Research Paper

Analysis of Postmortem Examination in Exhumed Cases Done in and Around Bangalore, India for 10 Years: A Retrospective Study

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ABSTRACT

Background: Exhumation is the process of removing the dead body from the grave. The reasons and time limit for exhumation may vary from country to country. After receiving a request from the Magistrate, exhumation followed by postmortem is done to gain essential evidence.

To comprehensively analyze the exhumation cases done in Victoria Hospital, Bangalore, and how exhumation followed by postmortem examination aids in finding the cause of death.

Methods: All cases of exhumations performed for 10 years (from January 1, 2012, to December 31, 2021) in the Department of Forensic Medicine and Toxicology, Victoria Hospital, Bangalore, were studied retrospectively. The essential data were collected from requisition forms, exhumation, and postmortem reports. The results were obtained after tabulating, and data were analyzed with an observational method.

Results: A total of 37 exhumation cases were done during the study period. Young males in the age group of 21 to 30 years were the major population. Out of 37 cases, the cause of death was established in 25 cases (68%).

Conclusion: Analysis of postmortem examination in exhumed cases gives much information from a medicolegal point of view to determine the cause and reveal the mysteries behind the manner of death. Hence it is not a vain procedure.

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1. Introduction

Exhumation (Latin: ex- out of; humus-ground) [syn: disinterment] means lawful disinterment or digging out of a buried body from the grave [1]. Exhumation is ordered by different authorities in different countries. In India, exhumation can only be done with a written order from the Executive Magistrate (S. 176 [3] CrPC [Criminal Procedure Code]) [2].

Exhumation is rarely done in India because the dead bodies are disposed of by cremation. Only certain communities bury their dead [2]. There is no time limit for exhumation in India. However, some countries like France, Germany, Scotland, etc., have fixed time limits for the exhumation [1]. The major reasons for exhumation are as follows: To relocate the graveyard, in cases where no suspicion at the time of death and hence, the body was buried without a postmortem, new facts come to light that requires additional information from the body, suspicion arising regarding the authenticity of earlier postmortem, to verify the cause of death or identify the deceased [3]. The second autopsy is done when the first report is challenged or ambiguous [4]. The number of exhumations is rising since awareness of people's rights has increased among the public [5].

The available literature about the case studies of exhumation is scarce and scanty. Hence, this study was done in the Department of Forensic Medicine and Toxicology, Victoria Hospital, Bangalore to analyse the sociodemographic profile, and postmortem changes which help in determining the time after death, cause of death, and poison if present.

2. Materials and Methods

All cases of exhumations performed for 10 years (2012-2021) in the Department of Forensic Medicine and Toxicology, Victoria Hospital, Bangalore were studied retrospectively. All cases were done in daylight. After receipt of a request from the Executive Magistrate by the Forensic Expert, the contents of requisition form 146 (i) and (ii), like sex, age and religion were noted in detail along with other parameters like the situation of the graveyard, duration of burial, depth of the graveyard, and the condition of the body on exhumation. An external examination was performed to identify features, deformities, and injuries. Complete dissection of the body was done by opening all body cavities and removal of organs by the en-bloc method. All the internal organs are weighed and observed for any significant pathology and injuries. Multiple linear parallel incisions were made on the thorax, abdomen, and limbs. All bones were examined to rule out any fractures. Relevant photographs were taken throughout the procedure. Organs (for chemical analysis examination and histopathologic examination), soil, hair, nails, and bones were preserved in relevant cases.

The parameters of the study were tabulated in the master chart and the obtained parameters were analyzed using SPSS version 21.0. The results obtained were presented as percentages in figures and tables. All exhumations followed by postmortem examination done for 10 years (2012-2021) in the Department of Forensic Medicine and Toxicology, Victoria Hospital, Bangalore were included in the study and none was excluded.

3. Results

Out of 37 cases, 28 cases were males and 9 were females (Figure 1).

Out of 37 cases, 28 cases were males and 9 were females (Figure 1). The majority of the cases belonged to the 20-29 agegroup. The youngest case was a 9 months old boy andthe oldest was a 64 years old man (Figure 2).The majority of the deceased were Hindus (Table 1). Hindu burial ground with tombstones kept for identification (Figure 3). Maximum cases were done in the year 2013 (Table 2).The majority of the cases were booked under sections174 'C' and 302 IPC (Table 3). The majority of thedead bodies were found on burial grounds and identified by relatives of the deceased (Table 4). More caseswere done in Bangalore urban area (Table 5). Most ofthe dead bodies were buried at a depth of fewer than 4feet (Table 6). The earliest exhumation was done within 2 days of burial, while the most delayed was 1 year and 8 months after burial (Table 7). Antemortem fracture with blood extravasation was noted in one case (Figure 4). Buried body shows soft tissue attachments to the Skeleton demonstrating advanced levels of decomposition (Figure 5). Only 20.8% of samples,tested positive in chemical analysis (Table 8). Organs forhistopathological examination were sent in 12 cases andthe cause of death was ascertained in only 6 cases (Table 9). Out of 37 cases, the cause of death was establishedin 25 cases (67.6%) (Figure 6). Accident followed by homicide is the most common manner of death. Of the11 cases which were filed U/S 302 IPC (Table 3), only 7 cases were found to be a homicide (Table 10). Dead-body in the grave in fetal position with hands and feet tied together point towards homicide (Figure 7).

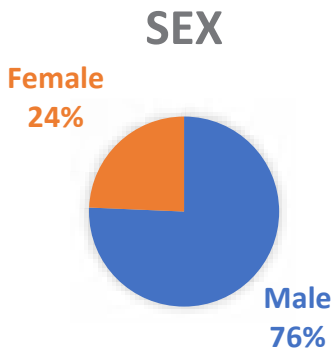

Figure 1. Sex-wise distribution of cases

4. Discussion

Legally interred exhumation is very rare in literature.

In the current study, out of 37 cases a male predominance is seen i.e., 28 cases (76%) (Figure 1). Gitanjali et al., Grellner et al., and Akhiwu et al. also reported a male predominance, 12 male cases (63.16%), 34 male cases (73.9%) and 34 male cases (72.3%), respectively [5-7].

In this study, the cases were plotted under 10 age groups. Among 37 cases, the majority were of the younger ages (12 cases (32.4%) in the range of 20-29 years and 9 cases (24.3%) in the age group of 30-39 years (Figure 2). Accordingly, Gitanjali et al. mentioned that the maximum cases were in the age group between 21 to 30 years i.e., 9 cases (47.3%) [5]. Akhiwu et al. reported that the most affected age group was between 20-29 years i.e., with 9 cases (19.1 %) [7]. But the study conducted by Ingale et al. showed a different trend in the maximum age group, 7 cases (38.88%) out of 18 cases fell in the age group of 41-50 years [8].

In terms of religion, in our study, most deceased were Hindus, i.e., in 31 cases (83.8%) (Table 1), which is similar to the studies conducted by Gitanjali et al. (14 cases (73.68%)) [5] and Ingale et al. (16 cases (88.88%) [8].

Considering the IPC (Indian Penal Code) section under which the case is filed, we found that maximum cases, i.e., 12 cases (32.4%) exhumed, were dealt with under section (U/S) 174 'C' IPC (when any doubt regarding the cause of death) and 11 cases (29.7%) were dealt U/S. 302 IPC (Punishment for murder), followed by 8 cases

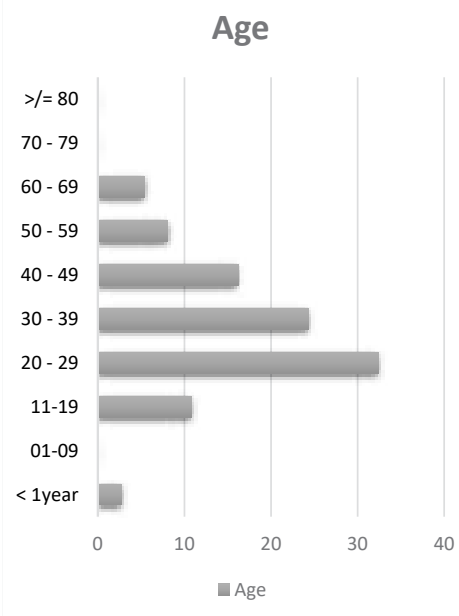

Figure 2. Age of deceased at the time of death

Table 1. Religion-wise distribution of the cases

Caste	No. (%)
Hindu	31(83.8)
Muslim	4(10.8)
Others	2(5.4)
Christian	0(0)

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U/S 304 'A' IPC (Causing death by negligence) (Table 3). However, Ammani et al. reported that most cases were dealt U/S 174 IPC [9] (Police to inquire and report on suicide, etc.).

Normal burial areas depending on culture and religion, included the following: burial grounds (23 cases [62.1%]), farmlands (7 cases [18.9%]), and deceased compound (3 cases [8.1%]). The majority of the grave was identified by relatives of the deceased (30 cases [81.1%]) (Table 4). In an interesting case of abduction and homicide, a remote forest area was chosen as the place of burial to conceal the crime. This instance was found under the observation by Akhiwu et al. [7]. In one of our cases, the visit to the crime scene helped conclude the manner of death and recovery of weapons. In another case, a thorough inspection of the vicinity of the exhumation site helped recover the dental implants using his past dental records. It confirmed the deceased's identity. An ideal grave should have a depth of 180 cm (5.9 ft). Nevertheless, in recent times, a depth of 129.54 cm (4.25 ft) is accepted, such that the coffin takes 38.1 cm, and 90 cm (2.95 ft) is left above the coffin [10]. In our study, the depth of the grave varied from 1.5 ft to 8 ft (Table 6). A depth less than 4 ft is observed in 21 cases (56.8%), and 12 out of those were less than 2 ft, which contributed to the high number of cases being dealt with under sections 174 'C' and 302. The superficial burial observed in our study indicated the intention of the perpetrator to hide the crime in a hasty manner which is similar to the findings observed by Ammani et al. [9]. In a study by Bardale et al., the depth of the grave varied from 1.5 ft to 7 ft with a mean depth 3.39 ft [11]. A deep burial of 8 ft, noted in our study, was about a COVID-19 death where the existing guidelines suggested a deep burial.

The level of decomposition was related to the duration of burial (Table 7). In our study, most cases (11 cases) showed partial decomposition, the duration between burial and exhumation was 1 to 4 weeks, and 5 cases done after 6 months were skeletonized. Partial adipocere was observed in 8 cases from 1 to 3 months. Similar

Table 2. Year of conducting exhumation

Year	No. (%)
2012	6(16.2)
2013	8(21.6)
2014	0(0)
2015	5(13.5)
2016	3(8.1)
2017	3(8.1)
2018	2(5.4)
2019	4(10.8)
2020	2(5.4)
2021	4(10.8)

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Table 3. Nature of inquest

Indian Penal Code (IPC)	No. (%)
174	2(5.4)
174 'C'	12(32.4)
302	11(29.7)
304 'A'	8(21.6)
Others	4(10.8)

Table 4. Graveyard: situation, identified by whom

Variables		No. (%)
Place	Burial ground	23(62.1)
	Farmland	7(18.9)
	Deceased compound	3(8.1)
	Forest	1(2.7)
	River bank	0(0)
	Others	3(8.1)
Identified by	Relatives	30(81.1)
	Police	7(18.9)

Figure 3. Picture of a typical Hindu grave in our study area

Table 5. Place, Bangalore urban or rural

Bangalore	No. (%)
Urban	24(64.9)
Rural	13(35.1)

Table 6. Depth of the grave

Depth	No. (%)
<4 feet	21(56.8)
4-6 feet	14(37.8)
>6 feet	2(5.5)

Table 7. Duration of burial and state of the body

Duration	No.	State of the Dead Body
<1 Week	9	Early decomposition, Face recognition was possible
1 week – ≤4 weeks	11	Partial decomposition
>1 month – <3 months	8	Partial adipocere, Decomposition
>3 months – ≤6 months	4	Partial skeletonization with adipocere
>6 months – ≤1 year	2	Skeletonized
>1 year	3	Skeletonized

Figure 4. Exhumed skull with ante-mortem fracture

Figure 5. Exhumed body in skeletonization stage

Table 8. Sample sent for chemical analysis

Sent	Positive Samples, No. (%)
24	5(20.8)

Table 9. Sample sent for histopathological examination

Samples sent, No.	Positive Samples, No. (%)
12	6(50.0)

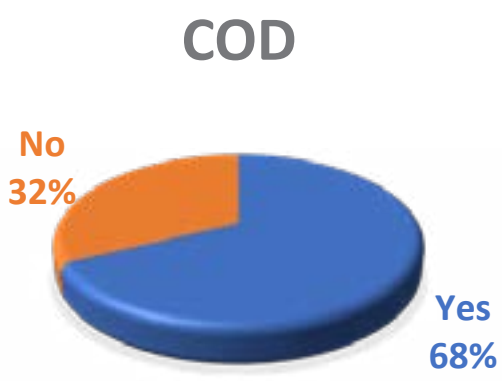

Figure 6. Ability to find the cause of death

Table 10. Manner of death

Manner	Cases, No. (%)
Undetermined	12(32.4)
Accidental	8(21.6)
Homicidal	7(18.9)
Natural	6(16.2)
Suicidal	4(10.8)

Figure 7. Body in grave with hands and legs tied together

Figure 8. Exhumed dead body covered with plantain leaf and rock salt

findings were noted in a study by Ingale et al., partial decomposition/ adipocere was noted in a case done on the 53rd day of burial. Skeletonization was noted in 3 cases after 110 days and more after burial [8].

The body was covered by cloth in 18 cases (48.6%), which was followed by plantain leaf covering along with Rock salt (9 cases [24.3%]) based on cultural practices (Figure 8).

Out of 37 cases, samples were collected and sent for chemical analysis in 24 cases (64.9%). Only 5 cases (20.8%) showed positive results (Table 8), with ethyl alcohol in 3 cases (with a history of renal tubular acidosis) followed by organophosphorus and barbiturates each. In a study by Ingale et al., viscera from 2 cases were sent for chemical analysis, but both were negative [8]. Death was ascertained in 6 cases with the histopathological examination (Table 9). Even though the tissues get autolyzed, positive results obtained in a study could be attributed to early body recovery and preservation of the vitality of the tissues.

In our study, we could establish the cause of death in 25 cases (67.6%) (Figure 6). Similar results were reported by Akhiwu et al. in his retrospective study; they mentioned that cause of death was found in 63.8% of exhumed bodies (47 cases) [7]. Also, in a 10-year retrospective study conducted by Bardale et al., the cause of death was determined in 66.6 % [11] and 88.88% of cases in a study by Ingale et al. [8]. However, in the study by Gitanjali et al., cause of death on exhumation could be determined only in 42.10% cases [5]. An autopsy was already done on 5 of the exhumed bodies; this confirmed the identity of an unknown body, the discrepancy in history and cause of death, and the unwillingness of relatives to accept the cause of death.

5. Conclusion

In the present study, 37 cases of exhumations were done at the Department of Forensic Medicine, Victoria Hospital, Bangalore, during 2012-2021. Considering the rarity of these cases in regular medicolegal work, the study of 37 cases is noteworthy. The study of these cases, from registration to reburial, has provided much information from a medicolegal point of view. EPME is not in vain as the cause of death can be found in most cases regardless of the length of burial. Delayed exhumation due to a lengthy legal process results in the body breaking down, making it impossible to determine the cause of death.

Study limitations

1. It is a retrospective study.

2. Validation and uniformity in objectifying are complex as different forensic experts did cases.

3. No comment on forensic entomology.

Recommendations

1. Visiting the scene of the crime should be practiced.

2. It is essential to inspect the environment of the exhumation site in cases of superficial burial since scattered skeletal remains can be recovered, which are carried by predators.

3. Videography of the exhumation in a high-quality camera is preferable.

Ethical Considerations

Compliance with ethical guidelines

The confidentiality of information of the deceased was maintained when the data were obtained from the exhumation and postmortem records. All guidelines of the Declaration of Helsinki were observed in all study stages. Ethical approval was obtained from the University Ethics Committee.

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Authors' contributions

All authors equally contributed to preparing this article.

Conflict of interest

The authors declared no conflict of interest.

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References

[1] Krishan Vij. Medicolegal autopsy, exhumation, obscure autopsy, anaphylactic deaths, and artefacts. In: Krishan Vij, editor. Textbook of Forensic Medicine & Toxicology: Principles & Practice. Amsterdam: Elsevier Health Sciences; 2014. [Link]

[2] Narayan Reddy K S, Murty OP. Medicolegal autopsy. In: Narayan Reddy K S, editor. Essentials of forensic medicine & toxicology. New Delhi: Jaypee Brothers Medical Publishers Pvt; 2017. [DOI:10.5005/jp/books/18492_7]

[3] Aggrawal A. Exhumation. In: Aggrawal A. Textbook of forensic medicine and toxicology. New Delhi: Avichal Publishing Company; 2014. [Link]

[4] Lincoln Exhumation. World of Forensic Science. 2005. Encyclopedia.com. 30 Apr. 2015. available at: http://www.encyclopedia.com

[5] Gitanjali D. Descriptive study of exhumations--a four-year study in a medical college in north Tamilnadu--India. Journal of Evolution of Medical and Dental Sciences. 2018; 7(23):2757-61. [DOI:10.14260/jemds/2018/623]

[6] Grellner W, Glenewinkel F. Exhumations: Synopsis of morphological and toxicological findings about the post-mortem interval: Survey on 20 years and review of the literature. Forensic Science International. 1997; 90(1-2):139-59. [DOI:10.1016/S0379-0738(97)00154-0]

[7] Akhiwu WO, Nwafor CC. Exhumations: Rarely done procedure but useful in many circumstances—a review of 47 cases in Nigeria. Egyptian Journal of Forensic Sciences. 2019; 9(67). [DOI:10.1186/s41935-019-0175-x]

[8] Ingale D, Bagali MA, Bhuyyar C, Hibare SR. Profile of exhumations and autopsy on an exhumed dead body or human remains A retrospective study. Al Ameen Journal of Medical Sciences. 2016; 9(1):47-52. [Link]

[9] Ammani J, Sudheer S, Roopesh T. Analytical study of exhumations and its medicolegal importance. International Journal of Contemporary Medical Research. 2016; 3(4):972-5. [Link]

[10] Wikipedia. Grave. San Francisco: Wikipedia; 2022. [Link]

[11] Bardale R, Ambade V, Dixit P. Exhumation: A 10-year retrospective study. Journal of Indian Academy of Forensic Medicine. 2012; 34(2):143-5. [Link]