







ORIGINAL

Biosafety in the work performance of workers exposed to biological risks

La bioseguridad en el desempeño laboral de trabajadores expuestos a riesgos biológicos

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ABSTRACT

Introduction: occupational biological risk is the probability that workers will suffer health damage from contact or exposure to biological agents. To prevent occupational diseases, workers need biosafety knowledge that enables them to develop appropriate attitudes and practices in their work.

Objective: to determine the level of biosafety knowledge, attitudes, and practices of workers exposed to biological risks at the National Center for Minimally Access Surgery.

Method: a descriptive, observational, cross-sectional study was conducted. The study population consisted of 198 workers exposed to biological risks at the institution. Using simple random sampling, the sample consisted of 98 workers. A performance observation guide was applied, allowing for the assessment of variables using the designed qualitative scale, considering the positive value for each variable studied.

Results: 71,9 % of the respondents rated their level of knowledge as insufficient, while 65,3 % rated their attitudes and appropriate practices regarding biosafety as insufficient, and 59,7 % rated their attitudes and appropriate practices regarding biosafety as insufficient. The most affected variables were insufficient knowledge for identifying risks in the workplace and managing hospital waste, as well as inadequate response to accidents involving biological agents.

Conclusions: workers exposed to biological risks at the National Center for Minimally Access Surgery (CMS) have insufficient knowledge, attitudes, and appropriate practices in biosafety to prevent occupational accidents and diseases while on the job.

Keywords: Knowledge; Attitudes and Practice in Health; Biosafety; Occupational Exposure.

RESUMEN

Introducción: el riesgo biológico ocupacional es la probabilidad de que los trabajadores sufran daños a la salud por contacto o exposición a agentes biológicos. Para la prevención de enfermedades ocupacionales, los trabajadores precisan de conocimientos en bioseguridad que permitan actitudes y prácticas adecuadas en su desempeño.

Objetivo: determinar el nivel de conocimientos, actitudes y prácticas en bioseguridad de los trabajadores expuestos a riesgos biológicos del Centro Nacional de Cirugía de Mínimo Acceso.

Método: se realizó un estudio observacional descriptivo transversal. El universo de estudio estuvo constituido por los 198 trabajadores expuestos a riesgos biológicos de la institución. Mediante un muestreo aleatorio simple la muestra quedó conformada por 98 trabajadores. Se aplicó una guía de observación al desempeño que permitió la valoración de las variables mediante la escala cualitativa diseñada, considerando el dato positivo de cada variable estudiada.

Resultados: el nivel de conocimientos fue valorado de insuficiente en el 71,9 % de los estudiados, en el 65,3 % y el 59,7 % se valoraron de insuficientes las actitudes y prácticas adecuadas con relación a la bioseguridad. Las variables más afectadas fueron los insuficientes conocimientos para la identificación del riesgo en el ambiente laboral y el manejo de desechos hospitalarios, así como, inadecuados modos de actuación ante accidentes por agentes biológicos. Conclusiones: los trabajadores expuestos a riesgos biológicos del Centro Nacional de Cirugía de Mínimo Acceso, poseen insuficientes conocimientos, actitudes y prácticas adecuadas en bioseguridad, para la prevención de accidentes y enfermedades ocupacionales durante el desempeño laboral.

Palabras clave: Conocimientos; Actitudes y Práctica en Salud; Bioseguridad; Exposición Laboral.

INTRODUCTION

Biological risk has gone from being an unknown scenario to becoming part of everyday life.⁽¹⁾ The SARS-CoV-2 coronavirus pandemic has highlighted that uncontrolled biological hazards can have a devastating impact worldwide.⁽²⁾

Occupational biological risk is the possibility of a worker suffering harm from exposure to or contact with biological agents while performing their work. Healthcare workers are the most susceptible occupational group due to the intrinsic characteristics of their profession and the environment in which they work.^(3,4)

Healthcare workers can be affected in their work environment, either as a result of exposure or contact with these agents, and this is more common in those who handle samples with contaminated bodily fluids or with a high probability of contamination.^(5,6)

The World Health Organization (WHO) estimates that human resources working in healthcare institutions are exposed to some 60 infectious pathogens, including: the acquired immunodeficiency virus (HIV), which has become important due to its high incidence; hepatitis B (HBV); hepatitis C virus (HCV); and the new SARS-CoV-2 and Mycobacterium tuberculosis, with high frequencies of exposure.⁽⁷⁾

The authors of the research believe that occupational safety and health plays a fundamental role in the prevention of occupational diseases among workers exposed to biological risks, as it determines the laws and regulations that enable, through prevention, the control of occupational hazards, the physical integrity and health of workers, and maximum safety for the population and the environment in the performance of their work.

That is why, in Cuba, the Constitution of the Republic establishes that the state must guarantee the right to occupational safety and health through the adoption of adequate measures for the preservation of workers' health and the prevention of occupational accidents and diseases.⁽⁸⁾

In addition, the protection of workers in the country against risks related to exposure to biological agents is regulated by various legal documents, including Decree Law 190/99, which establishes the implementation of biological safety, requiring an adequate supervision and control system.⁽⁹⁾

In turn, workers must have adequate knowledge of biosafety to enable them to understand the laws and regulations governing this discipline and to develop appropriate practices for the prevention of accidents and diseases related to the work they perform.

In the same way that workers develop skills and abilities to perform their work, to mitigate the risks of infection or injury from various biological agents, they must take extreme measures to avoid becoming a source of infection for patients and contamination of the environment.⁽¹⁰⁾

Mastering biosafety measures, the proper use and safe removal of personal protective equipment, and ongoing training and education for exposed personnel are essential mechanisms for preventing occupational accidents and the development of occupational diseases related to biological hazards.

However, the low level of implementation of personal protective measures, the poor application of biological risk management procedures, the lack of awareness of universal precautions, and the inadequate disposal of hospital waste are causes for concern worldwide.⁽¹¹⁾

For its part, the European Agency for Safety and Health at Work (EU-OSHA) has highlighted the persistent lack of knowledge and awareness of exposure to biological agents and related health problems, as well as the lack of a systematic approach to the prevention of these risk factors in the workplace.⁽¹²⁾

Similarly, the quality of medical care a patient receives is closely linked to the health and safety conditions

in which workers operate. Therefore, there is no doubt that the health of this occupational risk group is critical.

The National Center for Minimally Invasive Surgery (CNCMA) is a reference center for endoscopic therapy and minimally invasive surgery, certified by the Quality Management System under the ISO 9001:2015 standard by the National Standardization Office and by the Certification Institute, S.L. (ICDQ) in Spain, where surgical procedures and other high-risk procedures involving exposure of workers and patients to biological agents are performed.

However, specialists from the Hygiene and Epidemiology section and members of the biological safety committee have identified, through observations of the behavior of workers exposed to biological risks, whether professional or not, that there is insufficient knowledge to identify hazards and minimize damage to health in the workplace.

It is therefore necessary to determine the knowledge, attitudes, and practices in biosafety for the job performance of workers exposed to biological risks at the CNCMA, to design a training strategy that will preserve the health of workers and patients, protect the environment, and provide quality medical care.

METHOD

A descriptive cross-sectional observational study was conducted between January and December 2024. The study population consisted of 198 workers exposed to biological hazards at the CNCMA. To select the units of analysis and ensure the representativeness of the sample, three strata were established according to risk level, occupation, and job position.

The first stratum, with a total of 54 workers, consisted of administrative staff, doctors, and nurses; the second stratum, with 20 workers, comprised clinical laboratory, microbiology, pathological anatomy, and blood bank personnel; and a third stratum, with 24 workers, which included laundry service personnel, sterilization center personnel, general service assistants, and outdoor area personnel.

The sample consisted of a total of 98 workers exposed to biological risks, with proportional allocation to each stratum, representing 49,5 % of the study population. A simple random sample was used to select the subjects to participate in the research.

To fulfill the research objective, a performance observation guide was developed and applied to the selected workers, which allowed for the determination of the knowledge, attitudes, and practices related to the job performance of workers exposed to biological hazards. The guide was validated using the Aiken method⁽¹³⁾, according to expert criteria, before its application.

Quantitative and qualitative variables were used to characterize the study sample, such as age, sex, level of education, occupation, place of work, and years of service.

To determine the level of knowledge, the variables studied included the level of expertise in identifying biological risks in the workplace, the level of knowledge about workplace protection measures, and the level of knowledge about managing hospital waste and the principle of universality in biosafety.

Three variables related to workers' attitudes toward biosafety were also studied: proactive and responsible attitude in complying with the principle of universality, commitment to complying with daily procedures, and responsibility toward group work about biosafety measures.

To determine biosafety practices in the work performance of the sample studied, the following variables were investigated: application of knowledge of the institution's biosafety program, use of protective equipment, modes of action in the event of incidents or accidents involving biological contaminants, skills in handling sharp objects, application of theoretical knowledge of biosafety principles for hand washing, and proper handling of hospital waste.

Each variable studied was evaluated using the following scale: observed (SO), sometimes observed (SOAV), and not observed (NSO), once the observation guide was applied during the performance of each of the workers belonging to the research.

To determine the level of knowledge, attitudes, and practices in biosafety, the following qualitative scale was established based on the positive data obtained. - adequate: 100-75 %, partially adequate: 74-50 %, and inadequate: less than 50 %.

The SPSS v.23.0 statistical package was used to process the data and analyze the results. Indices and percentages were calculated as necessary indicators to output the study variables.

Ethical principles and informed consent from participants were taken into account in the research. The results are presented in tables and graphs for better understanding.

RESULTS

A total of 98 workers exposed to biological risks participated in the study, with women accounting for 56,3 % of the total number of participants, and the age groups 35 to 39 and 40 to 44 being the most represented.

According to occupational category, nursing staff predominated (33,7 %), followed by doctors (21,4 %) and general service assistants (12,2 %).

In terms of the department where they work, the most significant number of respondents belong to the hospital ward (22,6 %), endoluminal service (17,0 %), and general services (11,3 %). According to years of service, the highest percentage (43,4 %) responded that they had been working in the service for between 6 and 15 years.

Of the total number of workers surveyed, 53,1 % are university graduates. The upper technical level is represented by 18 workers, corresponding to 18,4 % of those studied. 11,2 % are mid-level technicians, and 10,2 % have completed pre-university education. The rest (8,2 %) completed basic secondary education as their highest level of schooling.

When assessing the level of knowledge in biosafety among workers exposed to biological risks, it was determined that 72 % of the workers studied had an inadequate level of knowledge, followed by 19,1 % with an adequate level and 8,9 % of the total sample with a partially adequate level.

In turn, analysis of the results of the variables studied related to the level of knowledge revealed that 87,8 % did not demonstrate mastery of the principle of universality in biosafety, as well as in the management of hospital waste, and 83,7 % were unable to identify biological hazards present in the workplace. However, 61,2 % had adequate knowledge of the protective equipment to be used according to the work they perform.

Table 1. Distribution of workers exposed to biological risks according to variables related to the level of knowledge. CNCMA.2024.

Variables	Observed		Observed Sometimes		Not observed	
	No	%	No	%	No	%
Level of knowledge about the protective equipment to be used in the workplace	60	61,2	10	10,2	28	28
Level of knowledge to identify biological risks present in the workplace	5	5	1	11	8	83,7
Level of knowledge for handling hospital waste	5	5	7	7	86	87,8
Level of knowledge about the principle of universality in biosafety	5	5	7	7	8	87

On the other hand, about workers' attitudes during work performance, it was observed that they were inadequate in 65,3 % of the total, adequate in 20,1 %, and partially adequate in 14,6 %.

In this regard, it was determined that 73,5 % of workers do not demonstrate responsibility for group work with a multidisciplinary approach to compliance with biosafety measures; 70,4 % of those studied did not show a proactive attitude in complying with the principle of universality; and in 52,0 % there was no commitment to comply with daily procedures regarding biosecurity measures. The results are shown in table 2.

Table 2. Distribution of workers exposed to biological risks according to variables related to attitudes toward job performance. CNCMA.2024.

Variables	Observed		Observed Sometimes		Not observed	
	No	%	No	%	No	%
Commitment to comply with daily procedures regarding biosecurity measures	32	32,7	15	15	51	52
Proactive attitude in complying with the principle of universality.	12	12	17	17	69	70,4
Responsibility for group work with a multidisciplinary approach to compliance with biosafety measures.	15	15	11	11	72	73

Regarding the assessment of biosafety practices among the workers studied, the findings indicated that 62,9 % were inadequate, 22,6 % were adequate, and 14,5 % were insufficient.

The study of the variables showed that in 67,3 % of cases, there was no evidence of application of the theoretical elements of the institution's biological safety program, in 77,6 % of cases, there was a lack of skills in handling sharp objects, and in 82,7 % of cases, there was a lack of skills in responding to incidents and/or accidents involving biological contaminants. In addition, 84,7 % did not demonstrate skills in identifying, segregating, and handling different types of solid waste in the workplace.

About the use of protective equipment and hand washing, 52,0 % of the workers observed used the appropriate protective equipment for the task they were performing and washed their hands properly according to biosafety

standards.

Table 3. Distribution of workers exposed to biological hazards according to variables related to work performance practices. CNCMA.2024

Variables	Observed		Observed Sometimes		Not observed	
	No	%	No	%	No	%
Theoretical knowledge about the institution's biosafety program	6	6	7	7	85	86,7
How to respond to incidents or accidents involving biological contaminants (blood and fluids)	9	9	8	8	8	82,7
Application of theoretical knowledge to identify, segregate, and handle types of solid waste in the workplace	7	7	8	8	8	84,7
Skills in handling sharp objects for the prevention of occupational diseases	9	9	13	13	7	77,6
Application of theoretical knowledge about biosafety principles in proper hand washing according to the type of procedure	51	52	24	24	23	23
Use of protective equipment according to the risk to which they are exposed	51	52	25	25	22	22

DISCUSSION

Biosafety, as a preventive discipline, establishes standards and procedures aimed at protecting workers. For this reason, healthcare workers exposed to biological risks must have knowledge of biosafety that allows them to develop appropriate attitudes and practices for the prevention of occupational diseases and accidents, protect the health of patients and the environment, and provide excellent services.

The study determined the knowledge, attitudes, and practices in biosafety for the job performance of workers exposed to biological hazards at the CNCMA in 2024. It found that the majority of workers had an inadequate level of knowledge, which, according to the authors of the study, is related to insufficient attitudes and practices in the majority of those studied.

The results of this research are similar to other studies reviewed, which report low levels of knowledge and inadequate practices among healthcare personnel about biosafety. For example, researcher Urquiaga Vargas⁽¹⁴⁾, in a study conducted in Peru to identify the biosafety knowledge and practices of nursing staff in an intensive care unit, found that 55 % of workers had a low level of knowledge, 40 % had a medium level, and only 5 % had a high level. Similarly, she reported inadequate practices in 70 % of those studied.

Meanwhile, a study conducted by Baldera Paico and other researchers⁽¹⁵⁾ found that 50,9 % of the participants in the research engaged in inadequate practices about biosafety measures, as did 54,8 % of those studied by Carhuanambo Cachi⁽¹⁶⁾, in research aimed at relating the level of knowledge to the practice of biosecurity measures among nursing staff, similar results to those found in this research.

However, other studies differ from the results shown in this research, such as that carried out by Condor Ahumada⁽¹⁷⁾ in Peru, which revealed that 60 % of the healthcare personnel studied had a high level of knowledge, 51 % had a medium level of attitudes, and 55 % had a high level of practices.

On the other hand, the results obtained from the study of variables related to knowledge differ from those found by Dipaz Chávez⁽¹⁸⁾ in his research, who identified that 100 % of workers have sufficient knowledge regarding the disposal of needles or other sharp objects and the handling and disposal of contaminated waste.

Similarly, Valdiviezo Castro⁽¹⁹⁾ stated that 74,1 % of workers have mastered the principle of universality in biosafety, and only 22,1 % have negative attitudes. These results also differ from those found by the authors of this research.

Other studies reviewed, which also differ from the results identified in this study, include that conducted by Troncos Barreto⁽²⁰⁾, where only 22 % and 32 % of workers had low levels of attitudes and practices, respectively. The authors Huachaca Sarmiento⁽²¹⁾ also found positive attitudes toward biosafety in 69,3 % of those studied.

It is concluded that workers exposed to biological risks at the CNCMA demonstrate insufficient knowledge, attitudes, and practices regarding biosafety, which is crucial for preventing accidents and occupational diseases during their work.

The results of this study will serve as a basis for the design of a training strategy aimed at this occupational risk group, to guarantee the health of workers and patients, protect the environment, and continue to provide excellent services at the institution.

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No conflicts of interest are declared.

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