Study of the Prevalence of Nosocomial Infections in the University Hospital Center of Béni-Messous, Algiers in 2023 – Algeria

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Abstract:- The risk of contracting an infection in the hospital has always existed. It has increased with the evolution of patient care practices. The objectives of our study were to determine the prevalence rate of nosocomial infections in our establishment, to know the most frequent sites of these infections and their prevalence, to determine the microorganisms and to study the risk factors linked to these infections.

This is a descriptive cross-sectional survey measuring the instantaneous prevalence of NI (nosocomial infections) "on a given day". Data collection took place from 28th May to 15th june 2023 with a single pass per service. Only the microbiological results were subsequently documented. The survey concerned 20 hospitalization departments and all patients hospitalized for more than 48 hours. The definitions of hospital infection were based on those from the Centers for Disease Control and Prevention (CDC). The data were entered and analyzed using Epi data 3.0 and Epi data analysis software.

A total of 393 patients were hospitalized, among them 237 were included in the study (hospitalized for more than 48 hours), i.e. a rate of 60.30%. The study population was relatively young with an average age of 41.9 ± 22.54 years. The overall prevalence rate was 5.9%. Overall, pulmonary infections (28.5%) were the most common. Pediatric services recorded a particularly high prevalence (16%) after hematology (25%). On the day of the survey, 54.4% of patients were under antibiotic treatment, including 51.2% with an empirical indication. The most frequently isolated germs were *Escherichia coli* (27.2%) and *Acinetobacter Baumanii* (27.2%), *Staphylococcus aureus* (18.18%). The occurrence of a nosocomial infection was significantly associated with immunosuppression and the presence of a central venous catheter. This study allowed us to better understand local specificities by highlighting services presenting particular risks and certain practices, in particular the frequent prescription of antibiotics.

Keywords:- *Prevalence, Nosocomial Infections, Risk Factors, Microorganisms, University Hospital Center.*

I. INTRODUCTION

Nosocomial infections (NI) represent a real public health problem today, with considerable consequences on patients by increasing the length of hospital stay, morbidity and even mortality, and also on the socio-economic level due to the burden linked to overconsumption of hospital resources[1,2,3]. INs have costs, their impacts being direct and indirect (increased length of hospitalization, mobilization of staff, lethality, temporary or permanent disabilities, number of days not worked per patient, etc.)

The risk of contracting an infection in hospital has always existed. It has increased with the evolution of patient care practices. The practice of care is effective but often invasive because it is accompanied by the possibility of contamination by microorganisms of endogenous or exogenous origin.

Prevalence surveys constitute the basic tool for monitoring nosocomial infections. They have even been recommended by the World Health Organization for national or international studies [4].

This advantage is even more considerable in countries of low socio-economic level where the resources available for the fight against nosocomial infections are lacking [5]. In addition, these surveys constitute a staff awareness and information tool [6, 7].

Awareness of the reality of this phenomenon, in a context of improving the quality of care, has led to the control of nosocomial infectious risk being made a real health priority [8].

In the Mediterranean region, few multicenter studies have been conducted on the subject. Except a national prevalence study conducted in Morocco in 1994, and in the Mediterranean region in 2010 [9,10].

Other surveys concerning nosocomial infection have been carriedout on a more restricted scale, often at the level of a single hospital.

The objectives of our study were to determine the prevalence rate of nosocomial infections in our

establishment, to know the most frequent sites of these infections and their prevalence, to determine the micro-organisms most involved in nosocomial infections, to study the risk factors linked to these infections.

II. MATERIAL AND METHODS

This is a descriptive cross-sectional survey measuring the instantaneous prevalence of ni "ON A GIVEN DAY".

Data collection took place over 15 working days from May 28 to June 15, 2023 with a single visit per department. Only the microbiological results were subsequently documented.

The survey concerned all hospitalization departments and all hospitalized patients except those where the stay did not exceed 48 hours (day hospital, hemodialysis patients, patients who stayed less than 48 hours in adult UMC and children).

The collection of information, by trained investigators, was done by examining the medical records of the patients, those of nursing care and the laboratory results, in addition. Interrogation of personnel, if necessary. Definitions of nosocomial infection were based on those of the Centers for Disease Control and Prevention [11].

The data collected on a standardized form concerned: the patient characteristics: admission, age, sex, intrinsic risk factors (diabetes, obesity, undernutrition, immunosuppression, neutropenia);

Extrinsic risk factors: urinary catheter, peripheral or central vascular catheter, parenteral nutrition, mechanical ventilation, surgical procedure;

The presence of a nosocomial infection: only active infections were taken into account: date of the start of the infection, cultures, microbiological results and resistance for certain organisms, two active infections could be noted;

The prescription of antibiotics: molecule and indication. To guide the screening of infected patients, the investigator should look for a temperature >37.8; general anti-infectious treatment; the prescription of bacteriological examinations (ECBU, blood cultures, etc.); In those who have undergone surgery, the notion of flow at the wound level.

The data were validated and entered on Epi data 3.0 and Epi data analysis software.

The analysis of risk factors was carried out for all nosocomial infections and for the most frequently identified sites during the survey. A univariate analysis made it possible to measure the association of the different factors with the occurrence of nosocomial infection (or sites of infection). This association was measured using the odds ratio (OR).

III. RESULTS

Among the 37 departments in our establishment, 20 hospitalization departments were concerned by the survey, i.e. (54%). The distribution of patients included according to the services surveyed is given below medicine department, surgery department, intensive care (Fig. 1)
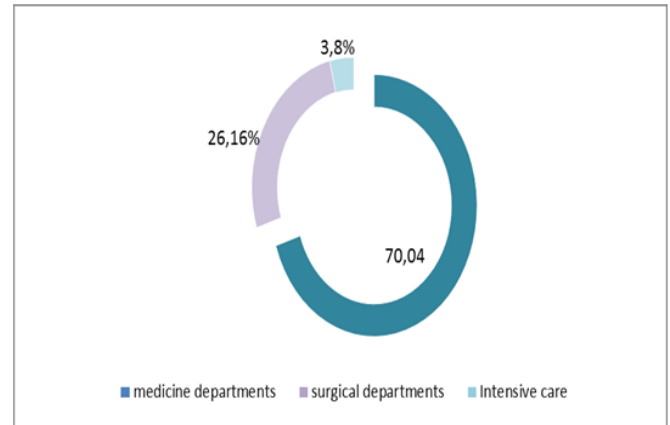

Fig 1 Distribution of Hospitalized Patients According to Service Specialty

➢ *Description of Patients Included*

- A total of 393 patients were hospitalized, among them 237 were included in the study (hospitalized for more than 48 hours), i.e. a rate of 60.30%.
- Our population was characterized by a slight female predominance. The sex ratio was 0.92.
- The mean age was 41.9 ± 22.54 years, with a median of 42 years and extreme ages ranging from 2 to 83 years.
- 24 children were less than two years old with an average age of 5 ± 6.27 months.

➢ *Intrinsic (patient-related) risk factors*

- 59.9% of patients had an underlying pathology
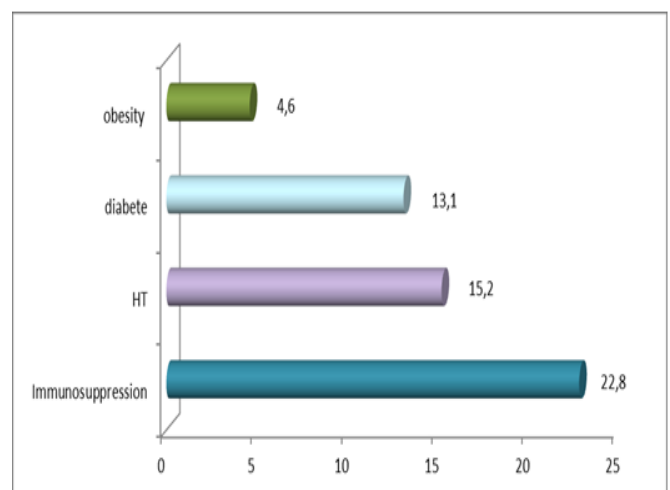- The main factors of fragility are represented in the following graph (Fig. 2)

Fig 2 Main Factors of Fragility Linked to the Terrain

➢ *Extrinsic Risk Factors (Invasive Gestures)*

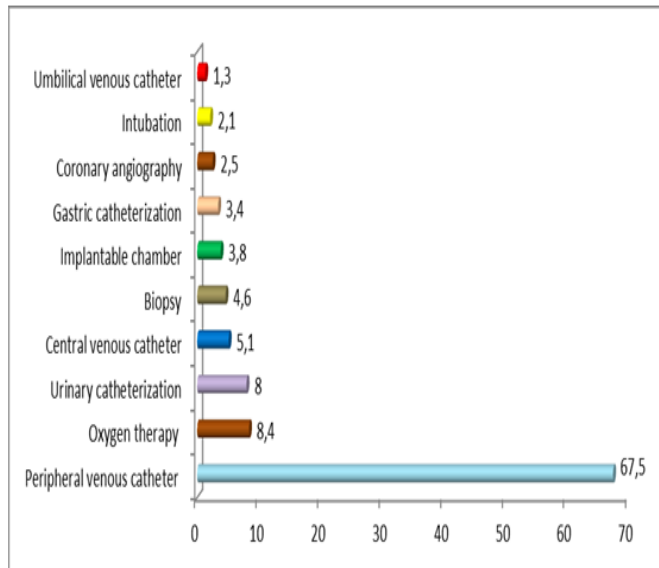171 patients (72.2%) had an invasive device, distributed as follows (figure 3)

Fig 3 Main Extrinsic Risk Factors

➢ *Type of Intervention*

Forty-nine patients (20.7%) were operated on. The distribution of interventions according to the surgical site showed a predominance of ophthalmological surgery (42.9%) and Gynecology / obstetrics (18.4%) followed by CCI (16.3%), ENT (12.2%) and lastly general surgery (6.1%) and Urological surgery (4.1%).

➢ *Anti-Infectious Treatment*

The proportion of patients on antibiotics on the day of the survey was 54.4% (129/237) with an indication of empirical (preventive) prescription in 51.2% of cases, for curative purposes in 44.2% and finally 4.7 % of prescriptions were for a nosocomial infection. The use of monotherapy was noted in 56 patients. Dual therapy in 40 patients and triple therapy in 24 patients.

The most prescribed antibiotic is Cefotaxime in 54.3% followed by Gentamicin in 31.8% and Ciprofloxacin in 13.9%.
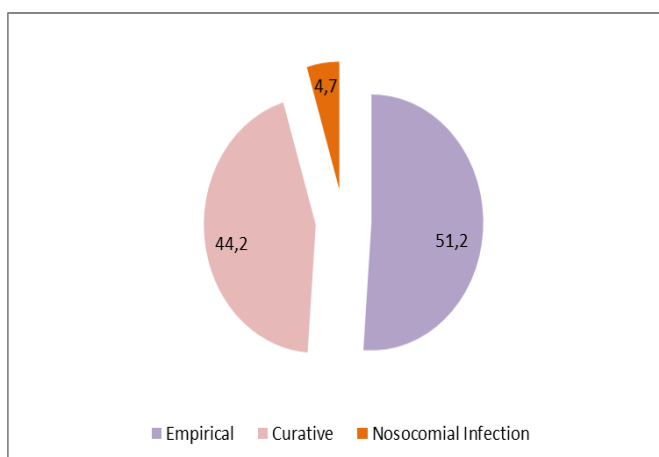

Fig 4 Anti-Infectious Treatment During Hospitalization

➢ *Prevalence of Nosocomial Infections*

Of the 237 patients surveyed, 13 patients had a nosocomial infection including one patient with two anatomical sites, which gives a prevalence rate of infected patients of 5.5% and a prevalence rate of nosocomial infection 5.9% (14/237).

Infections occurred in six out of 20 departments. Among them, medical departments were more affected by this scourge (14.8%), while the prevalence rate in the surgical sector was 9% (DNS). The prevalence of nosocomial infection according to services is as follows (Table I)

Table 1 Prevalence of in by Service

Service	Infected patients	Number	Prevalence
Gynecology	2	22	9%
Hematology	2	8	25
Pediatrics	7	42	16.7
Pneumo allergology	1	14	7.1%
Internal medicine	1	20	5%

➢ *Anatomical Sites of Nosocomial Infections*

Pulmonary infections were the most frequent, they represented 28.5% of all contracted INs, followed by surgical site infections (SSI) and urinary infections with a frequency of 21.42% and lastly and bacteremia/sepsis and skin infections with a frequency of 14.28%
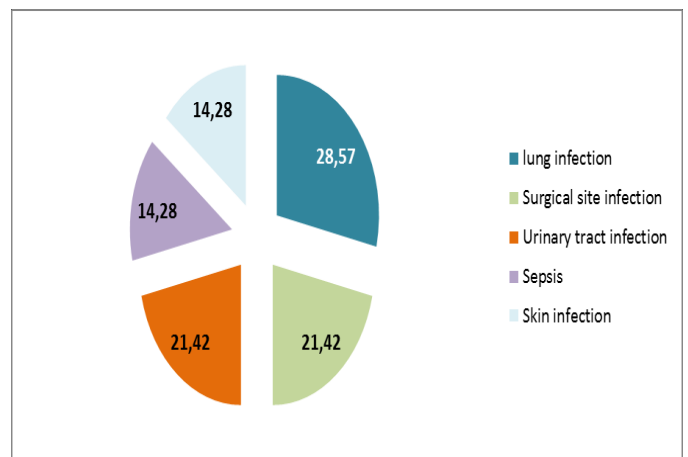

Fig 5 Description of IN Infections According to Site Anatomical

➢ *Microorganisms Isolated*

Among the 14 infections identified, 3 did not benefit from a bacteriological sample. (table 2)

Table 2 Nature of Isolated Germs

Microorganisms	Number	%
Acinetobacter Baumanii	3	27.27 %
Candida Albicans	1	9.09 %
Escherichia Coli	3	27.27 %
Pseudomonas Sp	1	9.09 %
Staphylocoque Aureus	2	18.18 %
Klebseilla Pneumoniae	1	9.09 %
Total	11	100%

➢ *Factors Associated with Nosocomial Infections*

Comparing infected and non-infected patients for certain characteristics allowed us to identify certain potential risk factors. These factors were of two types: intrinsic factors linked to patients and extrinsic factors linked to care (Table 3)

The analysis of intrinsic factors revealed that three factors were significantly linked to the presence of nosocomial infection; namely, age, obesity, immunosuppression, central vascular catheter.

Table 3 Summary of Risk Factors

	The patients Infected n = 13 Numbers (%)	Uninfected patients n = 224 Workforce (%)	p value	OR IC à 95%
Age (ans) **0-19** **19-39** **39-49** **49-59** **>60**	7(53.9) 3(23.1) 2(15.4) 0(0) 1(7.7)	61(27.3) 49(21.9) 26(11.6) 40(17.9) 48 (21.4)	< 0.01	_
Obesity Yes **No**	2(15.4) 11 (86.6)	9 (4) 215(96)	0.05	4.34 [0.57-26.03]
Diabète Oui **Non**	1(7.7) 12 (92.3)	30 (13.4) 194 (86.3)	0.55	
Immuno Suppression **Yes** **No**	8(61.5) 5(38.5)	46(20.5) 178(79.4)	<0.01	7.44 [2.08-27.6]
Central vascular catheter **Yes** **No**	3(7.7) 10(92.3)	9(0.9) 215(99.1)	<0.01	7.17 [1.3 – 36]

IV. DISCUSSION

The prevalence rate of nosocomial infections in our study was 5.9%. These figures are close to the range of those reported in the literature, whether in European countries or in South Mediterranean countries [12,13,14,15,16,17]. But it should be emphasized that medical activity predominates within our establishment and direct comparison with literature data remains difficult due to various factors such as the size and activity of the establishments, as well as the methodology adopted.

The high frequency of infections in intensive care is regularly found in all IN prevalence surveys [9,13,18,19,20]. It is associated with a high frequency of invasive procedures being performed, but in our survey no cases were recorded, this is probably linked to poor recruitment (only three eligible patients were present on the day of the survey). On the other hand, we recorded high prevalence rates in hematology (25%) and in the pediatrics department (16.77%), which is usually a department with a low prevalence rate of nosocomial infections whether in developed countries or in other countries. countries with a lower socio-economic level, this is partly related to the nature of the activity which is dedicated to oncology and intensive care [9,16,18].

Of particular concern was the prescribing of antibiotics. The proportion of patients on antibiotics on the day of the survey was 54.4% (129/237) with an indication for empirical (preventive) prescription in 51.2% of cases (of which 33.3% received double antibiotic therapy and 7.5 % triple antibiotic therapy). The observation of high antibiotic prescribing has been noted in studies conducted in developing countries|[16,

21]. Kallel H et al. found similar results in 46.8% of patients under antibiotic treatments, half of whom received two or more molecules; third-generation cephalosporins were the most frequently prescribed [19]. On the other hand, in the national prevalence survey conducted in France in 2001, only 15.9% of patients were prescribed antibiotics [22].

Most studies show that the most reported INs are pulmonary infections, surgical site infections and urinary infections [23,24,25,26]. The same results were found in our study, pulmonary infections occupy first place with 28.7% of all infections followed by surgical site infections (SSI) and urinary infections with a frequency of 21.42% each. In some British hospitals Emmerson et al. showed that SSI comes in third position (10.7%) preceded by respiratory infections (22.9%) and urinary infections (32%) [27].

The distribution of nosocomial infections according to age groups finds a high prevalence among those under 20 years old (10.3%) and those aged 40 to 49 years old (7.14%), this is quite comparable to that found by Bezzaoucha and al.[28]. This distribution is partly linked to the high risk in pediatric services already reported.

Regarding the analysis of risk factors, the data in the literature are relatively disparate; some authors have demonstrated that diabetes and obesity are risk factors for the appearance of nosocomial infections (respiratory and complications). at the surgical site) [29,30] On our part, this relationship was non-significant for diabetes and borderline significant for obesity.

In the majority of studies, immunosuppression has been recognized as a predisposing factor for nosocomial infection [31, 32,33,,34,,35,,36]. This was identified as a significant risk factor in our study (OR = 7.44, 95% CI [2.08-27.6], p<0.01)

Central catheterization is also a definite risk factor for IN [32,37,38,39,40]. For our part, the infection was significantly linked to the central venous access (OR=7.17 (95% CI [1.3 – 36], p<0.01). Catheter infection is the consequence of the quality of placement, care maintenance and ablation time.

Our investigation also offers a description of the bacterial ecology linked to nosocomial infections. The most frequently isolated microorganisms were Gram negative bacilli in 72.7% of cases (Escherichia coli and Acinetobacter Baumani in 37.5% each), Staphylococcus aureus Gram positive bacteria was found in 18.18% of cases, yeasts in 9.09% of cases . This ecology is similar to that described in other investigations [18,41,42]. In fact, the main germs encountered are influenced mainly by the different distributions of the anatomical sites [43,44,45,46].

V. CONCLUSION

Nosocomial infections should not be the price to pay for medical progress, because they are at least partly preventable. Inherent patient risk factors remain an intrinsic characteristic, providing healthcare professionals with few opportunities for intervention to reduce the risk of infection. However, it is imperative to act on avoidable elements, namely extrinsic risk factors.

This study allowed us to better understand local specificities by highlighting services presenting particular risks and certain practices, in particular the frequent prescription of antibiotics.

An adapted prevention program has been established with the establishment of epidemiological surveillance in the pediatric department and the creation of an anti-infectious committee which will aim to improve the management of the use of antibiotics and establish standards of good practices.

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