

Prevalence of Nosocomial Infections in Elidrissi Regional Hospital in the Region of Gharb, Kenitra

N. Saouide el ayne^{1,5}, A. Laaraifi¹, N. Auajjar², S. Hamama³, A. Echchelh¹,
A. Soulaymani⁴, A. Chaouch⁵

¹Laboratory of Electrical Engineering and Energy System, Faculty of Science
IbnTofail, Kenitra, Morocco

²Medical laboratory, Hospital ElIdrissi, Kenitra, Morocco

³Cellquality, Hospital ElIdrissi, Kenitra, Morocco

⁴Laboratory of biometric and population genetic,

⁵Laboratory of Applied Chemistry and Quality Control Faculty of Science
IbnTofail, Kenitra, Morocco

Abstract: *Objective.* - Determine the prevalence of nosocomial infections and study the risk factors associated to these infections.

Method. - A prevalence survey "one day gave" was conducted in the hospital. A survey sheet was developed and applied to any patient hospitalized the day of the survey, this plug could so collect numerous data such as exhibitions factors and clinical and microbiological arguments in favor of a nosocomial infection.

Results. - Two hundred and forty-eight (248) patients were included in the investigation, about 59.3% occupancy of available beds. We found Nosocomial infection in 22 patients with prevalence rate of 8.9%. It was higher in intensive care services and surgery (25%). The most frequently encountered nosocomial infections were urinary tract (42.3%), surgical site (42.3%) and pneumonia (15.4%). The most frequently identified microorganisms were *Klebsiellapneumoniae* (39%), followed by *Staphylococcus aureus* (26%) and *Pseudomonas aeruginosa* (17.4%). Almost 86% of infected patients receiving antimicrobial therapy. The most frequently found families were Amoxicillin + clavulanic acid (36%), 3rd generation Cephalosporins (18%) and Fluoroquinolone (14%).

Keywords: *prevalence survey, nosocomial infections, Risk Factors, microorganisms, antimicrobial therapy*

1. INTRODUCTION

Nosocomial infections is considerate as a real problem of public health due to their ever-increasing frequency, severity of the fact of multidrug resistance of germs object of the study without mentioning the forensic aspect they raise, as well as the economic costs they generate.

According to the foreign statistics, mainly American, 5-7% of hospitalized patients had a nosocomial infection [1, 2]. Surplus due to these infections stay is 4 days on average [3]. A study on the prevalence of nosocomial infections, conducted under the auspices of who in 55 hospitals in 14 countries in 4 continents revealed that on average 8.7% of hospitalized patients had acquired a nosocomial infection [4].

Morocco, one of the first investigations at the national level was carried out in 1994 and found an overall prevalence of nosocomial infection in Moroccan hospitals of 8.1%.

Few studies have been conducted in Morocco for the prevention of nosocomial infections. This prevention is based on the understanding of the means of acquisition and transmission of nosocomial infections.

In general, nosocomial infections are likely to lead to an increase in the length of stay in intensive care, secondary treatment of infection and the possible complications associated with the economic consequences and an increased risk of mortality.

The purpose of this work was to calculate the rate of nosocomial infections at the regional hospital El Idrissi of Kenitra and determine the risk factors associated with these infections through the analysis

and interpretation of data from the survey of prevalence realized within all departments of the hospital.

2. MATERIAL AND METHODS

2.1. Hospital and Surveyed Population

This is a cross-sectional study on nosocomial infection in hospital El Idrissi of Kenitra, Morocco. The hospital with 418 beds and the sample studied is 248 patients consisting of all patients who were hospitalized at the time of the investigation including newborns.

The information gathered concerning the patient (medical and socio-professional characteristics that motivated the hospital stay). Investigations and risk treatments that the patient suffered during stay (including surgical) and nosocomial infections based on definitions recommended by the Superior Council of Hygiene Public of France [5], also as the definitions established in 1988 by the Centers for Disease Control and Prevention in Atlanta [6]. Investigators (head of the investigation, referring physicians, majors nursing services, biologist and the head of the CLIN) participated in the gathering of information from each service, from recorded data on temperature, the medical and nursing sheet and also laboratory results, even questioning the patient himself. The diagnosis of nosocomial infection was made after agreement between investigators, medical and health care service teams.

2.2. Parameter Studies

A data collection form was completed for each eligible patient in the study. It includes 7 items:

- Demographic and administrative data.
- Any invasive devices.
- Surgical procedures.
- The use of systemic anti-infective.
- Indicators of the seriousness of the State of health of the patient.
- The existence or non-existence of infectious signs.
- Information on nosocomial infection.

2.3. Method

For this investigation, a methodological guide and investigator's guide have been developed and validate them with the working group.

The study was conducted according to the technique known as «a day given», a hospital service should be investigated on the same day and all the hospital services during the same week.

The statistical operation was carried out using the software SPSS 20° version.

2.4. The Study Area

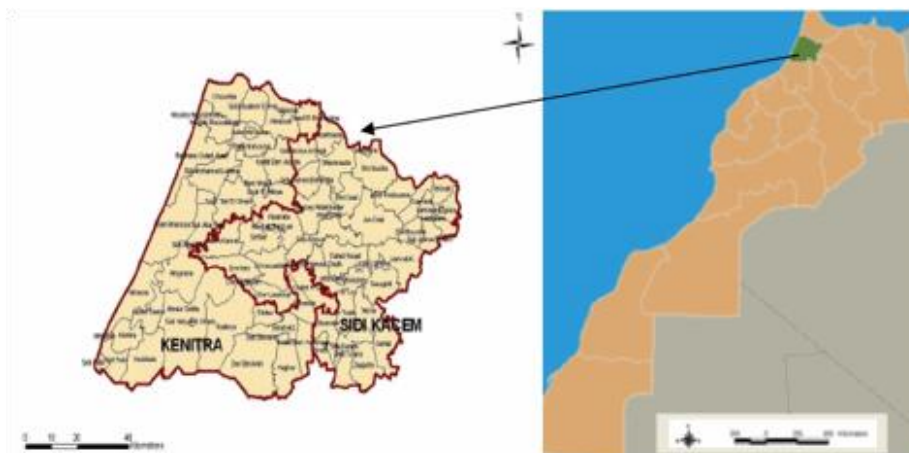


Figure1. Location of the Region of Gharb-Chrarda-BeniHssen[7].

Gharb-Chrarda-BéniHssen region is located in the Northwest of the Kingdom part. It is limited to West by the Atlantic Ocean, to the North by the region of Tanger-Tétouan, to the East by the two regions of Taza-Al Hoceima-Taounate and Fès-Boulemane, and on the South by the regions of Meknes-Tafilalet and Rabat-Salé-Zemmour-Zaer.

It extends over approximately 8.805 km², approximately 1.23% of the area of the Morocco. Its population, estimated at 1.859.540 (6.2% of the national population) was distributed, according to the latest administrative division, through two provinces (Kenitra and SidiKacem), including 12 municipalities, 61 rural communes and urban community [7].

3. RESULTS

3.1. General Data

Two hundred and forty-eight (248) patients were included in the survey, including 8 (3.2%) admitted to the cardiology, 36 service (14.5%) in service surgery for infant surgery 14 (5.6%), hemodialysis 16 (6.5%), maternity 60 (24.2%), medicine 14 (5.6%), ORL 12 (4.8%), Pediatrics 32 (12.9%), respiratory care 16 (6.5%), intensive care unit 8 (3.2%) and traumatology 32 (12.9%).

The average age of the patients was 35.6 ± 23.17 years and the median age was 32 years. Sex ration was equal to 1.14 in favor of women (132 women, 116 men). The average value of duration of hospitalization of patients the day of the survey was 8.5 ± 18.8 days (median was 3 days).

3.2. Nosocomial Infections: Patients and Sites

Nosocomial infection was manifested in 22 patients (table 1). Thus, the rate of prevalence of infected patients was 8.9% (95% confidence interval: 5.3-12.5). According to the hospital services, the prevalence rate of patients who acquired a nosocomial infection was higher in intensive care unit and surgery 25%, then in the respiratory care by 12.5%, 9.3% traumatology, medicine and infant surgery of 7.14% and finally, maternity service by 6.6% (figure 2).

Table1. Prevalence of nosocomial infection on the basis of age

Age	Total of patients	Patient infected	%
≤1	22	0	0
2-5	15	1	4,54
6-10	6	0	0
11-15	3	0	0
16-25	50	6	27,27
26-45	67	7	31,81
46-65	58	6	27,27
≥66	27	2	9.1
Total	248	22	100

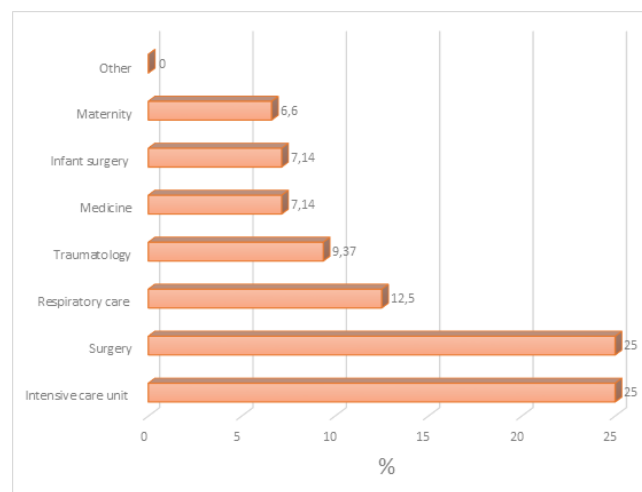


Figure2. Prevalence of patients with nosocomial infections by type of service

The average length of hospitalization for patients with nosocomial infection the day of the survey was 31.9 ± 47.3 days and the median value of 12 days. The most common ASA Score in these infected

patients was 3 (54.5%) and 4 (45.5%). The number of patients with at least an invasive device is 124 patients among the surveyed 248 (50%).

3.3. Risk Indices

The prevalence of nosocomial infection increases with the presence of an invasive device as a rate of 15.3%. So there is a relationship between the frequency of occurrence of a nosocomial infection and the presence of an invasive device ($p < 0,001$) as well as the presence of a probe urinary ($=70,3$; $p < 0,001$).

There's no significant difference in the prevalence of nosocomial infections in patients with immunosuppression ($=1,73$; $p > 0.05$).

Prevalence increases with the severity of the patient's health status according to the ASA classification, the verification is very significant.

The prevalence rate increases 2 to 3 times when the patient has undergone surgery, the difference is very significant ($^2=34, 8$; $p < 0.001$). Also there is a very significant link between the length of stay and the occurrence of a nosocomial infection.

Table2. Epidemiological characteristics of the study population

Variables	Modality	Numberof patients	Number ofinfected cases	□ □	P
Sex	Male	116	14	2.757	0.097
	Female	132	8		
Age	Baby	35	1	1.823	0.177
	Children	11	0	1.120	0.290
	Adolescent	12	1	0.005	0.946
	Adults	190	20	2.754	0.097
Invasive device	No	124	3	12.769	<0.001
	Yes	124	19		
Urinary catheter	No	231	11	70.384	<0.001
	Yes	17	11		
Immunosuppression	No	231	19	1.739	0.187
	Yes	17	3		
ASA score	1	149	0	136.669	<0.001
	2	61	0		
	3	18	12		
	4	20	10		
Iftransfer	No	128	7	3.788	0.052
	Yes	120	15		
Surgery	No	204	8	34.842	<0.001
	Yes	44	14		
Length of stay, days	≤ 3	128	1	125.5	<0.001
	4-7	52	4		
	8-15	43	10		
	≥ 16	25	7		
Anti-infective therapy	No	139	3	17.628	<0.001
	Yes	109	19		
p≥0.05: no significant difference ; 0.001≤p<0.05 : significant difference ; p<0.001 High significant difference					

3.4. Bacteriological Results

23 microorganisms were isolated and identified for the 22 cases of nosocomial infections. The predominant germs were bacilli gram - and in particular *Klebsiellapneumoniae* (39%) found in 6 cases of urinary tract infection and 4 cases of surgical site infection. Cocci gram + were dominated by *Staphylococcus aureus* (26%) isolated in 5 cases of urinary tract infection and 1 infection of the surgical site. Then *Pseudomonas aeruginosa* (17.4%) in 2 cases of urinary tract infection, 1 case of pneumonia and 2 cases of surgical site infection. Finally, *Proteus rettgeri* (9%) and *Enterobacter cloacae* (9%) in 4 cases of surgical site infection. 2 cases of nosocomial pneumonia were negative bacteriological results as they were under an anti-infective treatment (antibiotic prophylaxis).

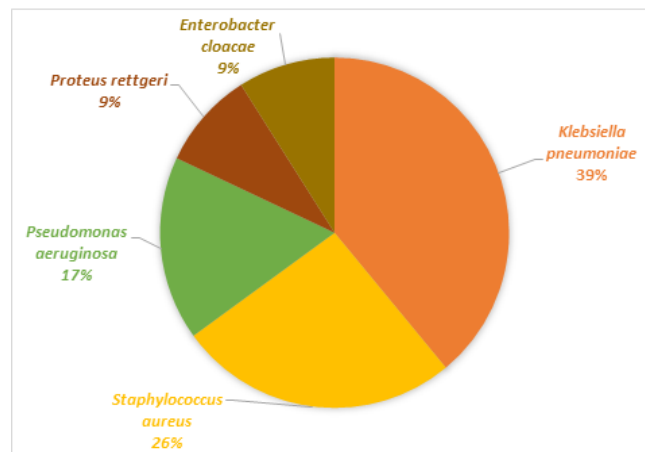


Figure3. Bacteriological data of nosocomial infections

3.5. Therapeutic Aspects

Almost 86% of nosocomial infected were under antibiotic treatments and 9 antibiotics were used. The most frequently found families were Amoxicillin + clavulanic acid (36%), 3rd generation Cephalosporins (18%), Fluoroquinolone (14%), aminoglycosides (11%).

The protocols were variable; monotherapy was predominant (63%).

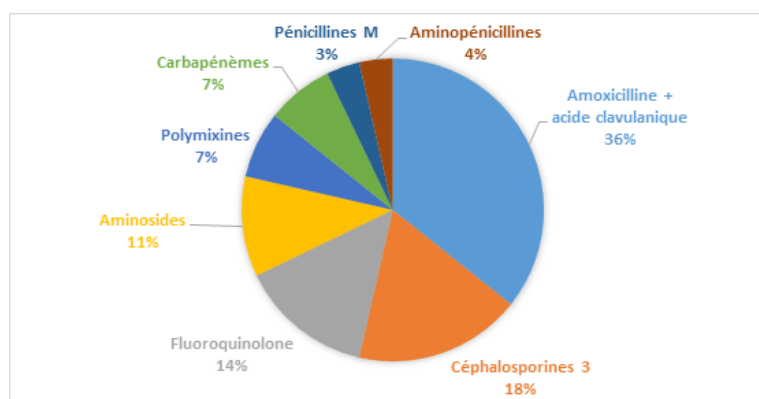


Figure4. Distribution of the main classes of anti-infective

4. DISCUSSION

Prevalence studies allow quite easily, and at a reduced cost, appreciating the infectious situation at the hospital. They could even help, when they are repeated on a regular basis, to assess the evolution of the infectious situation under the influence of preventive measures. They have however drawbacks: they are the infectious situation until the day where they are realized and can't usually detect epidemic phenomena.

Globally, prevalence varies between 1% and 20%. These figures likely vary according to services: for example, found in surgery 2% to 15%, in resuscitation 30% to 35%, medicine 1% and inversely correlated to age for Pediatrics. On the other hand, the overall incidence worldwide is estimated at 5% to 10%. These data also vary from one country to the other, to the United States, 5% to 10% of all hospitalized patients acquire a nosocomial infection compared with 7.9% to the Canada and 9% to 12% in Europe [8].

A study on the prevalence of nosocomial infections, conducted under the auspices of World Health Organization (WHO) in 55 hospitals of 14 countries in 4 continents revealed that on average 8.7% of hospitalized patients had acquired a nosocomial infection. In France, it is estimated between 6 and 7%, reaching 20% in intensive care units [4]; the most affected are those of resuscitation services, hematology, surgery and burns.

Morocco, one of the first investigations at the national level was carried out in 1994 and found an overall prevalence of nosocomial infection in Moroccan hospitals of 8.1%. It varied depending on the

level of technicality and specialty of hospital facilities. It was 4.1% in provincial hospitals, 7.7% in regional hospitals and ranging from 9.5% to 11.5% in teaching hospitals [9].

Our prevalence survey of nosocomial infection in June 2013 at the regional hospital of Kenitra has identified several hospital epidemiology data. Comparison of prevalence rates obtained with values reported in other countries is difficult because of methodological differences. These differences concern the criteria of definition of nosocomial infections, the mode of collection of information and the number of sites infectious investigated, so the type of hospital or service studied [10].

However, it is possible, despite these reservations, compare some of our results with those of other surveys. Thus, the overall prevalence rate of infections acquired in hospitals rated in Kenitra, Morocco, was 8.9%. It is almost equal to the measured rates in similar surveys in Europe since 2000: Italy, 2000: 4.9% [11]; Switzerland, 2004: 7.2% [12]; Finland, 2005: 8.5% [13]; England, 2006: 8.2% [14]. But less than what is found in a structure of health of Dakar 2007: 10.9% [21].

The three main infectious sites identified in our survey (urinary tract infection, pneumonia, and surgical site infection) were also found among the five most frequent sites in all of the surveys of prevalence [15-16; 11-14].

Nosocomial bloodstream infections are frequently found in surveys of prevalence [17], we didn't find any for our study, which is surely under-diagnosis relating to the less demand of blood culture and/or not respected sampling conditions, the long duration of treatment of blood cultures in the laboratory.

On the distribution of the micro-organisms identified in the framework of hospital-acquired infections were comparable to those of other surveys with a predominance of bacilli gram-, including *Escherichia coli*, followed by cocci gram +, including *Staphylococcus aureus*. Except in this case *Escherichia coli* was replaced by *Klebsiella pneumoniae* (39%).

The important part of the use of Amoxicillin-clavulanic acid, Fluoroquinolones and Cephalosporins 3rd generation is found in other prevalence surveys [18, 19]. These three antibiotics or classes of antibiotics represent over a third of global anti-infective prescriptions. Antibiotics which used as indicators of nosocomial infection are Fluoroquinolones and Cephalosporins 3rd generation. Although poorly represented in quantitative terms in the prevalence survey, glycopeptides also occupy a privileged place in the treatment of nosocomial infections instead.

Few studies have been conducted in Morocco in the prevention of nosocomial infections. This prevention is based on understanding the modes of acquisition and transmission of nosocomial infections. It is based on the use of standard and additional precautions. For standard precautions, it is a number of measures to minimize the risk of transmission of micro-organisms as well as caregivers to the patient, the patient and caregiver, the application must be systematic at all contact with a patient. These general measures based on hand hygiene, wearing gloves and gowns. Whereas additional precautions, it is of additional measures to be implemented before the special risks associated with a specific mode of transmission, and are recommended for patients infected with a highly pathogenic transmissible or epidemic microorganism and patients with weakened defenses (isolation, wearing goggles or mask particular outfit: gown ...) [20].

5. CONCLUSION

Nosocomial infections are not an indicator of quality. Control enhances the credibility of the hospital structure. They involve multiple risk factors; some of these factors can be avoided through monitoring and prevention.

Conducting a prevalence study of nosocomial infections has enabled us to evaluate, in an objective manner, the frequency of these. This study has therefore attained one of its original goals. Despite the difficulties we have made, measuring the prevalence of infection is a convenient and useful to educate medical and nursing team's tool and implement means of prevention of nosocomial infections. After this first national survey, the development of a program of surveillance of nosocomial infections, taking into account the main factors known adjustment is necessary in order to measure the impact of prevention on the epidemiology of nosocomial infections.

These activities of data collection, monitoring, control strategies must be conducted in each health facility under the auspices of a committee to fight against nosocomial infections, which is a fundamental tool to improve quality in a hospital.

REFERENCES

- [1] HALEY R.W., CULVER D.H., WHITE J.W. et al – The nationwide nosocomial infection rate. A new need for vital statistics. *AmJEpidemiol.* 1985; 121 : 159-67.
- [2] LEPOUTRE-TOULEMON A., FABRY J. - Enquête sur les moyens dans les établissements hospitaliers français pour la lutte contre les infections nosocomiales. *Bull EpidemiolHebd.* 1992; 15: 65-6.
- [3] HALEY R.W. - Managing hospital infection control for cost-effectiveness. A strategy for reducing infectious complications. American Hospital Publishing, inc, 1986.
- [4] MC CAUGHEY B. Reduce Infection Deaths: Unnecessary Deaths: The Human and Financial Costs of Hospital Infection 3rd Edition 2008.
- [5] Conseil Supérieur d'Hygiène Publique de France, Section "Prophylaxie des Maladies", Groupe de Travail "Infections Nosocomiales". . 100 recommandations pour la surveillance et la prévention des infections nosocomiales. *Bulletin Epidemiologique Hebdomadaire*, numero special: Juillet 1993.
- [6] Bureau des Maladies Transmissibles, Direction Générale de la Santé, Ministère de la Santé (France). *Infections Nosocomiales: définitions du CDC*, 1988.
- [7] RGPH, 2004. Recensement général de la population et de l'habitat 2004. <http://www.hcp.ma/>
- [8] Arrête n°64/msp. portant création d'un comité de lutte contre les infections nosocomiales au niveau des établissements de santé. *Infections hospitalières ou nosocomiales.* http://www.medix.free.fr/cours/epidemie_c_004.php consulté le 2 mars 2010.
- [9] Ministère de la santé. Enquête nationale de prévalence 1994 au Maroc (rapport interne). Rabat, 1994. <http://www.emro.who.int/publications/emhj/1301/article7.htm> consulté le 13 mars 2010.
- [10] BRENNER H., SAVITZ D.A. - The effects of sensitivity and specificity of case selection on validity, sample size, precision, and power in hospital based case-control studies. *Am JEpidemiol.* 1990; 132: 181-92.
- [11] Liziolia A, Privitera G, Alliata E, Antonietta Banfi EM, Boselli L, Panceri ML, Perna MC, Porretta AD, Santini MG, Carreri V. Prevalence of nosocomial infections in Italy: result from the Lombardy survey in 2000. *J Hosp Infect* 2003;54:141-8.
- [12] Sax H, Pittet D pour le comité de rédaction de Swiss-NOSO et le réseau Swiss-NOSO Surveillance. Résultats de l'enquête nationale de prévalence des infections nosocomiales de 2004 (snip04). *Swiss-NOSO* 2005;12(1):1-4.
- [13] Lytikainen O, Kanerva M, Agthe N, Mottonen T and the Finish Prevalence Survey Study Group. National Prevalence Survey on Nosocomial Infections in Finnish Acute Care Hospitals, 2005. 10th Epiet Scientific Seminar. Mahon, Menorca, Spain, 13-15 October 2005 [Poster].
- [14] Anonyme. Press release for: The Third Prevalence Survey of Healthcare-associated Infections in Acute Hospitals. Hospital Infection Society, Londres, 27/10/06. Disponible à l'adresse : www.his.org.uk/content_display.cfm?cit_id=461
- [15] Quenon JL, Gottot S, Duneton P, Lariven S, Carlet J, Regnier B, Brucker G. Enquête nationale de prévalence des infections nosocomiales en France : Hôpital Propre (octobre 1990). *BEH* n° 39/1993.
- [16] Lepoutre A, Branger B, Garreau N, Bouletreau A, Ayzac L, Carbonne A, Maugat S, Gayet S, Hommel C, Parneix P, Tran B pour le Réseau d'alerte, d'investigation et de surveillance des infections nosocomiales (Raisin). Deuxième enquête nationale de prévalence des infections nosocomiales, France, 2001. *Surveillance nationale des maladies infectieuses, 2001-2003.* Institut de veille sanitaire, 2005. www.invs.sante.fr/publications/2005/snmi/infections_noso_enquete.html
- [17] Materston R, Drusano G, Patterson DL, Park G. Appropriate antimicrobial treatment in nosocomial infections: the clinical challenges. *J Hosp Infect* 2004;56(2):142-9.

- [18] AVRIL J.L., CORMIER M., LE VERGE R., DONNIO B.Y., MICHELET C., CHEVRIER S. - Infections et usage des antibiotiques & l'hôpital, résultats d'une enquête de prévalence en 1986. RevEpidem Santé Publique. 1988 ; 36 : 451-6.
- [19] QUENON J.L., GOTTOT S., DUNETON P., CARLET J., REGNIER B., DESHONS J.P., BRUCKER G. - First national prevalence survey of hospital acquired infections in France. Poster n ° 1150. The 32nd Interscience Conference on Antimicrobial Agents and Chemotherapy (ICAAC), 11-14th October 1992, Anaheim, USA.
- [20] Ministère de l'emploi et de la solidarité d'état à la santé et l'action sociale, comité technique national des infections nosocomiales. 100 recommandations pour la surveillance et la prévention des infections : 2ème édition paris 1999.
- [21] N.M. Dia a, R. Kab., C. Dieng a, R. Diagne b, M.L. Dia b, L. Fortes a, B.M. Diop a, A.I. Sowb, P.S. Sowa. Prevalence of nosocomial infections in a university hospital (Dakar, Senegal), Médecine et maladies infectieuses 38 (2008) 270–274

AUTHORS' BIOGRAPHY



Nabila Saouide elayne PHD student, Non permanent University Professor at Ibn Tofail University.

Amal Laaraifi PHD student, Non permanent University Professor at Ibn Tofail University.

Nabila Aujjar Laboratory of medical analysis.

Samir Hamama Quality Technichal Hospital Elidrissi kenitra Morocco.

Adil Echhelh PHD, Professor, Laboratory of Electrical Engineering and Energy System, Faculty of Science IbnTofail, Kenitra, Morocco.

Abdelaziz Chaouch PHD, Professor Ibn Tofail University, Laboratory of Applied Chemistry and Quality Control, Faculty of Science IbnTofail, Kenitra, Morocco.

Abdelmajid Soulaymani, Professor, Laboratory of Genetics and Biometrics, Kénitra Faculty of Sciences, Ibn Tofail University, Kénitra, Morocco.