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RESEARCH ARTICLE

INCIDENCE OF NOSOCOMIAL BLOOD STREAM INFECTION, PNEUMONIA AND URINARY TRACT INFECTION IN PEDIATRIC WARD AT KING ABDULAZIZ UNIVERSITY HOSPITAL, JEDDAH, SAUDI ARABIA 2015- 2016.

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Abstract

Background: Nosocomial infections (NI): “defined as those occurring within 48 hours of hospital admission, 3 days of discharge or 30 days of an operation”. NI is Major complication in pediatric patients at different hospital wards. NI is associated with significant morbidity and mortality. Studies had shown that NI are associated with prolonged hospital stay and increase economic burden on the health care system.

Objectives: -Identify the commonest organism which causes nosocomial BSI, pneumonia or UTI among pediatric patients at KAUH, 2015-2016. To know the prevalence of nosocomial BSI, pneumonia and UTI among pediatric patients at KAUH, 2015-2016. -Identify the commonest predisposing factors which lead to nosocomial BSI, pneumonia and UTI among pediatric patients at KAUH, 2015-2016.

Methods: This is a retrospective study done at King Abdulaziz University Hospital Jeddah Saudi Arabia 2015-2016. This includes all pediatric patients who developed fever after 48 hours of hospital admission, 3 days of discharge or 30 days of an operation in pediatric ward 2015-2016.

Results: The number of patients who admitted was 1502 patients, 111 patients got NI. Infants are more reliable to have NI by (62.2%). Patient who had cardiovascular disease (18.9%) is more susceptible to have NI. The commonest type of infections were UTI (25.2%), BSI (21.6%) and pneumonia (19.8%). Gram negative were the dominant (48.9%). The commonest pathogen was Coagulase negative staphylococci (25.3%). The most predisposing factors were Immunosuppressive medications (22.5%), Central venous catheter (22.5%) and Nasogastric tube (19.8%).

Conclusions: Infant patients are more reliable to get NI. The UTI is the commonest type of infection. Gram negative are the commonest but, the Coagulase negative staphylococci is the common organism. Immunosuppressive medications, Central venous catheter and Nasogastric tube are the most predisposing factors.

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Introduction:-

Nosocomial infections (NI): “defined as those occurring within 48 hours of hospital admission, 3 days of discharge or 30 days of an operation” (1). NI are a Major complication in pediatric patients at different hospital wards. NI are associated with significant morbidity and mortality. Studies had shown that nosocomial infection is strongly associated with prolonged hospital stay and increase the economic burden on the health care system (2). Many studies had shown that the most common organisms are gram-negative bacteria as *Klebsiella pneumoniae*, *E.coli*, and *Pseudomonas aeruginosa*, followed by gram positive bacteria as *Staphylococcus aureus*, and enterococci (3). The most common type of infections are blood stream infection, followed by pneumonia, and UTI(4). There are multiple risk factors that precipitate NI as prolonged hospital stay, and patients who are admitted to ICU are more prone to have NI (5). Patients who are on mechanical ventilation device, central venous line, or urinary catheter are at higher risk to develop NI. (6) In Tunisia, a prospective cohort study was done and showed over all incidence of NI is (6.5%), mostly caused by Gram-negative bacteria (68%) with *Klebsiella pneumoniae* accounting (22.7%), the commonest type is BSI (7). On the other hand, in a multicenter European prospective study showed that the overall incidence of NI is (2.5%), mostly caused by bacteria accounting for (68%). Most of these bacteria are gram negative bacilli but, that coagulase negative *Staphylococcus* is the main pathogen. The same study showed that antibiotic resistant was highest in PICU compared to the general pediatric unit. (8) Locally, at Al-Hada Armed Forces Hospital in Taif, Saudi Arabia during the year 2004. A prospective study was for all patients admitted there. The most common site of infection was pneumonia (32.3%), followed by urinary tract infection (UTI) (25.7%) and blood stream infections (BSI) (18.6%). The most common organism was Gram negative (66.2%). *E.coli* was the most common organism (22.3%) (9).

Research objectives:-

1. Identify the most common organism which causes nosocomial blood stream infection, pneumonia or Urinary tract infection among pediatric patients at KAUH,2015-2016.
2. To know the prevalence of nosocomial blood stream infection, pneumonia and Urinary tract infection among pediatric patients at KAUH,2015-2016.
3. Identify the most common predisposing factors which lead to nosocomial blood stream infection, pneumonia and Urinary tract infection among pediatric patients at KAUH,2015-2016.

Research Methodology:-

This is a retrospective observational study done at KAUH, Jeddah, Saudi Arabia 2015-2016.

This include all pediatric patient who admitted to the pediatric ward between 15 February 2015 to 16 February 2016

Inclusion criteria: “infection than occurring within 48 hours of hospital admission, 3 days of discharge or 30 days of an operation” (1).

Statistical analysis: In the present study, statistical analysis using "IBM SPSS statistics ver. 20.0" was applied to evaluate and test the hypothesis.

Descriptive statistics, charts (Frequencies and percentage) .

study tools: a data gathered by hospital system using a data sheet with include demographics, date of admission, date of discharge, comorbidity, diagnosis, length of stay, investigation (on admission, with infection, after infection)

imaging, medication, risk factor(blood transfusion, immunosuppressant medication, stress ulcer prophylaxis ,central line, PICC line, NGT, TPN, urinary catheter, ventilator, tracheostomy), outcome.

Results:-

The total number of patients who admitted between 15 February 2015 to 16 February 2016 was 1502 patients, 111 patients got a nosocomial infection.

Among the different age groups, the Infants are more reliable to have a nosocomial infection by (62.2%).The patient who had an underlying cardiovascular disease (18.9%) are more susceptible to has a nosocomial infection, followed

by a neurological disease (16.2%) and gastrointestinal disease (16.2%). The most common type of infections in this study was UTI (25.2%) followed by blood stream infection (21.6%), pneumonia (19.8%).

Gram-negative organisms were the dominant by (48.9%). gram positive caused (43.3%) , fungi caused (7.8%) .

The most common pathogen was Coagulase-negative staphylococci (25.3%), followed by pseudomonas aeruginosa (14.5%) and Enterococcus faecalis (7.2%).

The three most potential predisposing factors were Immunosuppressive medications (22.5%), Central venous catheter (22.5%) and Nasogastric tube (19.8%). This study also showed that increase length of stay may increase the chance to get a nosocomial infection.

The majority of patients recovered within one week (57.7%). the mortality were only (3.6%).

Table 1:- Distribution of pediatric age groups

	Age	
	Frequency	Percent
Infant	69	62.2
Up to 10 years	30	27.0
Above 10 years	12	10.8
Total	111	100.0

Table 2:- Underlying disease of all Pediatric patients who developed NI

	Yes		No	
	Count	Table N %	Count	Table N %
Cardiovascular diseases	21	18.9%	90	81.1%
Neurology diseases	18	16.2%	93	83.8%
GI diseases	18	16.2%	93	83.8%
Respiratory diseases	14	12.6%	97	87.4%
Hematology diseases	10	9.0%	101	91.0%
Oncology diseases	10	9.0%	101	91.0%
Renal diseases	8	7.2%	103	92.8%
Genetics diseases	7	6.3%	104	93.7%
Endocrine diseases	6	5.4%	105	94.6%
Infectious diseases	5	4.5%	106	95.5%

Table 3:- Results of all cultures done for all Pediatric patients who developed NI

Urine Culture		
	Frequency	Percent
Positive	28	25.2
Negative	47	42.3
No culture	36	32.4
Total	111	100.0
Blood culture		
	Frequency	Percent
Positive	24	19.8
Negative	67	60.4
No culture	22	19.8
Total	111	100.0
Respiratory culture		
	Frequency	Percent
Positive	22	19.8
Negative	20	18
No culture	69	62.2
Total	111	100.0

Table 4:- Result of Positive cultures

	Frequency	Percent
Gram negative	44	48.9
Gram positive	39	43.3
Fungus	7	7.8
Total	90	100

Table 5:- Causative bacterial Organisms

Organism		Frequency	Percent
	coagulase negative staph	21	25.3
	pseudomonasaeruginosa	12	14.5
	Enterococcus faecalis	6	7.2
	Enterobacter cloacae	5	6.0
	ESBL positive e.coli	5	6.0
	acinetobacterbaumannii	4	4.8
	E.coli	4	4.8
	stenotrophomonasmaltophilia	3	3.6
	streptococcus viridans	3	3.6
	ESBL positive klebsiella pneumonia	3	3.6
	Klebsiella pneumonia	3	3.6
	Enterococcus faecium van a vre	2	2.4
	MRSA	2	2.4
	Gram negative bacilli	2	2.4
	Staphylococcus hominis	1	1.2
	serratiamacescens	1	1.2
	dermacoccusnishinomiyaensis	1	1.2
	citrobacteramalonaticus	1	1.2
	Staphylococcus epidermidis	1	1.2
	Citrobacterkoseri	1	1.2
	streptococcus pnemoniae	1	1.2
	Streptococcus salivaris	1	1.2
	Total	83	100.0

Table 6:- Foreign bodies associated with NI

Central venous catheter			
		Frequency	Percent
	Yes	25	22.5
	No	86	77.5
	Total	111	100.0
Peripherally inserted catheter			
		Frequency	Percent
	Yes	18	16.2
	No	93	83.8
	Total	111	100.0
Nasogastric tube			
		Frequency	Percent
	Yes	22	19.8
	No	89	80.2
	Total	111	100.0
Tracheostomy			
		Frequency	Percent
	Yes	8	7.2

	No	103	92.8
	Total	111	100.0
Mechanical ventilator			
		Frequency	Percent
	Yes	14	12.6
	No	97	87.4
	Total	111	100.0
Foley Catheter			
		Frequency	Percent
	Yes	11	9.9
	No	100	90.1
	Total	111	100.0
Parenteral Nutrition			
		Frequency	Percent
	Yes	16	14.4
	No	95	85.6
	Total	111	100.0

Table 7:- treatment associated with NI

Immunosuppressive medications			
		Frequency	Percent
	Yes	25	22.5
	No	86	77.5
	Total	111	100.0
Stress ulcer prophylaxis			
		Frequency	Percent
	Yes	20	18.0
	No	91	82.0
	Total	111	100.0
Blood Transfusion			
		Frequency	Percent
	Yes	24	21.6
	No	87	78.4
	Total	111	100.0

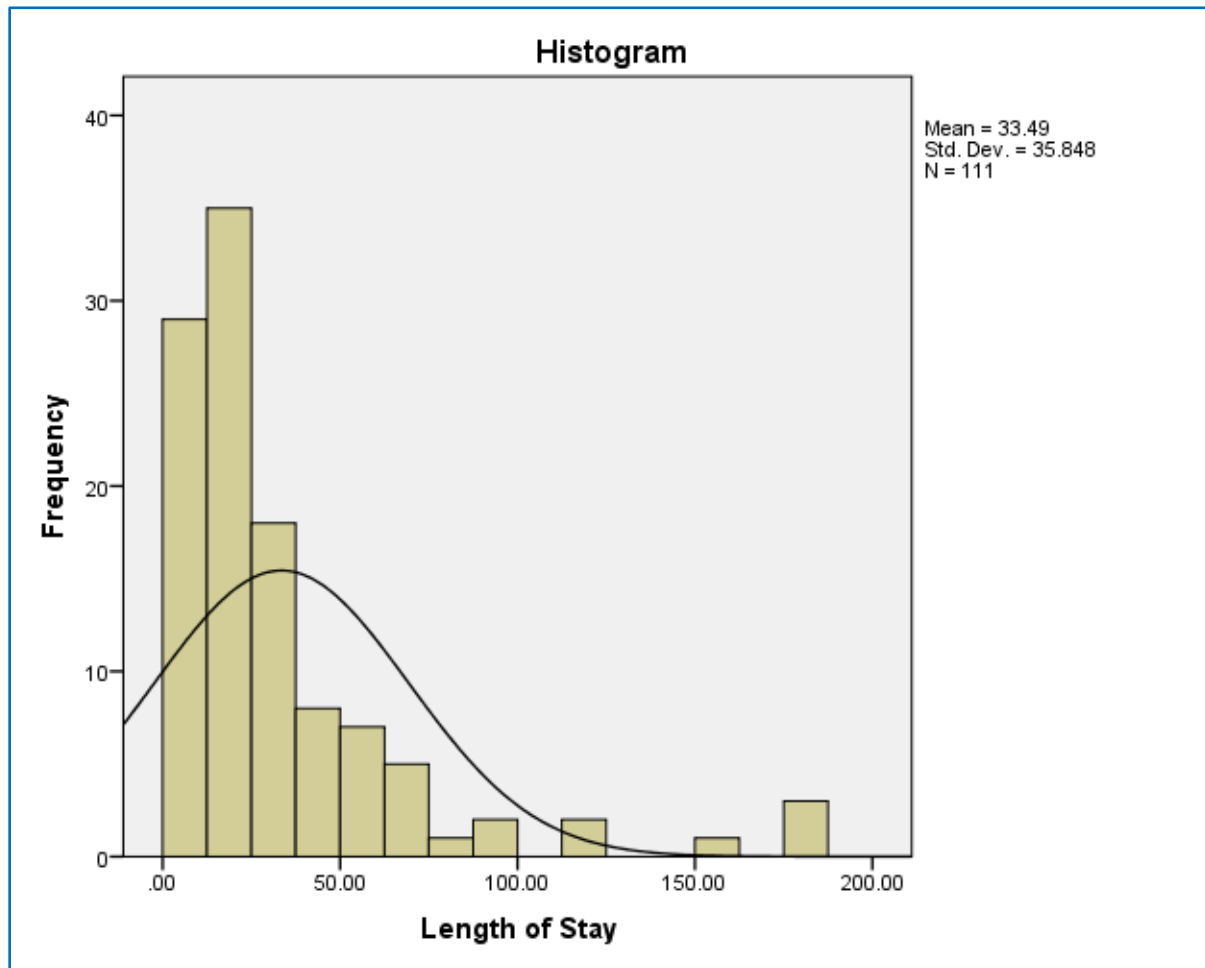


Figure 1:-The length of stay ranged from 3 minimum to 180 maximum days with a mean of (34 +or- 36) days. The length of stay was not normally distributed as seen from the graph, therefore, main patients stayed between 0 and 70 days with the median of 21 days.

Table 8:- The outcomes.

Outcome			
		Frequency	Percent
	Recovery within 1 week	64	57.7
	Recovery > 1 week	38	34.2
	Recovery with comorbidities	5	4.5
	Mortality	4	3.6
	Total	111	100.0

Discussion:-

The goals of the study were to know the most common organism that cause nosocomial infection, most common site of infection and the risk factors. Coagulase-negative staphylococci was the most common infection which present (25.3%) of our samples.

Coagulase-negative staphylococci are part of normal flora of the human skin, and it can be transmitted throw any invasive devises to the blood and cause infection, that's why it's the most common infection in hospitals.

A study of 24,179 cases of nosocomial in 49 hospitals across the United States suggest that (31%) of sample were coagulase negative staphylococci (11).

But on the other hand, a study of 841 patients done in tertiary care teaching hospital showed that klebsiella pneumonia was predominant (12).

The data indicate that the UTI is the most common site of infection.

A study done in United States, 110709 pediatric patients with 6290 nosocomial infections suggest that the blood stream infection is more frequently than UTI (13).

Prolonged hospital stay and frequently used of invasive devices with poor hygiene can cause hospital acquired infection and may cause complication such as sepsis and maybe death .

Immunosuppressive medication, central venous catheter and nasogastric tube are most common predisposing factors. Study of 911 cases was performed at St Louis Children's Hospital, showed that patients with bloodstream infection were more likely to have multiple central venous catheters (14). On the other hand, in Egypt, there is a study conducted in devices associated infection, they found that the Patients who are on mechanical ventilation device, central venous line, or urinary catheter are at higher risk to develop NI (6). But in our study we found that Patients who are on central venous line, peripherally inserted catheter and Nasogastric tube are at higher risk to develop NI.

Conclusion:-

Infant patients are more reliable to get a Nosocomial infection than the other pediatric age groups. In this study, the UTI is the commonest type of infection. Gram negative organisms are the most common to cause an NI but, the Coagulase-negative staphylococci is the common organism. Immunosuppressive medications, Central venous catheter and Nasogastric tube are the three most potential predisposing factors. The majority of patients recovered within one week.

Perspectives:-

We believe that we need further similar studies with multicenter and larger sample size. Also, a control group that involves patients with a non-nosocomial fever might help to understand the possible risk factors for the development of nosocomial infection.

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