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Biological hazards in clinical laboratories

Riesgos biológicos en laboratorios clínicos

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ABSTRACT

The objective of this research is to analyze the biological risks in clinical laboratories in the city of Ambato - Ecuador. A descriptive type of research was developed. The biological risk found in laboratories that handle dangerous samples such as viruses and bacteria, must have all the protective measures to avoid the contagion of laboratorians, it is necessary to identify the best protocol for the care of the professional starting from biosafety standards and especially the transport, handling and storage of the sample, thus avoiding a large percentage of the level of contagion by exposure. These are the microorganisms that were found in the areas of the different private clinical laboratories in the city of Ambato, caused by the handling of biological agents, and these can cause serious diseases such as HIV, Hepatitis A, Hepatitis B, Tuberculosis, different Pneumonias, Influenza and Covid-19.

Descriptors: working conditions; occupational safety; safety measures. (Source: UNESCO Thesaurus).

RESUMEN

La investigación tiene por objetivo analizar los riesgos biológicos en laboratorios clínicos de la ciudad de Ambato – Ecuador. Se desarrolló una investigación de tipo descriptiva. El riesgo biológico encontrado en los laboratorios que manejan muestras peligrosas como virus y bacterias, deben contar con todas las medidas de protección, para evitar el contagio de los laboratoristas, es necesario identificar cual es el mejor protocolo para el cuidado del profesional partiendo desde normas de bioseguridad y sobre todo el transporte, manejo y almacenaje de la muestra, evitando así en un gran porcentaje el nivel de contagio por exposición. Estos son los microorganismos que se encontraron en las áreas de los distintos laboratorios clínicos privados de la ciudad de Ambato, causados por la manipulación de agentes biológicos, y estos nos pueden causar enfermedades graves como VIH, Hepatitis A, Hepatitis B, Tuberculosis, distintas Neumonías, Influenza y Covid-19.

Descriptores: condiciones de trabajo; seguridad en el trabajo; medida de seguridad. (Fuente: Tesauro UNESCO).

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INTRODUCTION

Clinical laboratories consist of the following areas; sample collection, hematology, biochemistry, immunology, uro analysis, coprology, coagulation, microbiology (Patel, *et al*. 2016). Workers when handling biological fluids are exposed to various risks, so that failure to comply with preventive measures and biosafety standards can lead to the acquisition of various diseases (Bentrón, 2020). That is why the value of recognizing biological hazards in clinical laboratories, in their process or study area (Loh, *et al*. 2020), while (Wang, *et al*. 2020), indicate that current infection prevention strategies in clinical laboratories, are based on lessons learned from severe acute respiratory syndrome, expert judgments and related regulations.

In order to determine the most common biological risks to which health personnel are exposed in the clinical laboratory area and to establish measures to avoid future accidents and possible illnesses or diseases (Pérez-Díaz, *et al*. 2020), resulting in the application of the BIOGAVAL method, useful for the detection of risk factors associated with biological risk.

Due to the above; the research aims to analyze the biological risks in clinical laboratories in the city of Ambato - Ecuador.

METHOD

A descriptive research with a non-experimental design was developed, describing the situation in which health professionals are exposed to biological elements during their working day in clinical laboratories.

The study population consisted of five (05) clinical laboratories with Biosafety level type 2, for a total of 20 people working in the different institutions.

The data collection technique used was the survey through the application of the Biogaval neo 2018 method, proposed by the Valencia Institute of Safety and Health at Work (INVASSAT).

The information collected was processed using descriptive statistics with the support of the SPSS V25 statistical program.

RESULTS

These are the microorganisms that were found in the areas of the different private clinical laboratories in the city of Ambato, caused by the handling of biological agents, and these can cause serious diseases such as HIV, Hepatitis A, Hepatitis B, Tuberculosis, different Pneumonias, Influenza and Covid-19.

The classification of biological agents describes that most of the biological agents are within the scores 2 and 3 that represent little probable and probable, and with a score of 4 of high risk level are the influenza virus and the SARS-CoV-2 virus, since both cause severe diseases in humans if they are not treated.

The routes of transmission, it is observed that the SARS-CoV-2 virus is the most transmissible by having 3 routes of transmission, direct, indirect and airborne, together with the influenza virus that have a score 4, with two routes of transmission, so it is essential to recognize the direct and airborne routes of transmission are the main causes for catching the virus.

By the level of transmissibility we have as main the SARS-CoV-2 virus, as it has a high level to be transmitted both by direct, indirect and airborne transmission, it was a new disease worldwide, so much that infected several people during the pandemic and a high level of mortality was observed, so it is very striking that laboratory workers are very exposed, so it is necessary to strengthen biosecurity measures in them.

As for the influenza virus, we have a moderate level of transmissibility since there is already immunization within the health scheme and treatment established, recommended for this disease, therefore, it is transmitted quickly but it is no longer fatal, then we have enteric diseases caused by Salmonella Typhi and Shigella, which are not very transmissible but when infected, they cause

a moderate level of severity.

Regarding the probability of contact, a high incidence of HIV, influenza virus, Staphylococcus aureus, and SARS-CoV-2 virus is observed, these data were obtained according to the formula provided by the BIOGAVAL method. According to the laboratories, the SARS-CoV-2 virus has the highest incidence level, followed by the influenza virus, which shows that these are two viruses that cause totally infectious diseases that affect workers in a high level.

The health personnel studied presented 100% vaccination for Hepatitis B and Varicella Zoster, since they are within the vaccination schedule of our country, and the vaccine for Hepatitis B is requested as an entry requirement for the positions in the health area, we have 90% vaccinated for influenza and COVID-19.

The risk would be exceeding the biological action level in 4 biological agents such as HIV with a value of 9, Sars-Cov-2 Virus with a value of 10, Influenza Virus with a value of 8 and Staphylococcus Aureus, with a value of 9, for which immediate preventive actions should be taken, acting on the time of exposure to the biological agent and the hygienic measures adopted.

When observing a decrease in the level of biological action, the most important thing is that in no laboratory studied were values higher than 12 observed, i.e. it does not represent a situation of intolerable risk.

DISCUSSION

The biological risk found in laboratories that handle dangerous samples such as viruses and bacteria, must have all the protective measures to avoid the contagion of laboratorians in the work area (Bentrón, 2020), so it is necessary to identify the best protocol for the care of the professional starting from biosafety standards and especially the transport, handling and storage of the sample, thus avoiding a large percentage of the level of contagion by exposure.

Through the analysis of viruses and bacteria handled in private laboratories in the city of Ambato, it was identified that the Acquired Immunodeficiency Virus (HIV), Sars-Cov-2 virus, Influenza virus and Staphylococcus Aureus, have a prevalence of infection, with values above and equal to 8, which correspond to a level of biological action with high risk, which means that laboratories should use all biosafety measures to avoid direct contact with these pathogens (Lippi, *et al*. 2020).

Being important to take into account the vision of (Inal, *et al*. 2018), who expose the importance of organizing the workflow is an important task of laboratory management. Recently, clinical laboratories have begun to adopt methodologies such as Lean Six Sigma and some successful implementations have been reported. In this order, (Wurtz, *et al*. 2016), indicate that laboratory-acquired infections have been infrequent and even rare in recent years, and human errors account for a very high percentage of cases. Today, most of the risks from biohazards can be reduced through the use of appropriate procedures and techniques, containment devices and facilities, and personnel training.

Complementing the above; (Peng, *et al*. 2018), expound that education and training of laboratory personnel are indispensable to acquire adequate awareness to handle biohazardous materials according to internationally recognized strategies. In addition, workshops should be organized among laboratory workers to make them aware of the epidemiology, pathogenicity, and human susceptibility of laboratory-acquired infections (LAIs). Thus, various health-related threats resulting from biohazardous materials can be reduced or minimized and controlled by proper implementation of nationally and internationally certified protocols that include appropriate microbiological practices, containment devices/appliances, satisfactory facilities or resources, barrier protection, and specialized education and training of laboratory personnel.

Likewise, the roles of the occupational physician should be emphasized, especially for risk assessment, health and clinical-epidemiological surveillance, with the need to monitor the second effectiveness of preventive interventions, particularly for biosafety and biosecurity levels in RL. It should be useful to increase the epidemiological surveillance capacity of LAIs (Porru, *et al*. 2019).

CONCLUSION

The biological risk found in laboratories that handle dangerous samples such as viruses and bacteria, must have all the protective measures to avoid the infection of laboratorians, it is necessary to identify the best protocol for the care of the professional starting from biosafety standards and especially the transport, handling and storage of the sample, thus avoiding a large percentage of the level of exposure contagion. These are the microorganisms that were found in the areas of the different private clinical laboratories in the city of Ambato, caused by the handling of biological agents, and these can cause serious diseases such as HIV, Hepatitis A, Hepatitis B, Tuberculosis, different Pneumonias, Influenza and Covid-19.

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CONFLICT OF INTEREST

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