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RESEARCH ARTICLE

CATHETER ASSOCIATED URINARY TRACT INFECTION (CAUTI) IN MEDICAL WARD, AND ICU KFHH DURING YEAR 2017.

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Abstract

Background: Catheter-associated urinary tract infection (CAUTI) is one of the most common hospital acquired infection.

Objectives: determining the risk factors, causes and frequency of CAUTI among infected cases with CAUTI in King Fahad Hofuf hospital and to provide local evidence-based recommendations for prevention of CAUTI.

Methods: It is a prospective surveillance study of CAUTI. The study was carried out at the Medical ward in King Fahad Hofuf hospital (KFHH) from May to August 2017. The study included all adult patients who are admitted to medical or ICU during the study period with medical conditions rather than UTI and have been catheterized with Foley catheter. The information of the patients were collected from the medical records of the wards and day care unit.

Results: the most common causes were sepsis and pneumonia followed by hyperglycemia. Most of the patients showed no symptoms however only 4.5% have fever and there was a positive association between fever and CAUTI as a risk factor for CAUTI. About 29.55 of patients had CAUTI with the majority of them located in ward than ICU. The most common isolated organism among patients with CAUTI are Yeast, candida, E-coli and pseudomonas. The most commonly used antibiotic for CAUTI including ceftriaxone, Linezolid, colistin and fluconazole. CAUTI was significantly associated with female gender.

Conclusion: CAUTI was most common among patients located in ward than ICU. The most common risk factors were female gender, fever, previous illness and long duration of illness. Yeast and candida are the most common isolated microorganisms among patients with CAUTI.

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Introduction:-

Catheter-associated urinary tract infection (CAUTI) is one of the most common hospital acquired infection ⁽¹⁾. It is estimated for more than 30% of infections reported by acute care hospitals ⁽²⁾. CAUTI is defined as a symptomatic patient with a urinary catheter (UC) had one or more of the following signs or symptoms, with no other recognized infection: fever (temperature ≥ 38 °C), urinary urgency, frequency, dysuria, or suprapubic tenderness, and this patient had a positive urine culture with no more than two pathogens isolated. Or a patient with a UC had at least two of the following signs or symptoms, with no other recognized infection: fever (temperature ≥ 38 °C), urinary urgency, frequency, dysuria, or suprapubic tenderness, and one of the following: positive dipstick analyses for leukocyte esterase or nitrate, pyuria (urine specimen with ≥ 10 WBC/mm³ a pathogen observed on Gram staining of midstream urine, and the physician instituted appropriate therapy for a urinary tract infection ^(3,4).

The impact of a UTI on the individual can vary greatly, depending on age, co-morbidities and socio-economic circumstances. CAUTIs may lead to unnecessary use of antibiotics and antimicrobial resistance and longer hospital stays ⁽⁴⁾. Virtually CAUTI is caused by instrumentation of the urinary tract and has been associated with increased morbidity, mortality, hospital cost, and length of stay ⁽⁵⁾.

It causes secondary nosocomial bloodstream infection as 17% of nosocomial bacteremia originated from urinary with an associated mortality of 10%. However, 17% and 69% of CAUTI can be prevented through implementation of evidence-based bundle for CAUTI ⁽⁶⁾. This study aimed at determining the risk factors, causes and frequency of CAUTI among infected cases with CAUTI in King Fahad Hofuf hospital and to provide local evidence-based recommendations for prevention of CAUTI.

Methods:-**Study design:**

It is a prospective surveillance study of CAUTI.

Study setting:

The study was carried out at the Medical ward in King Fahad Hofuf hospital (KFHH) from May to August 2017. The bed capacity of about 210 bed include 15 bed in adult medical ICU, Bed occupancy rate 61.2% in medical ward and 100% in medical ICU, estimated average length of stay in medical ward about 4.9 days and medical ICU 9.8 day

Study population:

The study included all adult patients who are admitted to medical or ICU during the study period with medical conditions rather than UTI and have been catheterized with Foley catheter. The exclusion criteria were patient admitted with community acquired UTI, Foley catheter and those who are transferred from other hospital with indwelling urinary catheter.

Study tools and data collection:

The information of the patients were collected from the medical records of the wards and day care unit. The collected data included information on the demographic, clinical data, type and cause of admission, co-morbidities, risk factors, causes of urinary catheterization, number of patients who had any type of infection at admission, duration of devices use, number of days each Foley catheter use, type Foley catheter, date of infection, type of isolated pathogen contribute to infection, antibiogram, prescribed antibiotic, dose and duration of antibiotics, length of hospital stay and outcome of CAUTI management..

Also, the main outcome measures will include the suitability of indicated prophylactic antibiotic, the antibiotic choice, dosage of administration, timing and duration.

Ethical considerations:-

A written approval was provided from the ethic committee in KFHH the aim of the study and research proposal. Oral or informed consent were given by all patients enrolled in the study.

Statistical analysis:

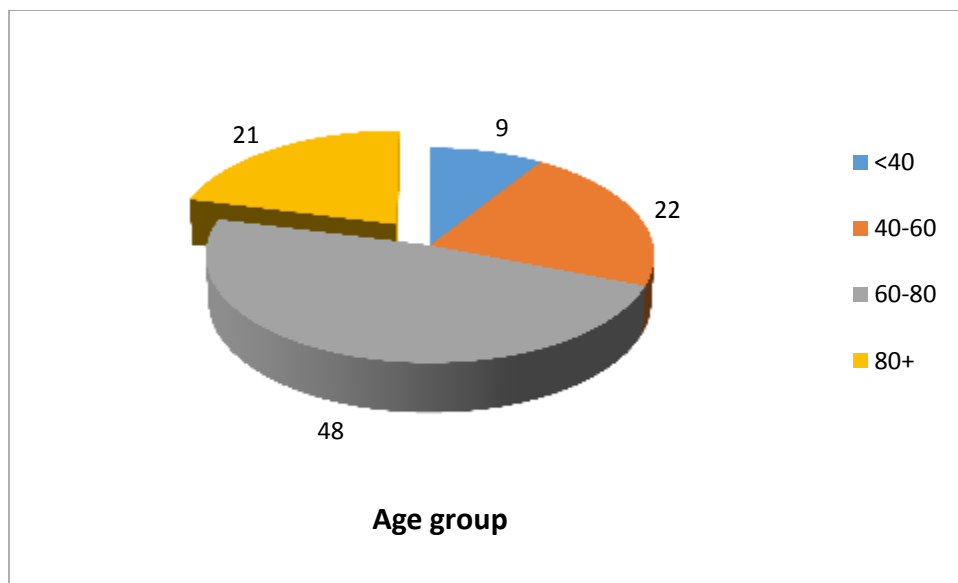
The data processing was done using SPSS version 20. Descriptive statistics were presented as percentages and frequencies. The Chi squared test was used to detect any significant difference between categorical variables. P value significance level 0.05 and 95% confidence intervals are considered as significant.

Results:-

Table 1 & 2 showed the demographic characteristics of the included patients as age, gender and body mass index (BMI) (Figure. 1 &2).

Table 1:- Demographic characteristics of the included patients:

	No.	%
Age group		
<40	18	9.0
40-60	44	22.0
60-80	96	48.0
80+	42	21.0
Range	14.0-101	
Mean±S.D.	66.83±17.78	
Sex		
Male	55	27.5
Female	144	72.0
BMI		
Under weight	44	22.0
Normal weight	64	32.0
Over weight	62	31.0
Obese/morbid obese	30	15.0
Range	15.6-54.8	
Mean±S.D.	27.4±6.21	



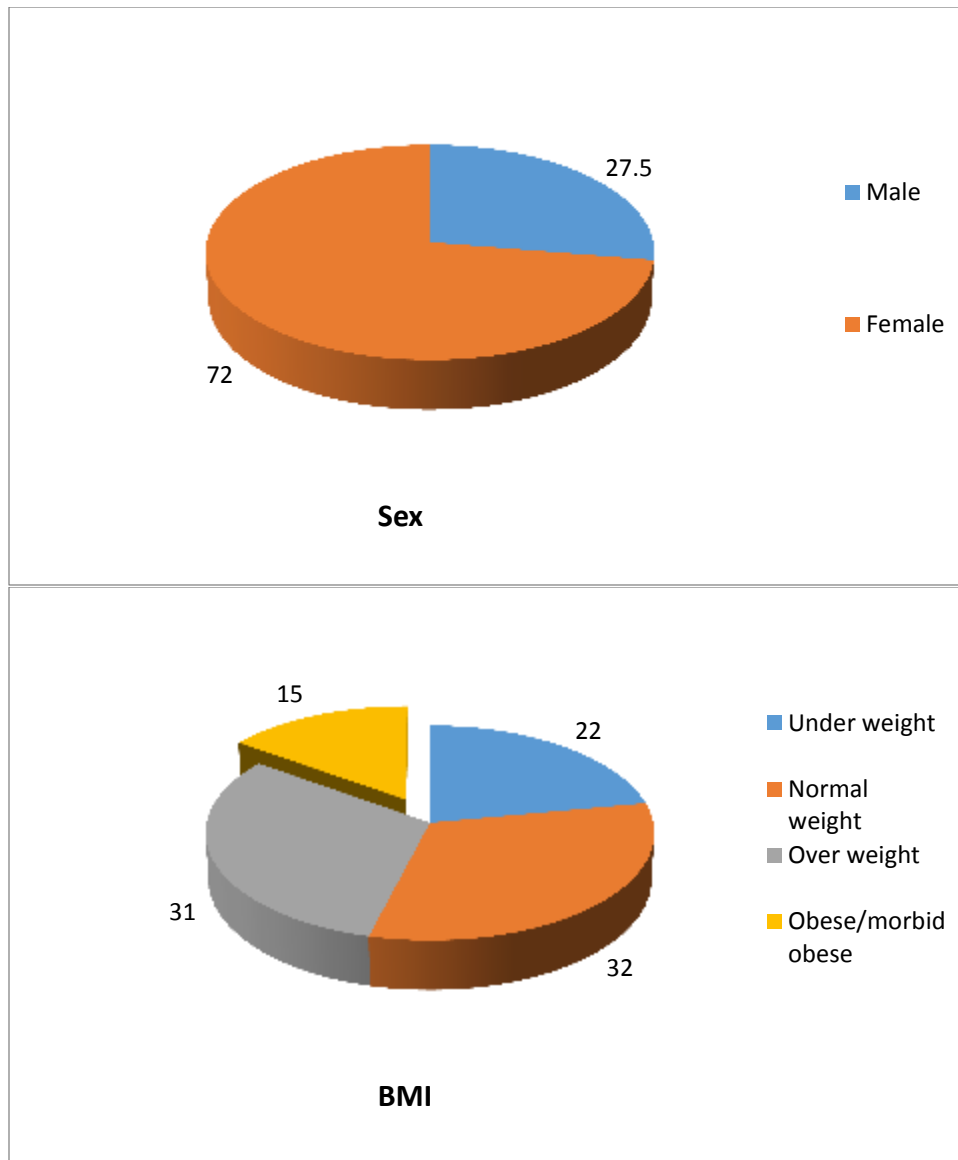


Fig 1:- Demographic data of the studied patients group.

The cause of admission and associated disease:

The cause of admission to the hospital was shown in table 2 and the most common causes were sepsis and pneumonia followed by hyperglycemia. Most of the patients have no associated disease (35%) but 22% have diabetes with hypertension and 10% have diabetes only (Table. 3).

Table 2:- Distribution of the studied patients regarding the cause of admission:

Cause of admission	Frequency	Percent
Acute confusional state	1	.5
Acute GE	2	1.0
Acute Heamorrhagic strock	1	.5
AKI	1	.5
Anaemia	3	1.5
Anorexia dehydration	2	1.0
Ascites	2	1.0
Aspiration syndrome	5	2.5
CAP	2	1.0

CHF	17	8.5
Coma	1	.5
COPD	12	6.0
CVA	16	8.0
DCMP	1	.5
Dehydration	3	1.5
Dilated cardiomyopathy	1	.5
DKA	2	1.0
Drug overdose	2	1.0
Electric shock	1	.5
Epilepsy	3	1.5
Fever of unknown origin	1	.5
Heart Failure	2	1.0
Hepatic encephalopathy	2	1.0
HTN	1	.5
Hyperglycaemia	22	11.0
Hypoglycaemia	2	1.0
Hyponatraemia	2	1.0
Hypoventilation syndrome	1	.5
Infected bed sores	7	3.5
Lung abscess	1	.5
Melena	3	1.5
Obstructive sleep apnea	1	.5
Pericardial effusion	1	.5
Pneumonia	24	12.0
Pulmonary fibrosis	3	1.5
SCD	4	2.0
Sepsis	3	1.5
Sepsis	28	14.0
Septic shock	9	4.5
Syncopal attack	1	.5
Type 2 respiratory failure	2	1.0
Warfarin overdose	2	1.0
Total	200	100.0

Table 3:- Distribution of the studied patients regarding the associated disease:

	Frequency	Percent
No associated disease	70	35.0
Bedridden	1	.5
CKD	1	.5
CKD-DM-HTN	1	.5
CKD-IHD	1	.5
CVA	7	3.5
CVA-bedridden	1	.5
CVA-DM-HTN	1	.5
DM	20	10.0
DM- HTN	6	3.0
DM-AF-IHD	1	.5
DM-CKD	2	1.0
DM-CVA	1	.5
DM-HTN	45	22.5
DM-HTN-CKD	2	1.0
DM-HTN-COPD	2	1.0
DM-HTN-CVA	4	2.0

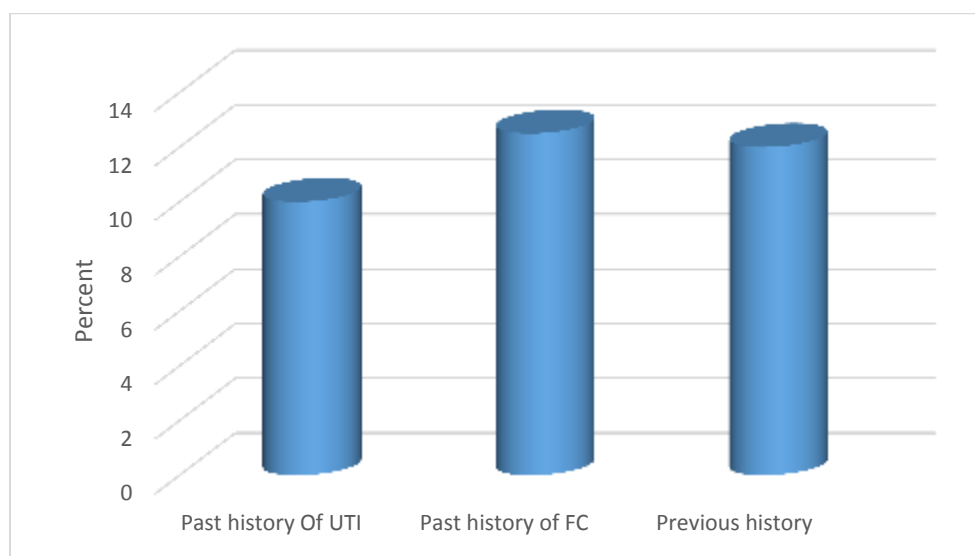
DM-HTN-HCV	2	1.0
DM-HTN-IHD	5	2.5
Epilepsy	7	3.5
HCV-DM	1	.5
HTN	9	4.5
HTN- RF	1	.5
HTN-CKD	1	.5
IHD	2	1.0
MR- Epilepsy	2	1.0
Old CVA	2	1.0
Pancreatic cancer	1	.5
Renal impairment	1	.5
Total	200	100.0

Base line and past history:

The majority of patients have no past history of UTI, with negative urine analysis among all the patients. The other variables are presented in table. 4& Figure. 2).

Table 4:- Distribution of the studied patients regarding the clinical data at base line and past history.

	No.	%
Past history Of UTI		
Yes	20	10.0
No	180	90.0
Base line urine analysis		
Positive	0	0.0
Negative	200	100.0
Past history of FC		
Yes	25	12.5
No	174	87.0
Type of FC		
S	200	100.0
Previous operation		
Yes	24	12.0
No	176	88.0

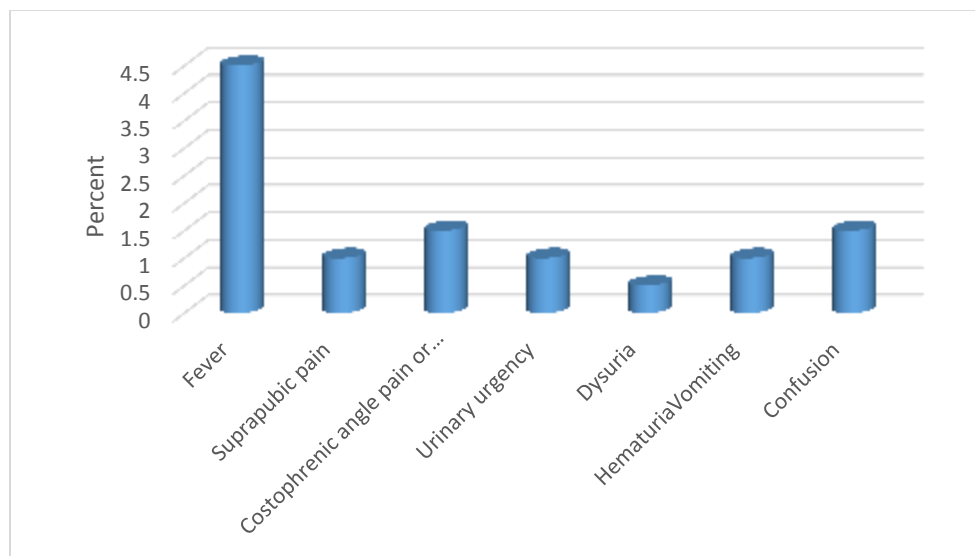
**Fig. 2:-** Distribution of the studied patients regarding the past history of UTI and F.C.

The symptoms of the studied patients:

Most of the patients showed no symptoms however only 4.5% have fever (Table .5, figure. 3)

Table 5:- Distribution of the studied patients regarding the symptoms.

	No.	%
Fever	9	4.5
Suprapubic pain	2	1.0
Costophrenic angle pain or tenderness	3	1.5
Urinary urgency	2	1.0
Urinary frequency	0	0.0
Dysuria	1	0.5
Hematuria Vomiting	2	1.0
Confusion	3	1.5
Fatigue	0	0.0

**Fig. 3:-** Distribution of the studied patients regarding the symptoms**Catheter-associated urinary tract infection:**

Most of the patients showed no signs of CAUTI (70.5%) while 29.5% had positive signs for CAUTI.

Table 6:- Distribution of the studied patients regarding Catheter-associated urinary tract infection.

	No.	%
Catheter-associated urinary tract infection.		
+ve	59	29.5
-ve	141	70.5

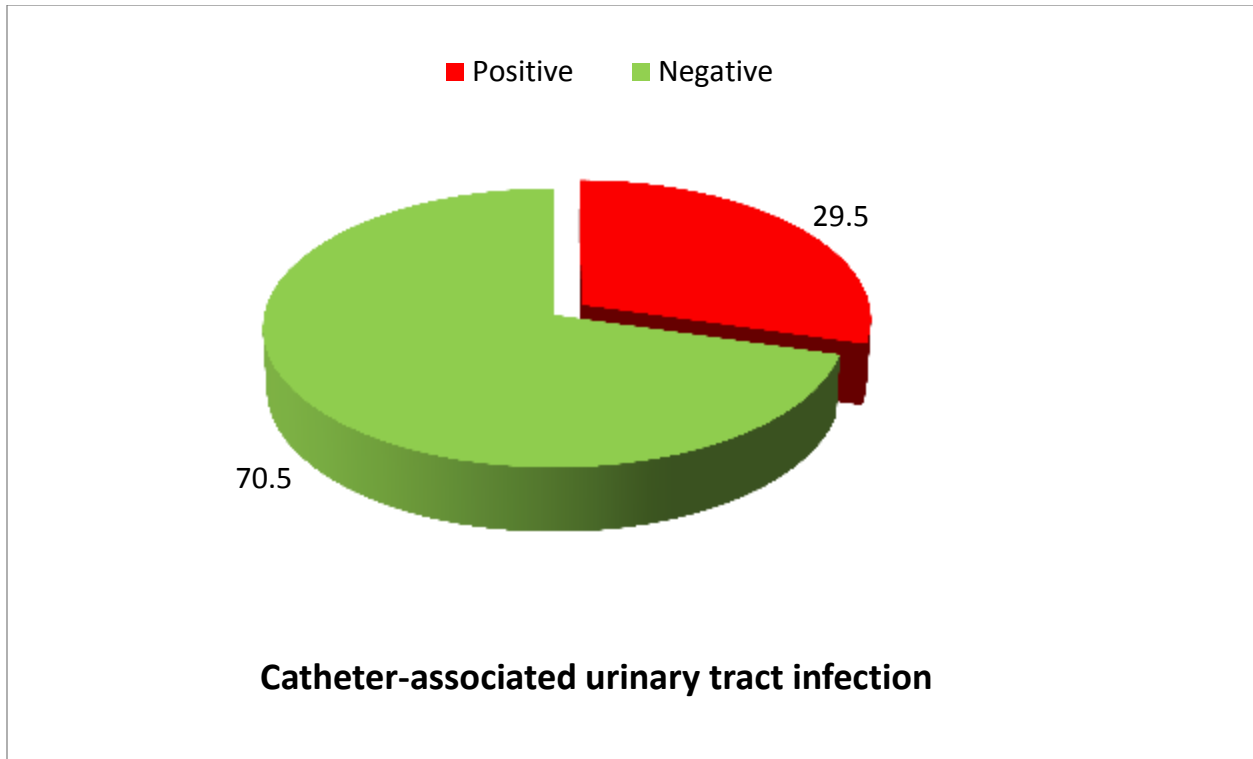


Fig. 4:- Distribution of the studied patients regarding catheter-associated urinary tract infection.

The type of isolated organism associated from urinary tract infection:

The most common isolated organism among patients with CAUTI are Yeast, candida, E-coli and pseudomonas.

Table 7:- Distribution of positive cases catheter associated urinary tract infection regarding the type of isolated organism

Type of isolated organism	Number	Percent
Acinetobacter	1	1.7
Candida	11	18.6
E.Coli	7	11.9
Enterococcus faecalis	1	1.7
Enterococcus feacalis+	1	1.7
Pseudomonas		
Klebsiella	2	3.4
Proteus	1	1.7
Pseudomonas	4	6.8
Streptococcus	1	1.7
Vancomycin resistant enterococcus	4	6.8
Yeast	26	44.1
Total	59	100.0

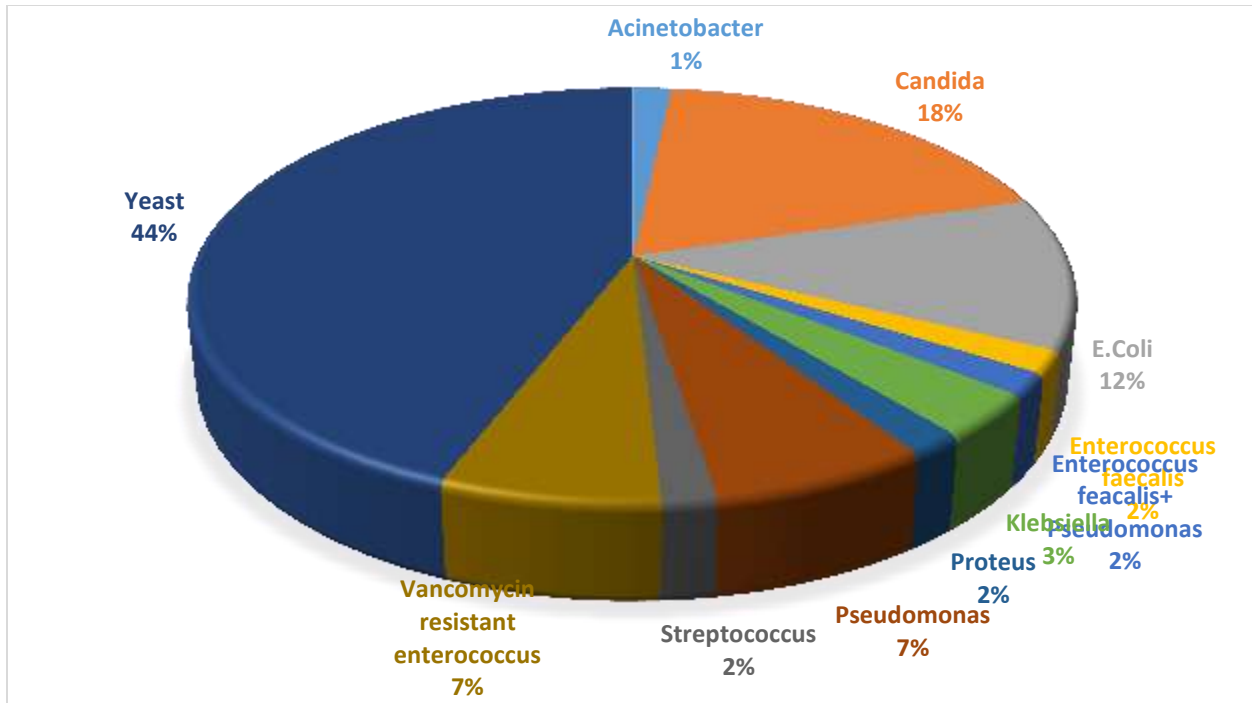


Fig. 5:- Distribution of positive cases catheter associated urinary tract infection regarding the type of isolated organism

The type of treatment of CAUTI:

Table 8 showed that the most commonly used antibiotic for CAUTI including cefatrixon, Linezolid, colistin and fluconazole (Table. 8 & Figure. 6).

Table 8:- Distribution of positive cases catheter associated urinary tract infection regarding the type of treatment

Antibiotic received	Number	Percent
Amikacin	1	4
Amikacin-Meropenum	1	4
Augmentin	1	4
Cefatrioxon	6	24
Colistin	3	12
Fluconazole	3	12
Imipenem	3	12
Linezolid	4	16
Meropenum	2	8
Meropenum-Vancomycin	1	4
Total	25	100.0

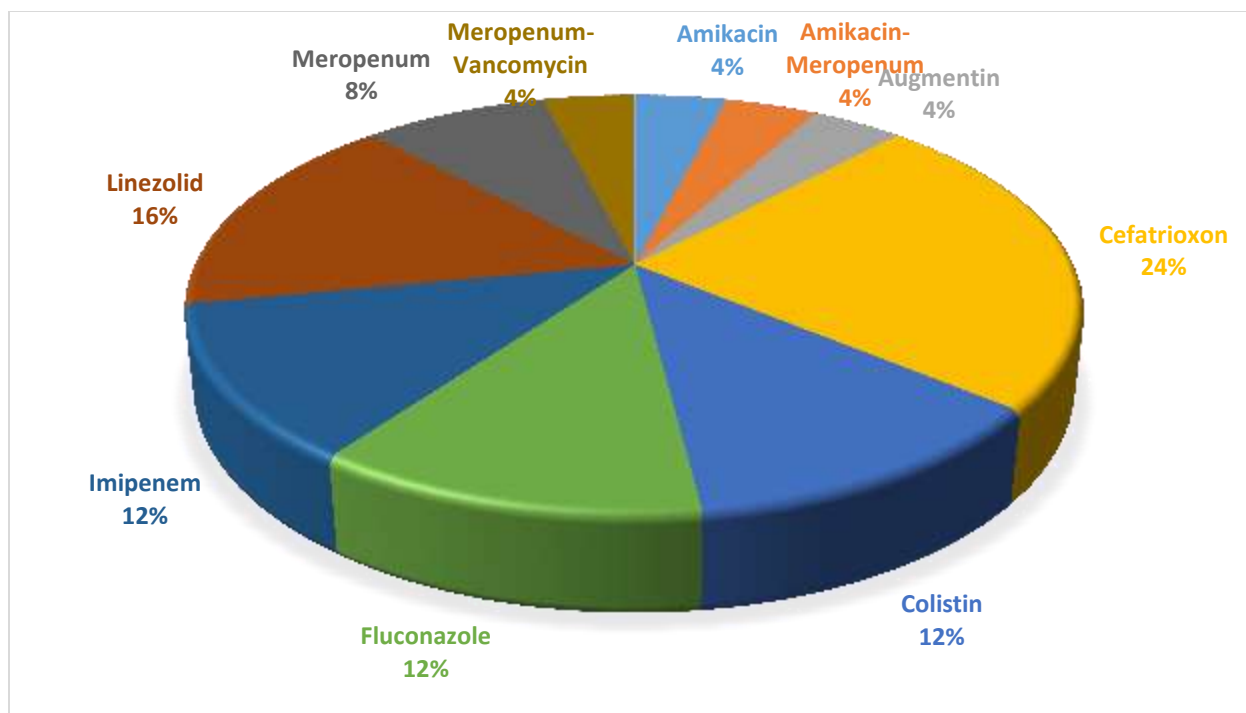


Fig. 6:- Distribution of positive cases catheter associated urinary tract infection regarding the type of treatment

The outcomes:

The outcomes of CAUTI were complete recovery among 98.5% of patients (table. 9, Figure. 7)

Table 9:- Distribution of the studied patients group regarding outcome.

	Number	Percent
Out come		
complete recovery	197	98.5
Discharge against medical advice	1	.5
Died	2	1.0
Total	200	100.0

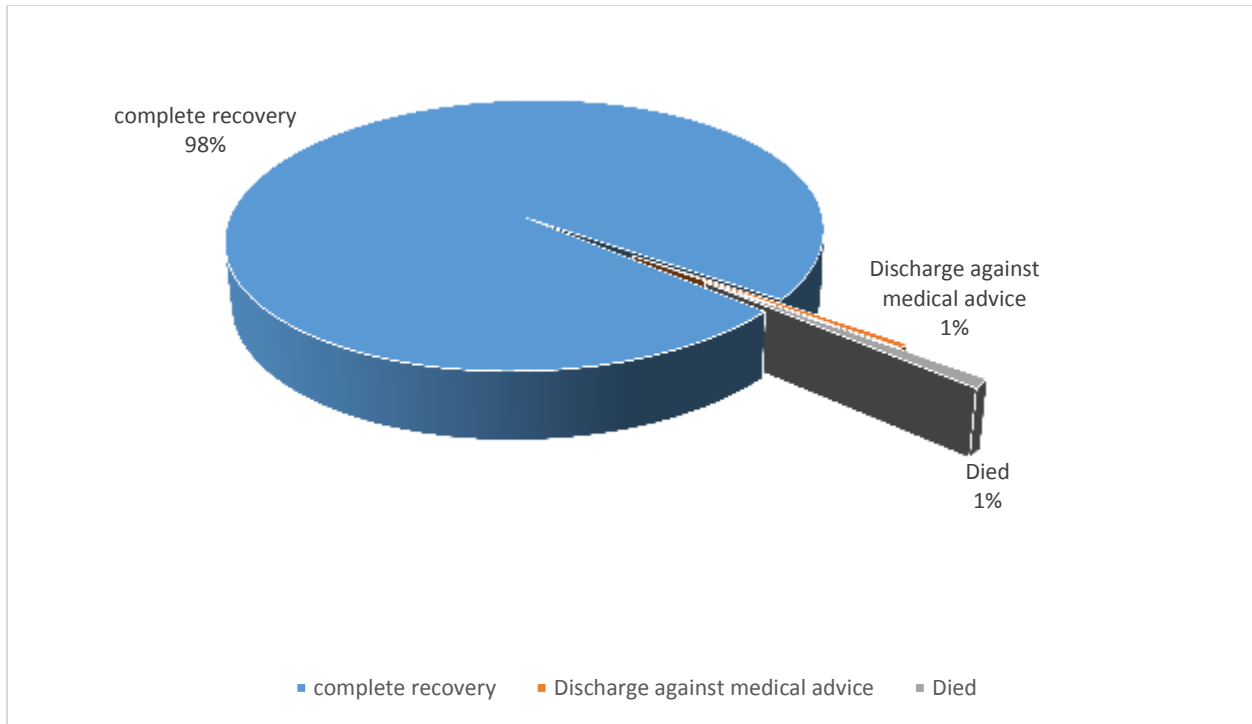


Fig. 7:- Distribution of the studied patients group regarding outcome.

Distribution of the studied patients group regarding to their location:

Table. 10 showed the distribution of the patients regarding their location as 82.5% were in medical ward and 17.5% were in ICU.

Table 10:- Distribution of the studied patients group regarding to their location

	Number	Percent
Location		
ICU	35	17.5
Ward	165	82.5
Total	200	100.0

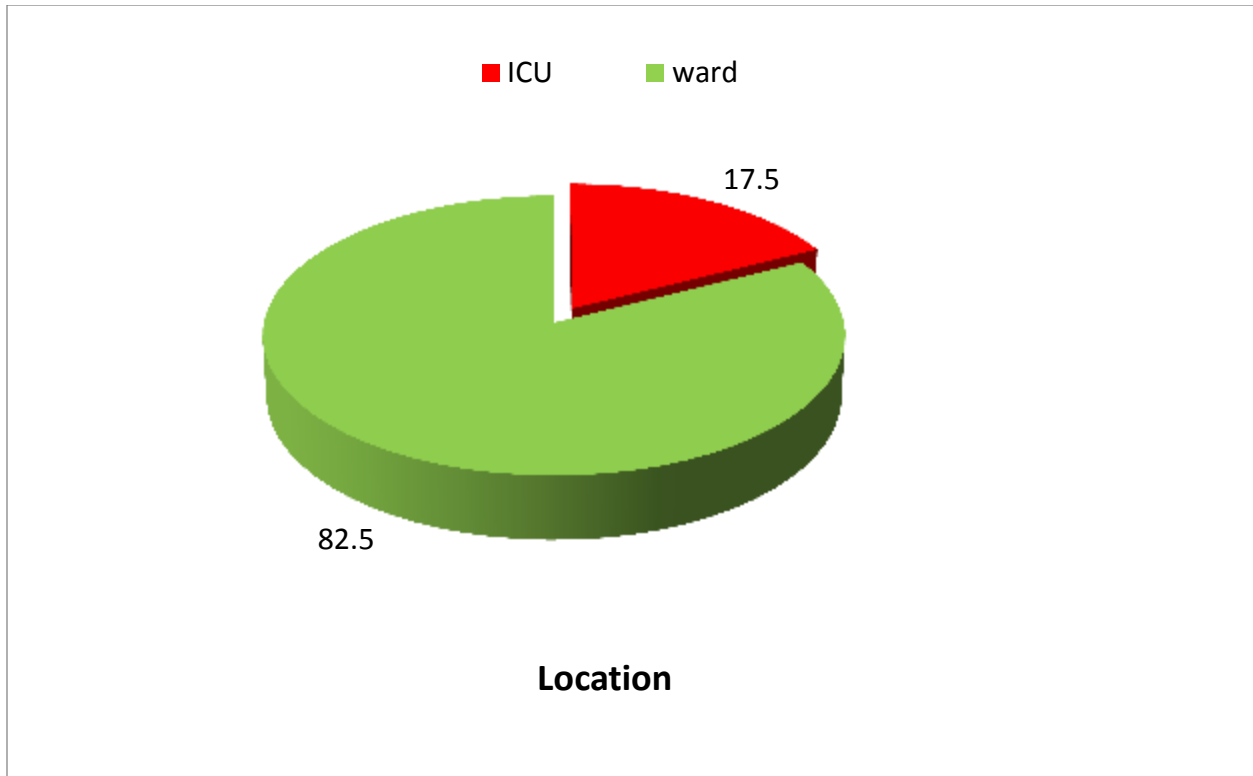


Fig. 8:- Distribution of the studied patients group regarding to their location

Relation between catheter-associated urinary tract infection and demographic data as a risk factors:

There was no correlation between the CAUTI with the age, BMI, PH of UTI, past history of FC. On the other hand, it was significantly associated with female gender and the type of associated disease.

Table 11:- Relation between catheter-associated urinary tract infection and demographic data as a risk factors.

	Catheter-associated urinary tract infection				Odd's ratio	X² p
	+ve "n=59"		-ve "n=141"			
	No.	%	No.	%		
Age group					0.98	0.712 0.870
<40	5	8.5%	13	9.2%		
40-60	12	20.3%	32	22.7%		
60-80	31	52.5%	65	46.1%		
80+	11	18.6%	31	22.0%		
Sex						
Male	11	18.6%	44	31.2%	2.11	3.292 0.050*
Female	48	81.4%	97	68.8%		
BMI	26.47±7.06		27.62±8.26		1.00	0.158
PH Of UTI						
Yes	8	13.6%	12	8.5%	1.11	1.178 0.278
No	51	86.4%	129	91.5%		
Past history of FC						
Yes	9	15.3%	16	11.3%	0.988	0.580 0.446
No	50	84.7%	125	88.7%		
Associated disease	51	86.4	79	56.0	3.25	6.58 0.001*

Relation between catheter-associated urinary tract infection and symptoms:

There was no correlation between the CAUTI with the symptoms among patients including fever, urinary urgency, hematuria vomiting and confusion while other symptoms showed no association with CAUTI.

Table 12:- Relation between catheter-associated urinary tract infection and symptoms.

	Catheter-associated urinary tract infection				Odd's ratio	X ² p
	+ve "n=59"		-ve "n=141)			
	No.	%	No.	%		
Fever	8	13.6%	1	0.7%	3.92	15.982 0.0001*
Suprapubic pain	1	1.7%	1	0.7%	1.22	1.25 0.089
Costophrenic angle pain or tenderness	2	3.4%	1	0.7%	1.31	2.023 0.155
Urinary urgency	2	3.4%	0	0.0%	2.65	4.828 0.028*
Dysuria	1	1.7%	0	0.0%	1.00	2.402 0.121
Hematuria Vomiting	2	3.4%	0	0.0%	2.65	4.828 0.028*
Confusion	3	5.1%	0	0.0%	2.98	7.279 0.007*

Relation between catheter-associated urinary tract infection and duration of treatment as a risk factors:

There was a highly significant association between the duration of treatment and the CAUTI as the higher the treatment period the higher the risk of CAUTI.

Table 13:- Relation between catheter-associated urinary tract infection and duration of treatment as a risk factors.

Duration of treatment	Catheter-associated urinary tract infection				Odd's ratio	X ² p
	+ve "n=59"		-ve "n=141)			
	No.	%	No.	%		
< 7 days	3	5.1	45	31.9	3.11	12.52 0.001*
7-14 days	2	3.4	52	36.9		
14-30 days	18	30.5	15	10.6		
>30 days	36	61.0	29	20.6		

Relation between catheter-associated urinary tract infection and outcome:

There was no correlation between the outcomes of treatment and the CAUTI.

Table 14:- Relation between catheter-associated urinary tract infection and outcome.

Outcome	Catheter-associated urinary tract infection				Odd's ratio	X ² p
	+ve "n=59"		-ve "n=141)			
	No.	%	No.	%		
complete recovery	58	98.3	139	98.6	0.98	1.068 0.586
Discharge against medical advice	0	0.0	1	0.7		
Died	1	1.7	1	0.7		

Discussion:-

Urinary tract is recurrently exposed to colonization of numerous usual flora some of which can act as adaptable pathogens⁽⁷⁾. Urinary Tract Infection (UTI) is a comprehensive term that describes a group of diseases that can

result from the settlement of microbes in the urinary tract ⁽⁸⁾. UTI consist of a multiple of disease including urethritis, pyelonephritis and cystitis ⁽⁸⁾.

UTIs continue is a serious risk to millions of cases per year with possibility of evolving many chronic diseases ⁽⁹⁾. It can also have a significant impact on the socioeconomic lives of affected individuals, contributing largely to the increase in the consumption of antimicrobial drugs ^(10, 11). Many complications can originate from using indwelling bladder catheter ⁽¹²⁾.

This study showed that the most common causes were sepsis and pneumonia followed by hyperglycemia. In consistence, most of CAUTI patients fever has many causes of admission including pneumonia, bloodstream infection, or an intracranial bleed ⁽¹³⁾. This is also in the same pattern with other previous studies ^(14, 15).

Most of the patients showed no symptoms however only 4.5% have fever and there was a positive association between fever and CAUTI as a risk factor for CAUTI. In accordance, Fever is particularly communal among critically ill patients also catheterized patients must be evaluated for CAUTI if fever presented ^(13, 16, 17).

About 29.55 of patients had CAUTI with the majority of them located in ward than ICU. The same results were shown in other reports as about 75% of CAUTIs occurred in ward but not in ICU patients ⁽¹⁸⁾. In the same respect, many studies showed that more than half of CAUTI patients were located in non-ICU wards ^(19, 20).

The most common isolated organism among patients with CAUTI are Yeast, candida, E-coli and pseudomonas. Also, Yeast has been found to regularly colonize in the urinary catheters in about 50% of CAUTI ⁽¹³⁾. Another study showed that the most common pathogens isolated from CAUTI patients were Escherichia coli, enterococci and Candida species ⁽¹⁸⁾.

The most commonly used antibiotic for CAUTI including ceftriaxone, Linezolid, colisitn and fluconazole. However, there is no recommendation for antibiotic prophylaxis can be specified for repetitive use for prevention of CAUTI ⁽²¹⁾.

CAUTI was significantly associated with female gender. Similar results were shown by kashef et al. (2010) ⁽²²⁾ where 85.2% of females had UTI. Also, another study proposed that more than half of patients were females ⁽²³⁾ as the anatomical structure of the female genitourinary tract makes them more susceptible to the disease, particularly during pregnancy ^(10, 24).

Conclusion:-

CAUTI was most common among patients located in ward than ICU. The most common risk factors were female gender, fever, previous illness and long duration of illness. Yeast and candida are the most common isolated microorganisms among patients with CAUTI.

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Conflicts of Interest: No conflicts of interest

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