

PREVALENCE OF NOSOCOMIAL URINARY TRACT INFECTION AMONG IN-PATIENTS IN AI-SALM TEACHING HOSPITAL / NINEVEH ⁺

انتشار عدوى خمج المجاري البولية المكتسبة بين المرضى الراقدين في مستشفى السلام
التعليمي / نينوى

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Abstract:

Nosocomial Infections or Hospital-Acquired Infections is a substantial public health problem in many countries and has been associated with a range of adverse consequences including increase of morbidity and mortality rates, hospitalization time, and the costs on the patients and Hospitals. The present study aimed to identify the prevalence of nosocomial urinary tract infection among hospitalized patients, and to examine the relationship between demographic characteristics of the patients and the acquisition of nosocomial infection. The sample of the study included all the patients who admitted to the surgical and orthopedic wards in AL- Salam-Teaching Hospital in Mosul City during a period of four months extending from 30th of December 2009 to 1st of May 2010. The Data were collected through two ways: patient's demographic sheet in addition to health history through an interview technique for all patients, and urine examination for all subjects in the sample. The study revealed that (33.3%) of the sample acquired nosocomial urinary tract infection at hospitalization, mainly in the third day, also it indicated that presence of an indwelling bladder catheter and suffering from chronic diseases had statistical significant differences in their relation with acquisition of nosocomial urinary tract infections. The study concluded that nursing staff shortage, negligence of patient unit and hospital environment care can be risk factors for acquisition of nosocomial urinary tract infections; and it recommended the increase of number of nursing staff especially in the night shift, taking care of the patient unit or environment as an important aspect of patient care, and further researches about the care provided directed to prevent the acquisition of nosocomial urinary tract infections.

Key Words; Prevalence, Nosocomial Infection, Urinary Tract Infection, Inpatient.

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يعتبر خمج المستشفيات مشكلة صحية كبيرة في عدة بلدان وتصاحبها نتائج غير مرغوبة تتضمن زيادة في معدلات المراضة والوفيات وطول فترة الرقود والتكلفة المادية على المرضى والمستشفيات. تهدف هذه الدراسة إلى التأكد من انتشار عدوى خمج المجاري البولية بين المرضى الراقدين والتعرف على العلاقة بين الخصائص الديموغرافية للمرضى وعلاقتها باكتساب العدوى. شملت عينة الدراسة كل المرضى الذين دخلوا إلى ردهات الجراحة والكسور في مستشفى السلام التعليمي في مدينة الموصل خلال فترة جمع البيانات والبالغة أربعة أشهر التي امتدت من الثلاثين من كانون الأول ٢٠٠٩ إلى الأول من أيار ٢٠١٠ ، حيث تم جمع المعلومات بطريقتين هما : طلبة المريض ذات المعلومات الديموغرافية بالإضافة إلى التاريخ الصحي خلال تقنية المقابلة لكل المرضى، وفحص الإدرار لكل فرد من العينة. توصلت الدراسة إلى أن (33.3%) من عينة الدراسة اكتسبوا التهابات المجاري البولية أثناء فترة رقودهم في المستشفى خصوصاً في اليوم الثالث من الدخول، كما وأظهرت بان وجود قسطرة المثانة البولية والإصابة بالأمراض المزمنة عند المرضى الراقدين كان لهما علاقة إحصائية ذات دلالة معنوية باكتساب العدوى . واستنتجت الدراسة إلى أن نقص الملاك التمريضي وإهمال وحدة المريض وقلة الرعاية ببيئة المستشفى قد تكون عوامل خطورة رئيسية في اكتساب العدوى. وأوصت الدراسة بضرورة زيادة الملاك التمريضي خصوصاً في التناوب الليلي والعناية بوحدة المريض وبيئة المستشفى إضافة إلى إجراء بحوث مستقبلية حول الإصابات المستشفوية وطرق منع اكتسابها لمنع اكتساب خمج المجاري البولية داخل المستشفى .

Introduction:

Nosocomial Infections are infections that are acquired as a result of exposure to a microorganism in a hospital setting [1]. These infections typically occur within seventy-two hours of hospitalization [2,3]. Nosocomial infections are classified as infections that are associated with the delivery of health care services in a health care facility. Nosocomial infections can either develop during a client's stay in a facility or manifest after discharge. Nosocomial microorganisms may also be acquired by health personnel working in the facility and can cause significant illness and time loss from work [4]. Nosocomial infections have received increasing attention in recent years and are believed to involve about two million clients per year [5].

The importance of the study emerged from: **Firstly**; Nosocomial infections increase the morbidity and mortality rate [6], and **Secondly**; Nosocomial infections increase the period of stay inside the hospital and lead to increase the cost on the patients and hospital [4].

Objective of the study; The study objected to compute the prevalence of nosocomial urinary tract infection among inpatients and to identify the relationship between nosocomial urinary tract infection and many variables.

Methodology:

A descriptive design was depended to carry out this study through the period (30th) of December to (1st) of May 2010. The study was carried out at the surgical and orthopedic wards in AL-Salam Teaching Hospital in Nineveh Governorate. All the patients admitted to the surgical and orthopedic wards in AL-Salam Teaching Hospital during the period of data collection, (300 patients) were the sample of the study. Mid-Stream Urine specimens were taken from all patients admitted to the two

wards; ninety patients of them diagnosed "depending on the results of specimens investigated" as they had urinary tract infection at admission (carrier UTI), therefore, they were excluded from the study, whereas, the final study sample remained (210) patients. The instrument depended in the study is composed of two parts; Firstly- Health history sheet regarding the demographical characteristics of the sample, as; Biographical data, present illness, medical history, drugs taken, foley catheter, and Secondly- Laboratory examination {General Urine Examination}, by using The URXXXON relax (MACHEREY -NAGEL GMBH & CO. KG., Germany) that is reflection photometer for the analysis of urine test sticks. The measurement is performed under standardized conditions, measured values may be displayed, printed and transferred to a computer. The URXXXON relax is designed for in-vitro diagnostic use (IVD) and should be used by health care professionals only. Data were collected through an Interview method with each subject of the sample to fill in the health history sheet, each interview lasted (15-30) minutes and by collecting a urine specimen (mid stream urine) from each subject of the study sample and sending it to the laboratory department to examine (General Urine Examination), and later documenting the result in the patient health sheet "Daily urine specimen exam were conducted for the all, whenever, such specimen demonstrated presence of UTI, the patient documented as Nosocomial Infection Case, and the others investigated day by day till indication of UTI or not till discharge". The same procedure, the same laboratory technician and the same device were used in the laboratory exam for specimens. To describe and analyze the findings of the study, the statistical means used were: Mean, Standard deviation, Frequency and Percentage as descriptive statistic and Histograms, Chi-square as inferential statistic, while the significance level was depended in the study to identify the relationship among nosocomial infection and variables was (P. < 0.05).

Results:

Table; Demographic Characteristics of the Study Sample.

Variables	Frequency	Percent
Gender		
Male	119	56.7
Female	91	43.3
Age		
Under 10 years	17	8.1
11-20 year	41	19.5
21-30 year	35	16.7
31-40 year	28	13.3
41-50 year	33	15.7
51-60 year	38	18.1
61-70 year	18	8.6
Mean and Standard deviation= 36.86 ± 19.04		
Chronic diseases		
Didn't Suffer	156	74.3
Suffered from	54	25.7
Ward		
Surgical	142	67.6
Orthopedic	68	32.4
Foley's catheter		
Presence	25	11.9
Absence	185	88.1
Drug taken		
Didn't Administer	8	3.8
Administered	202	96.2
Present illness		

skeletal system	58	27.6
muscular system	29	13.8
nervous system	2	1.0
digestive system	109	51.9
reproductive system	7	3.3
lymphatic system	5	2.4

According to the gender, the highest percentage was of males (56.7%), and according to the age, the highest percentage was of the age group (11-20 year) that was 19.5%. With regard to chronic disease, (74.3%) of patients did not suffer from any chronic diseases. According to the ward (67.6%) were surgical ward inpatients, and with regard to Foley's catheter (88.1%) of patients didn't have Foley catheter. As for the drug taken (96.2%) of patients had taken antibiotics, and according to the present illness (51.9%) of patients were suffering from digestive system disorders.

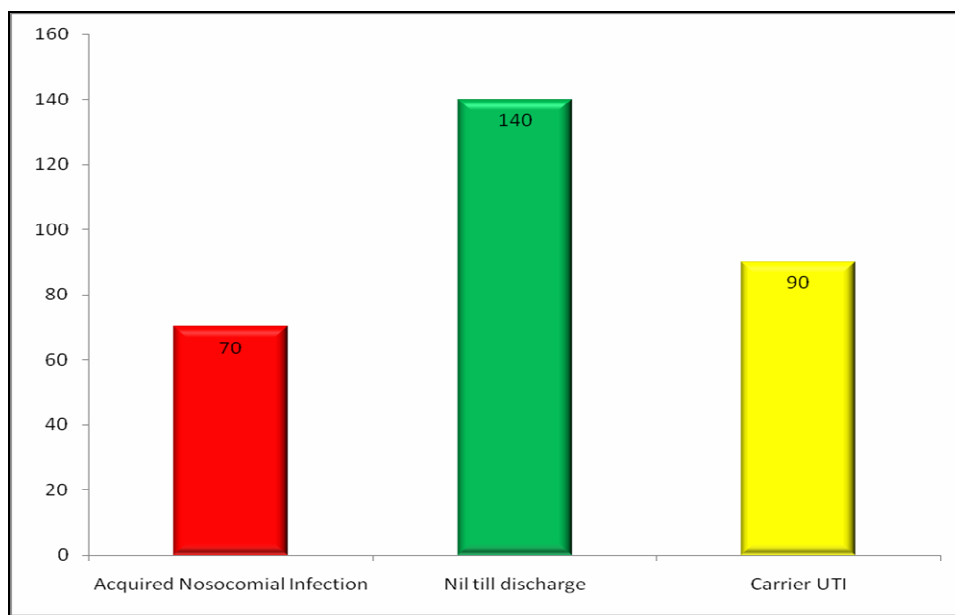


Figure (1); Distribution of Inpatient during the Period of Study with Regard to Nosocomial Urinary Tract Infection.

Figure (1) demonstrates that (140) patients out of (300) patients admitted to the hospital didn't get acquired infection during hospitalization as a highest column (46.67%); seventy patients acquired infection while hospitalization, while the rest (90 patients) were carriers of UTIs before admission.

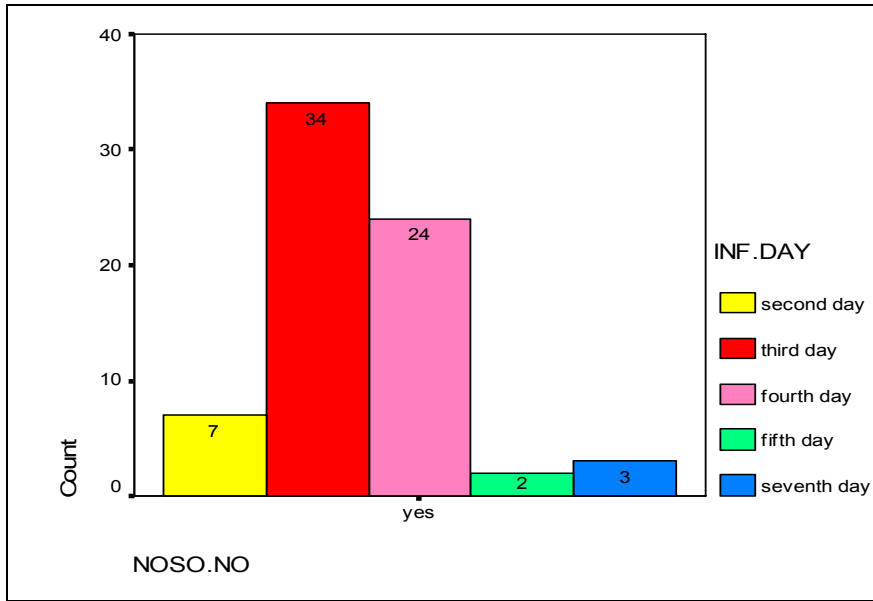
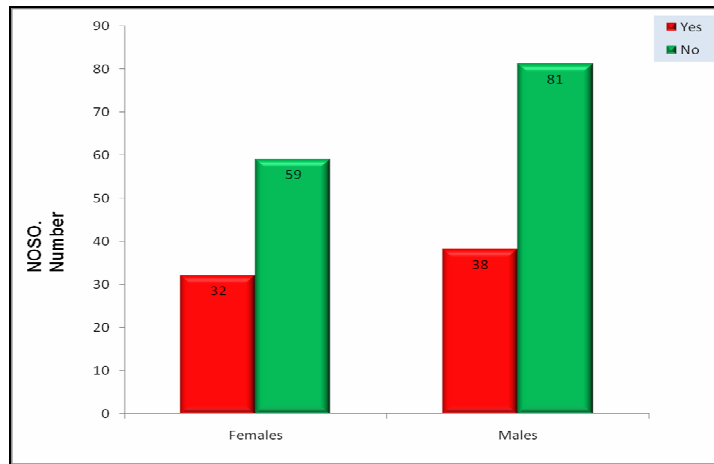


Figure (2); Distribution of Nosocomial Urinary Tract Infection with Regard to Day of Admission

Figure (2) shows that the third day of admission recorded the highest incidence of nosocomial infection (34) case from (70) case (48.57%).



Chi-square test; value= 0.242, DF= 1, non significant

Figure (3); Relationship between Gender and Nosocomial Urinary Tract Infection

Figure (3) shows that the percentage of infected females is more than of males as 35.16% (32/ 91) vs. 31.93% (38/119). While by using Chi-square test to identify the relationship, it was found that there is no significant relationship.

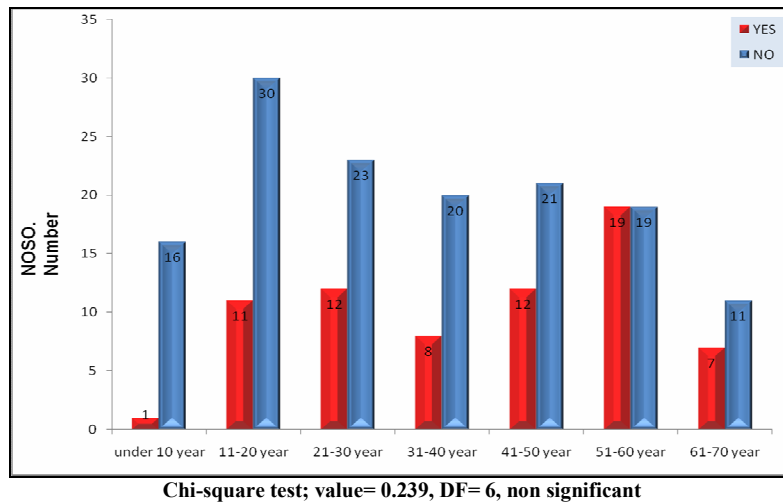


Figure (4); Relationship between Age Groups and Nosocomial Urinary Tract Infection

Figure (4) shows that the highest frequency of nosocomial infection in the study sample was higher among the age Group (51-60) years (19/70) as a number of cases among the all age groups, while it was 50% (19/38) among the group patients themselves, while by using chi-square test, there is no significant relationship at any level.

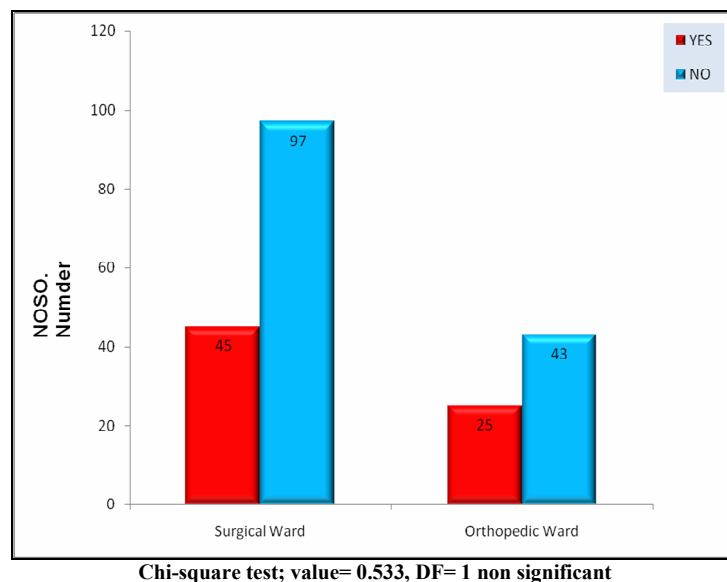


Figure (5); Relationship between Ward and Nosocomial Urinary Tract Infection

Figure (5) depicts that the percentage of incidence of nosocomial urinary tract infection in orthopedic ward is more than in surgical ward 36.76% (25/68) vs. 31.69% (45/142). While by using chi-square test; it was found that there is no significant relationship at any level.

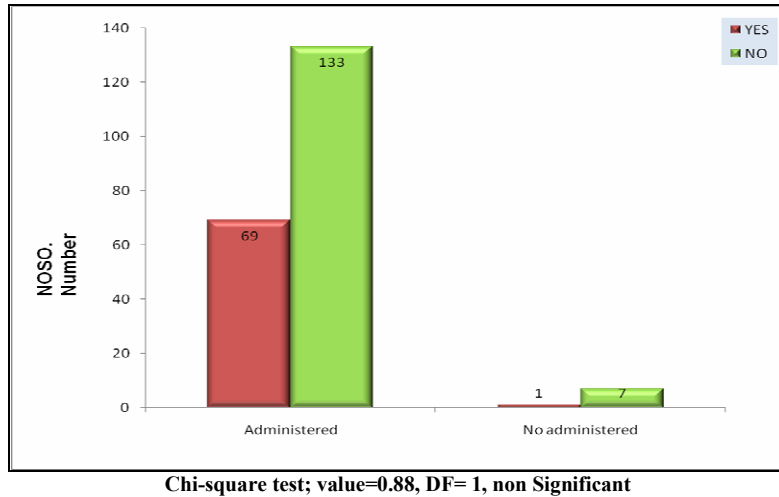


Figure (6); Relationship between Drug Administered and Nosocomial Urinary Tract Infection

Figure (6) shows that from the total nosocomial infection cases, it had increased among patients who had been taken (antibiotic drugs) (69/202), while by using chi-square test, it was found that there is no significant relationship at any level.

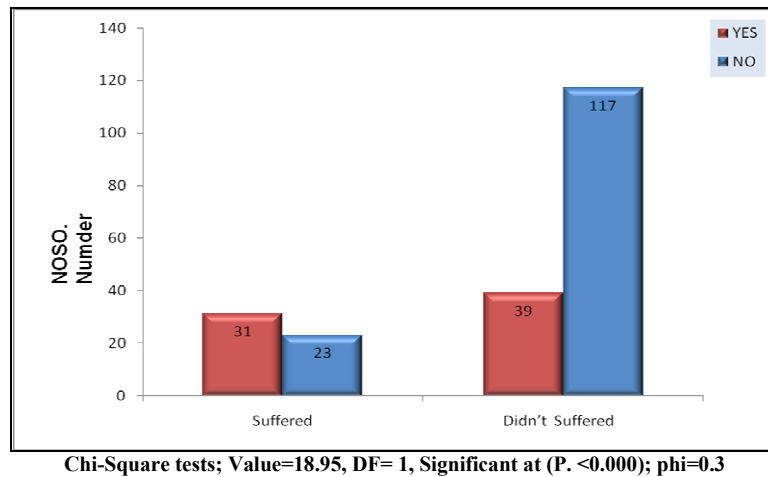
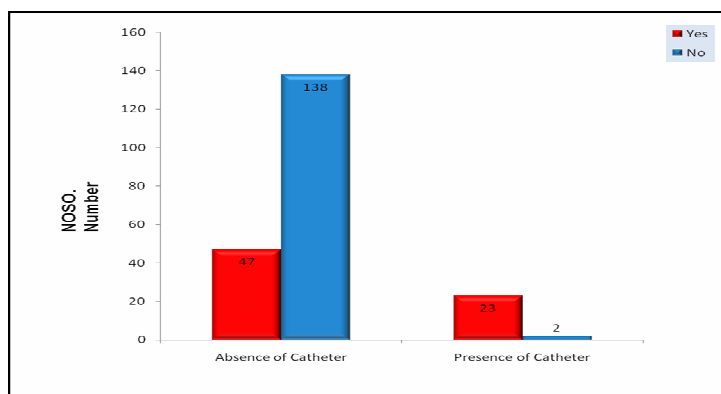


Figure (7); Relationship between Chronic Diseases and Nosocomial Urinary Tract Infection

Figure (7) shows that increase of incidence of nosocomial urinary tract infection among patients suffer from chronic diseases as 57.41% (31/54), and by using chi-square test, it was found that there is significant relationship at (P. <0.000).



Chi-square test; value=0.457, DF=1, Significant at (P. < .000); phi=0.457

Figure (8); Relationship between Indwelling Urinary Catheter and Nosocomial Urinary Tract Infection

Figure (8) shows that increase of incidence of nosocomial urinary tract infection among patients with indwelling catheter as 92% (23/25), and by using chi-square test, it was found that there is significant relationship at (P.<0.000).

Discussion:

Many factors can contribute to the acquisition of nosocomial infection during patient hospitalization as a predisposing or precipitating factors, they can emerge from many origins or sources: Patient-related, health care personnel-related, environmental-related and care or such procedures-related, therefore, some of these infections can be obvious to measure their effect or relation while others are hidden and cannot be measured. From there, the present study had been carried out as a trial to explore some of these related factors which are mainly patient-related.

Many researchers indicated the acquisition of overall nosocomial infection incidence during the patient's stay in the hospital as: 30.9% [7], 8.03% [8], 29.1% [9], 19.7% [10] and 33.5% [11]. With regard to urinary tract infection as one aspect of nosocomial infection, many researchers also indicated its incidence as: 40% [12], 39.1% [9], 45% [10], 35-45% [13,14], 31% [15] and 47% [16]. In the present study, it was found that among (300) patients admitted to the hospital, (70) patients acquired urinary tract infections while (90) patients were detected as a carrier of urinary tract infections via urine specimen investigation at admission (they were excluded from the study) as in (Figure-1). What so ever, it was found that UTIs is a health problem some people in the community suffered from, for it constitutes 30% (90/300) of patients admitted to the hospital. This phenomenon reflects obviously low awareness of self health care, inappropriate and inadequate health services and bad sanitation.

The prolonged hospital stay has an adverse effect for it could expose the patient to the hospital flora a longer time, the seriously ill patients who are at risk of prolonged hospitalization may be prone to, hospital acquired urinary tract infection(HAUTI) on account of their immune incompetent status. Further, nosocomial infections including hospital acquired urinary tract infection are known to increase the number of hospital-days [17]. Another study indicated that a statistically significant association was noted as the incidence of hospital acquired urinary tract infection increased with duration of hospitalization [8]. Many researchers agreed upon that nosocomial infection developed at (48-72) hours after hospital admission or within (48) hours after being discharged that was incubating at the time of admission to hospital [10,12,18,19,20].

In this study as (Figure-2) demonstrates, it was found that (48.57%) of the infected cases were acquired at the third day of admission. On the other hand, (82.86%) of the infected cases were acquired during the third and fourth days of admission. What does it mean when this miserable percentage of acquired infection got in this short period of hospitalization except the low immunity, chronicity of some diseases inappropriate and inadequate care provided in addition to the bad care of environment and so on!!!

Risk Factors of Nosocomial Urinary Tract Infection;

Gender:-

In the present study, as (Figure-3) demonstrates, females acquired infection more than males as (35.16% vs. 31.93%), respectively. Anatomically, this phenomenon can be accepted due to the shortness of urethra in females than males which makes them more susceptible to UTIs. Previous studies indicated that females have a stronger predilection for hospital acquired urinary tract infection compared to males as; (6.57%) among males and (9.82%) among females [8,21], and as (65.6%) among females, while another study contradicted that as it was higher among males more than females as (75%) [12], (14.07% vs. 5.68%) respectively [10] and [22].

Age:-

The present study finds that the mean age of its patients was (36.86 ± 19.04 years). Many studies contradicted this finding for that the mean age of their patients was (51.9 ± 17.7 years) [12,23,24], while another study agreed with this finding for that the mean age of its patients was (37.04 ± 17.15 years) [9]. The incidence of nosocomial infections in geriatric patients was (19.7%) [10]. There are many factors which lead to increase the risk of infection among elderly persons such as: poor nutrition, immobility leading to poor hygiene, chronic illnesses and increased stress on the body and strain on the body's defense mechanisms against that disease, this makes the person more susceptible to other infections, such as: prostatic hypertrophy and degeneration of nerves to bladder that cause urine stasis in bladder as a result of incomplete emptying, stasis predisposes to urinary tract infection [17]. In the present study, the geriatric patients (over fifty years old) acquired infections constitutes 46.43%, while age doesn't indicate any statistically significant difference as in (Figure-4). Old age has a heavy burden on the individual for the degenerative diseases develop sooner and their immunity is compromised.

Site of Patients:-

The present study as in (Figure-5) explores the incidence of hospital acquired urinary tract infection in surgical and orthopedic wards, it was found that the incidence among orthopedic patients is more than among surgical patients (36.76% vs. 31.69%), but it didn't indicate any statistical significant differences. Orthopedic patients especially of pelvic and lower extremity fractures or surgeries may or must be in many instances immobile, also the perineal care after elimination (urination or defecation) is so difficult, inadequate and unhealthy practices that expose this area to more contamination. Many studies agreed upon that urinary tract infections is the most common frequent nosocomial infections seen in critically ill patients [15,25,26].

Drug Administration:-

Figure (6) demonstrates that (34.16%) of the acquired infection cases occurred despite drug administration versus (12.5%) without drug administered, while it doesn't record

any statistically significant difference. The aim of antimicrobial therapy is to choose a drug that is selectively active against the most likely pathogen(s) and the least likely to cause adverse effects or promote resistance [19]. But there are many problems today in the use of antimicrobials; problems include overprescribing administration of suboptimal doses, too short treatment period, and misdiagnosis leading to an inappropriate choice of agent. These problems lead to the emergence of resistant organisms that are spread when hand washing, barrier precautions and equipment cleaning are not optimal [14]. The organisms that cause nosocomial infections are often drug-resistant. The regular use of antimicrobials for treatment therapy or prophylaxis promotes the development of resistance. Through antimicrobial-driven selection and the exchange of genetic resistance elements, multi-drug resistant strains of bacteria emerge [19]. Inappropriate and excessive use of antimicrobial drugs leads to the selection of antibiotic-resistant microorganisms and nosocomial outbreaks of infection with multi-resistant strains [27].

Chronic Diseases:-

Chronic diseases lead to impairing the normal defense mechanisms; serious illness taxes the immune system causing greater susceptibility to other pathogens [14]. It was found that (22.5%) of the patients with chronic diseases as (diabetes mellitus, benign prostatic hyperplasia and cancer) could have contributed significantly to the development of nosocomial infections [10]. Figure (7) presents that (57.41%) of hospital acquired urinary tract infections were among patients suffering from such chronic disease versus (25%) of it is among patients free from any chronic disease, while it reports statistically significant difference at ($P < 0.000$).

Indwelling Bladder Catheter:-

The indwelling urinary catheter as an invasive device has a significant association with hospital acquired urinary tract infections for it provides either a portal of entry for microorganism or a place for colonization of microorganism [14]; approximately 66-86% of nosocomial urinary tract infection is associated with Foley's catheter [4], 33.6% among patients admitted to Medical College Hospital in Goa [8], 9.2% among intensive care unit patients [12], 28% [28]. Thirty per one thousand among burn patients [29] and 20-30% among intensive care unit patients [15]. In the present study, as in (Figure-8), tremendous feature for indwelling urinary catheter emerged. It is reported that (92%) of hospital acquired urinary tract infections among patients are statistically significant at ($P < 0.000$). Caring of catheter is very important and intended to prevent infection and other complications by keeping the catheter insertion site clean, routine catheter care typically is performed twice daily, after the patient's morning bath and immediately after perineal care and in the bedtime [31].

Nursing implication:-

Nosocomial Infections do not only affect patient health and safety, but also the health care system as a whole. It is estimated that nosocomial infections increased the cost of health care, increase the number of days a patient spends in the hospital, requiring additional medical care and hours spent providing patient care. The transmission of hospital-acquired infections through both patients and health care workers in developing countries remains an important patient-safety issue [6]. Healthcare

workers may be potential vectors of disease, disseminating virulent microorganisms among their patients because patient can shed infectious microorganisms into the healthcare environment, by the virtue of their constant contact with patients. Healthcare workers are also at risk of transmitting microorganisms [32]. Thus, both patients and healthcare workers can transmit infection through direct contact with patients, as well as through indirect contact with inanimate objects. Items such as stethoscopes [33], masks [34], neckties [35], pens [36], badges and lanyards [37] and white coat [38] all have the potential to transmit hospital-acquired infections. White coats used by healthcare workers can harbor a very high load of bacteria agents and may play a contributory role in the transmission of nosocomial infections in healthcare settings [38,39,40,41,42].

The high rate of bacterial contamination of white coats may be associated with the following two facts: first, patients continuously shed infectious microorganisms in the hospital environment, and healthcare workers are in constant contact with these patients. Therefore, there is a high probability of cross-contamination. Second, it has been demonstrated that microorganisms can survive between (10 and 98) days on fabrics found in hospitals, such as those used for white coats, including cotton, cotton and polyester, or polyester materials [43]. Regarding healthcare workers in the present study, many aspects can be behind acquisition of nosocomial infections among patients:

A. Nurse-Patient Ratio: - when the nurse-to-patient ratio declines, the amount of care and time allotted to each patient also decreases [44]. A consequence of the current nursing shortage is a decrease in nurse-to-patient ratio, thus increasing each nurse's patient load. Numerous studies have associated short staffing and high nursing patient loads with increases in nosocomial infections [45,46,47,48]. California Assembly Bill (AB) began in (2004) to include a nurse-to-patient ratio of one licensed nurse to every six patients on general medical-surgical units. This ratio was updated in (2005) to increase the nurse-to-patient ratio to one nurse per every five patients [45]. In the settings of the present study, the total patient's beds in each setting were (33) bed, but they weren't occupied all over time. For surgical ward, occupied beds rate was 71.4% [25 bed from 35], and for orthopedic ward, it was 57.1% [20 bed from 35] through the study time. On the other hand, the nursing staff working at the daily shift were (4) nurses, while for the night shift were (2) nurses for both settings, so when calculating the nurse-patient ratio, it has been found that it should be, for surgical ward [one nurse for 6.2 patients for daily shift and one nurse for 12.5 patients for night shift], while it should be for orthopedic ward [one nurse for four patients for daily shift and one nurse for ten patients for night shift]. This situation led to an overload on the nurse who reflects the inadequate and inefficient of care providing to the patients.

B. Other factors: - One of the most pertinent factors leading to nosocomial infections is noncompliance with infection control measures by health care providers [49]. Hand hygiene, environmental cleaning, and appropriate hospital staffing can impact infection rates [50]. Hospital factors and patient-related risk factors, showed that long work hours among staff were associated with increased risk of infection, other staff-related correlates of infection were high work stress, as indicated by high imbalance between efforts and rewards, low trust between work unit members, injustice in the distribution of work and poor collaboration between ward supervisors [51]. In the settings of the study, likewise, our hospitals, the care provided to the patient depended on traditionally routine. For it depends on therapeutic regimen (drugs),

without appropriate care of the patient's unit, hospital environment, appropriate collaboration and therapeutic physician-nurse relationship, poor relationship between administrators or managers and nursing staff, and absence of actual professional evaluation of staff. The previous factors in addition to others perhaps can be the cause of the high acquisition of the nosocomial infections.

Conclusions:

1. Urinary Tract Infections is one of the public health problems.
2. Nosocomial Urinary Tract Infections emerged as a large problem.
3. There are many patient-related factors that can interfere with acquisition of Nosocomial Urinary Tract Infections (e.g. gender, age, chronic diseases).

Recommendations:

1. Increase or enhance the public health awareness with regard to Urinary Tract Infections.
2. Increase the number of nursing staff especially in the night shift.
3. Enhance or develop the qualifications of the nursing staff.
4. Take care of the patient unit or environment as an important aspect of patient care.
5. In-depth researches in the care provided are directed to prevent the acquisition of Nosocomial Urinary Tract Infections.

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