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Self-Esteem and Associated Factors among Orthopedic Trauma Patients with Nosocomial Infections in Kenitra, Morocco: A Cross-Sectional Study

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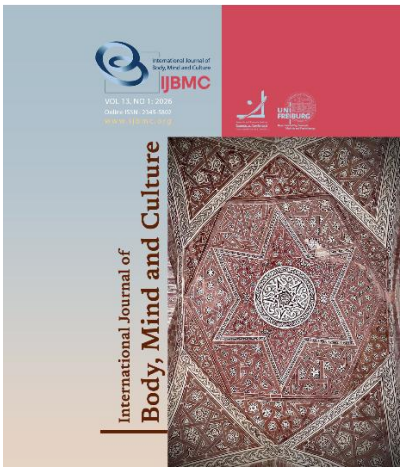

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ABSTRACT

Objective: Nosocomial infections (NI) represent a major worldwide public health problem, with several repercussions on the psychological health of patients. The study aimed to assess the level of self-esteem and its associated factors in orthopedic trauma patients who have developed a nosocomial infection at the Hospital El Idrissi of Kenitra, Morocco.

Methods and Materials: A descriptive–analytical cross-sectional study was conducted from October 2020 to April 2022. Sixty-five adult orthopedic trauma patients with confirmed NI were included. Self-esteem was measured using the Rosenberg Self-Esteem Scale and categorized as low versus moderate/average based on predefined cut-offs. Hygiene level (poor vs average) was assessed by nursing staff using standardized observable criteria prior to NI onset. Clinical and sociodemographic variables (e.g., age, sex, comorbidities, infection site, length of stay, smoking) were extracted from records and interviews. Data were analyzed in SPSS using chi-square/Fisher's exact tests and ANOVA where appropriate ($p<0.05$).

Findings: The mean age was 47.78 years with a balanced sex ratio. Surgical site infection was the most frequent NI (>50%). Low self-esteem was observed in 66.2% of patients, with higher prevalence among women. Self-esteem impairment was significantly associated with hygiene level, comorbidities (notably diabetes/hypertension), hospitalization characteristics/length of stay, age, sex, and infection site.

Conclusion: Low self-esteem is common among orthopedic trauma patients with NIs and is linked to clinical and care-related factors. Integrating psychological screening and support into infection-management pathways, alongside strengthened prevention and hygiene protocols, may reduce the psychosocial burden of Nis.

Keywords: nosocomial infection, orthopedic trauma, self-esteem, hygiene, Morocco.

Introduction

Nosocomial infections represent one of the most critical challenges facing contemporary medicine (Friedrich, 2019). They are generally defined as infections acquired during hospital care, particularly during an invasive medical procedure such as surgery, puncture, or venous catheterization (Khoury, 2004). The complexity of these infections often lies in the impossibility of precisely identifying their etiology. It is estimated that 6 to 7% of hospitalized patients contract a nosocomial infection, of which approximately 40% are of urinary origin, particularly in patients with bladder catheters (Cavallo & Garrabe, 2003). A large majority of these infections (80 to 90%) are directly associated with invasive procedures on the urinary tract, mainly catheterization, while the remaining 10 to 20% are related to more complex urological procedures (Cavallo & Garrabe, 2003). Worldwide, more than 1.4 million people suffer from hospital-acquired infections at any given time. The risk of contracting such an infection is estimated to be two to twenty times higher in low- and middle-income countries than in high-income countries (Mbim et al., 2016). According to a (Organization, 2003) study conducted in 55 hospitals in 14 countries, the average prevalence of hospital-acquired infections was 8.7% among hospitalized patients (Mbim et al., 2016). This prevalence varies depending on the level of development of health systems: it ranges from 3.5% to 12% in high-income countries, compared to 5.7% to 19.1% in low- and middle-income countries (Allegranzi et al., 2011).

Beyond their clinical implications, healthcare-associated infections also have a significant impact on the psychological well-being of patients (Mitchell et al., 2022). Advances in intensive care medicine have improved the prognosis of critically ill patients. However, the survival of these patients, particularly after a prolonged stay in the intensive care unit, is frequently accompanied by medium- and long-term physical and psychological aftereffects, the nature of which closely depends on the events experienced (Wang et al., 2023).

Among the psychological dimensions affected, self-esteem occupies a central place. It corresponds to the set of perceptions, feelings, and judgments, both positive and negative, that an individual maintains about themselves (Brown, 2014). This concept is based on three fundamental components: self-confidence, self-image, and self-love (narcissism).

Nosocomial infections (NIs) remain a major public health concern, particularly in orthopedic surgery, where they are among the most feared postoperative complications. The steady increase in the number of surgical procedures, linked to the aging population and the rising prevalence of chronic diseases, contributes to a progressive rise in their incidence. Although antibiotic prophylaxis protocols and hospital hygiene standards have been strengthened, the complete elimination of the risk of infection remains unattainable, due in particular to the complexity of surgical procedures and the increasing resistance of microbial agents (Stavrou, 2018).

In the Moroccan context, the issue of NIs is of particular importance. National surveys conducted in public hospitals have revealed a significant prevalence of healthcare-associated infections, prompting health authorities to strengthen infection prevention, surveillance, and control programs. The impetus provided by the Ministry of Health through national plans to combat nosocomial infections, the progressive improvement of hospital hygiene committees, and the development of microbiology laboratories reflect an institutional commitment to harmonizing practices and raising patient safety standards. However, the management of complex osteoarticular infections often remains concentrated in university hospitals, where multidisciplinary teams integrating infectious disease specialists, orthopedic surgeons, radiologists, and microbiologists are gradually being established (Grosbois & Fiasse, 2016).

Diagnostic advances, particularly in microbiological culture, specialized imaging, and molecular identification—have enabled earlier detection of pathogens responsible for infections of prostheses or osteosynthesis materials. Simultaneously, orthopedic surgery benefits from more standardized therapeutic approaches, allowing for conservative treatment of the implant in certain situations. However, the increasing legal involvement in the management of NIs, also observed in Morocco, has led to a rise in the number of complaints and requests for medical expertise, reinforcing the need for surgeons to update their knowledge on the prevention and management of these infections (Brown, 2014).

Beyond the clinical and medico-legal dimensions, nosocomial infections in orthopedics are accompanied by often underestimated psychological repercussions. Chronic pain, prolonged hospital stays, lasting functional impairment, fear of recurrence, successive reoperations, and disruption of life plans generate significant psychological distress. Such an experience can affect body image, compromise autonomy, and reduce self-esteem, while also leading to high levels of anxiety, stress, or depressive symptoms (AlHarbi, 2022).

In this perspective, the present study aims to examine the level of self-esteem and its associated factors in orthopedic trauma patients who have developed a nosocomial infection and to analyze the relationships between self-esteem and different clinical and sociodemographic factors in order to better understand the overall impact of these complications and to identify ways to improve integrated care.

Methods and Materials

Study Design

This is a descriptive and analytical cross-sectional observational study carried out from October 2020 to April 2022, in the service of anesthesia-intensive care unit, which includes three rooms, two of which were individual, with a total of seven beds. All trauma patients admitted to the unit and whose hospital stay was greater than or equal to 48 hours were included in this study. These were mainly road traffic accidents. Nosocomial infection was defined according to the criteria of the Center of Disease Control (CDC) in Atlanta and according to the 5th Consensus Conference of the French Society of Anesthesia and Intensive Care [3,4]. All patient data were transcribed onto a data collection form, including: age, sex, medical history, length of hospitalization, outcome of the ICU stay, type of trauma, antibiotic treatment upon admission, invasive devices (type and duration of exposure), the occurrence or absence of a nosocomial infection, time to onset of infection, site of infection, potential complications, probabilistic antibiotic therapy, and its efficacy. For each documented nosocomial infection, the following were recorded: the type of specimen, the isolated organisms, and their antibiotic susceptibilities. For the analysis of risk factors for HI, the population was divided into two groups: the HI(+) group comprised 96 patients (37.9%) and the HI(-) group comprised 157 patients (62.1%). At admission, the two groups were comparable in terms of demographic and anamnestic characteristics (age, sex, medical history).

Population

Among 723 orthopedic trauma patients admitted during the study period, 65 developed a nosocomial infection and constitute the population analyzed for the self-esteem assessment. Patients with orthopedic trauma, hospitalized in the orthopedic department, and who developed a nosocomial infection.

Inclusion criteria were as follows: Orthopedic trauma, confirmed nosocomial infection, age ≥ 18 years and informed consent. Exclusion criteria were known psychiatric history (if not assessed), cognitive impairment, refusal to participate and major data gaps.

Instrument

The Rosenberg Self-Esteem Scale is a self-assessment of ten items. Simply add the scores for questions 1, 2, 4, 6, and 7 and use a reverse score for questions 3, 5, 8, 9, and 10 (Table 1). The total of 40 points is used to establish a typical self-esteem profile. Responses are scored on a four-point scale. Totally disagree 1/Somewhat disagree 2/Somewhat agree 3/Totally agree 4. Score less than 25: low self-esteem; Score between 25 and 30: moderate self-esteem; and Score higher than 30: high self-esteem.

Hygiene level

Patient hygiene levels were assessed using a standardized method by the healthcare team (the designated nurse for the ward) upon admission and before the onset of a nosocomial infection. The assessment was based on observable clinical criteria, including general personal hygiene, bed linen cleanliness, adherence to personal hygiene practices (regular washing, changing clothes), and the cleanliness of the surgical site or invasive devices. Based on this assessment, hygiene levels were classified into two categories: poor (hygiene deemed insufficient or not compliant with hospital recommendations) and average (hygiene deemed acceptable but not optimal). No "good" category was included to limit subjectivity in the assessment and ensure sufficient sample sizes for statistical analysis.

Tobacco consumption

Tobacco use was collected from medical records and a structured interview with the patient at the time of the survey. For statistical analysis, the variable was defined as current smoking status and coded dichotomously.

Patients were classified as smokers if they reported active tobacco use at the time of hospitalization, regardless of the duration or intensity of consumption. Patients who had quit smoking before hospitalization, as well as those who had never smoked, were grouped into the non-smoker category. Detailed information regarding the duration of consumption and the number of cigarettes per day was not systematically available and was therefore not included in the analysis, which constitutes a recognized methodological limitation.

Analysis

All collected data was initially entered and filtered using Microsoft Excel software, then transferred to the IBM SPSS Statistics environment for in-depth analysis. Two categories of variables were considered in this study: qualitative variables, processed as absolute and relative frequencies (as percentages); quantitative variables, summarized by the arithmetic mean and standard deviation.

Inferential statistical analyses were conducted to explore the relationships between the different variables. One-way analysis of variance (ANOVA) was used to assess mean differences between groups, while the chi-square (χ^2) test was used to examine associations between qualitative variables. Fisher's exact test was used when the expected sample size was insufficient. No multivariate analysis was performed due to the limited sample size. Furthermore, the Pearson correlation coefficient was used to assess the strength and direction of linear relationships between numerical variables. The significance threshold used for all tests was 5% ($p < 0.05$), thus ensuring statistical rigor in accordance with health sciences research standards.

Findings and Results

Sociodemographic characteristics of patients

The study involved a total of 65 patients. The mean age of the study population was 47.78 ± 2.55 years, with a range from 18 to 92 years and a median of 43 years. The age distribution was relatively symmetrical, as evidenced by a skewness coefficient of 0.47 and a kurtosis coefficient of 0.86.

Analyzing by sex, the mean age of women was 43.06 ± 3.8 years, while that of men was higher, at 52.09 ± 3.3 years, a difference that was statistically significant ($F = 3.23$; $p < 0.05$).

Furthermore, 66.15% of patients were from urban areas, of which 74.42% were men. Conversely, among patients from rural areas, 90.90% were women. This association between place of residence and sex was very strong, with an estimated odds ratio of 29.09 [95% confidence interval: 5.83–145.08] and a Yule coefficient of 0.93.

Clinical characteristics of patients

Sixty percent of patients included in the study had at least one risk factor likely to interfere with the occurrence of a nosocomial infection, including high blood pressure, diabetes, or a combination of both (comorbidities). The prevalence of comorbidities was 54.60% in women, compared to 64.71% in men, with no statistically significant difference between the sexes (odds ratio = 0.66; 95% confidence interval: 0.24–1.79).

The distribution of healthcare-associated infections by location revealed three predominant sites: the surgical site (50.77%), the respiratory tract (27.69%), and the urinary tract (21.54%). Among patients who contracted a surgical site infection (n = 33), 69.69% were women. In contrast, more than 55% of pulmonary infections occurred in men, and all urinary tract infections (100%) were observed in male patients. The chi-square test revealed a statistically significant association between sex and site of infection ($\chi^2 = 19.25$; $p < 0.001$).

Regarding hospitalization, no significant association was found between sex and the hospitalization rate ($\chi^2 = 0.46$; $p = 0.49$). However, the hospitalization rate was 38.71% in women versus 47.06% in men, with an estimated odds ratio of 0.71 (95% CI: 0.26–1.91) (Table 1).

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Table 1

Demographic and clinical characteristics of patients

Variable	Modality	Women	Man	total	
Age	Mean ±SD (min ; max)	43.06 ± 3,80 (19 ; 90)	52.09 ± 3.30 (18 ; 92)		Fisher=3.23 (p<0.05)*
Origin	Rural	20	2	22	χ^2 =24,89
	Urban	11	32	43	(p<0.000) ***
Comorbidity	Yes	17	22	39	χ^2 =6.14 (p<0,189)
	No	14	12	26	
Infection site	Operating site	23	10	33	χ^2 =19.25
	respiratory tract	8	10	18	(p<0.000)***
	urinary tract	0	14	14	
Hospitalization	Yes	12	16	28	χ^2 =0.46 (p<0.49)
	No	19	18	37	

** Significant, ** very significant, and *** very highly significant difference.*

Study of self-esteem in patients

The Rosenberg Self-Esteem Test demonstrated satisfactory reliability, with a Cronbach's alpha coefficient of 0.71, indicating acceptable internal consistency between items (p < 0.001) and the total score, with the exception of item 10 ("I sometimes believe I am worthless").

The mean score was 29.18 ± 0.53, with a range of 18 to 39 and a median of 29. The distribution of scores was normal, as indicated by a skewness coefficient of -0.199 and a kurtosis coefficient of -0.169. The coefficient of variation was 14.74% (4.30/29.18), reflecting moderate heterogeneity.

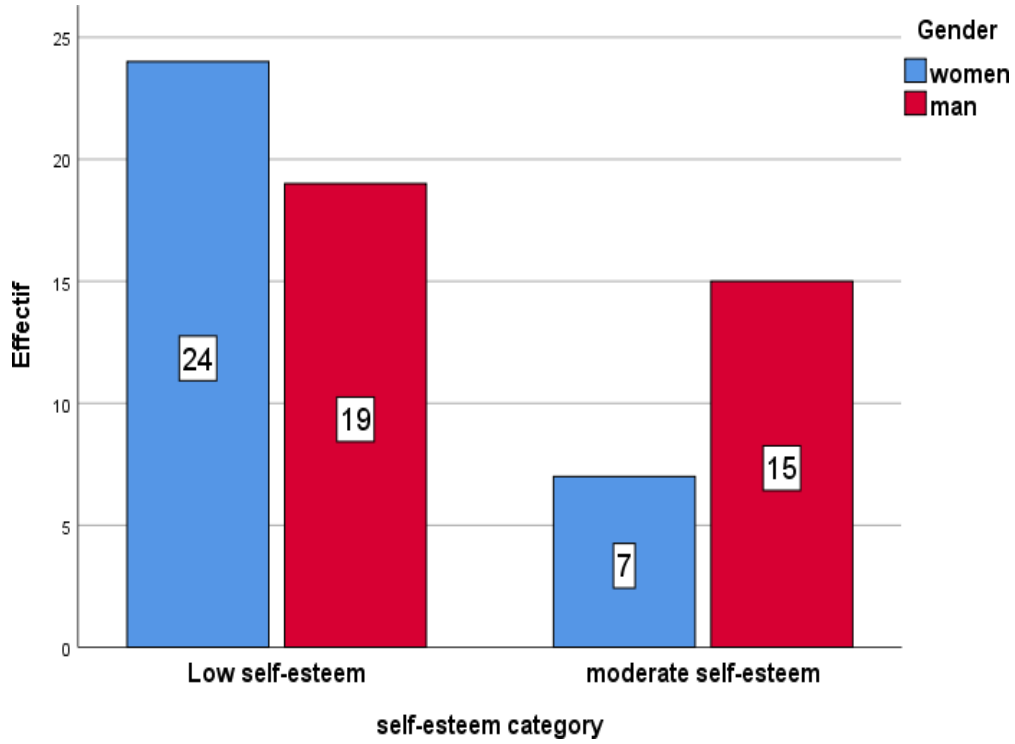
The distribution of patients according to their level of self-esteem shows that no individual had high self-esteem. In contrast, 66.2% (n = 43) of patients had low self-esteem, while 33.8% (n = 22) had moderate self-esteem (Figure 1). This latter category requires careful monitoring, as it can evolve into either low or high self-esteem over time.

Furthermore, the chi-square test revealed a significant association between the level of self-esteem and gender (χ^2 = 3.36; p < 0.05). The rate of low self-esteem was higher among women (77.42%) compared to men (55.88%) (Figure 1). The risk attributable to this sex factor was 21.54% in favor of women, with an odds ratio of 2.71 (95% confidence interval: 0.92–7.98).

Finally, a Fisher analysis of variance (ANOVA) revealed a significant difference between the mean age of patients with low self-esteem and those with moderate self-esteem (Fisher = 6.87; p < 0.011). Indeed, the mean age of patients with low self-esteem was 43.21 ± 16.79 years (range: 19–85 years), compared to 56.73 ± 24.45 years for those with moderate self-esteem.

Figure 1

Distribution of patients according to gender and degree of self-esteem



Determining factors

Table 2 presents the results of the chi-square test analyses examining the relationships between self-esteem (SE) categories and various sociodemographic and clinical variables. A significant association was observed between SE categories and patients' hygiene level. Indeed, the percentage of patients with low self-esteem among those with poor hygiene level was 52.5%, compared to 88% among individuals with average hygiene level (attributable risk = -35.5%; odds ratio = 0.15; 95% confidence interval: 0.04–0.58).

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Table 2

Association between self-esteem and socio-demographic and clinical parameters.

variables		class SE			total	χ^2 (p value)
		low	moderate	strong		
Hygiene level	bad	21	19	0	40	8,66 (p<0,003)**
	average	22	3	0	25	
Current smoking status	Yes	24	7	0	31	3,36 (p<0,067)
	No	19	15	0	34	
Hospitalization	Yes	13	15	0	28	8,55 (p<0,003)**
	No	30	7	0	37	
Infection	Operative	24	9	0	33	7,52 (p<0,023)*
	Pulmonary	14	4	0	18	
	Urinary	5	9	0	14	
Comorbidity	Diabetes	11	4	0	15	11,36 (p<0,023)*
	Hypertension	11	13	0	24	
	Nothing to report	21	5	0	26	
Origin	Rural	17	5	0	22	1,84 (p<0,17)
	Urban	26	17	0	43	
Gender	women	24	7	0	31	3,36 (p<0,05)*
	man	19	15	0	34	
Total		43	22	0	65	

** : Significant difference ** : very significant difference*

Regarding hospitalization, the chi-square test also revealed a significant relationship with self-esteem (χ^2 = 8.55; p < 0.003). The rate of patients with low self-esteem was 46.43% among hospitalized patients, compared to 81.08% among those not hospitalized (attributable risk = -34.65%; odds ratio = 0.20; 95% CI: 0.07–0.61).

Furthermore, a statistically significant association was established between the site of infection and self-esteem (χ^2 = 7.52; p < 0.023). Thus, the rate of low self-esteem was 72.72% among patients with surgical site infection and 77.78% among those with pulmonary infection, while this rate was reduced to 35.71% among patients with urinary tract infection. Also, more than 75% of diabetic patients and more than 46% of hypertensive patients had low self-esteem. In contrast, variables related to smoking and living environment revealed no statistically significant association with self-esteem.

For comorbidities, particularly diabetes and hypertension, were significantly associated with self-esteem (χ^2 = 11.36; p < 0.023). In contrast, no statistically significant association was found with geographic origin (χ^2 = 1.84; p < 0.17). Current smoking status and sex showed marginal associations with self-esteem, with a higher frequency of low self-esteem among smokers (p < 0.067) and women (χ^2 = 3.36; p < 0.05).

Discussion and Conclusion

Few studies have assessed the psychological impact of nosocomial infections (NI). Self-esteem, a major psychological concept, refers to a person's overall judgment, whether positive or negative, of themselves (Grosbois & Fiasse, 2016). Research indicates that self-esteem attributes are relatively stable, although they are not fixed and can evolve in response to life events (AlHarbi, 2022). This work aims to assess the links between NI and patients' psychological behavior, particularly their attitude toward isolation measures, and to identify avenues for improvement.

NIs are a common complication among trauma patients hospitalized in intensive care, with serious consequences for both patients and the healthcare system. According to the WHO Global Report on Infectious Disease Prevention and Control (2022), 7% of hospitalized patients in high-income countries and 15% in low- and middle-income countries contract at least one nosocomial infection during their hospital stay, with an average mortality rate of approximately 10%. In Europe, the incidence of NI is estimated at 5.5%, representing 9.9% of hospital admissions (Brun-Buisson, 2005). In Morocco, the reported prevalence is 6.7% (Chemsi et al., 2013).

In our study, surgical site infections were the most common, with a rate exceeding 50%, significantly higher than the rates reported by Nagoura et al., which ranged from 6.8% to 26%, with a predominance in general

surgery in sub-Saharan Africa (Ngaroua et al., 2016). Our results show that NIs mainly affect at-risk patients, particularly those with chronic conditions such as diabetes and hypertension, in line with the literature (Eggimann & Pittet, 2001; Vermeil et al., 2019). These patients may experience feelings of helplessness and vulnerability, negatively affecting their self-esteem and self-confidence (Njuguna et al., 2022). Furthermore, the stigma associated with infection can have lasting repercussions on their psychological well-being. Several studies have highlighted an increased level of anxiety and depression among patients in contact isolation (Parker et al., 2011). Purnell and Andersen highlighted the crucial role of psychological and spiritual balance, showing that meaning and purpose in life facilitate psychological adjustment after acute illness and subsequent treatments (Dekker, 2024; Marrakchi et al., 2024).

In our cohort, 46.43% of hospitalized patients presented with potentially low self-esteem, which correlated with a prolonged hospital stay. Low self-esteem was more frequently observed among women than men. Although this difference reached statistical significance, the strength of the association remains limited. Indeed, the odds ratio was associated with a wide confidence interval, reflecting considerable uncertainty in the estimate, likely due to the relatively small sample size.

The attributable risk of 21.54% represents the excess proportion of low self-esteem observed among women compared with men in this population. However, this measure should be interpreted with caution, as it does not imply causality and remains sensitive to sampling variability. Taken together, these results suggest a possible sex-related trend in self-esteem rather than a robust association. Larger, adequately powered studies are required to better characterize the magnitude and consistency of this relationship.

Furthermore, a highly significant association between the level of hygiene and the occurrence of nosocomial infections, exceeding 60%, was observed. Other factors, such as the use of medical devices and the cleanliness of the hospital environment, may also be major determinants of hospital-acquired infections (Dasgupta et al., 2015; Purnell & Andersen, 2009).

The results of this study show that several clinical and behavioral factors are associated with low self-esteem. The significant associations observed with hygiene levels, hospitalization, infections, and comorbidities suggest that impaired health status and the constraints of medical care can negatively impact self-perception. These factors may reflect increased psychological vulnerability in patients facing more serious clinical conditions (Cohen, 2021).

Regarding sex, although women have a higher prevalence of low self-esteem, the observed association remains statistically marginal and characterized by significant uncertainty. Similarly, the link between smoking and self-esteem, while suggesting a trend, does not reach statistical significance. These results should therefore be interpreted with caution and considered as trends rather than robust associations. Future studies with larger sample sizes would allow for a more precise understanding of the role of these sociodemographic factors in determining self-esteem (Karki et al., 2021).

Differences in self-esteem levels were observed depending on the site of infection. The finding that a lower proportion of patients with low self-esteem had urinary tract infections appears counterintuitive and should be interpreted with caution. This observation could reflect differences in perceived severity, functional impact, or length of hospital stay depending on the type of infection, rather than a psychological effect specific to the site of infection. In the absence of qualitative or longitudinal data, these results should be considered exploratory (Zhang et al., 2024).

Although some previous studies have highlighted links between severe illness, anxiety, depression, and psychological adjustment, these dimensions were not assessed in the present study. Therefore, it is not possible to extrapolate the observed results on self-esteem to overall psychological adjustment. Self-esteem represents a specific dimension of psychological functioning, and its interpretation should remain confined to the methodological framework of this study. Future work incorporating multidimensional psychological assessments would allow for a better understanding of the interactions between self-esteem and other indicators of mental health (Elyadini et al., 2024; Henriksen et al., 2017).

This study has several important limitations. First, it is a single-center study conducted in a single hospital in Kenitra, which limits the generalizability of the results to other hospital or regional settings. The sample size (n =

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65 patients with a nosocomial infection) is relatively small for some statistical analyses, particularly for 2×2 or 2×3 tables, which may reduce the power to detect differences and the precision of odds ratios. Furthermore, the absence of a control group of non-infected trauma patients makes it impossible to distinguish the specific impact of the nosocomial infection from that of the trauma or hospitalization in general. Some potential confounding factors, such as psychiatric history, depressive or anxiety symptoms, socioeconomic status, education level, and marital status, were neither assessed nor adjusted, which limits the interpretation of the observed associations. Furthermore, some key variables are defined in a simplified manner: hygiene level was assessed by the lead nurse using two categories (poor and average), without a more detailed scale, and smoking status was collected only in terms of current smoker versus non-smoker, without precise data on the duration or intensity of consumption. Finally, the self-esteem measurement relies on a single instrument (the Rosenberg Self-Esteem Scale) and does not allow for the assessment of other dimensions of psychological health, such as anxiety or depression. These limitations must be taken into account when interpreting the results, and future studies, ideally multicenter and with longitudinal follow-up, are needed to confirm these observations and refine the analyses of factors associated with self-esteem in infected trauma patients.

Analysis of self-esteem, assessed using the Rosenberg scale, provided an assessment of the subjective mental health of patients with hospital-acquired infections. Self-esteem, which is relatively stable, could benefit from sustained improvement, likely to provide long-term psychological protection for affected patients. Consequently, it is essential to pay particular attention to individuals with low self-esteem, by developing targeted therapeutic interventions to strengthen this psychological dimension.

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Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants. Ethical considerations in this study were that participation was entirely optional.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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Authors' Contributions

All authors equally contribute to this study.

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