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Staphylococcus aureus Resistant to Methicillin (MRSA) in Hospitals in Abidjan: ORMICI Network 2005-2015



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ABSTRACT

Objective: The purpose of this work is to determine the strain frequency of *Staphylococcus aureus* resistant to methicillin (MRSA), isolated in health care centers in Abidjan, Côte d'Ivoire. **Materials and Methods:** 2035 *Staphylococcus aureus* strains from hospitalized patients or not were analyzed from 2005 to 2015. The isolation and identification of *S. aureus* strains were made using conventional bacteriological methods. The methicillin resistance of these strains was detected by the agar diffusion method on Mueller-Hinton, including the extent of inhibition diameter of ceftazidime (30 µg) and oxacillin (30 µg). **Results:** 921 strains resistant to methicillin have been identified among strains of *S. aureus* in 2035 or 45.3%. These MRSA were isolated open suppurations (47.3%), urine (20.6%), blood cultures (14.6%), pleural fluid (6.7%), surgical wounds (3, 7%), catheters (1,7%) and other organic products (5.2%). The samples came from hospitalized patients (66.6%) and outpatients (33.4%). The original services: pediatrics (26%), nephrology (22%), Traumatology (10%), intensive care (10%), maternity-Neonatology (10%), surgery (6%) and other services (17%). **Conclusion:** Multiresistance strains of MRSA in hospitals as in the community is important, hence the need for regular monitoring.



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INTRODUCTION

Staphylococcus aureus is a ubiquitous bacterium, gifted with a remarkable capacity for survival in an unfavorable environment or even hostile. Staphylocoque infections have an important place in our health facilities. The introduction of new antimicrobial molecules engender the emergence of multiresistant strains ^{1,2}; in the case of *S. aureus* resistant to methicillin (MRSA), which has been detected for the first time in hospitals in 1960 ³, just one year after the introduction of methicillin as new antibiotic. This *S. aureus* resistant to methicillin (MRSA) worsen the prognosis and complicates serious manner the management of staphylococcal infections. Therefore, they represent a major public health problem ^{4,5}. These bacteria are responsible for severe nosocomial infections but also ^{6,7,8} community pathologies. The presence of MRSA in hospitalized patients is no longer an isolated phenomenon, but recurrent in many health facilities ⁹. Epidemiologic studies have established that methicillin resistance is acquired by *S. aureus* due to the integration of an important genomic resistance island called cassette chromosome mec (SCC mec) ¹⁰. It was from 1999 that new community highly epidemic MRSA strains containing the gene for Pantone-Valentine leukocidin (PVL) appeared and made the management of MRSA infections¹¹. Thus almost all of cases of colonization and infection with MRSA is due to an exogenous transmission from other MRSA in healthcare facilities. The transmission of these microorganisms is often hand-borne primarily from human reservoirs, consisting of patients and hospital staff infected or colonized or families ¹². These problems are not unknown in Cote d'Ivoire. These data led us to assess and analyze the current state of MRSA at the Abidjan care facilities. This study aims to determine the frequency of MRSA strains isolated in health facilities in Abidjan from 2005 to 2015.

MATERIALS AND METHODS

Bacterial strain

S. aureus strains were isolated from samples of organic products referred to diagnosis from patients in different departments or treated as outpatients. This work was conducted from 2005 to 2015 Bacteriology-Virology Department of the Pasteur Institute of Cote d'Ivoire.

Isolation and Identification

Isolation and identification of *S. aureus* strains were performed by conventional bacteriological techniques¹³.

Antibiotic sensitivity

The study of antibiotic susceptibility was performed by the middle agar diffusion method of Mueller-Hinton (MH), according to the standards recommended by CA-SFM (Antibiogram the Committee of the French Society for Microbiology)¹⁴. Detection of methicillin resistance was determined by measuring the diameter of the inhibition zone on oxacillin disk (30 mcg) and ceftioxin (30 mcg). The strength of detected MRSA strains was confirmed by screening on Mueller-Hinton containing 6 mg/ml of oxacillin (CA-SFM standards). A reference strain (*S. aureus* ATCC 25923) was used as internal control lamp.

RESULTS

On Stem 2035 *S. aureus* studied, 921 (45.3%) were resistant to oxacillin and 1114 (54.7%) were sensitive to oxacillin. These non-redundant strains resistant to oxacillin were isolated from various biological products, i.e. pus (47.3%), urine (20.6%), blood culture (14.6%), pleural fluid (6.7%), surgical wound (3.7%), catheters (1.7%) and other pathological products (5.2) (Figure 1).

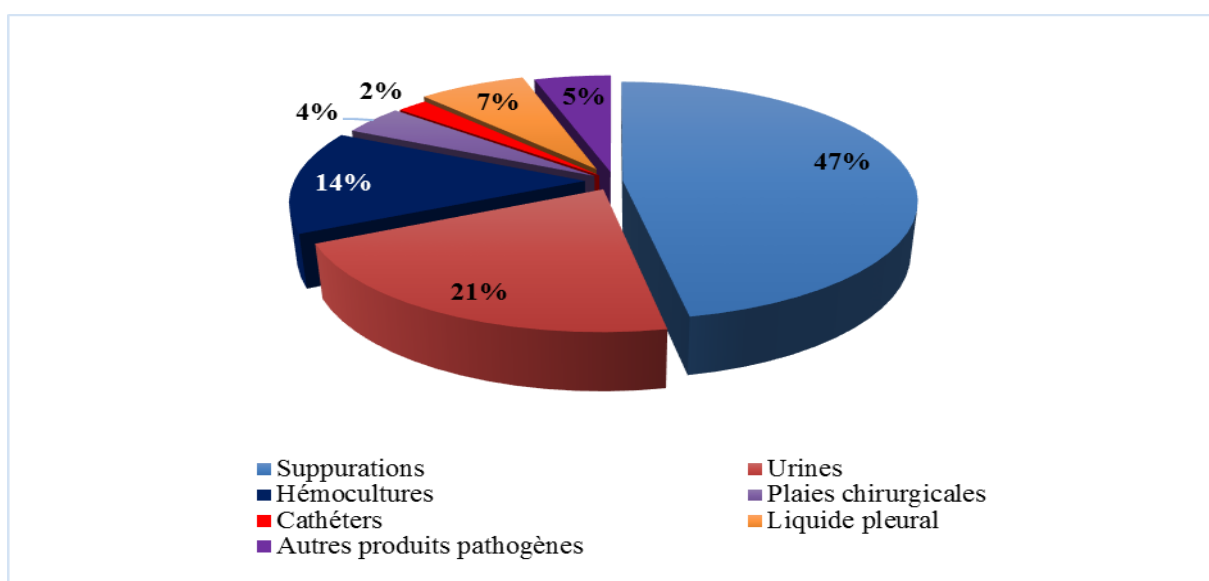


Figure 1: Distribution of MRSA strains based on sampling sites

The resistance of *S. aureus* to methicillin (MRSA) over the study period, from 2005 to 2015, there is high resistance rate of 2006 and 2015 or the resistance rate was over 60%. Resistance experienced fluctuations from 2010. This rate rose from 58.3% in 2010 to 26.9% in 2015 (Figure 2).

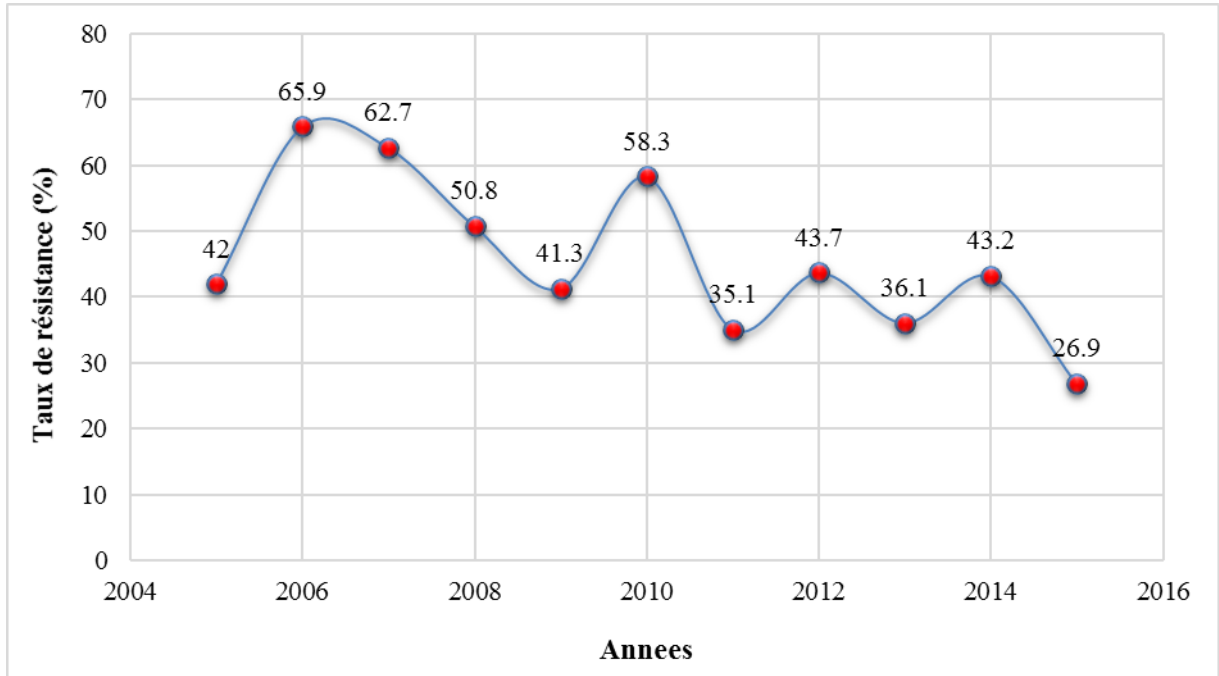


Figure 2: Evolution of MRSA resistance to oxacillin from 2005 to 2015

The highest methicillin-resistant strains of rates were at the hospital from 2005 to 2012. In 2013, there was a strong community resistance in a hospital rate. From 2014 to 2015, high methicillin-resistant strains of rates were observed in hospitals (Figure 3).

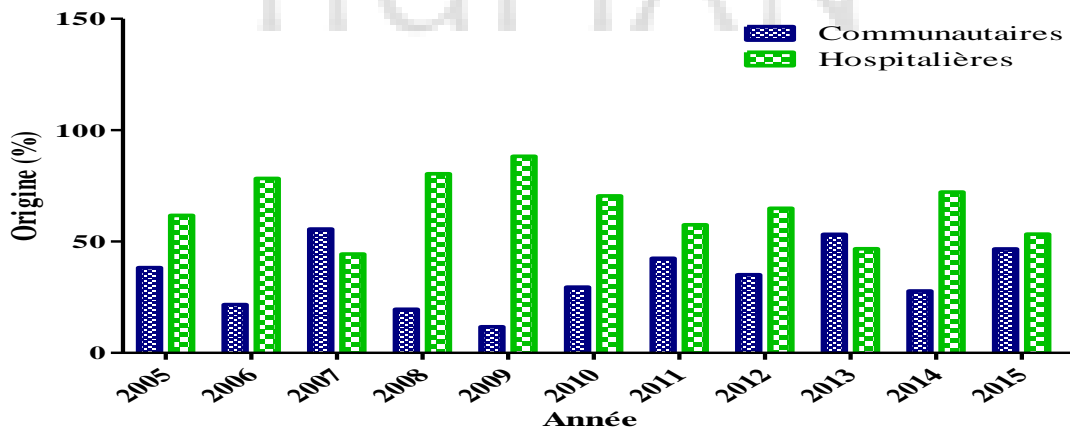


Figure 3: Distribution of MRSA strains based on origins

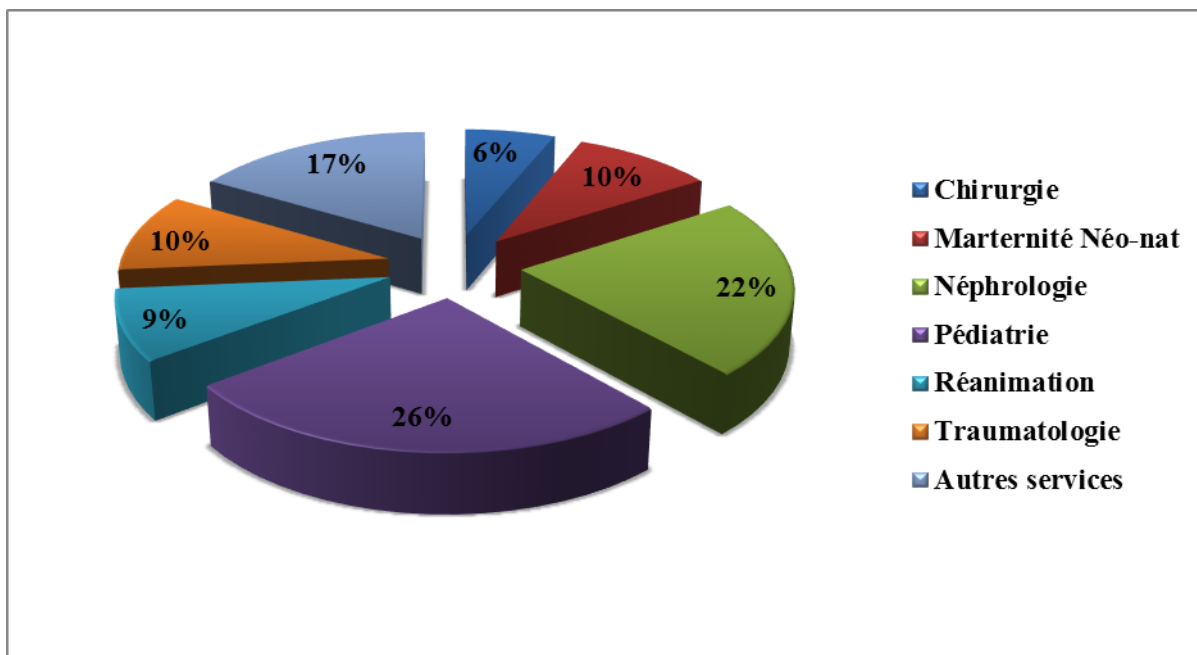


Figure 4: Distribution of MRSA strains based on clinical services

DISCUSSION

In this study, MRSA rate is high especially in the hospital than Community, it is 66.6% and 33.4% respectively. This proportion varies according to the type of activity of hospital services. The rate of *S. aureus* resistant to methicillin (MRSA) isolated during the period of this study is 45.3%, which is comparable to the rates observed in Greece (44%), Great Britain (44%) and Ireland (42%)¹⁵. therefore, we can say that the situation in Côte d'Ivoire is at a level of countries with high prevalence of MRSA. It is, however, less important compared to the figures seen in other countries. Indeed, the highest frequency of MRSA was registered in Asia (64% in Shanghai)¹⁶. In the American continent, it was reported MRSA rate from 36 to 62.6%^{16,17,18}. This data is marked also by a continuous growth in the time^{17,19}. In European countries, MRSA rates ranging from 20 to 50% have been reported in *S. aureus* infections^{16,20,21} (case of Greece, Italy, Spain, the England, Ireland, Belgium and France).

However, this rate is higher than in some countries. In Algeria, there is 32.7%²². It is also significant compared to the figures of the ONERBA (35%)^{23,24}. Other European countries keep a low prevalence of MRSA, such as Belgium (13%) and Germany (5%)²⁵. And even below that threshold for the Netherlands, Denmark, Sweden and Finland¹⁵. In Africa, the MRSA rate in Tunisia is 10%²⁷. This is explained by the importance of engagement hospitals

in these countries substantial programs of anti-MRSA^{15,26} struggle. These programs are developed and put into practice a long time, they concern the surveillance of nosocomial infections and their prevention, leading to better risk management of their occurrence and better control and use of antibiotics.

CONCLUSION

The high resistance rate of *S. aureus* to methicillin justifies the interest and the importance of careful monitoring of the spread of these strains, particularly in the hospital setting. For this reason, the usefulness of implementing national observatories to manage monitoring programs of the development of resistance and prevention of MRSA infections seems evident and should be done in collaboration with private health centers to control the spread of MRSA not only in different hospitals but also in community.

Interest conflict

No.

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