

## AN OBSERVATIONAL REVIEW OF DETERMINANTS OF PERINATAL DEATHS IN KWAHU EAST, WEST AND SOUTH DISTRICTS

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### Abstract

**Background:** Perinatal deaths, largely occurring in full-term pregnancy<sup>1</sup>, are usually of unknown causes even with statutory routine autopsy performance<sup>2</sup>. Autopsies reveal causes in only 40%<sup>4</sup>. Data paucity remains a major challenge in developing countries<sup>7</sup>.

**Objective:** The study aimed to identify determinants of perinatal deaths in three Kwahu Districts and assess their preventability.

**Methodology:** An observational study with an unmatched case control design using Health Facility-based data.

**Results:** Most perinatal deaths occurred at term. Mean gestational age at delivery was 37 and 38.8 weeks for cases and controls respectively. Cases were mainly rural residents with informal occupations and comparatively higher gravidity and parity. Controls had higher educational backgrounds. Factors associated with perinatal deaths were Rural residence, OR - 2.7

(95% CI = 2.02 - 3.6), grandmultiparity OR - 2.0 (95% CI = 1.3 - 3.2), mal presentation OR - 2.5 (95% CI = 1.4 - 4.4), Low Birth Weight OR - 2.3 (95% CI = 1.4 - 3.8), delayed second stage OR - 8.4 (95% CI = 2 - 27), Hypertensive disease OR - 3.0 (95% CI = 1.8 - 3.6), uterine rupture OR - 2.0 (95% CI = 1.8 - 2.1) and prematurity OR - 3.8 (95% CI = 2.7 - 5.3). Formal occupations OR - 0.4 (95% CI = 0.3 - 0.7), referrals OR - 0.6 (95% CI = 0.4 - 0.7), tertiary education OR - 0.3 (95% CI = 0.2 - 0.5) and adequate ANC OR - 0.5 (0.3 - 0.6) significantly reduced odds of deaths.

**Conclusions:** Perinatal deaths remain preventable with accessible quality ANC, delivery and postnatal services supported by comprehensive, sustainably funded surveillance. The Human Rights Based Approach to programming must be prioritized.

**Key Words:** *Perinatal death, stillbirth, early neonatal death, classification, case control.*

### Introduction

Perinatal deaths i.e. fetal deaths after 28 completed gestational weeks to the first week of life<sup>1</sup> mainly occur in full-term pregnancy<sup>1</sup> due to largely unknown causes even with routine statutory autopsy performance<sup>1</sup>. Infrequently referred to as Sudden Antenatal Death Syndrome (SADS)<sup>2</sup>, autopsies may establish causes in only 40%<sup>3</sup>. They are, in extant literature, largely attributed to bacterial infection, birth defects, chromosomal aberrations, growth retardation, intra-hepatic cholestasis of pregnancy, maternal diabetes, high blood pressure (including pre-eclampsia) etc<sup>4</sup>. Despite observed gradually declining rates in developing countries<sup>5</sup>, data remains paucity<sup>6</sup> with overtly inefficient legal frameworks to prioritize accurate perinatal death registration<sup>6</sup>. Due to lack of prioritization for surveillance activities in many developing countries<sup>5</sup>, studying historical trends remains arduous<sup>7</sup> with such regions still lacking maternity services for safe delivery and newborn care<sup>6</sup>. Non-registration of some deliveries in these Regions (where an estimated 98% i.e. 3.2 million of the global burden occurs) further exacerbates challenges to

accurate estimations<sup>8</sup>. Rates in developed countries also continue to significantly decline<sup>9</sup>. Health facility-based data on Perinatal Death Audit Forms remains the only reliably available data source in Ghana. Prevalence of perinatal deaths in the Kwahu Districts in the north of Ghana's Eastern Region remains comparatively high i.e. 1.3 - 1.5%. This study therefore aimed to identify (1) patterns and distribution of risk factors, (2) strengths of association between identified risk factors and perinatal deaths and (3) assess perinatal death preventability.

### Methods

The study is an observational study with an unmatched case control design carried out in three steps comprising (1) identification of cases of perinatal deaths from filled perinatal death audit forms, (2) identification of control observations (3) and analyses of acquired data. Cases comprised stillbirths, i.e. fetal death after 28 completed gestational weeks or Early Neonatal Death i.e. neonatal death within the first 7 days of life. Case finding was passive as all available perinatal death audit forms were duly audited at the facility level by facility audit teams. Controls comprised live births by vaginal delivery or cesarean section sampled at hospitals and sub district health facilities where deliveries are conducted, interviewed with structured, pre-tested questionnaires. To ensure efficient data capture, questionnaires were administered during mornings to facilitate capture of data on parturients with uncomplicated deliveries as

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well since they are typically discharged after routine ward rounds by the doctors. ANC books and labor charts of participants were additionally a source document for verification of information acquired through interviews. Reproductive health units of hospitals were visited at least 2 times daily by trained assistants to administer questionnaires. Pregnant women yet to deliver were excluded as the study primarily aimed to investigate perinatal survival. To aide efficient resource management, midwives at Sub-district health facilities were trained to administer questionnaires to enable research assistants visit such facilities for data collection less frequently. Due to the unavailability of a globally utilized classification system for perinatal deaths<sup>10, 11, 12</sup>, the study employed the third revision of the Perinatal Death Classification used by the Perinatal Society of Australia and New Zealand (PSANZ) classifications for Perinatal Death Classification and the accompanying Classification Guide (which provides a detailed description of the classification and case examples), first released in May 2003. This classification system aides identification of single most important factors preceding the chain of events resulting in death while the purpose of the PSANZ Neonatal Death Classification (PSANZ-NDC) is, in addition to the PSANZ-PDC, to identify the single most important factor in the neonatal period causing death. Perinatal deaths included in this study were classified to the nearest matching category on the PSANZ Perinatal Mortality Classification system.

## Results

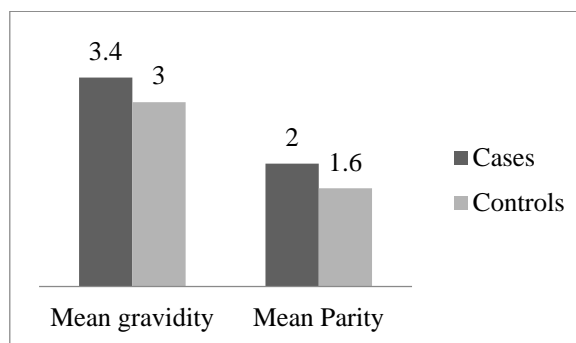
A total of 394 cases and 399 controls were included in the study with prior assumptions that respondents not consenting to participation did not significantly differ from participants though such refusal was not encountered. Mean maternal age for cases and controls varied negligibly i.e. 28 and 27 for cases and controls respectively while mean gestational age (in weeks) at delivery was 37 for cases and 38.8 for controls. Mean birth weight was 2.6 kg and 3.07 kg for cases and controls respectively. At least 24.8% of controls and 18.5% of cases were in age group 21 – 25 years. Cases had a higher frequency of participants in the advanced maternal age category than controls i.e. 20% and 14% respectively. Controls, unlike cases were mainly urban residents and this pattern however varied among adolescents who had 21% resident in urban communities as compared with 16.6% of controls resident in rural communities. Occupation patterns (analyzed as formal and informal) suggested comparatively higher proportions of cases were engaged in informal occupations than controls. Analyses of participants' highest education attained suggested controls were of comparatively higher educational backgrounds than cases i.e. a higher

proportion of controls were of Senior High School and tertiary educational backgrounds. See table 1.

**Table 1:** Area of Residence, Occupation Types and Educational Backgrounds' of Participants

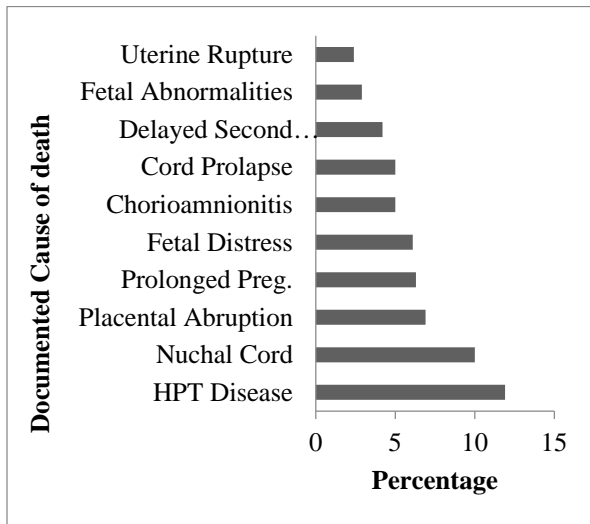
No.	Characteristic	Cases		Controls	
		N	(%)	N	(%)
<b>Area of Residence</b>					
1.	Urban Residence	153	39.0	252	63.3
2.	Rural Residence	239	61.0	146	36.7
<b>Occupation (Formal and Informal)</b>					
1.	Formal	30	7.7	65	16.3
2.	Informal	362	92.3	333	83.7
<b>Education (Highest Education Attained)</b>					
1.	Nil education	35	8.9	24	6.1
2.	Primary	94	24	55	14.1
3.	JHS	217	55.4	217	55.5
4.	SHS	30	7.7	40	10.2
5.	Tertiary	16	4.1	55	14.1

Mean gravidity and parity were comparatively higher for cases than controls. See graph 01.



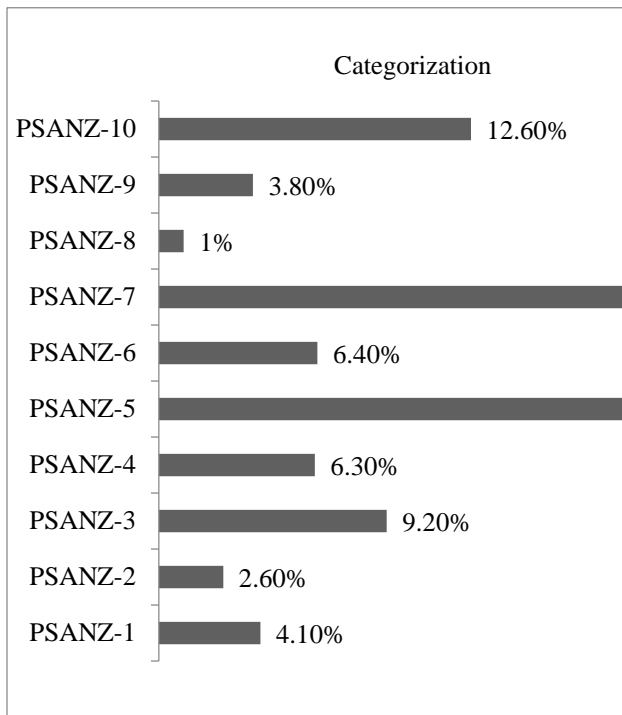
**Graph 1:** Mean Gravity and Mean Parity Patterns of cases and controls

Cesarean section delivery rates were higher among cases than controls while majority of perinatal deaths occurred in full term pregnancy – 83%. The leading causes of death included hypertensive disease in pregnancy, placental abruption, prolonged pregnancy, fetal distress, chorioamnionitis, cord prolapse, delayed second stage, fetal abnormalities and uterine rupture. About 62.5% of perinatal deaths for which no cause of death was established were macerated while 26.7% were fresh still births. About 61.4% of perinatal deaths of unknown cause occurred in women with purportedly unremarkable ANC i.e. no risk factor identified as suggested by relevant records.



**Graph 2:** Top ten Perinatal Death Causes among Cases and Controls

Analyses of categorized causes of death by PSANZ-PDC and PSANZ-NDC categorization indicated that perinatal deaths were largely due to PSANZ-7 factors i.e. hypoxic peripartum death (typically infants of >28 weeks gestation or >800g birth weight) with intrapartum complications - uterine rupture, cord prolapse, shoulder dystocia etc. Second in this series were PSANZ-5 factors which include Maternal Conditions e.g. diabetes/gestational diabetes, maternal sepsis, obstetric cholestasis and other specified maternal conditions.



**Graph 3:** Causes of Perinatal Deaths in the Three Kwahu Districts by PSANZ

Bivariate analyses suggested rural residents were about 3 times as likely to have perinatal deaths as urban residents OR – 2.7 (95% CI = 2.02 - 3.6). Formal occupations reduced odds of perinatal deaths by 60% OR - 0.4 (95% CI = 0.3 - 0.7). A tertiary educational background reduced odds of perinatal deaths by 70%, OR – 0.3 (95% CI = 0.2 - 0.5). Grandmultiparity was associated with significantly increased odds of perinatal deaths, OR – 2.0 (95% CI = 1.3 - 3.2). Adequate ANC attendance i.e. upwards of 4 attendances and identification of obstetric risk factors at ANC reduced odds of death OR – 0.5 (95% CI = 0.3 - 0.6) and OR – 0.7 (95% CI = 0.5 - 0.9) respectively. Mal presentation at delivery, operationally defined non-cephalic presentation in this study, significantly increased odds of perinatal deaths, OR – 2.5 (95% CI = 1.4 - 4.4). The increased perinatal death odds with mal presentation was however not amenable to adequate ANC attendance OR – 2.4 (95% CI = 1.3-4.3). Low Birth Weight (i.e. 2.4 kg or less) increased odds of perinatal deaths OR – 2.3 (95% CI = 1.4 - 3.8). Other specific conditions and states significantly associated with perinatal deaths include fetal abnormalities, delayed second stage, fetal distress, pregnancy induced hypertension, malaria and ante partum hemorrhage. Anemia in pregnancy OR – 0.06 (95% CI = 0.02 - 0.2), birth asphyxia OR – 0.1 (95% CI = 0.04 - 0.3), fetal macrosomia OR - 0.2 (95% CI = 0.05 - 0.6) and Bad Obstetric History (BOH) significantly reduced odds of perinatal deaths on the contrary. Preterm birth significantly increased odds of perinatal deaths OR – 3.8 (95% CI = 2.7 - 5.3) while. Cesarean delivery for APH did not reduce Odds of perinatal deaths OR – 4.1 (95% CI = 1.4 - 12.8). Cesarean delivery for previous cesarean delivery significantly reduced odds of perinatal deaths OR – 0.17 (95% CI = 0.04 - 0.55) while odds of perinatal deaths was also reduced by cesarean section for suspected fetal macrosomia, OR – 0.2 (95% CI = 0.06 - 0.07).

Specific factors classified in accordance with PSANZ-PDC and PSANZ-NDC specifications, increasing odds of perinatal deaths included PSANZ-2 OR – 11.2 (95% CI = 3.4 - 37), PSANZ-3 OR – 2.9 (95% CI = 1.7 - 4.9), PSANZ-4 OR – 4.8 (95% CI = 2.4 - 9.3), PSANZ-6 OR – 11.5 (95% CI = 4.5 - 29), PSANZ-7 OR – 1.8 (95% CI = 1.3 - 2.4), PSANZ-9 OR – 2.8 (95% CI = 2 - 4) and PSANZ-10 OR – 17 (95% CI = 8 - 34). PSANZ-5, characterized by maternal conditions, however significantly reduced odds of perinatal deaths. Rural residence, adjusted for age groups with intervals of 5 indicated that, rural residents aged 21-25 years were 6 times as likely to have perinatal death as rural residents of other age categories OR – 6 (95% CI = 3.1-11.8). Woolf’s test (chi square test for differing odds ratios) of 0.0062 significantly suggested effect modification, indicating the stratum specific odds Ratios differed significantly. Rural residents for whom an obstetric risk factor was identified during ANC had reduced but still significant odds of perinatal deaths

OR – 1.9 (95% CI = 1.2-2.9) and OR – 3.6 (95% CI = 2.3-5.5) respectively. Woolf's test was significant at 0.03. Rural residents with formal occupations had 50% reduced odds of perinatal deaths, Adjusted OR – 0.5 (95% CI = 0.3-0.8). Being referred to another health facility confounded the relationship between rural residence and perinatal deaths, Crude OR – 2.8 (95% CI = 2.1-3.7), and Adjusted OR – 3.2 (95% CI = 2.3-4.4). Rural residents had increased odds to be referred to the next level of care OR – 1.9 (95% CI = 1.4 - 2.6). Rural residents exposed to herbal medicines were about twice as likely to have perinatal deaths as those who did not OR – 1.8 (95% CI = 1.13-3.1). Formal occupation was associated with significantly reduced odds of perinatal deaths for clients who had upwards of Senior High School educational background, OR – 0.3 (95% CI = 0.16-0.5) - Woolf's test being significant at 0.006. The protective exposure identified with formal occupation lost significance with exposure to herbal medicines. Multivariate analyses using unconditional logistic regression bore credence to significance of associations between perinatal deaths and rural residence, informal occupations and inadequate ANC attendance.

## Discussion

Live births were mainly experienced by women 21-25 years old while perinatal deaths mainly characterized obstetric outcomes for women 15-20 years and upwards. Advanced maternal age of upwards of 35 years was importantly linked to adverse perinatal outcomes while higher mean gestational age above 39 weeks was importantly linked to improved perinatal survival. Adolescent fertility remains high albeit not significantly associated with perinatal deaths. Birth weight below 2.5 kg was importantly linked to unfavorable perinatal outcomes. Advanced maternal age (set at 35 years for purposes of this study) largely characterized women who experienced perinatal deaths with such participants being mainly rural residents. Associations of rural residence with bad perinatal outcomes warrants more research to investigate specific factors increasing odds of perinatal death. Findings suggesting comparatively higher CS deliveries among perinatal deaths should be interpreted within the context of obstetric complications that necessitated the CS delivery and the severity of these complications thereof. They may otherwise erroneously link CS to adverse obstetric outcomes. Occurrence of majority (83%) of perinatal deaths in full term pregnancy suggests need for intensified fetal health surveillance beyond establishment of viability. Perinatal deaths of unknown causes, following ANC otherwise deemed unremarkable, implicate doubtful quality of ANC services particularly at peripheral health facilities (i.e. Health centers, CHPS etc.) Formal occupations (inextricably linked to education, socio-economic status, residence etc) generally reduced odds of death and also reduced odds of death for rural

residents. Upwards of SHS educational background improved perinatal survival while high mean gravidity and parity did not improve perinatal survival. Prematurity, whose causes were beyond the scope of this review, importantly predicted perinatal deaths. Hypertensive disease in pregnancy was a leading cause of poor perinatal survival. The observed high prevalence of nuchal cords is likely attributable to tendencies to record such details only when perinatal outcomes are poor. Placental abruptions, consistent with normal expectations, significantly increased mortality. Other conditions among the leading 10 causes of perinatal deaths were prolonged pregnancy, fetal distress, chorioamnionitis, cord prolapse, delayed second stage, fetal abnormalities and uterine rupture. Other important causes were mal presentation, malaria, and ante partum hemorrhage. Cesarean delivery for APH marginally reduced odds of deaths suggesting immediate appropriate interventions with enhanced access to CEmONC and BEmONC may avert more perinatal deaths. Maternal anemia, birth asphyxia, fetal macrosomia, and Bad Obstetric History (BOH) reduced odd of perinatal death implying measures aimed to address these factors successfully facilitate their timely detection and intervention. Upwards of 4 ANC visits reduced odds of perinatal death. Perinatal deaths attributable to hypertensive disease in pregnancy were notably not amenable to adequate ANC attendance. Referral services, whose quality and reliability need further investigation by state, comprise an essential component in the continuum of Clinical Care. This service was associated with reduced odds of perinatal deaths. Referral Services, currently a primary responsibility of the Emergency Ambulance Service (EAS) face challenges that include: (1) cash payments of Ghc 200.00 or USD 50.00 payable by beneficiary (2) delays in arrival at emergency sites and (3) frequent break downs of service vehicles. Inappropriate modes of transportation therefore however prevail in the face above challenges. Meaningful analyses of exposure to herbal medicinal preparations remain difficult on account of the following:

- (1) Establishment of history of exposure to herbal medicines may only be necessitated by adverse perinatal outcomes,
- (2) paucity of evidence-base studies confirming fetotoxicity, teratogenicity etc of specific constituents,
- (3) unestablished temporal relationships of such preparations (i.e. exposure meaningfully preceding outcome),
- (4) differential reporting by clients based on perinatal outcomes
- (5) and concealment of exposure status due to knowledge of health worker disapproval of use. While some herbal medicines may indeed be harmful, others may only comprise impotent combinations of selected green plants best serving as placebos. In the capacity of placebos, they may negatively impact health seeking attitudes contributing to delays in seeking appropriate

interventions other than being independently sufficient predictors of adverse general health outcomes. Indeed, audit teams all too soon drift away from the beauty of the scientific process of thought once herbal medicine is mentioned leaving a frontier of possible causes unexplored. This however, does not confer upon us a freedom to ignore the knowledge we already have, or to postpone the actions that it appears to demand...an approach recommended by Sir Austin Bradford Hill. Herbal medicine use should be continuously discouraged.

## Conclusion

### Patterns and Distribution of Risk Factors

Maternal age of 20 to 35 years and birth weight above 2.5 kg are important for improving perinatal survival. Perinatal deaths were more prevalent among rural residents and less prevalent among women with formal occupations. Education and fertility control remain importantly linked to favorable reproductive health outcomes. Leading causes of perinatal death comprised hypertensive disease in pregnancy, placental abruption, prolonged pregnancy, fetal distress, chorioamnionitis, cord prolapse, delayed second stage, fetal abnormalities and uterine rupture. Establishment of causes of death remains difficult and sometimes beyond the capacity of some health institutions exacerbated by overt information paucity and unavailability relevant experts.

Association between Identified Risk Factors and Perinatal Deaths. Rural residence, informal occupations, low educational background, grandmultiparity, inadequate ANC attendance, failure to identify ANC risk factors i.e. poor ANC quality, mal presentation, prematurity, low birth weight, fetal abnormalities, delayed second stage, fetal distress, hypertensive disease in pregnancy, malaria, ante partum hemorrhage, and a host of unknown factors (unestablished during mortality audit) significantly increased odds of perinatal deaths. Anemia in pregnancy, birth asphyxia, fetal macrosomia, previous cesarean section and Bad Obstetric History (BOH) reduced odds of mortality suggesting success of measures rolled out for timely identification and intervention. Preventability of Perinatal Mortality in a Resource Constrained Setting Factors associated with perinatal mortality were largely preventable within the context and objectives of current program frameworks and initiatives e.g. ENC, BEmONC and CEmONC, FANC, EMTCT, MEBCI, etc. Prevention of perinatal deaths of known and unknown causes may only be achieved through improved access to quality ANC services and comprehensive diagnostics.

## Recommendations

Perinatal deaths are largely amenable to timely identification of causative factors and predisposition to them, appropriate and adequate interventions, quality ANC at hospitals and peripheral health facilities and

adequate skills and knowledge. Factors linked to perinatal deaths are directly or indirectly comprehensively addressed within the framework of various Human Rights Instruments as basic human rights (ensuring accountability, participation and inclusion, indivisibility and interdependence and equality and non-discrimination). Globally increasing emphasis on the Human Rights-Based Approach to Development prioritizes recognition of eminent inadequacies of consistently unsuccessful needs-based or service-delivery approaches to national development. Failures of the latter are premised on inherent lack of sensitivity to needs of rights holders by duty bearers. Evidence base suggests the combination of human rights, development and activism is more effective than any single approach to development in all sectors of state. This approach integrates norms, standards and principles of international human rights into entire processes of development programming, including plans, strategies and policies, creating greater awareness among governments and other relevant institutions of their obligations to fulfill, respect and protect human rights and to support and empower individuals and communities to claim their rights. Prioritization of comprehensive active Perinatal Death Surveillance (linked to active maternal death surveillance) will eliminate data paucity and reduce proportions of unreported deaths while fetal surveillance beyond fetal viability should be intensified. Availability of standardized nationally utilized classification systems (e.g. PSANZ-PDC and NDC) will be of immense clinical and public health benefit, enabling ease of audit, surveillance and research. Information, Education and Counseling for creation of awareness on recognition of perinatal beings as 'human' (and not one who only becomes human 7 days after birth) with rights enshrined in various human rights instruments should be a health promotional priority.

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