Chapter 3

Inhalation of Toxic Gases in the Kiss Nightclub Disaster: an Example of Inhalation Injury from Indoor Fires

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ABSTRACT
The Kiss Nightclub disaster, which occurred on January 27, 2013, in Santa Maria, Brazil, had an impact both on a national and global scale, as it was an accident with 230 immediate fatalities and can be compared to other indoors fires. In addition to bodily burns, inhalation injuries stood out, that is, thermal injuries of the airway, chemical injuries and intoxication by toxic gases. Carbon monoxide and cyanide are the main toxic gases produced in indoor fire situations and are formed from the incomplete combustion of hydrocarbons and carbonaceous and nitrogenous materials, respectively. While carbon monoxide, at high concentrations in the blood, promotes a shift of the oxyhemoglobin curve to the left and a consequent hypoxia condition, cyanide blocks the respiratory cycle, activating anaerobic respiration and evolving to an excessive production of lactic acid, which can lead the victim to death. Considering that in the accident of Santa Maria 169 individuals were hospitalized in a critical condition, it is necessary to understand the consequences and pathophysiology of inhalation injuries, being that the focus of this narrative review is the knowledge about poisoning by toxic gases. Moreover, it is essential to discuss proper diagnosis and treatment, in order to improve the prognosis of future victims of new fires in closed environments. Therefore, having knowledge about the potential causes of indoor fires helps in the prevention of similar disasters to the one that happened in the Kiss Nightclub.

Keywords: Fires, Smoke Inhalation Injuries, Carbon Monoxide Poisoning, Cyanide, Disasters. (Source: MeSH-NLM).

1 INTRODUCTION

The Kiss Nightclub accident occurred on January 27, 2013 in Santa Maria, in the state of Rio Grande do Sul, Brazil. The nightclub had approximately 1250 people, while its ideal capacity was 700 people and, in addition, the establishment was at odds with fire safety measures, since it did not have adequate alarm and sprinkler systems. The fire was caused by the use of fireworks that were inappropriate for closed spaces.

The inefficiency of fire extinguishers associated with the fact that the ceiling insulating material was combustible, made the fire quickly dispersed throughout the entire space of the club, spreading toxic smoke.[1] There were approximately 230 deaths immediately after the event and 169 people were hospitalized in critical condition because of inhalation injuries and burns.[1,2] The data prove that this was the second largest fire in the number of fatal victims in Brazilian history.[2] The Kiss Nightclub accident was responsible for great commotion in other parts of the world, due to their similarities with other tragedies already occurred, showing the importance of addressing the issue of fires in closed environments and their consequences for the human body.[1]

The oxygen (O_2) concentration in a suitable environment is 20%, however, during a fire this concentration drops to 10-15%, causing respiratory difficulty and death by asphyxiation.[2] Furthermore, through smoke and from the heat generated, the fire promotes inhalation injuries that can be categorized into three different types. The first type consists of heat damage, which primarily affects the upper airway, leading to obstruction and edema formation. The second type refers to injury by chemical substances generated when burning materials such as rubber, cotton, glues and plastic, which can affect the entire respiratory tract. Meanwhile, there is also systemic toxicity from inhalation of toxic gases, such as carbon monoxide (CO) and cyanide (HCN).[3]

About toxic gases, CO is an odorless gas generated by incomplete combustion and has a high affinity with hemoglobin, about 200 times more than O_2. This high affinity promotes the formation of carboxyhemoglobin, a very stable complex that compromises the transport and delivery of oxygen to body tissues, leading to hypoxia. HCN, on the other hand, also produced by incomplete combustion, inhibits cell oxygenation, once it binds to the cytochrome C oxidase enzyme, blocking the respiratory cycle and, thus, activating the anaerobic pathway of body metabolism, promoting an excessive accumulation of lactic acid, which can culminate in death by anoxia.[3,4]

In a fire, usually, between 60-80% of immediate deaths are caused by inhalation of toxic smoke, however, in the Kiss Nightclub accident, this number was at least 90%.[1,2] In addition, the Santa Maria fire represents only one example among many others that have occurred around the world.[2] Therefore, due to this high proportion and incidence of these accidents, it is necessary an in-depth study of fires in closed environments and their possible consequences, such as the high commitment and mortality of victims. Thus, the narrative review in question objective, through discussion based on scientific knowledge, to highlight the pathophysiology of intoxication by toxic gases, the best diagnostic methods and the best management strategies, as well as to discuss possible preventions for this type of accident.

2 SEARCH STRATEGY AND SELECTION CRITERIA

This study consists in a narrative review that seeks to understand the inhalation of toxic gases, as an example of inhalation injury resulting from fires in closed environments, with reference to the Kiss

Nightclub disaster. Initially, the subject was defined based on its importance to the medical and scientific community. Fires in closed environments occur in several parts of the world and, therefore, studying the subject, using the Kiss Nightclub accident as a reference, allows a better management of patients, besides avoiding other similar tragedies. Then, the objective of the study was defined and the search for articles in two databases was initiated, by defining inclusion and exclusion criteria, descriptors and keywords. After reading the selected articles, data collection and critical analysis were performed to start the construction of the review. In addition, the scale for the quality assessment of narrative review articles (SANRA) was used and adopted for this narrative review.

The search was conducted in the SciELO and PubMed databases in June and July 2021. In SciELO, the search was made in Portuguese, and the descriptors and Boolean operators were "intoxication AND carbon monoxide" and "Boate Kiss", without the use of filters. In relation to the first search, 9 results were obtained. Of these 9, 6 were excluded from the evaluation of titles and abstracts, as they had no correlation with the objective of the narrative review, presenting a specific thematic approach. Regarding the second search, 6 results were obtained, and 2 were used. 4 were eliminated according to the same exclusion criteria used previously after reading the titles and abstracts.

In PubMed, the descriptors and the Boolean operator were "Pathophysiology AND carbon monoxide poisoning", and the search was made in English, with the initial result of 816 studies. Later, the filters "free full text" and articles published in the last 10 years in English, Portuguese and Spanish were applied, obtaining 56 results. Of these, 48 studies were excluded by reading the titles and abstracts, because they were not in accordance with the review objective or because they were case reports of extremely rare manifestations. Finally, 8 studies were selected.

Thus, 13 articles make up the sample of the narrative review in question since they fit the main inclusion criterion, that is, being related to the objective of the article. These are included in the table below.

Table 1. Information about the articles that make up the sample of the narrative review.

Author/year	Title	Databases	Types of study	Objectives	Results/ conclusion
Albuquerque *et al.*, 2015.	Physical therapy performance in the rehabilitation of survivors of the Kiss nightclub tragedy: an experience report	Scielo	Quantitative-qualitative study.	To report the experience of a group of physical therapists from UFSM in the rehabilitation of fire survivors.	A total of 270 Kiss Nightclub survivor patients were evaluated to determine the most prevalent clinical manifestations in the intoxication rehabilitation process.
Atiyeh, 2012.	Desastre na Boate Kiss, Brasil	Scielo	Editorial	Report the accident in detail and expose the author's opinion about what happened.	An account of what happened at the Kiss nightclub and the revolt over the negligence and lack of security at the place.

Souza, *et al.*, 2004.	Lesão por inalação de fumaça	Scielo	Literature review	Address the pathophysiological mechanisms, diagnostic methods and treatment strategies for victims of inhalation injury.	Report on the production and constitution of smoke, the mechanisms of injury, the diagnosis and the treatment of inhalation injuries.
Antonio, Castro e Freire, 2013.	Smoke inhalation injury during enclosed-space fires: an update	Scielo	Literature review	Review and update the literature on inhaled airway injuries, CO poisoning and cyanide poisoning.	Smoke inhalation injury should be suspected in every indoor fire. Treatment is primarily supportive. HBO therapy is controversial.
Bassi, *et al.*, 2014.	Atendimento às vítimas de lesão inalatória por incêndio em ambiente fechado: o que aprendemos com a tragédia de Santa Maria	Scielo	Case report	Report, through 4 cases, the different consequences of smoke inhalation in fires.	Inhalation injuries play a major role in indoor fires. Invasive ventilatory support should not be postponed and hyperoxia should be instituted early.
Chan, *et al.*, 2016.	Acute carbon monoxide poisoning in a regional hospital in Hong Kong: historical cohort study.	PubMed	Historical cohort study	Describe the clinical profiles of hospitalized CO intoxication patients in order to increase surveillance for delayed sequelae and identify prognostic factors and to evaluate the impact of hyperbaric oxygen therapy.	A well-defined treatment protocol, adequate follow-up time, and neuropsychiatric testing, along with an in-hospital hyperbaric chamber, are recommended for the management of patients with severe CO intoxication.
Sun, *et al.*, 2013.	Potential use of hyperoxygenated solution as a treatment strategy for carbon monoxide poisoning	PubMed	Experimental study	Explore the feasibility and effectiveness of using a hyperoxygenated solution (HOS) to treat acute severe CO poisoning in an animal model.	HOS effectively relieves brain damage in rats with intoxication and therefore may serve as a new way to treat human patients with such poisoning.
Eichhorn, *et al.*, 2018.	The Diagnosis and Treatment of Carbon Monoxide Poisoning	PubMed	Literature review	Evaluate possible diagnoses and treatments for CO poisoning.	There is a lack of high quality prospective randomized studies that would allow a definitive judgment of the effectiveness of Hyperbaric oxygen therapy.
Kinoshita, *et al.*, 2020.	Carbon Monoxide Poisoning.	PubMed	Literature review	Discuss the physicochemical properties of CO and the toxicological evaluation of poisoning.	The data obtained are valuable for interpreting CO poisoning and can provide diagnostic information.
Gozubuyuk *et al.*, 2017.	Epidemiology, pathophysiology, clinical evaluation, and treatment of carbon	PubMed	Literature review	Evaluate the epidemiology, pathophysiology, clinic and treatment of CO poisoning.	CO poisoning is one of the most common types of intoxication, causing deaths worldwide. Clinically, the

	monoxide poisoning in child, infant and fetus				involvement of the CNS and the cardiovascular system is predominant. Oxygen is the antidote for CO and can be administered in a normobaric or hyperbaric way.
Casillas, *et al.*, 2019.	Effectiveness of Hyperbaric Oxygenation Versus Normobaric Oxygenation Therapy in Carbon Monoxide Poisoning: A Systematic Review	PubMed	Literature review	Systematically review hyperbaric and normobaric oxygenation and compare their effectiveness.	HBO is the most effective in moderate to high-risk situations and should be the therapy of choice, however, if the hospital does not have hyperbaric chambers, NBO can be considered.
Dries e Endorf, 2013.	Inhalation injury: epidemiology, pathology, treatment strategies.	PubMed	Literature review	Evaluate the epidemiology, pathology, and treatment strategies for inhalation injuries.	The literature recognizes the need for standardized diagnostic criteria and an inhalation injury quantification system.
Hess, 2017.	Inhaled Carbon Monoxide: From Toxin to Therapy	PubMed	Literature review	Discuss the toxicity, epidemiology and treatment of CO poisoning. In addition, the article also seeks to explore the therapeutic role of CO inhalation.	CO toxicity is an important cause of morbidity and mortality. Given the abundance of basic science that supports a therapeutic role for CO, the review shows that clinical trials are exploring this potential.

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3 EPIDEMIOLOGY

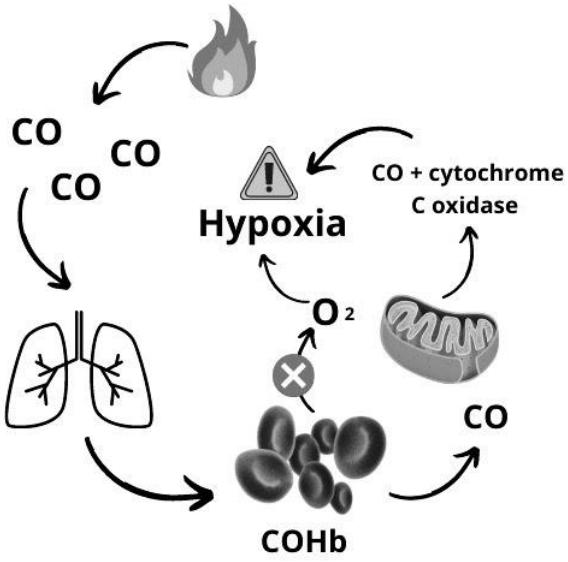
Indoor fires are not uncommon around the world, once there have been many tragedies similar to the one at the Kiss Nightclub. Unfortunately, most of these disasters are preventable, being triggered by negligence and ineffective fire prevention measures. The Station nightclub in Rhode Island, USA in 2003, a club in Bangkok, Thailand in 2008, a nightclub in Buenos Aires in 2004 and another nightclub in Perm, Russia in 2009 are examples of other places which had similar outcomes to Santa Maria, leading to countless victims and immediate deaths by inhaling toxic smoke from fires. As in the Kiss Nightclub, some of these other fires were caused due to the use of inappropriate fireworks for indoor environments, and some of these accidents were aggravated by overcrowding, the lack of a sprinkler system and the excess of materials that lead to the production of toxic gases when they combust.[1]

An accident that can also be cited is the fire that occurred in São Paulo, Brazil, at the Memorial of Latin America, a cultural, political and leisure center, in 2013. The firefighters, the main victims, were mainly affected by inhalation of the toxic gases CO and HCN, as well as thermal damage to the airways and bronchospasm. This disaster, despite not having resulted in many victims, occurred in the same year as the Santa Maria fire and was considered very similar, also requiring immediate management and the use of intensive care.[2]

4 PATHOPHYSIOLOGY OF CO INTOXICATION

Carbon monoxide, formed by the incomplete combustion of hydrocarbons, is an odorless, asphyxiating, colorless gas and is present in low concentrations in the environment, usually less than 10^{-3}%. However, in fire situations where there is incomplete combustion due to a lower percentage of O_2 in the air, CO is released in larger quantities and, when its concentration is about only 1%, it is already harmful to the body.[2] Once CO enters the bloodstream through the respiratory tract, it binds strongly to hemoglobin due to the fact that its affinity is 200 to 300 times greater than the affinity of oxygen with this protein. With the formation of carboxyhemoglobin (COHb), the exacerbated affinity of this complex promotes a shift of the oxyhemoglobin curve to the left, which means a lower capacity to transport and deliver O_2 to the cells and tissues of the body.[5,6] This shift results from a mitochondrial dysfunction caused by the binding of CO with the cytochrome C oxidase enzyme and, thus, there is the beginning of a cellular ischemic process and an increase in the production of reactive oxygen species, accompanied by an inflammatory process, as a way to adapt to the hypoxic environment.[5,7] Thus, the excess of reactive O_2 species, in addition to the inflammatory reaction, promote oxidative stress and stimulus to apoptosis.[6]

Figure 1. Pathophysiology of Carbon Monoxide Poisoning.



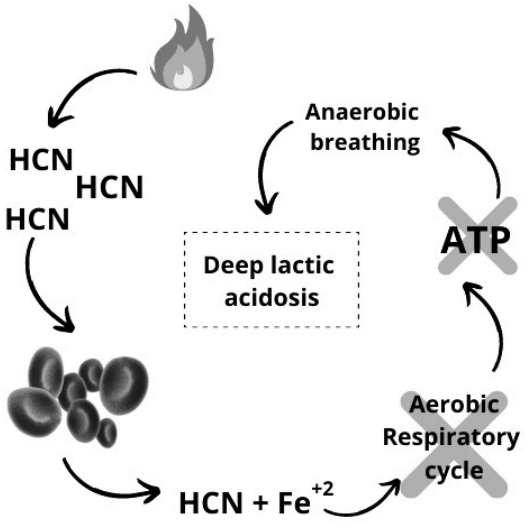
Source. Created by the authors.

In addition, CO also has affinity with other proteins that have the heme prosthetic group, such as myoglobin of skeletal and cardiac muscle, triggering physiological changes in these tissues. This different affinity of CO with these proteins leads to nonspecific clinical manifestations that are difficult to diagnose. The reduced O_2 supply in these circumstances promotes dizziness, headache, myalgia and confusion. In addition, as a compensatory mechanism for the hypoxia generated by CO, tachycardia and tachypnea may be presented.[6] Other manifestations related to cerebral vasodilation and hypoxia can be syncope, presyncope and seizures. There is also an increased cardiac output in these situations, as a way of trying to transport and deliver oxygen to the tissues and, thus, this altered cardiac output can lead to angina, arrhythmias and acute pulmonary edema, which are more frequent and exacerbated in individuals with heart or lung diseases. In a context of late sequelae due to CO poisoning, cognitive alterations, personality changes, dementia, psychosis and other neuropsychiatric sequelae have been reported.[4]

5 PATHOPHYSIOLOGY OF HCN INTOXICATION

HCN is also a compound formed through incomplete combustion, but unlike CO, the reacting material is carbonaceous and nitrogenous. When the ambient temperature is above 78°F (25.6°C), this compound presents itself in gas form and is found as a normal metabolite in small amounts in the bloodstream of healthy individuals, being 0.3mg/L in non-smokers and 0.5mg/L in smokers.[3] In fires, especially in closed places, as occurred in the Kiss Nightclub accident, this gas is detected in higher concentration, due to the burning of materials such as plastic, sponges, paper, wood and synthetic polymers. After HCN comes in contact with the blood, it binds to iron ions and is transported through the red blood cells to the body's cells, where it blocks the respiratory cycle because of its binding with the cytochrome C oxidase enzyme A. Thus, with the absence of ATP production, the intoxicated individual starts a predominantly anaerobic respiration and, thus, evolves to a state of deep lactic acidosis, which can lead to death in a short time.[2,8]

Figure 2. Pathophysiology of Cyanide Poisoning.



Source. Created by the authors.

The severity of clinical manifestations resulting from HCN poisoning is related to their serum levels in the body, with concentrations of 0.5-1.0 mg/L generating mild signs and symptoms, 2-3 mg/L moderate and, finally, intoxication can be lethal when the concentration is above 3 mg/L. Since the pathophysiology of intoxication by this gas results from the blockage of ATP synthesis, the initial manifestations are anxiety, headache, palpitations, vomiting and nausea. As an attempt to compensate for the deep metabolic acidosis caused by lactic acid, hyperventilation is initiated, but soon afterwards the individual develops bradycardia and hypotension, which can lead to cardiorespiratory arrest and, in more severe cases, neurological damage.[8]

6 DIAGNOSIS

Most of the studies affirm that in order to make a diagnosis of CO poisoning, it is necessary to pay attention to the patient's physical examination and history of exposure to the gas. At the same time, by means of a blood sample, it is ideal to measure the COHb level by co-oximetry.[2,3] However, with highly non-specific clinical manifestations, the diagnosis is hardly ever made quickly, which can lead to neurological sequelae because the treatment was also performed late. Thus, numerous studies have focused on the urgency of the diagnosis, in order to obtain better results through immediate care.[5] In the case of poisoning by HCN, a blood sample should be collected immediately at the scene of the accident, since this gas has a very short half-life, disappearing quickly from the bloodstream and being difficult to measure.[2]

When dealing with fires in closed places, such as the one that occurred in the Kiss Nightclub, it is important to emphasize that other types of inhalation injuries can also be present, such as thermal and chemical ones. Therefore, fibrobronchoscopy is classified as the gold standard method for diagnosing these injuries, as it allows the visualization of the airways, such as the larynx, trachea and bronchi.[2] Through this exam, it is possible to verify the presence of alterations in the respiratory tract, which helps to classify the

inhalation injury and directs the treatment of fire victims. In addition, fibrobronchoscopy can also be used to clean the airways, removing obstructive plugs and particulate materials, besides aspirating inflammatory secretions formed because of the process of cell necrosis.

Finally, given that CO poisoning can lead to arrhythmias, angina and acute pulmonary edema due to increased cardiac output, some studies recommend that an electrocardiogram (ECG) and measurement of cardiac enzymes be performed in patients in whom the diagnosis of poisoning has been confirmed. This test is mainly recommended for patients with heart disease, lung disease and for those who have manifestations suggestive of myocardial ischemia.[2,4]

7 MANAGEMENT

The initial management of a victim of CO intoxication should focus on the immediate evacuation of the patient from the site contaminated by high concentrations of CO, maintaining adequate ventilation and perfusion, as well as neurological examination and analysis of the patient's exposure history. Thus, in order to verify the individual's clinical status, it is essential to take measures such as the administration of supplemental oxygen via a face mask or endotracheal tube, arterial blood gas analysis, and checking the metabolic status and carboxyhemoglobin level.[3,9]

The treatment of CO poisoning is controversial in relation to the best choice of oxygen therapy, considering that some studies emphasize the use of normobaric oxygen (NBO) and others prioritize hyperbaric oxygen (HBO). The main indications for the use of HBO are: loss of consciousness, visual impairment, patients with COHb>25-40%, patients with ischemic heart disease (if COHb>20%) and in cases of persistence of clinical manifestations after 4 hours of NBO.[10] Normobaric oxygen therapy is the most commonly used in several cases of respiratory conditions, besides being the least expensive, since it consists of offering O_2 through nasal cannulas and masks. On the other hand, hyperbaric oxygen therapy focuses on the administration of this gas at 100% concentration in a pressure 2 to 3 times higher than atmospheric pressure. This therapeutic modality has a high value, considering that it is performed inside an equipment called hyperbaric chamber. Furthermore, this therapeutic technique of hyperbaric oxygenation, despite accelerating the process of CO decoupling with hemoglobin and reversing mitochondrial dysfunction resulting from poisoning, has potential complications that include barotrauma, gas embolism, tympanic membrane rupture and seizures.[11] Therefore, it is not a technique used by scientific consensus, but according to hospital availability and risk-benefit assessment.[3,9]

Thus, according to what was identified from the narrative review, the use of HBO proved to be efficient in neutralizing CO toxicity, since it reduces the half-life of carboxyhemoglobin and, therefore, it is more indicated in moderate to high-risk cases. However, since this therapy is not widely available in hospital networks due to its high cost, NBO is a viable therapy for carbon monoxide poisoning situations.[5]

After the initial management and discharge of patients intoxicated by CO, continuous clinical follow-up is necessary to evaluate the individual's recovery and identify possible sequelae that may persist from exposure to the gas or that may develop later. Rehabilitation is the indicated therapy for patients who have persistent symptoms arising from sequelae of intoxication, such as cognitive, occupational, physical and psychiatric.[3]

HBO is often not considered a viable therapeutic solution, considering that its availability is not guaranteed in all hospitals and it can cause adverse effects in some cases. Thus, studies on the hyperoxygenated solution (HOS) are underway in China and in the United States. HOS is a medical drug developed by Chinese scientists and consists of converting certain already existing solutions, such as glucose and saline solutions, into medicine with dissolved oxygen at high concentrations and pressures, reaching values up to 10 times higher than partial pressure of oxygen (PaO_2) in arterial blood.[12] In one of the analyzed articles in this narrative review, a study with rats was conducted to test the treatment with HOS in cases of CO poisoning. After administration of the solution into the femoral vein of the rats, a delay in the increase in serum COHb concentrations and a decrease in PaO_2 and oxygen saturation were noted. In addition, an improvement in cognitive function and hypoxic lesions was verified in the rodents used in the experiment. Thus, with the evolution of HOS studies in humans, this treatment presents itself as a potential future therapy in cases of CO intoxication.[12]

For the management of the patient poisoned by cyanide, there are some distinct antidotes with different mechanisms of action that allow the intracellular detoxification caused by the gas. Hydroxocobalamin is a drug that is currently seen as the medication of first choice when there is exposure to HCN, since it has a fast action of neutralizing the gas, binding to it to form cyanocobalamin, which is subsequently eliminated in the urine. Many studies prove that the use of this drug has been shown to be effective in victims who have suffered inhalation injuries and who have had a high exposure to smoke. However, this therapy can cause some side effects, such as hypertension, reflex bradycardia, headache, allergic reactions and changes in skin and urine color. [3,8]

Although controversial, due to limited documentation about its effectiveness, another therapy strategy is the cyanide antidote kit, composed of amyl nitrite, sodium nitrite and thiosulfate, which has a slow onset action and generates a series of reactions resulting in excretion of thiocyanate in the urine. However, this kit is not indicated for patients intoxicated by CO and HCN simultaneously, as it may increase the individual's hypoxia state.[3,8]

In cases where CO and HCN inhalation is suspected, the use of HBO as a form of treatment is controversial, since a significant reduction of HCN in the bloodstream was not observed in a quasi-experimental study.[8]

Fibrobronchoscopy, as well as being considered the gold standard method for diagnosis, is also an effective way of treating inhalation injuries resulting from fires, as it promotes airway hygiene.[3,8] A survey

by Carr and collaborators compared the use or not of bronchoscopy in burned patients with inhalation injuries.[3] After a critical analysis of the results, it was concluded that victims who underwent bronchoscopy, at least once, had a shorter length of stay in Intensive Care Units or in hospital, in addition to a lower risk of death, compared to those who have not undergone this procedure.

Prevention

Given that most fires in closed environments are caused by negligence and lack of compliance with safety standards, there is no doubt that the prevention of fires in closed environments requires greater vigilance from the competent bodies, with the creation of appropriate emergency plans. Therefore, the rules regarding the maximum number of people, emergency exits, the quality and maintenance of fire extinguishers and the use of appropriate fireworks to the local area must be followed. In addition, it is necessary that all environments have an installation of sprinkler systems and fireproof materials.[1]

Prevention can also be done in order to avoid further sequelae resulting from smoke inhalation. The immediate management based on the ABCDE of trauma, along with an early diagnosis of inhalation of toxic gases are essential to avoid worsening of clinical conditions.[2,8] After a suspicion of CO intoxication through the patient's clinical manifestations and exposure history, arterial gasometry should be urgently performed, since it allows an accurate assessment of the carboxyhemoglobin level and the metabolic state regarding gas exchange. It is also important to perform a blood collection immediately at the scene of the accident to identify levels of HCN in the blood.[2] These measures are important to avoid more serious consequences, as they assess ventilatory conditions and help guide the diagnosis and treatment of the victim.[3,8]

Hydroxocobalamin can be used in the pre-hospital setting in cases of patients who present a Glasgow score of 13 or less, or in those with signs of hemodynamic instability and respiratory failure, given that this drug is used as a therapy in cases of HCN poisoning and, if administered quickly, it can prevent the patient from dying.[8] Finally, also as a way to prevent the most severe evolution of fire victims, immediate oxygen therapy stands out.

8 CONCLUSION

Considering the reading of several articles that address the issue of smoke inhalation, the importance of this topic on a global scale becomes evident, since fires in closed environments are frequent disasters in the world. Therefore, knowing the pathophysiology of intoxication by CO and HCN, as well as the main clinical manifestations of these conditions, effectively guide the case towards its diagnosis and the best treatment option. Thus, the importance of the union of knowledge and efforts for a before and inside hospital management, besides a complete follow-up of patients, favors a good prognosis for victims of fires in closed environments, as in the case of the Kiss Nightclub.[13] Therefore, It is also important to highlight, through

the narrative review in question, the new researches and studies that involve new forms of management in cases of intoxication.

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