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PREVALENCE OF NOSOCOMIAL *STENOTROPHOMONAS MALTOPHILIA* INFECTIONS IN ASSIUT UNIVERSITY HOSPITALS

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Stenotrophomonas maltophilia is an emerging multidrug-resistant global opportunistic pathogen and is acquiring increasing importance as a nosocomial pathogen.

This study aimed to determine the prevalence of nosocomial S. maltophilia infections and the important risk factors associated with such infections in Assiut University Hospitals.

This study included 362 patients with nosocomial infections admitted to different wards and intensive care units (ICU) from March 2011 to March 2012. A total of 690 different clinical samples according to the site of infection were collected from them. The samples were processed and diagnosed by conventional bacteriological methods.

A total of 35 strains of S. maltophilia were isolated from 362 patients (9.6%). The commonest clinical manifestations were lower respiratory tract infections (71.43%), wound infections (17.14%), bacteraemia (8.57%) and urinary tract infections (2.86%). The chest ICU showed the highest percentage of isolation (14.75%). Previous antibiotic intake was found to be a significant risk factor for nosocomial Stenotrophomonas maltophilia infections.

We conclude that nosocomial Stenotrophomonas maltophilia infections are significant in Assiut University Hospitals with lower respiratory tract infections being the commonest and previous antibiotic intake an important risk factor.

INTRODUCTION

Stenotrophomonas maltophilia (initially classified as *Pseudomonas maltophilia* and later as *Xanthomonas maltophilia*) is an aerobic, Gram-negative, ubiquitous bacillus with low virulence and is considered as an uncommon pathogen in immune-competent individuals[1]. However, it is also one of the multiresistant opportunistic nosocomial pathogens especially affecting immuno-compromised patients and is being isolated worldwide with increasing frequency[1-3].

S. maltophilia can adhere to moist foreign surfaces and form biofilms. It can thus colonize the inanimate hospital environment and the devices used for patient care[4]. The nosocomial *S. maltophilia* infections are typically polyclonal in origin, except for those acquired in the intensive care unit (ICU)[5]. The main types of infections associated with *S. maltophilia* include pneumonia, bloodstream infections, as well as urinary tract infections, intra-abdominal infections, meningitis, and ocular infections[1].

Potential risk factors for *S. maltophilia* infection include prolonged hospitalisation, previous antibiotic therapy, malignancies, chronic respiratory diseases (especially cystic fibrosis), prolonged endotracheal intubation and the presence of an indwelling central venous catheter[1&6].

S. maltophilia strains are resistant to virtually all classes of beta-lactams including extended-spectrum penicillins, third generation cephalosporins, carbapenems and other antibiotics including aminoglycosides with variable susceptibility to fluoroquinolones[1&7].

This study aimed to determine the prevalence of nosocomial *S. maltophilia*

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infections and to define the important risk factors associated with such infections in Assiut University Hospitals.

MATERIALS AND METHODS

Study population

A total of 362 nosocomially infected patients during one year from March 2011 to March 2012 were included in the study. Clinical samples (n= 690) were collected from these patients according to the site of infection and were sent to the Infection Control Laboratory for further processing. These samples included endotracheal swabs (n=205), blood (n= 199), urine (n=114), wound swabs (n=86), sputum (n= 45), throat swabs (n= 24), rectal swabs (n=12), and bed sore swabs (n=5). For patients who had more than one episodes of infection with *S. maltophilia*, only the first episode was analyzed in our study.

Bacteriological testing

The collected samples were cultured on MacConkey agar, Herellea agar, Blood agar, Eosin methylene blue, Triple sugar iron agar, Simmon's citrate medium, and semi solid agar for motility test (HiMedia). Further identification was confirmed by biochemical tests as oxidase, catalase, nitrate reduction test and esculin hydrolysis and the API 20NE system (bioMérieux,, France)

Statistical analysis

Data entry and data analysis were done using SPSS version 16. Data were presented as numbers and percentages. Chi-square test was used to compare qualitative variables between groups. P-value was considered significant when $p< 0.05$.

RESULTS AND DISCUSSION

Results

All *S. maltophilia* were described as Gram negative bacilli, motile, non spore forming, mostly oxidase –ve, reduce nitrate to nitrite, hydrolyze esculin, don't ferment sugars and are citrate positive. *S. maltophilia* grow on blood agar as mucoid colonies, grow on MacConkey agar as non-lactose fermenter colonies, and produce purple colonies on Herellea agar.

A total of 35 strains of *S. maltophilia* were isolated from 362 patients with nosocomial infections (9.7%). All *S. maltophilia* strains were isolated with other organisms (i.e. polymicrobial). Table 1 shows the distribution of Gram negative bacilli co-isolated in different clinical samples.

Table 1: Gram negative bacilli co-isolated with *S. maltophilia* in different clinical samples.

Samples Collected	No. of samples collected	Gm-ve bacilli					
		Lactose fermenters		Non Lactose fermenters			
				S. maltophilia		Others*	
		No.	% #	No.	% #	No.	% #
Endotracheal swabs	205	177	86.34%	19	9.27%	115	56.10%
Blood culture	199	30	15.08%	3	1.51%	10	5.03%
Urine	114	39	34.21%	1	0.88%	16	14.04%
Wound swab	86	67	9.71%	6	6.98%	43	50%
Sputum	45	28	62.22%	5	11.11 %	13	28.89%
Throat swab	24	17	70.83%	1	4.17%	4	16.67%
Rectal swabs	12	12	100%	-	0%	8	66.67%
Bed sores	5	5	100%	-	0%	4	80%
Total	690	375	54.35%	35	5.07%	213	30.87%

*Others included *Pseudomonas, Proteus*, and *Acinetobacter spp*.

#The percentage was calculated against the total number of clinical samples collected from the infection sites.

A total of 35 strains of *S. maltophilia* were isolated from different clinical samples as shown in table 2.

Table 2: Distribution of isolated *S. maltophilia* in different clinical samples.

Specimen	(n) %
Endotracheal swabs	(19) 54.29%
Wound swabs	(6) 17.14%
Sputum	(5) 14.29%
Blood cultures	(3) 8.57%
Urine	(1) 2.86%
Throat swabs	(1) 2.86%
Total	(35) 100%

S. maltophilia was isolated from patients in different ICUs and wards. The chest ICU showed the highest percentage of isolation (14.75%) and the pediatrics ICU showed the lowest percentage (6%) as shown in table 3.

Table 3: Distribution of *S. maltophilia* among patients admitted to different ICUs, and wards in Assiut University Hospitals.

Unit / Ward	Total number of samples collected	*S. maltophilia* isolated	
		No.	Percentage %
Chest ICU	61	9	14.75%
Trauma ICU	84	9	10.71%
Trauma unit	54	5	9.26%
Neurology ICU	110	9	8.18%
Pediatrics ICU	50	3	6%
Total	359	35	9.75%

Concerning risk factors for *S. maltophilia* infection, a significant association was detected with prior antibiotic intake and age as shown in table 4.

Table 4: Risk factors for *S. maltophilia* infection.

Variable	*S. maltophilia*		Non *S. maltophilia*		P-value
	No.	%	No.	%	
Age group: (years)					
0-25	11	31.43	55	16.82	
26-45	4	11.43	88	26.91	0.045*
46-65	15	42.86	128	39.14	
≥ 66	5	14.29	56	17.13	
Gender					
Male	20	57.1	200	61.61	0.643
Female	15	42.9	127	38.84	
Prior antibiotic treatment:					
Yes	30	85.7	220	67.28	0.025*
No	5	14.3	107	32.72	
Urinary catheterization:					
Yes	27	77.14	210	64.22	0.126
No	8	22.86	117	35.78	
Venous catheterization:					
Yes	23	65.71	182	55.66	0.254
No	12	34.29	145	44.34	
Immuno-suppression:					
Yes	15	42.9	133	40.67	0.803
No	20	57.1	194	59.33	
Mechanical ventilation:					
Yes	15	42.9	174	53.21	0.244
No	20	57.1	153	46.79	
Malnutrition:					
Yes	14	40	160	48.93	0.315
No	21	60	167	51.07	
Diabetes mellitus:					
Yes	9	25.7	83	25.38	0.966
No	26	74.3	244	74.62	
Surgery:					
Yes	7	20	34	10.4	0.155
No	28	80	293	89.6	

*means statistical significant value when ($p < 0.05$).

Discussion

During the study period from March 2011 to March 2012, the percentage of *S. maltophilia* causing nosocomial infections was (9.7%, 35/362). Our findings are higher than that reported by Caylon *et al*.[8], who found *S. maltophilia* isolates in 6.67% of the investigated specimens. However, our results are in accordance with Samonis *et al*.[9] who identified *S. maltophilia* isolates in 10% of the studied samples during a six-year study period. On the other hand, other studies reported a much lower percentage; Nseir *et al*.[10], identified *S. maltophilia* isolates in 2% of the clinical samples during a three year study period[10]. The difference may be attributed to different patient population with different underlying risk factors and diseases. In addition, to the difference in the study periods and number of investigated specimens.

The spectrum of clinical diseases caused by *S. maltophilia* in this study was similar to what has been observed in other studies with different percentages. In the current study, the percentages of *S. maltophilia* isolated from respiratory specimens (endotracheal swabs and sputum), wound, blood and urine were 71.43%, 17.14%, 8.57% and 2.86% respectively. Our results are higher than the results of other studies. Valdezate *et al* found the percentage of *S. maltophilia* to be 59.8%, 14.4%, and 11.4% in respiratory specimens, blood, and wound, respectively[5]. In a previous Egyptian study, Kandeel *et al*. reported the percentage to be 50%, 27.3%, and 13.6% in respiratory specimens, blood, and urine, respectively[11]. Also, in the recent study of Samonis *et al*, the main type of infection associated with *S. maltophilia* was respiratory tract infection (54.4%) followed by bloodstream infections (16.2%), skin and soft tissue infections (10%) and lastly urinary tract infection (4.4%)[9].

In 2012, the SENTRY Antimicrobial Surveillance program reported that S. maltophilia is one of the top 10 pathogens causing pneumonia in patients in Latin American medical centers in Brazil, Argentina, Mexico and Chile[12]. The variation in the percentages in different studies may be attributed to the patients recruited in the studies whether from the intensive care units (ICUs) or from other hospital wards. Most of the patients included in our study were ICU patients which lead to higher percentages of infections.

The risk factors for development of nosocomial infections are well known and include misuse of antibiotics, catheterization, mechanical ventilation, prolonged hospitalization, and malnutrition[6]. Our results demonstrated that the risk factors for acquisition of *S. maltophilia* noscomial infections did not differ significantly from the risk factors of non *S. maltophilia* infections except for prior antibiotic treatment (P value= 0.025) and age (P value= 0.045). This disagreed with Pathmanthan *et al*. who found that prior antibiotic treatment and age did not differ significantly between acquisition of *S. maltophilia* infection and controls[13]. Other studies reported many risk factors for *S. maltophilia* infection as underlying malignancy[14], the presence of indwelling devices (e.g., catheters[14&15]), chronic respiratory disease, immunocompromised host[14], prior use of antibiotics[15&16], and long-term hospitalization or ICU stay[17]. Our study didn't include a control group of patients without nosocomial infections, all patients included had nosocomial infections. That's why we didn't report many significant risk factors.

In our study, the index culture from which *S. maltophilia* was diagnosed was polymicrobial. This is not in agreement with the finding of Samonis *et al* who reported that 66.2% was monomicrobial and 29.4% was polymicrobial with other Gram negative bacilli[9]. Our finding doesn't define a certain pathogenic role of *S. maltophilia* in cases of polymicrobial infections. Other more virulent pathogens may be more important in this regard. However, in any case, polymicrobial infections have bad prognosis[17]. The pathogenic role of *S. maltophilia* is increasingly being recognized in patients with underlying co-morbidity (as most ICU patients)[18].

In conclusion, nosocomial *Stenotrophomonas maltophilia* infections are significant in Assiut University Hospitals with lower respiratory tract infections being the commonest and previous antibiotic intake an important risk factor.

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نشرة العلوم الصيدلية
جامعة أسيوط

انتشار عدوي المستشفيات الخاصة ببكتريا ستينوتروفوموناس. مالتوفيليا في مستشفيات اسيوط الجامعية

اماني جمال ثابت – ايناس عبد المجيد ضيف – نهلة محمد الشربيني – احسان محمد وجيه

قسم الميكروبيولوجيا الطبية والمناعة ،كلية الطب ، جامعة اسيوط ، مصر

ستينوتروفوموناس. مالتوفيليا هي واحدة من الكائنات المقاومة للادوية والتي تكتسب اهمية كبيرة كمسبب لعدوي المستشفيات. هدفت هذه الدراسة إلى تحديد حالات س. مالتوفيليا التي تسبب عدوى المستشفيات في المرضى ، واهم عوامل الخطر المرتبطة بهذه العدوي بمستشفيات اسيوط الجامعية.

شملت هذه الدراسة ٦٩٠ عينة والتي تم جمعها من ٣٦٢ من المرضى المصابين بالعدوي المكتسبة من المستشفيات المقبولين في وحدات العناية المركزة و العنابر في مستشفيات أسيوط الجامعية في الفترة من مارس ٢٠١١ إلى مارس ٢٠١٢، وتم فحص العينات بالطرق البكتريولوجية التقليدية.

تم عزل ٣٥ من سلالة س. مالتوفيليا من عينات المرضي بنسبة (٩,٦ ٪). تم عزل البكتريا في حالات عدوي الجهاز التنفسي بأعلي نسبة (٧١,٤٣ ٪)، واقل نسبة عزل في حالات التهابات المسالك البولية (٢,٨٦٪). أظهرت وحدة العناية المركزة الصدرية أعلى نسبة مئوية في العزل (١٤,٧٥٪). لقد وجد ان استخدام المضادات الحيوية من اهم عوامل الخطر لاكتساب عدوي المستشفيات ببكتريا س. مالتوفيليا.