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REVIEW

Biosafety in stomatology

Bioseguridad en estomatología

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ABSTRACT

Biosafety is a doctrine of behaviors aimed at achieving attitudes and behaviors that reduce the risk of transmission of microorganisms in Public Health services, becoming a public health problem when the principles established by it are not complied with. In Stomatology, it is vital to achieve quality in the services; however, the attention given to it in the services is insufficient. The objective of this study was to explain the importance of biosafety within the work environment in stomatological services. The documentary analysis method was used and a total of 40 bibliographies were reviewed. The data served as support to develop considerations and reflections in relation to the subject, exposing as-pects of daily practice to be taken into account in order to rescue it. A quality work environment for patients and providers contributes to the excellence and efficiency of the health system.

Keywords: Biosafety; Stomatology; Work Environment.

RESUMEN

La bioseguridad es una doctrina de comportamientos encaminados a lograr actitudes y conductas que disminuyan el riesgo de transmisión de microorganismos en servicios de Salud Pública, convirtiéndose en un problema de salud pública cuando no se cumple con los principios establecidos por ella. En Es-tomatología, es vital para lograr la calidad en los servicios; sin embargo, es insuficiente la atención que se le presta en los servicios. El objetivo del presente trabajo fue explicar la importancia de la bioseguridad dentro del ambiente laboral en los servicios estomatológicos. Se utilizó el método de análisis documental y se revisaron un total de 40 bibliografías. Los datos sirvieron de sustento para desarrollar consideraciones y reflexiones en relación a la temática, exponiéndose aspectos de la práctica diaria a tener en cuenta para rescatarla. Un ambiente laboral de calidad para pacientes y prestadores, contribuye a la excelencia y eficiencia del sistema de salud.

Palabras clave: Bioseguridad; Estomatología; Ambiente Laboral.

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INTRODUCTION

Humanity has embraced the right to life and its preservation as a fundamental principle. Science and technology have advanced in pursuit of a better life; however, the unthinking use of this knowledge poses threats to life, which is why biological safety has been a hot topic in public opinion in many countries over the last 60 years.

"quality of life" is often used in research, primarily about patients. However, in the health-disease process, the quality of life of healthcare providers, non-professional healthcare workers, medical students, managers, and patient companions is no less important.

Staff working in various dental specialties are exposed daily to numerous biological risks that can affect our health, which is why we are looking for ways to minimize the possibility of contamination by various agents during oral procedures. Hence, it is important to create a series of measures and regulations to keep all medical science personnel updated and protected in their daily activities, considering the need for mechanisms to ensure compliance with biosafety for these personnel. Based on the above criteria, the authors set this review's objective to explain the importance of biosafety within the workplace in dental services.

DEVELOPMENT

The World Health Organization (WHO) defines biosafety as a set of rules and measures to protect the health of personnel from biological, chemical, and physical hazards to which they are exposed in the course of their daily duties, as well as to patients and the environment.[1] In 2000, Papone established that biosafety should be understood as a doctrine of behavior aimed at achieving attitudes and behaviors that reduce the risk of healthcare workers acquiring infections in the workplace. It also commits all other people in the healthcare environment, which must be designed within a risk reduction strategy.[2]

In 2002, Tovar defined it as a paradigm shift in attitudes and behaviors that reduce the risk of acquiring infections in the workplace. It has rules and protocols designed to maintain, control, and reduce occupational risk factors, avoiding contact with pathogens in health services linked to accidents involving the handling of potentially infectious blood or body fluids.[3]

Splashes of contaminated biological products pose a risk of infection if they come into contact with mucous membranes or skin tissue. Protective barriers are all measures implemented to prevent contact with splashes of contaminated biological products of oral origin, as they pose a risk of infection when they come into contact with skin tissue or conjunctival mucosa that has a break in continuity or inflammatory processes that facilitate the penetration of possible microbial agents into the dermis. These barriers have been increasingly implemented in the conduct of oral health workers, and their use, along with various techniques, provides a sterile and contaminant-free environment.[4]

Stomatology is a branch of health sciences that deals with the diagnosis, treatment, and prevention of diseases of the stomatognathic system, including the teeth, gums, tongue, palate, oral mucosa, salivary glands, and other anatomical structures involved, such as the lips, tonsils, oropharynx, and temporomandibular joint.[5] Quality of life is often used in research, primarily about patients. However, in the health-disease process, the quality of life of healthcare providers, non-professional healthcare workers, medical students, managers, and patient companions is no less important.[6]

Biosafety was established worldwide in April 1987 to reduce risks that endanger the health or even the lives of individuals, families, and communities. It can be applied in all areas, including the home, school, and workplace, among other activities. It plays an important role in the health sector because healthcare workers are in constant contact with sick people or contaminated material, making them vulnerable to infectious diseases.

This is where biosafety standards become a code of conduct, contributing to activities and behaviors that reduce risks to healthcare workers. At the same time, they enable healthcare workers to follow practices that help maintain epidemiological control of infected patients and prevent the spread of disease.

Universal precautions include hand washing, careful handling of sharp objects, compliance with sterilization and disinfection processes, proper instrument disposal, and the appropriate use of protective equipment such as sanitary gowns, gloves, masks, sanitary caps, goggles, or face shields. Biosafety is a vital component of the healthcare quality assurance system.[3]

The different opinions on the subject and compliance with established standards constitute a health problem in the global and Cuban dental community.[6] Science and technology have advanced in areas that improve quality of life; however, the unthinking use of this knowledge poses threats. That is why biological safety has been a constant topic of public debate in many countries over the last 60 years.

In recent decades, both nationally and internationally, a wide range of regulatory documents on biosafety and biological protection have been developed. The Ministry of Science, Technology, and Environment (CITMA) has been Cuba's leading institution in this field. Since the 1980s, it has systematically held important international meetings, events, and conferences to consolidate knowledge and design strategies to create safe and secure environments. Environmental and biosafety planning is not a spontaneous or group activity today; it has a legal framework that regulates actions in this area.[6]

Stomatologists should not focus on simply restoring aesthetics but should study all the phenomena that occur at the environmental level.[5] It is essential to have and manage the necessary knowledge since dentists and dental staff are exposed to a wide variety of microorganisms, including spores, bacteria, fungi, viruses, and protozoa that can be found in a patient's blood or saliva. These pathogens can cause infectious diseases through needle sticks, sharp instruments, or splashes produced by the air rotor used in dental practice. This is caused indirectly when cleaning instruments or removing debris.

Dentistry must be regulated by biosafety methods, techniques, and procedures that optimize patient care in dental offices. This involves improving the quality of clinical care to benefit patients and professionals. In this regard, it is necessary to establish concepts that facilitate an understanding of biosafety regulations and the rationale that legitimizes the strict implementation of measures to protect those who work in and receive care in the healthcare setting.

From the perspective of dental teaching, biosafety can be understood as a set of organized measures that encompass and involve human, technical, and environmental elements aimed at protecting all actors and the environment from the risks inherent in dental practice, with an emphasis on the teaching-learning process. On the other hand, peripheral actors are also represented by dental technicians, assistants, equipment and service maintenance technicians, and cleaning staff, given their collateral participation.[9]

Antisepsis eliminates vegetative forms of pathogenic bacteria and much of the resistant flora on the skin and mucous membranes by applying chemical substances. Asepsis refers to all the maneuvers and procedures that must be used to prevent microorganisms from entering the operating room, doctor's office, surgical instruments, gauze, gloves, and masks.[8]

Disinfection is the physical or chemical treatment that destroys microbial vegetative forms but not the spores found on or in objects. Instruments and procedures are classified according to the risk of contamination as critical, semi-critical, and non-critical. Critical instruments are those used to penetrate soft and bone tissue, i.e., they penetrate the subepithelial tissue and reach the vascular system; these include those used in tooth extraction, such as chisels, syndesmotomes, and instruments for tartar removal.

Semi-critical instruments come into contact with intact mucosa or organic secretions such as saliva and, therefore, do not penetrate the tissues that make up the oral cavity; these include surgical instruments and those used in orthodontic and prosthetic treatments. Non-critical instruments do not come into contact with organic secretions, only with the patient's intact skin, or do not come into contact at all; these include dam clamps, plaster spatulas, and others.

Since 1992, with the publication of the Manual of Biosafety Standards Applied in Cuba to Occupational Risk, ongoing training sessions, workshops, and educational conferences on biosafety have been held to motivate healthcare personnel and users of the system to protect our work, family, and community environments. In 1995, the Pan American Health Organization (PAHO) established that the biosafety and infection control practices recommended by international organizations apply to all settings and all specialties in which dental treatment is provided. According to data provided by the WHO for the year 2000, there were 2 billion people infected with hepatitis B worldwide (38 % of the world's population) and 170 million infected with hepatitis C in the same year (3 % of the population). According to data from the UN/AIDS program, by the end of 2002, there were 42 million people infected with HIV worldwide, equivalent to 0,8 % of the world's population.[9]

The biosafety chain is a dynamic and balanced process between agent, host, and environment.[10] Most dental procedures are invasive, and related activities are high-risk for healthcare personnel and patients. Therefore, when performing activities inherent to our profession, dental personnel, health planners, and managers must adopt a responsible attitude that generates behavioral changes and sound decision-making.

Among the basic principles of biosafety is universality, which assumes that everyone is a carrier of some infectious agent until proven otherwise. All service personnel must be involved, even if their serology is unknown, and all standard recommendations for preventing exposure to risks must be followed. Protective barriers include the concept of avoiding direct exposure to blood and other potentially contaminating body fluids through the use of appropriate materials that prevent contact with them. Waste disposal methods include all devices and procedures through which materials used in patient care are deposited and disposed of without risk.[11]

The National Committee on Biosafety in Oral Health, in collaboration with national and international technical experts and accordance with its functions, presents the second revision of the Manual of Biosafety Standards. This manual is intended for oral health teams, planners, architects, engineers, administrators, biomedical professionals, occupational health personnel, merchants, and others, with the purpose of providing them with a tool to minimize the risks inherent in dental practice to the health of our patients, dental personnel, and the community.

When referring to the hospital environment, we generally mean the water, air, temperature, food, waste, and physical conditions surrounding patients, staff, and the population that could affect their senses or body tissues.[12] Biosafety is extremely important, as it refers to measures designed to establish a barrier mechanism that prevents the transmission of infections in all health-related activities. Its importance lies in the prevention and control of infections.[13]

Work activities must be subject to guidelines and standards that guarantee workers' health—a whole series of strategies and procedures to prevent accidents and illnesses. The area of knowledge that deals with all of this is biosafety.[14] Its main objective is to reduce workplace accidents, making it necessary to have a safe working environment where occupational health laws promote the identification of potential risks in daily activities.[15]

Implementing the necessary biosafety measures is essential, as otherwise the likelihood of workplace accidents in dentistry departments increases.[15] Effective control must be carried out to prevent cross-infection in dentistry departments, using appropriate disinfection methods, sterilization, and instrument storage, scheduling patients appropriately, and keeping work areas clean.[16]

At the conclusion of each patient care activity and work day, the surfaces of the furniture should be cleaned with water and disposable towels and disinfected with an appropriate solution with a medium bactericidal level, or hospital disinfection.[17] Surfaces such as tables, countertops, which have come into contact with fluids, blood or materials used inside the patient's oral cavity, should be decontaminated with a hospital disinfection solution (phenol and chlorinated compounds) and covered with sterile disposable cloths.[18]

Aseptic technique refers to practices before or during a clinical or surgical procedure to reduce the risk of infection in the patient by decreasing the likelihood of microorganisms entering areas of the body where they can cause infection.[19] Hand washing is among the main aseptic techniques in surgical centers, which reduces the risk of infection in the patient if gloves are perforated or broken. The warm, moist conditions inside gloves promote the growth of microorganisms. Surgical washing with an antiseptic before removing gloves removes or eliminates many microorganisms and helps prevent their growth.[20]

Various comparative studies have shown that hand washing should last between 3 and 5 minutes. It is recommended that it be done two or three times, rinsing each time to remove contaminated soap. It is usually done with brushes that contain povidone-iodine

or chlorhexidine. It is recommended to focus on the fingers, folds, and nails.[21]

The objective of ventilation in operating rooms is to reduce the concentration of particles and bacteria. Surgical clothing and drapes placed between sterile and non-sterile areas of the surgical field and personnel act as barriers and thus protect against the transmission of bacteria from one area to another. The most important characteristic of surgical clothing is its impermeability to moisture, as the capillary effect of a wet cloth or uniform will transmit bacteria from one side of the material to the other. Reusable surgical uniforms should be cotton with 420 and 810 threads/meter22 fabric density.

Given the epidemiological context, disposable gowns made from processed and treated cellulose fiber are used as an alternative. Gowns made from 810 threads/meter are effective as a barrier but have the disadvantage of losing this effect after being washed more than 75 times. Various studies have found that up to 15 % of gloves break during surgery or have holes at the end of the procedure.[21]

Masks must be used because many operating room personnel carry highly pathogenic germs in their nostrils or mouths. Conflicting studies attempt to demonstrate the effect of masks. While some have found a decrease in infections with the use of masks, others have found similar results with or without masks, although the latter studies were conducted on short-term procedures. A stable temperature between 20 and 24 degrees Celsius should be maintained, while the humidity in operating rooms should be 30 to 60 %.[23]

Dental staff providing clinical services should use isolated barriers, simply suitable materials that prevent contact with blood or other potentially contaminated body fluids. Although such barriers do not prevent accidents involving exposure to these fluids, they do reduce the consequences of such accidents. Gloves, considered a second skin, are the best mechanical barrier for the hands as a protective measure for professionals, technical staff, and patients.[25]

Oral and nasal protection, or face masks, are extremely important for any dental procedure. Contamination of the oral and nasal mucosa with microorganisms in the office is widespread and can lead to various diseases. These must be made of material impervious to aerosols or splashes; if textiles are used, they must be sterile. The use of sanitary gowns is mandatory for all healthcare team members and must be changed when they show visible signs of contamination.[26]

In all types of dental treatment, sterile gowns with long sleeves and reaching the middle of the legs must be worn. In addition, healthcare gowns must not be worn outside the dental office, as this contributes to the spread of microorganisms, and gowns must not be washed with other types of clothing. Caps should be an important part of dental staff attire, as they act as a barrier preventing scalp cells or loose hair from carrying resident bacteria to the surfaces of the operating field or viruses such as SARS-COV-2 from being transmitted from aerosol droplets to that area.[25]

Goggles prevent fluids from the patient from reaching the eyes of staff, so wearing goggles with a mask increases the safety of the dentist; they should be cleaned routinely before attending to another patient. Furthermore, shoes should be comfortable, with soft but thick soles that prevent a needle accidentally dropped on the floor from piercing the sole and pricking the surface of the foot. Surgical boots should be clean and, after use, should be placed in a suitable location for further processing.

The design of the surgical area must meet minimum requirements: floors and walls must be made of flat, waterproof, unalterable, hard, and resistant material with rounded corners to facilitate cleaning; the ceiling must be 3 meters high from the floor; and there must be a specific area for the temporary storage of contaminated clothing or equipment. Dentists should avoid, as far as possible, sudden movements that expose participating personnel to sharp injuries and excessive bleeding. In addition, they should handle tissues delicately, eliminate dead spaces, place appropriate drains, and reduce the duration of surgery as much as possible to eliminate risks of contact or transmission of noxious agents between professionals and patients or vice versa.[24]

Healthcare personnel should avoid wearing jewelry and watches in the consultation room; rugs, mats, curtains, plants, or false ceilings should also be avoided. Eating, drinking, smoking, or applying cosmetics in work areas is prohibited, as is moving around different areas while wearing protective equipment or gloves, touching body parts, or handling objects other than those in the work area.[26] Wrap surfaces that are difficult to disinfect, use thick gloves, wash laboratory equipment and materials with water and hypochlorite, and keep nails short and unpainted.[27]

Sterilization is the process by which all living forms are eliminated from inanimate objects. It destroys the vegetative forms and spores of microorganisms and provides antibacterial protection for instruments and materials. Sterilization can be achieved through physical means, such as heat, or through chemical substances. Dry or moist heat should be used as a means of sterilization.[28]

In dental clinics, to achieve a cleaner, more sustainable, and more economical environment that contributes to excellence and efficiency in providing services, it is vital to implement Cleaner Production and the Energy Saving and Rational Use Program.[29] This study evaluates teachers' knowledge about Cleaner Production in Dentistry at the Gibara Teaching Dental Clinic. To this end, a survey was conducted among all teachers at this health center. Cleaner Production is the continuous application of an integrated prevention strategy to processes, products, and services to increase efficiency and reduce risks to human life and the environment.[30]

In 2006, the WHO established four categories comprising the different factors in the health sector that influence staff performance, classified as individual, organizational, health sector, and environmental factors. Individual factors refer to the professionals' characteristics, including age, sex, marital status, professional training, length of service, knowledge of concepts, and training. Organizational factors depend on and are inherent to the institution where the professional activity is carried out: institutional regulations, material, and equipment in terms of operability and adequate number, and sufficient staffing according to patient demand.[31]

In the opinion of the authors, students, dentists, specialists, and all those working in the health sector, these factors are associated with properly implementing all biosafety measures that lead to safety, thus guaranteeing the integrity of the people involved. The consequences of poor implementation due to lack of knowledge trigger critical exposure to various pathologies that, in one way or another, threaten the health not only of the stomatologist but also of auxiliary staff and patients. Biosafety in stomatology is vital to

achieving quality services, and this issue, which constitutes a problem in stomatological care, must be reflected upon.

Among the principles of biosafety are universal precautions, which constitute a set of measures that must be applied systematically to all patients without distinction, considering that any person may be at high risk. Likewise, all bodily fluids must be identified as potentially contaminating.[32] Biosafety measures must involve all patients,[33] regardless of whether or not they have visible signs or symptoms of a disease that could lead to an imbalance in the health-disease process.

Hand washing techniques vary according to the length of time the professional is in contact with the antiseptics and disinfectants used to achieve cleanliness, i.e., the elimination of all pathogenic microorganisms found on the hands. Hand washing techniques have been classified as short, clinical, medium, and long or surgical.[34]

Sterilization is the process by which all living forms are eliminated from inanimate objects; it destroys the vegetative forms and spores of microorganisms and provides antibacterial protection for instruments and materials.[35]

Personal hygiene is considered one of the most important biosafety standards. Within this standard, special importance should be given to the following aspects:

- Tie back your hair and wear a cap during all procedures in the dental office.
- Operators' cuts and wounds must always be covered with waterproof dressings before starting work. Skin lesions on the hands must also be covered with dressings and gloves.
- Do not wear jewelry during working hours.
- Wash your hands before putting on gloves and after finishing with each patient.
- Do not touch any part of your body while wearing gloves.
- Gowns should be long-sleeved and changed daily or more frequently if visibly contaminated.
- Keep nails clean, unpainted, and short, not extending beyond the fingertips. In addition, do not use acrylic nails.
- Wear closed shoes.

Workers with open sores, weeping dermatitis, or similar lesions, especially on the hands, should avoid contact with patients until they have healed.[36] For hand washing, use antimicrobial liquid soap with a dispenser or, if conditions do not allow, hydroalcoholic gel. It is imperative to wash the forearms, palms, backs of the hands, between the fingers, and around the nails, paying special attention to the folds, which accumulate the most bacteria.

The use of protective equipment is essential in dental services. This equipment includes sanitary gowns, goggles, face masks, caps, shields, boots, and gloves. A sanitary gown must be worn when entering the dental clinic or, if this is not available, other clothing that covers street clothes, taking care to cover cuffs and remove neck scarves. Upon arrival at the consultation room, a long-sleeved gown must be worn, which must be sterile to prevent contamination of everyday clothing in the dental office.[36,37,38]

In addition, wearing goggles prevents eye infections and injuries caused by particles projected into the operator's eyes. Although they protect against frontal impacts and splashes, their side protection is poor unless they have side shields.[39] The authors consider that goggles should be large and fit snugly to the face to provide adequate protection. Currently, they should be used with protective face shields over them to achieve maximum protection, especially considering the contagiousness and transmissibility of microorganisms such as SARS-COV-2 found in the oral cavity, which can enter the human body through the conjunctiva of the eyes.

Masks that protect the nasal and oral mucosa should be used to prevent contamination from aerosols originating from the rotary instrument used in surgical procedures. The face mask should be disposable and large enough to cover the nose and mouth, and the WHO recommends using the mask in the current COVID-19 pandemic for greater protection.[40]

One that fits the operator's face well should be selected to minimize the passage of unfiltered air. Ideally, it should be changed between patients. If this is not possible, caution should be exercised, and it must be changed when it is damp or dirty.[40]

There are various materials for gloves, such as latex, vinyl, synthetic polymer, and nitrile.[40] In Cuba, latex gloves are generally used. They must be adequately worn, fitted to each operator's hand, and discarded between patients. Surgical gloves must be used for invasive procedures. Patient protection is also of particular importance, yet, in the authors' opinion, it is one of the least compelling aspects in Cuba.

The authors believe that the main difficulties in complying with biosafety standards include the shortage of material resources such as gloves, bibs, burs, root canal files, and ultrasound tips, which must be reused. Other difficulties include the use of clothing, the incorrect use of protective equipment, incorrect hand washing, poor hygiene in the dental office, and poor ventilation and lighting, caused by a lack of knowledge, irresponsibility on the part of healthcare personnel, and a lack of standards and negligence on the part of administrative staff.

The risk of contracting, transmitting, and spreading numerous infections during professional practice in dental clinics has led Cuba as a country to create an infection prevention and control program for dental services and rigorously enforce biosafety standards, adapting them to the nation's existing conditions from both an epidemiological and economic standpoint.

CONCLUSIONS

Dentists must have a detailed knowledge of biosafety principles and standards and incorporate them into their daily practice in dental services, thereby preventing cross-contamination and the spread of infectious diseases.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

AUTHORSHIP CONTRIBUTION

Conceptualization: Rosa María Montano Silva, Yoneisy Abraham Millán, Yaima Pupo-Martínez.
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