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Report: Forensic Examination and Medicolegal Aspects in A Case of Death by Hanging

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Abstract

Abstract: Background: Suicide is a serious global health problem, with hanging being the most dominant method, including in Indonesia. Hanging causes asphyxia through airway obstruction, vascular compression, and vagus nerve stimulation. Risk factors include mental disorders, substance abuse, socioeconomic stress, and family problems. Clinical, forensic, and epidemiological studies are crucial to differentiate hanging from other forms of asphyxia and to develop effective prevention strategies to reduce mortality rates. Case Description: We report a case of death by hanging involving a 20-year-old woman. In this case, it is suspected that the victim's actions were motivated by psychological pressure that influenced her thoughts to end her life. The victim hanged herself using a scarf that she owned and did so in the ventilation of the bathroom door. Signs of suicide were also reinforced by the discovery of previous suicide attempts, in the form of incised wounds on the victim's lower arms and thighs. Ligature marks were found in the form of abrasions that crossed obliquely across the front of the victim's neck. The hanging was carried out by complete hanging because the victim's entire body was hanging freely. Based on the location of the knot, this case is classified as a typical hanging because the knot was located behind the neck. The possible mechanism of death was compression of the blood vessels and asphyxia. Conclusion: Death by hanging is a frequently reported form of suicide and is influenced by psychological and socioeconomic factors. Medicolegal forensic examination helps determine the mechanism and cause of death, which in cases of hanging is usually caused by compression of the neck blood vessels due to the ligature.

Keyword: *Forensic Examination, Medicolegal Aspects, Death Cases, Hanging*

INTRODUCTION

Suicide is one of the most serious global public health problems, with enormous social, psychological, and economic burdens. The World Health Organization (WHO) reports that more than 700,000 people die by suicide each year, making it the 17th leading cause of death globally and one of the main causes of death among young people. Indonesia is not exempt from this issue, as the prevalence of suicide has shown an increasing trend over the past decade in line with social changes, economic pressures, and mental health problems (Maharani et al., 2019).

The distribution of suicide cases is largely concentrated among the productive age group. Data indicate that about 46% of cases occur in the 25–49 age range, while 75% occur among individuals aged 15–64 years. This makes suicide a significant cause of the loss of human potential and productivity (De Simone et al., 2024). Furthermore, the mortality rate due to suicide is higher among men than women, even though suicide attempts are more frequently reported among women.

Methods of suicide vary according to cultural background, availability of means, and social factors. However, one of the most frequently found methods is **hanging**. Various studies have noted that this method accounts for more than 50% of suicide cases in many countries, reaching

up to 60.9% in some reports (De Simone et al., 2024). The high frequency of hanging is attributed to its easy accessibility, the lack of need for special tools, and the belief among individuals that it has a high success rate. A cross-country review reported that hanging is most commonly used by men (53%) and by women at a rate of 39% (Maharani et al., 2019).

Several studies show that hanging is the most common suicide method in Indonesia. A psychological autopsy study in Bali reported that 68.3% of suicide cases involved hanging (Maharani et al., 2019). Research in Jakarta found that 55.1% of suicides used hanging, while in elderly populations in Gunungkidul, Yogyakarta, the figure reached as high as 96.2%. These findings confirm that hanging is the dominant method of suicide in Indonesia and requires serious attention from both prevention and forensic perspectives (De Simone et al., 2024).

Medically, hanging is defined as death due to asphyxia resulting from obstruction of the airway and blood flow to the brain caused by external pressure on the neck from a ligature or similar object (De Simone et al., 2024). This pressure occurs due to the victim's body weight, either from full or partial suspension. The pathophysiological mechanisms involved include airway obstruction, compression of the carotid arteries and jugular veins, and vagal nerve stimulation, which may cause sudden cardiac arrest (Maharani et al., 2019).

Cases of hanging are significant not only medically but also for their forensic, social, and psychological implications. From a forensic standpoint, it is essential to distinguish hanging from other forms of asphyxia such as strangulation or mechanical compression of the neck. A thorough examination is necessary to determine the true cause of death and to rule out the possibility of homicide disguised as suicide (Maharani et al., 2019).

Risk factors for hanging suicide are diverse, including mental health disorders such as depression, schizophrenia, and anxiety; substance abuse; socioeconomic stress; family problems; and traumatic experiences. In addition, cultural and environmental factors influence the choice of suicide method (Indrayathi et al., 2019).

Given the complexity of the issue and the high incidence rate, studies on hanging suicide are crucial not only for clinical and forensic purposes but also for developing more effective prevention strategies (Indrayathi et al., 2019). A comprehensive understanding of the epidemiology, mechanisms, clinical and pathological signs, and underlying risk factors of hanging suicide cases can contribute significantly to efforts to reduce suicide-related mortality (Maharani et al., 2019).

The urgency of this case report arises from the fact that hanging is one of the most frequent methods of suicide both globally and in Indonesia, causing broad impacts from medical, legal, social, and public health perspectives (Indrayathi et al., 2019). Systematic documentation of case chronology, forensic findings, and risk factors is essential not only to assist medical and law enforcement personnel in case analysis but also to provide valuable data for epidemiological research and prevention strategies. Moreover, information on victim characteristics, event patterns, and environmental factors can be used to design targeted interventions such as early detection, counseling, and public policy, while ensuring legal justice by distinguishing suicide from accidental or criminal causes (Indrayathi et al., 2019).

Case Report

The body of a 20-year-old woman with the initials HNA was brought by officers from the Gubeng Police Sector to the Forensic Medicine Department of Bhayangkara Hospital H.S. Samsoeri Mertojoso, East Java Regional Police, on Tuesday, August 19, 2025, from 20:46 to 21:52 WIB, for a *Visum et Repertum* examination. According to the written request, the deceased was found by her friend in her rented room. Upon discovery, she was found hanging with a scarf tied around her neck.

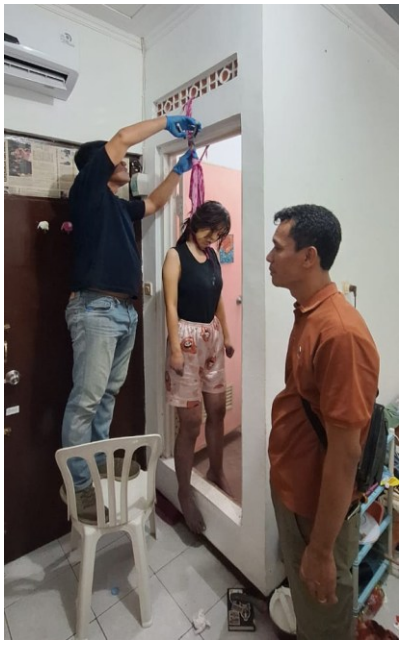


Figure 1. Crime scene investigation of a female student who hanged herself.

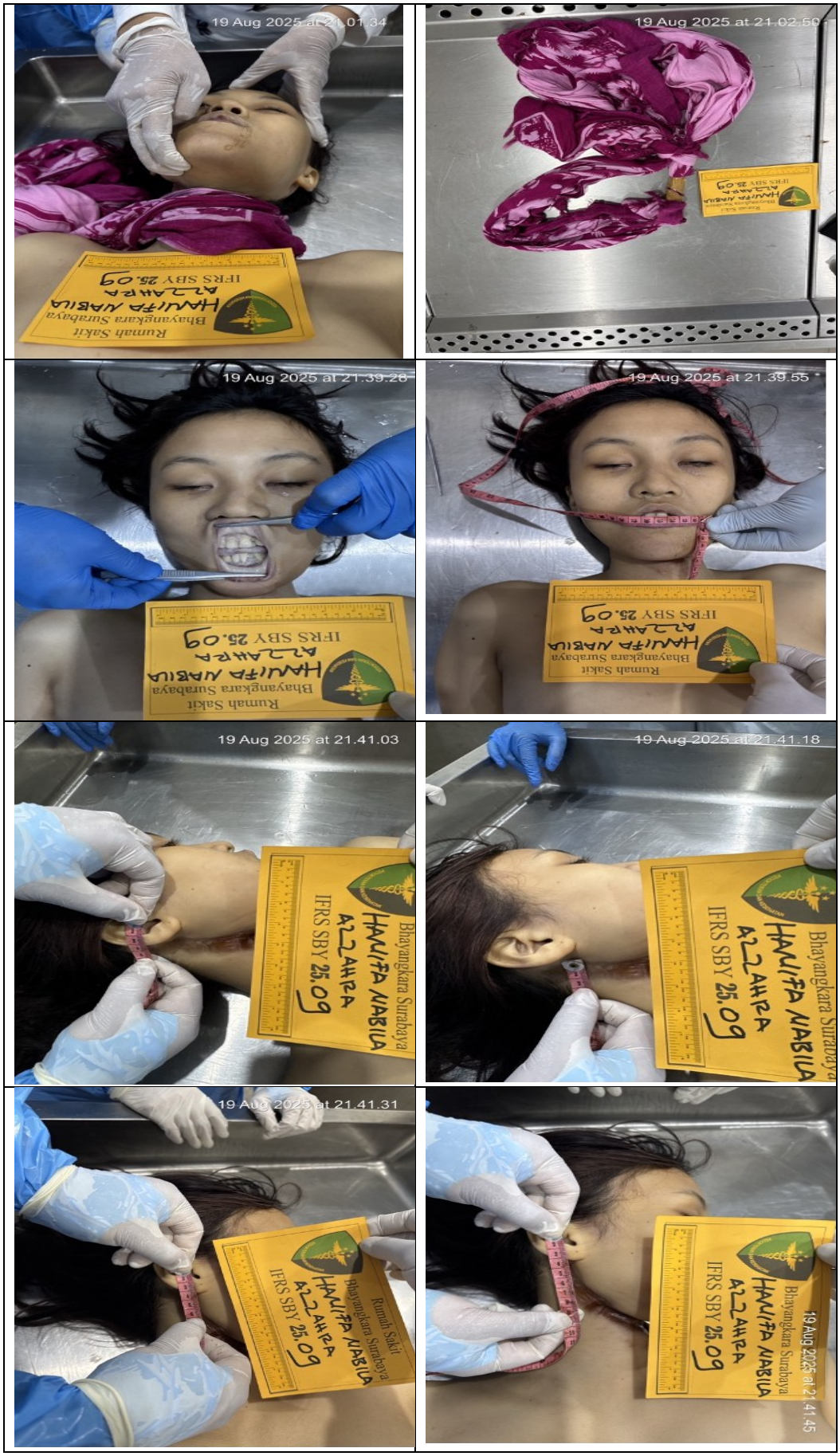
The following are the results of the external examination of the body:

In the general identification, a female corpse was found with a body length of 168 cm, an estimated age of around 20 years, medium brown skin tone, adequate nutritional status, and a body weight of approximately 50–60 kg. The victim had long, straight black hair with dye, averaging 32 cm in length. The victim was found wearing a black sleeveless Adidas undershirt, pink shorts with a face pattern and no brand, black underwear with a sanitary pad containing brownish bloodstains still attached, and a black unbranded bra. In addition, a pink scarf with a leaf pattern was found tied and wrapped around the victim's neck, extending from the front to the back.

On external examination of the body, signs of death were observed in the form of postmortem lividity that disappeared upon pressure in the areas below both nipples, lower legs, waist, buttocks, and fingers down to the palms of both hands. Rigor mortis was present in some joints of the body. No signs of decomposition were found.

In the mouth area, bluish discoloration was observed on the lips. On the neck area, a pink scarf was found wrapped once around the neck with a live knot. Four centimeters below the right ear canal, a brownish pressure abrasion was found, 2 cm in width, continuing forward under the chin with a width of 2 cm, extending to 9 cm below the left ear canal, with a total wound length of 24 cm. On the upper right teeth, the first and second molars were missing; on the upper left teeth, the third molar was missing; on the lower right teeth, the first and third molars were missing; and on the lower left teeth, the third molar was missing.

A wound was found on the front side of the upper left arm, 9.5 cm above the left wrist, showing a horizontal incised wound measuring approximately 2–4 cm in length. On the front side of the lower right leg, 10.5 cm below the right hip bone protrusion, a horizontal incised wound was found measuring approximately 0.8–8 cm in length.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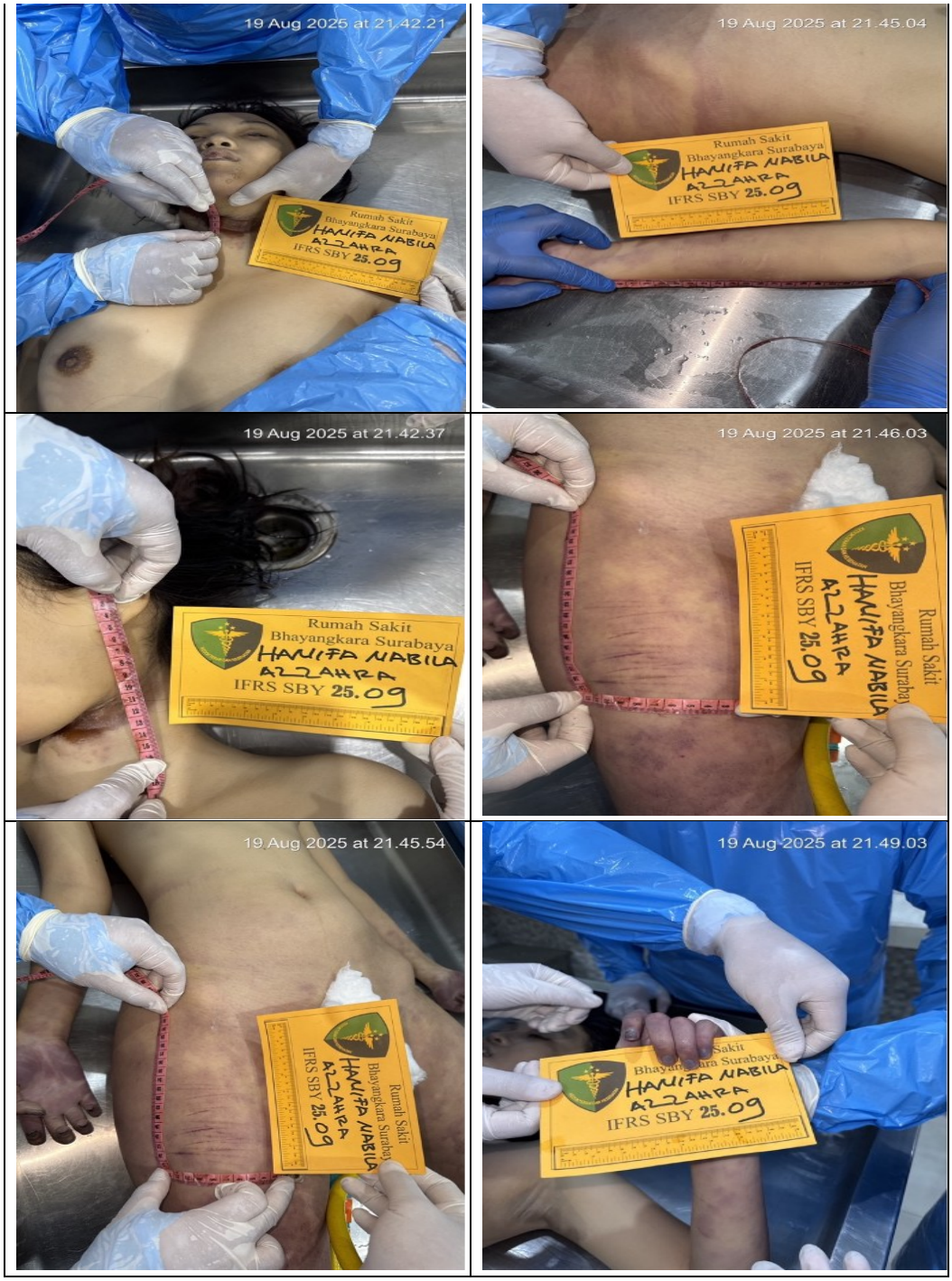
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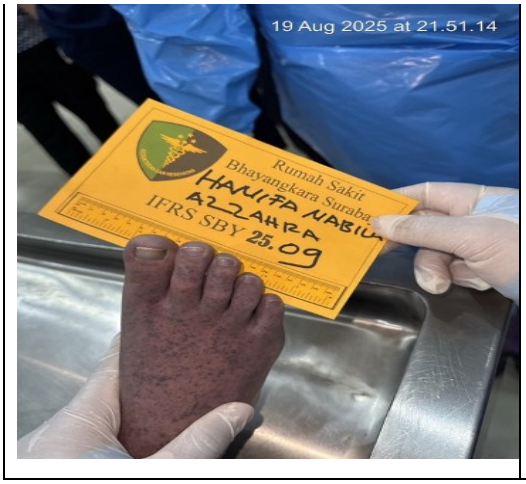

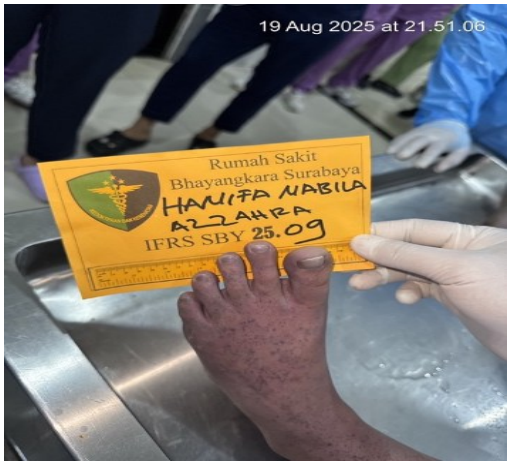

DISCUSSION

Hanging is defined in forensic literature as asphyxial death due to a suspensory ligature causing compression of the blood vessels, airway, and/or cervical nerves. In the epidemiological practice of suicide, this term is often grouped under the strangulation/suffocation category and coded separately from self-poisoning or mechanical trauma, so understanding the mechanism is very important for interpreting mortality figures and prevention interventions. Globally, suicide remains a major public health problem; WHO estimates hundreds of thousands of deaths per year (more than 700,000 per year according to the 2019/2023 global summary), and suicide is one of the leading causes of death among adolescents and young adults. The pattern of methods varies greatly by country and the availability of means.

In terms of method, cross-country and systematic reviews consistently find that hanging is one of the most common methods in many countries. Several multi-country analyses show that hanging accounts for the largest proportion of suicide deaths, and men tend to have higher suicide mortality rates than women. Specific studies on the epidemiology and prevention of hanging highlight that this method has high fatality, is difficult to prevent at the time of the act (as it often results in rapid death), and that changes in method trends (e.g., shifts from poisoning to asphyxial methods) can occur along with social changes and access to means.

In Indonesia, the most comprehensive evidence currently available comes from the new national statistical profile (Onie et al., 2024), which combines several sources (civil registry, police, SRS, hospital studies) to reconstruct more realistic estimates. Key findings indicate that hanging and self-poisoning are the most frequently reported methods. Onie et al. (2024) found an estimated under-reporting of ~859.10% (95% CI reported in the paper), meaning the coverage of official reports (which capture only a small fraction of cases) is estimated at around 12.8%, and with additional surveillance (verbal autopsy & improved quality control), coverage can rise to around 51.4%. The important implication is that official figures greatly underestimate the true burden of suicide in Indonesia. The authors also reported a female-to-male sex ratio of approximately 1:2.11 and identified provinces with the highest rates (e.g., Bali, Riau Islands, Yogyakarta, Central Java, Central Kalimantan), as well as clear urban–rural differences in case distribution.

In more detail, the analyzed data show that the proportion of methods varies by local context. In many national and SRS series, the majority of suicide deaths were recorded as hanging (e.g., reported rates of ~60% in several datasets reviewed by the authors), while poisoning (including pesticides) and other methods (jumping, sharp weapons) accounted for smaller but still relevant proportions in certain agrarian areas. National prevention emphasis and consortia highlight that without improved recording (e.g., integration of hospital, police, civil registry, and verbal autopsy data), method-specific rates and per-100,000 rates will remain

downward biased, making intervention planning (e.g., pesticide access restriction vs. public environment design to prevent hanging) difficult to optimize without accurate data.

The forensic and clinical aspects of hanging cases require careful examination—complete hanging shows ligature marks, the presence of internal injuries (e.g., hemorrhage in neck tissue), and body position patterns can provide clues as to whether the death was self-inflicted, caused by another person, or accidental (Frontiers in Neurology, 2023). Psychological-forensic methods such as the psychological autopsy have been promoted to understand motives, underlying mental illness, and social factors of victims, but implementation in Indonesia remains limited by capacity, resources, and practical doubts. General literature on psychological autopsy explains its methods, strengths, and limitations, and can therefore serve as a reference for field development.

Several sociodemographic risk factors consistently appear in local and global analyses. Male gender, adolescent-young adult age, relationship/family problems, mental disorders (depression, bipolar disorder, substance abuse), economic problems, and access to suicide means are important determinants. In addition, social stigma against suicide and religious/cultural taboos that categorize suicide as disgraceful can influence how families report causes of death, worsening under-ascertainment. Effective population-level interventions are supported by international evidence, including means restriction, optimization of primary mental health services, anti-stigma campaigns, as well as screening programs and crisis pathways, and these principles are adapted in Indonesia's national suicide prevention strategy developed by stakeholders.

From a policy perspective, practical recommendations emerging from international evidence and national reviews include: (1) strengthening death information systems through data integration between civil registries, hospitals, forensics, and police, as well as the use of verbal autopsy in areas with weak recording; (2) training forensic teams and primary health workers to detect, document, and refer suicide attempt cases; (3) implementing contextually relevant means restriction (e.g., pesticide regulation and safe storage in agricultural areas, public environment design reducing hanging points/access); and (4) expanding accessible mental health services and 24/7 crisis lines, especially for high-risk groups—all these steps are supported by WHO guidelines and Indonesia's national prevention review (WHO, 2021).

In this case, the victim was a 20-year-old female who died by hanging. In this case, it is suspected that the act was carried out by the victim due to psychological pressure that affected her thoughts to end her life. In addition, the victim's choice to use the hanging method was influenced by the ease of access to this suicide method. The victim hanged herself using a scarf that she owned and did it on the air ventilation of her bathroom door. Signs of suicide were also reinforced by the discovery of previous suicide attempts, indicated by incised wounds on the victim's lower arm and thigh.

Hanging cases almost always require forensic examination to determine the cause of death, distinguishing between suicide, homicide (homicidal hanging), or accident (auto-erotic asphyxia, accidental hanging in children/workers). Characteristic autopsy signs include an oblique, incomplete ligature mark usually high on the neck in suicide cases. In contrast, in homicidal ligature cases, the ligature mark may be more horizontal and completely encircle the neck (Diagn Histopathol, 2025). This distinction is important in medicolegal aspects, as it determines whether the case is closed as suicide or investigated as homicide.

According to the near-hanging review by Kannamani et al. (2024), the main mechanism involved is external pressure on the neck due to body suspension, producing structural compression of veins, arteries, and respiratory structures such as the larynx/trachea. Compression of the jugular veins and impaired venous return from the head cause cerebral congestion and rapid reduction in cerebral oxygenation. Then, if pressure is sufficient, the carotid or vertebral arteries are also compressed, drastically reducing brain perfusion and accelerating

loss of consciousness. This mechanism is reinforced by vagal reflexes that can be triggered if the ligature presses the carotid sinus, causing a drastic decrease in heart rate or even cardiac arrest. Besides vascular and reflex effects, airway obstruction (particularly if the larynx or trachea is directly affected) contributes to hypoxia and hypercapnia, though it is often secondary to vascular compromise. Studies also show that in near-hanging cases, victims who survive to hospital still have high risks of pulmonary (including edema) and neurological injury due to hypoxic periods, even if initially appearing stable.

An observational autopsy study of 46 hanging cases (February 2023–June 2024) reported gross and histopathological findings including clear ligature marks, neck tissue edema and hemorrhage, and histological changes in the skin layers and tissues around the ligature mark, strengthening that the injury occurred during life (anhit)/antemortem. Physiological changes in veins and local tissue appeared significant in cases where the ligature mark compressed neck soft tissues for a prolonged time (Epidemiology and Outcome Study, 46 Cases, 2023–2024).
The study "Death by hanging: examination of autopsy findings and best approach to the post-mortem examination – an update" (Diagn Histopathol, 2025) explains that the diagnosis of death and determination of manner must consider a combination of findings such as ligature location, whether the ligature mark is flat, the presence of cartilage injury or fracture, the presence of hemorrhage in neck tissues, and brain evidence such as cerebral edema, as well as correlation with scene evidence. In forensic contexts, thyroid/hyoid fractures occur more often in hanging with strong traction or complete suspension, while partial hanging often shows ligature marks only without fractures.

A scoping study on cardiac arrest due to hanging, "Epidemiology and outcome predictors in 450 patients with hanging-induced cardiac arrest" (2023), found that poor prognostic factors include prolonged cardiac arrest, arrest upon hospital arrival, and severe neurological hypoxia; mechanisms of death in these cases involve combined brain damage from oxygen deprivation, cardiovascular failure, and in some cases vagal reflexes worsening the situation (bradycardia/arrest) (Frontiers in Neurology, 2023).

In this case, a ligature mark was found in the form of an abraded wound crossing obliquely across the front of the victim's neck. This occurred due to the scarf ligature applied by the victim. The hanging was a complete hanging because the victim's body was fully suspended without touching the floor or ground. Based on the knot location, this case falls into typical hanging because the knot was located behind the neck. The likely mechanism of death was vascular compression and asphyxia. However, the exact cause of death could not be confirmed because no internal examination (autopsy) was conducted.

Internal examination in hanging cases also includes evaluation of internal injuries, such as hemorrhage in neck muscles (sternocleidomastoid, strap muscles), fractures of the hyoid bone and thyroid cartilage, and petechiae on the conjunctiva. Hyoid fractures are more commonly found in elderly victims (>40 years) due to bone fragility, and this finding can be important evidence to distinguish hanging from ligature strangulation (Knight & Saukko, 2016). From a legal perspective, every death suspected to be due to hanging must be treated as an unnatural death until proven otherwise. This means it must be reported to the police, and a forensic autopsy is required to determine the cause and manner of death. In Indonesia, this obligation is regulated in the Criminal Procedure Code (KUHAP) articles 133 and 134, which require doctors to perform *visum et repertum* upon investigator request in unnatural death cases (Soerjono & Sulistyowati, 2019).

In addition to physical examination, psychosocial aspects are also important. Psychological autopsy is a modern medicolegal investigative method to uncover the victim's mental condition before death, stress history, and suicide risk factors. Its implementation in Indonesia is still limited, but several forensic studies have recommended it as an important step to complement medicolegal and public health data (Widyarso et al., 2022). The medicolegal

aspect of hanging also touches on life insurance issues. In many jurisdictions, life insurance claims can be denied if death is proven to be suicide within a certain period after policy activation (for example, 1–2 years), making clarity of forensic diagnosis between suicide and accident very important. From a public health perspective, accurate medicolegal reporting affects not only legal processes but also national mortality statistics. WHO emphasizes the importance of consistent ICD-10 coding (X70 for hanging) based on forensic evidence, since suicide under-reporting often results from families rejecting the suicide label due to stigma or administrative reasons (WHO, 2021).

CONCLUSION

Death due to hanging is one of the most frequently reported suicide cases. Suicide cases, especially in the context of hanging, are often influenced by various factors, particularly psychological and socioeconomic factors. Forensic and medicolegal examinations in this case can help determine the mechanism and cause of death. In suicide cases by hanging, the cause of death is generally due to compression of the blood vessels caused by the ligature around the neck.

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