

## Medicolegal Study of Hanging Cases In North Goa

Case Study

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### Abstract

The hanging deaths are one of the most important asphyxial types of deaths encountered in day to day life by Forensic Pathologist. The present study was conducted with the objective of studying the incidence of hanging deaths & other various factors like socio demographic factors and type of hanging among all unnatural deaths in North Goa District of Goa state.

The study included 101 hanging cases brought for autopsy to Department of Forensic Medicine, Goa Medical College, Goa. Incidence of hanging was found 7.75%. The most common victims were the married males in the age group of 21 to 30 years. Most of the victims were illiterate & unemployed. In majority of cases, the causative or precipitating factor was physical illness. 72% cases were taken place indoor & in urban area. 47.52% cases were reported during months of January to April. 81% cases were of Atypical Complete variety. Soft ligature was used as ligature in 53.46% cases; Rope being the most common one. Most cases showed Slip knot with right side of neck being the most common place. In all cases, ligature mark was obliquely placed & in 91% it was lying above thyroid eminence. Hemorrhage in neck muscles under ligature mark was seen in 19% cases & fracture of hyoid bone was found in 3% cases.

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### Introduction

The hanging deaths are one of the most important asphyxial types of deaths which are encountered in day to day life by Forensic Pathologist. The deaths due to hanging are so wide and varied that they are challenging the Autopsy Surgeons on many occasions, therefore, careful study and meticulous examination of every case is mandatory to bring the wide variety of observations in death by hanging and also to differentiate it from the other conditions like strangulation.

In India, deaths by hanging claims thousands of lives every year, where the victim under the scenario of ever rising unemployment, limitless expectations and many a times, consequent disappointments, faces ever increasing stress. Hanging has been one

of the popular modes of suicide in our country since time immemorial for its simplicity and efficacy in committing suicides. The commonly available objects and the presence of relative isolation that go with hanging make it a much adopted method of suicide. The relative dimensions of hanging and factors associated with it assume critical significance in order to differentiate it from other causes, which might have been used to cause death and hanging, is used as a camouflage, and also to help in differentiating it from either homicidal or accidental hanging. So it is of imperative nature, the constant and continuous investigation and pursuit is done of various facets associated with hanging- the cause, the types, the articles used, the pathophysiology, the postmortem indicators and consequently the interventions, which help. The simplicity of death by hanging assumes immense importance, to properly elucidate the circumstances involving hanging, the findings in corpus delicti and the implications in it, and is of great medico-legal significance in establishing beyond doubt that there is no other contributory reason or cause which leads to death. There is also high incidence of hanging cases in the State of Goa due to various factors like unemployment, seasonal variation, alcoholism etc. The present study has been undertaken to identify and evaluate the incidence and pattern of hanging deaths occurring in North Goa District of Goa State.

### Materials and Methods

1. All hanging cases brought to department of Forensic Medicine and Toxicology, Goa Medical College, Bambolim, Goa for medicolegal autopsy during the study period from November 2008 to October 2009.
2. Brief history as obtained from relatives of the deceased.
3. Inquest reports.
4. Suicidal notes.

The present study was conducted in the department of Forensic Medicine, Goa Medical College, Bambolim, Goa, from November 2008 to October 2009 for a period of one year. The sample size was 101 cases. Detailed information regarding the circumstances of death was sought from police, relatives and friends in the form of history, inquest report, suicidal note if any and also photographs of the scene of occurrence when available.

Postmortem examination of each case was carried out as per the

Standard autopsy techniques taking all the precautions to prevent any artefacts. The analysis was done to know the socioeconomic profile, site of ligature mark, course of ligature mark on the neck and the position of knot.

Thyroid cartilage, cricoid cartilage & Hyoid bone was dissected out for fractures, its ante-mortem characteristics taking all the precautions to prevent any postmortem fractures by adopting standard autopsy techniques in all cases.

## Results

**Table 1. Incidence of hanging during the study period.**

Cases	No.	Percent
Hanging	101	7.75
Others	1202	92.25
Total	1303	100

During the one year study period, total number of autopsy done was 1303, out of which 101 cases of hanging were noted. Incidence of hanging was found 7.75%.

**Table 2. Sex wise distribution of cases in hanging.**

Sex	No.	Percent
Male	79	78.22
Female	22	21.78
Total	101	100

Out of 101 cases of hanging, 79(78.21%) were males and 22(21.78%) were females.

**Table 3. Age wise distribution of cases in hanging.**

Age group (years)	No.	Percent
Below 10	0	0.0
11-20	9	8.91
21-30	38	37.62
31-40	25	24.73
41-50	19	18.81
51-60	8	7.92
61-70	2	1.98
Above 70	0	0.0
Total	101	100

Out of 101 cases of hanging, highest number of cases were seen in the age group of 21-30 years (37.62%) followed by the age group 31-40 years (24.73%). The youngest was 11 years and oldest being 65 years of age.

**Table 4. Marital status and Sex wise distribution of cases in hanging.**

Marital status	Male		Female		Total	
	No.	Percent	No.	Percent	No.	Percent
Married	47	59.49	9	40.90	56	55.44
Unmarried	29	36.71	13	59.09	42	41.58
Unknown	3	3.79	0	0.0	3	2.97
Total	79	100	22	100	101	100

Out of 101 cases of hanging, majority belonged to married group of 56 (55.44%) cases, out of which 47 (59.49%) were males and 9 (40.9%) were females. Unknown group consist of 3 cases.

**Table 5. Residential status of cases in hanging.**

Residential status	No.	Percent
Rural	28	27.72
Urban	73	72.28
Total	101	100

Out of 101 cases of hanging, 73(72.28%) cases were reported from urban area and 28 (27.72%) cases were from rural area.

**Table 6-A: Education in relation to hanging cases.**

Education	No.	Percent
Illiterate	31	30.69
Up to tenth standard	22	21.78
Higher secondary	11	10.89
Graduate	25	24.75
Postgraduate	9	8.91
Unknown	3	2.97
Total	101	100

**Table 6-B. Occupation in relation to hanging cases.**

Occupation	No.	Percent
Housework	11	10.89
Farmer	16	15.84
Student	17	16.83
Employed	14	13.86
Business	6	5.94
Unemployed	34	33.66
Unknown	3	2.97
Total	101	100

As evident from above two tables (6-A & 6-B), majority of victims were from the illiterate 31(30.69%) and unemployed group 34 (33.66%). Farmers contributed to 16(15.84%) cases.

**Table 7. Distribution of causative factors for hanging.**

Causative factors	No.	Percent
Physical illness	23	22.77
Psychiatric illness	05	4.95
Loan/poverty	22	21.78
HIV/AIDS	0	0
Torture/dowry related	1	0.99
Failure in exams	5	4.95
Domestic problems	11	1.89
Drug addiction	17	16.83
Death of family member	3	2.97
Frustration in life	10	9.90
Unknown	4	3.96
Total	101	100

In majority of cases, the causative or precipitating factor was physical illness, 23(22.77%) cases followed by poverty, 22(21.78%) and drug addiction, 17(16.83%) cases.

**Table 8. Distribution of cases according to time of year among hanging.**

Time of year	No.	Percent
January to April	48	47.52
May to August	30	29.70
September to December	23	22.77
Total	101	100

Among 101 cases of hanging, majority were noted in the months of January to April with 48 (47.52%) cases followed by 30 (29.7%) cases in months of May to August and least in the months of September to December. The high number of cases during January to April could be attributed to the significant variation in climatic conditions like Humidity, Temperature etc. in Goa.

**Table 9. Distribution of cases according to place of hanging.**

Place of hanging	No.	Percent
Indoor	72	71.29
Outdoor	29	28.71
Total	101	100

Out of 101 cases of hanging, 72(71.29%) victims chose indoor site as a preferential place for hanging as compared to outdoor sites, 29(28.71%).

**Table 10. Distribution of cases according to type of hanging**

Type of hanging	No.	Percent
Typical - Complete	4	3.96
Typical - Incomplete	0	0.0
Atypical - Complete	82	81.19
Atypical - Incomplete	15	14.85
Total	101	100

Out of 101 cases of hanging, atypical complete hanging was seen in 82 (81.19%) cases, a typical incomplete in 15 (14.85%) cases. Typical complete hanging was noted only in 4 (3.96%) of our cases while none in typical incomplete group.

**Table 11-A: Distribution of cases according to quality of ligature material used for hanging.**

Ligature material	No.	Percent
Soft	54	53.46
Hard	47	46.53
Total	101	100

Out of 101 cases of hanging, soft ligature was used in 54(53.46%) cases and hard ligature in 47(46.53%) cases.

**Table 11-B. Distribution of cases according to ligature material used for hanging.**

Ligature material	No.	Percent
Rope(plastic/fibre)	44	43.56
Chunni / Dupatta	23	22.77
Bed sheet	12	11.88
Sari	11	10.89
Pant/Pajama/Loongi	8	7.92
Electric wire/cable	3	2.97
Total	101	100

Among 101 cases of hanging, the most common ligature material used was rope (plastic/fibre) in 44 (43.56%) cases, followed by dupatta in 23 (22.77%) cases and bed sheet in 12 (11.88%) cases.

**Table 12. Distribution of cases according to type of knot in hanging.**

Type of knot	No.	Percent
Slip	85	84.15
Fixed	16	15.84
Total	101	100

Among 101 cases of hanging, 85 (84.15%) victims have used slip knot and 16 (15.84%) victims used fixed knot.

**Table 13. Distribution of cases according to site of knot in hanging.**

Site of knot	No.	Percent
Left side of neck	33	32.67
Right side of neck	61	60.39
Front of neck	1	0.99
Back of neck	6	5.94
Total	101	100

Out of 101 cases of hanging, the knot was seen on right side of neck in 61 (60.39%) cases, on left side of neck in 33 (32.67%) cases, on front of neck in 1 (0.9%) case and on back of neck in 6 (5.94%) cases.

**Table 14. Distribution of cases according to number of ligature marks (turns) in hanging.**

Number of ligature marks (turns) in hanging	No.	Percent
Single	96	95.04
Multiple	5	4.95
Total	101	100

Ligature mark was single in 96 (95.04%) cases of hanging and multiple in 5 (4.95%) cases.

**Table 15. Distribution of cases according to level/position of ligature mark in relation to thyroid cartilage.**

Level/ Position of ligature mark	No.	Percent
Upper/above thyroid cartilage	92	91.09
Middle/over thyroid cartilage	9	8.91
Lower/below thyroid cartilage	0	0
Total	101	100

Among 101 cases of hanging, ligature mark was found above thyroid cartilage in 92 (91.09%) cases, over thyroid cartilage in 9 (8.91%) cases and no case below thyroid cartilage level.

**Table 16. Distribution of cases according to the Direction of ligature mark in hanging.**

Direction of ligature	No.	Percent
Oblique	101	100
Horizontal	0	0
Total	101	100

In all 101 cases of hanging, the ligature mark was placed obliquely around the neck with no case showing it as horizontal.

**Table 17. Distribution of cases according to the color / Nature of ligature mark in.**

Color / Nature of ligature mark	No.	Percent
Reddish-brown	21	20.79
Parchmentised	70	69.31
Pale	10	9.90
Total	101	100

The ligature mark was reddish brown in color in 21 (20.79%) cases while it was parchmentised in 70 (69.31%) cases and pale in 10 (9.9%) cases.

**Table 18. Incidence of hemorrhage in neck muscles beneath the ligature mark in hanging.**

Hemorrhage in neck muscles beneath ligature mark	No.	Percent
Present	19	18.81
Absent	82	81.18
Total	101	100

Out of 101 cases of hanging, Hemorrhage in neck muscles beneath ligature mark was found in 19 (18.81%) cases while it was absent in 82 (81.18%) cases.

**Table 19. Incidence of fractures of hyoid bone, thyroid and cricoid cartilage and tracheal rings in hanging.**

Fracture	No.	Percent
Hyoid bone	3	2.97
Thyroid cartilage	1	0.99
Cricoid cartilage	0	0.0
Tracheal rings	0	0.0

Out of 101 cases of hanging, fracture of hyoid bone was seen in 3 (2.97%) cases. All the three cases showed fracture of left greater cornu. Fracture of superior horn of thyroid cartilage at its base was seen in 1 case (0.99%).

**Table 20. Incidence of other relevant factors in hanging.**

Factors	No.	Percent
Dribbling of saliva	28	27.72
Protrusion of tongue	51	50.49
Seminal emission	11	10.89
Urinary incontinence	1	0.99
Fecal incontinence	0	0.0
Congestion of face	86	85.15
Petechiae over face, conjunctiva	44	43.56
Le Facie sympathique	0	0.0
Postmortem staining of lower limbs	79	78.21
Cyanosis of nail beds	67	66.33
Congestion of organs	92	91.08
Intestinal Lividity	101	100

**Table 21. Manner of death in hanging.**

Manner of death	No.	Percent
Suicidal	100	99.01
Homicidal	0	0.0
Accidental	0	0.0
Inconclusive	1	0.99
Total	101	100

Manner of death was suicidal in all cases of hanging except in 1 case where it was inconclusive.

**Discussion**

Most of the hanging cases are noticed indoor (Table-9) and it is comparable with findings of Luke [12] and Davidson [13].

The ligature material most commonly preferred in this study is Rope (Table-11B), this finding is comparable with that of Luke [9], Reddy [10], Simonsen [11], Davidson [12] and Luke et al [13] where it was most preferred material used, ranging from 65 to 80.4%. The most preferred quality of material is soft ligature (Table-11A) in our study, this finding is comparable with that of Sen Gupta [8].

Out of 101 cases studied, 86 (85.14%) cases are of complete hanging, where the victim is fully suspended with his feet clearly off the ground and 15 (14.85%) cases are of incomplete/partial hanging where some part of the body is in touch with the ground [2, 3] (Table-10). These findings are similar to that of Sen Gupta [8], James and Silocks [14] and Morild [15] where in complete hanging was more common ranging from 51.25% to 87.12% whereas partial hanging was more common in studies done by Luke et al [13], Simonsen [11] and Davison [12] where it ranged from 50% to 52.45%. 4(3.96%) cases are of typical hanging and 97(96.04%) cases are of a typical hanging (Table-10). This finding correlates with that of Simonsen [11] wherein 76.25% were a typical and 23.75% were typical and in the Morild [15] study, 65% were a typical and 35.6% were typical.

**Postmortem Findings**

In the present study, postmortem staining (Table-20) was present on legs and hands in 79(78.21%) cases. This finding correlates with the duration of suspension noted.

**Ligature Mark**

Pressure abrasion mark under the ligature material was present in 101 (100%) cases. The findings are comparable with study done by Sen Gupta [8], Luke [9] and Luke et al [13]. The ligature mark is well marked and grooved in cases where the ligature material is rough and strong like rope and also when the period of suspension is long. Running noose was seen in 85 (84.15%) cases and fixed knot was seen in 16 (15.84%) cases (Table-12). The margins of the ligature mark were more pronounced in cases where in hard material was used. The skin underneath the ligature was hard and parchmented. Parchmentisation of skin was noticed in 70 (69.31%) cases, while it was 73.7% in Luke et al [13], and was seen in almost all cases in Sen Gupta [8] study. The color of ligature mark depends largely on the duration of suspension of the body

and the nature of the ligature material used.

It was observed that in 92 (91.09%) cases, ligature mark was situated above the thyroid cartilage, 9 (8.9%) cases showed it passing over the thyroid cartilage (Table15), while in Sen Gupta [8] the observation was 72.27% above, 26.73% over and 0.99% below thyroid cartilage and in Reddy [10] it was 90.47% above, 16% over and none below thyroid cartilage. Davison [12] found ligature material in 6.33% of cases below Thyroid cartilage.

**Petechiae**

In asphyxial deaths, these lesions are product of disproportionate vascular compromise resulting from external compression of the neck. Circumferential tension required to occlude jugular veins has been experimentally calculated to be 2Kgs, the carotid arteries 5Kgs, the trachea 15 Kgs and vertebral arteries 20 Kgs.

Circumstances causing reduced ligature pressure to the neck and less arterial compromise might result in increased levels of intravascular pressure and more frequent petechiae.

The findings regarding petechial hemorrhages tend to support this study (Table-20). It is observed that petechiae over the face, conjunctivae were present in 44 (43.56%) cases. In other series like Luke [9], Simonsen [11], Davison [12], Luke et al [13], petechial hemorrhages were seen in 23.63% to 70.87% of cases.

**Tongue**

Protrusion of tongue was noted in 51 (50.49%) cases (Table-20) in this study. This finding was comparable with that of Sen Gupta8, wherein tongue was protruded in 55.45% cases. The reason for this phenomenon could be that the constricting force of the ligature causes compressive narrowing of laryngeal and tracheal lumen, forces up the root of the tongue against the posterior pharyngeal wall causing asphyxia as well as protrusion of tongue.

**Others**

Dribbling of saliva from the angle of the mouth is supposed to be sure sign of Antemortem hanging, having taken place during life. It could be because of congestion and mechanical stimulation of the salivary glands consequent upon friction by ligature. In 28 (27.72%) cases of this study, dried salivary mark was present over the angle of mouth, sides of chin and front of chest. Dribbling of saliva was noticed by Sen Gupta [8] in 74.1% of cases.

In our study there was 1 (0.99%) case showing urinary discharge,



which does not have any comparable study. Fecal discharge was not seen in any case, while Sen Gupta<sup>8</sup> observed it in 14.85% cases. Other body fluids like semen discharge was seen in 11 (10.89%) cases and this is noted by Sen Gupta [8] in 51.4% of cases.

Bluish discoloration (cyanosis) of nail beds was noted in 67 (66.33%) cases, whereas other authors do not mention this.

Neck muscles beneath the ligature mark showed hemorrhages in 19 (18.81%) cases and it was 7.14% in Luke's [8], 42.42% in Luke et al [13] and 2.9% in Davison [12] study. The soft tissues under the ligature mark were pale and glistening.

Hyoid bone was seen fractured in 3 (2.97%) cases, all cases showing fracture of greater cornu. Among these 3 cases, one case also showed associated fracture of superior horn of Thyroid cartilage. The possible reason for this could be that hyoid bone becomes ossified after the age of 40 years and in this study most of the victims were below 40 years.

Hyoid bone fracture were seen by Reddy [10] in 6% cases and by Khokhlov [16] in 5% cases. The hyoid bone were not seen in studies by Franklin [16], Mallik [18], Krishnan[4].

It was observed by few investigators like Luke [9], Simonsen [11] that hard variety of ligature material used for hanging could cause increased frequency of fracture of hyoid bone and thyroid cartilage and in the present study hard material (rope) was preferred in 54 (53.46%) cases and soft material was used in 47 (46.53%) cases. Increased duration of suspension is said to be factor for increased frequency of fracture of hyoid bone and thyroid cartilage as observed by Simonsen and Morild [15]. Lastly, complete hanging is considered to cause increased frequency of fracture of hyoid bone and thyroid cartilage. Whereas few others like Luke [13], Morild [15] considered it to be depend upon the position of knot. Morild's observation is frequency of fracture of hyoid bone is more in atypical hanging, whereas Simonsen's observation is contrary to this. In this study, among 86 (85.15%) cases of complete hanging with atypical complete 82 (81.19%) and typical complete 4 (3.96%), fracture for hyoid bone was found only in 3 (2.97%) cases.

Fracture of cricoid cartilage and tracheal rings was not observed in any of our cases, which is a consistent finding with the author's like Luke [9], Simonsen [11], Luke et al [13], James [14], Morild [15].

## Summary

Hanging has been a favored mode of committing suicide since time immemorial due to its simplicity and efficacy. Keeping in mind the significance and importance of knowing the medico-legal significance, the present study entitled as "Medico Legal Study of Hanging cases in North Goa" is undertaken from November 2008 to October 2009.

The analysis was done to know the socioeconomic profile, course of ligature mark, site of ligature mark on the neck and the position of knot. The various postmortem findings and evaluating the frequency of fracture of hyoid bone, thyroid and cricoids cartilage and tracheal rings is studied.

In this study, largest group constituted of illiterates and unemployed people. Male preponderance over female is observed with 78.21% male cases and 21.78% female cases. The hanging is noticed in youngest age of 11 years, oldest being 65 years. The largest age group constituted of 21-30 years, followed by the age group of 31-40 years and the smallest group being above 60 year of age group. 55.44% of victims are married.

72.28% of cases were reported from urban area. In majority of cases, the causative or precipitating factor was found in form of a physical illness (22.77%) followed by poverty (21.78%) and drug addiction (16.83%).

47.52% cases of hanging take place in duration between January to April.

The place of incidence for hanging is indoor, which is often preferred suitable place by victim. The material used most commonly is rope in 43.56% of cases, as rope is easily available material in the vicinity.

Complete type of hanging, being the most common type is found in 85.14% cases. A typical hanging is seen in 96.03% cases.

84.15% of cases have used running noose.

Knot was seen on right side of neck in 60.39% cases.

Ligature mark is present in 100% of cases and it is found corresponding with the ligature material in all cases. The ligature mark is situated above the thyroid cartilage in 91.09% of cases. The mark was oblique place in all 101 cases.

Parchmentisation is seen in 69.31% of cases. Face is congested in 85.15% of cases.

Neck muscles beneath the ligature mark showed hemorrhages in 18.81% of cases.

Hyoid bone fracture (at greater cornu) was found in 2.97% of cases. Thyroid cartilage fracture (at superior horn) was noted in 0.99% cases. Fracture of cricoids cartilage and tracheal ring was not observed in any of our cases.

Protrusion of tongue was seen in 50.49% of cases. Dribbling of saliva was observed in 27.72% of cases.

Postmortem staining in legs and hands was noted in 78.21% of cases. Bluish discoloration (cyanosis) of nail beds was seen in 66.33% of cases.

Seminal discharge was seen in 10.89% of cases. Urinary incontinence was present in 0.99% of cases.

Congestion of organs like brain, liver, lungs, kidneys and spleen was noticed in 91.08% of cases.

Postmortem intestinal lividity was noted in all cases.

## References

[1]. TD Dogra, OP Murty (2002) GA.Study of Ligature marks in asphyxia deaths of hanging and strangulation. *Int.J of Med Toxicology &Legal Med*



- 4(2): 21-24
- [2]. Polson CJ, Gee DJ and Knight B (1985) The essentials of Forensic Medicine. (4th Edtn) Oxford; Pergamon Press 357-388.
- [3]. Rao NG (2000) Textbook of Forensic Medicine & Toxicolog (1st Edtn) Jaypee Brothers, New Delhi 152-160.
- [4]. Krishnan MKR (1990) Handbook of Forensic Medicine. (9th Edtn) Kothari Books: Hyderabad 113-132.
- [5]. Reddy KSN (2005) The essentials of Forensic Medicine & Toxicology (24th Edtn) K. Sugunadevi, Hyderabad 286-293.
- [6]. Gordon I, Shapiro HA, Berson SD (1991) Forensic Medicine (3rd Edtn) Churchill Livingstone, New York 111.
- [7]. Nandy A (2004) Principles of Forensic Medicine. (2nd Edtn) New Central Book Agency(P) Ltd, Calcutta 315-322.
- [8]. Sen Gupta BK (1965) Studies on 101 cases of death due to hanging. J. Indian Medical Association 45(3): 135-139.
- [9]. Luke J L (1967) Asphyxial deaths by hanging in New York City.1964-1965. J. Forensic Sci 12: 359-369.
- [10]. Reddy KSN (1978) Fracture of hyoid bone. Journal of the Indain Academy of Forensic Medicine 1: 7-15.
- [11]. Simonsen J (1988) Patho-anatomic findings in neck structures in asphyxiation due to hanging: A survey of 80 cases. Forensic Science Int 38: 83-91.
- [12]. Davison A and Thomas K (1986) Hanging in Northern-Ireland—A Survey. Med. Sci. Law 26(1): 23-28.
- [13]. Luke J L, Donald T, Reay, John W, Eisele, et al. (1985) Correlation of circumstances with pathological findings in asphyxia deaths by hanging—A prospective study of 61 cases from Seattle WA. J.Forensic Sci 30(4): 1140-7.
- [14]. James R and Silcocks P (1992) Suicidal hanging in Cadiff – A 15 year retrospective study. Forensic Sci. Int 56: 167-175.
- [15]. Morild I (1996) Fractures of neck structures in suicidal hanging. Med. Sci. Law 36(1): 80-84.
- [16]. Khokhlov VD (1997) Injuries to the hyoid bone and laryngeal cartilages: Effectiveness of different methods of Medicolegal investigation. Forensic Sci. Int 88: 173-183.
- [17]. Franklin CA (1993) Deaths from asphyxia hangings. Modi's Medical Jurisprudence and Toxicology (21st Edtn) Tripathi Private limited, Bombay 188-194.
- [18]. Mallik CC (1969) Asphyxia: A handbook of Medical Jurisprudence. (1st Edtn) Academic Publishers, Calcutta 83-118.