Risk identification from maternal and neonatal data for improvements in Quality of Care: A comparison of audit based approach with Maternal and Child Tracking System and Verbal Autopsy

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ABSTRACT

Background: Maternal and Child Tracking System (MCTS) and Verbal Autopsy (VA) are inadequate in risk identification from the available maternal and neonatal data. Hence community-based audit approach is required. Maternal and neonatal data obtained from MCTS, VA were compared with data obtained from the Audit model **t**o know the differences in: (1) Quantity of information. (2) Relevance of the information.

Methods: Perinatal death auditing was conducted in two districts of Karnataka state with the help of an expert panel consisting of paediatricians and obstetricians. Information on perinatal deaths were received from hospitals as well as from the community. Data collection tool covered details pertaining to care received, transport, referral, apart from socio-demographic details. Medical Social Workers collected filled tools from the hospitals. Maternal and neonatal data of audit model was compared with that obtained from MCTS and VA.

Results: The data captured from audit model (n=1032) was more than MCTS (n=224) and VA (n=165) as it included the data from private hospitals and community. Maternal and neonatal risk identification was possible with audit system but not with MCTS and VA.

Conclusion: Audit system is comprehensive and provides inputs for health care planning.

Key Words: Maternal & Neonatal data; Risk Identification; MCTS; Verbal Autopsy; Audit Based Approach; Quality of care

INTRODUCTION

Sustainable Development Goals (SDG) target to reduce the global maternal mortality ratio to less than 70 per 100 000 live births by the year 2030.[1] SDG also envisages to end preventable deaths of newborns and children under 5 years of age, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1,000 live births and under-5 mortality to at least as low as 25 per 1000 live births. [1] To end preventable newborn deaths and reduce maternal mortality, it is important to identify high risk mothers / deliveries, high risk neonates and improve the quality of care provided to them. Government of India has outlined many steps to accomplish

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these targets.[2] Maternal and child tracking system (MCTS) which is a web based system was launched by the government of India with the purpose of providing timely and accurate information to take decisions.[3]

Since its launch in the year 2009, some attempts have been done to evaluate Maternal and child tracking system (MCTS).[4-6] It was found to be incomplete and inaccurate.[4,5] Apart from the use of tools that were not standardized, there were lacuna related to supervision and monitoring.[4] These quantitative evaluations make no mention of information about quality of care.[4,5] But it could be inferred that risk identification of the mothers did not happen.[4] Most of the MCTS information about children is focussed on vaccination. Information regarding high risk neonates and the treatment provided is not documented routinely in MCTS. From the perspective of identifying high risk mothers and newborns MCTS has been inadequate.[4,5]

Based on MCTS database, it is possible to know about maternal deaths and their risk profiles that occur in government hospitals.[7-10] Private hospitals are not a part of this system. Private Hospitals are the largest maternal and child health care providers in India and preferred over government hospitals [11]. Verbal Autopsies (VA) are supposed to be conducted for reported maternal and neonatal deaths that occur in the hospitals of a district [12,13]. As VA is based on direct interaction with family members of the deceased, it is possible to infer the probable cause of death, but is inadequate to know about the risk profiles of the mother and neonate. So identification of high risk mothers and preventable newborn deaths would be difficult.

Perinatal death auditing would help identify preventable perinatal deaths [14-17]. Apart from identifying high risk neonates, it would provide inputs for planning and prevention of perinatal deaths [14-17]. Similarly maternal death auditing would help identify high risk mothers, issues related to care received by the mother and provides inputs to prevent maternal deaths [18,19].

Though audit-based approach serves the purpose of identifying high risk cases and preventable deaths, they are usually limited to a single institution/hospital [20-28]. So there is a need for a community based audit approach which captures qualitative information from all hospitals (government & private) and the community.

A community based interventional study on perinatal death auditing was conducted in two districts of Karnataka State, India. This paper describes the audit model and compares it with MCTS and VA in the context of maternal and neonatal risk identification. The maternal and neonatal data captured by the audit model is compared with the data obtained from MCTS and VA with the objectives to know the differences in: (1) the quantity of information obtained. (2) Relevance of the information obtained.

MATERIALS AND METHODS

Study Setting: Dakshina Kannada district which is economically, educationally better developed, and with better health care infrastructure; as compared with Koppal district which is poorly developed would help understand the difference in the three approaches in two different types of the districts ie, better and poor conditions [29,30].

Maternal and Child Tracking System (MCTS): This is a web-based information gathering system established by the government of India [3]. The information obtained from government hospitals is entered in to this system which generated reports and provides information to the district health administration. Expectant mothers are registered on the system and are followed up by health care workers up to delivery and post-partum period. Neonates are required to be followed until immunization is completed. Primary objective of this system is to monitor pregnancy and identify high risk pregnancies and also risk transition from at risk to high-risk pregnancy [3, 7-10].

Verbal Autopsies (VA): These are supposed to be carried out for maternal and child deaths reported from the hospitals in a district [12,13]. VA is routinely carried out by field health workers/doctors in PHCs and analysed by district health authorities.

Audit Model: The overall design and audit model is depicted in Figure No 1. The sources of information included the hospitals (government & private) and the community. The details of all the government and private hospitals in both the districts are described elsewhere [31].

Personnel: (A) Expert panel was constituted one for each district the role and functioning are depicted in Figure 1. The panel consisted of paediatricians, obstetricians from government and private hospitals apart from Reproductive Child Health (RCH) officer of the district. (B) Medical-Social Workers: These were recruited and trained to fill the information gathering tool used during the study. They visited and collected information from all the hospitals and community. Their role and work is depicted in fig 1.

Information gathering tool: Which captures different types of information which were classified under the following heads.(a) Socio-Economic Background; (b) Antenatal Referral Details; (c) Antenatal Care Details including investigations and treatment; (d) Intrapartum Referral Details; (e) Newborn details at Birth; (f) Status of the child at the time of admission to special neonatal care unit or neonatal intensive care units, (g) Out-born neonatal referral details; (h) Neonatal transport details. In addition to these, it also captures (i) Type of documents examined and their status; and (j) Referral related factors. The form also had a provision to note any other details relevant to, but not covered under the above heads.

Training: Familiarization and training sessions were held in workshop module in batches for doctors,

nurses and paramedical personnel at both the districts. Doctors and paramedical personnel were trained to fill the tool.

Sources and flow of information: sources of information included all the hospitals and the community as depicted in figure No 1. MSWs were the link for to and fro flow of the information from the expert panel to the hospitals and community.

Outcome measures:1]. Proportions of maternal and neonatal risk identified from the maternal and neonatal data by three different approaches. 2]. Difference in relevance of information obtained from three different approaches.

Data collection: Necessary clearances were taken from the government before beginning of the project. Medical Social workers (MSWs) visited the office of the district health officer in both the districts apart from hospitals (government and private) and community the details of which are depicted in Figure 1.

Data Analysis: Maternal and neonatal data of the audit model is compared with the data obtained from MCTS and VA approaches. The results are expressed as proportions in tables. Differences in the relevance of the information are described and discussed.

RESULTS

Maternal and neonatal data obtained from the audit model (n = 1032) was much higher than that obtained from MCTS (n = 224) and VA (n=165). So, only that information from the audit model which is comparable with the other two approaches is shown in Tables. The breakup of the data from the two districts (Table 1) shows that Dakshina Kannada had much lesser antenatal data (n = 56 , 11) as compared to Koppal District (n= 168, 154) through MCTS and VA respectively though the differences in audit model is much lesser (n=444 and 588).
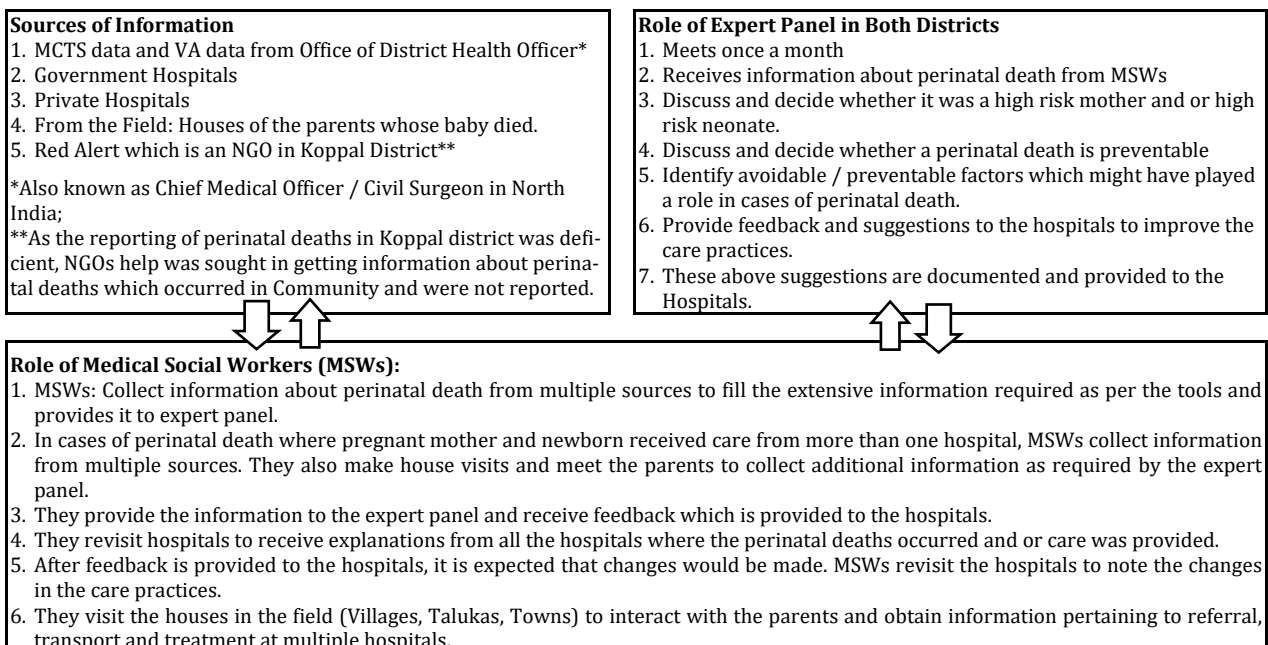

Sources of Information
1. MCTS data and VA data from Office of District Health Officer*
2. Government Hospitals
3. Private Hospitals
4. From the Field: Houses of the parents whose baby died.
5. Red Alert which is an NGO in Koppal District**

*Also known as Chief Medical Officer / Civil Surgeon in North India;
**As the reporting of perinatal deaths in Koppal district was deficient, NGOs help was sought in getting information about perinatal deaths which occurred in Community and were not reported.

Role of Expert Panel in Both Districts
1. Meets once a month
2. Receives information about perinatal death from MSWs
3. Discuss and decide whether it was a high risk mother and or high risk neonate.
4. Discuss and decide whether a perinatal death is preventable
5. Identify avoidable / preventable factors which might have played a role in cases of perinatal death.
6. Provide feedback and suggestions to the hospitals to improve the care practices.
7. These above suggestions are documented and provided to the Hospitals.

Role of Medical Social Workers (MSWs):
1. MSWs: Collect information about perinatal death from multiple sources to fill the extensive information required as per the tools and provides it to expert panel.
2. In cases of perinatal death where pregnant mother and newborn received care from more than one hospital, MSWs collect information from multiple sources. They also make house visits and meet the parents to collect additional information as required by the expert panel.
3. They provide the information to the expert panel and receive feedback which is provided to the hospitals.
4. They revisit hospitals to receive explanations from all the hospitals where the perinatal deaths occurred and or care was provided.
5. After feedback is provided to the hospitals, it is expected that changes would be made. MSWs revisit the hospitals to note the changes in the care practices.
6. They visit the houses in the field (Villages, Talukas, Towns) to interact with the parents and obtain information pertaining to referral, transport and treatment at multiple hospitals.

Figure 1: Overall audit model in each of the two districts

Table 1: Comparison of the maternal data captured and risk identification by Maternal and Child Tracking System, Verbal Autopsy and Community Based Audit Model

Antenatal Parameters	Maternal & Child Tracking Sys			Verbal Autopsy			Community Based Audit Model		
	DK (n=56)	Koppal (N=168)	Total (N=224)	DK (N=11)	Koppal (N=154)	Total (N=165)	DK (N=444)	Koppal (N=588)*	Total (N=1032)
Antenatal Data									
Antenatal Checkups	44 (78.5)	145 (86.3)	189 (84.3)	11 (100)	151 (98)	162 (98.1)	359 (80.8)	379 (64.4)	738 (71.5)
Period of Gestation	---	---	---	10 (90.9)	150 (97.4)	160 (96.9)	444 (100)	269 (45.7)	713 (69)
Hb#	---	---	---	---	---	---	343 (77.2)	409 (69.5)	752 (72.8)
Blood Grouping	---	---	---	---	---	---	389 (87.6)	409 (69.5)	799 (77.4)
Ultrasound Examination	---	---	---	---	---	---	384 (86.4)	126 (21.5)	510 (49.4)
Intranatal Data									
Type of delivery	35 (62.5)	116 (69)	151 (67.1)	10 (90.9)	150 (97.4)	160 (96.9)	416 (93.6)	426 (72.4)	842 (81.5)
Intranatal Complications	25 (44.6)	15 (8.9)	40 (17.8)	9 (81.8)	25 (16.2)	34 (20.6)	183 (41.2)	54 (9.1)	237 (22.9)
Use of Partograph	---	---	---	---	---	---	271 (61)	376 (63.9)	647 (62.6)
Presence of FHS	---	---	---	---	---	---	372 (83.7)	283 (48.1)	655 (63.4)
Birth Weight	28 (50)	85 (50.5)	113 (50.4)	11 (100)	135 (87.6)	146 (88.4)	429 (96.6)	473 (80.4)	902 (87.4)
Apgar Score	---	---	---	---	---	---	150 (33.7)	31 (5.2)	181 (17.5)

*At Koppal District there were a total of 626 forms. But 38 forms are not included in analysis as there was no data available.
#Hemoglobin; FHS=Foetal Heart Sounds; Figure in parenthesis indicate percentage.

Table 2: Comparison of the neonatal data captured and risk identification by VA and Community Based Audit Model

Neonatal Parameters	Maternal & Child Tracking Sys			Verbal Autopsy			Community Based Audit Model		
	DK (56)	Koppal (168)	Total (224)	DK (11)	Koppal (154)	Total (165)	DK (194)	Koppal (210*)	Total (404)
Neonatal Data									
Birth Asphyxia	---	---	---	---	39 (25.3)	39 (23.6)	105 (23.6)	92 (15.6)	197 (19)
First Cry	---	---	---	9 (81.8)	149 (96.7)	158 (95.7)	177 (39.8)	151 (25.6)	328(31.7)
Warmer Care	---	---	---	---	---	---	175 (39.4)	85 (14.4)	260(25.1)
Initiation of Breast Feeding	---	---	---	6 (54.5)	86 (55.8)	92 (55.7)	10 (2.2)	21 (3.5)	31 (3)
Post-Resuscitation Care	---	---	---	---	---	---	7 (1.5)	25 (4.2)	32 (3.1)
Referral Data	---	---	---	---	119 (77.2)	119 (72.1)	14 (3.1)	161 (27.3)	175(16.9)
Identified High Risk Factors									
Anaemia	1 (1.7)	27 (16)	28 (12.5)	1 (9)	3 (1.9)	4 (2.4)	134 (30.1)	395 (67.1)	529(51.2)
PIH**	---	---	---	---	5 (3.2)	5 (3)	138 (31.8)	82 (13.9)	220(21.3)
Birth Asphyxia	---	---	---	---	39 (25.3)	39 (23.6)	105 (23.6)	92 (15.6)	197 (19)
Preterm	---	---	---	5 (45.4)	10 (6.4)	15 (9)	134 (30.1)	112 (19)	246(23.8)
RDS***	---	---	---	2 (18.1)	14 (9)	16 (9.6)	77 (17.3)	5 (0.8)	82 (7.9)
Postpartum Infections	---	---	---	---	4 (2.5)	4 (2.4)	59 (13.2)	1 (0.1)	60 (5.8)

*At Koppal District there were a total of 626 forms. But 38 forms are not included in analysis as there was no data available.
Pregnancy Induced Hypertension; * Respiratory Distress Syndrome; Figure in parenthesis indicate percentage.

Information pertaining to antenatal risk identification and care are missing in MCTS for both the districts except for maternal anaemia (Table 1).

Though quantitatively VA is slightly better than MCTS it is far below in antenatal risk identification and care (Table 1). Quantitatively intra-natal data captured in MCTS and VA is better than antenatal data though they are far below audit model (Table 1).

As neonatal data pertaining to care and deaths are not captured in MCTS, only the data from VA which is comparable with audit model are presented in Table 2. Most of the information about intranatal care is captured by audit model though VA provides very little information about neonatal care (Table 2)

DISCUSSION

Comparison of data obtained from audit model with MCTS and VA is unique with no other similar study. Quantitatively higher magnitude of data was captured by audit model as compared with MCTS. As MCTS relies on the data from the government hospitals it misses the data from the private sector which is the largest provider of maternal and child health care in India [11]. So audit model is more representative than MCTS. Though VA captures data from the hospitals, it is not for identification of risk and lacuna in the care provided (Tables 1 & 2). Audit model ensures that information about maternal and neonatal care received in the private sector is traced by the MSWs by repeated hospital visits coupled with community visits as required. So quantitatively more and qualitatively better information is obtained from audit model about mothers and children as compared with VA making it more relevant.

Dakshina Kannada district has much lower information than Koppal district through MCTS as compared with audit model. Dakshina Kannada district is more developed in terms of availability of private health care facilities, economy and affordability among the

people [29]. As private health care is preferred over government hospitals, the available data in MCTS is lesser than audit model which includes data from private hospitals as well. Koppal district is poorer in terms of private health care facilities, economy and people prefer government hospitals where the services are free [30]. Audit model gathers information from private hospitals and community as well so the differences between Koppal and Dakshina Kannada districts are lesser (n=588 and 444). This makes information available through audit model representative increasing its relevance for health care planning as compared with MCTS or VA alone.

Identification of high risk pregnancy / delivery and neonatal cases helps to plan and provide quality health care reducing maternal and neonatal mortality. Apart from being inadequate to identify high risk antenatal mothers, MCTS did not capture information pertaining to quality of antenatal care (like checkups, haemoglobin, blood grouping, ultrasound examination) and intranatal care (like use of partograph) making it less useful than audit model. As the information about neonatal care is not available in MCTS, it is not suitable to identify high risk neonates increasing the relevance of audit model for health care planning. As VA cannot capture information pertaining to risk and care received, its relevance is limited to cause of death identification of only the reported cases. Our experience suggests that audit model has other advantages like identification of preventable deaths and avoidable / preventable factors in care helping accomplish maternal and neonatal targets of SDG.[1]

There are some limitations. This type of audit model takes time and effort to collect and analyze information from different sources unlike MCTS and VA which are quicker. Sometimes repeated Visits to different sources including community are required to gather information. Considering the representativeness and relevance of the information, audit model

deserves to be part of the India's efforts to accomplish SDG goals.[1]

CONCLUSIONS

Community based audit model is comprehensive and relevant for maternal and neonatal risk identification. It provides quality inputs for health care planning.

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