



Rev Mex Med Forense, 2019, 4(1):36-42

ISSN: 2448-8011

# **Epidemiological behavior of mechanical asphyxias in the forensic medical service of the Veracruz-Boca del rio zone**

**Original Article**

**Antonio Miguel Bautista-Hernández<sup>1</sup>, Guadalupe Melo-Santiesteban<sup>2</sup>, Patricia Beatriz Denis-Rodríguez<sup>3</sup>**

---

Received: June 8, 2018, Accepted: September 18, 2018, Published: January 15, 2019

<sup>1</sup> Clinical Chemist, Master in Forensic Medicine

<sup>2</sup> Master in Forensic Medicine, PhD in Education, Institute of Forensic Medicine, Universidad Veracruzana

<sup>3</sup> Master in Forensic Medicine, PhD in Education, Institute of Forensic Medicine, Universidad Veracruzana

Corresponding author: [Guadalupe Melo-Santiesteban, gmelo@uv.mx](mailto:gmelo@uv.mx)

## SUMMARY

**Introduction.** *There has been an increase in violent deaths worldwide and these constitute a public health problem. Mechanical asphyxia is one of the main causes of violent death.*

**Methods.** *A retrospective and observational study of the Forensic Medical Service data base was conducted, corresponding to the metropolitan area of Veracruz-Boca del Río, in the period between January 2010 and December 2016.*

**Results** *A total of 5144 autopsies performed in the study period were analyzed; in 567 cases, the cause of death was mechanical asphyxia (11%); 78% were male, mainly in the range of 15 to 35 years of age.*

**Discussion.** *With the data obtained, prevention campaigns can be reinforced in the population with the highest incidence of cases.*

**Keywords:** *Mechanical asphyxia, epidemiology, Forensic Medical Service*

## INTRODUCTION

Currently there has been an increase in violent deaths worldwide and these constitute a public health problem. Each year, more than 1.6 million people around the world lose die violently. Violence is one of the main causes of death in the population aged between 15 and 44 years. Approximately half of these deaths were due to suicides, almost one third to homicides and approximately one fifth to armed conflicts.

According to mexican national data, during 2015 there were 5,718 suicides of which 80.8% were completed by men and 19.2% by women. The main method used, in both men and women, was hanging, strangulation or suffocation (78.1% and 72.4%, respectively). Suicide in adolescents aged 15 to 19 years, is listed as the third cause of death being 43.5% and 10.2% corresponds to people aged 60 and over.

Asphyxia from the pathophysiological point of view is described as an insufficient exchange of respiratory gases. The reduction of blood flow below a certain level is expressed in a reduction in the availability of oxygen to the subject, and potentially to the brain, and can result in reduced consumption by that organ. Under these conditions the anaerobic metabolism can be used for the production of energy and the lactic acid will be the final product, originating tissue acidosis. At the same time there may be an insufficient elimination of carbon dioxide from the tissues, and consequently, a respiratory acidosis develops. Therefore, the definition of asphyxia includes a reduction of the oxygen content, an elevation of the partial concentration of carbon dioxide and a reduced pH. Having decreased brain metabolism and neuronal damage.

Hanging is the mechanical suffocation that is produced by the traction of the body on a loop, which compresses the neck and depends on a fixed point. The

knot that holds the cord is called the distal knot and the one near the neck is the proximal knot. It represents the most frequent and most used form of suicide by the male gender, although it can be accidental or serve to disguise a homicide. In the mechanism of death participate asphyxia, inhibition and deficit of cerebral circulation. The asphyxia is produced by compression of the trachea and especially by the rejection of the base of the tongue against the posterior wall of the base of the pharynx; 15 kilograms of tensile force is required to obtain a mortal result. The suspension of the body is not necessary to produce death, because when the body lies on the ground by the feet, it is enough that the head and a part of the trunk are raised, since in this position the pulling force is from 10 to 20 kg.

The main objective of Legal Medicine is the support for the prosecution of justice, as well as to illustrate the authorities on medical issues; in these cases it explains injuries in an organism caused by the different asphyxia types, mechanism of production and etiology. However, in the metropolitan area of Veracruz-Boca del Rio there is no information about mechanical asphyxia as a cause of death. It is important to gather information about the causes, the most affected age group and other conditions that may be related, to establish support programs for the most vulnerable groups, as well as to generate statistical data that may be relevant for future research.

## **METHODS**

It was a retrospective and observational study carried out in the forensic medical service databases of the Veracruz-Boca del Río metropolitan area, during the period between January 2010 and December 2016. We included information such as age, gender, date of death (day, month, year) and final diagnosis of the autopsy, specifying the cause of death. All those files in which the information was incomplete or illegible were eliminated. The anonymity of the deceased individuals was respected, as well as the personnel who participated in the autopsy. Taking into account that the study is of a retrospective, observational and descriptive type, the analysis of the results was made based on measures of central tendency and frequency.

## **RESULTS**

The total number of autopsies performed during the period from January 2010 to December 2016 was 5144, of which 567 (11%) stated mechanical asphyxia as the cause of death. Of these, in 285 cases the mechanism was hanging, in 146 it was anoxia by submersion, in 89 it was suffocation, in 34 broncoaspiration, in 32 strangulation, in 6 cases it was carbon monoxide poisoning and in 2 cases the mechanism was confinement (figure 1).

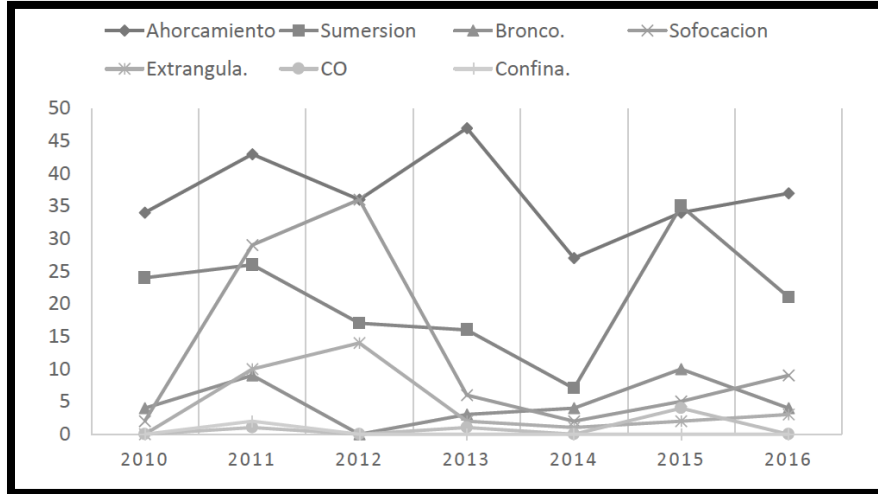


Figure 1. Relationship between the mechanism of asphyxia and the year of presentation

A predominance of male individuals was observed, as can be seen in figure 2. The age at which the prevalence was highest corresponded to the range between 15 and 35 years of age,

both in men as in women (figure 3). The largest number of cases was presented in the month of September, followed by the months of April, May and July.

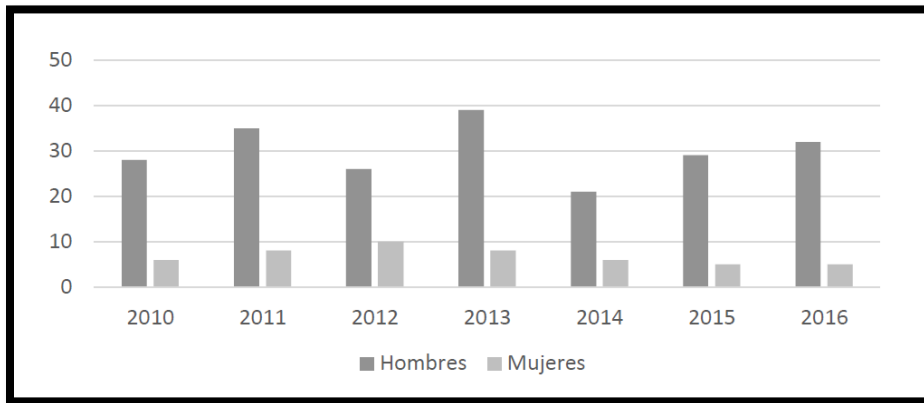


Figure 2. Distribution by sex in relation to the year of presentation in cases of mechanical suffocation by hanging

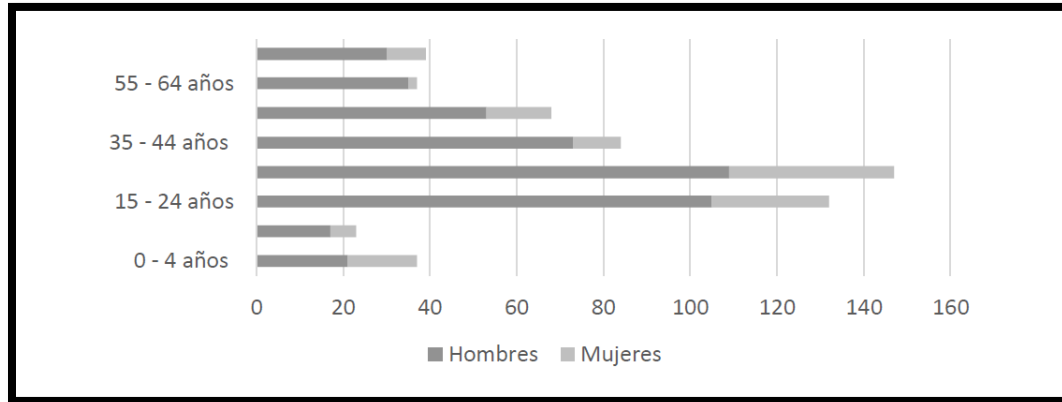


Figure 3. Relationship between the frequency of mechanical asphyxia and the age of presentation in both sexes

## DISCUSSION

Hanging is the most frequent mechanical suffocation and this agrees with a study conducted by Pérez et al in 2011 (Toluca, México); death by hanging, suspension or hanging is generally suicidal and less often accidental. Homicidal hanging is unusual, being described as a mechanism to disguise the true cause of death; suicide in young people is increasing according to Villagómez (2012), who found that people aged 15 to 35 are the ones who most have mechanical asphyxia as causes of death, coinciding with Pérez et al, who believe that it could be related to economic factors and social, addictive substance abuse and low schooling; In the present study we could not determine the relationship between the prevalence of mechanical asphyxia and potential predisposing factors, but it is clear that from these observations, the health institutions of the country should develop support and education programs aimed at people from scarce resources, information programs on drug abuse, social development programs to acquire social skills, control anger, resolve conflicts and develop a moral perspective

as well as suicide prevention programs including the medical treatment of psychiatric disorders.

Pérez et al observed that during the Christmas season the frequency of depressive disorders increases, mainly related to economic difficulties, unemployment, loneliness, illnesses and even weather conditions. According to recent data from the National Institute of Geography and Information (INEGI), during the winter season there are more cases of depression and, as a consequence, there is a rebound in the numbers of suicide attempts and thoughts. The data also indicate that the rebound of those who usually show symptoms of depression during this season of the year is due to various factors such as the lack of economic resources to cover all the expenses, as well as debts, unemployment, the loss of a loved one, terminal illnesses of their own or of a relative, loneliness, lack of self-love and even weather conditions. In our casuistry, it was observed that the climatic conditions during the period from January 2010 to December 2016 did not influence the incidence of the cases.

The campaigns for the prevention of this type of deaths should be directed mainly to people of the masculine gender, who have economic and social risk factors and who are in an age of 15 to 35 years.

## REFERENCES

1. Censo de Población y Vivienda 2011, <http://www.inegi.gob.mx>.
2. Informe mundial sobre la violencia y la salud. Washington, D.C., Organización Panamericana de la Salud, Oficina Regional para las Américas de la Organización Mundial de la Salud, 2002.
3. Estadísticas a propósito del día mundial para la prevención del suicidio\_ Aguascalientes, Ags., a 10 de septiembre de 2013.
4. Vargas AE. Medicina Legal. Editorial Trillas, México. Cuarta Edición, 1996: 174-187.
5. Martínez MS, Saldivar SL. Medicina Legal. Editorial Méndez Oteo, México. Tercera edición, 1985: 93-94.
6. Gisbert Calabuig, Medicina Legal y Toxicología, Editorial Masson. Sexta Edición, 1985: 455- 480.
7. Simonin C. Medicina Legal Judicial. Editorial JIMS, Barcelona. Tercera Edición, 1980: 196-242.
8. Grandini G. J. Medicina Forense. Editorial Mc Graw Hill. Primera edición, México 2004: 75-80.
9. Argimon P, Jiménez VJ. Métodos De Investigación Clínica y Epidemiológica. Editorial Harcourt, Barcelona. Segunda edición, 2000: 304-305.
10. Bonnet EF. Ma. Legal. Editorial López Libreros, Buenos Aires. Segunda Edición, 1980: 1295-1397.
11. Patitó AJ, Lessetti AO, Trezza CF. Tratado de Medicina Legal y Elementos de Patología Forense. Editorial Quórum. Argentina, 2003: 685-742.
12. García Dolores F. Detección de Lactoalbumina y Lactoglobulina en muerte súbita del lactante. 90 simposio Nacional y 60 Internacional de Temas Selectos en Ciencias Forenses 2010. México. DF.
13. Di Maio V J M y Dana S E. Manual de Patología Forense. Editorial Díaz De Santos. Madrid 2003. N: 195-199.
14. Sibonolano A, Martínez García P y Palacios Granero R. Muerte por ahorcadura. Cuadernos. Medicina. Forense. 2005; N° 40: 145-149.
15. Romero Palacio J. Muertes por sumersión. Revisión y actualización de un tema clásico de la medicina forense. Cuadernos. Medicina. Forense. 2007; N° 13: 48-49.
16. Sotelo N y Cervantes VM. Asfixia por sumersión en niños. Rev Mex Pediatría 2000; 67(4); 154-160.
17. Concheiro Carro L, Suárez Peñaranda JM. Asfixias mecánicas. In: E Villanueva (Ed), Medicina Legal y Toxicología. 6° edición, Masson. Barcelona. 2004. 460-478.
18. Lorente JA, Villanueva E, Hernández-Cueto C y Luna A. Plasmatic levels of Atrial Natriuretic Peptide (ANP) in drowning. A pilot study. J Forensic Sci 1990; 44; 69.
19. Knight B. Medicina Forense de Simpson. Edit Manual Moderno. México 1999. Pp 115 119
20. Pérez Cárceles MD, Martínez Díaz F, Sibón A, Vizcaya MA, Casas M, Gil MI, Osuna E Falcón M y Luna

- A. Niveles de estroncio y proteína A del surfactante (SP-A) en diferentes causas de muerte. Estudio preliminar. XVI Jornadas Internacionales Mediterráneas de Medicina Legal. Sevilla, 17-20 Nov 2004.
21. Azparren JE, Fernandez-Rodriguez A, Vallejo G. Diagnosing death by drowning in fresh water using blood strontium as an indicator. *Forensic Sci Int*. 2003 Oct 14; 137(1):55-9.
22. Piette M, Timperman J, Parisis N. Serum strontium estimation as a medicolegal diagnostic indicator of drowning. *Med Sci Law* 1989; 29: 162-171.
23. Vallejos M, Rinaldi D y Delfino MR. Diatomeas en Tejidos Biológicos. Comunicaciones científicas y tecnológicas 2005. Universidad Nacional del Nordeste.
24. Ludes B, Coste M, North N, Diatom analysis in victim's tissues as an indicator of the site of drowning. *Int J Legal Med*, 1999; 112:163

