Study of *Proteus mirabilis* Infections in Al-Nassiria city

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Abstract:

Two hundred- Ninety seven clinical samples were collected from two hospitals in Al- Nassria city which includes, General Al-Nassiria hospital and Pediatric hospital since June 2005 to April 2006 and found 129 cases was caused by *Proteus mirabilis* as follows: Urinary tract infections 63(48.8%) , bacteremia 45 (34.8%)and wound and burn infections 21(16.2%). The percentage of infections in male was (59%) higher than female (41%).The age distribution varied from one day to seventy years .The peak incidence was between less than ten years(age group -1-) 31(24%) followed by 51-60 years (age group -6-) 29 (22.4%).The most effective antibiotics were chloromphenicol 83.7% and ciprofloxacin 79% followed by norfloxacin ,tobramycin and gentamycin, 75.9 , 75.19 and 73.6% respectively , while this bacterium occurred resistant to amoxicillin 38% , carbenicillin37.3% and cefotaxime 33.4%.In our study 12(9.3%) of *Proteus mirabilis* isolates were multi resistance isolates and β - lactamase producing.

الخلاصة:

مائتان وسبع وتسعون عينة قد جمعت من المرضى المراجعين لمستشفى الناصرية العام ومستشفى الولادة والأطفال في مدينة الناصرية للفترة من حزيران ٢٠٠٥ إلى نيسان ٢٠٠٦. أوضحت الدراسة أن ١٢٩ إصابة كانت بسبب بكتريا بروتيس ميرابيلس وكالاتي التهاب المجاري البولية ٦٣ (٤٨.٨%) إصابة ، تجرثم الدم ٤٥ (٣٤.٨%) إصابة والتهاب الجروح والحروق ٢١(١٦.٢%) إصابة.أوضحت الدراسة أيضا إن نسبة الإصابة في الذكور (٥٩%) أعلى مما هو علية عند الإناث (٤١%) . وقد ظهرت اغلب الإصابات في الفئة العمرية الرابعة(الأعمار التي اقل من عشر سنوات) إذ بلغت نسبة الإصابة في هذه الفئة العمرية ٣١ إصابة شكلت نسبة ٢٤%، تلتها الفئة العمرية السادسة (الأعمار التي تتراوح بين٥١- ٦٠ سنة)حيث بلغت نسبة الإصابة فيها ٢٩ إصابة شكلت نسبة ٢٢.٤% .كما وجد من خلال الدراسة إن المضادات الحيوية الأكثر فاعلية ضد هذه البكتريا هي : الكلورامفنيكول ٨٣.٧% والسبروفلوكساسين ٧٩% تلاهما المضادات الحيوية الآتية:نوروفلوكساسين، التوبرامايسين والجنتامايسين ٧٥.٩% ،٧٥.١٩% و ٧٣.٦% على التوالي بينما أبدت بعض عزلات هذه البكتريا مقاومة لمضاد الاموكسيسيلين وبنسبة ٣٩.٦% تلاه المضاد الامبيسيلين وبنسبة ٣٨% أما مضادي الكاربنسيلين والسيفوتاكسيم فقد كانت نسبة المقاومة لهما ٣٧% و٣٣.٤% على التوالي. وجد من هذه الدراسة أيضا إن ١٢عزلة من عزلات بكتريا بروتيس ميرابيلس كانت ذو مقاومة متعددة للمضادات الحيوية و منتجة لإنزيم البيتالاكتاميز مثلت نسبة ٩.٣% من العدد الكلي للعزلات.

Introduction :

Proteus mirabilis **causes 90%of all Proteus infections it belongs the tribe proteae [1].** ***Proteus mirabilis*** **is one of the most common pathogens encountered in clinical samples and can cause a variety of community or hospital acquired illnesses, including urinary tract , wound, borne and bloodstream infections [2].** ***Proteus mirabilis*** **is a common cause of upper urinary tract infections that can involve invasion of host urothelial cells [3] .The most common infection associated with genus (proteus) is urinary tract infections and the most common species isolated is** ***Proteus mirabilis*****.** ***Proteus mirabilis*** **was the second most common isolate from urinary tract infections (after** ***Escherichia coli*****) [1] .** ***Proteus mirabilis*** **is commonly associated with complicated urinary tract infections and may cause cystitis, eventually acute pyelonephritis or even septicemia [4]. Urinary tract infection with Proteus mirabilis may lead to serious complications, including cystitis, acute pyelonephritis, fever, bacteremia, and death. In addition to the production of hemolysin and the enzyme urease, fimbriae and flagellum-mediated motility have been postulated as virulence factors for this species.** ***Proteus mirabilis*** **responsible about 25% of bacteremia at a large community teaching hospital [5] .Bloodstream infection due to** ***Proteus mirabilis*** **strains is a relatively uncommon clinical entity [6].** ***Proteus mirabilis*****, an organism that is often considered to be implicated in contamination and colonization, is occasionally isolated in severe infections. In hospitals it is the second most frequently isolated Enterobacteriaceae species after** ***Escherichia coli*** **Wild -type isolates of this species are susceptible to ß-lactams [7]. ESBL production in** ***P. mirabilis*** **was first documented in 1993 [8], and the increase in clinical prevalence of ESBL-producing strains has recently been noted in survey studies in separate geographic areas, including the United States, Europe, and Asia. The proportion of ESBL-positive isolates has increased from 0.8% of** ***P. mirabilis*** **isolates in 1991 ,[8] to 6.9% in 1998 [9] in France. Surveillance studies conducted in the United States and Italy showed 9.5% and 8.8% ESBL prevalence among** ***P. mirabilis*** **isolates, respectively [10] Acquired resistance is usually enzyme mediated and the most common plasmid-mediated ß-lactamases reported are TEM-penicillinases. Mutant TEM-type ß-lactamases have been observed in France in** ***Proteus. mirabilis*** **since 1991 for extended-spectrum ß-lactamases (ESBLs) and since 1996 for inhibitor resistant TEM (IRT) [11, 12, 13 , 14]. This study was initiated to evaluate the** ***Proteus mirabilis*** **infections and determine the diseases caused by this bacterium in addition to evolution of antibiotic susceptibility of** ***Proteus mirabilis*** **isolates.**

Materials and Methods:

*** Patients and bacterial strains:**

The samples were collected from two hospitals in Al- Nassiria city which includes General Al-Nassiria hospital and paediatric hospital since June2005 to April 2006 which includes the collection of different clinical samples obtained from 297 patients as follows:urine:136 ,blood : 94 and wound and burn : 67.

***Microbiological methods:**

The samples were cultured on Blood ,MacConkey and Nutrient agar media ,then incubated at 37C for 24-48 hrs, while blood culture were incubated for 7 days at 37C. The isolated bacteria were identified by microscopic examination, culture characteristics and by using many different biochemical tests to be *Proteus mirabilis*, in addition due to characteristic swarming, motility and lactose negativity.

***Determination of antibiotic susceptibility:**

Antibiotics susceptibility test were done according to Bauer – Kirby procedure ,[15]

***ß-Lactamase study:**

Detection of *Proteus mirabilis* isolates which β- lactamase producing were done by using iodometric test [16] , and acidimetric test method [17].

Result and Discussion:

Two hindered-ninety seven clinical samples were collected from patients surfeiting from urinary tract, bacteremia and wound and borne infections from this 129 cases were caused by *Proteus mirabilis* as follows: urinary tract infection 63 isolates ,bacteremia 45 isolates and wound and borne infections 21 isolates Table (1) .Our data demonstrated that urinary tract infections was the predominant of systemic *Proteus mirabilis* diseases similar findings were reported by [18] . Bacteremia is commonly associated with systemic infections caused by this bacterium [5] ,while other reported mentioned *Proteus mirabilis* the major cause of wound and borne infections

[18]. *Proteus mirabilis* produce several virulence factors and this virulence factors enable this bacterium to cause many diseases our results go with another studies [19]. Table (2) shows relationship between sex and type of diseases due to *Proteus mirabilis* and found the percentage of infections in male 76(59%) higher than female 53(41%). This result disagreement with [1] because he mentioned the *Proteus mirabilis* infections in female higher than male . In addition in some social circumstances men work outside home and therefore they are more likely to contact the diseases than women .

Table(1):frequency of different diseases due to *Proteus mirabilis* **(No. of cases %)**

Diseases	No. of Isolates	%
Urinary tract infections	63	48.8
Bacteremia	45	34.8
Wound and burn infections	21	16.2
Total	129	100

Table (2): Relationship between sex and type of diseases due to *Proteus mirabilis*

Diseases	No. of Isolates	Male	%	Female	%
Urinary tract infection	63	38	(60.3)	25	(39.7)
Bacteremia	45	27	(60)	18	(40)
Wound and Burn infections	21	11	(52.3)	10	(47.7)
Total	129	76	(59)	53	(41)

The age of the 129 patients were from one day to seventy years, the age distribution for all patients were shown in Table (3), thirty – one (24%) of all cases were in age group-(less than 10 years) followed by age group – 6 (51 – 60) years 29 (22.4) while lower percentage of infections were occurred in age group – 7 (61 – 70) 7 (5.4%). Age distributions of *Proteus mirabilis* infections can be explained by changes in the immunity status with age. The high percentage of infection between age group -1 may be due to lack antibodies against to infections caused by this bacterium or because uncompleted immunity system .Our results indicate high percentage of infections occur in age group -7, we thinks that due to decrease the immunity system defense , the age distribution of *Proteus mirabilis* infections forms a "U" shape distribution that is weighted in the younger and older age groups .

Table(3):Relationship between age and type of diseases due to *Proteus mirabilis*

Diseases	No. of isolates	* Age groups (years)						
		>10	11 20	21 30	31 40	41 50	51 60	61 70
Urinary tract infection	63	18	5	9	7	4	15	5
Bacteremia	45	11	3	8	6	7	8	2
Wound and burn infections	21	2	2	1	7	3	6	-
Total	129 (100 %)	31 (24%)	10 (7.7%)	18 (13.9%)	20 (15.5 %)	14 (10.8%)	29 (22.4%)	7 (5.4%)

Table(4) shows antibiotic sensitivity pattern of Proteus mirabilis isolates to antibiotics and we found, Of the 129 isolates 51(39.6%) were resistant to Amoxicillin, 49(38%) to ampicillin, 43 (37.3%) to carbenicillin, while the most effective antibiotics were chloramphenicol 108 (83.7%) and ciprofloxacin (79%)

followed by norfloxacin, tobramycin,and gentamycin 75.9% , 75.19% and73.6% respectively. Multi resistant *Proteus mirabilis* clinical isolates were isolated from 12 patients as follows: 7 isolates were isolated from patients suffering from urinary tract infections, 3 isolates recovered from patients with bacteremia while the number of multi resistant of *Proteus mirabilis* isolates was recovered from patients with wound and borne infections were 2 isolates
All of twelve isolates were β-lactamase producing. Table (5)

Table (4): Antibiotics sensitivity pattern of 129 isolates of *Proteus mirabilis.*

Antibiotics	Sensitive	%
Penicillin's: *Ampicicillin	80	(62%)
*Amoxicillin	78	(60.4%)
*Carbenicillin	81	(62.7%)
Cephalosporins: *Cefotaxime	86	(66.6%)
*cephalexin	92	(71.3%)
Aminoglycosides: *Gentamycin	95	(73.6%)
*Tobramycin	97	(75.19%)
Refamycin: *Refampicin	92	(71.3%)
Fluoroquinolones: *Ceprofloxacin	102	(79%)
*Norfloxacin	98	(75.9%)
*Nalidixic acid	81	(62.7%)
Phenicols *Chloramphenicol	108	(83.7%)

Table(5):No. and percentage of *Proteus mirabilis* isolates producing β-lactamase

Diseases	No. of Isolates	No, of multi resistant *Proteus mirabilis* isolates which β-lantanas producing.
Urinary tract infection	63	7 (11.11%)
Bacterimia	45	3 (6.66%)
Wound and Burn infections	21	2 (9.52%)
Total	129	12 (9.3%)

.Since 1990 there has been a notable increase in the frequency of resistance of *Proteus mirabilis* to β – lactams , aminoglycosides and quinolones [1].However drug resistance has been increasingly reported from this species and the diffusion of resistance to β – lactams antibiotics to the production of extended-spectrum β – lactamase (ESBL) has become of great concern [6] . Over the last few years (ESBL) – positive *Proteus mirabilis* isolates have been recovered worldwide [20 ,21 , 22 ,23]. These results go with our present study.

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