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Prevalence and Antimicrobial Susceptibility Patterns of Bacteria Isolated from Body Fluid Specimens

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Abstract: The current study carried out to determine the predominance of bacterial isolates responsible for body fluid infections and determine the antimicrobial resistance patterns of all bacteria which isolated in this study during a period extended form the first of January, 2021 to the end of December, 2021 at Teaching Laboratories in the medical city. During this study, 212 body fluids specimens (synovial, pleural, ascetic, Cerebra spinal fluid (CSF), seminal, peritoneal, BAL, nasal and bronchial fluids) were collected from both sexes and all ages. Bacterial isolates were isolated according to standard microbiology methods, then the identification of bacteria was done by Vitek-II system. Out of these 212, the highest percentage was from ascitic fluid 72(33.96%) while the lowest percentage was from nasal fluid 2(0.94%). On the other hand 81 (38.21%) of specimens showed positive bacterial growth, while 131 (61.79%) of specimens showed negative bacterial growth. Out of 81 positive bacterial growth, 51(63%) of the bacteria were Gram-positive and 30(37%) of the bacteria were Gram-negative. Out of those 51 isolates of the gram positive bacteria, *Staphylococcus epidermidis* isolates were predominant 9(17.65%), followed by *Staph. hominis* ssp *hominis* 8(15.68%), while *Burkholderia capacia* isolates 7(23.33%) were the predominant gram negative bacteria followed by isolates of *Escherichia coli* 5(16.67%). Isolates of Gram negative bacteria including *Burkholderia capacia, Escherichia coli, Salmonella, Acinetobacter baumannii, Pseudomonas and Entereobacter* showed highest resistance rate toward Ampicillin, Aztreonam, Cefazolin and Ceftriaxone and the highest sensitivity rate was toward Meropenem and Imipenem. Isolates of *Klebsiella pneumoniea* ssp. *Pneumoniae, Salmonella entrica* and *Acinetobacter baumannii* isolated in this study were multi-drug resistance and they resist to all antimicrobial agents used in this study.

Keywords: Body fluid, Gram-positive bacteria, Gram-negative bacteria and Antimicrobial resistance patterns.

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Introduction

Various specimens from body fluids such as pleural, ascitic, synovial, peritoneal and cerebrospinal fluids, received frequently for cultures in all microbiology laboratory when infections were suspected and these infections always associated with morbidity as well as mortality (1). Under normal circumstance, body fluids are sterile fluids free from pathogens and normal bacteria. Therefore, germs can invade body fluids (1,2), and cause severe infections in the body (3,4). Also infections of the sterile body fluids are dangerous and urgent infections that need to be treated right away treated because if these infections left

untreated, they could develop into disease which threatening the life (5). Wide range of bacterial types, including both Gram-positive bacteria and Gram-negative bacteria like *Streptococci*, *Enterobacter*, and *Staphylococci*, as well as gram-negative species like *E. coli*, *Klebsiella*, *Acinetobacter*, and *Pseudomonas*, have been identified as sterile body fluid infections (6,7).

Multidrug resistance (MDR) to widely used antimicrobials is rapidly rising, which is become major concern for the public health around the world. Antibiotic resistance occurs when bacteria resist the effects of antibiotics that would normally kill them or stop them from growing. Recently, the rate of antimicrobial resistance has increased due to a number of factors, such as the irrational use of antimicrobial agents, their overuse, the extension of standard antimicrobial regimens, and the purchase of non-prescription drugs(8), self-medication, the needless use of leftover medicines, and patients' conviction that antibiotics are useful in curing minor illness(9). Antibiotic resistance leads to stays in hospitals for longer times, and the costs of medicines are higher finally the mortality increased(10). Consequently, it is important to recognize and identifying all bacteria that can caused these infection as soon as possible. In order to assess the prevalence of microorganisms, microorganism species and antibiotic susceptibility pattern of isolates derived from the bodily fluid infections to determine the extent of the development of resistance of local isolates to antibiotics, the current study was creatd.

Material and methods

Period of Study

This study was occurred in period extended for whole year (form the first of January, 2021 to the end of December, 2021). It included patients of both gender and all ages which they attended to Baghdad Teaching Hospital in the Teaching Laboratories in Medical City/ Baghdad.

Isolation and Identification of bacterial isolates

Different body fluids specimens (synovial, pleural, ascetic, CSF, seminal, peritoneal, BAL, nasal and bronchial fluids) were cultured and the bacteria were isolated from all specimens according to standard microbiology methods in the Teaching Laboratories/ Medical City. Then identification of all bacterial species under study was done by Vitek-II system from Bio-Merieux Company/ France, by using ID-GNB cards for Gram-negative species identification and Identification–Gram positive Bacteria (ID-GPB) cards.

Antimicrobial Susceptibility Test

Antimicrobial susceptibility test was done to all bacterial species under study toward different types of antimicrobial agents by Vitek-II compact system, with cards for antibiotic sensitivity test (AST) for both Gram–negative and Gram-positive species according to instructions of the manufacturer in Teaching Laboratories/ Medical City.

Results and discussion

Collection and isolation of bacterial isolates

Through a whole year (form the first of January, 2021 to the end of December, 2021), 212 body fluids specimens were reached to the Teaching Laboratories/ Medical City for culture and sensitivity. Bacterial isolates were isolated according to standard microbiology methods, then bacteria were identified by Vitek-II compact system.

Numbers and percentages of body fluids specimens

In this study, 212 different body fluid specimens (synovial, pleural, ascetic, CSF, seminal, peritoneal, BAL, nasal and bronchial fluids) were collected from both sexes and all ages, and out of these 212 body fluids specimens, the highest percentage was from ascitic fluid 72(33.96%) while the lowest percentage was from nasal fluid 2(0.94%) and others body fluids were found in different percentages including; Synovial fluid 38(17.92%), Plueral fluid 53(25%), CSF fluid 14(6.61%), Seminal fluid 20(9.43%), Peritoneal fluid 6(2.83%) , BAL fluid 3(1.42%) and Bronchial wash fluid 4(1.89%) as shown in Figure (1).

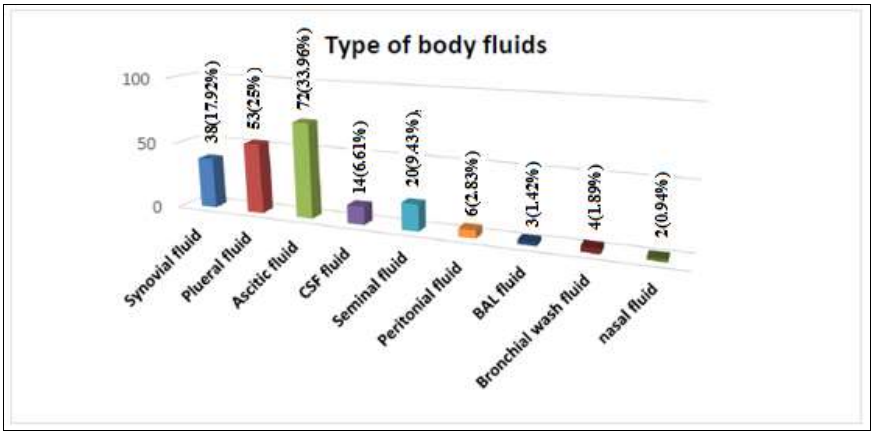

Figure (1): Types and Numbers body fluid specimens.

Growth of bacterial isolates

Out of 212 body fluids specimens collected, 81 (38.21%) of specimens showed positive bacterial growth, while 131 (61.79%) of specimens showed negative bacterial growth.

Identification of bacterial isolates

Out of 81 positive bacterial growth, 51(63%) of the bacteria were Gram-positive and 30(37%) of the bacteria were Gram-negative.

Bacterial species isolated during this study

Gram positive bacteria

Out of the 51 isolates of the gram positive bacteria there were *Staphylococcus epidermidis* 9 (17.65%), *Staph. hominis ssp hominis* 8 (15.68%), *Enterococcus faecalis* 6 (11.76%), *Staphylococcus lentus* 6 (11.76%), *Staphylococcus heamolyticus* 5 (9.80%), *Staphylococcus aureus* 4 (7.84%), *Streptococcus salivarius ssp salivarius* 2 (3.92%), *Streptococcus pneumonia* 1 (1.96%), *Enterococcus faecium* 1 (1.96%), *Streptococcus thoraltensis* 1(1.96%), *Streptococcus thoraltensis* 1(1.96%), *Staphylococcus warneri* 1 (1.96%), *Staphylococcus sciuri* 1 (1.96%), *Staphylococcus xylosus* 1 (1.96%), *Staphylococcus pseudintermedius* 1 (1.96%), *Staphylococcus chromogenes* 1 (1.96%), *Staphylococcus lugdunensis* 1 (1.96%), *and Staphylococcus ssp.* 1 (1.96%) as shown in Figure (2).

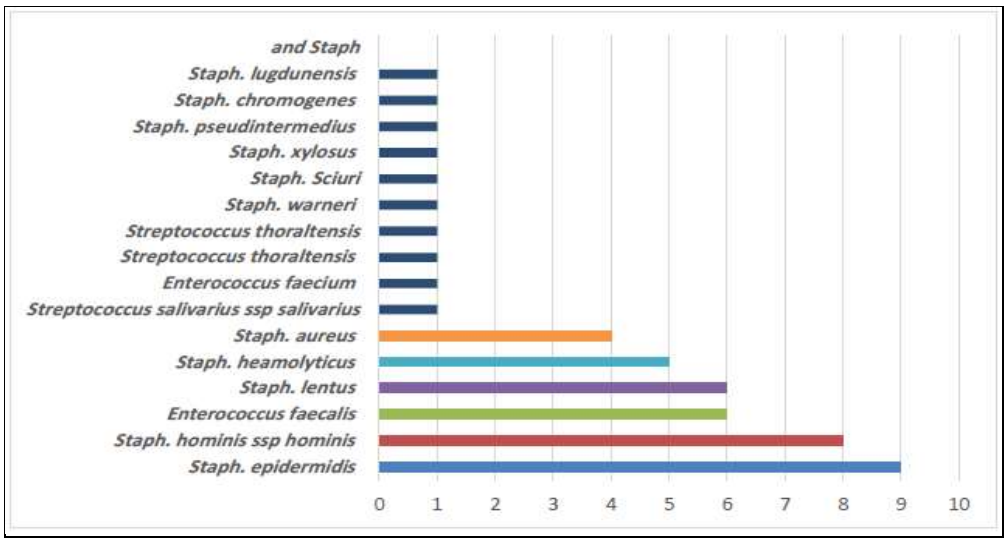

Figure (2): The number of Gram positive species isolates from body fluids specimens during the study.

Gram negative bacteria

Out of the 30 gram negative isolates, there were 7(23.33%) isolates of *Burkholderia capacia,* 5(16.67%) isolate of *Escherichia coli*, 4(10%) isolate of *Acinetobacter baumannii complex,* 3(13.33%) isolate of *Klebsiella pneumoniae ssp pneumoniae,* 1(3.33%) isolate of *Pseudomonas fluorescens,* 1(3.33%) isolate of *Pseudomonas stutzeri*, 1(3.33%) isolate of *Pseudomonas olevorans* , 1(3.33%) isolate of *Globicalella sangainis*, 1(3.33%) isolate of *Salmonella enterica ssp enterica*, 1(5.263%) isolate of *Acinetobacter baumannii,* 1(3.33%) isolate of *Enterobacter aerogenes,* 1(3.33%) isolate of *Enterobacter cloacae ssp dissolevns*, 1(3.33%) isolate of *Serratia plymuthica*, 1(3.33%) isolate of *salmonella* group 1(3.33%) isolate of *pantoea ssp*. and 1(3.33%) isolate of *Listeria* ssp. as shown below in Figure (3).

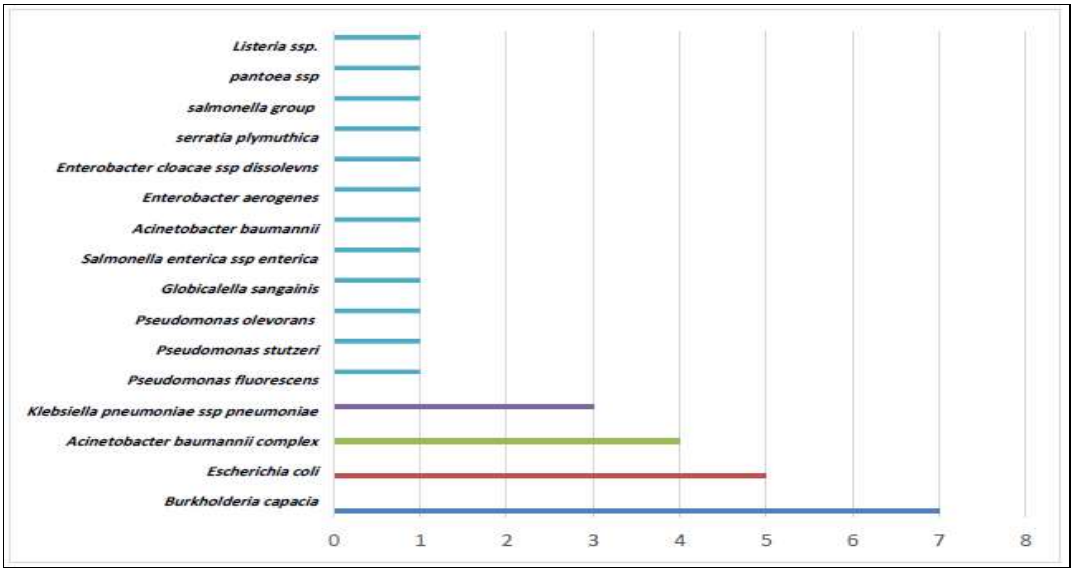

Figure (3): The number of Gram negative species isolates from body fluids specimens during the study.

Antimicrobial susceptibility test for Gram negative bacteria

1. Antimicrobial susceptibility test for Burkholderia capacia isolates

The antimicrobial susceptibility test was done to all Burkholderia capacia isolates under study and the isolates showed that the highest resistance among the used antimicrobial agents was against Ampicillin, Axtreonam and Piperacillin (100% resistant) and the lowest resistance was against Meropenem (100% sensitive) as listed in table (1).

Table (1): Antimicrobial susceptibility results of *Burkholderia capacia* isolates.

Isolate No.	AMP	PIT	CAZ	FEP	ATM	IMP	MEM	AK	GN	TA	CIP
1	R	R	S	R	R	R	S	R	R	R	R
2	R	R	I	I	R	S	S	S	S	S	S
3	R	R	S	S	R	I	S	S	S	S	S
4	R	R	S	R	R	R	S	R	R	R	R
5	R	R	S	S	R	S	S	S	S	S	S
6	R	R	I	R	R	R	S	R	R	R	R
7	R	R	S	R	R	R	S	R	R	R	R

R=Resistant I=Intremediate S=Sensitive
ATM=Axtreonam, GN=Gentamicin, IMP=Imipenem, CAZ=Ceftazidime, FEP=Cefepime, PIT=Piperacillin, MEM=Meropenem, AK=Amicacin, TA=Tobramycin, CIP=Ciprofloxacin, AMP=Ampicillin.

2. Antimicrobial susceptibility test for *Escherichia coli* isolates

Antimicrobial susceptibility test was done to all *E. coli* isolates under study and the isolates showed that the highest resistance rate among the used antimicrobial agents was against Ampicillin, Cefazolin and Ceftriaxone (100% resistant) and the lowest resistance rate was against Imipenem and meropenem (100% sensitive) as listed in Table (2).

Table (2): Antimicrobial susceptibility results of *Escherichia coli* isolates.

Isolate No.	AMP	PIT	CZ	CAZ	CRO	FEP	IMP	MEM	AK	GN	CIP
1	R	R	R	R	R	S	S	S	S	R	R
2	R	S	R	R	R	R	S	S	I	S	R
3	R	S	R	R	R	S	S	S	S	S	R
4	R	R	R	R	R	R	S	S	I	R	R
5	R	S	R	R	R	R	S	S	S	S	R

R=Resistant I=Intremediate S=Sensitive
AMP=Ampicillin, AK=Amikacin, PIT=Piperacillin, CZ=cefazolin, FEP=cefepime, GN=Gentamicin, CAZ=Ceftazidime, CRO=Ceftriaxone, IMP=Imipenem, CIP=Ciprofloxacin

3. Antimicrobial susceptibility test for *Acinetobacter baumannii* isolates

The antimicrobial susceptibility test was done to *Acinetobacter baumannii* isolates under study and the result showed that the 2 *Acinetobacter baumannii* isolates were resist to all antimicrobial agents under study (multi drug resistant isolates), while other 2 *Acinetobacter baumannii* complex isolates showed variable resistance rates to the antimicrobial agents as listed in Table (3).

Table (3): Antimicrobial susceptibility results of *Acinetobacter baumannii* isolates.

Isolate No.	SP	AMP	PIT	CTX	CAZ	FEP	IMP	MEM	TMP	GN	CIP
1	*A. baumannii*	R	R	R	R	R	I	I	R	R	R
2	*A. baumannii complex*	R	R	R	R	I	S	S	S	R	R
3	*A. baumannii complex*	R	R	S	R	S	I	S	S	R	I
4	*A. baumannii*	R	R	R	R	R	R	R	R	R	R

R=Resistant I=Intremediate
S=Sensitive CTX=Cefotaxime, CIP=Ciprofloxacin, AMP=Ampicillin, MEM=Meropenem, PIT=Piperacillin, IMP=Imipenem, CAZ=Ceftazidime, FEP=Cefepime, GN=Gentamicin, TMP=Trimethoprim

4. Antimicrobial susceptibility test for *Salmonella* species

Antimicrobial susceptibility test was done to *Salmonella* isolates under study and the result showed that *S. entrica* isolate was resist to all antimicrobial agents under study (multi drug resistant isolate), while *S. group* isolate was sensitive to all antimicrobial agents except Ampicillin under study as listed in Table (4).

Table (4): Antimicrobial susceptibility results of *Salmonella* isolates.

Isolate No.	Sp.	AMP	PIT	CTX	CAZ	FEP	ERP	IMP	AK	GN	CIP
1	*S. group*	R	S	S	S	S	S	S	S	S	S
2	*S. entrica*	R	R	R	R	R	R	R	R	R	R

R=Resistant S=Sensitive
AK=Amikacin, AMP=Ampicillin, CAZ=Ceftazidime, PIT=Piperacillin, GN=Gentamicin, CTX=Cefotaxime, ERP= Ertapenem, IMP=Imipenem, FEP=Cefepime, CIP=Ciprofloxacin

5. Antimicrobial susceptibility test for *Pseudomonas* isolates

Antimicrobial susceptibility test was done to *Pseudomonas* species under study and the result showed that *Pseudomonas* species (*P. olevorans*, *P. stutzeri* and *P. fluorescens*) showed variable resistance rates to the antimicrobial agents under the study as shown in Table (5).

Table (5): Antimicrobial susceptibility results of *Pseudomonas* isolates.

Isolate No.	Sp.	AMP	TIC	PIT	CAZ	FEP	IMP	MEM	AK	GN
1	*P. olevorans*	R	S	S	R	S	S	S	S	S
2	*P. stutzeri*	R	S	S	R	S	S	S	S	S
3	*P. fluorescens*	R	R	R	R	R	S	S	S	R

R=Resistant S=Sensitive
AMP=Ampicillin, MEM=Meropenem, AK=Amikacin, FEP=Cefepime TIC=Ticarcillin, PIT=Piperacillin, CAZ=Ceftazidime, IMP=Imipenem, GN=Gentamicine

6. Antimicrobial susceptibility test for *Klebsiella pneumoniea* ssp. *pneumoniae* isolates

The antimicrobial susceptibility test was done to *Klebsiella pneumoniea* ssp. *pneumoniae* isolates under study and the result showed that *Klebsiella pneumoniea* ssp. *pneumoniae* isolates were resist to all antimicrobial agents under study (100% resistant), from

these results noticed that *Klebsiella pneumoniea* ssp. *pneumoniae* isolates under study were multi drug resistant as listed in table-6. From this table notice that *Klebsiella pneumoniea* ssp. *pneumoniae* isolates were the most resistant isolates of Gram negative isolates.

Table (6): Antimicrobial susceptibility results of *Klebsiella pneumoniea* ssp. *Pneumoniae* isolates.

Isolate No.	SP.	AMP	PIT	FEP	CAZ	CTX	CIP	GN	IMP	MEM	AK
1	*K. pneumoniae*	R	R	R	R	R	R	R	R	R	R
2	*K. pneumoniae*	R	R	R	R	R	R	R	R	R	R
3	*K. pneumoniae*	R	R	R	R	R	R	R	R	R	R

R=Resistant
AMP=Ampicillin, PIT=Piperacillin/Tazobacter, FEP=Cefepime, CAZ=Ceftazidime, CTX=Cefotaxine, CIP=Ciprofioxacin, IMP=Impipenem, MEN=Meropenem, AK=Amikacin, GN=Getamicin.

7. Antimicrobial susceptibility test for *Enterobacter* isolates

The antimicrobial susceptibility test was done to *Enterobacter* isolates under study and the result showed that *Entereobacter cloacae* isolate was resist to all antimicrobial agents under study (100%) (Multi drug resistant isolate), while *Enterobacter aerogenes* isolate showed variable resistance results to the antimicrobial agents under the study as listed in Table (7).

Table (7): Antimicrobial susceptibility results of *Enterobacter* isolates.

Isolate No.	Sp.	ERP	AMP	PIT	CTX	CAZ	FEP	IMP	MEM	AK	GN	CIP
1	*E. aerogenes*	S	R	R	R	R	S	S	S	S	R	R
2	*E. cloacae*	S	R	R	R	R	R	R	R	R	R	R

S=Sensitive R=Resistant
AMP=Ampicillin, AK=Amikacin, ERP=Ertapenem, GN=Gentamicin, IMP=Imipenem, PIT=Piperacillin, CTX=Cefotaxime, CAZ=Ceftazidime, FEP=Cefepime, MEM=Meropenem, CIP=Ciprofioxacin

Antimicrobial susceptibility test for Gram positive bacteria

1. Antimicrobial susceptibility test for different *Staphylococcus* species isolates

The antimicrobial susceptibility test was done to all *S. epidermidis* isolates under study, from results found that all isolates of *S. epidermidis* were resist to the Erythromycin (100% resistant). On the other hand all isolates were sensitive to Linezolid and Tigecycline (100% sensitive) as shown in Table-8. Also from Table-8, the results showed that all isolates of *S. hominis* were resist to Erythromycin (100% resistant), while all *S. hominis* were sensitive to Vancomycin, Linezolid and Tigecycline (100% sensitive). The results of antimicrobial susceptibility test for all *S. haemolyticus* isolates under study found that all isolates of *S. haemolyticus* were resist to Erythromycin (100% resistant),.while all *S. haemolyticus* were sensitive to Vancomycin, Linezolid and Tigecycline (100% sensitive). Also the antimicrobial susceptibility test done to all *Staphylococcus* species (five isolates of *S. lentus* and one isolate for each of the *S. Warneri*, *S. Sciuri*, *S. Xylosus* and *S. Chromogenes*) under study and the result showed that all those species were sensitive to Linezolid and

Tigecycline (100% sensitive) as in Table-8. From Table-8, notice that all *S. aureus* (4 isolates) under study were multidrug resistant isolates that were resist to most antimicrobial agents under study, noticed from results all isolates of *S. aureus* were resist (100% resist) to the Trimethoprim, Ciprofloxacin, Gentamicin, Erythromycin, Clindamycin and Tetracycline, while all isolates were sensitive to Tigecycline (100% sensitive) as listed in table-8. From the results Tigecycline the effective antibiotic against multi-drug resistant *S. aureus* isolates and other species of *Staphylococcus* isolated during this study.

Table (8): Antimicrobial susceptibility results of *Staphylococcus* species isolates.

Isolates No.	TMP	VA	GN	CIP	MEM	E	CL	LIN	TE	TGC
S. epidermidis 1	S	S	S	S	S	R	S	S	S	S
S. epidermidis 2	S	S	S	S	S	R	S	S	S	S
S. epidermidis 3	S	S	S	S	S	R	S	S	R	S
S. epidermidis 4	S	R	S	S	S	R	R	S	S	S
S. epidermidis 5	S	S	S	S	S	R	S	S	R	S
S. epidermidis 6	R	S	S	S	S	R	S	S	S	S
S. epidermidis 7	S	R	R	R	I	R	S	S	R	S
S. epidermidis 8	R	S	R	R	I	R	R	S	R	S
S. epidermidis 9	R	S	S	S	S	R	S	S	S	S
S. hominis 1	R	S	R	R	R	R	R	S	R	S
S. hominis 2	R	S	S	S	S	R	S	S	S	S
S. hominis 3	S	S	R	S	S	R	R	S	R	S
S. hominis 4	S	S	R	S	S	R	R	S	R	S
S. hominis 5	R	S	S	S	S	R	S	S	S	S
S. hominis 6	R	S	S	S	S	R	S	S	S	S
S. hominis 7	S	S	R	S	S	R	R	S	R	S
S. hominis 8	R	S	R	R	R	R	R	S	R	S
S. haemolyticus 1	R	S	R	S	R	R	S	S	R	S
S. haemolyticus 2	S	S	R	R	I	R	S	S	R	S
S. haemolyticus 3	S	S	R	S	S	R	S	S	R	S
S. haemolyticus 4	S	S	S	S	S	R	R	S	R	S
S. haemolyticus 5	S	S	S	S	S	R	R	S	R	S
S. warneri	R	S	R	R	R	R	S	S	R	S
S. lentus 1	S	S	R	S	S	R	S	S	S	S
S. lentus 2	S	I	R	S	S	R	R	S	S	S
S. sciuri	S	S	S	S	I	R	S	S	S	S
S. xylosus	S	S	S	S	S	R	S	S	S	S
S. chromogenes	R	R	I	R	R	R	R	S	R	S
S. lentus 3	S	I	R	S	S	R	R	S	S	S
S. lentus 4	R	I	R	S	S	R	R	S	S	S
S. lentus 5	R	I	R	R	S	R	R	S	S	S
S. aureus 1	R	R	R	R	R	R	R	R	R	S
S. aureus 2	R	S	R	R	S	R	R	S	R	S
S. aureus 3	R	S	R	R	I	R	R	S	R	S
S. aureus 4	R	I	R	R	S	R	R	S	R	S

R=Resistant S=Sensitive I=Intermediate
TMP=Trimethoprim, VA=Vancomycin, CIP=Ciprofloxacin, GN=Gentamicin, MEM=Moxifloxacin, E=Erythromycin, CL=Clindamycin, LIN=Linezolid, TE=Tetracycline, TGC= Tigecycline.

2. Antimicrobial susceptibility test for *Enterococcus* isolates

The antimicrobial susceptibility test was done to all *Enterococcus* species (one isolate of *E. faecium* and six isolates of *E. Faecalis*) under study and the result showed that all *Enterococcus* species were resist to Erythromycin and Tetracycline (100% resistant), and all isolates were sensitive to Linezolid and Tigecycline (100% sensitive) as listed in table (9).

Table (9): Antimicrobial susceptibility results of *Enterococcus* isolates.

Isolate No.	Sp.	VA	TPN	NOR	CIP	LEV	E	LIN	TE	TGC	NIF
1	*E. faecium*	S	R	R	R	R	R	S	R	S	R
2	*E. faecalis*	S	S	S	S	I	R	S	R	S	S
3	*E. faecalis*	R	R	R	R	R	R	S	R	S	R
4	*E. faecalis*	S	S	R	I	S	R	S	R	S	S
5	*E. faecalis*	S	S	R	R	R	R	S	R	S	S
6	*E. faecalis*	S	S	S	R	R	R	S	R	S	R
7	*E. faecalis*	S	S	S	S	S	R	S	R	S	I

R=Resistant S=Sensitive I=Intermediate
TPN=Teicoplanin, VA=Vancomycin, LEV=Levofloxacin, E=Erythromycin, LIN=Linezolid, TE=Tetracycline, TGC=Tigecycline, NIF=Nitrofurantion, NOR=Norfioxacin

3. Antimicrobial susceptibility test for other *Streptococcus* species

The antimicrobial susceptibility test was done to all *Streptococcus* species (two isolates for each of *S. salivarins* and *S. thoraltensis*, and one isolate of *S. pneumoniae*) under study and the result showed that all *Streptococcus* species were resist to Erythromycin and Penicillin (100% resistant), sensitive to Linezolid, Vancomycin and Tigecycline (100% sensitive) as listed in Table (10).

Table (10): Antimicrobial susceptibility results of *Streptococcus* species.

Isolate No.	Sp.	CL	CRO	E	LIN	P	TGC	VA	CTX	LEV
1	*S. pneumoniae*	S	S	R	S	R	S	S	R	S
2	*S. salivarins*	S	R	R	S	R	S	S	R	S
3	*S. thoraltensis*	S	R	R	S	R	S	S	R	R
4	*S. thoraltensis*	R	S	R	S	R	S	S	R	S
5	*S. salivarins*	R	S	R	S	R	S	S	R	R

R=Resistant S=Sensitive
CI=Clindanycin, CRO=Ceftriaxon, P=Penicillin,VA=Vancomycin, LIN=Linezolid, LEV=Levofloxacin, CTX=Cefotaxime, TGC=Tigecycline, E=Erythromycin.

The overall prevalence of bacterial infections (pathogens) in present study was 38.21%, which is consistent with findings of other studies from Turkey (25%) (11) and India (36%) (12). On the other hand, it is greater than previous research Ethiopia (11.5%) (13), and Nepal (10.7%) (14), these discrepancies can be linked to changes in laboratory procedures, sample processing methods, and infection control practices (15). Gram positive bacteria accounted for 63% of the bacteria that were recovered in this investigation, and this finding comparable with other studies conducted in Turkey (12), and from India (16,17) which reported that gram-positive bacteria were found to be the most common isolates. In contrast,

other studies from India (71%) (13), and Ethiopia (74.6%) (13), revealed that the most prevalent isolates were gram-positive bacteria, and revealed that gram-negative bacteria were the most often isolated types. This discrepancy might be caused by various hospital-acquired diseases and variations in recommended infection control measures (18,19).

The most common bacterial species isolated and responsible for sterile body infections in this study were *Staphylococcus epidermidis* 9(17.65%), followed by *Staphylococcus hominis* ssp *hominis* 8(15.68%) out of those 51 Gram positive isolates. *Burkholderia capacia* isolates 7(23.33%) followed by *Escherichia coli* 5(16.67%) were the most common Gram negative isolates. These results differed from other studies conducted in India (13), which found that *K. pneumoniae* isolates were the most frequently isolated bacterial species.

Imipenem and meropenem were discovered to be the most efficient antibiotics against those gram-negative bacteria in this investigation, as all of the gram-negative isolates exhibited multi-drug resistance and resistance to all of the antimicrobial drugs utilized. Conversely, the least effective antibiotics against those gram-negative agents were beta-lactam drugs like ampicillin and cephalosporins. This finding is agreement with studies from Indian (13). On the other side, Tigecycline had the highest sensitivity rate, followed by Linezolid and Vancomycin, while Erythromycin had the highest resistance rate in gram-positive isolates (100%). The widespread and excessive use of these antibiotics, their accessibility, the practice of self-medication, the scarcity of diagnostic facilities, and the improper administration of antibiotic are all associated with the elevated of beta-lactam drug resistance (20,21). Furthermore, antibiotic resistance can develop spontaneously as result of degradation enzymes, drug-binding site modifications, efflux pumps, and membrane permeability (20). The harboring of intrinsic determinants of bacterial resistance are not the main serious problem. Instead, in hospitals, the acquired resistance in the populations of bacteria which it originally susceptible to the antibiotics, the increasing in the develops of acquired resistance can be as a result of mutations in the chromosomal genes or from acquisition of external genetic agents for resistance, can be obtained from bacteria which intrinsically resistant to antibiotics that present in the environment (22).

Conclusion

Among body fluid infections, it was found a higher prevalence of Gram-positive bacteria, with *Staphylococcus epidermidis* being the most common, while *Burkholderia cepacia* was the predominant Gram-negative isolate. Multidrug resistance was observed in *Klebsiella pneumoniae*, *Salmonella enterica*, and *Acinetobacter baumannii*, resisting all tested antibiotics. Effective infection control and antibiotic stewardship are crucial to combat rising resistance.

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