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# A rare case of suicide by bleach fatal ingestion: a case report and a literature overview

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**Abstract**

*Background.* Nowadays it is estimated that worldwide more than 700 000 people die by suicide every year and a greater amount attempt this practice. Suicide is the fourth cause of death among 15-29 years old people. Sodium Hypochlorite (NaOCl) is used in household and commercial bleaches and due to its easy availability, accidental exposure to or intentional ingestion of NaOCl occurs frequently. In most cases health effects are only transient but if the subject ingests a large amount of this substance, this can generate severe consequences as oesophageal or stomach lesions and electrolytic imbalance. In the present study we analyse a rare case of suicide by fatal ingestion of bleach.

*Case Report.* Case of a caucasic 47 years old woman with a background of several suicide attempts by exogenous substance ingestion that was found death alone in her apartment. The purpose of our investigation was identifying the cause of death. A rigorous and multidisciplinary methodological approach was adopted, including an accurate judicial inspection of the environment, an anamnestic collection, an autoptic procedure completed by macro and microscopic examinations of internal organs and a toxicological examination of biological fluids. Furthermore, a literature overview of similar cases was carried out. The resulting evidence demonstrates that woman's death occurred after a massive bleach ingestion.

*Conclusions.* This case report highlights the importance of forensic methodology in investigating the ingestion of exogenous substances. Crime scene investigation, a detailed post-mortem examination, toxicology and a complete histopathological study are mandatory to solve the enigma. ***Clin Ter 2024; 175 Suppl. 2(4):223-228 doi: 10.7417/CT.2024.5122***

**Keywords:** *suicide, bleach ingestion, toxicology, forensic medicine*

## Introduction

Nowadays, worldwide the phenomenon of self-suppression represents a global problem since the global annual mortality rate has been estimated by the World Health Organization WHO to be 10,7 per 100.000 individuals, with variations across age groups and countries and even a greater amount of people which attempt this practice (1-3). Suicide is the fourth cause of death among 15-29 years old people. As clearly outlined by numerous studies, male frequently die by more violent suicide methods than those adopted by female according to the "gender paradox in suicidal behaviour", which is a phenomenon widely documented (4-6). Therefore, women are more likely to commit suicide acts using non-violent methods with a lower fatality rate, including ingestion of exogenous substances. Specifically, the "gender paradox" is a phenomenon regarding the differences found in suicidal behaviour between male and female subjects who committed suicide in western countries (6). It has been observed that despite a higher rate of suicidal ideation by the female sex, the death rate appeared higher in the male sex. Among the explanations attributed to this phenomenon there are the social conception and vision of man as an aggressive, violent and independent subject and of the woman as more docile, dependent and passive creature (7). Consequently, male population tend to perform rapidly suppressive, scarcely premeditated and more violent gestures, while on the contrary, women often placed a mere request for attention in suicidal gesture, without a real desire to perish (8-9).

Although these gender differences, among the most documented suicidal risk factors psychiatric diseases and other mood disorders are included. People with mental diseases resort to self-suppressive methods at least ten times more frequently than the general population (10). In particular, Sodium Hypochlorite (NaOCl) is commonly present in household products and commercial bleaches and due to its easy availability, accidental exposure to it or its intentional ingestion occur frequently. In most cases health effects are only transient, but if the subject ingests a large amount of this substance, it can generate severe consequences as oesophageal or stomach lesions and electrolytic imbalance.

In the present study we analyse a rare case of suicide by fatal ingestion of bleach and its consequences on the organism.

## Case Report

A 47 years-old female subject was found dead alone in the kitchen of her home. The subject was a patient with

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anamnestic notes of chronic psychosis and paranoid schizophrenia, admitted several times to the emergency rooms of different hospitals in Rome due to multiple failed suicide attempts by exogenous substance ingestion. These events were also confirmed by information provided by family members regarding the subject, which outlined that there were repeated manifestations of this specific behaviour and a tendentious chronic pejorative depressed mood. Specifically, at the forensic medical inspection the female body was found lifeless, lying clothed on the floor of the room, with its head near the kitchen's front door and its feet toward the window, in a supine position with both upper limbs along its sides. Inspection of the environment showed no signs of a struggle. As circumstantial elements, numerous packages of antipsychotic drugs were found in the living room. Furthermore, two packages of bleach-based cleaning products were found next to them. Eventually, on the threshold of the bedroom there was a blue-colored plastic bucket inside which it was detected a clear liquid whose odor suggested the presence of unspecified cleaning products. On external examination, the corpse was wearing three hairpins, a bra, a t-shirt, underpants, a pair of pants and socks, although both the bra and the t-shirt have been lifted during attempted resuscitation operations. As far as the initial medico-legal inspection is concerned, there were no detectable signs of external injury attributable to third parts. At the handling of the corpse with the aim of making temperature's detection, there was the leakage of blood serum material from the buccal orifice whose smell was analogue to the content of the bucket found in the doorway of the bedroom. Moreover, the abdominal region appeared slightly bloated and as we applied pressure on it, the smell increased (Figure 1). In addition, temperature readings were taken during the inspection and stiffness was evaluated, resulting appreciable at the level of all joint districts, but with a weak intensity. Hypostasis were present at the declivities of the back and completely modifiable at acupressure. Another element detected at the autopsy was a lesion located at the right upper lip fissure, lateral to the naso-labial fold, on the external slope. Particularly, it was an excoriation of irregular shape, reddish in color, with greater transverse axis, with maximum dimensions of cm 1.5 x cm 0.5. Additionally, I the same site there was the presence of an ecchymotic area of irregular shape, reddish-purple in color, with greater transverse axis, with maximum dimensions of cm 1.5 x cm 0.5.

An autopsy was carried out and some important elements were collected. Firstly, the macroscopic investigation of all organs outlined the presence of hematic infiltration round shaped area whose diameter was about 4.5 cm in the right occipital region of the brain, attributable to the fall of the body to the floor. Moreover, multiple rib fractures were identified - specifically at the level of the right III and VI ribs on the hemiclavicular line and of the right IV and V ribs on the anterior axillary line - but they could be interpreted as the outcome of the resuscitation operations. Key elements were identified at the "in situ" opening of the first airway tract and of the proximal tract of the oesophagus (Figure 2). Specifically, the trachea was characterized by blood varnish of the walls with associated mucosal hyperemia. On the contrary, the oesophageal mucosa of the cervical tract appeared free of major pathologic changes in the proximal tract but thinned and easily flaky in the more distal tract. The lungs, congested and edematous, also showed numerous hemorrhagic petechiae at the sub-pleural level, mainly evident at the level of the right upper lobe. Finally, the stomach contained about 500 centiliters of undifferentiated, brownish-colored fluid material with a slightly viscous consistency and a mentholated odor. This material was also detectable at the level of the first duodenal tract. On lavage, the mucosa appeared hyperemic with spot of postmortem autolysis. All this macroscopic evidence were then analyzed with a more detailed microscopic investigation. Various samples from multiple organs underwent formalin fixation and were marked with hematoxylin and eosin coloration. The histopathological examination was carried out by a highly qualified pathologist and showed massive edema and polyvisceral congestion in the lungs, heart, brain, cerebellum, spleen, kidney as well as liver stasis. Moreover, two suggestive elements were observed: a significant congestion with intramural hemorrhage and epithelium in desquamation in the oesophagus' sample (Figure 2) and a major congestion of submucosal and intramural vessels with marked edema in the stomach (Figure 4).

Finally, toxicological examinations were performed on numerous biological fluid samples of central blood, bile, urine and gastric content. Results showed the detection of benzodiazepines and lamotrigine in therapeutic concentrations in both blood and urine, while the ethyl alcohol levels in the blood was not significant and could be suggestive of an assumption done shortly before death as much as of putrefactive degeneration. The totality of the circumstantial, autopsy and laboratory findings allowed the exclusion of a violent cause, as well as a pathological condition or intoxication by psychotropic substances, but they were correlated to a massive intake of a sodium hypochlorite and wine vinegar solution with the development of chlorine, hydrochloric acid and free radicals. These elements determined superficial irritation of the digestive mucosa and acute metabolic and electrolyte imbalance with cardiovascular arrest. In addition, the absence of external injury, the type of the cause of death - intoxication - and the psychic status of the woman are all findings which pointed out and emphasized the suicidal nature of the event. As a matter of fact, the accidental ingestion of sodium hypochlorite is a low incidence event mostly observable in pediatric population. Moreover, death generally occurs due to intake of high volumes of very diluted substance or little volume of very concentrated substance, both elements that cannot be detected in the household products commonly used (11). Thus, death is a consequence of the intake of high volumes of substance and in literature this method is included among those implemented for suicidal purposes. Furthermore, it is fundamental to take into consideration the complex diagnosed psychopathology of the subject who, in addition to has being pharmacologically followed for many years, had previously tried to enact analogue anticonservative gestures.

Hence, in the presented case the cause of death was attributed to the development of an acute intoxication from exogenous intake of sodium hypochlorite with suicidal intent.

Fig. 1. Inspection of the body on the crime scene

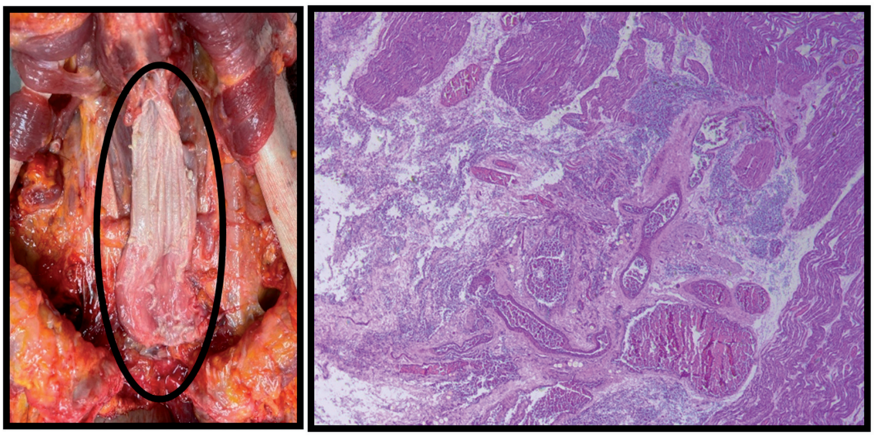

Fig. 2. Macroscopic examination of the proximal tract of the oesophagus. Histological H&E investigation on an oesophageal sample

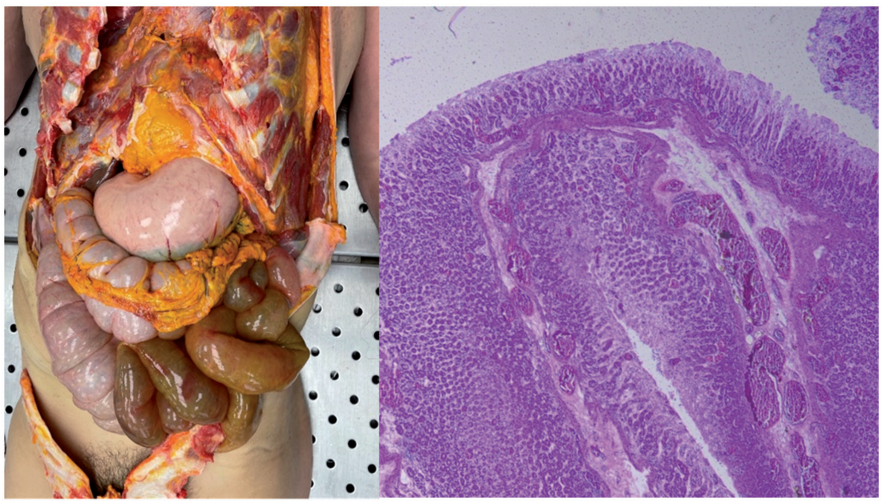

Fig. 3. Macroscopic presentation of the stomach. Histological H&E investigation on a stomach sample

## Discussion

The role of the forensic pathologist consists in the ability of analyzing all the elements related to the heinous event to critical evaluate it and formulate a correct death's diagnosis. Particularly, dealing with a case of suspected suicide often represents an important challenge for the coroner in differentiating it from a case of homicide or accidental injury. Thus, a good forensic pathologist must evaluate every possibility using a standardized and systematic methodological approach. To reach this aim, it is essential to adopt a rigorous and multidisciplinary methodology through a series of steps, which start with an appropriate crime scene inspection (12-13).

Thus, firstly, is it fundamental to carry out a detailed analysis of the environment with a proper collection of both anamnestic and clinical findings. The interpretation of various aspects such as the absence of signs of a struggle, the finding of lactiferous means, the presence of typical elements of the suicidal dynamics, the compilation of farewells messages, the anamnestic compatibility with known intentions or predisposing conditions and the collection of so-called "hesitation marks" are fundamental to direct further investigations. For this reason, it is essential to perform a rigorous inspection of the crime scene accompanied by planimetric and photographic documentation, as well as the collection of any pertinent element. Moreover, starting from these data, it is possible to proceed with the evaluation of anamnestic elements relating to social, psychological, emotional, pathological and pharmacological status of the dead individual. Specifically, in the case presented the absence of environmental and physical signs of a struggle permitted to exclude the hypothesis of an attack and, consequently, of a murder. Moreover, the premeditation of the gesture, confirmed by the anamnestic information given by the victim's related affections were fundamental to focus our analysis. As a matter of fact, as previously stated, psychiatric illness are highly predictive states for suicide and play a consistent role in the idealization and execution of self-suppressive acts. Therefore, the discovery on the crime scene of antidepressant drugs and multiple empty bottles of household cleaning products can be interpreted as evidence of the will of the subject to commit the self-suppressive act.

These first passages are then followed by an autopsy. In particular, in Italy performing a complete autopsy is a relevant feature taking into consideration the highly significant Italian tradition about anatomical studies and cadaver dissections.(14) Thus, the autopsy investigation must be conducted through a meticulous external inspection, an expert dissection of all body districts, a careful photographic documentation of each data identified and additionally, with the sampling of biological fluids and tissues to carry out toxicological and histological exams. Eventually, the results of the autopsy and of the micro and macroscopic investigations combined with the circumstantial and anamnestic elements may allow the coroner to resolve the case and reach a correct death's diagnosis.

In the presented case, the comprehension of the cause of death has been possible by the combination of an accurate environmental inspection, a detailed autopsy, a focused microscopic and toxicological examination and the exclusion of any other lethal cause of death. As a matter of fact, the adherence to this standardized diagnostic procedure allowed to evaluate the most complete amount of data possible, making sure to analyze all the elements in order to confirm the suspicion of suicide or conversely to discover an unexpected result.

Furthermore, statistical and epidemiological considerations may be particularly useful in order to better interpret the data and formulate the hypothesis bringing it back to accidental, self-suppressive or criminal event. Hence, a consultation of some homologous cases reported within the international literature can be carried out with the aim to better understand the data.

Thus, regarding the peculiar mean of suicide of our case, physiologically sodium hypochlorite is a strong oxidizing and chlorinating substance, typically present in household cleaning products in concentrations of 3-6%, often associated with other substances, such as sodium dioxide in order to preserve a pH stability between hypochlorite and chlorine (15). The mechanism of toxicity is related to the intrinsic oxidizing capacity of the chemical and the pH of the associated solution; there are three different mechanisms of organic toxicity (16). The first one arises when this substance binds to water present in the membranes of the oral mucosa, oesophagus and respiratory tract by going on to form hypochloric acid and oxygen free radicals with cytotoxic action. The second mechanism occurs when it reacts with ammonia-based substances to form toxic gases such as chloramine which when inhaled chemically interacts with mucus in respiratory tract membranes producing ammonia, hydrochloric acid and free radicals. These substances can produce respiratory tract irritation and at high concentrations they have corrosive effects with associated cellular damage, including chemical pneumonitis and edema. Eventually, when sodium hypochlorite is associated with the intake of an acid, it is capable of releasing chlorine (in gaseous form) which can damage mucosal tissues by reacting with the water contained in membranes going on to release hydrochloric acid and free radicals, with the same cytotoxic mechanism seen in the previous instances. Therefore, different clinical manifestations may occur following the intake of the substance and these are characterized by gastro-intestinal symptoms, such as nausea, vomiting or diarrhea, but also by respiratory changes, such as cough, dyspnea, tachypnea, aspiration pneumonia(15). Additionally, less frequently this ingestion can also determine pulmonary edema, tachycardia, hypotension, coma, convulsions and eventually cardiorespiratory arrest (17-19). Finally, regarding the most severe and potentially lethal symptoms, it can occur metabolic imbalance and electrolytic disturbances generated by the chemical reactions produced by the interaction of the substances taken, able to trigger metabolic acidosis, hypernatremia and hyperchloremia (16,20-23).

In the literature overviewed, fatal cases due to intoxication from bleach ingestion are rarely observed. In particular, the highest rate of bleach ingestion is found as an inadvertent event which occurs among children, more susceptible to accidental intake of these exogenous caustic substance considering its presence in all the commonly known cleaning products. Despite this, however, it should be specified that such assumption rarely result in the death of the subject. As

a matter of fact, intake of less than 100 ml of this substance do not cause serious problems. (23)

Regarding the case we analyzed, the young woman made an anti-conservative gesture by ingesting a quantity of bleach far above a critical threshold, as clearly detected at the autopsy, where we found ad important gastric content of about 500ml of bleach.

Thus, the peculiarity of our case is that in order to certainly arrive to the cause of death, a comprehensive and all-inclusive examination needed to be performed, especially considering the volatility of the ingested substance, whose detection is not so straightforward. As a matter of fact, the toxicological analyses conducted did not identify bleach in the biological liquid collected, even though the smell coming from the dead body at the first inspection and during the autopsy was highly suggestive. Only combining these elements with the histological findings and the environmental and the anamnestic data it was possible to formulate a correct and certain death's diagnosis, highlighting what stated above regarding the efficiency of a comprehensive forensic investigation.

## Conclusions

The analysis of the presented cases highlights the importance of forensic methodology in solving diagnostic dilemma between homicidal or suicidal fatalities due to ingestion of exogenous substances.

Initially, the theory of "gender paradox" lead to exclude the possibility that a violent self-suppressive gesture could be performed by a woman. Although this, the consideration of all the elements such as circumstantial data, anamnestic information and autopsy findings allows the formulation of a scientifically founded correct judgment. This is the reason why a standardized and systematic methodological approach is mandatory to solve any case of extraordinary complexity.

Hence, in this case report although there were not present macroscopic or toxicological evidence clearly referable to bleach ingestion, a detailed crime scene investigation as well as an accurate post-mortem examination and a complete histopathological and toxicological studies were fundamental to obtain a solid knowledge for the resolution of this enigmatic case.

In conclusion, the combination of all these elements represents a gold standard method to reach solid and certain diagnosis of death.

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