, (24.2%) was *Bacillus subtilis* followed by *Escherichia coli* (14.6%), *Staphylococcus aureus* (13.4%), *Micrococcus* (13.0%), *Staphylococcus salbus* (10.6%), *Pseudomonas aeruginosa* (10.2%), *Klebsiella* (9.9%), *Proteus* (2.5%) and *Enterobacter* (1.6%); general isolates were displayed high resistance to Vancomycin, Erythromycin, Ampicillin and Cefixime; lacking or slight resistance to Amikacin, Gentamicin, Ciprofloxacin, Norfloxacin, Azithromycin, Ceftriaxone and Rifampin.

Conclusions: Study revealed that Iraqi currencies that circulating in Duhok city was contaminated with diverse and likely pathogenic bacteria comprising multi antibiotic resistant strains. Therefore the need to progress health awareness among people while handling currency is a crucial matter.

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Keywords: Bacterial infection, Iraqi currencies, Antibiotics susceptibility.

Money is widely exchanged in populations for goods and services, payment of debts and for delayed expenses in economic events. Regular dealings and pass through many hands that could pathogens become forced on them before they are finally left in banks.¹ The contaminated currency notes continue circulates and contaminate the

hands of others, transferring microbes in the process.² Currency and coins are important items most frequently passing from hand to hand; during its passing and counting currencies gets contaminated with normal flora and pathogens from the skin, respiratory secretions, alimentary tract, water, soil and aerosols.³

The chance of various forms of currencies

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such as notes and coins may do as possible route for the spread of potential pathogenic microorganisms.⁴ Most of the people ensure not attention how unclean their hands after count the money. The contaminated notes and coins go within circulation and spread contaminated microbes to others hands and transmitting pathogenic organisms in the process. Potential pathogens have been isolated from currency notes and these include species of *Staphylococcus*, *E.coli* and *Pseudomonas*.

Bad-tempered contamination by concurrent handling of money and animal products, poor sanitation practices in market, butchery and restaurant also increase the risk of infection by multi-resistant strains.⁵ Though, like elsewhere in the world, currency and coins are important vehicles for carriage of pathogen in Duhok city, the bacterial profile remain not recognized. Towards our knowledge, there are no available documents on these features. The current study is an attempt to find response to these requests. Therefore, the aim of the current study was designed to discovery out bacterial profile from Iraqi currency notes from different regions that play a potential vector of various bacterial pathogens and study of antibiotics susceptibility in Duhok city, Iraq.

MATERIAL AND METHODS

Sample collection: In the present study 302 samples of Iraqi paper currency in Duhok city were collected grounded on the level of treatment and thus circulation during February till May 2015. Currency notes were obtained from 8 community populations (students, markets,

butchers, taxi drivers, restaurants, fuel stations, exchanger then pharmacies). The values of currencies were: 50 of the 250 ID, 32 of the 500 ID, 100 of the 1000 ID, 50 of the 5000 ID, 50 of the 10000 ID and 20 of the 25000 ID (in addition to fresh control), which were collected randomly. Each paper currency was collected straight into a sterile plastic container and transferred to Microbiology Laboratory, School of medicine and Faculty of Medical Sciences at Duhok University for subsequent analysis.

Isolation and identification of bacteria:

Each paper currency was soaked separately in bottles containing 10 ml that comprised sterilized buffered peptone water and the bottle strongly shaken for 2 minutes. The currency was taking off and the remaining peptone water solution was incubated for 24 hours at of 37°C. The incubated test sample was then cultured by sterilized swab onto Blood, MacConkey, and Chocolate agar that incubated at 37°C for 24 hours. Pure cultures were got by doing sub-culturing separated colonies. Control samples experienced the similar processes. Growing up bacterial isolates was recognized using ordinary techniques as briefly follow;

For Identification of Gram-negative bacteria: includes performing of morphological features, grams stain and motility test. Growth patterns on MacConkey agar. For biochemical reaction, sugar fermentation, IMVIC test, KIA, urease besides nitrate test was done.⁶

Gram-positive Bacteria: comprised of morphological features and Gram stain. Growth pattern Blood agar (with 5-7% defibrinized blood), MacConkey agar, chocolate agar, nutrient agar, Mannitol salt

agar. For biochemical tests, sugar fermentation, coagulase, catalase, oxidase test and novobiocin disc (30) were done.⁶

Identification of *Bacillus subtilis* Isolates: morphological options (no effects on blood agar), Gram stain, motility test, starch hydrolysis, Voges-Proskauer test, citrate utilization and growth in 6, 5% NaCl nutrient broth were done.⁶

Antibiotic Susceptibility tests: Antibiotic susceptibility tests were performed on identified colonies of *Bacillus subtilis* isolates choosing commercially ready antibiotic sensitivity disc (Oxoid, England) by technique of modified Kirby-Bauer method according to CLSI guidelines, using Mueller-Hinton agar standard media. The inhibition zone standards for antimicrobial susceptibility were measured from tables for interpretative zone diameters of Clinical and Laboratory Standards Institute.⁷ Antibiotics used were ampicillin (5µg), amoxiclav (5µg), cefotaxime (30µg), ceftriaxone (30µg), cefixime (30µg), azithromycin (10µg), vancomycin (30µg), erythromycin (10µg), gentamicin (15µg), rifadin (30µg), ciprofloxacin (5µg), norfloxacin (5µg), nalidixic acid (20µg) and amikacin (30µg).

RESULTS

A total of 302 Iraqi currencies were analyzed for bacterial contamination; giving the percentage of contamination to be 96%; that 16 % had multiple bacterial isolates.

Table 1, Shows that overall of 9 diverse bacterial species isolated from six Iraqi currencies of them; (24.2%) was *Bacillus subtilis* next by *E coli* (14.6%), *S aureus* (13.4%), *Micrococcus* (13.0%), *S albus* (10.6%), *Ps aeruginosa* (10.2%), *Klebsiella* (9.9%), *Proteus* (2.5%) and *Enterobacter* (1.6%). *Bacillus subtilis* was most frequently bacterial population isolated from overall types of currencies samples especially small ones and with except fuel station, taxi drivers and students samples, where, the dominant bacterial species were *Klebsiella*, *S albus* and *E coli* respectively. Generally, small currencies (250 ID, 1000 ID and somewhat 5000 ID) were more contaminated with bacterial species than big one like (1000 ID and 25000 ID).

Table 1: Rates of Bacterial Isolates from Currencies in Different Sources

Sources	Currency (NO)	No. of Bacterial Isolates								
		<i>Staph aureus</i>	<i>Staph albus</i>	<i>Bacillus</i>	<i>Micrococcus</i>	<i>E coli</i>	<i>Klebsiella</i>	<i>Proteus</i>	<i>Pseudomonas</i>	<i>Enterobacter</i>
Markets	250 (15)	2	-	3	2	1	1	2	4	-
	500 (11)	-	-	1	-	-	-	-	-	-
	1000 (30)	2	2	8	6	5	3	2	5	-
	5000 (15)	-	1	4	1	3	3	2	1	-
	10000 (15)	3	1	1	4	4	1	-	1	-
	25000 (6)	2	-	1	1	1	-	1	1	-
	Total	9	4	18	14	14	8	7	12	
Restaurant	250 (5)	2	1	2	-	-	-	-	-	-
	500 (3)	-	-	3	-	-	-	-	-	-
	1000 (10)	3	1	6	1	-	-	-	-	-
	5000 (5)	1	-	2	-	1	-	-	-	-

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	10000 (5)	2	-	3	-	-	-	-	-	-
	25000 (2)	-	-	1	-	1	-	-	-	-
	Total	8	2	17	1	2				
	250 (5)	-	-	1	1	2	2	-	-	-
	500 (3)	-	-	-	-	-	-	-	-	-
	1000 (10)	6	3	1	1	1	-	-	5	-
	5000 (5)	1	-	4	1	-	-	-	-	-
Hospital	10000 (5)	-	3	2	2	2	-	-	2	-
	25000 (2)	1	-	1	1	-	-	-	1	-
	Total	8	6	9	6	5	2		8	
	250 (5)	1	2	2	-	3	-	-	-	-
	500 (3)	-	-	3	-	-	-	-	-	-
	1000 (10)	-	4	6	1	2	-	-	1	-
	5000 (5)	-	1	-	-	3	-	-	-	1
Butchers	10000 (5)	2	1	-	2	5	-	-	-	-
	25000 (2)	-	1	2	1	-	-	-	-	-
	Total	3	9	13	4	13			1	1
	250 (5)	-	1	1	-	-	3	-	-	-
	500 (3)	-	-	1	1	-	1	-	1	-
	1000 (10)	-	2	2	4	2	1	-	1	-
	5000 (5)	-	-	1	1	-	1	-	2	-
Fuel stations	10000 (5)	-	-	1	1	-	2	-	2	-
	25000 (2)	-	1	-	1	-	1	-	-	-
	Total		4	6	8	2	9		6	
	250 (5)	-	-	1	-	3	1	-	-	-
	500 (3)	-	-	-	-	-	2	-	-	-
	1000 (10)	-	-	4	3	1	-	-	2	-
	5000 (5)	-	1	3	-	-	-	-	1	-
Exchange	10000 (5)	-	4	-	-	-	1	-	-	-
	25000 (2)	-	-	-	1	-	-	-	1	-
	Total		5	7	4	1	4		4	
	250 (5)	1	-	1	-	1	1	-	1	-
	500 (3)	-	1	2	-	-	-	-	-	-
	1000 (10)	2	1	2	-	3	1	-	1	-
	5000 (5)	1	-	1	-	2	-	-	-	1
Students	10000 (5)	2	-	-	-	2	-	1	-	-
	25000 (2)	-	-	-	1	-	1	-	-	-
	Total	6	2	6	1	8	3	1	1	1
	250 (5)	1	-	1	2	-	-	-	-	-
	500 (3)	1	-	-	2	-	-	-	-	-
	1000(10)	1	2	-	-	-	4	-	-	3
	5000(5)	3	-	1	-	1	-	-	-	-
Taxi drivers	10000 (5)	4	-	-	-	1	-	-	-	-
	25000 (2)	1	-	-	-	-	-	-	1	-
	Total	11	2	2	4	2	4		1	3
Overall No.	302	45	34	78	42	47	32	8	33	5
(%)		(14.0)	(10.6)	(24.2)	(13.0)	(14.6)	(9.9)	(2.5)	(10.2)	(1.6)

;- no growth occurrence

Table 2, Shows resistance rates of all bacterial isolates; general isolates showed high resistance to vancomycin, erythromycin, ampicillin then cefixime with percentages 100%, 100% , 89% and 87% respectively. On another hand, isolates of all bacterial species showed lacking or slight resistance rates towards

antibiotics such as amikacin, gentamicin, ciprofloxacin, norfloxacin, azithromycin, ceftriaxone and rifampin that were 0%, 0% , 0%, 11%, 22% and 33 % respectively. Moreover, among all bacterial species high resistance rates was found with *Enterobacter* isolates.

Table 2: Antibiotic Resistance Patterns of Bacterial Isolates from Iraqi Currencies

Antibiotics	Bacterial isolates									
	<i>Staph aureus</i>	<i>Staph albus</i>	<i>Bacillus</i>	<i>Micrococcus</i>	<i>E coli</i>	<i>Klebsiella</i>	<i>Proteus</i>	<i>Pseudomonas</i>	<i>Enterobacter</i>	*
Ampicillin (AM)	82 %	50%	80 %	83 %	73 %	67 %	90 %	100 %	100 %	89
Amoxiclav (AMC)	59%	17 %	40 %	67 %	47 %	33 %	90 %	53 %	100 %	56
Cefotaxime (CTX)	41%	67 %	60 %	83 %	60 %	27 %	40 %	53 %	75 %	67
Cefixime (CF)	88%	33 %	80 %	100 %	87 %	33 %	60 %	80 %	100 %	78
Ceftriaxone (CRO)	35%	33 %	60 %	17 %	33 %	27 %	30 %	33 %	75 %	22
Vacomycin(V)	53%	83 %	60 %	83 %	53 %	67 %	70 %	67 %	100 %	100
Rifampsin (RA)	59%	50 %	20%	33 %	47 %	33 %	60 %	47 %	75 %	33
Gentamicin (CN)	41%	17 %	10 %	17 %	20 %	0 %	0 %	13 %	0 %	0
Ciprofloxain (CIP)	29%	0 %	0 %	17 %	7 %	0 %	0 %	7 %	0 %	0
Norfloxain (NOR)	29%	0 %	0 %	33 %	20 %	0 %	10 %	20 %	0 %	0
Nalidixic acid (NA)	47%	33 %	60 %	67 %	53 %	40 %	60 %	53 %	75 %	67
Erythromycin (E)	82%	83 %	80 %	67 %	87 %	73 %	70 %	100 %	100 %	100
Azithromycin(AZM)	35%	0 %	10 %	33 %	27 %	20 %	20 %	27 %	75 %	11
Amikacin (AK)	24%	17 %	0 %	0 %	20 %	7 %	0 %	27 %	0 %	0

*Percentage of resistant isolates collectively to antibiotics used.

DISCUSSION

Money has mass circulation among the general public and has potentiality to transmit disease causing microorganisms so that currency of paper form is frequently contaminated with bacteria and this may play a part in the spread of potentiality harmful microorganisms. These currency notes may assist as a transporter of microbes, thus important to the transmission of infectious diseases. In present study, percentage of bacterial contamination was 96% and smaller unit currencies (250, 500, 1000 and somewhat 5000ID) were highly contaminated than bigger unit notes such as 10000 and 25000 ID notes. Similar findings of bacterial contamination in Iraqi currencies were 100

%, 100% and 88% found in other studies.⁸⁻

¹⁰This is already documented in other studies.^{5,11-13} These results are possibly because the smaller unit notes are greatest frequently handled and as they are circulated among people from several occupations and tread of lifetime. Therefore, there are chances of higher levels of microbial contamination on lower denomination notes.¹⁴ This is shown that currency which is touched by large numbers of the people in Duhok city which includes a large population under a diversity of personal and environmental circumstances and low values are more extensive range of exchangeable between people in population. We observed *Bacillus subtilis* as the commonest

contaminant of the circulating currency and commonly found in the soil. So it is common practice to keep notes in contact with surfaces such as the ground, soil, table surfaces and the likes. Three observations in Iraq and one in Nigeria were similar to this result.^{8-10,14} abundant nature of the *Bacillus* spp. giving it superior colonization capacity as well as the ability of its spores to resist environmental changes, survived dry heat and certain chemical disinfectants for reasonable periods. Moreover, in this study, large numbers of isolates belong to *E. coli* and *Klebsiella* from butchers, students and fuel station samples. Over and above, isolates of *S. aureus* and *Ps. aeruginosa* were more prevalent in hospital samples. These results accord with.⁸ This is a warning that money contamination is associated to unclean practice of people and is suggestive of significant fecal contamination of currency, and is a reflection of poor local environmental sanitation also signifies a potential minefield for nosocomial infections.¹⁵ Thus the chance of transmitting infections caused by the pathogenic organisms which were found in lower frequencies cannot be ruled out. Our results differ with observations of other studies that found *Enterococcus* sp. as the commonest contaminant of the circulating currency.^{16,17} discrepancy in bacterial pattern may be attributed to regional variation of bacterial profile, habits of the local people. Bacterial isolation was less in the higher currencies one in this study that might be due to their good paper quality and people use large denominations for their savings either at home or in banks which may keep them away from hand

contamination for a period of time. Similar results were stated in other studies.^{5,8-10,18}

This study revealed that many multidrug resistant strains of different isolates were prevalent in the Iraqi currencies that further emphasize the public health significance of the notes and clearly indicates a marked resistance to the commonly used antibiotics. For example; isolates of various bacterial species recorded high rates of resistance collectively as 100%, 100%, 89%, 78% and 67% against vancomycin, erythromycin, ampicillin, cefixime and cefotaxime respectively. This result agrees with.^{15,17-19} Presence of multidrug-resistant strains poses a big challenge to human survival and continued existence in relation to bacterial infection and diseases that is highly consequential when contracted by the debilitated individuals. The detected high antibiotic resistances could be ascribed to the abuse of antibiotics which indicated that majority of the population sampled purchases antibiotics in the open market without any medical instruction and use them for the incorrect diseases and infections.¹⁵ Antibiotics like ciprofloxacin, norfloxacin, gentamicin, amikacin, azithromycin, ceftriaxone and rifampin; collectively expressed absent and little resistance rates. This latter observation goes with.^{8,15,17,20} Furthermore, the description of isolates didn't comprise molecular methods for creating a link between isolates from currency and those of clinical origin to determine the role of currency in transmission of pathogens. Despite these restrictions, the current study produced valuable data to be used for

immediate involvement besides helping as a baseline for additional studies.

The outcomes from current study shows that Iraqi currency notes in exchange are contaminated with several bacteria of which greatest are resistant to frequently used antibiotics and therefore signify risks and public health exposures to the community and individuals managing currency notes. Thus persons should improve upon their personal health awareness by washing their hands repeatedly after handling of currency notes, prevent babies from handling currency notes and evade the use of saliva during calculating of currency notes as well as cease from placing money in the mouth, stabbing currency notes in brassieres and sharp off corners of banknotes.

REFERENCES

1. Awodi NO, Nock IH and Aken OI. Prevalence and Public Health Significance of Parasitic Cysts and Eggs on the Nigerian Currency. The Nigerian Journal of Parasitology. 2000; 22:137-142.
2. Yakubu J M, Ehiowemwenguan G and Inetianbor JE. Microorganisms Associated With Mutilated Naira Notes In Benin-City, Nigeria. International Journal of Basic and Applied Science. 2014; 3: 9-15.
3. Thiruvengadam S, Shreenidhi KS, Vidhyalakshmi H, Ramya M, Kamala T, Sundararaman TR and Selvi R. A Study of Bacterial Profiling on Coins and Currencies under Circulation and Identifying the Virulence Gene in Chennai (TN). Chem Tech Res. 2014; 6(9): 4108-4114.
4. Abrams BL and Waterman NG. Dirty money. Journal of American Medical Association. 1972; 219: 1202-1203.
5. Emikpe BO and Oyero OG. Preliminary Investigation on the Microbial Contamination of Nigerian Currency. International Journal of Tropical Medicine. 2011; 2:29-32.
6. Koneman EW, Allen SD, Janda WM, Schreckenberger PC and Winn WC. Color Atlas and Textbook of Diagnostic Microbiology. Philadelphia, Washington: JB: Lippincott; 1992.
7. Clinical and Laboratory Standard Institute. Performance standards for antimicrobial susceptibility testing. M100-S16. Wayne, PA: CLSI. 2006.
8. AL-Abbasi IJ. Investigation of bacterial contamination in Iraqi paper currency. journal of kerbala university. 2010; 8(3):153-7.
9. Abid H S. Bacterial Contamination of Iraqi Paper Currency Notes in Circulation & Resistance of Pathogenic Bacteria to Antibiotics. Iraqi Journal of sciences. 2012; 53: 81-87.
10. Abdulla SM. Isolation and Identification of causative agents from some Iraqi Banknote currency. Ibn Al-Haitham Journal for Pure & Appl Sci. 2013; 26 (1):75-81.
11. Guerin PJ, Brasher C, Baron E, Mic D, Grimont F and Ryan M, Aavitsland P, Legros D. Shigella dysenteriae serotype 1 in West Africa: Intervention Strategy for an Outbreak in Sierra Leone. Lancet. 2003; 362:705-706.
12. Hosen JM, Sarif DI, Rahman MM and Azad MA. Contamination of Coliforms in Different Paper Currency Notes of

- Bangladesh. Pak J Bio Sci. 2006;9: 868-870.
13. Felgo P and Nkansah M. Bacterial Load on Ghanaian Currency Notes. Afr J Microbiology Research. 2010; 4(22): 2375-2380.
 14. Orukotan AA and Yabaya A. Microbial contamination of naira notes in circulation within Kaduna metropolis. Journal of Medical and Applied Biosciences. 2011; 2: 20-27.
 15. Tagoe DN, Adams A, and Land VG. Antibiotic Resistant Bacterial Contamination of the Ghanaian Currency Note: A Potential Health Problem. J Microbiol Biotech Res. 2011; 1 (4): 37-44.
 16. Adegoke R and Anthony A, Anthony I. The in vitro effect of vancomycin on multidrug resistant Staphylococcus aureus from hospital currency notes. African Journal of Microbiology Research. 2011; 5(14):1881-7.
 17. Pal K, Das NS and Bhattacharya S. Bacteriological profile of Indian currency circulating in a tertiary care hospital in rural Bengal. IJRRMS. 2013; 3(2); 23-30.
 18. Azza SM, Abuelnaga AA, Samy MA and Bakry AS. Bacteriological Assay for the Egyptian Currency Collected from Veterinary Field. International Journal of Microbiological Research. 2014; 5 (1): 48-53.
 19. Oluduro AO, Omoboye OO, Orabiya RA, Bakare MK and David OM. Antibiotic Resistance and Public Health Perspective of Bacterial Contamination of Nigerian Currency. Advances in Life Science and Technology. 2014; 24: 4-9.
 20. Dehghani M, Dehghani V and Estakhr J. Survey of Microbial Contamination of Iranian Currency Papers. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2011; 2 (3): 242-8.

پوخته

بیسبونه به کتريا ی پارهیت قاغهز یی یی عراقی له باژییری دههوکى

پیشهکى و ئارمانج: پارهیت قاغهز یی یی عراقی به ههمى جوریت وی دییتا فهکوستن ناف کومه لکاهى به شیوکى بهربلاف فیژا دییبیتته کارى کهر له سهر توشبونا زور جوریت به کتريا یی ئیش دار. ئه رمانجه فى فهکولین بیزان له سهر بیسبونه جوریت به کتريا پارههیت قاغهز یی یی عراقی به ههمى جوریت وی دناف سیکا دههوکى ههروسا بیزان له سهر ریژا به کريا دژی انتى بایوتیک.

رێکێن فهکولینی: سى ست و دوو نمونیت قاغهز یی یی عراقی به ههمى جوریت وی هاته کووم کرن له هشت جیه له باژییری دههوکى ووان نموو هاته جاندن له سهر جهند جورى میدیای به کتریولوجى وهك مهكونكى وبلهد وهجولکیت ههروهسا به کتریت هاته شین کرن له سهر وان میدیا دیسا هاته بیشکیننکردن به امپریت کلاسیکى یی ستاندهرت. بیشکینن دژی انتى بایوتیک هه رهسا هاته ئه نجام دان بوو وان به کتريا یا وه به کارینانا 14 جوریت انتى بایوتیک.

ئه نجام: له ناف وان سى ست و دوو نمونیت قاغهز یی یی عراقی یی هاته کووم کرن 96% وان زهرعه به کتري لى ده یاریی وههروسا 16% زهرعه به کتري یی جوراو جوربو. نه ه 9 جوریت به کتريا هاته دهست نیشانکردن له وان 24.2% به کتريا *Bacillus subtilis* , 14.6% *E coli* , 13.4% *Staphylococcus aureus* , 13% *Micrococcus* , 10.6% *Staphylococcus albus* , 10.6% *Pseudomonas aeruginosa* , 9.9% *Klebsiella* , 2.5% *Proteus* و 1.6% *Enterobacter* بو. ئه نجامیت بیشکینن دژی انتى بایوتیک ده یاریی کو وان جوریت به کتريا به ریژه کا زور به کرى هه ی دژی که له ک جوریت انتى بایوتیک وهك *Cefixime* , *Vancomycin* , *Erythromycin* , *Ampicillin* له هه مان کاتده به رکریکه لاواز هه بوو دژی وان انتى بایوتیکه وهك *Amikacin* , *Gentamicin* , *Ciprofloxacin* , *Norfloxacin* , *Azithromycin* , *ceftriaxone* , *Rifampin* .

ده رئه نجام: ده رئه نجام دیاریی کو پارهیت قاغهز یی یی عراقی به ههمى جوریت وی له ناف باژییری دههوکى هه لکره بو زور جوریت به کتريا یی مه ترسی هه یا بو درسکرنا ئیشتی کران له ناف کومه لکه ههروهسا به رکریکا زور هه یا دژی که کهک جوریت انتى بایوتیک. فیجا بیزانینا زور له سهر دانوستاندن وان پارهیت قاغهز یی ههروسا به کوالیتیکا بلندزور فهره.

الخلاصة

التلوث البكتيرية للعملات الورقية العراقية في مدينة دهوك، العراق

الخلفية والأهداف: العملات الورقية تتداول على نحو واسع في مجتماعتنا وتتبادل بين يدٍ لأخرى، ويُمكنُ أَنْ يَعْمَلَ كوسائطٍ لانتقال المسببات البكتيرية المرضية المتعددة المقاوم للمضادات الحياتية. إنَّ الهدفَ من هذا الدراسة هو لمعرفة مدى تلوث البكتيري للعملات العراقية المتداولة بين مختلف الشرائح في داخل مركز مدينة دهوك وكذلك معرفة نسب حساسية العزلات تجاهها لمضادات الحيوية الشائع الاستخدام في مدينة دهوك، العراق.

طرق البحث: مامجموعه 302 عملة ورقية عراقية بمختلف انواعها جُمِعَتْ مِنْ ثَمَانِ مصادر متنوعة وتم زرع العينات على اوساط وتم تشخيص العزلات باستخدام Blood agar, Chocolate agar, Mannitol salt agar, MacConkey agar الطرق البكتريولوجية التقليدية. حيث تم اجراء اختبار حساسية المضادات الحيوية للعزلات ضد أربعة عشر نوع مضاد حيوي.

النتائج: من بين 302 عينة جمعت، 96% بينت تلوث أبكتيريا، منهم 16 % كانت تلوثا بكتيريا متعدّد. مامجموعها 9 عزلة بكتيرية جمعت من ست عملات ورقية عراقية منها (24.2% *Bacillus subtilis*), (14.6% *E.coli*), (13.4% *Staphylococcus aureus*), (13% *Micrococcus*), (10.6% *Staphylococcus albus*), (10.2% *Pseudomonas aeruginosa*), (9.9% *Klebsiella pneumoniae*), (2.5% *Proteus*), و (1.6% *Enterobacter*). كما بينت العزلات مقاومة عالية للمضادات الحياتية تجاه Vancomycin, Cefixime, Erythromycin, Ampicillin, Gentamicin, Ciprofloxacin, Amikacin, Norfloxacin, Azithromycin, ceftriaxone و Rifampin.

الاستنتاجات: كشفتُ هذا الدراسةُ بان العملات العراقية المتداولة في مدينة دهوك ابدت تلوثا عاليا بمختلف انواع البكتيريا المسببة للأمراض والمتعدّد المقاومة للمضادات الحياتية. لذا تتطلب الحاجة الماسة لتحسين وعي الصحي بين الناس بما فيها معالجة وتحسين نوعية العملات الورقية.