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Original Article

Nasal colonization with *Staphylococcus aureus* in individuals with HIV/AIDS attended in a Brazilian Teaching Hospital¹

Lilian Andreia Fleck Reinato²Daiana Patrícia Marchetti Pio³Leticia Pimenta Lopes⁴Fernanda Maria Vieira Pereira³Ana Elisa Ricci Lopes²Elucir Gir⁵

Objective: to evaluate the prevalence of nasal colonization with *Staphylococcus aureus* in individuals with HIV/AIDS under inpatient treatment in a teaching hospital in the state of São Paulo (Brazil). **Method:** a cross-sectional study undertaken in two units specialized in attending people living with HIV/AIDS, in the period August 2011 – July 2012. Socio-demographic and clinical data was collected through individual interviews and from the medical records; samples of nasal secretion were collected with Stuart swabs on the first day of inpatient treatment. Ethical aspects were respected. **Result:** of the 229 individuals with HIV/AIDS hospitalized in this period, 169 participated in the study, with *Staphylococcus aureus* being identified in the culture tests of 46 (27.2%) of the individuals, resistance to oxacillin being evidenced in 10 (21.8%) participants. **Conclusion:** the results of the research indicate that the prevalence of colonization with *Staphylococcus aureus* in individuals with HIV/AIDS in the specialized units was considered relevant, possibly contributing to future investigations and, moreover, to the implementation of measures to prevent and control this pathogen in this population.

Descriptors: *Staphylococcus aureus*; Methicillin-Resistant *Staphylococcus aureus*; Acquired Immunodeficiency Syndrome; Nursing; Clinical Nursing Research.

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² Master's student, Escola de Enfermagem de Ribeirão Preto, Universidade de São Paulo, WHO Collaborating Centre for Nursing Research Development, Ribeirão Preto, SP, Brazil.

³ Doctoral student, Programa Interunidades de Pós-graduação em Enfermagem, Escola de Enfermagem, Universidade de São Paulo, São Paulo, SP, Brasil and Escola de Enfermagem de Ribeirão Preto, Universidade de São Paulo, WHO Collaborating Centre for Nursing Research Development, Ribeirão Preto, SP, Brazil.

⁴ Doctoral student, Escola de Enfermagem de Ribeirão Preto, Universidade de São Paulo, WHO Collaborating Centre for Nursing Research Development, Ribeirão Preto, SP, Brazil.

⁵ PhD, Full Professor, Escola de Enfermagem de Ribeirão Preto, Universidade de São Paulo, WHO Collaborating Centre for Nursing Research Development, Ribeirão Preto, SP, Brazil.

Corresponding Author:

Elucir Gir

Universidade de São Paulo. Escola de Enfermagem de Ribeirão Preto

Departamento de Enfermagem Geral e Especializada

Av. Bandeirantes, 3900

Bairro: Monte Alegre

CEP: 14040-902, Ribeirão Preto, SP, Brasil

E-mail: egir@eerp.usp.br

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Introduction

Staphylococcus aureus is a gram-positive bacteria which colonizes the skin and has a preference for the anterior nares, with this colonization's prevalence varying, depending on the population studied. It has a mean of 37.2% in the general population, and a rate of up to 35.5% in the nasal sites of patients with Human Immunodeficiency Virus (HIV)⁽¹⁻²⁾.

Staphylococcus aureus's resistance to methicillin (MRSA) was first described in Europe in 1961, as a nosocomial pathogenic agent⁽³⁾.

For researching *Staphylococcus aureus* and, principally, MRSA, the sites of the greatest interest are the nasal mucosa and the skin, due to their characteristic of being naturally colonized.

The colonization of individuals with HIV/AIDS by pathogenic micro-organisms has been associated with higher risk of morbidity and mortality, principally when related to *Staphylococcus aureus*. Researchers found a rate of 76.7% of colonization with this bacteria in this population, indicating prolonged hospitalization (over 10 days) as a risk factor for resistance to methicillin⁽⁴⁾.

The prevalence of nasal colonization with *Staphylococcus aureus* varies depending on the population studied. The recent use of antibiotics and inpatient treatment in the last year have been found as independent predictors for nasal MRSA colonization in HIV-positive patients treated as outpatients⁽⁵⁾.

In individuals living with HIV/AIDS, immunosuppression and the constant use of antimicrobials can viabilize colonization with multi-resistant bacteria and the occurrence of infections.

This manuscript's relevance is explained by the fact that publications on the issue of *Staphylococcus aureus* in people living with HIV/AIDS were not found in Nursing periodicals in Brazil.

Objective

To evaluate the prevalence of nasal colonization with *Staphylococcus aureus* in individuals with HIV/AIDS receiving inpatient treatment in a teaching hospital in the state of São Paulo (Brazil).

Method

The present study is quantitative and cross-sectional and was undertaken in two units which are

specialized in attending individuals with HIV/AIDS in a large* teaching hospital in the state of São Paulo.

This research project was considered and approved by the Research Ethics Committee of the Ribeirão Preto School of Nursing (Protocol nº 1304/2011 EERP-USP).

The inclusion criteria established were: to be aged over 18 years old; to be aware of the diagnosis of infection with HIV/AIDS; to be clinically well enough to understand the guidance and to take the decision to participate or not. Individuals with HIV/AIDS using any ventilatory equipment which would make consenting or data collection impossible were excluded, as were those who were inpatients before the data collection period.

On the first day of inpatient treatment, (the first 24 hours) the individual was invited to participate and received information referent to the study objective and the research's ethical precepts; once the individual had understood and accepted to participate, he or she signed the Terms of Free and Informed Consent.

Socio-demographic and clinical data was collected through individual interviews and by accessing the medical records; the biological material was collected respecting the recommended bio-security measures, in the period August 2011 – July 2012. The nasal secretion was obtained using Stuart swabs, these being rubbed lightly in the left and right anterior nares.

The material collected was seeded and the isolation and the phenotypic identification of *Staphylococcus aureus* were carried out by an automatized method, using Vitek® system cards (BioMérieux™). Susceptibility to antimicrobials was tested using the AST-P585 card (BioMérieux™).

The data was organized in Microsoft Office and Mac Excel 2011 spreadsheets and then exported to the Statistical Package for the Social Science program, version 17.0. The distribution of the frequencies (mean and median) and the subsequent descriptive statistics of the data were undertaken.

Results

Of the 229 individuals approached in the period, 169 (73.8%) participated in the research; these were individuals with HIV/AIDS receiving inpatient treatment during the data collection period, who met the inclusion criteria; 57.4% were male, their ages varied between 19 and 72 years, with a mean of 42 years, and 39.6% of them were in the age range between 40 and 49 years

*In the Brazilian context, a 'large' hospital is one with between 150 and 500 beds. Translator's note.

old. White ethnicity was predominant, corresponding to 63.9% of the participants. In relation to education, 45.0% of the interviewees had completed primary school, and only 3.6% stated that they had completed higher education.

The microbial analysis of the material resulted in 123 (72.8%) non-colonized individuals and 46 who were colonized with *Staphylococcus aureus* in the nostrils, which corresponds to a prevalence of 27.2%. Among those who were colonized, 36 (78.3%) presented *Staphylococcus aureus* which was sensitive to oxacillin, these being denominated MSSA, and 10 (21.7%) were resistant to oxacillin, these known as MRSA.

Nasal colonization with *Staphylococcus aureus* was observed more in male individuals with HIV/AIDS, with

52.8% MSSA and 90.0% MRSA, the predominant age range being 30 to 39 years old, with 36.1% MSSA and 60.0% MRSA being evidenced in this age range. The level of education prevalent among the individuals with HIV/AIDS who were colonized in the nostrils with MSSA was equally distributed in the following categories: primary education incomplete and primary education complete, each with 36.1%; among those colonized in the nostrils with MRSA, there was predominance in the category 'primary education complete', 60% of the participants having this phenotype.

Table 1 presents the individuals with HIV/AIDS by the variables: sex, age, ethnicity, education, and classification regarding colonization or non-colonization with MSSA or MRSA.

Table 1 - Distribution of the individuals with HIV/AIDS receiving inpatient treatment in two units of a teaching hospital (N=169) by socio-demographic variables and nasal colonization with *Staphylococcus aureus*, sensitive to (MSSA), and resistant to, oxacillin (MRSA). Ribeirão Preto, SP, Brazil, 2011-2012

Variables	Non-colonized (n=123)		Colonized (n=46)			
			MSSA (n=36)		MRSA (n=10)	
	f	%	f	%	f	%
Sex						
Male	69	56.1	19	52.8	9	90.0
Female	54	43.9	17	47.2	1	10.0
Age range						
19 to 29	11	8.9	6	16.7	1	10.0
30 to 39	32	26.0	13	36.1	6	60.0
40 to 49	54	43.9	12	33.3	1	10.0
50 to 59	20	16.3	2	5.6	1	10.0
≥60	6	4.9	3	8.3	1	10.0
Education						
Illiterate	8	6.5	2	5.6	1	10.0
Primary - incomplete	29	23.6	13	36.1	3	30.0
Primary - complete	57	46.3	13	36.1	6	60.0
Secondary - complete	24	19.5	7	19.4	0	0.0
Higher Ed. - complete	5	4.1	1	2.8	0	0.0

In relation to the viral load of the HIV, MSSA was isolated in 16 (44.4%) of the individuals with HIV/AIDS who had counts below 100 copies/ml, while MRSA was identified in 4 (40.0%) of the individuals in the same range of viral load count. In relation to the determination of CD4+ T lymphocytes, among those colonized with MSSA and MRSA, there was a predominance of the range below 200 cells/mm³ in 16 (44.4%) and 6 (60.0%) individuals, respectively.

Regarding the number of episodes of inpatient treatment in the previous six months, it was observed that 44.4% of the individuals with HIV/AIDS colonized with MSSA, and 30.0% of the individuals with HIV/AIDS colonized with MRSA, had not received inpatient

treatment in the period. Among the participants with MRSA, 60.0% mentioned one episode of inpatient treatment in the previous six month period. The use of antimicrobials was observed in 66.7% of the individuals with HIV/AIDS with MSSA, and in 80.0% of the individuals with HIV/AIDS with MRSA, evidencing the predominance of the use of antimicrobials in those colonized with *Staphylococcus aureus*.

The use of antiretroviral drugs was identified in 43.5% of the individuals colonized with MSSA, not being observed in 60.0% of those individuals colonized with MRSA.

Table 2 brings together the characterization of those subjects classified as colonized or not, with MSSA

or MRSA, by the variables of viral load, CD4+ T cell count, number of episodes of inpatient treatment in the

previous six months, use of antimicrobials, and use of antiretroviral drugs.

Table 2 - Distribution of the individuals with HIV/AIDS receiving inpatient treatment in two units of a teaching hospital (N=169) by the variables of the disease, treatment, hospitalization and colonization with *Staphylococcus aureus*, sensitive to oxacillin (MSSA) and resistant to oxacillin (MRSA). Ribeirão Preto, SP, Brazil, 2011-2012

Variables	Non-colonized (n=123)		Colonized (n=46)			
	f	%	MSSA (n=36)		MRSA (n=10)	
			f	%	f	%
Viral load (copies/ml)						
≤100	39	31.7	16	44.4	4	40.0
101 to 100,000	45	36.6	12	33.3	2	20.0
100,001 to 500,000	24	19.5	4	11.1	1	10.0
≥500,001	12	9.8	0	0.0	3	30.0
Information unavailable	3	2.4	4	11.1	0	0.0
CD4 T Lymphocytes (cell/mm ³)						
>350	29	23.6	9	25.0	2	20.0
200 to 350	15	12.2	10	27.8	2	20.0
<200	76	61.8	16	44.4	6	60.0
Information unavailable	3	2.4	1	2.8	0	0.0
Episodes of inpatient treatment						
None	45	36.6	16	44.4	3	30.0
One	41	33.3	10	27.8	6	60.0
≥Two	37	30.1	10	27.8	1	10.0
Use of antimicrobials (ATM)						
Yes	84	68.3	24	66.7	8	80.0
No	39	31.7	12	33.3	2	20.0
Use of antiretroviral drugs (ARV)						
Yes	55	44.7	20	43.5	4	40.0
No	68	55.3	16	34.8	6	60.0

Discussion

Of the samples collected from the nostrils of 169 (73.8%) individuals with HIV/AIDS receiving inpatient treatment in a large teaching hospital, 46 (27.2%) were positive for *Staphylococcus aureus*, of whom 36 (78.3%) were identified as MSSA and 10 (21.7%), as MRSA.

The male sex was more frequent in the population studied, both in those individuals who were colonized and among those who were not. The predominant age range was from 30 to 39 years of age among those colonized with *Staphylococcus aureus*. The predominant level of schooling was completed primary school.

A similar, retrospective, study, with individuals with HIV/AIDS, undertaken to identify risk factors for colonization or infection with MRSA, obtained results showing that 63.0% of the participants were male and that the mean age was 41 years old (22 to 60 years old).

Nasal colonization in individuals with HIV/AIDS was identified more in those who had a low viral load (≤100 copies/ml), CD4+ T lymphocytes count <200 cells/mm³, those with a history of at least one episode of inpatient treatment in the previous six months, and who were using

antimicrobials. Only MRSA was identified with greater frequency among the individuals who were not using antiretroviral drugs, as, in the MSSA evidence, the majority of the participants were using antiretroviral drugs.

Previous research had identified a rate of 34% of nasal colonization with *Staphylococcus aureus* in individuals with HIV, emphasizing being a nasal carrier, having a vascular catheter, a low CD4+ T lymphocyte count and neutropenia as important risk factors for infections related to this pathogen⁽⁷⁾.

Research conducted among individuals with HIV found that 83.3% of the nasal carriers of *Staphylococcus aureus* were patients with CD4 T lymphocytes <200 cells/mm³, while among those who had a CD4 T cell count above 300 cells/mm³, MRSA was not isolated⁽⁴⁾.

Inpatient treatment, the previous use of antimicrobials, skin/soft tissue infection or being HIV-positive may all be considered as risk factors for patients who presented colonization with MRSA⁽⁸⁾.

Some risk factors for MRSA infection are indicated for individuals living with HIV, the following being highlighted: the immunosuppressed condition, and associated co-morbidities and specified life-style-related

behaviors, such as high-risk sexual practices and the use of illicit drugs⁽⁹⁾.

The use of antimicrobials has also been documented as a risk factor for colonization with *Staphylococcus aureus* in individuals with HIV⁽¹⁰⁾.

The use of antiretroviral drugs and the prophylactic use of Trimethoprim/sulfamethoxazole (TMP/SMX) are included among probable protective factors against colonization with *Staphylococcus aureus* among individuals with HIV^(6,10-11).

Some measures for the prevention and control of MRSA can be instituted, such as the investigation of patients who are suspected of being colonized or infected with MRSA, as well as this patient's restriction in the hospital environment (private room and bathroom); the investigation of body sites with swabs (nasal site, the genital region), and the use of personal protective equipment for the health professionals when in direct contact with the suspected cases, followed by the treatment and decolonization of patients and health professionals identified as colonized⁽¹²⁾.

One study undertaken with health professionals emphasizes the need to implement strategies which cover public policies directed at programs for the control of this pathogen in the hospital setting, promoting broad discussions on this topic⁽¹³⁾.

Conclusion

The concern with identifying colonization with *Staphylococcus aureus* in the population which lives with HIV/AIDS is growing, in view of the need for interventions for controlling the spread of this pathogen, minimizing correlated future infections.

In spite of being a bacteria first isolated in human beings over four decades ago, *Staphylococcus aureus* commonly causes the infection of skin and soft tissues, among others, both in people receiving inpatient treatment and those living in the community.

It is necessary for there to be joint action from professionals and government bodies linked to health, so as to improve policies of control related to antimicrobial resistance and to multi-drug-resistant micro-organisms.

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