

CASE REPORT

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# Choking together with aspiration of gastric contents: rare form of maternal death

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## Abstract

**Background:** The common causes of early postpartum maternal deaths are cardiomyopathies, obstetric hemorrhage, hypertensive disorders, and sepsis. However, a maternal death from choking together with aspiration of gastric contents is a rare occurrence to be diagnosed at the autopsy examination.

**Case presentation:** A 27-year-old previously healthy lady developed breathlessness 48 h after delivery, while on supine position, 1 h after meals, and pronounced death on admission. Autopsy was insignificant except for large amount of gastric contents in the air ways. Microscopic examination revealed bronchioles filled with eosinophilic materials and a significant number of neutrophil infiltrations at the margin. Alveoli were free from edema fluid and inflammatory cells. Some alveoli were expanded with broken septae. Cause of death was airway obstruction due to choking together with aspiration of gastric contents.

**Conclusions:** Aspiration of gastric contents can cause sudden unexpected death at postpartum, and it is recommended to educate immediate and early postpartum mothers regarding the risk of aspiration.

**Keywords:** Airway obstruction, Forensic pathology, Gastroesophageal reflux, Maternal death, Sudden death

## Key points

- Aspiration and choking are well-recognized types of asphyxia.
- These two types are rarely seen in normal healthy individuals.
- A case where aspiration together with choking is identified as cause of death in a young healthy female following parturition is reported.
- Such a case has not been reported previously to the best of the authors' knowledge.

## Background

According to the National Maternal Mortality Surveillance System in Sri Lanka, a maternal death is defined as “the death of a woman while pregnant or within 42 days after the termination of pregnancy, irrespective of the duration and the site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes” (National Maternal Mortality Surveillance System 2015).

According to the World Health Organization, the postnatal period starts just after the delivery of the child and extends up to 42 days. Usually, physiological changes that occur during pregnancy and the effects of childbirth take a period of 42 days to return to the nonpregnant state. The first 24 h after the delivery is considered as immediate postpartum period, day 2 to day 7 as early postnatal period and day 8 to day 42 as late postnatal period (Mathai M. and Von Xylander Z. 2010). This case can be considered as a maternal death since it fits into the

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timeline of the aforementioned definitions with relevant postmortem and histological findings.

When considering the global picture, the risk of maternal mortality ranges from one in six in poorer countries to one in 30,000 in northern Europe and causes include severe bleeding, hypertensive diseases, and infections (Ronsmans et al., 2006). In Sri Lanka, the leading causes of maternal deaths are obstetric hemorrhage, cardiac diseases, respiratory diseases including influenza, hypertensive disorders, sepsis, malignancy, thromboembolism, amniotic fluid embolism, suicides, miscarriages, ruptured ectopic pregnancy, and acute fatty liver in pregnancy (Wijesinghe P. et al. 2019, Haththotuwa H. et al. 2009, Ariyaratna H. and Hulathduwa S. 2019, Senanayake H. et al. 2011). However, death from choking and aspiration of gastric contents in a postpartum period was not frequently recorded in previous literature. In a forensic viewpoint, a thorough postmortem investigation, incorporated with histological findings, support in the exclusion of the various causes of sudden death and ascertain the cause of death in such a case.

### Case presentation

A 27-year-old mother, who delivered her second baby by vaginal route following an uncomplicated pregnancy at a teaching hospital in Sri Lanka, was discharged on the following day after an uncomplicated immediate postpartum period.

On the next day at around 1:30 pm, she has had a rice-based meal and went to the bed to have a short sleep. At around 2:30 pm, her husband had noticed that she was struggling to breathe in the supine position and rushed to nearest primary care medical facility and was pronounced dead on admission. Her husband had noticed that she had become unresponsive on the way. Resuscitation was not initiated at the local hospital as she was already dead.

The home of the deceased was located in a rural area and had a good supportive household environment. The deceased had not suffered from any psychiatric, neurological condition, or gastroesophageal reflux disease. This was her second pregnancy, and her first pregnancy and postpartum period were uneventful.

### Autopsy findings

Body was well preserved until autopsy examination, and it was an averagely build Caucasoid young female of 154 cm in height and 53 kg in weight (body mass index — 22.3 kg m<sup>-2</sup>). There was no evidence of trauma, nutritional deficiencies, congenital abnormalities, or infections. Signs of asphyxia such as petechial hemorrhage, congestion, edema, and cyanosis were not identified on the head and neck region. The specific autopsy findings are summarized in Table 1.

Microbiological studies, toxicological screening for common poisons, therapeutic drugs, and drugs of abuse and vitreous analysis for electrolytes, glucose, and ketone bodies did not reveal significant abnormalities. Significant histological, microbiological, toxicological, and biochemical findings are summarized in Table 2.

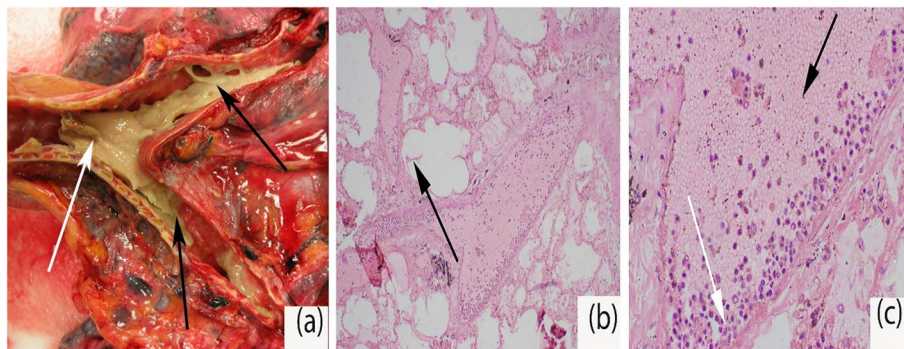
The cause of death was stated as airway obstruction consequent upon aspiration of gastric contents.

### Discussion

Choking is blockage of internal airways usually between pharynx and bifurcation of trachea by foreign bodies, food boluses, blood clots, and laryngeal pathology, and it can cause sudden unexpected deaths (Saukko P. and Knight B. 2016). Deaths from choking occur due to hypoxic manifestation, neurogenic shock, or excess catecholamine release from the adrenal response. However, the rapidity of collapse highlights the dominant role of reflex vagal inhibition over mechanical airway obstruction (Byard R. 2018). Choking due to aspiration of gastric content is not common in previously healthy persons.

**Table 1** Specific autopsy findings

Organ/system	Finding
Lungs and respiratory system	Weight: right lung — 350 g, left lung — 357 g No petechial hemorrhages in visceral pleura Partially digested gastric contents within trachea, bronchi, and well beyond the secondary bronchi (Fig. 1a) Respiratory mucosa — mildly inflamed No evidence of pulmonary thromboembolism and pulmonary infections
Heart	No petechial hemorrhages in epicardium. Normal artery circulation. Normal myocardium and valves
Stomach	Full with gastric contents — 800 ml of partially digested rice and curry No evidence of hiatal hernia, varices at the gastroesophageal junction, and inflammation at the lower esophagus. No gastric mucosal erosions and ulcerations
Uterus and genitourinary system	Uterus enlarged in size with a small amount of retained product of conception and blood clots No evidence of trauma at the vulva, vaginal canal, or cervix



**Fig. 1** Macroscopic appearance of respiratory passage showing gastric contents in trachea (white arrow) and the bronchial tree (black arrows) (a) and microphotograph of lungs H&E (10 × 0.25) (b) showing expanded alveoli with broken septa (black arrow) and (40 × 0.25) (c) showing bronchioles filled with eosinophilic materials (black arrow) and significant number of neutrophil infiltrations at the margin (white arrow)

**Table 2** Summary of lab investigations

Investigation	Findings
Histology	Bronchioles filled with eosinophilic material Neutrophil infiltrations at the margin with hematoxylin and eosin stain (Fig. 1c) Alveoli free from edema fluid and inflammatory cells Some alveoli were expanded with broken septa
Microbiology	Bacteriology and virology studies yielded negative
Toxicology	Negative for common poisons, therapeutic drugs, and drug of abuse
Vitreous analysis	Sodium — 140 mmol/l Potassium — 4.0 mmol/l Glucose — 40 mg/dl Ketone bodies — negative

However, neuropsychiatric conditions, alcohol intoxication, or sedative drugs can predispose an individual to end up in sudden death from choking consequent upon aspiration of food particles (Wick R. et al. 2006).

Gastric contents can be found in the airways in most of the decomposed bodies and occasionally in fresh bodies due to postmortem spillage and agonal aspiration. Differentiation between antemortem aspiration and postmortem spillage is a challenge for forensic pathologists (Saukko P. and Knight B. 2016). However, in our case, respiratory passage including trachea and bronchi showed mildly inflamed mucosa, and body was well preserved until autopsy examination. In postmortem spillage, gastric contents do not reach beyond the secondary bronchus (Agarwal S. et al. 2010). In the deceased of our case, gastric contents had reached well beyond the secondary bronchus, and a significant number of inflammatory cells had infiltrated the bronchiolar lumen. Expanded alveoli along with broken septa, as seen in this patient, may be caused due to forced expiratory effect against closed airways (Agarwal S. et al. 2010).

In this presented case, petechial hemorrhages were not seen over the epicardial surface and pleural surface. However, asphyxial signs are nonspecific findings as those may be absent in undoubted hypoxic deaths and might be present in some non-hypoxic deaths (Saukko P. and Knight B. 2016). The factors increasing the risk of aspiration associated with pregnancy include the gravid uterus, progesterone-mediated lower esophageal sphincter relaxation, lower gastric pH, and delayed gastric emptying (UK Obstetric Surveillance System 2016). Most of the above risk factors cease with the termination of pregnancy, but some residual effects persist in the immediate and early postpartum period, and these effects may contribute to gastric content aspiration (Thélin C. and Richter J. 2020) similar to our case.

A large amount of gastric contents, gastroesophageal reflux disease and hiatal hernia also contribute to gastric content aspiration (Brodsky J. and Lemmens H. 2011). In this patient, no history or postmortem evidences suggestive of gastroesophageal reflux disease and hiatal hernia were found. However, physiological sphincter action of the lower esophagus cannot be assessed during the autopsy. According to the recent clinical records, she had not suffered from gastroesophageal reflux disease. Effects of labor and opioid drugs are known to cause delayed gastric emptying in puerperium (Gin T. et al. 1991). It is possible that opioids and effects of labor have contributed to delayed gastric emptying in this patient. Based on the history and recent clinical records, she had not suffered from any neurological impairment, and there were no gross and microscopic abnormalities of the central nervous system. Extensive neuro-pathological examination may warrant identifying rare causes of aspiration, and such facilities are not available where this autopsy was conducted.

Postpartum hemorrhage and amniotic fluid embolism are known to cause sudden death in postpartum mothers, which can present as obstetric shock (Steiner, P. E., & Lushbaugh, C. C. 1986). However, in this case, such causes can be excluded since her immediate postpartum period was uneventful.

When considering sudden cardiac deaths, which contribute to a majority of sudden deaths, autopsy findings play a major role in ascertaining the cause of death. Coronary artery diseases and noncoronary artery diseases such as rheumatic heart disease, syphilis, hypertensive heart disease, myocarditis, acute aortic dissection, and cardiomyopathy show features of such conditions in gross examination and histological examinations to support the diagnoses (Sessa et al. 2021 and Banner et al. 2021).

Similar sudden death in pregnancy can occur with conditions like arrhythmogenic right ventricular cardiomyopathy/dysplasia (ARVCD). In such cases, fibro-fatty changes in the myocardium with associated inflammatory cell infiltration will be expected to see at the autopsy (Lynch M. and Noel W. 2008). However, in this patient, there was no demonstrable macroscopic or microscopic and toxicological evidence to explain the sudden death except the presence of gastric content throughout the large and small airways with microscopic evidence of inflammation. Evidence of inflammation excludes the postmortem spillage and agonal aspiration. Presences of inflammatory cells further exclude the immediate death by neurogenic shock in choking. History of sudden onset of breathing difficulty, risk factors of early postpartum period, and recent heavy meal were supportive for antemortem gastric content aspiration.

Majority of sudden deaths during the puerperium results from cardiovascular and gynecological conditions and holds medicolegal significance particularly if associated with criminal abortion or medical negligence (Vadysinghe A. et al. 2017). However, it should not be forgotten that physiological changes in pregnancy itself can predispose an individual to be ended up in a sudden death. As in this case, gastric content aspiration can present as an asymptomatic silent killer particularly in parturient mothers given their increased risk induced by physiological changes in pregnancy. Even though there are no well-established screening programs for such case identification, prevention of gastric content reflux can be done by simply following conservative measures such as lifestyle and dietary modifications (Vazquez J. 2015).

This case shows how the involvement of various disciplines would facilitate the investigation of a complex case (Ferrara M. 2019). Inputs from neurohistopathology and cardiachistopathology would have positively influenced the diagnostic procedure, and lacking of such involvement is a shortcoming in this case.

## Conclusions

This case highlights the importance of multidisciplinary approach and meticulous investigations of sudden unexpected deaths in puerperium to identify the cause of death to implement preventive measures with the view of further minimizing maternal mortality rate. Since every pregnant and postpartum woman has the potential of experiencing gastric aspiration, it is important to identify risk factors early in pregnancy and anticipate their effects during postpartum period implementing preventive measures by considering all of them as vulnerable. It is suggested to incorporate these measures in to the antenatal and postnatal care program.

## Abbreviations

H&E: Hematoxylin and eosin stain; ARVCD: Arrhythmogenic right ventricular cardiomyopathy/dysplasia.

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## Authors' contributions

ANV, TBN, and IB — autopsy and writing and editing the manuscript. RAEIP — writing and finalizing the case report. The authors read and approved the final manuscript.

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## Availability of data and materials

Not applicable.

## Declarations

### Ethics approval and consent to participate

All procedures performed in the study were in accordance with the ethical standards of the institution and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Ethical committee's reference number — not applicable. This is a case of autopsy which was done for medicolegal purposes. Therefore, written consent was obtained from the next of kin to use this case for academic purposes.

### Consent for publication

Not applicable.

### Competing interests

The authors declare that they have no competing interests.

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