Results

This study comprised 50 cases of nosocomial infection from different body sites.

Table (12) summarizes the nature of samples taken for this study & the morphology resistance/susceptibility patterns of inducible *β*-lactamases as detected by disk approximation technique.

Table (13) indicates the identification of isolated strains in this study, and morphological resistance/susceptibility patterns of inducible *β*-lactamases as detected by disk approximation technique. The most frequent producer of this type of resistance were *Morganella* (100 %), *Providencia,* (100 %), *Proteus vulgaris* (100 %), *Serratia* (83 %), *Enterobacter* (77 %), *Citrobacter (*75 %*), and Pseudomonas* (75 %*) &* the least producer of this type were *Klebsiella & E. coli*, (% respectively).

Table (14) shows the overall susceptiblity results detected by disk approximation technique. 70 % (No 35). of isolated strains showed resistance morphology types (C & D), & while 30 % (No 15) of isolated strains showed susceptible morphologies (absence of inducible *β*-lactamases; (S & S*l* types)

Table (12)

Types of samples and susceptibility results regarding inducible *β*-lactamase by disk approximation

Samples	***Total number***	***Susceptible***	***Percentage (%)***	***Resistant***	***Percentage (%)***
Urine	16	5	31%	11	69%
Sputum	8	1	12%	7	88%
Wound and Burn infection	9	5	55%	4	45%
Blood culture	14	3	21%	11	79%
CSF	1	0	0	1	100%
BAL	2	1	50%	1	50%

This table shows distribution of samples & susceptibility results regarding inducible β-lactamase .

There were 16 urine samples, 8 sputum samples, 9 superficial skin infection, 14 blood cultures, 1 CSF samples, & 1 Broncho-Alveolar Lavage samples.

Expression of inducible β-lactamase phenotype among different clinical varied from 45% to 100%.

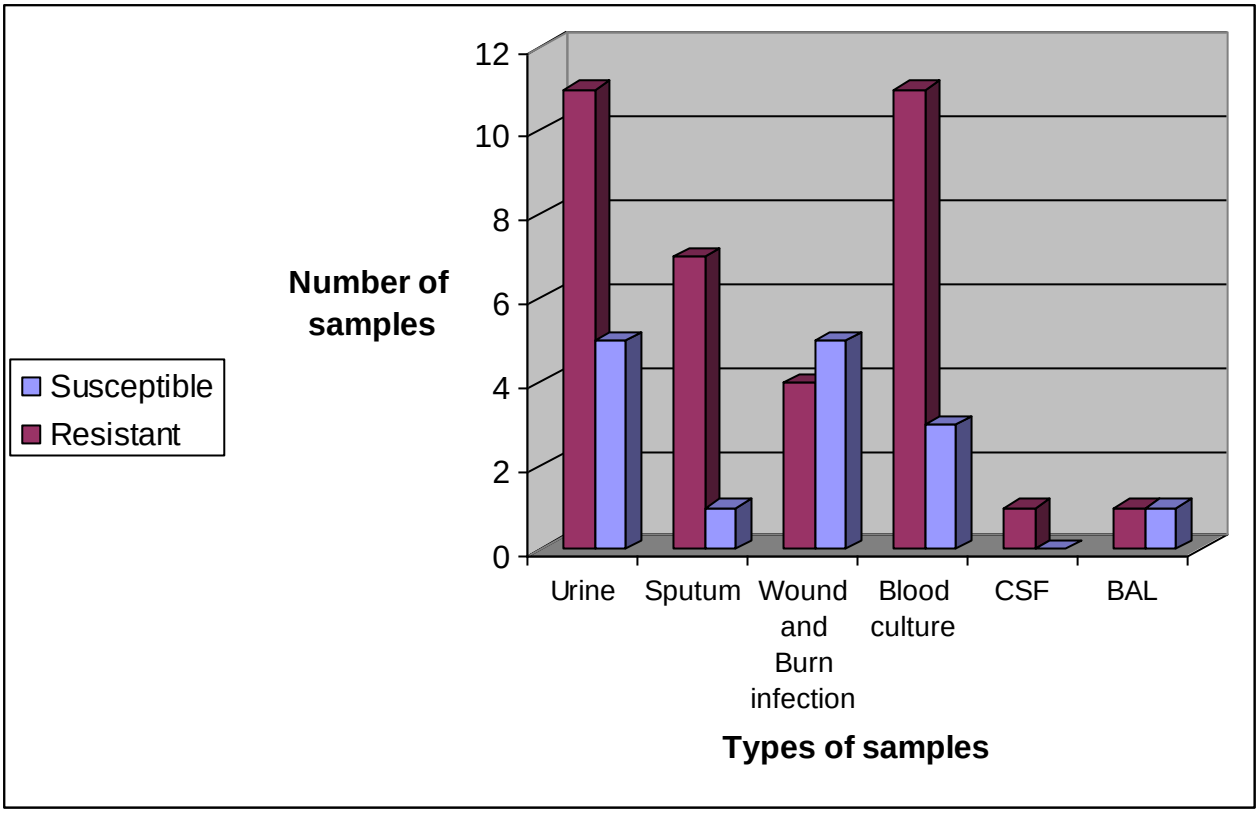


Fig. (3) Types of samples and susceptibility results regarding inducible *β*-lactamase by disk approximation.

This figure shows types of samples and susceptibility results regarding inducible β- lactamase by disk approximation.

Table (13)

Types of the deformity (disk approximation) of microorganism in urine samples.

No.	Type of microorganism	Deformity of disk approximation
1	*E. coli*	D-type
2	*Citrobacter*	S-type
3	*Pseudomonas*	D-type
4	*Enterobacter*	C-type
5	*Enterobacter*	C-type
6	*Proteus mirabilis*	D-type
7	*Enterobacter*	S-type
8	*Providencia*	D- type
9	*Serratia*	S- type
10	*Enterobacter*	D- type
11	*Citrobacter*	D- type
12	*Pseudomonas*	C- type
13	*Klebsiella*	S- type
14	*Enterobacter*	D- type
15	*Citrobacter*	C- type
16	*Morganella*	S- type

This table shows the bacteria species and the type of deformity (Disk approximation) in the 16 urine samples that collected, 11 (69%) were resistant (showed type D& C deformity) and 5 (31%) were susceptible (showed type S deformity).

Table (14)

Types of the deformity (disk approximation) of microorganism in sputum samples.

No.	Type of microorganism	Deformity of disk approximation
1	*Pseudomonas*	**C-** type
2	*Proteus vulgaris*	**D-** type
3	*Serratia*	**C-** type
4	*Pseudomonas*	**C-** type
5	*E. coli*	**SL-** type
6	*Pseudomonas*	**C-** type
7	*Serratia*	**D-** type
8	*E. coli*	**C-** type

This table shows the bacteria species and the type of deformity (Disk approximation) in the 8 sputum samples that collected, 7 (88%) were resistant (showed type D& C deformity) and 1 (12%) were susceptible (showed type S deformity).

Table (15)

Types of the deformity (disk approximation) of microorganism in wound burn infection samples.

No.	Type of microorganism	Deformity of disk approximation
1	*Citrobacter*	D-type
2	*Pseudomonas*	S-type
3	*Providencia*	D-type
4	*Pseudomonas*	C-type
5	*Enterobacter*	SL-type
6	*Providencia*	D-type
7	*E.coli*	SL-type
8	*Serratia*	D-type
9	*Pseudomonas*	SL-type

This table shows the bacteria species and the type of deformity (Disk approximation) in the 9 wound and burn infection samples that collected, 4 (45%) were resistant (showed type D& C deformity) and 5 (55%) were susceptible (showed type S deformity).

Table (16)

Types of the deformity (disk approximation) of microorganism in blood culture samples.

No.	Type of microorganism	Deformity of disk approximation
1	*Klebsiella*	S-type
2	*Morganella*	D-type
3	*Morganella*	D-type
4	*E.coli*	S-type
5	*Proteus vulgaris*	C-type
6	*Serratia*	D-type
7	*Providencia*	D-type
8	*Morganella*	D-type
9	*Enterobacter*	C-type
10	*Serratia*	D-type
11	*Proteus mirabilis*	D-type
12	*Morganella*	D-type
13	*Enterobacter*	C-type
14	*klebsiella*	S-type

This table shows the bacteria species and the type of deformity (Disk approximation) in the 14 Blood culture samples that collected, 11 (79%) were resistant (showed type D& C deformity) and 3 (21%) were susceptible (showed type S deformity).

Table(17)

Types of the deformity (disk approximation) of microorganism in CSF samples.

No.	Type of microorganism	Deformity of disk approximation
1	*Klebsiella*	C-type

This table shows the bacteria species and the type of deformity (Disk approximation) in the 1 CSF samples that collected, 1 (100%) were resistant (showed type D& C deformity) and 0 (0%) were susceptible (showed type S deformity).

Table (18)

Types of the deformity (disk approximation) of microorganism in BAL samples.

No.	Type of microorganism	Deformity of disk approximation
1	*Klebsiella*	C-type

This table shows the bacteria species and the type of deformity (Disk approximation) in the 1 BAL samples that collected, 1 (100%) were resistant (showed type D& C deformity) and 0 (0%) were susceptible (showed type S deformity).

This (19)

The number of samples .sexual and the type of samples.

No.	*Patient age*	*Patient sex*	*Sample*
1	32 Years	Male	Wound infection
2	50 Years	Male	Sputum
3	35 Years	Male	Urine
4	36 Years	Female	Blood culture
5	25 Years	Male	Burn infection
6	46 Years	Male	Urine
7	52 Years	Male	Urine
8	53 Years	Male	Blood culture
9	36 Years	Female	Burn infection
10	47 Years	Male	Sputum
11	59 Years	Male	BAL
12	65 Years	Male	CSF (postoperative meningitis)
13	45 Years	Male	Urine
14	32 Years	Male	Wound infection
15	63 Years	Female	Blood culture
16	47 Years	Male	Blood culture
17	29 Years	Male	Urine
18	40 Years	Male	BAL
19	58 Years	Female	Blood culture
20	40 Years	Male	Burn infection
21	39 Years	Female	Urine
22	57 Years	Female	Urine
23	39 Years	Male	Blood culture
24	47 Years	Male	Sputum
25	65 Years	Female	Blood culture

No.	*Patient age*	*Patient sex*	*Sample*
26	36 Years	Male	Urine
27	42 Years	Male	Urine
28	37 Years	Female	Sputum
29	52 Years	Male	Blood culture
30	34 Years	Male	Blood culture
31	31 Years	Male	Burn infection
32	28 Years	Male	Burn infection
33	31 Years	Male	Urine
34	48 Years	Female	Sputum
35	35 Years	Male	Urine
36	42 Years	Male	Blood culture
37	57 Years	Male	Blood culture
38	39 Years	Male	Urine
39	29 Years	Female	Wound infection
40	32 Years	Male	Blood culture
41	21 Years	Male	Blood culture
42	41 Years	Female	Sputum
43	32 Years	Male	Burn infection
44	38 Years	Male	Urine
45	25 Years	Female	Blood culture
46	51 Years	Male	Urine
47	40 Years	Male	Urine
48	21 Years	Female	Sputum
49	54 Years	Female	Urine
50	30 Years	Male	Sputum

This table showing the number of 50 samples which isolates from different patient male& female) and the types of samples were collected.

Table (20)

The type of microorganism and the diameter of disk diffusion and the minimal inhibitory concentration and the type of disk approximation.

No.	*Organism*	*Disk diffusion diameter*		*MIC*		*Type of disk approximation*
		CAZ	*CRO*	*CAZ*	*CRO*	
1	*Enterobacter*	18	21	32	64	S*l* -type
2	*Pseudomonas*	18	23	64	128	C-type
3	*E. coli*	21	24	32	265	D-type
4	*Morganella*	20	28	64	128	D-type
5	*Providencia*	18	30	128	64	D-type
6	*Citrobacter*	24	25	64	128	S-type
7	*Pseudomonas*	27	26	32	256	D-type
8	*Morganella*	31	28	128	64	D-type
9	*E. coli*	91	32	64	64	S*l*-type
10	*Proteus vulgaris*	25	29	32	132	D-type
11	*Enterobacter*	23	28	64	256	C-type
12	*Klebsiella*	22	27	128	64	C-type
13	*Enterobacter*	19	26	32	32	C-type
14	*Serratia*	18	18	64	64	D-type
15	*E. coli*	19	21	32	128	S- type
16	*Proteurs vulgaris*	23	27	64	64	S-type
17	*Enterobacter*	28	29	128	128	C-type
18	*Klebsiella*	30	25	64	256	S-type
19	*Serratia*	18	24	64	64	D-type
20	*Pseudomonas*	21	23	32	64	S*l*- type
21	*Enterobacter*	23	22	32	64	D –type
22	*Klebsiella*	25	21	128	256	S-type
23	*Enterobacter*	28	23	128	256	D –type
24	*Serratia*	29	30	64	64	C-type
25	*Klebsiella*	30	25	64	64	S- type

No.	Organism	Disk diffusion diameter		MIC		Type of disk approximation
		CRO	CAZ	CRO	CAZ	
26	*Providencia*	21	28	32	64	D-type
27	*Serratia*	22	29	64	128	S-type
28	*Pseudomonas*	25	21	32	64	C-type
29	*Morganella*	18	21	32	128	D-type
30	*Enterobacter*	23	24	64	256	C-type
31	*Citrobacter*	21	25	64	256	D-type
32	*Pseudomonas*	19	25	32	128	S-type
33	*Enterobacter*	20	21	32	64	D-type
34	*E. coli*	24	23	128	64	S*l*-type
35	*Citrobacter*	21	24	64	128	D- type
36	*Serratia*	18	27	32	128	D-type
37	*Proteus mirabilis*	18	30	64	64	D-type
38	*Pseudomonas*	19	31	32	64	C- type
39	*Providencia*	23	21	64	256	D-type
40	*Enterobacter*	24	22	32	128	C-type
41	*Klebsiella*	25	23	32	64	S- type
42	*Pseudomonas*	18	21	32	64	C- type
43	*Pseudomonas*	18	21	128	128	D-type
44	*Klebsiella*	23	27	64	128	S-type
45	*Morganella*	19	25	32	64	D-type
46	*Enterobacter*	21	30	64	64	D-type
47	*Citrobacter*	25	31	64	128	C-type
48	*Serratia*	27	30	32	128	D-type
49	*Morganella*	18	29	32	64	C-type
50	*E. coli*	18	21	64	64	S*l*-type

This table showing the types of microorganisms which isolates from 50 samples of patients and the diameter of disk approximation in CAZ and CRO by the Standered Kirby Power Disk Diffusion , Minimal inhibitory Concentration in CAZ and CRO and the deformity with the disk approximation in these species.

Table (21)
The total number of patient different between male and female

Patient Age/Y	Total No.	Male	Percentage %	Female	Percentage %
20-25	2	1	50	1	50
25-30	6	4	67	2	33
30-35	7	7	100	0	0
35-40	10	6	67	4	33
40-45	6	5	83	1	17
45-50	6	5	83	1	17
50-55	6	5	83	1	17
55-60	4	2	50	2	50
60-65	1	0	0	1	50
65-70	2	1	50	1	50

This table showing the total number of 50 patients were connected different between males and females.

Table (22)
This table showed the number of Susceptibility microorganisms species and percentage according to the type of samples

Samples	No. of microorganism	Susceptible	Percentage (%)	Resistant	Percentage (%)
Urine	9	4	44%	5	56%
Sputum	5	1	20%	4	80%
Burn & Wound infection	6	2	40%	4	60%
Blood culture	8	4	50%	4	50%
CSF	1	0	0%	1	100%
BAL	1	0	0%	1	100%

This table shows the type of samples, number of microorganism species and number and percentage of susceptibility and resistance.

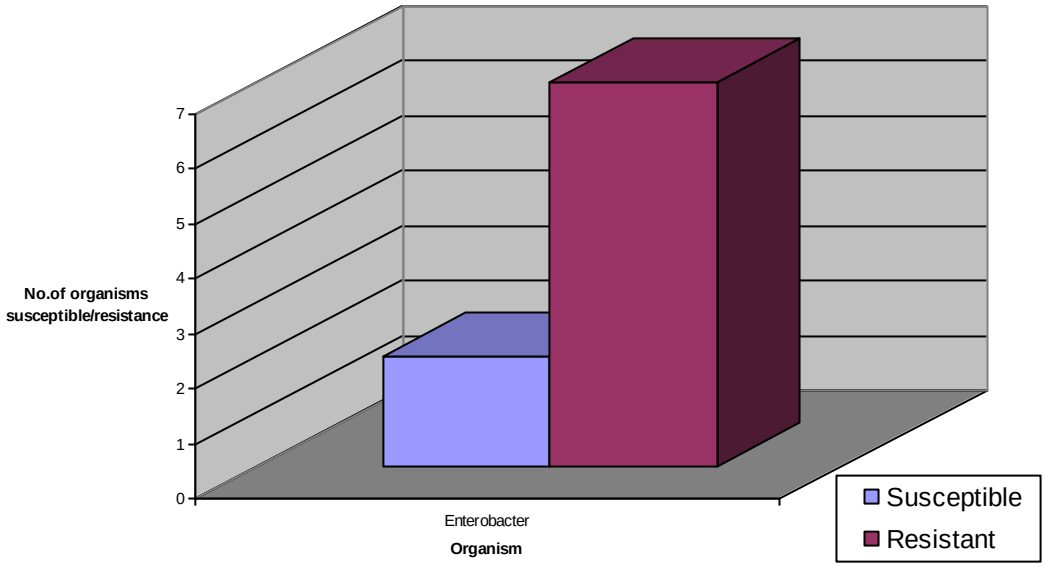
Table (23)

Detection of inducible β- lactamase by disk approximation of isolates according to identification:-

Organism	***Total number***	***susceptible***	***Resistant***
Enterobacter	9	2	7
E.coli	5	4	1
Pseudomonas	8	2	6
Morganella	5	0	5
Providencia	4	0	4
Citrobacter	4	1	3
Proteus vulgaris &Proteus mirabilis	4	1	3
Klebsiella	5	4	1
Serratia	6	1	5

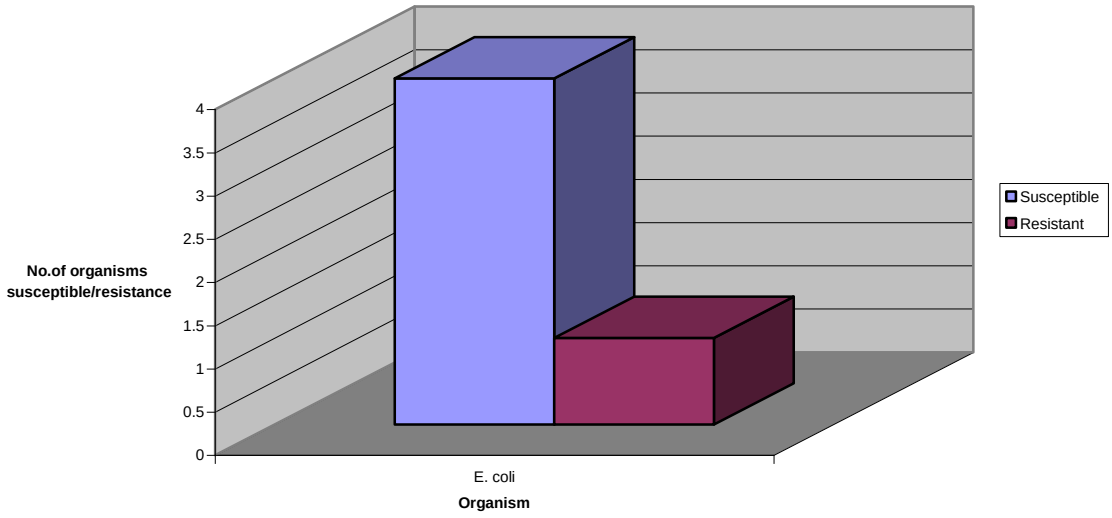
This table shows the detection of inducible β- lactamase disk approximation according to isolate type. It was least expressed in *E. coli* & *Klebsiella*. While it was most expressed in *Morganella* & *Providencia* isolates.

Fig. (4): shows susceptibility/resistance of inducible beta-lactamase for Enterobacter strains.



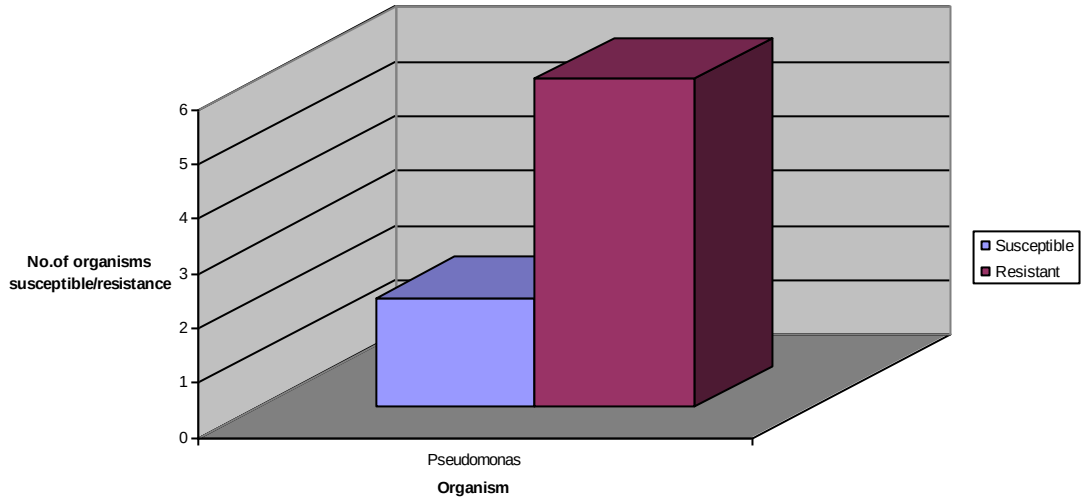
This figure shows susceptibility/ resistance of inducible β- lactamase for Enterobacter.

Fig. (5): shows susceptibility/resistance of inducible beta-lactamase for E. coli strains.



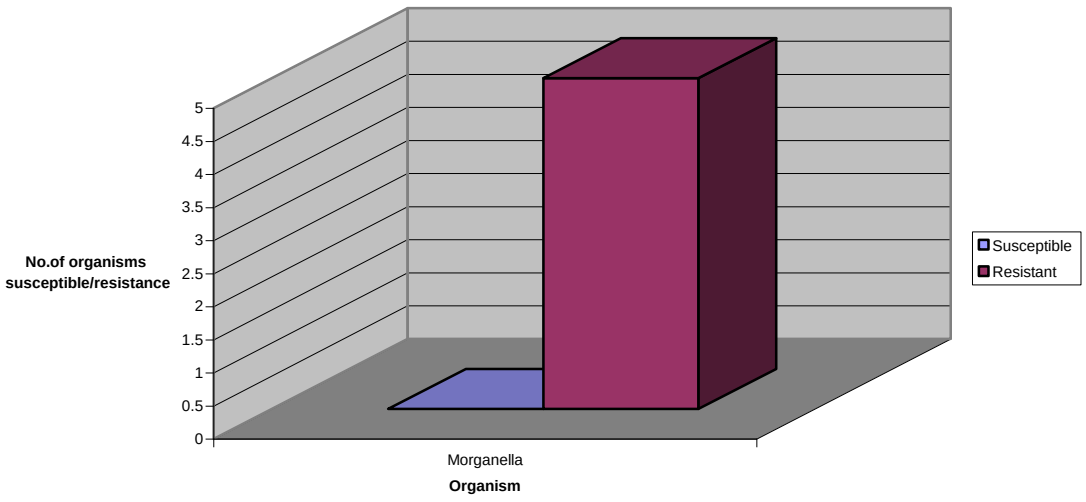
This figure shows susceptibility/ resistance of inducible β- lactamase for E.coli.

Fig. (6): shows susceptibility/resistance of inducible beta-lactamase for Pseudomonas strains.



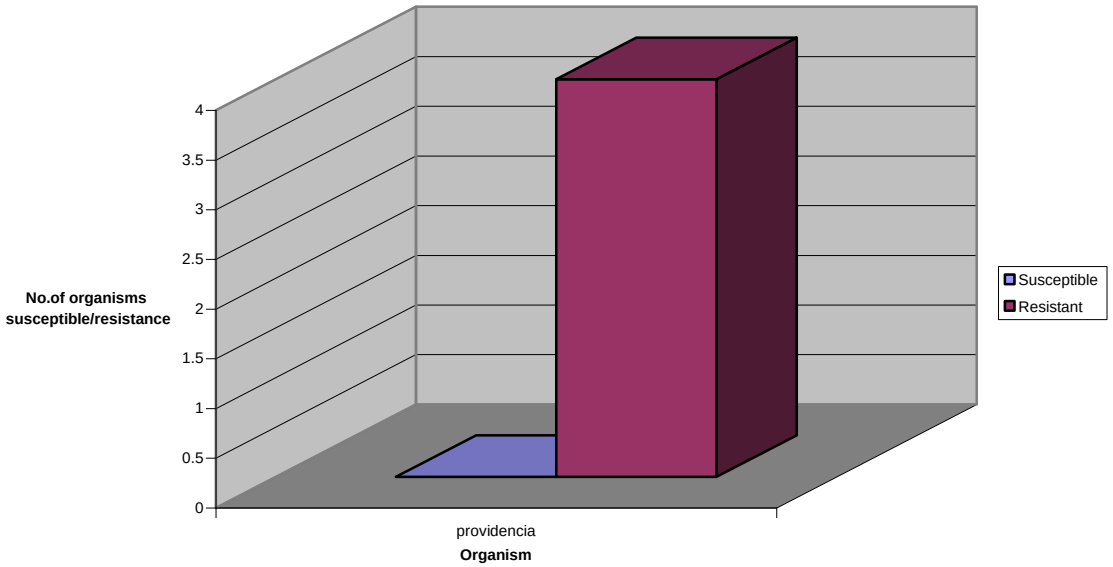
This figure shows susceptibility/ resistance of inducible β- lactamase for Pseudomonas.

Fig. (7): shows susceptibility/resistance of inducible beta-lactamase for Morganella strains.



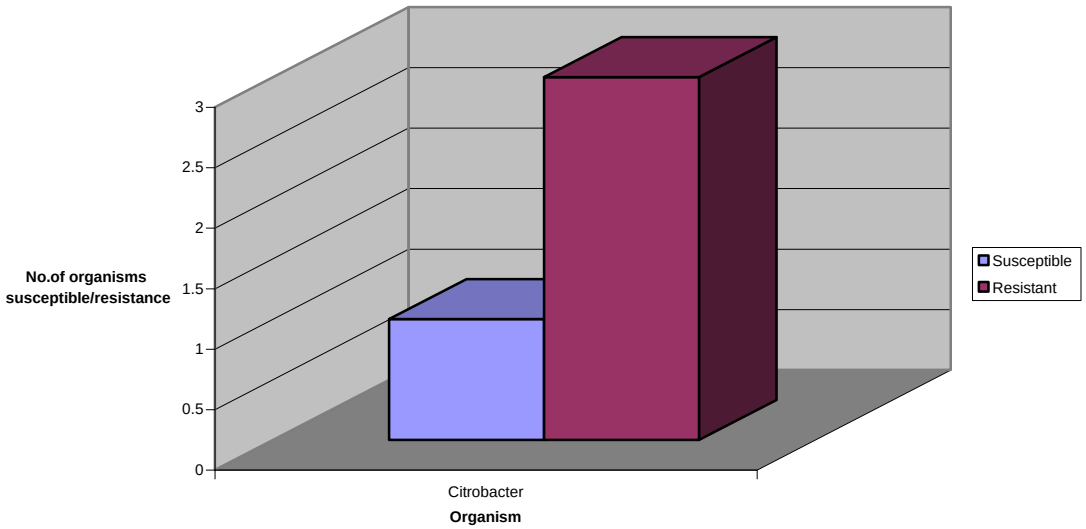
This figure shows susceptibility/ resistance of inducible β- lactamase for Morganella.

Fig. (8): shows susceptibility/resistance of inducible beta-lactamase for Providencia strains.



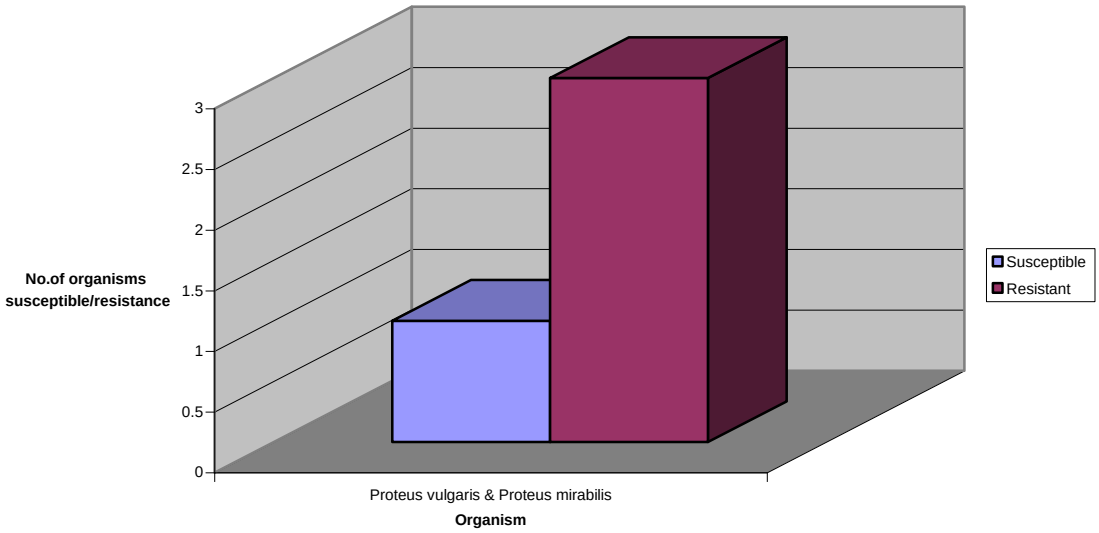
This figure shows susceptibility/ resistance of inducible β- lactamase for Providencia.

Fig. (9): shows susceptibility/resistance of inducible beta-lactamase for Citrobacter strains.



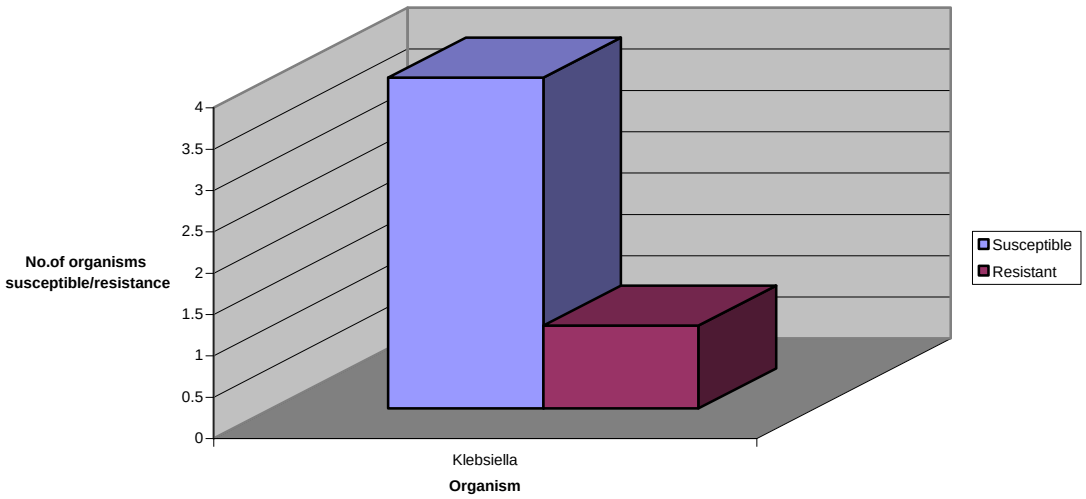
This figure shows susceptibility/ resistance of inducible β- lactamase for Citrobacter.

Fig. (10): shows susceptibility/resistance of inducible beta-lactamase for Proteus vulgaris & Proteus mirabilis strains.



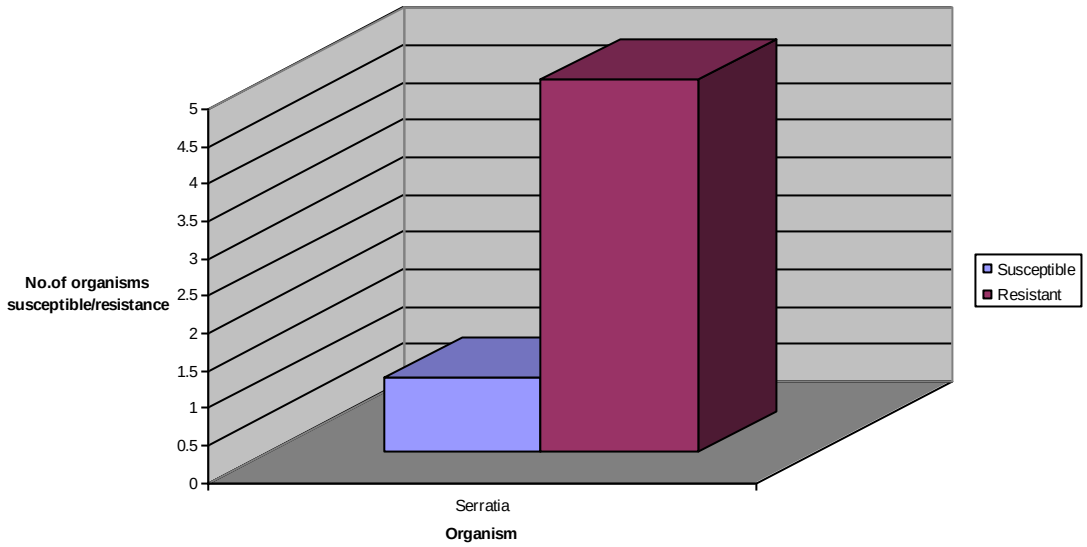
This figure shows susceptibility/ resistance of inducible β- lactamase for Proteus vulgaris & Proteus mirabillis.

Fig. (11): shows susceptibility/resistance of inducible beta-lactamase for Klebseilla strains.



This figure shows susceptibility/ resistance of inducible β- lactamase for Klebsiella.

Fig. (12): shows susceptibility/resistance of inducible beta-lactamase for Serratia strains.



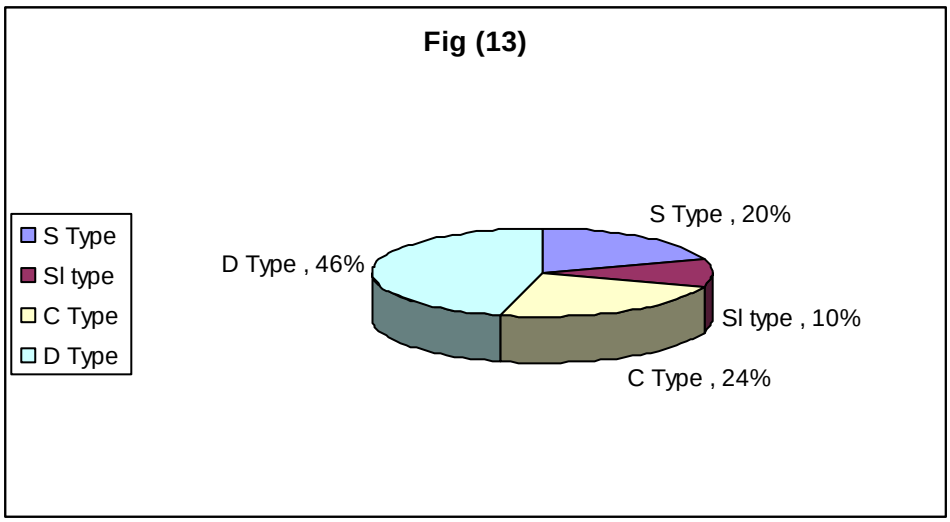
This figure shows susceptibility/ resistance of inducible β- lactamase for Proteus Serratia.

Table (24)
Showing susceptibility to 3 rd generation cephalosporin:-

KBDA zone types around CTX & CAZ	***No. of organism (n=50)***	***Percentage of zone type***	***Susceptible interpretation***
S - type	10	20 %	Susceptible 30%
S*I* – type	5	10 %	
C - type	12	24 %	Resistant (inducible) 76%
D – type	23	46 %	

This table shows 4 different patterns expressing the degree of expression of inducible β- lactamase by disk approximation method. The overall resistance detection (either C & D deformity) was 70 % among all studied cases.

Fig. (13 & 14): Showing susceptibility to 3 rd generation cephalosporin



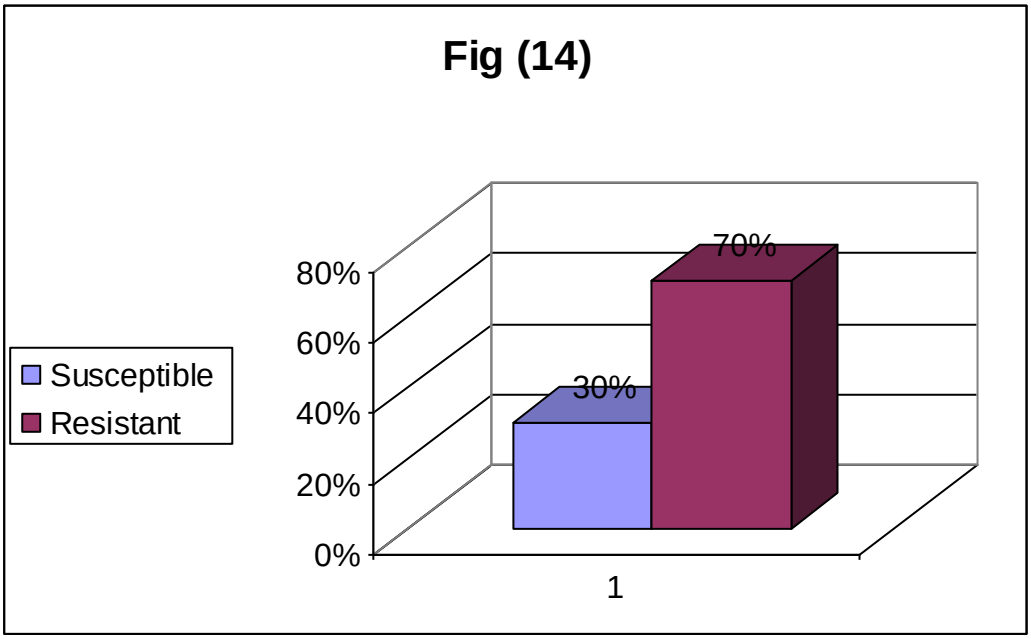
This figure shows the distribution of the 4 morphological results:

S: 20 %

Sl: 10 %

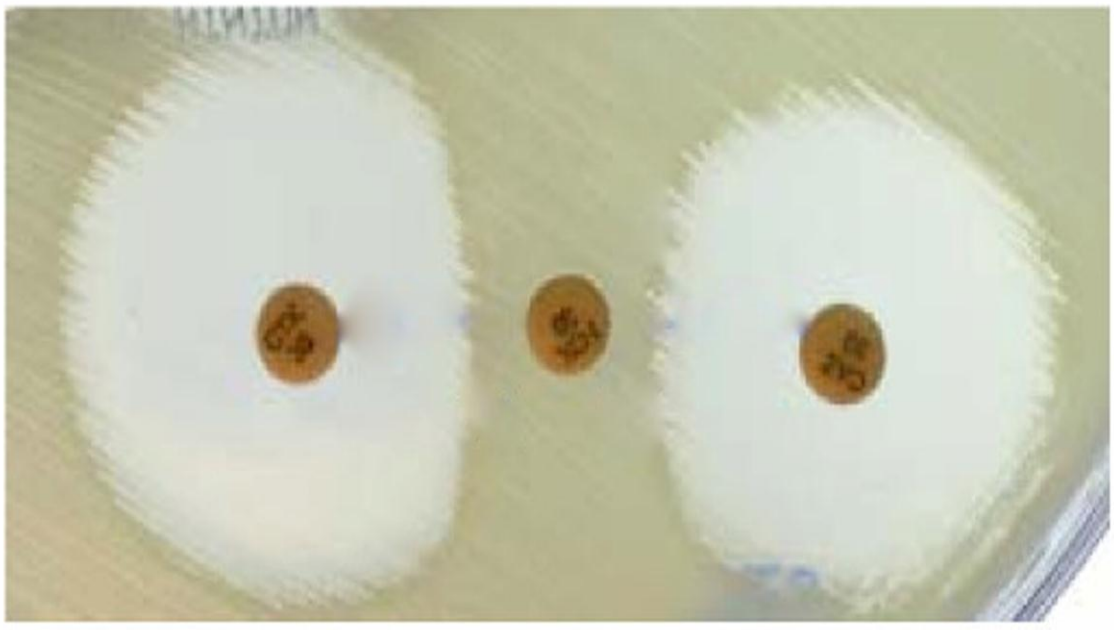
C: 24 %

D: 46 %



This figure shows the overall percentage of inducible β-lactamases among studied cases.

(C – deformity)



(D – deformity)

Two examples of disk approximation to detect inducible β-lactamase to D deformity and C deformity.