

# A Prospective Autopsy Study of Hanging Deaths Among Individuals Aged 15–60 Years at Tirunelveli Medical College

Sakthivel K<sup>1</sup>, Arun Balan M<sup>2</sup>, Pary Prasath M<sup>3</sup>, Kaviya K<sup>4</sup>, Arun Kumar M<sup>5</sup>

<sup>1,2,3</sup>Assistant Professor, Department of Forensic Medicine, Madurai Medical College, Madurai, <sup>4,5</sup>Junior Resident, Department of Forensic Medicine, Madurai Medical College, Madurai.

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## Abstract

**Background:** Hanging is one of the most common methods of suicide worldwide, posing significant forensic and medico-legal concerns. This study aims to analyze autopsy findings in hanging cases, focusing on ligature marks, types of hanging, and knot positions.

**Methods:** This prospective observational descriptive autopsy-based study was conducted over one year at Tirunelveli Government Hospital, Tamil Nadu. A total of 150 cases of hanging were examined. A purposive sampling method was used, including individuals aged 15–60 years. Detailed autopsy findings, including ligature material, neck compression patterns, and other forensic parameters, were recorded and analyzed.

**Results:** The study provides insights into the distribution of hanging cases concerning age, gender, type of hanging, ligature material used, and knot positioning. The forensic observations contribute to understanding the trends and medico-legal implications associated with hanging deaths.

**Conclusion:** The findings emphasize the need for awareness and preventive measures to address suicide by hanging. This study aids forensic experts in distinguishing suicide from homicidal hanging and other forms of asphyxial deaths.

**Keywords:** Hanging, Ligature Mark & Material, Suicidal Thoughts

## Introduction:

In India, one of the most common methods of suicide is hanging. Tirunelveli is one of the most highly populated areas in Tamil Nadu, with an approximate population of 6 to 7 million. Due to population explosion, poverty, and increasing stress and strain in our daily lives, we frequently come across cases of suicide.

“Death is an inevitable aspect of life, but among living beings, only humans exhibit the capacity to end their own lives through suicide.” There are many methods for committing suicide, like poisoning, hanging, self-immolation, and drowning, etc. Hanging is one of the most common, as the materials necessary are easily available and have

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**Corresponding Author:** Kaviya K, Junior Resident, Department of Forensic Medicine, Madurai Medical College, Madurai.

**E-mail:**

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of high success rate. Hanging is a form of asphyxia caused by body suspension by a ligature around the neck, the constricting force being the body's weight (complete hanging) or part of the body's weight (partial hanging).<sup>1</sup>

The term typical hanging is applied when the point of suspension is placed centrally over the occiput, i.e., the knot is at the nape of the neck on the back. If the point of suspension is at any other position, then the term atypical hanging is often applied.

Hanging materials were easily accessed, and respondents considered it 'simple' to perform without the need for planning or technical knowledge. Hanging was thus seen as the 'quickest' and 'easiest' method with few barriers to completion and sometimes adopted despite not being a first choice<sup>3</sup>.

"Psychological distress is a significant factor contributing to suicidal tendencies, as evidenced by various mental health studies."

By careful recording of the circumstances of the hanging case, any readily available material may be used as a ligature in cases of hanging. Common ligatures include soft fabrics such as dhotis (a traditional Indian men's garment), sarees (a long piece of cloth worn by women), or bed sheets. In many instances, individuals use whatever material is easily accessible at the location, as suicide by hanging is often an impulsive act.

To enhance understanding, here are images of the commonly used ligature materials:

1. **Dhotis** – A traditional Indian garment worn by men, often made of cotton.

Photographs: Below Photographs are Collected From Investigating Officers who Brought the Cases for Autopsy in Thirunelveli Medical College Morgue



**Figure No 1: Dhoti as Ligature Material, in Thirunelveli Medical College Morgue**

2. **Sarees** – A long-draped garment worn by women, typically made of silk, cotton, or synthetic fabrics.



**Figure no 2: Saree as Ligature Material, in Thirunelveli Medical**

3. **Bed sheets** – Readily available household items often used in impulsive acts of self-harm.



**Figure No 3: Using Towel and Lungi as Hanging Material, in Thirunelveli Medical College Morgue**



FIGURE NO.4. SHOWS PLASTIC COIR AS LIGATURE WITH LIGATURE NOTED IMPRESSION IN THIRUNELVELI MEDICAL COLLEGE MORGUE

### Review of Literature:

1. Choice of Method – Preference for Hanging Biddle et al. (2010)<sup>(3)</sup> conducted a qualitative study and observed that hanging was perceived as a quick, easily accessible, and painless method of suicide, requiring minimal preparation. This aligns with our findings, where commonly available ligature materials such as sarees and bedsheets were used, indicating impulsivity and ease of execution.
2. Epidemiology and Age Distribution Meel (2006)<sup>(4)</sup> reported a high frequency of suicide by hanging among young adults in South Africa, consistent with our study, where the majority of cases (45.33%) occurred in the 21–30 years age group. Similarly, the NCRB (2010)<sup>(5)</sup> data emphasized that a large proportion of suicides in India occur in reproductive age groups, particularly males in their 20s and 30s, matching our demographic findings.
3. Male Predominance in Hanging Robert and Pauline (2000)<sup>(8)</sup> highlighted that males are more prone to hanging, especially in the context of youth suicide. The study also revealed a male-to-female ratio of 2:1, supporting this gender disparity.
4. Impulsivity and Material Availability David et al. (2005)<sup>(7)</sup> in their systematic review found that ligature choice was primarily dictated by availability, with bedsheets and clothing items commonly used. The findings showed sarees (46%) and dupattas (40.67%) as the most used materials, emphasizing impulsive acts with accessible means.
5. Knot Position and Hanging According to Saini et al. (2005)<sup>(11)</sup>, the knot position and hanging type can offer insight into the manner of death. The study found atypical hangings to be more frequent than typical ones (38.3% vs. 11.67%) and detailed the predominance of ligature marks above the thyroid cartilage.
6. Motive and Socio-cultural Factors Sharija et al. (2011)<sup>(10)</sup> in Kerala reported that marital disharmony and family conflicts were leading causes of suicide by hanging, comparable to our findings, where 43% of cases were attributed to marital discord, followed by financial problems and unemployment.
7. Regional Trends in India Ahmad and Hossain (2010)<sup>(9)</sup> emphasized that hanging remains the most common method of suicide in rural South Asia due to simplicity and fatality.

**Objectives:** The objectives of the study are the following:

1. To study the incidence of hanging deaths reported at Tirunelveli Medical College
2. Age and sex distribution, and other socioeconomic factors of the deceased in hanging cases.

### Design:

This study is a prospective autopsy-based analysis conducted over one year at Tirunelveli Government Hospital (GRH), Tirunelveli, Tamil Nadu.

**Sample Size:** A total of 150 deceased individuals who died due to hanging were included in the study.

**Sampling Technique:** A purposive sampling method was employed, in which all cases of hanging autopsies at Tirunelveli Medical College during the study period within the age group of 15–60 years were included.

**Sources:** The study analyzed different types of hanging, ligature marks, ligature materials, and the position of knots in deceased individuals brought for autopsy from Tirunelveli and nearby districts. The analysis was conducted using SPSS 16, and the results were presented in terms of percentage and mean.

Descriptive statistics were used, and statistical significance was tested using the chi-square and z-test. All the statistical procedures were performed on separate data collection sheets using SPSS 16 software and run under Microsoft Windows XP.

**Research Gap:** While numerous studies have explored the forensic aspects of hanging, there remains a lack of region-specific data, particularly in the southern districts of Tamil Nadu. Existing research primarily focuses on broad epidemiological trends, but detailed autopsy-based studies analyzing ligature marks, knot positioning, and ligature material variations are limited. Furthermore, the influence of socio-economic and cultural factors on hanging cases remains underexplored.

**Need for the Study:** Understanding the forensic characteristics of hanging is crucial for accurate medico-legal investigations. This study aims to bridge the research gap by providing detailed autopsy-based findings, which can assist forensic experts, law enforcement agencies, and policymakers in developing preventive measures. The study will also contribute to distinguishing suicidal hangings from homicidal cases, ensuring more precise forensic interpretations.

**Results**

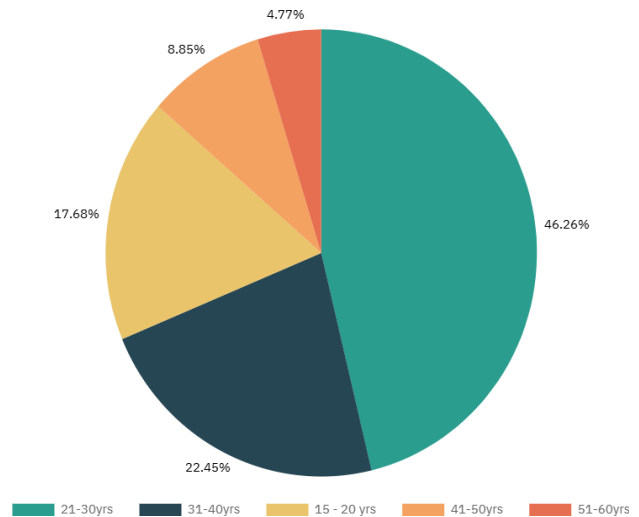
The results were documented retrospectively in an autopsy-based study. In the majority of the hanging cases, there were Male victims in 100 cases. Most of the victims were in the age group of 21-30 years, 69(45.33%). The motive of the suicidal thoughts mainly belonged to the marital harmony, 64 cases (43.3%), saree was commonly used ligature material than others. Most of the hangings are atypical and complete types. The most common Point of suspension used was the ceiling rod in 75 cases (49.57%). Characteristics of Ligature marks are, in most cases, prominent, and the level of ligature marks is above the thyroid cartilage in 123 cases (82%). In this study, only 6 cases had hyoid bone fracture; it is also a standing hanging case with a long period of suspension time.

A total of 150 deceased victims’ autopsy reports were analysed, and the following results were found.

**Age Wise Distribution:**

The distribution of study subjects according to age is depicted in Figure 1.

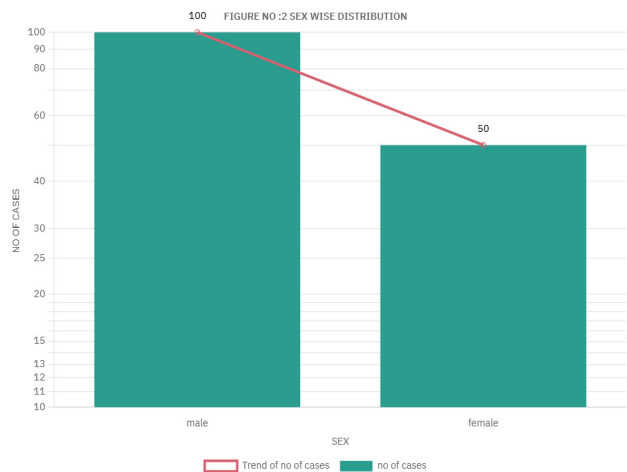
The most vulnerable age for hanging is found to be between 21 and 30 years, wherein 45.33% of deaths occurred. The next vulnerable age group is 31-40 years, in which 22% of deaths occurred.



**Figure No 1: Age Wise Distribution**

**Sex Wise Distribution**

The male-to-female ratio is 2:1. Males outnumbered the females in the present study (66.81% are males and 33.19% are females).



**Figure No 2: Sex Wise Distribution**

**Motive**

In the present study, marital disharmony was claimed by 43%. Financial problems accounted for 12.94%, and chronic physical pain accounted for 18%. Other motives behind hanging were love failure (9%), unemployment(10.11%), and psychiatric(6.89%).

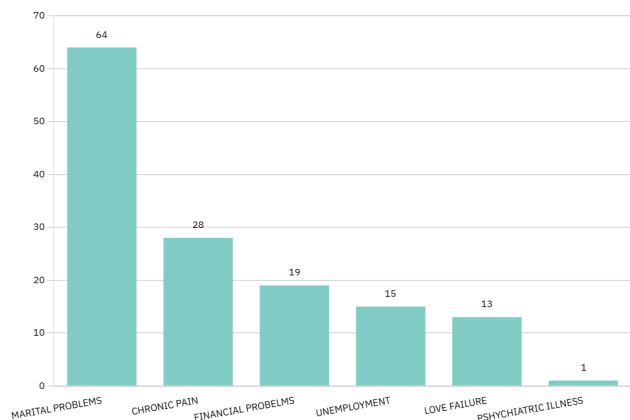


Figure No 3: Motives for Death

**Ligature Material**

When we compare ligature material, sarees were used frequently for hanging and accounted for deaths (46%), and also other ligature materials like Dupatta (40.67%). Plastic rope was used in 20% of the cases. Dhoti (14.67%) and (0.62. %). Electric wire;(10.67%) coir rope as ligature material.

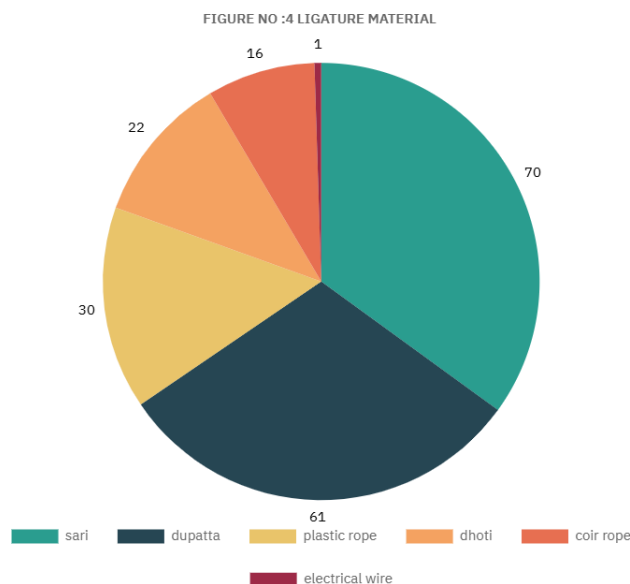


Figure No 4: Variants of Ligature Material

**Point of Suspension**

Most of the people in the study population are choosing a ceiling rod(49.57%) as a point of suspension, followed by a ceiling fan (43.54%). The rest of the points of suspension were trees (2.58%) and other suspension points like window grills, staircase handles, and door handles, which accounted for 4.31%.

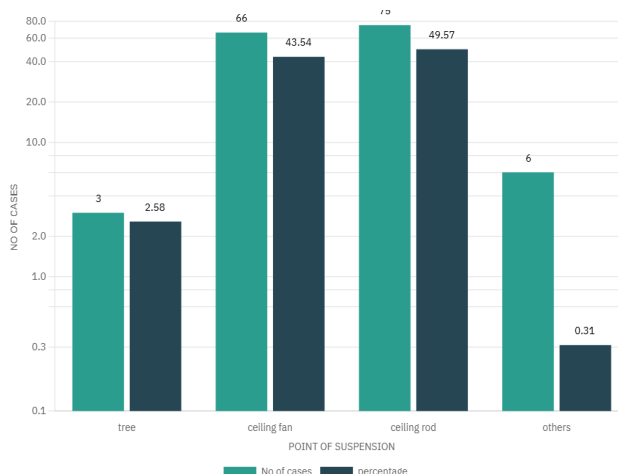


Figure No 5: Point of Suspension material

**Type of Hanging**

Hanging deaths can be categorized based on their execution into typical/atypical and complete/partial types. In this study, atypical hangings (38.3%) were the most common, followed by complete hangings (32.6%), partial hangings (17.33%), and typical hangings (11.67%). Among males, 17.33% of cases involved typical hanging.

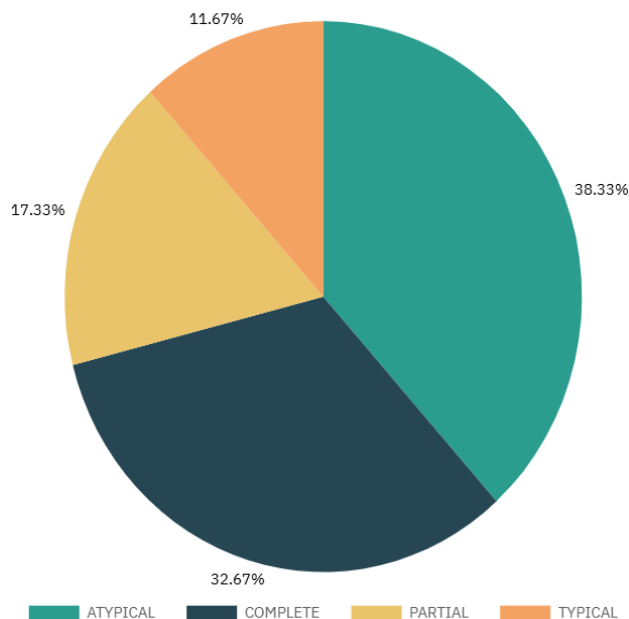
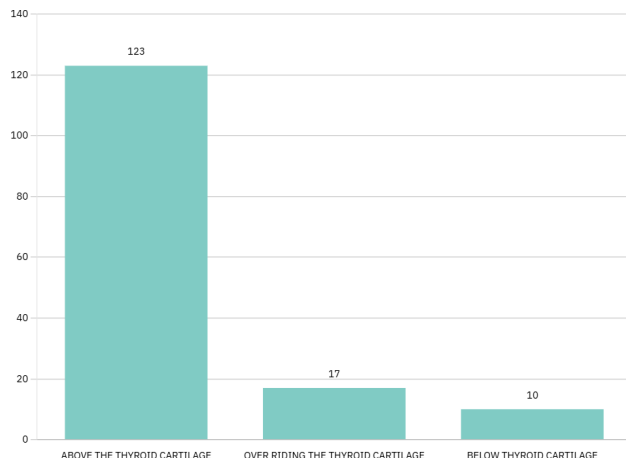


Figure No 6: Types of Hanging

**Level of Ligature Mark**

In the present study, it is observed that in 82% of cases, the level of the ligature mark was above the thyroid cartilage, below the thyroid cartilage in

6.67% of cases, and overriding the thyroid cartilage in 11.33% of cases.



**Figure No 7: Level of Ligature Mark**

**Fracture of the Hyoid Bone**

In the present study, no fracture was noted in 144 cases. Fracture of the great cornu of the hyoid bone on the right was observed in 6 cases. The reason is that the fracture increases with age, a high level of ligature marks on the neck, increased duration of suspension, and with a thin, hard ligature material.

**Table No 2: Fracture of Ligature Mark**

FRACTURE OF HYOID BONE	
PRESENT	6
ABSENT	144

**NEW AND UNEXPECTED FINDINGS**

Atypical hanging was more prevalent than typical hanging, challenging conventional forensic expectations.

The majority of ligature marks were found above the thyroid cartilage, suggesting that a predominant hanging technique was used in the study population.

A significant proportion of cases involved ligature materials like sarees and bedsheets, highlighting the accessibility and impulsive nature of the act.

Contrary to previous studies, a noticeable number of cases were found in certain socio-economic groups, indicating possible socio-cultural or economic stressors influencing the choice of hanging as a method of suicide.

**IMPLICATIONS OF THE STUDY**

This study offers several critical forensic insights and practical implications for understanding hanging deaths in the Tirunelveli region:

**Enhanced Crime Scene Analysis:** The identification of commonly used ligature materials (sarees, bedsheets) and the predominance of atypical hanging can improve forensic investigations by helping experts distinguish between suicidal and homicidal hangings.

**Region-Specific Forensic Profiling:** The study provides crucial data specific to the southern districts of Tamil Nadu, bridging a significant research gap. It highlights socio-economic factors influencing suicide, including marital discord, financial problems, and mental health issues.

**Standardization of Post-Mortem Protocols:** Understanding the distribution of ligature marks (predominantly above the thyroid cartilage) can guide forensic pathologists in accurately documenting and analyzing hanging cases.

**Mental Health Interventions:** The findings emphasize the importance of targeted mental health support, particularly for young adults aged 21-30 years, who were most vulnerable in this study. Awareness campaigns and counseling should focus on this demographic.

**Policy Recommendations for Suicide Prevention:** Given the socio- demographic patterns identified, policymakers can develop region- specific suicide prevention strategies, including educational programs and mental health support in workplaces.

**Educational and Training Applications:** The study’s findings can serve as a reference for forensic training programs, helping professionals recognize specific hanging characteristics and improve their diagnostic accuracy.

**Further Research Directions:** This study highlights the need for further research into the socio-cultural factors influencing suicide methods and the psychological triggers among different age groups.

**Discussion**

The present study analyzed 150 cases of hanging deaths in the Tirunelveli region, with the majority of

victims being males (66.81%) and predominantly in the 21–30 years age group (45.33%). These findings are consistent with earlier studies, such as the work by **Biddle et al.**<sup>11</sup> and **Ahmad & Hossain**, which also report a higher incidence of hanging among young adult males, highlighting socio-economic and psychological stress as significant contributing factors.

The predominance of atypical hangings (38.3%) in this study contrasts with some traditional forensic reports where typical hangings (knot at the nape) were more frequent (**DiMaio & DiMaio**<sup>2</sup>). This discrepancy may be due to cultural or regional differences in ligature material use and methods of suspension, which our study detailed with sarees and bedsheets being common ligatures.

Ligature marks were most commonly located above the thyroid cartilage (82%), aligning with findings from **Reddy**<sup>1</sup>, who noted that the ligature mark's position often depends on the knot placement and the type of suspension. The occurrence of hyoid bone fractures was low (4%), consistent with studies suggesting fractures increase with age and the use of harder ligature materials (**Meel**).

The primary motives identified—marital disharmony (43%), financial problems, and psychiatric illness—reflect socio-cultural stressors specific to this region and corroborate findings by **Sharija et al.**<sup>1</sup> in Kerala, indicating that family and economic pressures are common precipitants for suicide by hanging in southern India.

The point of suspension, predominantly ceiling rods and fans, reflects the accessibility of hanging points in domestic settings, which is similar to observations made by **Robert & Pauline**. This highlights the impulsive nature of many hanging suicides and suggests potential preventive measures focusing on restricting access to common suspension points.

Overall, the study reinforces the need for culturally sensitive suicide prevention programs tailored to young adults in the region, emphasizing mental health support and community awareness. Future studies could explore in-depth psychological profiling and longitudinal follow-ups to better understand the underlying causes and prevention strategies.

## Conclusion

The result of the study is mainly focused on hanging cases brought for autopsy. It helps us to differentiate the different ligature marks and ligature material and predisposing factors responsible for suicidal thoughts. Avoidance of suicidal death by promoting psychological counselling about dowry-related death and marital relationship, and social and psychological behaviour support by organizing NGO groups among students, work stations, and companies.

### Limitations:

The limitations of this study include the fact that the Study was confined to a particular area (Tirunelveli district), the areas which come under Tirunelveli Medical College and hospital jurisdiction.

Information regarding the head's ceased is based only on the history provided by the Police, Relatives, the Inquest, and the Photograph of the scene of occurrence.

### Recommendation:

The medical community's primary recommendations should focus on counselling, improved psychiatric care, and better access to medical treatment. In recent times, increased use of mobile phones to watch suicide-related content, engagement in online games promoting self-harm, and substance abuse have contributed to rising suicidal tendencies.

To prevent suicide by hanging, various approaches should be implemented, including restricting access to ligature materials and suspension points and reducing the lethality of suicide attempts. For individuals who survive a hanging attempt, prompt pre-hospital care and acute medical intervention can significantly improve survival outcomes.

Early intervention programs, such as counselling and access to mental health professionals, should be strengthened, particularly in educational institutions. Providing students with mental health support can help prevent suicidal thoughts.

Additionally, proper psychological counselling on mental well-being, substance abuse prevention, responsible mobile phone usage, reduced social media exposure, and avoidance of alcohol and drug addiction can play a crucial role in guiding young individuals away from harmful behaviors.

#### Foot Notes:

**Sources of support:** NIL

**Conflict of interest:** NONE

**Ethical Clearance:** Ref no:1397/FM/2018, Approval given by Dr J Suresh Durai, MD, Member Secretary, TIREC, Thirunelveli Medical College.

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