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Accuracy of risk factors for nursing diagnosis risk of infection in people with AIDS*

Acurácia dos fatores de risco do diagnóstico de enfermagem risco de infecção em pessoas com aids

Precisión de los factores de riesgo del diagnóstico de enfermería de riesgo de infección en personas con SIDA

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Cristiane da Câmara Marques[1]
Bárbara Coeli Oliveira da Silva[1]
Vanessa Pinheiro Barreto[1]
Aline Rodrigues Feitoza[2]
Ana Luísa Brandão de Carvalho Lira[3]
Alexsandra Rodrigues Feijão[3]

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[1] Universidade Federal do Rio Grande do Norte, Programa de Pós-Graduação em Enfermagem, Natal, RN, Brazil.

[2] Universidade de Fortaleza, Fortaleza, CE, Brazil.

[3] Universidade Federal do Rio Grande do Norte, Departamento de Enfermagem, Natal, RN, Brazil.

ABSTRACT

Objective: To evaluate the accuracy of risk factors for infection that add up to the nursing diagnosis risk of infection in people with AIDS who are hospitalized. **Method:** Accuracy study with case-control design carried out with a total of 208 people living with AIDS and hospitalized between 2010 and 2016. The cases comprised people living with HIV, hospitalized and who developed infection related to health care and controls to those who did not develop it. Secondary data from medical records and research forms were used to respond to the data collection instrument for sociodemographic, clinical evaluation and investigation of the presence or absence of risk factors. The accuracy of clinical diagnostic indicators was measured through specificity, sensitivity and predictive values. **Results:** The risk factor that showed the greatest sensitivity and specificity was chronic illness, while the invasive procedure and the change in the integrity of the skin had the highest positive predictive value. **Conclusion:** Accurate diagnoses allow nurses to build a nursing intervention plan aimed at the needs of this population.

DESCRIPTORS

Acquired Immunodeficiency Syndrome; Hospitalization; Risk Factors; Cross Infection; Nursing Diagnosis; Nursing Process.

Corresponding author:
Cristiane da Câmara Marques
Br-101, s/n, Lagoa Nova
59078-970 – Natal, RN, Brazil
enfa.cristianemarques@hotmail.com

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INTRODUCTION

AIDS is considered an advanced stage of infection by the human immunodeficiency virus (HIV), which causes a certain deficiency and dysfunction of lymphocytes, with consequent impairment of the immune system's response[1].

With the emergence of antiretroviral therapy (ART), radical changes were observed in the scenario of the HIV infection epidemic. People living with HIV (PVHIV) when they are properly treated with ART, compared to those who do not use therapy, are subject to fewer opportunistic infections, as well as improved quality of life. However, even though the available medications have wide efficacy and safety, the occurrence of late complications from HIV remains, in addition to complications from prolonged use of ART, opportunistic infections and even death[2].

Consequently, the number of hospitalizations due to the consequences of HIV/AIDS infection still remains high[3]. As they are people with their own clinical specificities and characteristics, related to specific morbidity, social and psychological factors, requires a humanized care from the nursing team, specialized care and subsidized by scientific evidence[4].

Thus, to perform nursing based on evidence, there is the Nursing Process (NP), which is considered a care model. In this model, the stage of Nursing Diagnosis (ND) stands out, seen as the primary stage for the survey of problems based on data obtained, making it possible to identify the needs presented by each individual[5].

The NANDA International Taxonomy (NANDA-I) is one of the most widely used nursing diagnosis classification systems in the world for clinical judgment about health problems or vital processes[6]. Based on these health problems, the nursing team will be able to determine good clinical indicators, which enable nurses to establish the judgment of nursing diagnoses with the minimum chance of errors, that is, with greater accuracy[7].

Considering that the hospitalized person with HIV/AIDS has a compromised immune status, some clinical situations can make the development of healthcare-related infection (HRI) easier. In addition to the immune status, this individual is exposed to numerous invasive procedures and diagnoses, making it susceptible to classic infections, whether they are of the urinary, respiratory tract or bloodstream, which makes the clinical situation more difficult[8–9]. Consequently, these factors will directly influence the length of hospital stay and greater care attention of the nursing team. Thus, it is up to nursing to evaluate and monitor clinical indicators to prevent and detect these events early.

The ND risk of infection can be cited as an important device to assist nurses in assessing the evolution of the patients' clinical conditions. This diagnosis is inserted in the safety/protection domain, and is defined as: vulnerability to invasion and multiplication of pathogenic organisms, which can compromise health and is determined by the presence of risk factors such as malnutrition, chronic illness, invasive procedures, among others[10].

The reliability in the choice of the nursing diagnosis is established through measures of accuracy of its defining characteristics or risk factors, as is the case of the studied diagnosis. From these measures, it is possible to verify which risk factors more accurately predict the occurrence of the investigated diagnosis[11]. The accuracy of nursing diagnoses can help restore patients' quality of life and contribute to the selection of risk factors that are sensitive and specific.

Thus, this research aimed to assess the accuracy of risk factors for infection that make up the nursing diagnosis risk of infection in hospitalized people with AIDS.

METHOD

Study Design

This is a case-control study of the accuracy of the risk factors for ND infection risk, developed in the medical and statistical archive service of a reference hospital in infectious diseases, toxicology and special immunobiologicals, located in the state from Rio Grande do Norte, Brazil, from April to August 2017.

Sample

The data were collected from 321 medical records of people with AIDS hospitalized between 2010 and 2016. The sample was selected at the hospital base in a single institution, in order to minimize sampling bias according to the following inclusion criteria: individuals over 18 years old, of both genders with AIDS and hospitalized in the medical center and in the Intensive Care Unit of the hospital. The following exclusion criteria were established: people with AIDS who did not have the medical records identified to complement the information and people with AIDS who had infections at the time of admission to the health institution.

The cases and controls were identified from the investigation files existing in the Hospital Infection Control Commission (HICC) of the institution. People living with AIDS who presented HRI were considered as cases, and as controls, people living with AIDS who did not develop HRI during the hospitalization period were considered as controls.

In order to obtain greater statistical precision and because it is a small population, it was preferred not to perform a sample calculation and to investigate all subjects who progressed with HRI and who met the eligibility criteria (104). In Group 2, it was decided to make a simple draw to obtain a quantity equivalent to that of group 1, totaling a sample of 208 participants.

Data Collection

The data were collected from the application of a form-type instrument, prepared based on the risk factors of the nursing diagnosis of infection risk of NANDA-I (2015).

As for the composition of the instrument, it was divided into four parts. The first part covered sociodemographic variables: age, gender, marital status, education level, occupation and origin. In the second part, the clinical

variables were incorporated: year of diagnosis of HIV infection, use of antiretroviral therapy, reason for hospitalization, sector, hemoglobin value, leukocyte value, development of HRI, use of invasive device, peripheral venous access, central venous access, bladder catheter, urinary bladder catheter, nasogastric catheter, nasoenteral catheter, tracheostomy, orotracheal tube and drain.

The third part of the form was assigned to group 01 (exposed/cases) with aspects of infection related to health care: type of material collected for culture, result of antibiogram and IRAS site. Finally, the fourth part covered the risk factors for NANDA-I infection.

Among the risk factors contemplated in the ND, risk of infection was assigned to those consistent with the hospitalization situation and capable of being collected and measured from the data in the investigation forms and medical records. The following variables were chosen and consisted of the study variables: chronic illness, invasive procedure, inadequate primary defenses (changes in skin integrity, changes in peristalsis and smoking) and inadequate secondary defenses (decrease in hemoglobin and leukopenia).

In order to prove its suitability, the instrument was subjected to a pre-test with 10% of the sample, in which it detected operational difficulties in collecting the following risk factors: malnutrition, obesity and inadequate secondary defenses (immunosuppression, suppressed inflammatory response and inadequate vaccination). Therefore, the form needed to be restructured to meet the research objectives. Based on this, medical records collected during the pre-test phase were discarded.

After adjusting the instrument, the collect began, in which hospital infection investigation forms were requested from the Hospital Infection Control Commission team of the hospital with the purpose of recognizing individuals who met the inclusion criteria. In addition to the identification number of the medical records, a survey of the infection data was carried out and, subsequently, the medical records at the Medical Archive and Statistics Service were investigated to complement the data that were not present in the investigation form.

Data Analysis

The data were compiled in spreadsheets using Microsoft Excel 2013® software and analyzed using descriptive and inferential statistics, with the help of the IBM SPSS Statistics version 20.0 statistical package. For the descriptive analysis, absolute and relative frequencies were used for the sociodemographic and clinical characterization variables.

Then, the accuracy of the risk factors for infection that composes the ND risk of infection in hospitalized people with AIDS was assessed by means of sensitivity, specificity, negative and positive predictive values. These measures were calculated based on the inference about the occurrence of the studied nursing diagnosis, with a value of 80% being established as the cutoff point. The reason why the researchers adopted this cutoff point is based on another accuracy study that used the same value, with the results obtained above this point being relevant[12].

Ethical Aspects

The research was approved by the Research Ethics Committee of the Federal University of Rio Grande do Norte, protocol 1177318, on August 10, 2015, in accordance with the provisions of Resolution No. 466/2012 of the National Health Council, which defines the guidelines and regulatory standards for research involving human beings.

RESULTS

Most were male (63.5% of cases and 75.9% of controls), single individuals (41.3% of cases and 77.9% of controls), economically active (43.3% of cases and 64.4% of controls) and 41.3% of cases were from the countryside of the state, while 50.9% of controls were from the capital of the state. Although the study was not paired by age group, it was observed that almost the entire sample (94.2% of cases and 91.3% of controls) was made up of adults up to 59 years old.

Regarding clinical variables, 36.5% of cases and 46.1% of controls were diagnosed with HIV between 2007–2016. As for the use of ART, 69.2% of the individuals did not use it, while 53.8% of the controls did used it. Concerning the hospitalization sector, most (67.3%) of the cases were admitted to the ICU, 57.7% of the controls were hospitalized in the inpatient unit, as well as 31.7% of the cases. Regarding the reason for hospitalization, 21.1% of the controls were admitted with neurotoxoplasmosis, and then 14.4% of the cases and 9.6% of the controls were admitted with pneumonia.

Regarding the invasive procedures presented in Table 1, most (95.2% of the cases and 98.1% of the controls) people living with AIDS used some type of invasive device, especially the bladder catheter (66.65% of cases and 51.9% of controls) and central venous access (61.54% of cases and 41.3% of controls), which were highlighted as the most frequent in this population.

Concerning the site of development of infections related to health care found in the research forms of the participants, bloodstream infection stood out with 40.3%, as shown in Table 2.

A great variety was obtained regarding the survey of microorganisms found in the results of antibiogram of the studied sample, Pseudomonas aeruginosa (14.56%), Staphylococcus epidermidis (8.74%), Staphylococcus sp. (7.77%), Acinetobacter baumannii (7.77%) and Klebsiella pneumoniae (7.77%) stood out.

Table 3 shows the sensitivity, specificity and predictive values of the risk factors of the nursing diagnosis risk of infection in people with AIDS who developed (case) and those who did not develop (control) HRI.

DISCUSSION

Regarding sociodemographic characteristics, the sample was predominantly male, the participants had no partner and had an employment relationship. The data corroborate with a study carried out in Santa Catarina, as it showed that 58.2% of people living with AIDS were men. Therefore, it confirms that sexual and blood transmission was directly associated with this population[13].

Table 1 – Characterization of invasive procedures performed on people living with AIDS who developed (cases) and did not develop (controls) infection related to health care – Natal, RN, Brazil, 2017.

Invasive procedures	Groups	
	Case N%	Control N%
Invasive device		
Absence	5 (4.8)	2 (1.9)
Presence	99 (95.2)	102 (98.1)
Bladder catheter		
Absence	35 (33.6)	50 (48.0)
Presence	69 (66.6)	54 (51.9)
Central venous access		
Absence	40 (38.4)	61 (58.6)
Presence	64 (61.5)	43 (41.3)
Nasogastric tube		
Absence	53 (50.9)	68 (65.3)
Presence	51 (49.0)	36 (34.6)
Peripheral venous access		
Absence	61 (58.6)	34 (32.7)
Presence	43 (41.3)	70 (67.3)
Orotracheal tube		
Absence	64 (61.6)	61 (58.6)
Presence	40 (38.4)	43 (41.3)
Nasoenteral probe		
Absence	75 (75.1)	81 (77.8)
Presence	29 (27.8)	23 (22.1)
Tracheostomy		
Absence	87 (83.6)	103 (99.0)
Presence	17 (16.3)	1 (0.97)
Drain		
Absence	101 (97.1)	100 (100)
Presence	3 (2.8)	0
Relief bladder catheter		
Absence	102 (98.0)	102 (98.0)
Presence	1 (1.9)	2 (1.9)

Note: (N = 208).

Table 2 – Characterization of the HRI development site of people living with AIDS who developed healthcare-related infection – Natal, RN, Brazil, 2017.

HRI site	Frequency	%
Bloodstream infection	42	40.3
Respiratory tract infection	30	28.8
Urinary tract infection	25	24.0
Not informed	06	5.7
Infection of non-surgical wound	01	0.9

Note: (N = 104).

Table 3 – Accuracy measures of the risk factors of the nursing diagnosis risk of infection in people living with AIDS who developed (case) and who did not develop (control) infection related to health care – Natal, RN, Brazil, 2017.

Risk factors	Sensitivity	Specificity	PPV* (%)[2]	NPV** (%)[2]
Chronic illness	52.8	50.6	18.3	83.6
Invasive procedure	49.2	28.6	95.2	1.9
Change in skin integrity	49.7	50.0	94.2	5.7
Alteration of peristalsis	33.8	41.0	24.0	52.9
Smoking	29.3	44.5	11.5	72.1
Decreased hemoglobin	36.4	20.0	50.0	12.5
Leukopenia	31.2	42.2	18.3	59.6

*PPV: positive predictive value.
**NVP: negative predictive value.
Note: (N = 208).

According to marital status, there was a greater predominance of single people, who worked and came from the countryside of the state. These results corroborate with some studies found in the literature on the subject, in which a greater predominance among singles was identified due to the lack of health care and risky behaviors, such as the propensity to have a greater diversity of partners[14].

Regarding the clinical characterization of the study, most did not use ART and were admitted to the ICU. This result corroborates the findings of the literature that identified the determining factors of knowledge and practices in PVHIV. Therefore, the findings bring the difficulty of adhering to ART by people living with AIDS. The literature brings some of the causes of non-adherence to therapy due to the side effects that medications cause, people who use alcohol or drugs abandon therapy more often, and yet another reason that may be related is the non-acceptance of the diagnosis[15].

A study carried out in Salvador-BA showed that 31.6% of people who adhered to ART had adverse reactions to antiretrovirals and were hospitalized. Among the adverse effects of therapy are headache, nausea, vomiting, liver dysfunction and triggers long-term effects, such as dyslipidemia, hematological, metabolic and renal changes, among many others. Therefore, just as therapy makes it possible to suppress viral replication, it also triggers some adverse reactions that can be acute or chronic, which is why it ends up making adhesion difficult for people with AIDS[16–17].

Adherence to ART is extremely important, as it allows the reduction of viral load by inhibiting viral replication, slows down the progression of infection by preventing people living with HIV from developing AIDS, characterized by being a more advanced stage of HIV infection[2].

Regarding most cases that remained in the ICU, this study showed that people who were in these units developed some type of HRI. Therefore, it is related to the severity of

these individuals who need greater care support, complex care and continuous monitoring[18].

Still on the clinical characterization, neurotoxoplasmosis was considered the first cause of hospitalization of people living with AIDS, followed by pneumonia. It is important to point out that with the decreased response of the immune system in PVHIV, people are more susceptible to a large number of co-infections, among which are pneumonia and neurotoxoplasmosis[19].

Neurotoxoplasmosis is considered the most common type of coinfection that affects the Central Nervous System (CNS) in PVHIV due to the clinical condition of immunosuppression, which can result in cognitive disorders, attention deficit and memory. A study shows that in PVHIV, serology for Toxoplasma gondii is positive in 84% of cases[20]. As for community-acquired pneumonia in PVHIV, it occurs more insidiously than in the general population, being related to immunosuppression, poor housing conditions and the use of intravenous drugs, which increase the chances of bacteremia[21].

The bladder catheter and the central venous access were considered as the most performed procedures among people with AIDS during hospitalization. The use of the bladder catheter catheterization can favor the proliferation and migration of microorganisms to the urinary tract, especially when the probe is handled frequently and incorrectly. The risk of infection of the urinary tract is directly related to the length of stay of the bladder catheter[22].

As for bloodstream infection related to the use of central venous access, it can occur due to several factors, such as: contamination of the infusion solution, incorrect handling of the catheter at the time of dressing or even at the time of insertion of the catheter by the professional. A study identified that 26.66% of the people had bloodstream infection, which makes the correct handling and asepsis of the catheters necessary[22]. In this study, bloodstream infection stood out (40.3%), a fact justified by the number of venous accesses performed on users.

The association between invasive procedures and the development of HRIs can occur frequently, especially in PVHIV, due to the numerous invasive procedures that are submitted and the immunosuppression that make them more susceptible to infections by multidrug-resistant microorganisms[23].

Regarding HRIs, the microorganism most frequently isolated was Pseudomonas aeruginosa, which reaffirms the evidence obtained in other studies[24–26]. This finding may be related to the number of people using the orotracheal tube (38.4%), consequently, under mechanical ventilation. It is worth mentioning that health conditions, the individual's immunity and bacterial virulence are considered influencing factors in the evolution of pathogen colonization. In addition, people hospitalized in ICUs are mainly exposed to a higher risk of developing pneumonia associated with mechanical ventilation due to the underlying disease, with the presence of invasive devices and the use of antimicrobials empirically.

The measures of accuracy of the risk factors of the nursing diagnosis risk of infection in people with AIDS, the invasive procedure and alteration in the integrity of the skin showed a greater positive predictive value.

Regarding the invasive procedure, hospitalized patients have a higher risk of infection, since they are exposed to invasive procedures routinely and excessively manipulated, we can mention venipuncture and mechanical ventilation[27].

It is important to highlight that the change in the integrity of the skin may be proportionally related to the fact that the study participants, when undergoing invasive procedures, will almost always have their skin broken. This fact increases the probability of the risk of infection, considering that the skin is an important primary defense.

The risk factor alteration in the integrity of the skin is a contributing factor for the occurrence of the diagnosis. The vulnerability to the infectious process can be explained by the loss of the protective barrier, which minimizes or makes the arrival of nutrients indispensable for the maintenance of the protective function unfeasible[28].

Still regarding accuracy measures, it was observed that the risk factor for chronic illness had the highest sensitivity value (52.8%), which means that this indicator presents the best measure of accuracy to infer the studied nursing diagnosis. This indicator still had a higher specificity value (50.6%), which suggests that it is a good indicator to confirm the presence of the diagnosis.

The risk factors leukopenia and decreased hemoglobin did not present a statistically significant relationship. However, it is important to note that some studies show that PVHIV frequently present hematological changes, as well as lymphopenia and thrombocytopenia. Studies indicate that there is a significant relationship between anemia, absolute lymphocyte count and thrombocytopenia with the CD4 count, which makes the patient more susceptible to the development of anemia, secondary infections and may be related to the side effects of ART[29].

Another risk factor that did not obtain statistical significance related to the diagnosis was the change in peristalsis. However, there are studies that demonstrate the relationship of this factor in PVHIV, as is the case of diarrhea. This result corroborates the findings of another study, by clarifying that one of the main agents causing diarrhea in PVHIV are intestinal and protozoan parasites, which mainly include Entamoeba histolytica, Cryptosporidium sp. and Giardia lambia. The aforementioned study identified that patients with low CD4 cell counts were more likely to develop chronic enteric diseases, such as diarrhea[30].

As limitations of the study, besides the lack of registration of risk factors which were not available in the medical records, such as: malnutrition, obesity and inadequate secondary defenses (immunosuppression, suppressed inflammatory response and inadequate vaccination), which could not be analyzed in this study.

CONCLUSION

Based on the objectives proposed in this study, it was found that the risk factors for invasive procedure and changes in skin integrity had a higher positive predictive value, while the risk factor with greater sensitivity and specificity for chronic illness.

It is hoped that the results obtained in this study may contribute to a better perception of the occurrence of this diagnosis in the highlighted population, as well as the risk factors that best predict the presence of the diagnosis, considering the main sociodemographic and clinical aspects involved. It is worth mentioning that accurate diagnoses will allow nurses to build a nursing intervention plan aimed at the needs of this population.

Finally, it is suggested the elaboration of future studies on the subject in question, in view of the purpose of strengthening research related to accuracy measures, which are extremely relevant for the inference of nursing diagnoses and, by doing this, advance knowledge about the theme.

RESUMO

Objetivo: Avaliar a acurácia dos fatores de risco para infecção que compõem o diagnóstico de enfermagem risco de infecção em pessoas com aids que se encontram hospitalizadas. **Método:** Estudo de acurácia com delineamento de caso-controle realizado com 208 pessoas vivendo com aids e internadas entre os anos de 2010 e 2016. Os casos compreenderam pessoas que viviam com HIV, internadas e que desenvolveram infecção relacionada à assistência à saúde e os controles corresponderam aquelas que não desenvolveram. Utilizou-se dados secundários provenientes de prontuários e fichas de investigação para responder ao instrumento de coleta de dados para avaliação sociodemográfica, clínica e investigação da presença ou ausência dos fatores de risco. Mensurou-se a acurácia dos indicadores clínicos do diagnóstico por meio da especificidade, da sensibilidade e dos valores preditivos. **Resultados:** O fator de risco que apresentou maior sensibilidade e especificidade foi a enfermidade crônica, enquanto o procedimento invasivo e a alteração na integridade da pele apresentaram maior valor preditivo positivo. **Conclusão:** Diagnósticos acurados permitem aos enfermeiros a construção de um plano de intervenções de enfermagem direcionado às necessidades dessa população.

DESCRITORES

Síndrome de Imunodeficiência Adquirida; Hospitalização; Fatores de Risco; Infecção Hospitalar; Diagnóstico de Enfermagem; Processo de Enfermagem.

RESUMEN

Objetivo: Evaluar la precisión de los factores de riesgo de infección que componen el diagnóstico de enfermería de riesgo de infección en personas hospitalizadas con SIDA. **Método:** Es un estudio de precisión con diseño de casos y controles realizado con 208 personas con SIDA, hospitalizadas entre los años 2010 y 2016. Los casos incluían a personas que vivían con el VIH, que estaban internadas y habían desarrollado una infección derivada de la atención sanitaria, y los controles correspondían a aquellas que no desarrollaron la infección. Se utilizaron datos secundarios de las historias clínicas y de los formularios de la investigación para la evaluación sociodemográfica y clínica y para la investigación de la presencia o ausencia de factores de riesgo, en la recogida de los datos. La precisión de los indicadores clínicos del diagnóstico se calculó mediante la especificidad, la sensibilidad y los valores predictivos. **Resultados:** El factor de riesgo con mayor sensibilidad y especificidad fue la enfermedad crónica, mientas que el procedimiento invasivo y la alteración de la integridad de la piel presentaron el valor predictivo positivo más alto. **Conclusión:** Los diagnósticos precisos ayudan a los enfermeros a construir un plan de intervenciones de enfermería volcado hacia las necesidades de dicha población.

DESCRIPTORES

Síndrome de Inmunodeficiencia Adquirida; Hospitalización; Factores de Riesgo; Infección Hospitalaria; Diagnóstico de Enfermería; Proceso de Enfermería.

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