

# Factors associated with the deaths of men poisoned by carbamate ("chumbinho")

*Fatores associados aos óbitos entre homens envenenados por carbamato ("chumbinho")*

*Factores de muertes de hombres envenenados por carbamato ("chumbinho")*



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## ABSTRACT

**Objective:** To determine the factors associated with death in poisoning victims by carbamate ("Chumbinho").

**Method:** Retrospective study, epidemiological case-control based on poisoning reporting forms, a poison control center located in the metropolitan region of Rio de Janeiro. We used 24 notification forms of poisoning in men aged 20 to 59 years with poisoning by carbamate history from 2005 to 2009. The records were randomly selected, respecting the ratio 1:3 (a case to three controls). The age range was 23-58 years, average 43.83 years.

**Results:** The most frequent symptoms were myosis (OR=1.0; 95% CI: 0.27 to 3.69 p=1.0.), drooling (OR=0.83; 95% CI: 0.22 to 3.12 p=0.78), and dyspnea (OR=0.66; 95% CI: 0.14-3.03 p=0.59).

**Conclusion:** The deaths were associated with drooling, miosis and dyspnea and a strong association with pulmonary rales, bronchospasm and pulmonary snoring.

**Keywords:** Men's health. Poisoning. Case-control studies.

## RESUMO

**Objetivo:** Determinar os fatores associados aos óbitos em vítimas de envenenamento por carbamato ("chumbinho").

**Método:** Estudo retrospectivo, epidemiológico tipo caso-controle, baseado nas fichas de notificação de intoxicação do centro de controle de intoxicações localizado na região metropolitana do Rio de Janeiro. Foram utilizadas 24 fichas de notificação de intoxicações de homens dos 20 aos 59 anos com história de envenenamento por carbamato entre 2005 e 2009. As fichas foram sorteadas aleatoriamente, respeitando-se a razão de 1:3 (um caso para três controles). A faixa etária variou de 23 a 58 anos; a média 43,83 anos.

**Resultados:** Os sintomas mais recorrentes foram: miose (OR = 1,0; IC 95%: 0,27 – 3,69. p= 1,0), sialorreia (OR = 0,83; IC 95%: 0,22 – 3,12. p= 0,78), dispnéia (OR = 0,66; IC 95%: 0,14 – 3,03. p= 0,59).

**Conclusão:** Os óbitos apresentaram associação com sialorreia, miose e dispnéia e uma forte associação com estertores pulmonares, broncoespasmos e os roncos pulmonares.

**Palavras-chave:** Saúde do homem. Envenenamento. Estudos de casos e controles.

## RESUMEN

**Objetivo:** Determinar los factores asociados a la muerte en las víctimas de envenenamiento por carbamato ("Chumbinho").

**Método:** Estudio retrospectivo, epidemiológico de caso y control sobre el envenenamiento en los formularios de notificación un centro de control de envenenamiento localizado en la región metropolitana de Río de Janeiro. Utilizamos 24 formularios de notificación de envenenamiento en hombres de 20 a 59 años con intoxicación por el carbamato de 2005 a 2009. Los registros fueron seleccionados al azar, respetando la proporción de 1:3 (un caso y tres controles). El rango de edad fue de 23 a 58 años, promedio de 43,83 años.

**Resultados:** Los síntomas más frecuentes fueron miosis (OR = 1,0; IC del 95%: 0,27 a 3,69 p = 1,0.), Babeo (OR = 0,83, IC 95% 0,22-3,12 p. = 0,78), disnea (OR = 0,66; IC del 95%: 0,14 - 3,03 p = 0,59).

**Conclusión:** Las muertes se asociaron con babeo, miosis y disnea, y una fuerte asociación con estertores pulmonares, broncoespasmo y el ronquido pulmonar.

**Palabras clave:** Salud de los hombres. Envenenamiento. Estudios de casos y controles.

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## ■ INTRODUCTION

The high prevalence of violent deaths among men partly explains differences in life expectancy at birth between men and women. Violent deaths include homicides, suicides, physical and psychological abuse, as well as those resulting from car accidents, falls, drowning, and trauma. In 1980, the life expectancy of Brazilian women was 65.7 years, while that of men was 59.6 years; that is, women lived 6 years longer than men<sup>(1)</sup>.

With the worsening of violence between 1980 and 1990, especially among young men, the difference in life expectancy at birth between sexes increased to 7.6 years in 2000. Men living in the Southeast lived almost 9 years less than women on average, while in the Northeast this difference was of 7.3 years and 7 years in the Midwest and South<sup>(1)</sup>.

Among the various situations experienced in the routines of emergency rooms, poisoning remains a constant and presents an important number of cases, especially those related to carbamate poisoning. There is, in the state of Rio de Janeiro, especially in Grande Rio, an important problem related not only to the use of carbamate as rodenticide but also its use in suicide and homicide attempts<sup>(2)</sup>, which leads to a significant increase in the demand on nursing services in emergency rooms. For this reason, these services need to be reorganized and healthcare workers need to be qualified to provide care to these victims.

SINITOX (Brazilian System of Toxic-Pharmacological Information) and the National Network of Information Centers and Toxicological Assistance<sup>(3)</sup> report a total of 115,285 cases of human poisoning in 2006 with 520 deaths. This is a significant number if we consider that SINITOX reports that the four highest mortality rates caused by poisoning in Brazil were generated by pesticides, rodenticides, drugs abuse, and veterinary products, with 2.99%, 1.31%, 0.94% and 0.59%, respectively.

Data analysis concerning the circumstances in which pesticide poisoning occurred indicates that the Southeast of Brazil presented the highest incidence of cases, while the North presents the lowest number of reports<sup>(3)</sup>. We also verified that suicide attempt was the circumstance with the highest prevalence in the entire country (49.3% of the poisoning cases analyzed): 993 cases in the Southeast and 955 in the Northeast<sup>(4)</sup>.

The relevance of this study is based on the National Priority Health Research Agenda<sup>(5)</sup>, in which one of its sub-agendas proposes assessing policies, programs, projects and remaining interventions related to violence prevention, accidents and traumas, suicide and homicide

attempts, traffic accidents, sexual abuse, consumption of psychoactive substances, alcohol and other types of poisoning, as well as the conduction of studies addressing the effects of violence on the health-disease continuum, and communication and health education designed to prevent violence, accidents, trauma and poisoning, taking into account regional peculiarities<sup>(5)</sup>.

Another relevant issue for the development of this study is centered on the National Policy of Men's Integral Health<sup>(6)</sup>, which emphasizes the need to change paradigms regarding the male population's perception concerning self-care and the care of their families. Other actions in addition to educational ones are necessary. Furthermore, public health services need to be organized to welcome and make men feel integrated as part of them<sup>(6)</sup>.

Therefore, we observe the importance of developing and providing new nursing care procedures concerning carbamate poisoning, which is considered a public health problem<sup>(7-8)</sup>. For this reason, it is imperative to implement educational campaigns and monitor the illegal selling of this product because these products (carbamates) account for a large number of human poisoning in Rio de Janeiro<sup>(7)</sup>, some of which are fatal. Given the high number of carbamate poisoning cases in Rio de Janeiro, healthcare workers question the indiscriminate sale of this product and its use as rodenticide<sup>(8)</sup>, which draws attention to the need to implement strategies to face the problem.

Given the previous discussion, we examine what the factors associated with the deaths of carbamate-poisoned men are. Therefore, for this study, we established the objective to determine the factors associated with deaths in poisoning victims by carbamate.

## ■ METHOD

A retrospective case-control study of an epidemiological nature was conducted with matching by year based on data collected from poisoning reporting forms from a center of poisoning control located in the metropolitan region of Rio de Janeiro, RJ, Brazil. The poisoning reporting forms of men aged between 20 and 59 years old with a history of poisoning due to carbamate from 2005 and 2009 and that resulted in death were included in the case group. The control group (survivors) was composed of poisoning reporting forms of men aged between 20 and 59 years old, poisoned by carbamate and classified as severe poisonings. The forms were randomly drawn according to a 1:3 ratio (three controls for each case).

The list used for randomly drawing the control cases was ordinated according to the years in which deaths oc-

curred, totaling 24 poisoning reporting forms. We discarded the controls from 2006 because no deaths due to carbamate poisoning were reported in this year, as well as those cases classified as moderate, mild, and those poisonings of indeterminate nature.

The sample of cases represented all the deaths caused by reported carbamate poisoning, totaling 6 cases (deaths), while the final number of controls (survivors) was 18. The following variables were analyzed: age, exposure time, circumstances, route of poisoning, symptoms, duration of hospitalization, and outcome.

Data were tabulated using Excel 2007 and EPI Info 3.5.1 was used to analyze data. Odds ratio (OR) was the measure of association used to assess the relationship between carbamate poisoning deaths and survivors.

Descriptive and univariate analysis of data were used. The case and control groups were compared using the one-tailed t-test and Chi-square test; p-value < 0.05 was established.

This study is part of a Master's thesis titled *POLÍTICA DE SAÚDE DO HOMEM: o Cuidar e o Cuidado de Enfermagem em Emergência às vítimas masculinas de intoxicação exógena por Carbamato (“Chumbinho”)*<sup>4</sup> [MEN'S HEALTH POLICY: Providing Care and Emergency Nursing Care Provided to Male Victims of Exogenous Carbamate Poisoning]. It was submitted to and approved by the Institutional Review Board at the City Health and Civil Defense Department – RJ (Protocol No. 35 from April 25, 2011).

## ■ RESULTS

In regard to the circumstances in which poisoning occurred, all the men in both the case and control groups were reported as suicide attempts. In regard to routes of poison intake, all the men in the case and control groups were reported as having orally ingested it, that is, self-ingestion predominated. The predominant age group in both groups was young adults of productive age (Table 1).

Data analysis shows that age ranged from 23 to 58 years old in the case group (deaths), with an average of 43.83 ± 14.75 years, and median 49 years old (23-58). Exposure time ranged between 20 and 360 minutes; the average exposure was 178 ± 132.7 minutes with a median of 120 (20-360) minutes. This shortest interval of exposure to final outcome (death) was 48 hours and the longest interval was 216 hours; the average time of 96 ± 62.58 hours and median of 84 (48-216) hours (Table 1).

Significant statistical evidence was found in the case group in regard to the analysis of age and exposure time (p=0.02) and association of age and outcome (p=0.03),

while no statistical evidence was found in regard to an association between exposure time and outcome (p=0.11). The results indicate that the older the individual and the longer the exposure among those in the case group, the greater the likelihood of death caused by carbamate poisoning.

The average age among those in the control group was 39.94 years old ± 3.82 years with a median of 41.5 (22-58) years old. The mean exposure time was 116 ± 104.8 minutes with a median of 75 (20-360) minutes. The average exposure time up to final outcome was 121.44 ± 91.68 with a median of 96 (24-384) hours (Table 1).

Statistical significance was found in regard to association between age and exposure time and between age and outcome (p < 0.01), while a p=0.04 was found in regard to the relationship between exposure time and outcome (Table 1).

The bivariate analysis did not show statistical significance in regard to the correlation among age (p=0.48), exposure time (p=0.13), and time up to the outcome (p=0.27) between the case and control groups.

The most recurrent clinical manifestations among the case and control groups were: myosis (OR=1.0; CI 95%: 0.27–3.69. p=1.0), drooling (OR=0.83; CI 95%: 0.22–3.12. p=0.78), dyspnea (OR=0.66; CI 95%: 0.14–3.03. p=0.59), bronchorrhea (OR=1.0; CI 95%: 0.2–4.9. p=1.0), muscle twitching (OR=1.5; CI 95%: 0.32–7.34. p=0.57), lung rhonchi (OR= 0.5; CI 95%: 0.1–3.05. p=95%: 0.06–3.74. p=0.49) and sweating (OR=1.5; CI 95%: 0.25–8.9, p=0.65), p > 0.2 so that these did not present statistical significance. Among the most prevalent clinical manifestations, pulmonary rales presented the highest statistical significance (OR=0.11; CI 95%: 0.096–1.28. p=0.078) (Table 2).

## ■ DISCUSSION

A retrospective analysis was conducted in this study to determine and discuss the factors associated with the deaths of victims of carbamate poisoning. All the deaths occurred due to oral ingestion and were reported as suicide attempts; that is, the individuals made attempts against their own lives by ingesting the poison and all cases were classified as severe poisoning. Since all the cases reported were suicide attempts, we verified that such circumstances may be linked to the fact that carbamate is inappropriately being used as a rodenticide, which contributes to the fact that many people use it to take their own lives<sup>(2)</sup>. We should keep in mind it is a easily accessed substance.

A study conducted in Chile<sup>(9)</sup> reports that human exposure to organophosphorus pesticides has been extensively documented, showing it is a health problem that

**Table 1** – Distribution of factors related to deaths (case X control) 2005 – 2009. Rio de Janeiro, RJ, Brazil, 2012

Case					
Variables	Age	Exposure time	P-value – age/ exposure	Duration of hospi- talization	P-value – age/ hospitalization
Age	28	120 minutes	0.02	48 hours	0.03
	56	120 minutes		96 hours	
	23	90 minutes		72 hours	
	58	360 minutes		216 hours	
	48	20 minutes		48 hours	
	50	360 minutes		96 hours	
Mean	43.83	178.33		96	
Median	49	120		84	
Control					
Age	48	90 minutes	0.002	72 hours	0.04
	33	60 minutes		240 hours	
	26	60 minutes		48 hours	
	31	90 minutes		48 hours	
	27	180 minutes		72 hours	
	32	60 minutes		96 hours	
	41	60 minutes		168 hours	
	33	60 minutes		48 hours	
	42	360 minutes		120 hours	
	22	120 minutes		96 hours	
	34	120 minutes		96 hours	
	58	120 minutes		216 hours	
	50	240 minutes		48 hours	
	48	20 minutes		48 hours	
	42	30 minutes		240 hours	
	56	30 minutes		24 hours	
	50	360 minutes		384 hours	
	46	30 minutes		120 hours	
Mean	39.94	116.11		121.44	
Median	41.5	75		96	

Source: Study's data, 2012.

is especially associated with rural workers in developing countries. Another study conducted in Kuwait reports that poisoning-caused suicide was the third most common modality of death and is an important problem in the developing world due to ample availability and easy access to substances by people susceptible to committing suicide<sup>(10)</sup>.

In regard to this circumstance in Brazil, self-poisoning was the method most frequently used by both sexes in

suicide attempts<sup>(11)</sup>. Intentional poisoning more frequently occurs among men. Among the cases in which the toxic agent was specified, 24.2% involve aldicarb poisoning and men were 6.98 times more likely to die in a suicide attempt than women<sup>(12)</sup>. Similar to data found in the literature<sup>(2, 11-13)</sup>, all the cases in this study refer to self-ingestion in suicide attempts, with a predominance of young adults. A study addressing the circumstances of intoxication<sup>(13)</sup> shows that

**Table 2** – Distribution of symptoms presented by the case and control groups. Rio de Janeiro, RJ, Brazil, 2012

Variables	Case		Control		Non-adjusted OR	CI 95%	P-value
	n=6	%	n=18	%			
Drooling	6	100%	15	83.3%	0.83	0.22 – 3.12	0.78
Myosis	6	100%	18	100%	1.0	0.27 – 3.69	1.0
Dyspnea	4	66.6%	8	44.4%	0.66	0.14 – 3.03	0.59
Bronchorrhea	3	50%	9	50%	1.0	0.20 – 4.9	1.0
Muscle twitching	3	50%	14	77.7%	1.55	0.32 – 7.34	0.57
Lung rales	3	50%	1	5.55%	0.11	0.096 – 1.28	0.07
Lung rhonchi	3	50%	5	27.7%	0.5	0.1 – 3.05	0.48
Sweating	3	50%	6	33.3%	0.66	0.12 – 3.5	0.63
Bronchospasm	2	33.3%	3	16.6%	0.5	0.066 – 3.74	0.49
Vomiting	2	33.3%	9	50%	1.5	0.25 – 8.9	0.65

Source: Study's data, 2012.

53.3% of those included in the study intentionally poisoned themselves, thus attempting suicide.

The results of another study<sup>(10)</sup> show that pesticides were the most prevalent type of substances used in suicide attempts, followed by paracetamol (acetaminophen), the author emphasizes the fact that both products are freely available in supermarkets. The easy and ample access to intoxicating substances may favor poisoning, especially when the product is illegal or is illegally sold as rodenticide in a solid granular form with coloration that ranges from gray to black, most composed of carbamate<sup>(2,13)</sup>. Note that in regard to self-ingestion, when asked about the flavor, the victims reported the substance has no taste.

Even though several routes of carbamate poisoning are described, in this study, oral ingestion was the most prevalent. It is believed that this fact is due to the product's easy handling and use, whether it is an accidental or intentional poisoning, in homicide or suicide attempts, and also due to the product's ample and misleading popularization in urban centers as a rodenticide<sup>(14)</sup>.

The health-disease continuum is socially determined, among other things, by the way individuals behave in society<sup>(15)</sup>. Various countries around the world report deaths caused by pesticide self-poisoning. A total of 447/100,000 self-poisonings were reported in Anuradhapura Province in Sri Lanka, while other locations also report such cases: Oxford in the UK (350/100,000), Newcastle in Australia (266/100,000), Mashhad in Iran (390/100,000), and Oslo in Norway (200/100,000). The male gender predominates<sup>(15)</sup>.

In Brazil, a study addressing mortality due to occupational pesticide poisoning<sup>(16)</sup> reports that organophos-

phate and carbamate poisonings were the most prevalent, as were deaths among males (ratio men:women, 5:1) aged from 25 to 44 years old living in the Northeast; the mortality coefficient was 0.47/100,000. Therefore, we infer that men, when in situation of vulnerability, may take advantage of the easy access to carbamate and the oral route, as it is an easy way to commit suicide.

The signs and symptoms manifested by carbamate poisoning victims interfere in the body's physiology and progress in such a way that the individual requires nursing care that can be determinant in their survival or death. Oftentimes, red code care<sup>(17)</sup> is implemented (all resources available are used by nursing professionals), alert care (remain alert for unpredictable aspects), decision-making care (based on rigorous observation of a situation, on decision-making, a rational approach, the close relationship between life and death), contingent care (built upon times in which there is a sudden or episodic situation), and comfort care (comfort reflects on the patients' bodies)<sup>(17)</sup>.

From this perspective, the signs and symptoms recurrent among adult male victims of acute carbamate poisoning and who composed the case group in this study, as identified on the reporting forms were: myosis, drooling, muscle twitching, sweating, vomiting, and bronchorrhea. It is worth noting that the literature describes acute poisoning as being relatively easy to diagnose because it is accompanied by cholinergic signs and symptoms<sup>(9)</sup>.

A study was conducted in Australia<sup>(18)</sup> to measure the activity of cholinesterase and the level of exposure associated with the routine use of organophosphates in a rural community in the city of Victorian. It reports that the

clinical manifestations in acute severe poisoning include muscle spasms (muscle twitching), headache, dizziness, seizures, bronchospasm, hypersecretion, ataxia, coma, respiratory failure, and loss of consciousness<sup>(18)</sup>.

The main clinical manifestations identified by a study addressing exogenous carbamate poisoning when suicide was attempted in the state of Goiás, Brazil coincide with those mentioned in the scientific literature, namely: myosis, drooling, vomiting, sweating, numbness to coma, and trembling<sup>(8)</sup>. In a study conducted with rural workers poisoned in Tanzania, the clinical manifestations more frequently reported were skin, eye and throat irritation, headaches, cough, nausea, excessive sweating, excessive salivation, blurred vision, and lacrimation<sup>(19)</sup>.

In this study, association among myosis, drooling and dyspnea appears as a strong predictor of deaths caused by carbamate poisoning. This symptomatology has already been described in scientific studies addressing the topic<sup>(2,8,13-14)</sup>. There is strong association with the symptoms previously described and pulmonary rales, bronchospasms, and pulmonary rhonchi.

In this sample, the deaths of male individuals poisoned by carbamate were analyzed. The literature recurrently describes men as being more susceptible to deaths due to external causes, especially those aged between 20 and 59 years old. The vulnerability of these individuals is based on the literature, as well as the cases of incidence of self-ingestion of carbamate<sup>(2)</sup>. All the poisonings selected in this study as case or control were classified as severe poisoning. The high incidence of severe poisoning suggests the need for preventive strategies in regard to the correct use of pesticides<sup>(20)</sup>.

PNAISH (Brazilian Policy of Integral Men's Health Care)<sup>(6)</sup> emphasizes the need for changing paradigms concerning the perception of the male population in regard to self-care and the care of their families. Therefore, it is necessary to establish strategies to conduct studies and research in this field, and develop the actions proposed by PNAISH, considering that men will not seek or attend health services if these services do not become relevant for them.

In this sense, the identification of factors associated with deaths among adult male victims of pesticide poisoning can guide nursing care directed to victims of poisoning, especially men and their gender characteristics and peculiarities inherent to their behavior and social awareness. It is clear that nursing plays a leading role in the construction of a conceptual framework related to Men's Integral Health-care, also contributing to raise awareness of men and involve them in self-care.

## ■ CONCLUSION

This study's findings enabled determining the factors associated with deaths caused by carbamate poisoning and presented moderate association with drooling, myosis and dyspnea, and a strong association with pulmonary rales, bronchospasms and pulmonary rhonchi. No protective effect was found for the victims after intentionally ingesting carbamate; however, shorter exposure to carbamate was related to the outcome of those in the control group.

All the victims were reported as suicide attempts through self-ingestion (oral route) and a predominance of young adults was found in both groups, confirming the fact that young adult males are more affected than women. All poisoning incidences selected for the case and control groups in this study were classified as severe poisonings; this high incidence of poisoning with this level of severity indicates the need to implement preventive strategies addressing the correct use of pesticides.

This study corroborates the principles of PNAISH<sup>(6)</sup>, as it acknowledges that the male population only accesses the health system through specialized care delivery and requires mechanisms to strengthen and qualify primary healthcare so that the healthcare system not only focuses on recovering health, but also ensures health promotion and prevention of avoidable diseases and events, considering that men deem themselves to be invulnerable and, therefore, more frequently expose themselves to risk situations. The masculinity issue was also addressed in the vulnerability dimension when men become vulnerable to social pressure exerted by men themselves, as well as self-care as strategy to prevent harm to the health of the male population.

Further studies addressing this topic are recommended to favor the dissemination of knowledge on this topic and the prevention of carbamate poisoning, which is claiming a portion of the male population, making clear the need for nursing professionals working in emergency rooms, especially those providing care to male patients, to investigate and understand the peculiarities inherent to the masculinity dimension. We also recommend the development of activities through various types of media, aiming to disseminate the risks and complications related to carbamate poisoning.

Finally, it is worth noting that even though this study addresses exogenous carbamate poisoning and men's health, it was not possible to exhaust all elements of this topic. Much remains to be explored in relation to men's health and issues related to men's vulnerabilities and social



and economic losses. One limitation was the impossibility of addressing all carbamate poisonings occurring in all hospital facilities, as only cases reported to one poison control center in Rio de Janeiro, RJ, Brazil were included.

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