An Analysis of Autopsied Maternal Deaths in Dakshina Karnataka District Over A 10-Year Period

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Abstract

Introduction: Though all deaths are accompanied by profound sorrow and anguish, maternal deaths are perhaps more so. Unfortunately, when these deaths are reported as medico-legal cases, the agony is then prolonged. Anguish from the family members is understandable, but opportunities to conduct autopsies on these deaths present an opportunity to examine in detail the pathophysiology of these deaths. This study is an attempt to find the cause of death in autopsied maternal death cases that have been filed as medico-legal cases and to compare the trends of autopsied maternal deaths with other regions.

Objectives: To find the cause of death in autopsied maternal death cases that have been filed as medico-legal cases and to compare the trends of autopsied maternal deaths with other regions.

Methods: A record-based study was conducted consisting of maternal deaths in the past 10 years based on the medico-legal autopsied reports from Government Wenlock Hospital mortuary.

Results: Among the causes of death attributed, the most common cause of death was embolism related with 4 deaths. This included deaths due to amniotic fluid embolism, trophoblast embolism and their complications such as DIC. Haemorrhage was the cause of death in 2 cases. In 2 cases, the cause of death was acute liver failure. However, one of these cases also had features of gestational acute respiratory distress syndrome. In one case, the cause of death was attributed to coronary artery disease complicated by pregnancy. One case was of ruptured ectopic pregnancy. In another case, the cause of death was a surgical complication of a dilatation and curettage procedure. In the remaining 3 cases, the cause of death could not be ascertained even after histopathological examination, chemical analysis, and a complete autopsy.

Key words: *Autopsied maternal deaths, embolism, haemorrhage, maternal mortality*

Introduction and Background

Three hundred thousand women die every year because of the various complications and obstacles of giving birth [(1)]. Unfortunately, even as recently as 2008, more than fifty percent of all recorded pregnancy-related deaths were in 6 countries namely India, Afghanistan Ethiopia, Pakistan, Nigeria, and the Democratic Republic of Congo [(2)]. Valid and reliable epidemiological data can lead to more effective and efficient health and social policies that will improve overall maternal health [(3)] . It is said that the difficulties in reporting maternal deaths arise because of "the lack of information about deaths among women in the reproductive age group, their pregnancy status at or near the time of death and the medically certified cause of death. These components can be difficult to measure accurately, especially in regions where deaths are not comprehensively or accurately reported" [(4)]. In addition, in developing countries, data

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on the cause of pregnancy-related deaths are still mainly from verbal analyses and clinical histories which do not give the complete picture.

The reasons causing women to die in pregnancy and childbirth are multi-layered. The major complications that are said to account for nearly seventy-five percent of all pregnancy-related deaths are said to be "haemorrhage, infection-related, blood pressure disorders of pregnancy, complications related to delivery, and unsafe abortion". However, many maternal deaths are still not identified due to various reasons [(5)].

Our study is an attempt at finding the cause of death in autopsied pregnancy-related deaths that have been filed as medico-legal cases and to compare the trends of autopsied maternal deaths with other regions.

Aim and Objectives

The study aimed to find out the causes of deaths of autopsied maternal deaths. We also hoped to analyse the trends in numbers of medico-legal autopsied maternal deaths as an indirect indicator of maternal health services and provide information that could lead to the better delivery of health services.

Materials and Methods

This was an organized longitudinal retrospective record-based study of 14 maternal autopsies performed at a government tertiary care mortuary (Government District Wenlock hospital) by the Forensic medicine and toxicology department of the attached medical college (Kasturba Medical College Mangalore). This hospital serves the health requirements of the population of Dakshina Kannada and neighbouring districts.

Inclusion criteria : All cases of maternal deaths classified as medico-legal cases which had been brought to District Government Wenlock hospital mortuary and cases that had been filed as closed by the police.

Exclusion criteria: Non-medico-legal cases of maternal deaths; sub-judice cases of maternal deaths.

This study protocol was presented for approval from the Institutional Ethics Committee (IEC) of Kasturba Medical College, Mangalore. After the authorization was obtained from the ethics committee, authorization was then obtained from the Head of the institution, after which permission was taken from the respective medical officer for analysis of their post-mortem reports. In total, 14 pregnancy-related deaths were autopsied during the 10-year period from 1st January 2009 to December 31st, 2018. The autopsy was done as the maternal deaths were registered as medico-legal cases either on behest of the treating doctor to find out the exact cause of death; when requested by the relatives of the deceased; or where the cause of death was uncertain. Clinical details, where ever available, were reviewed, either prior to or after conducting the autopsy. Complete autopsies were conducted in each case, with tissue specimens preserved in 10% formalin for further histopathological examination. Blood and viscera were also preserved, sealed, packed, and sent for toxicological analysis to the Forensic Science Laboratory located at Mangalore. The cause of death was opined based on perusal of hospital records (where available), chemical analysis report, histopathological examination report and the autopsy report.

Results

There were 8465 autopsies conducted at the Government Wenlock district hospital mortuary by the Forensic Medicine and Toxicology department, Kasturba Medical College Mangalore, during the study period. Of these 14 autopsies were related to maternal deaths, i.e. 0.16 % Among the autopsied maternal deaths, the minimum age of the deceased was 21 years and maximum age was 38. Table No.1 shows the frequency of deaths on a year-wise basis. There were no autopsied maternal deaths in three years, i.e. 2009, 2010 and 2016. The highest number of cases were in 2015 and 2014 with 3 deaths each. Deaths in the other years ranged from 1 to 2.

Among the causes of death attributed (Table No.2), the most frequent cause of death was embolism related with 4 deaths. This included deaths due to amniotic fluid embolism, trophoblast embolism and their complications such as DIC. Haemorrhage was the reason of death in two cases. In 2 cases, the reason of death was acute liver failure. However, one of these cases also had characteristics of gestational acute respiratory distress syndrome. In one case, the reason for death was assigned to coronary artery disease complicated by pregnancy. One case was of ruptured ectopic pregnancy. In another

case, the cause of death was a surgical complication of a dilatation and curettage procedure. In the remaining 3 cases, the underlying triggering reason for death could not be determined even after histopathological examination, chemical analysis, and a complete autopsy.

Table No.1 : Year-wise distribution of maternal deaths (n=14)

Year	Total number of deaths	Maternal deaths
2009	712	0 (0%)
2010	836	0 (0%)
2011	782	1 (0.12%)
2012	837	1 (0.11%)
2013	873	2 (0.22%)
2014	969	3 (0.30%)
2015	929	3 (0.32%)
2016	885	0 (0%)
2017	836	2 (0.23%)
2018	806	2 (0.24%)

Table No.2 : Causes of autopsied maternal deaths

Cause of death	Number of deaths (n=14)
Embolism or its complications	4 (28.57%)
Haemorrhage	2 (14.28%)
Pregnancy related liver disorders	2 (14.28%)
Coronary artery disease complicated by pregnancy	1 (7.14%)
Post-surgical complication	1 (7.14%)
Rupture of ectopic pregnancy	1 (7.14%)
Unascertained	3 (21.42%)

Discussion

The process of first obtaining the record of deaths and then designating a cause is not a simple one, and this, in itself, makes demonstrating trends – an increase or decrease – difficult [6]. "Up to two-thirds of the world's population reside where regular registration of deaths is missing, and for the other third, misclassification or wrong classification of causes or circumstances may lead to false trends and conclusions about progress" [7]. Without an appropriate analysis of the causes of pregnancy-related mortality, there will not be present a proportional allocation of resources to reduce its incidence. "In many developing countries only deaths occurring in a health facility are assigned a medical cause of death, as certification of deaths at home is rare and relatives' version of signs and symptoms might not be adequately accurate or dependable to draw conclusions. Also, for deaths at home, verbal autopsy techniques are often

used to determine the likely cause of death" [8]. Thus, the leading source of data on pregnancy-related deaths can be said to be clinical records and verbal autopsies in developing countries. Both of these sources have considerable constraints as a result of inconsistencies between the clinically assumed and the definite cause of death [9]. It has also been noted that verbal autopsies have little validity in attributing maternal deaths to a single specific medical cause and that there are intrinsic limitations in obtaining medical event records from non-medical informants who may not be literate and lack a medical background [10]. Another finding seen is that "Misclassification of medical cause of death is common for many categories of death, including in developed countries with sophisticated statistical systems [11] as well as in developing countries".[12]

It has been made repeatedly apparent that "Evidence provided by medical autopsies has played an important role in improving the accuracy of cause-of-death reports and improving clinical practice in the developed world" [9,13]. A trustworthy ascertainment of the causes of pregnancy-related mortality thus requires an autopsy [14]. The value of an autopsy in establishing the cause of death was revealed in the study of Sonderegger-Iseli et al. [9] with clinical differences in up to thirty percent of cases. Evidence from autopsies has been shown to invaluable for obtaining information that will prevent maternal deaths [15,16]. It is also apparent that "In the absence of a routine autopsy, many deaths in developing countries remain recorded as 'unknown'."

Time of death around pregnancy: Studies have "shown that maternal deaths cluster around labour, delivery and the twenty-four hours immediately postpartum" [17]. This is similar to the findings in our study which showed that the majority of deaths were in the third trimester and within 24 hours post-partum.

Cause of death: The major causes of maternal mortality in India have been identified as "anaemia (64.4%), pre-eclamptic toxaemia (PET) & eclampsia (25.5%), sepsis (20.6%) and haemorrhage (19.8%)" [18]. This contrasts with our study wherein the majority of deaths were related to embolism and its complications. Haemorrhage only accounted for two deaths in our study and showed an equal incidence to acute liver disease of pregnancy. The reasons for the cause of death being unascertained in three cases can be attributed to incomplete medical information furnished, a lack of hospital records, or natural causes of death that are difficult to diagnose at autopsy. Our study also shows different findings when compared to the study done by Bardale et al., where "haemorrhage was the leading cause of death (38.09%) followed by indirect causes (23.80%), undetermined (19.04%), sepsis (9.52%) and postpartum pre-eclamptic shock (9.52%)" [19].

Conclusion

Maternal mortality autopsies have perhaps more importance than autopsies of other deaths because these reports are then used to make suggestions for improving clinical obstetric practice and defining the cause of death [20]. In conclusion, maternal autopsy investigation offers an exact cause of death in most cases and is still an important tool for identifying the cause of maternal mortality [20]. The information gathered from maternal autopsies deliver feedback to clinicians which will help to improve clinical practice [15].

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References

1. You D, Hug L, Ejdemyr S, Idele P, Hogan D, Mathers C, et al. Global, regional, and national levels and trends in under-5 mortality between 1990 and 2015, with scenario-based projections to 2030: A systematic analysis by the UN Inter-Agency Group for Child Mortality Estimation. Lancet [Internet]. 2015 Dec 5 [cited 2020 Jul 1];386(10010):2275–86. Available from: https://pubmed.ncbi.nlm.nih.gov/26361942/
2. Hogan MC, Foreman KJ, Naghavi M, Ahn SY, Wang M, Makela SM, et al. Maternal mortality for 181 countries, 1980-2008: a systematic analysis of progress towards Millennium Development Goal 5. Lancet [Internet]. 2010 May 8 [cited 2020 Jul 1];375(9726):1609–23. Available from: http://www.thelancet.com/article/S0140673610605181/fulltext
3. Khan KS, Wojdyla D, Say L, Gülmezoglu AM, Van Look PF. WHO analysis of causes of maternal death: a systematic review. Lancet [Internet]. 2006 Apr 1 [cited 2020 Jul 1];367(9516):1066–74. Available from: https://pubmed.ncbi.nlm.nih.gov/16581405/

4. Christiansen LR, Collins KA. Pregnancy-associated deaths: A 15-year retrospective study and overall review of maternal pathophysiology. Am J Forensic Med Pathol [Internet]. 2006 Mar [cited 2020 Jul 1];27(1):11–9. Available from: https://pubmed.ncbi.nlm.nih.gov/16501342/
5. World Health Organization. Strategies towards ending preventable maternal mortality (EPMM). Available from https://apps.who.int/iris/bitstream/handle/10665/153544/9789241508483_eng.pdf
6. Hill K. Making deaths count [Internet]. Vol. 84, Bulletin of the World Health Organization. World Health Organization; 2006 [cited 2020 Jul 1]. p. 162. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2627301/
7. Mathers CD, Fat DM, Inoue M, Rao C, Lopez AD. Counting the dead and what they died from: an assessment of the global status of cause of death data. Vol. 83, Bulletin of the World Health Organization. 2005.
8. Ronsmans C, Vanneste AM, Chakraborty J, Van Ginneken J. A comparison of three verbal autopsy methods to ascertain levels and causes of maternal deaths in Matlab, Bangladesh [Internet]. Vol. 27, Great Bntain International Journal of Epidemiology. 1998 [cited 2020 Jul 1]. Available from: https://academic.oup.com/ije/article-abstract/27/4/660/754935
9. Sonderegger-Iseli K, Burger S, Muntwyler J, Salomon F. Diagnostic errors in three medical eras: A necropsy study. Lancet [Internet]. 2000 Jun 10 [cited 2020 Jul 1];355(9220):2027–31. Available from: https://pubmed.ncbi.nlm.nih.gov/10885353/
10. Sloan NL, Langer A, Hernandez B, Romero M, Winikoff B. The etiology of maternal mortality in developing countries: What do verbal autopsies tell us? Bull World Health Organ. 2001;79(9):805–10.
11. Deneux-Tharaux C, Berg C, Bouvier-Colle MH, Gissler M, Harper M, Nannini A, et al. Underreporting of pregnancy-related mortality in the United States and Europe. Obstet Gynecol [Internet]. 2005 [cited 2020 Jul 1];106(4):684–92. Available from: https://pubmed.ncbi.nlm.nih.gov/16199622/
12. Songane FF, Bergström S. Quality of registration of maternal deaths in Mozambique: A community-based study in rural and urban areas. Soc Sci Med [Internet]. 2002 [cited 2020 Jul 1];54(1):23–31. Available from: https://pubmed.ncbi.nlm.nih.gov/11820679/
13. Scottolini AG, Weinstein SR. The Autopsy in Clinical Quality Control. JAMA J Am Med Assoc [Internet]. 1983 Sep 2 [cited 2020 Jul 1];250(9):1192–4. Available from: https://jamanetwork.com/journals/jama/fullarticle/387892
14. Fligner CL, Murray J, Roberts DJ. Synergism of verbal autopsy and diagnostic pathology autopsy for improved accuracy of mortality data. Popul Health Metr [Internet]. 2011 Dec 1;9(1):25. Available from: https://pophealthmetrics.biomedcentral.com/articles/10.1186/1478-7954-9-25
15. Daramola AO, Banjo AAF. Autopsy as a tool in the prevention of maternal mortality. Niger J Clin Pract. 2009;12(4):457–60.
16. Daramola AO, Elesha SO, Banjo AAF. Medical audit of maternal deaths in the Lagos University Teaching Hospital, Nigeria. East Afr Med J [Internet]. 2005 [cited 2020 Jul 1];82(6):285–9. Available from: https://pubmed.ncbi.nlm.nih.gov/16175778/
17. Ronsmans C, Graham WJ. Maternal mortality: who, when, where, and why. Vol. 368, Lancet. Elsevier; 2006. p. 1189–200.
18. Bhatt R. Maternal mortality in India—FOGSI–WHO study. J Obs Gynecol India. 1997;(47):207–14.
19. Bardale RV, Dixit PG. Pregnancy-related deaths: A Three-year retrospective study. Journal of Indian academy of forensic medicine. 2010;32(1):15-8.
20. Keskin HL, Üstün YE, Sanisoğlu S, Karaahmetoğlu S, Özcan A, Çelen Ş, et al. The value of autopsy to determine the cause of maternal deaths in Turkey. J Turkish Ger Gynecol Assoc. 2018;19(4):210–4.