

Unexpected death presentation in infants

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SD: sudden death

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ABSTRACT

Introduction: Sudden infant death is the first cause of unexpected death in the first year of life, having social and even legal implications. In many cases, sudden infant death remains unexplained even after thorough investigation.

Objective: To characterize sudden infant death in Havana.

Method: Observational, descriptive, retrospective, cross-sectional study. The autopsy records, corresponding to 32 less than one-year-old infants, referred to the Institute of Legal Medicine between January 2010 and December 2015, were reviewed. Results are presented in tables and graphics.

Results: 62.5% of the deceased were male, 51.2% were dead on arrival at a health facility and 37% died at home over the late-night hours in the summer months. The cause of death was natural in 84.6% and violent in the remaining (15.4%); 9% were of homicidal medicolegal etiology. 48.9% of the deceased came from dysfunctional families and 53.7% had parents younger than 25 years old.

Conclusions: Sudden infant death was male predominant in younger than 1 year of age and the most frequent antecedent provided by the police instruction was the patient's referral to a medical center once he/she was already deceased. Cyanosis was seen in 56% of cases, severe pulmonary edema and interstitial pneumonitis were the frequent causes for natural deaths while suffocation was the explanatory cause for the violent ones.

Key words: Sudden death, Sudden Infant Death, Forensic Medicine, Natural death, Violent death

Presentación inesperada de la muerte en lactantes

RESUMEN

Introducción: La muerte súbita en lactantes constituye la primera causa de fallecimiento inesperado en el primer año de vida, con trascendencia social e incluso legal y para la cual, en muchas ocasiones, no existe explicación aun después de ser estudiada.

Objetivo: Caracterizar la muerte súbita en lactantes en La Habana.

Método: Estudio observacional, descriptivo, retrospectivo, de corte transversal. Se revisaron los expedientes tanatológicos correspondientes a 32 fallecidos, menores de un año, que ingresaron al Instituto de Medicina Legal, entre enero de 2010 y diciembre de 2015. Los resultados se presentan en tablas y gráficos.

Resultados: El 62,5% de los fallecidos fueron del sexo masculino, 51,2% llegó fallecido a una institución de salud y un 37% falleció en el domicilio, en el horario de la noche-madrugada, en los meses de verano. En el 84,6% la causa de muerte fue na-

tural y el resto (15,4%), violenta; un 9% fue de etiología medicolegal homicida. En 48,9% de los fallecidos la familia era disfuncional y en el 53,7% los padres tenían menos de 25 años.

Conclusiones: En la muerte súbita infantil en menores de un año prevaleció el sexo masculino, y el antecedente más frecuente que aporta la instrucción policial es el traslado fallecido a un centro asistencial. La cianosis se observó en el 56% de los casos, el edema pulmonar grave y la neumonitis intersticial fueron las causas frecuentes en muertes naturales, y la oclusión de orificios respiratorios fue la causa explicativa en las violentas.

Palabras clave: Muerte súbita, Muerte Súbita del Lactante, Medicina Legal, Muerte natural, Muerte violenta

INTRODUCTION

The sudden death (SD) in children has been one of the most controversial events in contemporary medicine¹. For many years, only developed countries like the United States, England, Holland and New Zealand could assign millionaire sums to the study of this subject, while in poor countries, the SD is an everyday fact where poverty and malnutrition claim millions of children's lives per year, without the parents being able to do something to avoid it; according to professor Acosta Tiele, these are high risk children¹.

The term SD has been used differently by epidemiologists, clinicians, cardiologists, pathologists and experts in legal medicine², without existing unanimity concerning the period of time that elapses between the onset of symptoms and death, for defining it as sudden.

For clinicians, it is often considered as that which takes place due to natural causes (which excludes accidents, suicide, poisoning, etc.) within the first hour after the onset of symptoms. Cardiologists define it as the unexpected, abrupt death from natural causes that takes place instantaneously or during the 24 hours after symptoms appear in healthy individuals or with a known cardiac condition³.

For the legal medicine, is that death which happens in a short period of time, in a healthy or apparently healthy individual, where its unexpected and sudden nature is emphasized; these deaths, due to their circumstances, are often considered suspicious of criminality^{4,5}.

In recent years, the knowledge and dissemination of the complex issue of sudden infant death (SID) has changed substantially; it is known to be a worldwide and serious problem and despite all the research carried out in recent years, it remains un-

predictable and imprevisible⁶.

Its definitions are multiple and the following are the most utilized:

- The SD in children under one year of age: this one remains unexplained after conducting a complete *post mortem* investigation, including autopsy, an examination of the scene of death and a review of the case history. Raised by the panel of experts convoked by the National Institute of Health and Development of the United States between 1987-1990⁷.
- The SD of any infant or young child: is the unexpected death by history in which a *post mortem* examination fails to reveal the causes of death. According to Ferrer Marrero *et al.*⁷, it was described by Bergman, Beckwith and Ray, at the second international conference of procedures on the causes of SD in children, held in Seattle (1970 and 1973).
- The sudden unexpected infant death: is a term used to describe any sudden and unexpected death in infants under one year of age, regardless of whether or not a cause of death was found. This term in turn involves three modalities⁸:
 1. Sudden infant death syndrome (SIDS): defined as the unexpected death of an infant under one year, which cannot be explained after making a proper investigation of the case, involving anamnesis, the scene of death and autopsy. It is also known as crib death, because it usually takes place while the infant sleeps⁸.
 2. SD of unknown cause: death of an infant under one year of age, in which an adequate and thorough investigation was not carried out, and therefore the origin of death could not be determined⁸.
 3. SD of determined cause: this type of death can be caused by two main reasons: a) accidental

suffocation and strangulation in bed, also called sleep-related deaths caused by different mechanisms; and b) other implicated mechanisms as infections, arrhythmias due to channelopathies, genetic metabolic disorders, trauma –accidental or not–, among others⁸.

The SID is normally an out-of-hospital event, without relevant history or symptoms that allow to predict the fatal outcome⁹. It should be noted that this death requires a thorough investigation to be able to elucidate its causes, which is not an easy task. Therefore, it is important to conduct a proper review in relation to the events that caused the death, the scene, the medical history, and family records, among other aspects.

The final diagnosis of SID requires a multidisciplinary study, which should not avoid that those families who suffer the unexpected death of an infant are probably going through the most traumatic time in their lives¹⁰ and that studies should be carried out taking into consideration, among other aspects, the pain of those affected.

Once the results are obtained, the family members should receive an explanation about what has been the cause of the unexpected death of the infant, if it is found, and if not, these parents, who are usually anguished and with feelings of guilt, should receive understandable explanations about their baby's death.

From all the above, this work aims to characterize the SD in children under one year of age.

METHOD

An observational retrospective descriptive cross-sectional study was performed on the deceased by SD under one year of age, who entered the Institute of Legal Medicine in Havana, Cuba, in the period between January 1st, 2010 to December 31st, 2015.

The sample consisted of 32 cases, which entered the center with a death suspicious of criminality, not being clear the causes or circumstances in which it occurred, therefore, the medical-legal autopsy was necessary.

In order to obtain information, the thanatological records were consulted in each case, which are on file at the Department of Medical Records of the Institute of Legal Medicine.

The data were processed manually with the use of a scientific calculator, and the absolute frequency and percentages were applied. The results are expressed as whole numbers and presented in tables.

RESULTS

In **table 1** is shown the chronological timing of deaths by sex and age. As it can be observed, the behavior per year was very similar, except in 2010, that the number of deaths, in general, was greater (9 cases representing 28.1% of total).

The 62.5% of deaths are male, and in relation to age it shows that the peak of deaths takes place in the second trimester, between 3 and 6 months, with a higher incidence around 6 months.

Table 1. Deceased infants according to year of occurrence, sex and age.

Years	Age in trimester and sex										Total			
	< 28 days		1º		2º		3º		4º		Male		Female	
	M	F	M	F	M	F	M	F	M	F	Nº	%	Nº	%
2010	-	-	3	1	1	1	2	1	-	-	6	18,9	3	9,3
2011	-	-	-	-	2	2	-	-	1	-	3	9,3	2	6,4
2012	-	-	1	-	1	-	-	1	1	-	3	9,3	1	3,1
2013	-	-	-	1	-	-	1	-	2	-	3	9,3	1	3,1
2014	-	1	-	1	2	-	-	-	1	-	3	9,3	2	6,4
2015	-	1	-	1	1	-	-	-	1	1	2	6,4	3	9,3
Total	-	2	4	4	7	3	3	2	6	1	20	62,5	12	37,5

Source: Thanatological Files. Department of Medical Records. Institute of Legal Medicine. Havana, Cuba.

Table 2. Deceased infants according to racial characteristics.

Years	Europoid	Negroid	Europoid-Negroid
2010	2	3	4
2011	1	1	3
2012	1	1	2
2013	-	-	4
2014	2	2	1
2015	1	2	2
Total	7	9	16

Table 3. Infants according to place of death.

Place of death	Nº	%
The deceased is brought to the health institution	17	53,1
Deceased at the residence	11	34,4
Others	4	12,5
Total	32	100

Table 4. Infants according to time of death.

Time of death	Nº	%
06:00 - 12:00 h	5	15,6
12:01 - 18:00 h	6	18,7
18:01 - 24:00 h	9	28,2
24:01 - 05:59 h	12	37,5
Total	32	100

Table 5. Infants according to cause of death.

Causes of death	Nº	%
Connatal sepsis	2	6,4
Severe pulmonary edema	6	18,7
Interstitial pneumonitis	5	15,6
Occlusion of respiratory holes	4	12,5
Other	15	46,8
Total	32	100

The racial characteristics of deceased infants did not show no significant differences (**Table 2**); however, there is a predominance of the europoid-negroid group; that is, mixed.

In **table 3** is shown that the SID, in most cases, takes place outside a hospital, taking into account that 53.1% came deceased to the health institution and 34.4% happened at home.

The time of death was more frequent at night and early morning (**Table 4**), between 18:00 and 6:00 (21 cases, 65.6%); and by 12.5% of cases, the cause of death was violent (occlusion of respiratory holes), while in the remaining 87.5% the cause of death was natural (**Table 5**). In 56% of cases of this latter group, the only found sign outside the corpse was the subungual cyanosis, while in the violent deaths was the peribuccal cyanosis. In the section "others", the respiratory distress was included and the bronchopneumonia to not specified germ.

Generally, it can be added that 53.7% of parents of the deceased infants were less than 25 years of age.

DISCUSSION

Although a plausible explanation was not found for the highest number of cases in 2010, the results of the present research coincide with those of other authors. In the study of the professor Nestor Acosta, between 1976 and 1980, the number of cases did not exceed ten each year, and in a study conducted at the Hospital Pediátrico Universitario Juan Manuel Márquez, of Havana, the behavior of the number of cases per year was also not significant¹¹.

The predominance of the male sex also corresponded to that found in the reviewed bibliography^{1,8,11}. Rocca Rivarola¹², in a study conducted at the judicial morgue of Buenos Aires, found that males are more at risk than females with a 2:1 ratio. Something similar happens with age, because the results presented herein coincide with those of other authors^{1,8,11,12}. In an analysis of relation between these variables, there was found that in the males, death occurs more frequently after 6 months of life (about 9 months), while in females occurs in the first trimester (around 3 months)^{1,8,11,12}.

The predominance of the Europoid-Negroid group is attributed to the high miscegenation of the Cuban population. In the bibliography reviewed, there were no elements that make reference to this

particular on the SID.

In most cases, the death happened at the out-of-hospital setting, what supports the criterion that the SID takes place in a short period of time after the onset of symptoms; which, in many cases, do not exist and the deceased baby was a healthy one^{1,11}.

Regarding the time of death, the literature reviewed reflects a behavior similar to that found in this research (at night and early morning), and relates it, largely, with the cause of death and the fact that it is a time in which the infant sleeps and is not under the supervision of an adult^{1,8,13}. This is not the case with regard to the season of the year, where no significant results were found, since in Cuba the weather does not allow defining seasons; however, it is important to note that the months of July and August were the ones with the highest number of deaths.

Regarding the cause, the study Quirós González *et al.*⁸ can be referenced, because it exposes that the SID can be of determined cause, where the two mechanisms that were mentioned above are involved: The accidental suffocation and other mechanisms such as infection, metabolic and genetic disorders, among others. In this study, the co-sleeping was the cause of 4 deaths.

In the cases of connatal sepsis, there was a history of prematurity.

The raised causes of death were corroborated in all cases by medical or legal autopsy and supported by anatomopathological and toxicological studies.

CONCLUSIONS

Males, late arrival of the infant to a health institution or deceased at the residence, in the evening hours prevailed in this research. The cyanosis was observed in a high percentage of the deceased infants. The pulmonary edema and interstitial pneumonitis were the most frequent causes of natural deaths. The occlusion of respiratory holes was the explanatory cause in the violent deaths.

REFERENCES

1. Acosta Tiele N. Muerte súbita en el niño: Un enigma del Siglo XX. La Habana: Editorial Cientí

fico-Técnica; 2003.

2. Pérez Álvarez H, Ferrer Marrero D. Aspectos médico-legales de la muerte súbita cardiovascular. CorSalud [Internet]. 2014 [citado 30 Oct 2016]; 6(Supl. 1):65-70. Disponible en: <http://www.corsalud.sld.cu/suplementos/2014/v6s1a14/legal.html>
3. Ochoa Montes LA. Muerte súbita cardíaca en comunidades de Arroyo Naranjo en el período 2000-2010 [Tesis doctoral]. La Habana: Universidad de Ciencias Médicas; 2012 [citado 31 Oct 2016]. Disponible en: http://tesis.repo.sld.cu/639/1/Luis_Alberto_Ochoa_Montes.pdf
4. Lancís F, Fournier I, Ponce F, González J, Valdéz L, Pons M. Medicina Legal. La Habana: Editorial Ciencias Médicas, 1999.
5. Calabuig G, Villanueva E, eds. Medicina Legal y Toxicología. 6ª ed. Barcelona: Masson; 2004.
6. Camarasa Piquer F. Evolución histórica del síndrome de la muerte súbita del lactante (SMSL) en España. En: Grupo de Trabajo de Muerte Súbita Infantil (Asociación Española de Pediatría). Libro Blanco de la muerte súbita infantil. 3ª Ed. Madrid: Ergon Creación, 2013. p. 37-46.
7. Ferrer Marrero D, Sánchez Ojeda Y, Alfonso Barrios G, Palma Machado L. Aspectos epidemiológicos y diagnósticos del síndrome de muerte súbita infantil. AMC [Internet]. 2014 [citado 31 Oct 2016]; 18(3):328-41. Disponible en: <http://scielo.sld.cu/pdf/amc/v18n3/amc08030314.pdf>
8. Quirós González G, Bolívar Porras M, Solano Tenorio N. Muerte súbita del lactante. Med Leg Costa Rica. 2016;33(1):44-56.
9. Blasco CP, Giner Blasco J. Implicaciones médico-legales de la MSI. Diagnóstico diferencial con la muerte violenta. En: Grupo de Trabajo de Muerte Súbita Infantil (Asociación Española de Pediatría). Libro Blanco de la muerte súbita infantil. 3ª Ed. Madrid: Ergon Creación, 2013. p. 227-235.
10. Aguilera B, Suarez-Mier MP. La importancia de la investigación del lugar de la muerte y de la entrevista familiar en casos de muerte súbita e inesperada del lactante. Cuad Med Forense. 2002;(30):33-8.
11. García García FE, Pérez Martínez T, Perea Corral J, Núñez Wong-Shue J. Muerte extrahospitalaria en menores de 1 año, 1991-1993. Rev Cubana Pediatr [Internet]. 2001 [citado 31 Oct 2016];73(4): 199-205. Disponible en:

- <http://scielo.sld.cu/pdf/ped/v73n4/ped01401.pdf>
12. Rocca Rivarola M. Síndrome de muerte súbita del lactante [Internet]. Intramed; 2015 [citado 31 Oct 2016]. Disponible en: <http://www.intramed.net/userfiles/2015/file/muer>
- [tesubita.pdf](http://scielo.sld.cu/pdf/ped/v80n2/ped09208.pdf)
13. García García FE. Síndrome de muerte súbita del lactante. Rev Cubana Pediatr [Internet]. 2008 [citado 31 Oct 2016];80(2). Disponible en: <http://scielo.sld.cu/pdf/ped/v80n2/ped09208.pdf>