



ISSN NO. 2320-5407

Journal Homepage: - [www.journalijar.com](http://www.journalijar.com)

## INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/9952  
DOI URL: <http://dx.doi.org/10.21474/IJAR01/9952>



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ADVANCED RESEARCH (IJAR)  
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Journal Homepage: <http://www.journalijar.com>  
Journal DOI: 10.21474/IJAR01

### RESEARCH ARTICLE

#### THE PREVALENCE AND CHARACTERS OF HOSPITAL ACQUIRED INFECTIONS IN THREE PRIVATE HOSPITAL, JEDDAH, SAUDI ARABIA.

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#### Manuscript Info

##### Manuscript History

Received: 18 August 2019  
Final Accepted: 20 September 2019  
Published: October 2019

##### Key words:-

Prevalence and characters, hospital acquired infections, private hospital, Jeddah.

#### Abstract

**Aim:** To estimate the prevalence of NI in three private hospitals and identify the related risk factors in Jeddah, Saudi Arabia.

**Method:** This was a retrospective observational study conducted at three private hospitals, Jeddah, Saudi Arabia. It included all hospitalized patient in ICU and surgical ward from January 2017 to August 2018.

**Result:** The samples mean age (48.58) with SD+16.65. Out of 398 inpatients, 234 (58.7%) were admitted to ICU and 164 (41.3%) were admitted to surgical ward. The most common diagnosis were as following; HTN (20.6%), followed by CNS (19.8%). Fourth of the cases 111 (27.9%) had DM. The median score of LOS was 4 days. Out of 398 patients, 14 (3.5%) were HAI, 12 positive cases were ICU patients, and 2 were ward patients. Infection sites were as following UTI (2.5%), RTI (2.3%), 3 (0.8%) and 2 (0.5%). The most common organism were E-Coli alone or in combination in 6 (40.1%) cases, followed by "Klebsilla Pneumonia" and "Staph aureus" equally 3 (20.0%). Less than tenth 27 (6.8%) died. Those who were older age, those with longer hospitalization, presence of drain, bedridden and death having significantly higher HAI than others ( $p < 0.0001$ ).

**Conclusion:** This study provides a baseline information of HAIs and associated risk factors for future surveillance. -The proportion of hospital acquired infection was (3.5%). The current findings can be utilized toward planning a surveillance program for nosocomial infection as a step toward a better infection control policy.

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#### Introduction:-

Hospital-acquired infection (HAI) which is known as nosocomial infection (NI) are a major public health worry around the world. It has strong participating in increased morbidity, mortality, and healthcare cost. (1-3) As well as it is a main safety issue disturbing the quality of care of hundreds of millions of patients yearly in both developed and developing countries. (4)

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The National Nosocomial Infections Surveillance (NNIS) defines NI as “a localized or systemic condition that results from adverse reaction to the presence of an infectious agent(s) or its toxin(s) and that was not present or incubating at the time of admission to the hospital”. (5) The common definition of HAI is “the infection acquiring during hospital care and not present or incubating at time of admission, it occurs within 48 hours after hospitalization, or after 3 days from discharging, or 30 days from an operation”. (5-8)

Several risk factors associate with HAIs : prolonged hospital stay, patients who are admitted to ICU are more prone to have NI and patients who are on (mechanical ventilation device , central venous line , or urinary catheter). Where the most common sites affected by HAI are the respiratory tract (31%) (usually ventilator- associated), urinary tract infection (24%) (usually catheter associated), blood stream infection (BSI) (16%) (usually associated with the use of an intravascular device) , and surgical wounds (8%). (1,4,6)

The most common pathogens associated with HAIs are ( gram – negative bacteria as klebsiella pneumonia , E-coli, and pseudomonas aeruginosa , followed by gram positive bacteria as staphylococcus aureus, and enterococci ). (5,9,10)

The prevalence of hospital-acquired infections ranges from 5% in Europe and North America to 40% in Sub-Saharan Africa, Latin America and parts of Asia.<sup>7</sup> According to a survey by the World Health Organization (WHO) that has been conducted in 14 countries, 8.7% of hospital inpatients have NIs.(2)

Till now, to the authors knowledge, there is no study measured the prevalence of HAI in private hospitals in Jeddah.

This study aimed to estimate the prevalence of NI in three private hospitals and identify the related risk factors in Jeddah , Saudi Arabia.

### **Method:-**

This was a retrospective observational study conducted at three private hospitals: Ibn sine , al-jedaani safe , and al-Jedaani Ghuleel , Jeddah , Saudi Arabia . It included all hospitalized patient in ICU and surgical ward during the period of (January 2017 to August 2018)

Complete enumeration of patients admitted to ICU and surgical wards from jan 2017 to August 2018 was done . Prior admission was obtained from research center at ISNC and concerned authorities to conduct the study . Date were collected from clinical records as temp . chart and laboratory reports were recorded . Check list was used to collect the data , and it consisted of three parts: first demographic data: age, sex and smoking habit. Second medical characteristics: patient diagnosis on admission, type of ward admitted to co- morbidity , type of HAI , microorganisms associated with infection , and length of hospital stay. And third exposure to invasive devices: (urinary catheters , central venous line , mechanical ventilation , drain and intubation.

HAI was defined according to CDC : any infection occurring more than 48 h after admission was considered .

### **Inclusion criteria:**

1. All patients with complete data, admitted to ICU or surgical ward for more than 48 h and aged>18y were included.
2. Exclusion criteria:
3. Patients who: 1-Shifted out from hospital within 48h of admission .
4. Aged less than 18y .
5. With incomplete data.

### **Statistical analysis:-**

The Statistical Package for Social Sciences (SPSS, version 21) was used for data entry and statistical analysis. Qualitative data were presented as frequency distributions, and quantitative data were presented as means and standard deviations. Independent t test and Chi square test were used to assess the association between having HAI and different risk factors. P- value < 0.05 was considered as significant.

### Result

All admitted patients during this period were 2628 , 398 were included in this study. The samples mean age (48.58) with SD+16.65. Both male 66.8% and female 33.2% were included in this study. Only 17 (4.3%) were smokers. (Table 1 & Figures 1,2, and 3)

**Table 1:-**Demographic data of the studied cases admitted to three private hospitals Jeddah, Saudi Arabia.

Variable	N	%
<b>Gender</b>		
Male	266	66.8
Female	132	33.2
<b>Age group</b>		
19-45	178	45.0
>45	219	55.0
<b>Variable</b>		
<b>Age</b>	<b>Mean± SD</b>	<b>Rang (min-max)</b>
	48.58± 16.65	(19-95)

Out of 398 inpatients, 234 (58.7%) were admitted to ICU and 164 (41.3%) were admitted to surgical ward. The most common diagnosis were as following; HTN (20.6%), followed by CNS (19.8%), then cardiology (16.8%), and lastly febrile illness (2.0%). Fourth of the cases 111 (27.9%) had DM. More than half of the cases 204 (51.3%) had surgical wound, 61 (15.3%) were bedridden, and 33(8.3%) reported drain. (Table 2 & Figures 4,5 &6)

**Table 2:-**Medical characteristics of the studied cases admitted to three private hospitals Jeddah, Saudi Arabia :

Variable	N	%
<b>Diagnosis on admission</b>		
Cardiology	67	16.8
Pulmonary	50	12.6
CNS	79	19.8
Upper gasro-intestinal	28	7.0
Lower gasro-intestinal	42	10.6
Inflammatory gasro-intestinal	51	12.8
Trauma	17	4.3
Renal dysfunction	28	7.0
HTN	82	20.6
febrile illness	8	2.0
Blood diseases	17	4.3
Hernia	28	7.0
Others	58	14.6
<b>Co- morbidity</b>		
DM	111	27.9
Liver failure	4	1.0
Active malignancy	12	3.0
Immunosuppressive drugs	2	0.5
<b>Admission type</b>		
Surgical ward admission	164	58.7
ICU admission	234	41.3
<b>Different characteristics</b>		
Surgical wounds	204	51.3
Drain	33	8.3
bedridden	61	15.3

Table (3) result revealed that the median score of LOS was 4 days. The majority of cases (> 91.0%) didn't reported CVC or MIV, while more than half (59.0%) reported no U-cath. (Table 3)

**Table 3:-**Hospitalization and duration of the studied cases admitted to three private hospitals Jeddah, Saudi Arabia :

Variable	Central venous catheter		Urinary Catheter		Mechanical Ventilation	
	N	%	N	%	N	%
No	373	93.7	235	59.0	364	91.5
less than one day	1	.3	7	1.8	3	.8
1-3 days	12	3.0	62	15.6	6	1.5
4-6 days	3	.8	47	11.8	8	2.0
7-9 days	2	.5	20	5.0	5	1.3
10-12 days	1	.3	6	1.5	3	.8
16-20 days	1	.3	7	1.8	1	.3
26-30 days	1	.3	4	1.0	3	.8
31-60 days	2	.5	1	.3	2	.5
more than 90 days	2	.5	1	.3	1	.3
<b>Variable</b>	<b>Median</b>			<b>Quartiles (25,75)</b>		
<b>Length of hospital stay</b>	4			(3,8)		

Regarding vital signs and laboratory, the majority of cases had normal TC (81.4%) and normal Platelets (77.6%). On the other hand, half of the cases had increased HCT, and (62.6%) reported neutrophilia. While more than third reported hypertension (37.7%) and leukocytosis (38.7%), RR was high among (30.4%) of the cases and 15.3% reported tachycardia. (Table 4)

**Table 4:-**Vital signs and laboratory of the studied cases:

Variable	N	%
<b>Body temperature</b>		
Hypothermic	18	4.5
Normal	324	81.4
Hyperthermia	24	6.0
Missing data	32	8.0
<b>Mean arterial blood pressure (MAP)</b>		
Hypotension	17	4.3
Normal	195	49.0
Hypertension	150	37.7
Missing data	36	9.0
<b>Heart rate (HR)</b>		
Bradycardia	4	1.0
Normal	299	75.1
Tachycardia	61	15.3
Missing data	34	8.5
<b>Respiratory rate (RR)</b>		
Low	5	1.3
Normal	215	54.0
High	121	30.4
Missing data	57	14.3
<b>Na</b>		
Hyponatremia	48	12.1
Normal	133	33.4
Hypernatremia	22	5.5

Missing data	195	49.0
<b>K</b>		
Hypokalemia	35	8.8
Normal	160	40.2
hypekalemia	16	4.0
Missing data	187	47.0
<b>CRS</b>		
Decreased	127	31.9
Normal	101	25.4
Increased	69	17.3
Missing data	101	25.4
<b>HCT</b>		
Decreased	119	29.9
Normal	49	12.3
Increased	200	50.3
Missing data	30	7.5
<b>WBC</b>		
Leukopnia	38	9.5
Normal	192	48.2
Leukocytosis	154	38.7
Missing data	14	3.5
<b>Neutrophils</b>		
Neutropnia	22	5.5
Normal	111	27.9
Neutrophilia	249	62.6
Missing data	16	4.0
<b>Platelets</b>		
Thrombocytopenia	45	11.3
Normal	309	77.6
Thrombocytosis	28	7.0
Missing data	16	4.0

Out of 398 patients, 14 (3.5%) were HAI, 12 positive cases were ICU patients, and 2 were ward patients. Infection sites were as following UTI (2.5%), RTI (2.3%), 3 (0.8%) and 2 (0.5%). The most common organism were E-Coli alone or in combination in 6 (40.1%) cases, followed by “Klebsilla Pneumonia” and “Staph aureus” equally 3 (20.0%). Less than tenth 27 (6.8%) died. (**Table 5 & Figures 7,8 &9**)

**Table 5:-**Prevalence of hospital acquired Infections and outcomes of the studied cases to three private hospitals Jeddah, Saudi Arabia

Variable	N	%
<b>Infections</b>		
Yes	14	3.5
No	384	96.5
<b>Infection site<sup>#</sup></b>		
Urinary tract infection (UTI)	10	2.5
Respiratory tract infection (RTI)	9	2.3
BSI	2	.5
Wound	3	.8
<b>Type of microorganism isolated<sup>#</sup></b>		
E-Coli	3	20.0
E-Coli and Proteus	1	6.7
E-Coli and candida	1	6.7
E-Coli and pseudomonas	1	6.7
Klebsilla Pneumonia	3	20.0

Pseudomonas and staph epidermidis	2	14.2
Staph aureus	3	20.0
Not determined	1	6.7
<b>Status</b>		
Dead	27	6.8
Alive	371	93.2

**# multiple responses**

The result revealed a significant difference in age and LOS regarding infection, where older age and those with longer hospitalization having more infection than others (65.2 vs 47.9,  $p < 0.0001$ ) and (25 vs 4,  $p < 0.0001$ ) respectively. (Table 6)

**Table 6:-**The association between having HAI and both age and length of hospital stay of the studied cases admitted to three private hospitals Jeddah, Saudi Arabia

Variable		Mean	SD	P value
Age	HAI	65.2	20.9	0.0001**
	No infection	47.9	16.2	
Variable		Median	Mean rank	P value
LOS	HAI	25	351.6	0.0001**
	No infection	4	193.9	

The result revealed a significant association between HAI, presence of drain, bedridden and death ( $p < 0.0001$ ). On the other hand there was no significant association between HAI and gender, smoking and surgical wound. (Table 7)

**Table 7:-**The association between having HAI and different risk factors:

Variable		Infection		P value
		HAI	No infection	
Gender	Male	8	258	0.303
		57.1%	67.2%	
	Female	6	126	
		42.9%	32.8%	
Surgical wound	Yes	7	197	0.569
		50.0%	51.3%	
	No	7	187	
		50.0%	48.7%	
Drain	Yes	6	27	0.0001**
		42.9%	7.0%	
	No	8	357	
		57.1%	93.0%	
Bedridden	Yes	7	54	0.0001**
		50.0%	14.1%	
	No	7	330	
		50.0%	85.9%	
Status	Dead	6	21	0.0001**
		42.9%	5.5%	
	Alive	8	363	
		57.1%	94.5%	

**Discussion:-**

Hospital acquired infections are widespread. They become a very important public health problem with increasing economic and human influence due to several reasons: 1) increasing number and crowding of people, 2) more

frequent impaired immunity (age, illness and treatments), 3 ) new microorganisms, and 4) increasing bacterial resistance to antibiotics. They are a main cause of preventable disease and death in developing countries. (6,8) Now days patients are highly mobile and hospital stays become shorter, which means that patients usually are discharged before the infection becomes obvious (symptomatic). Where, a huge number of nosocomial infections in inpatients - and those from ambulatory care facilities- becomes obvious only after discharging. This lead to difficulty in determining whether the source of the organism causing the infection is endogenous or exogenous.(7,8) HAI is a quality indicator of hospital inpatient services. Globally, WHO estimates that at least 1.5 million of hospital patients suffer from a HAI in any Hospital at any time. (12)

The overall HAI prevalence in the current study was 3.5%, it was lower than other studies, in Tunisia, a prospective cohort study was done and showed over all incidence of NI was (6.5%). (9) Another retrospective observational study was done at KAUH, Jeddah , Saudi Arabia during period of 2015-2016, concluded that incidence of NI was 7.3% . (10) Also, in Uganda study, the overall incidence of NI was (14%).(3) On the other hand, the current prevalence was higher than a multicenter European prospective study showed that the overall incidence of NI was (2.5%). (11) Also, in Danish study the incidence of HAI was 1.7 (62/3,568) per 100 days at risk (95% CI 1.4-2.2). (1)

In the current study, nosocomial UTI was the most common infection followed by pneumonia, similar to United States study. (13) While it was Pneumonia in Taif study, where pneumonia (32.3%), followed by (UTI)(25.7%) and (BSI)(18.6%). (8) In Tunisia study the commonest type was BSI. (9) And in Ethiopia study , the most common type was surgical site infection(51.0%).(4)

From the 14 HAI cases 12 cases were reported from ICU department , this consistent with other studies from Iran, Taif, India, and Uganda , where the rate increase form 17% to 50%. (1,4,5,8)

In the current study, Escherichia coli was the most common infecting organism in patients. It was responsible for approximately half of cases (40.0%). This consistent with Taif study and others. (4,5,8) In Tunisia study and the multicenter European prospective study the main organism was Gram-negative bacteria.(9,11)

The association between patient age and hospitalization and the occurrence of HAI was statistically significant. Where, older patients and those with longer hospitalization showed higher rate of having HAI. This result was in agreement with Uganda, Morocco, Iran and Europ studies. (2,3,6,11) This could be explained by the fact that elderly patients have less immunity and more co-morbidities which contribute in the occurrence of several complications. Also long duration in hospital make patients more weaker and vulnerable to catch any infections. (3,6,11)

### Conclusion:-

1. This study provides a baseline information of HAIs and associated risk factors for future surveillance .
2. The proportion of hospital acquired infection in the present study was (3.5% (14 of the 398 patients admitted ) .
3. Gram – negative Enterobacteriaceae , as a group, were the most frequently isolated pathogens, while E . Coli was the single most frequent causative organism .
4. Major hospital acquired infection as revealed by the present study was urinary tract infections followed by nosocomial pneumonia (ventilator associated pneumonia).
5. The acquisition of nosocomial infections in the ICU resulted in increased length of hospital stay .
6. These findings can now be utilized toward planning a surveillance program for nosocomial infection in our health care institution as a step toward a better infection control policy.

### References:-

1. Petersen MH1, Holm MO, Pedersen SS, Lassen AT, Pedersen C. Incidence and prevalence of hospital-acquired infections in a cohort of patients admitted to medical departments. Dan Med Bull. 2010 Nov;57(11):A4210.
2. Zahraei SM, Eshrati B, Masoumi Asl H, Pezeshki Z. Epidemiology of Four Main Nosocomial Infections in Iran during March 2007 – March 2008 based on the Findings of a Routine Surveillance System. Arch Iran Med. 2012; 15(12): 764 – 766.
3. Okello TR, Kansime J, Odora J. Invasive procedures and Hospital Acquired Infection (HAI) in A large hospital in Northern Uganda. East & Central African Journal of Surgery. 2014; 19(3): 77-84

4. Yallew WW, Kumie A, and Yehuala FM. Point prevalence of hospital-acquired infections in two teaching hospitals of Amhara region in Ethiopia. *Drug Healthc Patient Saf.* 2016; 8: 71–76.
5. Iyer AP, Baghallab I, Albaik M, Kumosani T. Nosocomial Infections in Saudi Arabia Caused by Methicillin Resistance *Staphylococcus aureus* (MRSA). *Clin Microbiol.* 2014; 3: 146. doi:10.4172/2327-5073.1000146
6. Agaba P, Tumukunde J, Tindimwebwa JVB, Kwizera A. Nosocomial bacterial infections and their antimicrobial susceptibility patterns among patients in Ugandan intensive care units: a cross sectional study. *BMC Res Notes.* 2017 Jul 28;10(1):349. doi: 10.1186/s13104-017-2695-5.
7. Abdel-Fattah MM. Nosocomial pneumonia: risk factors, rates and trends. *East Mediter Health J.* 2008; 14: 546 – 555.
8. Abdel-Fattah MM. Surveillance of nosocomial infections at a Saudi Arabian military hospital for a one-year period. *Ger Med Sci.* 2005 Sep 1;3:Doc06.
9. Ben Jaballah N , Bouziri A, Kchaou W, Hamdi A, Mnif K, Belhadj S, Khaldi A, Kazdaghli K. Épidémiologie des infections bactériennes nosocomiales dans une unité de réanimation néonatale et pédiatrique tunisienne. *EUROP. MÉDECINE ET MALADIES INFECTIEUSES.* 2006;6(37):379-385
10. Safder OY , Alzahrani MS, Alharbi WF, Balubaid HK, Bukhari MF, Alshomrany BS, Malibari BA , Alata NJ, ALmutairi MGand Alnajjar A. Incidence of nosocomial blood stream infections . pneumoniae and urinary tract infections in pediatric ward in King Abdul-Aziz University Hospital, Jeddah, Saudi Arabia 2015-2016. *Int. J. Adv. Res.* 2017; 5(1): 2083-2090
11. Raymond J1, Aujard Y. Nosocomial infections in pediatric patients: a European, multicenter prospective study. *European Study Group. Infect Control Hosp Epidemiol.* 2000 Apr;21(4):260-3.
12. Greco D, Magombe I. Hospital Acquired Infections in a large North Ugandan hospital. *J Prev Med Hyg.* 2011 Jun;52(2):55-8.
13. American Thoracic Society. Hospital-acquired pneumonia in adults: diagnosis, assessment of severity, initial antimicrobial therapy, and preventive strategies. A consensus statement, American Thoracic Society, November 1995. *Am J Respir Crit Care Med.* 1996;153(5):1711-25.