

EVALUATION OF BIOSAFETY KNOWLEDGE AMONG PROFESSIONALS AT THE MATERIAL AND STERILIZATION CENTER OF A REFERENCE HOSPITAL¹

AVALIAÇÃO DO CONHECIMENTO DE BIOSSEGURANÇA EM PROFISSIONAIS DA CENTRAL DE MATERIAL E ESTERILIZAÇÃO DE UM HOSPITAL DE REFERÊNCIA

Leticia Teixeira Lobo², Gabriel Nelson Rolim Remigio³ e Bruno Henrique Andrade Galvão⁴

ABSTRACT

Objective: to assess the knowledge and perception of biosafety among Central Sterile Supply Department (CSSD) professionals at a reference university hospital in Paraíba in 2022. **Methods:** descriptive observational study. The study population was formed by health professionals working in the CSSD at the hospital studied. The sample consisted of professionals who agreed to take part in the study and sign the informed consent form. The data was analyzed descriptively. **Results:** a total of 42 CSSD employees were interviewed. Of those interviewed, 52.4% had already taken a course on biosafety. Only 59.5% of the participants said they were aware of biosafety legislation in Brazil. Furthermore, around 80% of the professionals rated their knowledge and application of biosafety standards as at least satisfactory. **Conclusion:** CSSD professionals have satisfactory knowledge of biosafety standards, but there is still a need for greater educational investment in this area.

Keywords: Containment of Biohazards; Health education; Hospital Departments.

RESUMO

Objetivo: avaliar o conhecimento e a percepção sobre biossegurança dos profissionais da Central de Material e Esterilização (CME) de um hospital universitário de referência na Paraíba em 2022. **Metodologia:** estudo observacional de caráter descritivo. A população do estudo foram os profissionais de saúde com vínculo trabalhista no hospital estudado e que atuam na CME. A amostra foi composta por profissionais que aceitaram participar da pesquisa e assinar o termo de consentimento livre e esclarecido (TCLE). A análise dos dados foi efetuada de maneira descritiva. **Resultados:** foram entrevistados no total 42 funcionários integrantes da CME. Dos entrevistados, 52,4% já realizaram algum curso sobre biossegurança. Apenas 59,5% dos participantes afirmaram possuir conhecimento sobre legislação de biossegurança no Brasil. Ademais, cerca de 80% dos profissionais classificam seus conhecimentos e aplicações das normas de biossegurança como, no mínimo, satisfatório. **Conclusão:** os profissionais da CME possuem um conhecimento satisfatório acerca das normas de biossegurança, mas ainda há a necessidade de maiores investimentos educacionais nessa temática.

Palavras-chave: Contenção de Riscos Biológicos; Educação em Saúde; Departamentos Hospitalares.

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² Universidade Federal da Paraíba, Discente do curso de Biomedicina, João Pessoa, PB, Brasil. E-mail: ltl@academico.ufpb.br. ORCID: <https://orcid.org/0000-0001-6293-4325>

³ Universidade Federal da Paraíba, Discente do curso de Medicina, João Pessoa, PB, Brasil. E-mail: gabriel.remigio@academico.ufpb.br. ORCID: <https://orcid.org/0000-0002-4676-5274>

⁴ Universidade Federal da Paraíba, Doutor/Professor do Departamento de Fisiologia e Patologia, João Pessoa, PB, Brasil. E-mail: bruno.galvao@academico.ufpb.br. ORCID: <https://orcid.org/0000-0002-1914-4085>

INTRODUCTION

Biosafety, in addition to being related to the control of risks associated with recombinant DNA technology, is also directly connected to worker safety and accident prevention, including occupational safety concerning conventional risks (Beeckman; Rüdelsheim, 2020; Brazil, 1995). In this context, its focus has been on traditional processes and risks, playing an essential role in enabling professionals to perform their functions with individual and environmental safety, concentrating on work processes rather than merely on risk control. Analyzing the intrinsic risks of labor activities is fundamental to determining appropriate safety standards. By adopting certain definitions, it is notable that biosafety primarily aims to build a work environment that minimizes exposure to potentially harmful agents for professionals, patients and the environment (Safdar *et al.*, 2023).

Biosafety, especially after the COVID-19 pandemic, has gained prominence in health institutions that are developing systematic and effective approaches to policies, quality/accreditation programs and risk management (Rutjes *et al.*, 2023). In this new perspective, biosafety becomes an institutional priority and can be the starting point for the pursuit of multidisciplinary care excellence through risk management (Brazil, 2010).

Thus, understanding the concepts associated with biosafety and their applications in patient care and health services has been a strategy adopted by institutions seeking quality in all stages of their activities (Souza *et al.*, 2023), especially within hospital sectors such as the Central Sterile Supply Department (CSSD), where the occupational risks present in the location demand even stricter knowledge and application of biosafety standards (Azevedo *et al.*, 2021).

In this context, the perception of biosafety knowledge by CSSD professionals and the mechanisms employed to achieve risk reduction inherent to this sector are indispensable prerequisites for safeguarding public health, managing work processes, preserving the integrity of professionals, improving productivity indices, enhancing the quality of services provided in this hospital environment and ensuring patient safety (Almedaini, Anfal, Alanazi; 2021).

Therefore, understanding the level of knowledge of CSSD professionals regarding biosafety principles is relevant to establishing, if necessary, hospital accreditation programs capable of instituting infection control policies in health services and educational programs on the subject. The objective of the present study was to evaluate the knowledge and practices regarding biosafety among healthcare professionals during their routine work in the CSSD of a reference university hospital in Paraíba.

METHODOLOGY

This study is an observational, descriptive study conducted in the second half of 2022 and the first half of 2023 at a university hospital located in Paraíba, which is a reference for healthcare assistance for the residents of Paraíba and the surrounding region.

The study population consisted of healthcare professionals employed at the selected hospital who work in the CSSD sector. This study used a convenience sample composed of healthcare professionals who agreed to participate in the research. The inclusion criteria were: having a verified institutional affiliation with the analyzed hospital, being over 18 years old, and agreeing to sign the informed consent form. The exclusion criteria were: healthcare professionals who were absent from the work schedule on the days the questionnaire was administered or who refused to sign the informed consent form.

The data collection instrument used to assess the perception of biosafety among CSSD healthcare professionals was a structured questionnaire, administered during the working hours of the professionals invited to participate in the study. The questionnaire consisted of 37 questions that addressed topics related to the profile of the professionals working in the CSSD, their perception and compliance with biosafety standards, the occurrence of work-related accidents, and the presence of occupational risks in the sector. The questionnaires were administered to the professionals in the sector during December 2022, January and February 2023.

Data analysis was conducted descriptively, aiming to categorize the studied sample. For quantitative variables, descriptive statistical analysis was used, obtaining the mean and standard deviation to express the distribution and variability of the data. For each qualitative variable, categorical data analysis was performed, enabling the assessment of relative (%) and absolute (N) frequencies for the different classes.

The ethical aspects of the research were carried out in accordance with the ethical principles of Resolution 466 (MS, 2012) and submitted to the Ethics Committee. The study was approved under CAEE number 47637621.6.0000.8069 and approval statement 4.878.821.

RESULTS

The present study was conducted with a sample of 54 healthcare professionals who were part of the CSSD team during the year the study was carried out, with a total of 42 individuals interviewed. Among these professionals, it was observed that thirty-nine were women aged between 31 and 70 years, with the majority of the respondents being between 41 and 55 years old, as shown in Table 1.

Among the interviewees, all were nursing professionals, with the majority (88.1%) being nurses and nursing technicians. Additionally, it is possible to observe that 47.6% of these professionals have between 7 and 10 years of service.

Table 1 - Profile of CSSD workers.

Variable	Levels	Quantity	Percentage	
Gender	Female	39	92,9%	
	Male	3	7,1%	
Age (years)	31-35 years	1	2,4%	
	36-40 years	6	14,3%	
	41-55 years	29	69%	
	56-60 years	4	9,5%	
	61-70 years	2	4,8%	
Mean*				46,3
Mode*				42
Standard deviation*				7,89
Level of education	High school diploma	9	21,4%	
	Bachelor's degree	26	61,9%	
	Postgraduate degree	7	16,7%	
Profession	Nurse	15	35,7%	
	Nursing assistant	5	11,9%	
	Nursing technician	22	52,4%	
Years of work	1-3 years	1	2,4%	
	4-6 years	9	21,4%	
	7-10 years	20	47,6%	
	> 10 years	12	28,6%	
Mean#				11,7
Mode#				8
Standard deviation#				8,77

*Represent statistical analyses for the age variable. # Represent statistical analyses for the years of work variable. Source: research data.

In the analysis of responses obtained for questions related to biosafety, it was observed that 54.8% of the respondents stated that they had taken a biosafety course at some point in their education. Furthermore, only 59.5% of the respondents claim to have knowledge of biosafety legislation in Brazil, as can be seen in Table 2. This is an interesting fact to analyze, considering that 64.3% of the respondents claim to know about the Regulatory Standard 32 (RS-32), as demonstrated in Table 2, even though a lower number stated familiarity with biosafety legislation in Brazil.

When considering practical aspects of biosafety, all interviewees reported that the institution provides adequate Personal Protective Equipment (PPE) for the risks they are exposed to in their daily routines in the CSSD. Additionally, 97.6% (n = 41) of the interviewees stated that they have an updated vaccination card, which is extremely relevant for professionals in this hospital sector where there is a high biological risk.

Regarding the number of occupational accidents, 45.2% (n = 19) of the interviewees reported having experienced some type of accident in the work context, which is a frequent reality in the CSSD due to constant contact with high-temperature machinery and sharp objects.

A total of 100% of the interviewees stated that their biosafety actions were intensified due to the COVID-19 pandemic context, as the pandemic scenario required greater caution in work activities and even stricter compliance with biosafety standards.

Table 2 - Questions and answers obtained from the questionnaire administered to CSSD workers.

Answer	Absolute quantity	Percentage
Have you taken any independent or employer-provided Biosafety courses during your training?		
YES	23	54,8%
NO	19	45,2%
Do you have knowledge about the legislation regarding Biosafety in Brazil?		
YES	25	59,5%
NO	17	40,5%
Do you know what Norma Regulamentadora 32 is about ?		
YES	27	64,3%
NO	15	35,7%
Would you say that over your time working within the CSSD, your precautions regarding biosafety measures have changed?		
YES	37	88,1%
NO	5	11,9%
Do you consider relevant to provide continuous education for CSSD workers to comply with Biosafety standards?		
YES	40	95,2%
NO	2	4,8%
Do you wear closed-toe shoes in your workplace?		
YES	37	88,1%
NO	5	11,9%
Do you wear adornments during your work shift?		
YES	20	47,6%
NO	22	52,4%
Have you undergone any training on hospital biosafety measures during your time at the institution where you are employed?		
YES	23	54,8%
NO	19	45,2%

Source: research data.

The interviewees were also asked about how they would rate their knowledge and application of biosafety standards on a scale from 1 to 5, with 1 being completely unsatisfactory and 5 being completely satisfactory. Thus, it was observed that 52.4% (n = 22) of the employees rated their knowledge and application of biosafety standards as 4 (satisfactory), 26.2% (n = 11) as 5 (completely satisfactory), and 21.4% (n = 9) as 3 (reasonable).

However, even though many interviewees claimed to have satisfactory or completely satisfactory knowledge of biosafety (78.6%), the researchers conducting the interviews observed that 47.6%

(n = 20) wore adornments such as earrings, necklaces, bracelets, watches, and rings during working hours, and 11.9% (n = 5) of professionals did not wear properly closed shoes. These observations highlight that, despite being aware of biosafety standards, many professionals still do not implement such knowledge meticulously and satisfactorily.

When asked about the occupational risks that most bothered them in the workplace, with the possibility of pointing out more than one risk, it was observed that biological and ergonomic risks received a higher rate of mentions from the interviewees. Furthermore, when asked to indicate only one occupational risk that interviewees consider most frequent within the CSSD, pronounced values were again obtained for biological (45.2%) and ergonomic risks (42.9%), as observed in Table 3.

Table 3 - Occupational hazards that most bother/concern professionals in the CSSD department.

Classification	Absolute quantity	% of total
Which of the occupational hazards below bothers and concerns you the most in the workplace environment? (you can choose more than one hazard)		
Biological risks	33	78,6%
Ergonomic risks	32	76,2%
Physical risks	15	35,7%
Accident risk	11	26,2%
Chemical risks	10	23.8%
Which of the occupational hazards below bothers and concerns you the most in the work environment? (you can choose only one hazard)		
Biological risks	19	45,2%
Ergonomic risks	0	0%
Physical risks	18	42,9%
Accident risk	3	7,1%
Chemical risks	2	4,8%

Source: research data.

In this context, it is pertinent to note that despite ergonomic risk being one of the most disturbing for the interviewed professionals, only 21.4% (n = 9) claim to take any action such as stretching during their workday to reduce such risk. Additionally, although 76.2% (n = 32) of the respondents report that they find their workload appropriate, more than half (52.4%) of them state feeling physically overwhelmed in the workplace.

Finally, participants were asked whether they believe continuous education for CSSD professionals in terms of compliance with biosafety standards is relevant, and 95.2% (n = 40) responded that they consider this ongoing educational process important.

DISCUSSION

Regarding the profile of CSSD professionals, it is possible to observe a majority presence of female professionals, consistent with other studies conducted in this hospital sector (Hu *et al.*, 2024; Silva *et al.*, 2021; Azevedo *et al.*, 2021; Portella *et al.*, 2022; Lima *et al.*, 2018; Santos *et al.*, 2017; Aquino *et al.*, 2014; Rocha *et al.*, 2014). Furthermore, another characteristic that aligns with previous studies conducted in smaller hospitals (Espindola & Fontana, 2012; Portella *et al.*, 2022; Silva *et al.*, 2021) is the predominance of professionals aged 41-55 years, with a standard deviation of 7.89 years for this attribute. This indicates a low level of age variation among professionals working in this sector for the present study.

These observations suggest a pattern in the profile of professionals working in the CSSD, who are predominantly women over the age of 40. This can be attributed to the predominance of females in the nursing profession, which is predominant in this sector. The present research contributes to outlining the educational profile of workers in this sector, as all research participants are nursing professionals, with a predominance of nursing technicians (52.4%), consistent with the findings of other studies (Hu *et al.*, 2024; Azevedo *et al.*, 2021; Silva *et al.*, 2021; Portella *et al.*, 2022).

Only 54.8% of respondents reported having attended a biosafety course, a considerably lower percentage compared to another study conducted in the same sector of a university hospital in the Northern region, which had 78.2% affirmative responses to the same question (Portella *et al.*, 2022). This difference highlights a potential for more substantial preparation and study of biosafety regulations among professionals interviewed in the Northern region hospital compared to those who participated in the present research.

Additionally, more than 40% of professionals reported being unaware of Brazil's biosafety legislative norms, and over 35% could not identify what RS-32 entails. These results are unique to the present research, as the reviewed literature did not contain specific information on these questions in previous studies. Nonetheless, these findings are concerning, as the lack of such information can compromise work practices, further expose these professionals to occupational hazards inherent to the CSSD sector, and contribute to the spread of hospital infections.

Of the professionals interviewed, 41 reported having an up-to-date vaccination card. This aspect is extremely relevant within the CSSD unit for promoting broader and more effective occupational safety, given that these professionals frequently come into contact with materials potentially contaminated by various microorganisms and toxic products capable of causing a wide range of infections/contaminations. A study conducted in the CSSD of a hospital in Rio Grande do Sul demonstrated that vaccination is commonly adopted by various professionals in this sector as a tool for preventing accidents and potential health issues. However, this study did not perform a percentage analysis of professionals with up-to-date vaccination cards (Espindola; Fontana, 2012).

It was found that 100% of the interview participants stated that the hospital in question provides the necessary and adequate PPE according to Biosafety standards for CSSD professionals. In this context, among the studied literature, only the study by Portela *et al.* (2022) effectively sought to show whether the hospital adequately provided PPE, with 74% of respondents reporting that the institution supplied this equipment according to demand. However, it is worth noting that the analysis by Portela *et al.* (2022) was conducted during the COVID-19 pandemic, an extremely atypical scenario for the entire healthcare sector, which may explain the discrepancy in values found between the studies.

It was observed that 45.2% of professionals reported having experienced some type of accident in this hospital sector, a number very similar to that found in another study, where 46.15% of respondents also reported accidents (Anjos *et al.*, 2021). Unfortunately, this scenario is recurrent in the CSSD, given the frequent use and handling of many hot liquids and objects, sharp instruments, and chemical substances capable of causing a series of incidents during the workday.

All the professionals interviewed stated that their actions in relation to biosafety were intensified by the COVID-19 pandemic context, which is in line with the research carried out in a university hospital in northern Brazil, in which several questions to CSSD professionals highlighted changes in protocol, such as the use of new PPE appropriate to the new reality brought about by SARS-CoV-2 (Portella *et al.*, 2022). It is worth mentioning that changes in the laboratory and hospital context have been and continue to be essential to combat COVID-19 and ensure the protection of health professionals (Rutjes *et al.*, 2023).

The nursing professionals interviewed classified their knowledge and application of biosafety norms as mostly satisfactory or completely satisfactory. However, approximately 60% of these professionals wore adornments or did not wear closed shoes, a basic biosafety norm for the CSSD. This finding can be compared with another study which found that 83% of CSSD professionals consistently adhere to the complete use of PPE (Almedaini; Bujayr; Alanazi, 2021). Therefore, it is evident that the professionals interviewed for the present study need to exercise greater caution regarding compliance with dress codes and the correct and complete use of PPE. It is worth noting that non-compliance with biosafety norms and the lack of PPE usage is an aggravating factor for exposure to occupational hazards in the CSSD (Bertelli *et al.*, 2023).

The occupational hazards most highlighted by the interviewed professionals were biological and ergonomic risks. This information aligns with other studies, which also indicate that CSSD professionals are constantly exposed to infectious microorganisms, carry excessive weights, and adopt forced, inadequate, and harmful postures during work activities. These factors make the aforementioned risks more frequent in this sector (Lima *et al.*, 2018; Aquino *et al.*, 2014; Anjos *et al.*, 2021; Silva *et al.*, 2021; Mendes *et al.*, 2020). Other studies show an opposite scenario, where professionals reported that the most bothersome factor in the CSSD was the

physical risk of heat (Silva *et al.*, 2021; Espindola; Fontana, 2012). This factor can be related to the poorly maintained equipment used in the disinfection/sterilization process and the inadequate physical structure of the CSSD.

It is possible to assume that this difference occurs because the CSSD of the studied hospital has a better cooling and air circulation structure, although certain areas of the CSSD are hotter due to machinery such as autoclaves, leading to complaints about excessive heat, as observed in Table 3 under physical risk. However, this was not highlighted as the main complaint in the present study. It is important to emphasize that to confirm this assumption with complete certainty, a specific study on the physical structure of the CSSD in the hospital where the present research was conducted is necessary.

Despite ergonomic risk being identified as one of the main concerns within the CSSD, only nine professionals reported taking any action during their workday to reduce these risks. The study by Espindola and Fontana (2012), conducted with 13 CSSD professionals from a medium-sized hospital in Rio Grande do Sul, also showed a low percentage (7.69%) of professionals who engaged in activities to mitigate this risk.

Another study conducted in a large hospital in the state of Rondônia with 35 CSSD professionals indicated that the repetitive mechanical activities performed daily by these professionals directly contribute to the onset of physical discomfort, increasing complaints regarding ergonomic risks (Silva *et al.*, 2021). Therefore, due to the strong presence of these risks in this hospital sector, it becomes evident that there is a significant need to develop routine activities capable of mitigating the damages caused by this occupational hazard.

In a study conducted at a university hospital in Rio de Janeiro, the specific actions of professionals to address ergonomic risks were not evaluated. However, it was found that workplace gymnastics is a tactic adopted by programs aimed at promoting the physical and mental health of professionals, thereby enhancing health and quality of life (Costa *et al.*, 2015).

More than half (52.4%) of the interviewees reported feeling physically overburdened at work. This fact can be associated with a dual work shift and excessive workload, especially during peak times within the CSSD. It is worth noting that, through the analysis of the present study and other research, a predominance of women in this sector was observed, as previously mentioned. This contributes to the high levels of fatigue reported by professionals in this sector, as women still predominantly bear the primary responsibility for domestic activities and childcare. Consequently, this dual workload exposes professionals to the risk of physical and mental overload, or to health issues arising from the conditions of the work environment itself (Espindola; Fontana, 2012; Lima *et al.*, 2018).

Almost 90% of the professionals interviewed stated that their biosafety practices improved over time while working in the CSSD. This finding can be compared with another study that

analyzed the level of knowledge CSSD professionals had about occupational risks before working in the sector, revealing that approximately 52% reported having little or only moderate knowledge beforehand (Portella *et al.*, 2022). Thus, it can be suggested that, over time, professionals in the CSSD become more aware of the risks they are exposed to and therefore strive to implement good work practices that protect them and reduce their exposure to such risks and the rates of healthcare-associated infections.

Among the findings of the present study, 95.2% of the professionals interviewed consider continuous education for CSSD professionals regarding adherence to biosafety norms to be relevant. A study conducted in Amazonas on biosafety and behavior in critical environments applied questionnaires before and after training on the topic, observing a considerable increase in correct responses after the training (Azevedo *et al.*, 2021). This scenario highlights that continuous education is essential for qualifying individuals for direct or indirect care practices and strongly contributes to building theoretical and practical knowledge of biosafety norms, especially in the CSSD (Koikov *et al.*, 2020).

It is pertinent to highlight that continuous and ongoing education about biosafety norms for all healthcare professionals promotes an in-depth understanding of best risk prevention practices. It contributes to the training of more skilled, up-to-date professionals who can adequately adapt to changes in the healthcare field. Additionally, it ensures the safety of these professionals and their patients, maintains regulatory compliance, and contributes to the provision of high-quality and safe healthcare services (Primaz *et al.*, 2021; Nayahangan *et al.*, 2021; Emery *et al.*, 2022).

CONCLUSION

At the end of this work, it becomes evident that despite operating within a sector that requires exemplary adherence to biosafety standards, many professionals still require further clarification regarding this topic. This is evidenced by the lack of full compliance with these standards and by the fact that many CSSD professionals still feel insecure about their biosafety knowledge.

Therefore, studies that aim to analyze and map possible gaps in the work processes of healthcare professionals in the biosafety context help to develop policies and programs that are able to promote the maintenance of service quality, the safety of professionals, patients, and the community. For instance, the structuring of continuous and enlightening education for healthcare professionals through short-term courses can be a viable strategy to address potential CSSD shortcomings.

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