

Sampling of microbial reservoirs in surgery and maternity departments of a hospital in Albania

Qyli Z RN, Msc

ABSTRACT

Sampling of microbial reservoirs in surgery and maternity departments of a hospital in Albania

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Nosocomial infections continue to increase all over the world and remain a major cause of morbidity and mortality in hospitals. Microorganisms that cause nosocomial infections derive primarily from human sources, but inanimate environmental sources are implicated in transmission. This study aimed to make an overview for the microbial contamination of environments at the Surgery and Maternity Departments of the Regional Hospital of Korca, Albania. A total number of 1140 swabs were collected, respectively 611 swabs from the Surgery Department and 529 swabs from the Maternity Department. The swabs were inoculated in blood agar and sabouraud agar at 37°C for 24-48 hours. Microbial identification was based in the classics methods of microbiology: colonies morphology, microscopy after Gram stain and biochemical tests. From the total of 1140 swabs collected at the hospital, 283 (24.8%) samples resulted positive for microbial contamination. The swabs collected at the Surgery Department resulted positive in 106 (17.34%) samples and the swabs from the Maternity Department resulted positive in 177 (33.45%) samples. Microbial contamination of the Surgery and Maternity Departments is a potential risk for nosocomial infections. Human sources and inanimate surfaces contamination are considered to play an important role in cross-transmission of the microorganisms in hospitals.

INTRODUCTION

Nosocomial infections continue to increase all over the world and remain a major cause of morbidity and mortality in hospitals. There are

**Nursing Department, Fan S Noli University,
Korce, Albania**

three elements required for the transmission of nosocomial infections: a reservoir of microbial agent, a susceptible host with a portal of entry receptive to the agent and a mode of transmission for the microbial agent.

Microorganisms that cause nosocomial infections derive primarily from human sources¹⁻³, but inanimate environmental sources are implicated in transmission⁴.

Human reservoirs include patients, healthcare personnel, household members and visitors⁵. People in hospitals are usually already in a 'poor state of health', impairing their defense against bacteria. Invasive devices impair natural lines of defense against pathogens and provide an easy route for infection. Patients already colonized at the time of admission are instantly put at greater risk when they undergo invasive procedures⁶.

Environmental surfaces are contaminated with microbial agents and healthcare workers serve as a route of transmission of these infections to patients. Pathogens may also be transferred directly from contaminated surfaces to susceptible patients⁷⁻⁹.

Studies have shown that techniques of cleaning or disinfection of the environment can reduce transmission of healthcare-associated pathogens^{10,11}.

The hospital environment, especially surgical wards plays an important role in the spread of hospital-associated infections. The operating theater is a complex environment that poses a high risk of infection for patients and health care workers who may easily contract diseases because of their long exposures to various risks, including chemical, physical and biological¹²⁻¹⁵. Nosocomial infection is a frequent and potentially lethal complication in obstetrics for wom-

en and babies. Disinfection strategy, guidelines for infection prevention and control should be established in each obstetrics unit to prevent nosocomial infections^{16,17}.

This study aimed to make an overview for the microbial contamination of environments at the Surgery and Maternity Departments of the Regional Hospital of Korca, Albania. This hospital has a capacity of 510 beds with an average of 70 daily admissions. Surgery Department consists of the operating rooms, surgery intensive care unit and the rooms of the patients. Maternity Department consists of the obstetric ward, gynecologic ward, neonatology ward and the room of the patients.

MATERIAL AND METHODS

This was a cross-over study in two departments of an Albanian regional hospital. A variety of hospital environments and healthcare workers in these departments were chosen for sampling. A total number of 1140 swabs were collected, respectively 611 swabs from the Surgery Department and 529 swabs from the Maternity Department. At the Surgery Department were collected 112 swabs from the sterilized materials, 50 swabs from the textiles, 70 swabs from the health care workers, 202 swabs from the surfaces, 47 samples from air and 125 swabs from the systems of aspiration-intubation-oxygen. At the Maternity Department 108 swabs were collected from the sterilized materials, 45 swabs from the textiles, 64 swabs from the health care workers, 230 swabs from the

surfaces, 32 samples from air and 50 samples from the systems of aspiration-intubation-oxygen. After sampling the swabs from the sterilized materials, textiles, surfaces, health care workers and system of aspiration-intubation-oxygen were immersed in simple ground media and incubated in 37°C for 4-5 hours. After that the swabs were inoculated in blood agar media and sabouraud agar and incubated at 37°C for 24-48 hours. The air sampling was done with the method of sedimentation at the Petri Dishes with blood agar and sabouraud agar. The plates were left open for 20-30 minutes at different environments of the Surgery and Maternity units. The next step was the microbial identifi-

cation for the positive cultures. Microbial identification was based in the classics methods of microbiology: colonies morphology, microscopy after Gram stain and biochemical tests.

Statistical analysis was performed using Chi-square test analysis. The analysis was conducted using the SPSS version 20.0. Statistical significance was considered to be the value of $P \leq 0.05$.

RESULTS

From the total of 1140 swabs collected, the prevalence of positive samples was 24.82%.

Prevalence of positive samples from Surgery Department was 17.34% and from Maternity Department 33.45%, (Table 1).

Table 1. Prevalence of positive samples

Hospital departments	Positive samples n (%)	Negative samples n (%)	Total n
Surgery	106 (17.34%)	505 (82.65%)	611
Maternity	177 (33.45%)	352 (66.54%)	529
Total n	283 (24.82%)	857 (75.17%)	1140

n=number of samples

At the Surgery Department resulted positive 3(2.6%) samples of sterilized materials, 15(30%) samples of textiles, 32(45.7%) samples of health care workers, 23(11.3%) samples of surfaces, 5(10.6%) samples from air and 28 (22.4%) samples of systems of aspiration-intubation-oxygen. $\chi^2=123.7, p<0.01$, (Table 2). At the Maternity Department resulted positive 15(13.8%) samples of sterilized materials, 24 (53.3%) samples of textiles, 26(40.6%) samples of health care workers, 96 (41.7%) samples of

surfaces, 3 (9.3%) samples from air and 13 (26.0%) samples of systems of aspiration-intubation-oxygen. $\chi^2=137.9, p<0.01$, (Table 3).

Prevalence of pathogens at the Surgery Department was: Staphylococcus aureus 76.4%, E.Coli 13.2%, Pseudomonas spp 9.4%, Proteus spp 0.9%. Prevalence of pathogens at the Maternity Department was: Staphylococcus aureus 65.0%, E.Coli 28.2%, Pseudomonas spp 1.1%, Klebsiellae spp 0.6% and Saprophytes 5.1%, $\chi^2=374.3 p<0.01$ (Table 4).

Table 2. Prevalence of positive samples from the Surgery Department.

Sample	Results		Total n
	Positive n (%)	Negative n (%)	
Sterilised materials	3 (2.7)	109 (97.3)	112
Textiles	15 (30.0)	35 (70.0)	50
Health care workers	32 (43.2)	42 (56.8)	74
Surfaces	23 (11.3)	180(88.7)	203
Air	5 (10.6)	42 (89.4)	47
Systems aspiration-intubation-oxygen	28 (22.4)	97(77.6)	125
Total n (%)	106 (17.3)	505(82.7)	611

n=number of samples

Table 3. Prevalence of positive samples from the Maternity Department.

Sample	Results		Total n
	Positive n (%)	Negative n (%)	
Sterilised materials	15 (13.9)	93 (86.1)	108
Textiles	24 (53.3)	21 (46.7)	45
Health care workers	26 (40.6)	38 (59.4)	64
Surfaces	96 (41.7)	134(58.3)	230
Air	3 (9.4)	29 (90.6)	32
Systems aspiration-intubation-oxygen	13 (26.0)	37 (74.0)	50
Total n (%)	177 (33.5)	352 (66.5)	529

n=number of samples

Table 4. Prevalence of pathogens.

Pathogen isolates	Surgery n (%)	Maternity n (%)
Staphylococcus aureus	81 (76.4%)	115 (65.0%)
E.Coli	14 (13.2%)	50 (28.2%)
Pseudomonas spp	10 (9.4%)	2 (1.1%)
Klebsiellae spp	0 (0.0%)	1 (0.6%)
Proteus spp	1(0.9%)	0 (0.0%)
Saprophytes	0 (0.0%)	9 (5.1%)
Total n (%)	106 (100%)	177 (100%)

n=number of samples

DISCUSSION

The hospital environments are often contaminated with microorganisms. Inanimate environment and the health care workers are potential reservoirs for spread of nosocomial infections. Microbial population and colonization rate vary from different hospitals of different countries.

In this study the prevalence of positive samples at the Regional Hospital of Korca was 24.8%. We can consider that percentage as a middle level of contamination. Similar findings are reported from a study in Siena, Italy⁷ where the prevalence of positive samples was 22.2%. Contrasting results were reported in other studies 69.6% in Poland¹⁸, 38% in Besancon, France¹⁹, 78% in Pokhara, Nepal²⁰, 56.7% in Nigeria²¹.

Prevalence of positive samples at the Maternity Department of the Hospital of Korca was 33.4%.

Contrasting results were reported in a study in Nigeria²¹ where the prevalence of positive samples at Maternity clinic was 75.7%.

At the Maternity Department the most contaminated samples were the samples taken from the textiles 53.3%. Similar finding were reported in a study in France²² with a prevalence 55% of textile samples. Contrasting results were reported in USA²³ 7-81%.

Less contaminated were the samples taken from air 9.3%. The results of positive samples from air reported in Bari Italy²⁴ were 5-20% . A

study in Gana²⁵ reported a result in which prevalence of air population was 51%.

The prevalence of positive samples at the Surgery Department of the Hospital of Korca was 17.3%. Lower results were reported in Southern Italy²⁶ 11.9%, Baghdad²⁷ 3.7%, India²⁸ 5.07% and higher prevalence in a hospital in Nigeria²¹ 40%.

At the Surgery Department the most contaminated samples were the samples taken from the health care workers 45.7%. Contrasting results were reported in Ohio²⁹ 19.6% and Ethiopia³⁰ 28.8%.

Less contaminated were the samples taken from the sterilized materials 2.6%. A prevalence of 0.4-0.7% was reported in Texas USA³¹ and 0.5% in Genoa Switzerland³².

In this study *Staphylococcus aureus* was microbial pathogen with the higher prevalence 69.2%.

Staphylococcus aureus is the main microbial agent that caused nosocomial infections. This problem becomes more serious because of the increasing resistance of this pathogen to various antibiotics, which complicates the treatment of infections.

In other studies *Staphylococcus aureus* was the pathogen isolated in most of the positive samples. Some of the reports from other studies in different countries about prevalence of *staphylococcus aureus* are respectively 33.3% in Nepal²⁰, 33.1% in Ethiopia³³, 27% in Japan³⁴.

CONCLUSIONS

Surgery and Maternity Departments are considered to play an important role in transmission of hospital infections especially surgical site infections and infections of the neonates. Human sources and inanimate surfaces contamination are considered to play an important role in cross-transmission of the microorganisms in hospitals. These microorganisms, may survive for a long time in the environments of the hospital especially when there is lack in implementation of practices of cleaning and hygiene.

This study revealed a higher risk for developing nosocomial infections at the Maternity Department compared to the Surgery unit. This risk is both for mother and child. Therefore measures should be taken as:

Compilation and implementation of protocols for procedures and practices used in hospitals. Each hospital must establish its own surveillance and bacterial resistance rate.

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Corresponding author:

Zhinzela Qyli, RN

Nursing Department, Fan S Noli University, Korce, Albania

e-mail:zhinzelaqyli@gmail.com