

## MATERNAL AND NEWBORN HEALTH AND EMERGENCY TRANSPORT IN SUB-SAHARAN AFRICA.

### 1. CAUSES AND RISK FACTORS FOR MATERNAL DEATHS

**Bates I, Chapotera GK, McKew S, van den Broek N. Maternal mortality in sub-Saharan Africa: the contribution of ineffective blood transfusion services. BJOG. 2008 Oct; 115(11):1331-9.**

In sub-Saharan Africa, where blood supply is critically inadequate, severe haemorrhage is a leading cause of maternal deaths. The aim of this review was to estimate the impact of lack of blood on maternal deaths and identify reasons and potential solutions. Databases and websites from 1970 to 2007 were searched for information concerning maternal deaths and near misses due to haemorrhage in sub-Saharan Africa. Original studies that provided qualitative or quantitative information about blood transfusion services in relation to obstetric deaths or near misses were included. Data about maternal haemorrhage deaths associated with lack of blood for transfusion and reasons for blood shortages were extracted from the full text of articles by two independent reviewers using pre-designed, piloted forms. Twenty of 37 selected studies described a direct association between maternal deaths and lack of blood transfusions. Five of 37 provided quantitative information which showed that overall 26% (16-72%) of maternal haemorrhage deaths were due to lack of blood. Reasons included non affordability of blood, lack of blood donors, unwillingness of relatives to donate and inadequate supplies **and transport**. Lack of blood for emergency transfusions is a major, but poorly quantified and under-researched cause of maternal deaths in sub-Saharan Africa. Potential solutions include more blood donations, better financing mechanisms and more efficient management systems. Complementary approaches to prevent severe anaemia and treat hypovolaemia are important to reduce use of transfusions.

PMID: 18823485 [PubMed - indexed for MEDLINE]

**Abe E, Omo-Aghoja LO. Maternal mortality at the Central Hospital, Benin City Nigeria: a ten year review. Afr J Reprod Health. 2008 Dec;12(3):17-26.**

Maternal mortality remains a major challenge in Nigeria. This retrospective study was conceptualized to document the number and pattern of obstetric deaths at the Central Hospital, Benin City, over a ten year period, to identify common causes of maternal deaths and proffer relevant interventions. The overall maternal mortality ratio (MMR) was 518/100,000. MMR was 30 times higher in unbooked as compared to the booked patients, **while 60% of maternal deaths occurred within 24 hours of admission**. The leading direct causes of maternal deaths were sepsis, hemorrhage, obstructed labor and preeclampsia/eclampsia, while the major indirect causes are institutional difficulties and anaemia. Low literacy, **high poverty levels**, extremes of parity and **non-utilization of maternity services were associated with maternal mortality**.

Recommendations are made for public enlightenment campaign and advocacy activities aimed at mobilizing resources for reducing maternal mortality. Also,

female education and **poverty alleviation** programmes will contribute to the reduction of the burden of maternal mortality.

PMID: 19435010 [PubMed - indexed for MEDLINE]

**McDermott JM, Steketee R, Wirima J. Mortality associated with multiple gestation in Malawi. Int J Epidemiol. 1995 Apr;24(2):413-9.**

Data from a 1987-1990 prospective study of the effect of malaria chemoprophylaxis among pregnant women on birth weight and mortality of their infants in a rural area of Malawi were used to estimate the prevalence of multiple gestation and to quantify the risk of mortality associated with multiple gestation compared with single gestation. There were 88 (2.2%) multiple gestations among 4049 women enrolled at their first antenatal clinic visit at 1 of 4 antenatal clinics in the Mangochi District Malaria Research Project from 1987 to 1990. 87 had twin pregnancies and 1 had triplets. 25 (28%) of the 88 women delivered at home vs. 1659 (42%) of the 3962 women with singleton pregnancies (p 0.016). Mortality was high among the 177 infants of the 88 multiple gestations. In 20 (23%) of the pregnancies all of the infants were either fetal deaths or died within the 1st year. One of the infant pairs died in 29 (33%) of the pregnancies; 7 of the survivors were lost to follow-up. Only 33 (38%) of mothers were known to have all their infants survive to 1 year, compared with 74% in singleton gestations. Multiple gestation infants had higher rates of perinatal and postperinatal deaths and loss to follow-up than singleton infants (p 0.0001, 0.004, and 0.04, respectively). The risk of death for an infant of a multiple gestation was more than twice the risk for an infant of a singleton gestation. The increased mortality associated with multiple gestation was caused by 2 factors: a higher frequency of low birth weight and a 4-fold increase in perinatal mortality among the infants with birth weights or = 2500 g and among infants with unknown birth weight. It was estimated that multiple gestation contributed to 5.5% of perinatal, 1.2% of the postperinatal, and 11.5% of the maternal deaths in this population. Multiple gestation in Malawi contributed to increased perinatal and maternal mortality but did not increase the risk of mortality after the perinatal period.

PMID: 7635604 [PubMed - indexed for MEDLINE]

**Oyieke JB, Obore S, Kigundu CS. Millennium development goal 5: a review of maternal mortality at the Kenyatta National Hospital, Nairobi. East Afr. Med. J. 2006 Jan; 83(1):4-9.**

The authors undertook to review if there is a change in the maternal mortality rate at the Kenyatta National Hospital since the inception of the Millennium Development Goal strategy in 1990, compared to earlier reviews. DESIGN: A retrospective descriptive study. SETTING: Kenyatta National Hospital. SUBJECTS: Maternal deaths attributed directly to obstetric causes. MAIN OUTCOME MEASURES: Determination of maternal mortality rates of all patients admitted to the Kenyatta National Hospital Maternity up to six weeks after admission. Also determine any avoidable causes of the same. RESULTS: During the period under review, there were 27,455 deliveries and 253 maternal deaths giving a maternal mortality ratio of 921.5 per 100,000 live births. Direct obstetric causes accounted for 71% of all maternal deaths with sepsis, haemorrhage, and

hypertension being the leading causes. Respiratory tract infections associated with HIV/ AIDS infection was the prominent indirect cause. 67.5% of deaths occurred in women aged between 25 and 35 years and 78.7% were Para 2 or less. Evidently there was poor antenatal clinic attendance with only 28.6% having had any attendance at all. CONCLUSION: Antenatal clinic attendance needs to be re-emphasised if an impact is to be realised in curbing maternal mortality; moreover there is need for **early referrals and encouraging mothers to deliver under skilled care.**

PMID: 16642744 [PubMed - indexed for MEDLINE]

**Lema VM, Changole J, Kanyighe C, Malunga EV. Maternal mortality at the Queen Elizabeth Central Teaching Hospital, Blantyre, Malawi. East Afr Med J. 2005 Jan;82(1):3-9.**

BACKGROUND: Maternal mortality in Malawi continues to increase despite the global SMI and national safe motherhood programme's efforts to reduce it. OBJECTIVES: To identify the social, demographic and reproductive profiles of women suffering a maternal death, the main immediate causes and the operational factors. DESIGN: A retrospective descriptive survey. SETTING: The Gogo-Chatinkha Maternity Unit, Queen Elizabeth Central Hospital, Blantyre, Malawi, from January 1, 1999 to December 31, 2000. SUBJECTS: All women who suffered a maternal death in the unit. RESULTS: There were a total of 204 maternal deaths and 19,859 live births, giving a Maternal mortality ratio (MMR) of 1027.2/100,000 live births. Their ages ranged from 16 to 40 years. Adolescents comprised 20.6%, while the majority (56.4%), were aged 15 - 24 years. Almost half of the group (43.4%), were para 1 and less, with a range of 0 to 12. The top five causes of death were puerperal sepsis, (29.4%); postabortal complications, (23.5%); other infectious conditions, (20.1%); obstetric haemorrhage, (10.6%), and eclampsia, (6.4%). Some of the identified operational factors included **delay in accessing and receiving emergency obstetric care, poor quality services,** HIV infection/ AIDS and unsafe induced abortion following unwanted pregnancy. CONCLUSION AND RECOMMENDATIONS: Most of the causes and operational factors for maternal deaths are easily avoidable. The country needs to make more commitment and investments necessary to mitigate these deaths.

PMID: 16122104 [PubMed - indexed for MEDLINE]

**Kongnyuy EJ, Mlava G, van den Broek N. Facility-based maternal death review in three districts in the central region of Malawi: an analysis of causes and characteristics of maternal deaths. Womens Health Issues. 2009 Jan-Feb;19(1):14-20.**

PURPOSE: We sought to determine the causes and characteristics maternal deaths that occur in health facilities in Malawi. METHODS: Forty-three maternal deaths were reviewed in 9 hospitals in 3 districts in Central Malawi over a 1-year period. Causes and avoidable factors of maternal deaths were identified during the review, and recommendations made and implemented. MAIN FINDINGS: There were 28 (65.1%) direct obstetric deaths and 15 (34.9%) indirect obstetric deaths. The major causes of maternal deaths were postpartum hemorrhage

(25.6%), postpartum sepsis (16.3%), HIV/AIDS (16.3%), ruptured uterus (7.0%), complications of abortion (7.0%), anemia (7.0%), antepartum hemorrhage (4.7), and eclampsia (4.7). Two thirds of the women were referred either from another health facility (51.2%) or by a traditional birth attendant (TBA; 11.6%), and up to 79.1% were critically ill on admission. Four groups of factors that contributed to maternal deaths were identified: 1) health worker factors, 2) administrative factors, 3) patient/family factors, and 4) TBA factors. The major health worker factors were inadequate resuscitation (69.8%), lack of obstetric life-saving skills (60.5%), inadequate monitoring (55.8%), initial assessment incomplete (46.5%), and delay in starting treatment (46.5%). The most common administrative factor was lack of blood for transfusion (20.9%). The major problems encountered include shortage of staff and other resources, difficulty in maintaining anonymity, poor quality of data, and difficulty in implementing recommendations.

CONCLUSION: Adequate training on obstetric life-saving skills, addressing HIV/AIDS, and raising community awareness could be important factors for reducing maternal mortality in Malawi and countries with similar socioeconomic profiles.

PMID: 19111783 [PubMed - indexed for MEDLINE]

**Mbizvo MT, Fawcus S, Lindmark G, Nyström L. Maternal mortality in rural and urban Zimbabwe: social and reproductive factors in an incident case-referent study. Soc Sci Med. 1993 May;36(9):1197-205.**

A community-based incidence case-referent study was undertaken in a rural and an urban setting in Zimbabwe in order to define risk factors associated with maternal deaths at family, community, primary and referral health care levels. Referent subjects were drawn from place or area of delivery for each consecutive maternal death. Using a multiple source confidential reporting network for all maternal deaths, **the maternal mortality rate for the rural setting was 168/100,000 live births and that for the urban setting was 85/100,000 live births**. A model for interacting factors contributing to maternal mortality was designed. **Haemorrhage and abortion sepsis** were the major direct causes while malaria was the leading indirect cause in the rural setting. In the urban setting, **eclampsia, abortion and puerperal sepsis** were the leading causes of maternal deaths. It was found that all situations associated with diminished, or absent social support, that is, being single (Odds Ratio = 4.7, 95% CI = 2.2-9.8) divorced, widowed, one of several wives, cohabiting, or self-supporting carried an increased risk for maternal mortality, especially in the rural area. Income and level of education for index and referent subjects were comparable, probably because of the limited part of the population under study that belonged to a more affluent class. Distribution of cases and referents by religious-affiliation was also comparable. Age > 35 years and parity > 6 were significant risk factors for maternal mortality in the rural setting, whereas bad reproductive history with reported stillbirth or abortion constituted a high risk both in the city and in the rural areas (Odds Ratios 4-6). (ABSTRACT TRUNCATED AT 250 WORDS)

PMID: 8511649 [PubMed - indexed for MEDLINE]

**Fawcus S, Mbizvo MT, Lindmark G, Nystrom L. A community based investigation of causes of maternal mortality in rural and urban Zimbabwe. Maternal Mortality Study Group. Cent Afr J Med. 1995 Apr;41(4):105-13.**

Most data on maternal mortality in Zimbabwe has been urban hospital based. Using a network of informants and sensitized health workers an attempt was made to identify and investigate all maternal deaths in rural Masvingo and urban Harare over a two year period. The present report discusses place of death and the medical causes in both populations. Results gave maternal mortality rates of 168 and 85 per 100,000 live births for Masvingo and Harare respectively. These rates are significantly higher than those from conventional reporting systems especially in the rural area where 27 pc of deaths occurred at home or in transit. **The leading medical causes of death were haemorrhage in Masvingo (25 pc of deaths) and eclampsia in Harare (26 pc), with puerperal and post abortal sepsis as the next most common causes in both cases. Malaria featured as the major indirect cause in Masvingo (7.6 pc). There were four suicides committed following unwanted pregnancy.** The rural/urban variation in causation of death is discussed and the study results compared with other community based studies internationally. Synopsis: **This community based study revealed higher maternal mortality rates (MMR) than conventional statistics, especially in the rural area where deaths occurred at home or in transit. In the rural area the MMR was higher and the leading cause of death was haemorrhage, compared to eclampsia in the urban area. Strategies to reduce maternal deaths should include factors both within and outside health service structures.**

PMID: 7788680 [PubMed - indexed for MEDLINE]

**Fawcus S, Mbizvo M, Lindmark G, Nyström L A community-based investigation of avoidable factors for maternal mortality in Zimbabwe. Stud Fam Plann. 1996 Nov-Dec;27(6):319-27.**

A community-based investigation of maternal deaths was undertaken in a rural province (Masvingo) and an urban area (Harare) of Zimbabwe in order to assess their preventability. Avoidable factors were identified in 90 percent of the 105 rural deaths and 85 percent of 61 urban deaths. Delay in seeking treatment contributed to 32 percent and 28 percent of rural and urban deaths, respectively.

**Lack of transportation delayed or prevented access to healthy facilities in the rural area, a major problem in 28 percent of the cases studied.**

Suboptimal clinic and hospital management was identified in 67 percent and 70 percent of rural and urban deaths, respectively. **Lack of appropriately trained personnel contributed to suboptimal care.** In both settings, the severity of patients' conditions was frequently unrecognized, leading to delays in treatment and referral, and inadequate treatment. Appropriate community and health-service interventions to reduce maternal mortality are discussed.

PIP: A community-based survey of maternal deaths in a rural province (Masvingo) and urban area (Harare) of Zimbabwe in 1989-90 revealed a high incidence of avoidable factors, both within and outside the health sector. During the 2-year study period, 109 maternal deaths were identified in Masvingo

(168/100,000 live births) and 66 in Harare (85/100,000 live births). In Masvingo, the three leading causes of death were hemorrhage (25%), postabortion sepsis (15%), and puerperal sepsis (13%); in Harare, these causes were eclampsia (26%), postabortion sepsis (23%), and puerperal sepsis (15%). In Masvingo, the locations of maternal deaths included rural hospitals (50%), provincial hospitals (13%), home (13%), and travelling to or between health facilities (11%); all deaths in Harare occurred in central hospitals. One or more avoidable factors were identified for 90% of maternal deaths in Masvingo and 85% of those in Harare; these factors occurred at the community level in 47% and 38% of deaths, respectively. Among patient-related factors, ***delay in the decision*** to seek care for symptoms was most widespread (32% of deaths in Masvingo and 28% of those in Harare). ***Problems of access to transportation*** from home to health facility were implicated in 28% of deaths in Masvingo and 3% in Harare. Avoidable factors within the health sector were identifiable in 67% of Masvingo deaths and in 70% of Harare deaths. Notable was failure of health personnel to assess the severity of postabortion conditions and puerperal sepsis and initiate aggressive treatment. Recommended, to reduce maternal mortality in Zimbabwe, are community awareness of risk factors for pregnancy and delivery, ***collective emergency transportation mechanisms, maternity waiting shelters***, appropriate obstetric management protocols, more effective identification and treatment of emergency conditions, and liberalization of existing abortion legislation.

PMID: 8986030 [PubMed - indexed for MEDLINE]

**Menéndez C, Romagosa C, Ismail MR, Carrilho C, Saute F, Osman N, Machungo F, Bardaji A, Quintó L, Mayor A, Naniche D, Dobaño C, Alonso PL, Ordi J. An autopsy study of maternal mortality in Mozambique: the contribution of infectious diseases. PLoS Med. 2008 Feb;5(2):e44.**

BACKGROUND: Maternal mortality is a major health problem concentrated in resource-poor regions. Accurate data on its causes using rigorous methods is lacking, but is essential to guide policy-makers and health professionals to reduce this intolerable burden. The aim of this study was to accurately describe the causes of maternal death in order to contribute to its reduction, in one of the regions of the world with the highest maternal mortality ratios. METHODS AND FINDINGS: We conducted a prospective study between October 2002 and December 2004 on the causes of maternal death in a tertiary-level referral hospital in Maputo, Mozambique, using complete autopsies with histological examination. HIV detection was done by virologic and serologic tests, and malaria was diagnosed by histological and parasitological examination. During 26 mo there were 179 maternal deaths, of which 139 (77.6%) had a complete autopsy and formed the basis of this analysis. Of those with test results, 65 women (52.8%) were HIV-positive. Obstetric complications accounted for 38.2% of deaths; ***haemorrhage*** was the most frequent cause (16.6%). Nonobstetric conditions accounted for 56.1% of deaths; HIV/AIDS, pyogenic bronchopneumonia, severe malaria, and pyogenic meningitis were the most common causes (12.9%, 12.2%, 10.1% and 7.2% respectively). Mycobacterial

infection was found in 12 (8.6%) maternal deaths. **CONCLUSIONS:** In this tertiary hospital in Mozambique, infectious diseases accounted for at least half of all maternal deaths, even though effective treatment is available for the four leading causes, HIV/AIDS, pyogenic bronchopneumonia, severe malaria, and pyogenic meningitis. These observations highlight the need to implement effective and available prevention tools, such as intermittent preventive treatment and insecticide-treated bed-nets for malaria, antiretroviral drugs for HIV/AIDS, or vaccines and effective antibiotics for pneumococcal and meningococcal diseases. **Deaths due to obstetric causes represent a failure of health-care systems and require urgent improvement.**

PMID: 18288887 [PubMed - indexed for MEDLINE]

**Khan KS, Wojdyla D, Say L, Gülmezoglu AM, Van Look PF. WHO analysis of causes of maternal death: a systematic review. Lancet. 2006; 367(9516): 1066-74.**

**BACKGROUND:** The reduction of maternal deaths is a key international development goal. Evidence-based health policies and programmes aiming to reduce maternal deaths need reliable and valid information. We undertook a systematic review to determine the distribution of causes of maternal deaths. **METHODS:** We selected datasets using pre-specified criteria, and recorded dataset characteristics, methodological features, and causes of maternal deaths. All analyses were restricted to datasets representative of populations. We analysed joint causes of maternal deaths from datasets reporting at least four major causes (haemorrhage, hypertensive disorders, sepsis, abortion, obstructed labour, ectopic pregnancy, embolism). We examined datasets reporting individual causes of death to investigate the heterogeneity due to methodological features and geographical region and the contribution of haemorrhage, hypertensive disorders, abortion, and sepsis as causes of maternal death at the country level. **FINDINGS:** 34 datasets (35,197 maternal deaths) were included in the primary analysis. We recorded wide regional variation in the causes of maternal deaths. **Haemorrhage was the leading cause of death in Africa** (point estimate 33.9%, range 13.3-43.6; eight datasets, 4508 deaths) and in Asia (30.8%, 5.9-48.5; 11,16 089). In Latin America and the Caribbean, hypertensive disorders were responsible for the most deaths (25.7%, 7.9-52.4; ten, 11,777). Abortion deaths were the highest in Latin America and the Caribbean (12%), which can be as high as 30% of all deaths in some countries in this region. Deaths due to sepsis were higher in Africa (odds ratio 2.71), Asia (1.91), and Latin America and the Caribbean (2.06) than in developed countries.

**INTERPRETATION:** **Haemorrhage and hypertensive disorders are major contributors to maternal deaths in developing countries.** These data should inform evidence-based reproductive health-care policies and programmes at regional and national levels. Capacity-strengthening efforts to improve the quality of burden-of-disease studies will further validate future estimates.

PMID: 16581405 [PubMed - indexed for MEDLINE]

**Evjen-Olsen B, Hinderaker SG, Lie RT, Bergsjø P, Gasheka P, Kvåle G. Risk**

**factors for maternal death in the highlands of rural northern Tanzania: a case-control study. BMC Public Health. 2008 Feb 8;8:52.**

BACKGROUND: Tanzania has one of the highest maternal mortality ratios in sub-Saharan Africa. Due to the paucity of epidemiological information on maternal deaths, and the high maternal mortality estimates found earlier in the study area, our objective was to assess determinants of maternal deaths in a rural setting in the highlands of northern Tanzania by comparing the women dying of maternal causes with women from the same population who had attended antenatal clinics in the same time period. METHODS: A case-control study was done in two administrative divisions in Mbulu and Hanang districts in rural Tanzania. Forty-five cases of maternal death were found through a comprehensive community- and health-facility based study in 1995 and 1996, while 135 antenatal attendees from four antenatal clinics in the same population, geographical area, and time-span of 1995-96 served as controls. The cases and controls were compared using multivariate logistic regression analyses. Odds ratios, with 95% confidence intervals, were used as an approximation of relative risk, and were adjusted for place of residence (ward) and age. Further adjustment was done for potentially confounding variables. RESULTS: An increased risk of maternal deaths was found for women from 35-49 years versus 15-24 years (OR 4.0; 95%CI 1.5-10.6). Women from ethnic groups other than the two indigenous groups of the area had an increased risk of maternal death (OR 13.6; 95%CI 2.5-75.0). **There was an increased risk when women or husbands adhered to traditional beliefs**, (OR 2.1; 95%CI 1.0-4.5) and (OR 2.6; 95%CI 1.2-5.7), respectively. Women whose **husbands did not have any formal education appeared to have an increased risk** (OR 2.2; 95%CI 1.0-5.0). CONCLUSION: Increasing maternal age, ethnic and religious affiliation, and low formal education of the husbands were associated with increased risk of maternal death. Increased attention needs to be given to formal education of both men and women. In addition, education of the male decision-makers should be given high priority in the community, especially in matters concerning pregnancy and delivery preparedness, since their choice greatly affects the survival of the pregnant and delivering women.

**Høj L, da Silva D, Hedegaard K, Sandström A, Aaby P. Factors associated with maternal mortality in rural Guinea-Bissau. A longitudinal population-based study. BJOG. 2002 Jul;109(7):792-9.**

OBJECTIVE: To assess demographic and obstetric risk factors for pregnancy-related death in a multiethnic rural population in a developing country. DESIGN: A prospective survey of women in the fertile age-range. SETTING: Rural Guinea-Bissau. POPULATION: More than 15,000 women living in 100 clusters were visited at six-monthly intervals over a period of more than six years. A total of 10,931 pregnancies were registered prospectively; 85 of these pregnancies resulted in maternal or late maternal death. MAIN OUTCOME MEASURE: Maternal mortality ratio. METHOD: In the rural areas of Guinea-Bissau, we conducted a prospective survey of women in the fertile age range. More than 15,000 women living in 100 clusters were visited at 6-monthly intervals over a

period of more than six years. An analysis of demographic, environmental and obstetric risk factors for maternal death was performed based on 10,931 prospectively registered pregnancies; 85 of these pregnancies resulted in maternal or late maternal death. RESULTS: **In the adjusted model maternal mortality ratio increased with increasing distance from the regional hospital** (OR>25 km = 7.4 [95% CI: 1.6-132]). Multiple pregnancy was found to increase the risk of maternal death (OR = 3.4 [95% CI: 1.3-7.5]). The risk of subsequent maternal death was increased if the fetus was stillborn (OR = 5.3 [95% CI: 2.8-9.4]). Women living in the region of Gabu had higher mortality than those living in Biombo (OR = 2.5 [95% CI: 1.3-5.1]). No category of age or parity were associated with an increased risk of maternal mortality. Predictive values did not exceed 3% for any of the significant risk factors. CONCLUSIONS: **For the purpose of reducing maternal mortality, the screening approach of antenatal care is of limited value.** Age and parity should not be used routinely as selection criteria for transfer of otherwise healthy pregnant women to higher-level health institutions. Twin pregnancy seems to be the only operational risk factor identified in this study. Stillbirth is associated with an increased risk of maternal death. Regional differences must be studied further. **The distance to emergency obstetric care (EOC) may determine the outcome of a complicated delivery.**

PMID: 12135216 [PubMed - indexed for MEDLINE]

**Garenne M, Mbaye K, Bah MD, Correa P. Risk factors for maternal mortality: a case-control study in Dakar hospitals (Senegal). Afr J Reprod Health. 1997 Mar;1(1):14-24.**

This study was conducted in the three main hospitals of Dakar, the capital city of Senegal. Each case of 152 maternal deaths identified over a 12-month period was matched with two controls: a safe delivery in the same clinic, and a safe delivery in the same neighbourhood of residence. Controls were matched on age, birth order, place, and time of delivery. The leading causes of death were: puerperal sepsis and other infections (51 cases), haemorrhage (32 cases), eclampsia (29 cases), ruptured uterus (11 cases), and anaemia (7 cases). Results of the case-control study revealed the major risk factors associated with health system failures: medical equipment failure (odds ratio [OR] = 55.0), **late referral (OR = 23.2)**, lack of antenatal visit (OR = 16.9), and lack of available personnel at time of admission (OR = 6.6). Various indicators of maternal status at time of admission (complications, blood pressure, temperature, oedema, haemoglobin level) and of health history prior to admission (previous complications, previous C-section, lack of treatment) were also strong predictors of survival. Lastly, socio-demographic factors also appeared as correlates of maternal mortality, in particular: first pregnancy (OR = 2.3), pregnancy of high birth order (OR = 1.9), rainy season (OR = 2.4), being unmarried (OR = 2.5), and low level of education (OR = 1.6). Implications for policy are discussed.

PMID: 10214399 [PubMed - indexed for MEDLINE]

**Li XF, Fortney JA, Kotelchuck M, Glover LH. The postpartum period: the**

**key to maternal mortality. Int J Gynaecol Obstet. 1996 Jul;54(1):1-10.**

OBJECTIVES: To assess postpartum care at an international level, we reviewed published literature on postpartum maternal deaths. METHODS: Meta-analysis was used to summarize the literature reviewed. Postpartum deaths in developing countries were compared with those in the United States. RESULTS: In both developing countries and the United States, > 60% of maternal deaths occurred in the postpartum period; 45% of postpartum deaths occurred within 1 day of delivery, > 65% within 1 week, > 80% within 2 weeks. In developing countries, 80% of postpartum deaths caused by obstetric factors occurred within 1 week. CONCLUSIONS: **The first 24 h postpartum and the first postpartum week is the high risk of postpartum deaths**, and the risk remains significant until the second week after delivery. In developing countries, hemorrhage, pregnancy-induced hypertension complications, and obstetric infection are commonest causes of postpartum deaths. We suggest primary prevention, early detection, and secondary prevention of postpartum deaths.

PMID: 8842811 [PubMed - indexed for MEDLINE]

**Buor D, Bream K. An analysis of the determinants of maternal mortality in sub-Saharan Africa. J Womens Health (Larchmt). 2004 Oct;13(8):926-38.**

OBJECTIVE: To establish what population characteristics affect the high maternal mortality rate in the sub-Saharan Africa region and to propose possible solutions to reduce this rate. METHODS: This study is a secondary analysis of existing data sources from the World Bank, the World Health Organization (WHO), as well as direct and indirect sources from UNAIDS, the United Nations, Demographic and Health Surveys (DHS), Macro International, and national statistical offices. Instead of looking at continentwide or individual nation models, it develops a regional model. Sociodemographic population variables are used as independent variables to predict the dependent variable, maternal mortality. Additionally, a new country-specific political stability independent variable is introduced into the model. Data from 28 sub-Saharan African countries are used. Bivariate correlations are used to establish associations among the variables, whereas cross-tabulations, using Kendall's tau-c values, and regression lines are used to establish impacts. RESULTS: In the sub-Saharan Africa region, births attended by skilled health personnel and life expectancy at birth strongly correlate with maternal mortality. Gross national product (GNP) per capita and health expenditure per capita also have strong association with maternal mortality. CONCLUSIONS: **The availability of skilled delivery personnel**, life expectancy, national economic wealth, and health expenditure per capita predict the maternal mortality rate of a country. Based on these findings, it is recommended that structural arrangements be made to train skilled health personnel to take care of maternal health problems. In view of the high cost of training physicians, middle-level health personnel may offer an affordable alternative to handle emergency obstetrical cases to address the shortage of physicians. In addition, the allocation of adequate resources to the health sector could improve maternal mortality. The economic wealth of a country and life expectancy at birth are less modifiable through short-term specific interventions.

**Additionally, it is recommended that country-specific interventions are needed to correct the problem of lack of critical data for analysis.**

PMID: 15671708 [PubMed - indexed for MEDLINE]

**Rutgers S. Two years maternal mortality in Matebeleland north Province, Zimbabwe. Cent Afr J Med. 2001 Feb;47(2):39-43.**

OBJECTIVE: To describe timeliness and completeness of maternal mortality notifications after the introduction of a revised national notification form in 1998, as well as socio-demographic and obstetric variables and causes of maternal deaths. DESIGN: Retrospective descriptive study. SETTING: Seven districts in Matebeleland North province. SUBJECTS: 95 maternal death notifications from 1 August 1998 to 31 July 2000. MAIN OUTCOME MEASURES: Delay in submission and completeness of reports, age, marital status, religion, reproductive history, booking and referral status, duration and outcome of pregnancy, place of death, cause of death. RESULTS: 92/95 notifications were true maternal deaths, 86% were notified within 48 hours and 79% were complete, 74% of the deaths took place in a health facility. Mean age of the women was 27.8 years, mean parity 3.0. Sixty percent had booked. **The five main causes of death were obstetric haemorrhage (26%), malaria (24%), immune deficiency syndrome (13%), abortion (11%) and eclampsia (8%).** The maternal mortality ratio per 100,000 reported home and institutional live births ranged from 155 to 532 per district. CONCLUSION: There is under reporting of maternal mortality in some districts, although from 1997 to 2000 a 200% increase in reporting was seen. Timeliness and completeness of reporting was satisfactory. With the exception of a high contribution from malaria the causes of maternal mortality in Matebeleland North province are similar to those reported elsewhere in Zimbabwe.

PMID: 11957270 [PubMed - indexed for MEDLINE]

**Martey JO, Djan JO, Twum S, Browne EN, Opoku SA. Maternal mortality and related factors in Ejisu District, Ghana. East Afr Med J. 1994 Oct;71(10):656-60.**

A community-based survey on maternal mortality was carried out in the Ejisu health district of Ghana in January and February 1990 to identify all women who died in pregnancy, delivery or the puerperium from January 1985 to December 1989, determine their characteristics, the presumptive causes of death and related factors. Forty-four women who died in pregnancy, delivery or the puerperium were identified over the stated period. 59% were aged between 20 and 34 years. Eighty-two percent were married and sixty-six percent had at least primary education. Based on an average crude birth rate of 40 per 1000 population for the district over the period, the lowest maternal mortality rate occurred in 1988, 120 per 100,000 total births and the highest occurred a year later, 235 per 100,000 total births. **The main presumptive causes of maternal mortality in the district were postpartum haemorrhage 45.5%, jaundice in pregnancy 22.7%, obstructed labour 6.8%, eclampsia 6.8% and fever 4.6%.** 59% of them died in a hospital, 2% died at a Government Maternity Home and

7% died during referral from health facilities in the district. Thirty-four percent of the women who died did not attend any antenatal clinic. The actual number of deaths may be underestimated due to the sampling method used and the difficulties encountered in linking survey data with hospital records. Based on the survey findings and other related PMM research, plans have been developed to reduce maternal mortality in the district as outline in the conclusion.

PIP: A community-based survey was conducted among 1200 reproductive age women living in 80 out of 160 communities in Ejisu health district in Ghana during January-February 1990. Retrospective data was collected for the period January 1985-December 1989. Data was analyzed in order to determine maternal mortality, causes of death, and the characteristics of the mothers who died. The sample community was comprised of 223,632 persons in 1990. 44 women were identified as having died in pregnancy, delivery, or postpartum. 59% were 20-34 years old, and 41% were in high-risk age groups. 65.9% had at least some primary education, and 81.8% were married at the time of death. 27.3% were childless at the time of death. Maternal deaths were distributed by year as follows: 9 deaths in 1985, 10 in 1986, 7 in 1987, 6 in 1988, and 12 in 1989. The estimated maternal mortality was 211 per 100,000 live births in 1986 and 235 per 100,000 in 1989. The 4-year average was 181 per 100,000. 34% of deaths were to women who had not received any prenatal care in the last pregnancy. Almost 75% died during delivery. 59% died in a hospital, 7% during a referral to a hospital, and 2% at a Government Maternity Home. Over 66% died after reaching a health facility. 27% died at home. 2% died while under the care of a local traditional birth attendant. **Causes of maternal death were postpartum hemorrhage (45.5%), jaundice in pregnancy (22.7%), obstructed labor (6.8%), eclampsia (6.8%), and fever (4.6%). 2.3% of deaths were attributed to antepartum hemorrhage, ectopic pregnancy, and septic abortion.**

Prenatal care alone is not sufficient to prevent some deaths. The high mortality rate during delivery is a justification to improve the quality of care during delivery at all levels of the district health system. Listed are 9 potential interventions to reduce maternal mortality, including: establishing operating facilities at local health centers and maintaining a resident doctor for obstetric emergencies.

PMID: 7821246 [PubMed - indexed for MEDLINE]

**Le Bacq F, Rietsema A. High maternal mortality levels and additional risk from poor accessibility in two districts of northern province, Zambia. Int J Epidemiol. 1997 Apr; 26(2):357-63.**

BACKGROUND: Maternal mortality ratios in Kasama and Kaputa Districts, two remote rural areas of Northern Province, Zambia, were suspected to be very high. In order to evaluate the impact of a referral system baseline maternal mortality levels and additional maternal mortality risk arising from poor accessibility were estimated. METHODS: The sisterhood method was applied to a random population sample of 3123 respondents in Kasama District and to 2953 in Kaputa District during May and June 1995. For Kasama also hospital-based maternal mortality was calculated from record analysis from 1 January 1991 up to 31 December 1995. Population attributable risk and population etiological

fraction were calculated for Kasama District. RESULTS: Maternal mortality ratio for Kasama District was 764 per 100,000 live births and 1549 for Kaputa District. Kasama hospital-based maternal mortality was 543 per 100,000 live births. In Kasama District population attributable risk of maternal **mortality from poor accessibility** was 220 maternal deaths per 100,000 live births, and the population etiological fraction was 29%. In Kaputa District population attributable risk was 1006 maternal deaths per 100,000 live births, and the population etiological fraction was 65%. CONCLUSIONS: This study suggests that solving the **accessibility problem** would decrease the mortality burden from maternal causes with at least 29% in Kasama District and 65% in Kaputa District. PIP: Two community-based retrospective studies conducted in the northern province of Zambia and a review of mortality data from Kasama General Hospital from 1991 to 1995 confirmed the existence of exceptionally high maternal mortality levels in this area. The sisterhood method was applied to a randomly selected sample of 3123 respondents from Kasama District and 2953 from Kaputa District. The life-time risk of dying from maternal causes was 5.4% in Kasama and 11.0% in Kaputa. The maternal mortality ratio was 764/100,000 live births in Kasama District, 1549/100,000 live births in Kaputa District, and 543/100,000 live births at Kasama District Hospital. 94% of women delivering at the hospital were within two hours' walking distance from the facility. In Kasama District, the population-attributable risk (PAR, "risk in the total population minus risk in the unexposed population") **of maternal mortality from poor accessibility (more than 2 hours' walking distance) was 220 maternal deaths/100,000 live births,** and the population etiologic fraction (PEF, "PAR/risk in total population") was 29%. In Kaputa District, where there is no hospital, the PAR from poor accessibility was 1006 maternal deaths/100,000 live births and the PEF was 65%. **To reduce accessibility-related maternal mortality, both districts have established an ambulance service, set up strategic blood banks, and provided short wave radios to outlying health centers.**

PMID: 9169171 [PubMed - indexed for MEDLINE]

**Tlebere, P; Jackson, D; Loveday, M; Matizirofa, L; Mbombo, N; Doherty, T; Wigton, A; Treger, L; Chopra, M Community-based situation analysis of maternal and neonatal care in South Africa to explore factors that impact utilization of maternal health services. JOURNAL OF MIDWIFERY & WOMENS HEALTH 52 (4):342-350 2007.**

Abstract This community situational analysis determined factors impacting the utilization of maternal health services in South Africa. Quantitative and qualitative research methods were used, including semistructured household interviews, case studies of women with no antenatal care and/or home birth, and verbal/social autopsies of maternal and infant deaths, conducted in three diverse sites across the country. Data analysis used quantitative statistics for the semistructured interviews and a qualitative thematic content approach for the case studies and verbal/social autopsies. Each component was analyzed separately and then triangulated. The following themes emerged: 1) **transport and distance to care were the biggest problems, particularly in rural areas;**

2) providers' communication with families was very poor; 3) health-seeking behavior was better than anticipated; 4) treatment by health providers and quality of care showed mixed results; 5) HIV/AIDS is a major issue; however, basic maternity and neonatal service quality cannot be overlooked; and 6) families and communities are an untapped resource for improving maternal and neonatal health. Implications for maternal and infant health care in developing countries are discussed, with a particular focus on barriers to utilization and involvement of communities and families in maternity care. (c) 2007 by the American College of Nurse-Midwives

**Walraven, G; Telfer, M; Rowley, J; Ronsmans, C. Maternal mortality in rural Gambia: levels, causes and contributing factors. BULLETIN OF THE WORLD HEALTH ORGANIZATION 78 (5):603-613 2000**

Abstract A demographic study carried out in a rural area of the Gambia between January 1993 and December 1998 recorded 74 deaths among women aged 15-49 years. Reported here is an estimation of maternal mortality among these 74 deaths based on a survey of reproductive age mortality, which identified 18 maternal deaths by verbal autopsy. Over the same period there were 4245 live births in the study area, giving a maternal mortality ratio of 424 per 100 000 live births. This maternal mortality estimate is substantially lower than estimates made in the 1980s, which ranged from 1005 to 2362 per 100 000 live births, in the same area. A total of 9 of the 18 deaths had a direct obstetric cause - haemorrhage (6 deaths), early pregnancy (2), and obstructed labour (1). Indirect causes of obstetric deaths were anaemia (4 deaths), hepatitis (1), and undetermined (4). Low standards of health care for obstetric referrals, failure to recognize the severity of the problem at the community level, delays in starting the decision-making process to seek health care, ***lack of transport***, and substandard primary health care were identified more than once as probable or possible contributing factors to these maternal deaths

ISSN 0042-9686

**Nkata, M. Maternal deaths in Zambia. Afr Health 21 (1):2 1998**

Abstract A study conducted at Mansa General Hospital (Zambia) used birth records, death certificates, and operating theater and autopsy records to analyze maternal mortality. During the 2-year study period, there were 3282 live births and 95 maternal deaths at this facility, for a maternal mortality rate of 29/1000 live births. 35% of maternal deaths were to illiterate adolescents who relied on untrained traditional birth attendants. 18 women (19%) died immediately after emergency admission for delivery. The major risk factors for maternal mortality were a labor exceeding 48 hours, age in the teens, primiparity, use of herbal medicines, and uterine rupture. The principal causes of death were sepsis (53%) and hemorrhage (22%). Delay on the part of traditional birth attendants in referring women with obstructed labor and uterine rupture, ***the unavailability of emergency transport, insufficient blood supplies for transfusions, and a lack of qualified personnel at first-level health facilities*** contributed to maternal mortality

ISSN 0141-9536

**Urassa, E; Massawe, S; Lindmark, G; Nystrom, L. Operational factors affecting maternal mortality in Tanzania. HEALTH POLICY AND PLANNING 12 (1):50-57 1997**

**Abstract:** Identification of the main operational factors in cases of maternal death within and outside the health care system is necessary for safe motherhood programmes. In this study, a follow-up was done of all 117 cases of maternal deaths in Ilala district, Dar es Salaam, 1991-1993, at all levels of care. In all, 79% received some medical care whereas 11% arrived too late for treatment. For each case the major operational factors and all health care interventions were defined through interviews with family members and health care staff and from hospital records, and the avoidability of each case was determined. In the health institutions where the women had consulted, the available resources were assessed. It was found that in most cases the husband (29%) or the mother (31%) of the woman decided on her care in cases of complications, and together **with the lack of transport**, this often caused delay at home. Also, **delay in transfer from the district hospital was common**. Cases of abortion complications were often not managed on time because of the delay in reporting to hospital or misleading information. Suboptimal care was identified in 77% of the cases reaching health care. Inadequate treatment was identified by the district health staff in 61% and by the referral centres in 12% of their cases. Wrong decision at the district level and lack of equipment at the referral centre were the main reasons for inadequate care. It is concluded that although community education on danger signs in pregnancy and labour is important, provision of the core resources and supplies for emergency obstetric interventions, as well as clear protocols for management and referral, are absolutely necessary for improvement of maternal survival.

ISSN 0268-1080

**Campbell, M; Abu S. Z. Sudan: Situational analysis of maternal health in Bara District, North Kordofan. World Health Statistics Quarterly 48 (1):60-66 1995**

**Abstract** A high maternal mortality ratio was estimated in Bara District in Sudan during the late 1980's with approximately 407 women dying per 100,000 live births. In order to design effective intervention strategies, Care International and the Ministry of Health in Sudan conducted a study to identify the attitudes of women, staff, and TBAs towards motherhood, prenatal care, and practices affecting the health of women in the district. The previously conducted training programme for TBAs was also assessed in its impact. The study yielded the following results: in addition to the commonly known risk factors for maternal health e.g. haemorrhage, puerperal infection, obstructed labour, and anemia, the women in the villages and health staff identified female genital mutilation (pharaonic circumcision) as a major threat to safe motherhood. Health seeking behaviour was linked to problems of access and perceived quality of care: women did generally not wish to spend more than 30 minutes for reaching a

facility. But if the quality of a particular institution was considered good, and supplies and equipment were available, women would cover great distances to reach such a facility. Participation in prenatal care suffered from the equation of preventive with curative care. Women would therefore tend to turn to a clinic or service provider, if symptoms of illness occurred during a pregnancy. The village-based services suffered from the lack of equipment and poor staff training, which further undermined the motivation to seek prenatal care. When health staff recommended referral of a pregnant women for delivery, the advice was usually followed. (ABSTRACT TRUNCATED AT 250 WORDS) ; Care International and the Ministry of Health in Sudan used interviews, focus group discussions, and observations in their exploration of the attitudes of women, staff, and traditional birth attendants (TBA) toward motherhood, prenatal care, and practices affecting the women's health in the rural councils of Bara, Gerejikh, and Taiyba, Bara District. It was in this district during the late 1980s that approximately 407 women died per 100,000 live births. The study was designed and implemented over the period March-July 1990. Village women and health staff noted hemorrhage, puerperal infection, obstructed labor, anemia, and female genital mutilation as major threats to maternal health. Women did not want to spend more than thirty minutes reaching a health facility. If, however, the quality of a particular institution were considered good, and supplies and equipment were available, women would go far to reach that facility. It was found that women are unmotivated to seek prenatal care services because they do not understand that prenatal care exists to prevent morbidity and mortality, and village services also lack the necessary equipment and properly trained staff. The need to secure a husband's approval, ***lack of transport***, and the delayed recognition of risk conditions by health staff and TBAs ***all delay the provision of treatment for women referred for delivery***. Finally, postnatal care was inadequate, the women want to learn about birth spacing methods, and a completed TBA training program was generally regarded as satisfactory by the women and health staff in the communities.

ISSN 0379-8070

**Bankole A; Sedgh G, Okonofua F; Imarhiagbe C; Hussain R; Wulf D; Barriers to Safe Motherhood in Nigeria New York: Guttmacher Institute, March 2009.**

Nigeria has one of the highest maternal mortality ratios in the world: 1,100 maternal deaths for every 100,000 live births. Although patterns vary by region, high-risk births persist in Nigeria. In both 1990 and 2003, two-thirds of all births were high risk because of the mother's age, parity or spacing of births. More than 40% of women giving birth do not receive prenatal care from a trained health care provider. This proportion did not improve during the 13-year period. It is above average in the North East and North West regions. ***The proportion of women receiving health care from a trained provider at delivery has increased somewhat—from 30% in 1990 to 37% in 2003.*** Even so, it is still low and less than that in some other West African countries. Increasing urbanization and education coupled with a drop in the proportion of women who are married

have led to declines in fertility desires and childbearing. However, the desire for a smaller family appears to be outpacing reductions in fertility. This is evident in the increasing proportion of births that are unplanned, which largely reflects a low level of contraceptive use in Nigeria. The Nigerian government has adopted several policies aimed at reducing maternal mortality by 75% by 2015. However, they lack effective implementation, largely because of the very low level of government spending on health care. Most programming on safe motherhood has been initiated by nongovernmental organizations working with funding from international donors. Some recent programs and policies have the potential to improve the quality of maternal health care in Nigeria. To achieve this goal, the Nigerian government must make a commitment to provide adequate resources—trained providers, up-to-date equipment and, most importantly, sufficient funding—to end the many needless deaths associated with childbearing among Nigerian women

**Fenton PM, Whitty CJ, Reynolds F. Caesarean section in Malawi: prospective study of early maternal and perinatal mortality. BMJ. 2003 Sep 13;327(7415):587.**

OBJECTIVE: To examine potentially modifiable factors that may influence the high maternal and perinatal mortality associated with caesarean section in Malawi. DESIGN: A prospective observational study of 8070 caesarean sections performed between January 1998 and June 2000 and associated complications. SETTING: 23 district and two central hospitals in Malawi. PARTICIPANTS: 45 anaesthetists from hospitals that carried out caesarean sections. MAIN OUTCOME MEASURES: Associations between maternal or perinatal deaths in the first 72 hours and various quantifiable risk factors. RESULTS: Questionnaires were returned for 5236 caesarean sections in district hospitals and 2834 in central hospitals; 7622 (94%) were emergencies, 5110 (63%) were because of obstructed labour. Preoperative haemorrhagic shock was present in 610 women (7.6%), anaemia in 503 (6.2%), and ruptured uterus in 333 (4.1%). Eighty five women died (1.05%), 68 of whom died postoperatively on the wards. Higher maternal mortality was associated ***with ruptured uterus*** (adjusted odds ratio 2.3, 95% confidence interval 1.3 to 4.0), little anaesthetic training (2.9, 1.6 to 5.1), general as opposed to spinal anaesthesia (6.6, 2.3 to 18.7), and blood loss requiring transfusion of  $\geq 2$  units (21.0, 11.7 to 37.7). Perinatal mortality up to 72 hours was 11.2% overall and was significantly associated with ruptured uterus and general rather than spinal anaesthesia. CONCLUSION: ***In sub-Saharan Africa high maternal and perinatal mortality at caesarean section is associated with major preoperative complications that are unusual in developed countries.*** Improved training in anaesthetics, wider use of spinal anaesthesia, and improved surveillance and resuscitation in postoperative wards might reduce mortality.

PMID: 12969922 [PubMed - indexed for MEDLINE]

**[No authors listed] A review of maternal deaths in South Africa during 1998. National Committee on Confidential Enquiries into Maternal Deaths. S Afr**

**Med J. 2000 Apr;90(4):367-73.**

OBJECTIVE: To document the prevalence and causes of maternal mortality and to identify avoidable factors, missed opportunities and substandard care related to these deaths. METHOD: Maternal deaths are notifiable; when a maternal death occurs a maternal death notification form is filled in and sent to the provincial Maternal, Child and Women's Health (MCWH) units. Provincial assessors assess the death and submit a report. This report is forwarded to the National Committee on Confidential Enquiries into Maternal Deaths (NCCEMD), where the data are collated and the prevalence, pattern of disease, avoidable factors, missed opportunities and substandard care pertaining to maternal deaths are described. RESULTS: Data were collected on the maternal deaths occurring during 1998 in South Africa. Collection of data on maternal deaths was incomplete and a maternal mortality ratio could not be calculated. However, a clear pattern of disease and problems in patient care emerged. The 'big five' causes of death were complications of hypertensive conditions in pregnancy, AIDS, obstetric haemorrhage, pregnancy-related sepsis and pre-existing medical conditions. Women aged 30 years and older were at greater risk of dying than younger women. Women in their first pregnancy or who had had 5 or more pregnancies were also at greater risk. Obstetric haemorrhage was the most common cause of death at level 1 hospitals, AIDS at level 2 hospitals and hypertensive diseases at level 3 hospitals. The vast majority of anaesthetic-related deaths occurred at level 1 hospitals. Non-attendance and delayed attendance at the health institutions were the most common patient-orientated problems. **Poor transport facilities** and lack of intensive care facilities were the major administrative problems. Problems in the care of women occurred in more than half the cases of maternal death, the majority at the primary level of care. Poor initial assessment and diagnosis of cases, especially at secondary level of care, failure to follow standard protocols at primary and secondary levels, and poor monitoring of patients at all levels of care were the common health worker-related problems. CONCLUSION: Ten key recommendations based on this information have been made by the NCCEMD; if implemented these will result in a reduction of maternal deaths.

PMID: 10957921 [PubMed – indexed for MEDLINE]

**Bouvier-Colle MH, Ouedraogo C, Dumont A, Vangeenderhuysen C, Salanave B, Decam C; MOMA group. Maternal mortality in West Africa. Rates, causes and substandard care from a prospective survey. Acta Obstet Gynecol Scand. 2001 Feb;80(2):113-9.**

BACKGROUND: According to estimates of maternal mortality rates from WHO/UNICEF, the West African rates appear to be among the world's highest. The precision of these estimates from general mortality models is far from ideal and no information on the distribution of causes of death is provided. The principal objective of our study is to describe the maternal mortality, estimation of the rates and distribution of obstetric causes, from a population based survey of pregnant women carried out in West Africa. We also present the main characteristics of the deaths that occurred, including avoidable aspects.

**METHODS:** The survey included all the pregnant women living in seven defined areas, from December 1994 through June 1996, depending on the area. Twenty thousand three hundred and twenty-six pregnant women (94.3% of all those identified) agreed to participate and 19,545 were followed throughout the second trimester of pregnancy, delivery and the puerperium. Physicians from the survey team made special enquiries about all maternal deaths. But the deaths occurring during the first months of pregnancy could not be estimated. A subcommittee analyzed all the deaths, assigned the underlying cause and discussed the avoidable aspects of the death. **RESULTS:** Sixty-six deaths were reported. Fifty-five (three late) were deaths due to obstetric causes; six were fortuitous deaths, and no cause could be defined for five. As a mean and for pregnancy after week 25, the maternal mortality rate was estimated at 311 (95% CI 234-404) per 100,000 live births and 852 (95% CI 456-1457) in rural areas. Hemorrhages accounted for 29% of obstetric deaths, uterine rupture 13%, eclampsia and infectious diseases 11% each. **Seventy-four percent of the direct obstetric causes were considered avoidable.** **CONCLUSION:** Confidential enquiries into maternal deaths in West Africa are not just a concern of the others. They are urgently requested to promote the improvement of health services.

PMID: 11167204 [PubMed – indexed for MEDLINE]

**Moodley J. Saving mothers:1999-2001, S Afr. Med J. 2003 May; 93 (5):364-6.**

The 'big five' causes of maternal death in South Africa in the 3 years 1999-2001 were non-pregnancy-related infection (mainly AIDS), **complications of hypertension in pregnancy, obstetric haemorrhage, pregnancy-related sepsis and pre-existing medical conditions.** Women 35 years and older were at greater risk of dying than younger women, and women in their first pregnancy or who had had 5 or more pregnancies were also at greater risk. Recommendations have been made by the National Committee on Confidential Enquiries into Maternal Deaths (NCCEMD) that address the problems of avoidable factors. If implemented, these should result in a reduction of maternal deaths.

PMID: 12830600 [PubMed - indexed for MEDLINE]

**Onakewhor JU, Gharoro EP. Changing trends in maternal mortality in a developing country. Niger J Clin Pract. 2008 Jun;11(2):111-20.**

**OBJECTIVE:** To have a 5-year review of the maternal mortality ratio in the largest centrally located Mission hospital in Benin City where a large proportion of women deliver yearly. **METHOD:** This was a 5-year (January 1, 1996 through December 31, 2000) review of the causes of maternal mortality at the Saint Philomena Catholic Hospital, Benin City. The case notes of those that suffered maternal mortality were retrieved and thoroughly perused. Information on all cases of maternal mortality were extracted from the patients' case-notes; the labour ward Registers; the antenatal, postnatal, the female ward and the theatre registers. The midwifery/nurses' reports were also examined. The duplicate copies of the death certificates were examined and the necessary information was also extracted. The total deliveries for the period were extracted from the

delivery registers. RESULTS: There were 7055 women who gave birth during the 5-year period. There were 32 maternal deaths; Maternal Mortality Ratio (MMR) of 454/ 100,000 live births. Unbooked emergencies accounted for 68.7% of all deaths, and were more than doubled the booked women. The MMR increased progressively from 325 in 1996 to peak at 765 in 1999 ( $P < 0.0001$ ) with an insignificant drop in 1998 ( $P > 0.06$ ). It was lowest in 2000 (241) ( $P < 0.0001$ ). Paradoxically, as the number of deliveries decreased progressively from 1530 in 1996 to 1247 in 2000, the MMR increased progressively from 327 in 1996 to 675 in 1999. There were no postmortem examinations and no coroner's inquests. More than 76% of the women spent 48 hours or less from time of admission to death and majority of them were of low parity. Nulliparity was 37.5%. The mean parity was one. Young women 20-39 years old accounted for 81.3% with 9.4% teenage deaths due to illegally induced abortions. Eclampsia (34.4%), hemorrhage (25.0%), Infections (18.8%) and abortions 12.5%) were the four leading causes of death. Puerperal deaths were 56.3%. Five short case scenarios were presented to highlight the tortuous pathway the women passed to end in maternal mortality. CONCLUSION: The MMR ratio was still unacceptably high. The causative factors were largely preventable. The puerperium was the most dangerous period. Women empowerment, free or highly subsidized universal antenatal care services, and provision of adequate emergency obstetric services with effective contraceptive backup is suggested. Re-orientation of care givers and community leaders to enhance awareness and early recognition of the danger signs and risk factors associated with pre-eclampsia and eclampsia with prompt and adequate management ***or referral*** is emphasized.

PMID: 18817049 [PubMed - indexed for MEDLINE]

**Ujah IA, Aisien OA, Mutahir JT, Vanderjagt DJ, Glew RH, Uguru VE. Factors contributing to maternal mortality in north-central Nigeria: a seventeen-year review. Afr J Reprod Health. 2005 Dec;9(3):27-40.**

Maternal mortality ratio in Nigeria is one of the highest in the world. This paper reports a facility based study in north-central Nigeria to determine the magnitude, trends, causes and characteristics of maternal deaths before and after the launch of the Safe Motherhood Initiative in Nigeria, with a view to suggesting strategic interventions to reduce these deaths. The records of all deliveries and case files of all women who died during pregnancy and childbirth between January 1, 1985 and December 31, 2001, in the maternity unit of Jos University Teaching Hospital, Jos, Nigeria, were reviewed. Data collected were analysed for socio-biological variables including age, booking status, educational level, parity, ethnic group, marital status, mode of delivery, duration of hospital stay before death occurred, cause (s) of maternal deaths. There were 38,768 deliveries and 267 maternal deaths during the period under review, giving a maternal mortality ratio (MMR) of 740/ 100,000 total deliveries. The trend fluctuated between 450 in 1990 and 1,010/100,000 deliveries in 1994. The mean age of maternal death was 26.4 (SD 8.1) years. The greatest risk of MMR was among young teenagers ( $> 15$  years) and older women ( $< 40$  years). Parity-specific maternal mortality ratio was highest in the grand multiparous women. Unbooked as well as illiterate women

were associated with very high maternal mortality ratio. The Hausa - Fulani ethnic group contributed the largest number (44%) by tribe to maternal mortality in our study. **The major direct causes of deaths were haemorrhage (34.6%), sepsis (28.3%), eclampsia (23.6%) and unsafe abortion (9.6%).** The most common indirect causes of death were hepatitis (18.6%), anaesthetic death (14.6%), anaemia in pregnancy (14.6%), meningitis (12.0%), HIV/AIDS (10.6%) and acute renal failure (8.0%). Seventy-nine percent of the maternal deaths occurred within 24 hours of admission. Most of the deaths were preventable. A regional-specific programme should be planned to reduce the deplorably high maternal mortality in north-central Nigeria.

PMID: 16623187 [PubMed - indexed for MEDLINE]

**[No authors listed] Reaching help on time in an emergency delivery. Safe Mother. 1991 Mar-Jun;(5):5-7.**

PIP: Many maternal deaths in developing countries occur because mothers with complicated pregnancies or deliveries **cannot be transported** at all or fast enough to a health facility. A pregnant woman hemorrhaging greatly had to wait for a taxi because an unauthorized person had the health center's vehicle in Tanzania. Since most physicians practice in cities, most maternal deaths involve rural women. Further the less educated, lower the socioeconomic status, and lower the family's income the more likely she is to die. 3 phases contributed to transport delays of pregnant women. **The 1st phase includes the time it take for a woman and her family to decide if her condition is serious enough to require medical attention, and if so, can they afford to pay for transport.** Sometimes the services scare her or she considers the services to be of poor quality. The next phase involves the **availability of transport and the distance between the mother and the services. Indeed in Nigeria, 96% of mothers who do not use medical delivery services report that they do not do so because of distance.** Once at the health facility, the waiting period between arrival and meeting the woman's medical needs make up the 3rd phase. Often health facilities have inadequate number of medical personnel. Moreover the family must buy needed medical supplies before treatment can even begin. Alarm and transport systems are needed. In 1 area of India, pigeons carry messages to a physician that a woman is experiencing labor difficulties. **Prior to the civil war in Somalia, a distinct flag informed passing motorists that emergency transport was needed for a pregnant woman who was carried to the roadside on a stretcher or in a cart. High technology transport is not cost effective and should not be part of a primary health care system.**

PMID: 12284068 [PubMed - indexed for MEDLINE]

**Kaye D, Mirembe F, Aziga F, Namulema B. Maternal mortality and associated near-misses among emergency intrapartum obstetric referrals in Mulago Hospital, Kampala, Uganda. E. Afr Med J. 2003 Mar;80(3):144-9.**

BACKGROUND: Many maternal deaths (as well as related severe morbidity) are of women who do not attend antenatal care in a given health unit but are referred there when they develop life-threatening obstetric complications. OBJECTIVE:

To determine the reproductive characteristics of emergency obstetric referrals, and determine the contribution of emergency obstetric referrals to severe acute maternal morbidity (near-misses) and maternal mortality. **STUDY DESIGN:** Descriptive cross-sectional study. **SETTING:** Mulago hospital, the National Referral hospital, Kampala, Uganda, from 1st March to August 30th 2000. **SUBJECTS:** Nine hundred and eighty three consecutive women admitted as emergency obstetric referrals in labour or puerperium. **INTERVENTIONS:** Subjects were followed from time of admission to discharge (or death). They were interviewed (or examined) to obtain data on socio-demographic characteristics, reproductive history, obstetric outcome of the index pregnancy, obstetric complications and cause of death. Their records were reviewed to determine evidence of severe acute morbidity from acute organ/system dysfunction, using the definition by Mantel et al. These data were analysed using the EpiInfo computer programme in terms of means, frequencies and percentages. **MAIN OUTCOME MEASURES:** Socio-demographic characteristics, obstetric complications, cause of deaths, cause and type of near miss mortality and case fatality rates. **RESULTS:** Of the 983 referrals, over 100 were near-misses and 17 died. Using the definition of Mantel et al of near-misses enabled identification of six times as many near-misses as maternal deaths. The commonest causes of death were postpartum haemorrhage and eclampsia. Low status was highly associated with both maternal deaths and near misses. **CONCLUSION:** In developing countries, with poor obstetric services, **emergency transfers in labour are very common.** These women, who are of low status, contribute significantly to maternal mortality and morbidity.

PMID: 12762430 [PubMed - indexed for MEDLINE]

**Hounton SH, Sombie I, Townend J, Ouedraogo T, Meda N, Graham WJ. The tip of the iceberg: evidence of seasonality in institutional maternal mortality and implications for health resources management in Burkina Faso. Scand J Public Health. 2008 May;36(3):310-7.**

**AIMS:** The aims of this study were to investigate seasonal patterns of institutional maternal deaths and complications, and to test for an association with malaria seasons, rainfall, and household income. **METHODS:** A systematic case review of hospital records in the Boucle du Mouhoun health region (Burkina Faso) was conducted over a 2-year period. A statistical smoothing procedure (T4253H) and Freedman's test were used to investigate seasonality and association with malaria, rainfall or household income variations. **RESULTS:** The data consistently showed the greatest rates of maternal deaths, eclampsia and haemorrhage cases during the dry season, which is the low malaria transmission season, and the period of the year when households have most money available and the lowest opportunity cost of travelling to seek medical attention, **suggesting that financial and geographical barriers may be major underlying factors.** **CONCLUSIONS:** The management both of health resources in hospital and of referral systems should accommodate cyclical variations in the presentation of maternal complications. Effective mechanisms are needed to help reduce the significant barriers to uptake faced by women and

their families at particular times of the year.
PMID: 18519302 [PubMed - indexed for MEDLINE]
<b>Igberase GO, Ebeigbe PN. Maternal mortality in a rural referral hospital in the Niger Delta, Nigeria. Obstet Gynaecol. 2007 Apr;27(3):275-8.</b>
<p>Almost two decades after the safe motherhood initiative, maternal mortality figures remain very high in Nigeria. Very few studies are available on the features of maternal mortality in rural Nigeria. The objective of this study was to determine the incidence and causes of maternal mortality in a rural referral hospital in the Niger Delta, Nigeria. An audit of 115 consecutive maternal mortalities over a 10-year period at a rural-based tertiary hospital was undertaken. There were 5,153 deliveries and 115 maternal deaths during the study period, with a maternal mortality ratio of 2,232/100,000 live births. The most common causes of maternal mortalities were puerperal sepsis, abortion complications, pre-eclampsia/eclampsia, prolonged obstructed labour, haemorrhage accounting for 33%, 22.6%, 17.4%, 13.0% and 7.8%, respectively. The percentage mortality for unbooked was 10 times that for booked patients. Unbooked status is a risk factor for maternal mortality as this was statistically significant <math>p &lt; 0.0001</math>. Traditional birth attendants were involved in the initial management of at least two-fifths (38.2%) of the non-abortion mortalities while half had been managed in private hospitals and maternities. Maternal mortality will continue to increase unless appropriate steps are taken to improve the use of antenatal care, thereby reducing unbooked emergencies. <b><i>Hospitals need to be equipped with facilities for emergency obstetric care. Continuous programmes that will integrate TBAs and orthodox practices should be put in place as this will reduce delays and improve referral systems.</i></b></p>
PMID: 17464810 [PubMed - indexed for MEDLINE]
<b>Juma EA, Odiyo FN. Maternal mortality occurring at the Rift Valley Provincial General Hospital, Nakuru. East Afr Med J. 2000 Jul;77(7):382-5.</b>
<p>OBJECTIVE: To evaluate the factors that led to maternal mortality over a five year period at the Rift Valley Provincial General Hospital, Nakuru. DESIGN: A retrospective survey based on secondary data. SETTING: Department of Obstetrics and Gynaecology, Rift Valley Provincial General Hospital, Nakuru, between 1994 and 1998. SUBJECTS: Evaluation of 109 deaths where records were available. RESULTS: The average maternal mortality was 3.16/1000 live births. Twenty eight (26%) occurred in teenagers. Sixty two deaths (58%) accounted for those aged (14-24 years). Thirty four per cent of sixty two deaths occurred in nulliparous and primiparous patients. The commonest cause of death was haemorrhage and ruptured uterus (44%). Most deaths (53%) occurred within 24 hours of admission. Of these, 36 (62%) came directly from home in labour or ill or where deliveries were being attempted by non medical persons. CONCLUSION: Most of the deaths evaluated were preventable. Management of the major causes of death include blood (haemorrhage and ruptured uteri) transfusion. With poor blood transfusion services and the risk of HIV, this calls for alternatives to direct blood transfusion. <b><i>Referral systems need to be</i></b></p>

**overhauled and referring health institutions should get properly staffed.**

Despite good antenatal clinic attendance and availability of resources most patients still deliver at home.

PMID: 12862158 [PubMed indexed for MEDLINE]

**Saizonou J, Godin I, Ouendo EM, Zerbo R, Dujardin B. Emergency obstetrical care in Benin referral hospitals: 'near miss' patients' views**

OBJECTIVE: To evaluate emergency obstetric care and the perceptions and expectations of women who experienced 'near miss' events to improve maternal health in Benin. METHODS: Qualitative survey in seven hospitals at the three referral levels of the health pyramid from July to October 2003. We used two methods: 557 women with near miss events were interviewed in hospital and a standard questionnaire completed; then semi-structured individual interviews were conducted at home with 42 of these 557 women. RESULTS: Provided care, accommodation, facilities, costs and modalities of recovery, hygiene of the premises, dynamism, expertise, social support, behaviours and attitude of staff were the criteria used to express patients' satisfaction. Most women interviewed in hospital were happy with physical access, organization, functioning and environment. **However, excessive costs and coercive recovery of the expenses, failure of the referral system, lack of empathy and discrimination of the nursing staff, lack of resources for emergencies, lack of hygiene and comfort of the premises were criticized by the women interviewed at home.** CONCLUSION: The current maternal care system fails to effectively deal with obstetric complications. It needs to be better resourced, more easily available, cheaper and take into account the women's needs.

PMID: 16640620 [PubMed - indexed for MEDLINE]

**Pembe AB; Urassa DP; Carlstedt A; Lindmark G; Nyström L; Darj E; Rural Tanzanian women's awareness of danger signs of obstetric complications. BMC Pregnancy and Childbirth 2009, 9:12**

Abstract

Background: Awareness of the danger signs of obstetric complications is the essential first step in accepting appropriate and timely referral to obstetric and newborn care. The objectives of this study were to assess women's awareness of danger signs of obstetric complications and to identify associated factors in a rural district in Tanzania.

Methods: A total of 1118 women who had been pregnant in the past two years were interviewed. A list of medically recognized potentially life threatening obstetric signs was obtained from the responses given. Chi-square test was used to determine associations between categorical variables and multivariate logistic regression analysis was used to identify factors associated with awareness of obstetric danger signs.

Results: More than 98% of the women attended antenatal care at least once. Half of the women knew at least one obstetric danger sign. The percentage of women who knew at least one danger sign during pregnancy was 26%, during delivery 23% and after delivery 40%. Few women knew three or more danger

signs. According to multivariate logistic regression analysis having secondary education or more increased the likelihood of awareness of obstetric danger signs six-fold (OR = 5.8; 95% CI: 1.8–19) in comparison with no education at all. The likelihood to have more awareness increased significantly by increasing age of the mother, number of deliveries, number of antenatal visits, whether the delivery took place at a health institution and whether the mother was informed of having a risks/complications during antenatal care.

Conclusion: **Women had low awareness of danger signs of obstetric complications.** We recommend the following in order to increase awareness of danger signs of obstetrical complications: to improve quality of counseling and involving other family members in antenatal and postnatal care, to use radio messages and educational sessions targeting the whole community and to intensify provision of formal education as emphasized in the second millennium development goal.

**WHO. Maternal mortality in 2005 : estimates developed by WHO, UNICEF, UNFPA, and the World Bank. WHO Geneva, 2005**

**EXECUTIVE SUMMARY**

Improving maternal health and reducing maternal mortality have been key concerns of several international summits and conferences since the late 1980s, including the Millennium Summit in 2000. One of the eight Millennium Development Goals (MDGs) adopted at the Millennium Summit is improving maternal health (MDG5). Within the MDG monitoring framework, the international community committed itself to reducing the maternal mortality ratio (MMR) by three quarters between 1990 and 2015.

In this context, country estimates of maternal mortality over time are crucial to inform planning of sexual and reproductive health programmes and to guide advocacy efforts and research at the national level. These estimates are also needed at the international level, to inform decision-making concerning resource allocation by development partners and donors. However, assessing the extent of progress towards the MDG5 target has been challenging, due to the lack of reliable maternal mortality data – particularly in developing-country settings where maternal mortality is high.

The World Health Organization (WHO), the United Nations Children’s Fund (UNICEF), and the United Nations Population Fund (UNFPA) have made three previous attempts to develop internationally comparable estimates of maternal mortality (for the years 1990, 1995, and 2000) by using an approach that encompasses different sources of data. However, the exact methodology used by each exercise differed. The development of country, regional, and global estimates for 2005 followed a similar approach, but used improved methodological techniques. Development of this round of estimates involved The World Bank in addition to WHO, UNICEF and UNFPA. A separate analysis of trends was also performed, to assess the likely change in

MMR from 1990 to 2005 at the regional and global levels. Of the estimated total of 536 000 maternal deaths worldwide in 2005, developing countries accounted for 99% (533 000) of these deaths. Slightly more than half of the maternal deaths

(270 000) occurred in the sub-Saharan Africa region alone, followed by South Asia (188 000). Thus, sub-Saharan Africa and South Asia accounted for 86% of global maternal deaths.

By the broad MDG regions, MMR in 2005 was highest in developing regions (at 450 maternal deaths per 100 000 live births), in stark contrast to developed regions (at 9) and countries of the commonwealth of independent states (at 51). Among the developing regions, sub-Saharan Africa had the highest MMR (at 900) in 2005, followed by South Asia (490), Oceania (430), South-Eastern Asia (300), Western Asia (160), Northern Africa (160), Latin America and the Caribbean (130), and Eastern Asia (50).

A total of 14 countries had MMRs of at least 1000, of which 13 (excluding Afghanistan) were in the sub-Saharan African region. These countries are (listed in descending order): Sierra Leone (2100), Niger (1800), Afghanistan (1800), Chad (1500), Somalia (1400), Angola (1400), Rwanda (1300), Liberia (1200), Guinea Bissau (1100), Burundi (1100), the Democratic Republic of the Congo (1100), Nigeria (1100), Malawi (1100), and Cameroon (1000). By contrast, Ireland had an MMR of 1.

The adult lifetime risk of maternal death (the probability that a 15-year-old female will die eventually from a maternal cause) is highest in Africa (at 1 in 26), followed by Oceania (1 in 62) and Asia (1 in 120), while the developed regions had the smallest lifetime risk (1 in 7300). Of all 171 countries and territories for which estimates were made, Niger had the highest estimated lifetime risk of 1 in 7, in stark contrast to Ireland, which had the lowest lifetime risk of 1 in 48 000. These estimates provide an up-to-date indication of the extent of the maternal mortality problem globally. They strongly indicate a need for both improved action for maternal mortality reduction and increased efforts for the generation of robust data to provide better estimates in the future. Maternal Mortality in 2005

The separate analysis of trends shows that, at the global level, maternal mortality has decreased at an average of less than 1% annually between 1990 and 2005 – far below the 5.5% annual decline, which is necessary to achieve the fifth MDG, concerning maternal mortality reduction. To achieve that goal, MMRs will need to decrease at a much faster rate in the future – especially in sub-Saharan Africa, where the annual decline has so far been approximately 0.1%. Achieving this goal requires increased attention to improved health care for women, including high-quality emergency obstetric care.

**Ronsmans C; Graham WJ; on behalf of The Lancet Maternal Survival Series steering group Maternal mortality: who, when, where, and why. Lancet 2006; 368: 1189–200,**

**The risk of a woman dying as a result of pregnancy or childbirth during her lifetime is about one in six in the poorest parts of the world compared with about one in 30 000 in Northern Europe. Such a discrepancy poses a huge challenge to meeting the fifth Millennium Development Goal to reduce maternal mortality by 75% between 1990 and 2015.**

Some developed and transitional countries have managed to reduce their maternal mortality during the past 25 years. Few of these, however, began with the very high rates that are now estimated for the poorest countries—in which further progress is jeopardised by weak health systems, continuing high fertility, and poor availability of data. Maternal deaths are clustered around labour, delivery, and the immediate postpartum period, with **obstetric haemorrhage** being the main medical cause of death. Local variation can be important, with unsafe abortion carrying huge risk in some populations, and HIV/AIDS becoming a leading cause of death where HIV-related mortality rates are high. Inequalities in the risk of maternal death exist everywhere. Targeting of interventions to the most vulnerable—rural populations and poor people—is essential if substantial progress is to be achieved by 2015

**JANET ANSONG-TORNUI, \*MARGARET ARMAR-KLEMESU, DANIEL ARHINFUL, SUZANNE PENFOLD<sup>1</sup> and JULIA HUSSEIN<sup>1</sup> HOSPITAL BASED MATERNITY CARE IN GHANA – FINDINGS OF A CONFIDENTIAL ENQUIRY INTO MATERNAL DEATHS. GHANA MEDICAL JOURNAL 2007; 41(3): 125,**

Background: In Ghana, a universal free delivery policy was implemented to improve access to delivery care in health facilities, thereby improving access to skilled attendance and reducing maternal mortality.

Objective: A confidential enquiry was conducted to ascertain if changes had occurred in the care provided by reviewing the care given to a sample of maternal deaths before and after introduction of the policy.

Method: Twenty women who died as a result of pregnancy-related complications (maternal deaths) in selected hospitals in two regions were assessed by a clinical panel, guided by a maternal death assessment form. Unlike the traditional confidential enquiry process, both adverse and favourable factors were identified.

Findings: Clinical care provided before and after the introduction of the fee exemption policy did not change, though women with complications were arriving in hospital earlier after the introduction of the policy. On admission, however, they received very poor care and this, the clinical panel deduced could have resulted in many avoidable deaths; as was the case before the implementation of the policy. Consumables, basic equipment and midwifery staff for providing **comprehensive emergency obstetric care** were however found to be usually available.

Conclusion: Our findings suggest that the already poor delivery care services women received remained unchanged after introduction of the policy.

Keywords: Hospital, maternity care, confidential enquiry, maternal deaths

**Cisse, C T; Faye, E O; de Bernis, L; Dujardin, B; Diadhiou, F. [Cesarean sections in Senegal: coverage of needs and quality of services]. Sante 8 (5):369-77 1998**

Abstract A prospective longitudinal study was carried out of all women undergoing Cesarean section in the surgical maternity hospitals of Senegal between January 1 and December 31 1996. The epidemiology and quality of Cesarean sections were investigated. For each case, the following data were recorded: marital status, prenatal monitoring, conditions of hospitalization, indications for and outcome of surgery, maternal and neonatal follow-up one month after the operation. 2,436 Cesarean sections were performed. Of these, 2,269 cases were indexed and filed and 1,612 received a postnatal checkup one month after the operation. The mean age of the women involved was 26 years. The referral system is not effective, with 58% of patients being rushed to a surgical maternity unit in medically unsuitable forms of transport. Cesarean section is not widely available either geographically or economically. The mean national rate of Cesarean section was 0.6% of expected births but there were differences between regions. The main indications for Cesarean section were the fetus being too large to pass through the pelvic girdle (30%) and fetal suffering (18%). The maternal mortality rate was 3% and one third of the women who died did so immediately after the operation. Maternal morbidity occurred in 10% of cases, **mainly due to postoperative infection. The rate of perinatal stress was 25%, most deaths being caused by neonatal distress (33%) or infection (18%).** Thus, overall, both the availability and quality of Cesarean section in Senegal are poor. ; A prospective study was conducted of all women delivering by cesarean section in Senegal's 22 surgical maternity hospitals during 1996. Adequate data were available to include 2269 of the 2436 cesareans performed. 13 hospitals performing 55% of the cesareans were in the Dakar area. Two of Senegal's 9 regions had no surgical maternity hospital and 4 had no gynecologists. 19.5% of the mothers were adolescents, and the average maternal age was 26 years. 46.5% were primiparous. 64% of the mothers were urban. 65% had at least 3 prenatal consultations and 12% had none. Only 28% were referred for cesareans before the onset of labor, and 57% were emergency evacuations. 6.7% of the women had to be re-evacuated from supposedly ultimate referral hospitals due to lack of supplies or personnel. **41% were transported to the hospital in ambulances, 14% in private cars, and 44% by public transportation.** The 2436 cesareans corresponded to a rate of 0.6% of expected births, only 20% of the minimum need for cesareans estimated at 3%. Regional cesarean rates ranged from 1.3% in Dakar to 0.1% in Kaolack-Fatick. Feto-pelvic disproportion (30.4%) and fetal distress (18.2%) were the most common indications. 73 maternal deaths occurred, for a rate of 3%. 10% of the women had complications, with 55% involving infection. There were 9 cases of vesicovaginal fistula. The perinatal mortality rate was 25%, with 13% intrapartum and 13% neonatal. Neonatal distress and infection were the main causes of early neonatal death. **Accessibility of cesareans is poor both geographically and economically.**

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**Alihonou, E. Africa: time for action. Plan Parent Chall (1):15 1998**

Abstract In sub-Saharan Africa, the maternal mortality ratio has remained a

constant 500 deaths/100,000 live births despite increased efforts to address the problem since the launch of the Safe Motherhood Initiative in 1987. This situation is caused by 1) a poor referral system with little or no transportation, a lack of care during transport, and a lack of drugs for emergency treatment; 2) a low level of contraceptive availability and consequent use; 3) a high number of abortions with fatal complications; and 4) inadequate provision of adequate quality obstetric care. Research has indicated that countries with an annual per capita income of only \$200 have succeeded in substantially reducing maternal mortality. Thus, maternal mortality is more closely linked to poor organization of services than to a lack of national resources. **It is time for women and the whole of civil society to engage in advocacy activities of behalf of safe motherhood so that decision-makers will provide the necessary resources**

**Kodio B, de Bernis L, Ba M, Ronsmans C, Pison G, Etard JF. Levels and causes of maternal mortality in Senegal. Trop Med Int Health. 2002 Jun;7(6):499-505.**

OBJECTIVES: To report the findings of a direct, community-based, assessment of maternal mortality and medical causes of death using verbal autopsy in three unique cohorts in rural Senegal. METHODS: Methods from ongoing demographic surveillance systems. We obtained records of all deaths and births in women of age 15-49 over a period of 14 years in Niakhar, 10 years in Bandafassi and 13 years in Mlomp. Relatives of all women who died were interviewed using a standard questionnaire. Causes of death were assigned by three physicians independently. Maternal deaths were defined according to the ninth and tenth revisions of the International Classification of Diseases. RESULTS: The maternal mortality ratio was similar in Mlomp [436 per 100 000 live births (95% confidence interval 209-802)] and Niakhar [516 per 100 000 (413-636)] **but significantly higher in the more remote area of Bandafassi** [852 (587-1196)] [relative risk compared with Niakhar 1.6 (1.0-2.4)]. Two-thirds of the maternal deaths were from direct obstetric causes, haemorrhage being the most common. Abortion was rare. CONCLUSIONS: Demographic surveillance systems are useful tools for the measurement of maternal mortality provided special studies are carried out to arrive at the levels and causes of maternal death. The estimates of maternal mortality reported here are lower than those published by the WHO and UNICEF but remain extremely high, particularly in the very remote areas with very limited health infrastructure, where as many as one in 19 women may be expected to die as a consequence of childbirth.

PMID: 12031071 [PubMed - indexed for MEDLINE]

**Hofmeyr GJ, Haws RA, Bergström S, Lee AC, Okong P, Darmstadt GL, Mullany LC, Oo EK, Lawn JE. Obstetric care in low-resource settings: What, who, and how to overcome challenges to scale up? Int J Gynaecol Obstet. 2009 Aug 29.**

BACKGROUND: Each year, approximately 2million babies die because of complications of childbirth, primarily in settings where effective care at birth, particularly prompt cesarean delivery, is unavailable. OBJECTIVE: We reviewed

the content, impact, risk-benefit, and feasibility of interventions for obstetric complications with high population attributable risk of intrapartum-related hypoxic injury, as well as human resource, skill development, and technological innovations to improve obstetric care quality and availability. RESULTS: Despite ecological associations of obstetric care with improved perinatal outcomes, there is limited evidence that intrapartum interventions reduce intrapartum-related neonatal mortality or morbidity. No interventions had high-quality evidence of impact on intrapartum-related outcomes in low-resource settings. While data from high-resource settings support planned cesarean for breech presentation and post-term induction, these interventions may be unavailable or less safe in low-resource settings and require risk-benefit assessment. Promising interventions include use of the partograph, symphysiotomy, amnioinfusion, therapeutic maneuvers for shoulder dystocia, improved management of intra-amniotic infections, and continuous labor support. Obstetric drills, checklists, and innovative low-cost devices could improve care quality. Task-shifting to alternative cadres may increase coverage of care. CONCLUSIONS: While intrapartum care aims to avert intrapartum-related hypoxic injury, rigorous evidence is lacking, especially in the settings where most deaths occur. **Effective care at birth could save hundreds of thousands of lives a year, with investment in health infrastructure, personnel, and research-both for innovation and to improve implementation.**

PMID: 19815204 [PubMed - as supplied by publisher]

**Maine D, Rosenfield A. The Safe Motherhood Initiative: why has it stalled? Am J Public Health. 1999 Apr;89(4):480-2.**

Complications of pregnancy and childbirth are still the leading cause of death and disability among women of reproductive age in developing countries. After decades of neglect, the founding of the Safe Motherhood Initiative in 1987 promised action on this problem. A dozen years later, there is no evidence that maternal mortality has declined and there are still few sizeable programs. A major reason for this disappointing record is that the initiative lacks a clear, concise, feasible strategy. This article reviews the available options and proposes a strategy based on improving the availability and quality of medical treatment of obstetric complications. **Once district hospitals and health centers provide such needed care, community mobilization to improve prove utilization may be beneficial.** Substantial reductions in maternal deaths would be possible in a relatively short period of time if this strategy were embraced.

PMID: 10191784 [PubMed - indexed for MEDLINE]

**Ahmed Y, Mwaba P, Chintu C, Grange JM, Ustianowski A, Zumla A. A study of maternal mortality at the University Teaching Hospital, Lusaka, Zambia: the emergence of tuberculosis as a major non-obstetric cause of maternal death. Int J Tuberc Lung Dis. 1999 Aug;3(8):675-80.**

SETTING: The Department of Obstetrics and Gynaecology, University Teaching Hospital, Lusaka, Zambia. OBJECTIVES: To ascertain 1) the non-obstetric

causes of maternal mortality, 2) the importance of tuberculosis as a cause of maternal deaths, and 3) the trends in the aetiology of non-obstetric causes of maternal deaths during the past decade in the light of the human immunodeficiency virus epidemic. DESIGN: A 2-year retrospective study of the aetiology of all maternal deaths occurring at the University Teaching Hospital (UTH), Lusaka, Zambia between 1 January 1996 and 31 December 1997. Comparison of these data with available data published between 1974 and 1989. RESULTS: There were 251 maternal deaths recorded during the study period. Of these, 106 (42%) were due to direct (obstetric) causes and 145 (58%) were due to indirect (non-obstetric) causes. Malaria (30%), tuberculosis (25%) and unspecified chronic respiratory tract infections (22%) accounted for 77% of non-obstetric causes of maternal deaths and 44% of all causes of maternal deaths. The diagnosis of AIDS was closely linked with that of tuberculosis (92% of cases), and unspecified chronic respiratory illnesses (97%), but not with malaria (37%). The maternal mortality ratio for UTH was calculated at 921 per 100,000 live births, a significant increase from the 118 noted in 1982 and 667 in 1989. CONCLUSIONS: Despite improved obstetric services, the maternal mortality ratios at UTH, Lusaka, have increased eight-fold over the past two decades. This dramatic increase is mainly due to non-obstetric causes of death. Malaria and AIDS-associated tuberculosis and unspecified 'chronic respiratory illnesses' are now major causes of maternal death in Zambia. **Greater emphasis is urgently required on early detection, accurate diagnosis, treatment and prevention of malaria and tuberculosis in pregnancy. Further definition of chronic 'unspecified' respiratory illnesses is also required.**

PMID: 10460099 [PubMed - indexed for MEDLINE]

**Adamson SM, Phiri A. Did maternal mortality ratio increase in Malawi between 1992-1998? Review of Malawi Demographic and Health Surveys and other data sources. Trop Doct. 2003 Jul;33(3):182-5.**

Despite various programmes aimed at reducing the maternal mortality ratio (MMR) and improving reproductive health globally, and in Malawi especially, the 2000 Malawi Demographic and Health Survey (DHS) reported an MMR for Malawi as 1221 deaths per 100 000 live births. This represented an almost 80% rise from the 620 maternal deaths/100 000 live births estimated in the 1992 DHS. The possible reasons behind the rise in the MMR include: the growing HIV/AIDS pandemic in Malawi with an estimated infection rate of 14%; and the deteriorating healthcare situation and inherent inaccuracies in the estimation of maternal mortality. Continued surveillance and identification of factors responsible for the deterioration of Malawi's MMR are suggested. **It is necessary to design, implement and evaluate corrective measures in order to improve the situation.**

PMID: 12870616 [PubMed - indexed for MEDLINE]

**Kigbu JH, Daru PH, Ujah IA. Review of maternal deaths from unsafe abortion in Jos, Nigeria. Niger J Med. 2009 Jan-Mar;18(1):103-6.**

**BACKGROUND:** Unsafe Abortion assumes one of the lead causes of maternal deaths so long as contraceptive services remain low or unavailable and abortion laws remain restrictive. This study seeks to highlight abortion mortality, the practice of contraception amongst these women and complications arising from unsafe abortion. **METHOD:** This is a retrospective review of abortion related deaths in Jos University Teaching Hospital over a five year period (1st December 1989 to 30th November 2004). Patients files were retrieved from the hospital records and were reviewed in relation to socio demographic profile, clinical features and cause of death. **RESULTS:** Fourteen cases of abortion related deaths out of a total number of 188 induced abortion cases. The case fatality rate was 7.4% with abortion mortality of 74.4/100,000 deliveries. It constituted 12.8% of maternal deaths during the period. Seventy eight point six percent (78.6%) were below 24 years, while 85.7% of the patients were nulliparous. Ninety two point nine percent (92.9%) and 57.1% were single and dependent respectively. Fifty seven point one percent had never practiced contraception and 35.7% had previous pregnancy terminated. In 64.3%, the index pregnancy was terminated at 9 weeks and above because the pregnancies were unwanted in all (100%) cases. In 78.6% of cases the pregnancies were terminated by quacks. Forty two point nine percent (42.9%) presented after a week of termination. The causes of death were septicemia (71.4%), and hypovolaemic shock (28.6%). The average duration of hospital stay before demise was 5.6 days. **CONCLUSION: Unsafe abortion is a public health problem in Jos and policy makers should promote contraception and review existing abortion laws.**

PMID: 19485160 [PubMed - indexed for MEDLINE]

**Black V, Brooke S, Chersich MF. Effect of human immunodeficiency virus treatment on maternal mortality at a tertiary center in South Africa: a 5-year audit. *Obstet Gynecol.* 2009 Aug;114(2 Pt 1):292-9.**

**OBJECTIVE:** To review facility-based maternal deaths at a tertiary-level center in Johannesburg, South Africa, during a 5-year period (2003 to 2007) and to investigate the proportion of deaths attributable to human immunodeficiency virus (HIV), the etiology of deaths, and the effects of antiretroviral treatment introduced in late 2004. **METHODS:** Patient case files, birth registers, death certificates, and mortality summaries were reviewed. Cause of death was assigned through clinical case discussion. Annual maternal mortality ratios were calculated and disaggregated by HIV status. **RESULTS:** During the 5-year period, 106 maternal deaths occurred out of 36,708 births (facility-based maternal mortality ratios 289/100,000 live births, 95% confidence interval [CI] 237-349/100,000). In 72% of cases, HIV status was known (76/106), with the majority being HIV-infected (78%, 59/76). Among HIV-infected women, only two had initiated antiretroviral treatment, and 70% of deaths were HIV-related (41/59), mainly from tuberculosis (21) and pneumonia (12). Direct obstetric causes of death such as hypertension and pregnancy-related sepsis predominated in women who were HIV-negative or of unknown status (48.9%, 23/47). Maternal mortality ratios in HIV-infected women were 776/100,000 (95% CI 591-1,000/100,000), 6.2-fold higher (95% CI 3.6-11.4) than in HIV-negative women (124/100,000, 95% CI 72-199/100,000).

Changes in mortality over time were not detected. Although HIV testing increased 1.4-fold each year (95% CI 1.3-1.4) and estimated coverage of antiretroviral treatment for pregnant women reached 59.2% in 2007, levels remain suboptimal. **CONCLUSION: In Johannesburg, HIV remains the major cause of maternal mortality despite integration of antiretroviral treatment into prenatal services. Maternal health services should target barriers to uptake of HIV treatment and care. LEVEL OF EVIDENCE: III.**

PMID: 19622990 [PubMed - indexed for MEDLINE]

**Gessesew A. Unwanted pregnancy and its impact on maternal health and utilization of health services in Tigray Region (Adigrat Hospital). Ethiop Med J. 2009 Jan;47(1):1-8.**

**BACKGROUND:** Unwanted pregnancy is associated with increased risk of maternal mortality and morbidity. Knowledge of the causes and its impact on maternal health and utilization of health services is crucial to develop preventive strategies. **OBJECTIVE:** To assess possible factors of unwanted pregnancy and its impact on maternal health and utilization of health services. **METHODS:** This is a prospective study (February 1, 2002-January 31, 2004) conducted on patients with diagnosis of abortion and admitted to gynecological ward of a zonal hospital. **RESULTS:** Totally 907 patients were admitted with a diagnosis of abortion which accounted for 12.6% of all hospital and 60.6% of gynecological admissions. Majority (69.8%) had unwanted pregnancy. Interference was reported in 81.4% of unwanted pregnancy. More than 95% of patients with wanted and 74.9% of unwanted pregnancies reported to the hospital within 3 days of vaginal bleeding ( $P < 0.0001$ ). High incidence of complication was reported on patients with unwanted pregnancy. There were three maternal deaths and all were related to unwanted pregnancy. The mean hospital stay was 1.42 days in wanted and 2.06 days in unwanted pregnancies. Forced sex and failure of contraception were among the reasons for unwanted pregnancy. **CONCLUSION:** Unwanted pregnancy is associated with increased risk of maternal morbidity and mortality. Besides, it poses a burden to the utilization of health services. **The development and prompt implementation of a strategy, that enables to safely manage unwanted pregnancy is recommended.**

PMID: 19743774 [PubMed - indexed for MEDLINE]

**Oladokun A, Otegbayo JA, Adeniyi AA. Maternal and fetal outcomes of jaundice in pregnancy at the University College Hospital, Ibadan. Niger J Clin Pract. 2009 Sep;12(3):277-80.**

**OBJECTIVE:** This study is aimed at determining pregnancy outcome of cases of jaundice in pregnancy over a 10 year period at the University College Hospital, Ibadan. **METHODOLOGY:** All case records of patients with jaundice in pregnancy over a 10-year period from 1st January 1992 through 31st December 2001 were retrieved from the medical records office of the hospital and analysed. **RESULTS:** During the ten-year study period, there were 16,566 registered pregnancies in the hospital, and 52 cases of jaundice in pregnancy were seen, giving an overall incidence of 0.3% or 1 in 318 deliveries. However, 48 case

records were retrievable. Viral hepatitis was the commonest cause accounting for 58.3% of cases. It was followed by malaria and sickle-cell anaemia with 20.8% and 16.7% respectively. Other causes include sepsis 14.6%, cholestasis 6.3%, and Pre-eclampsia 2.1%. Preterm delivery occurred in 39.6%, while intrauterine fetal death (IUFD) occurred in 8.3% of cases, all occurring in the third trimester. A case of early neonatal death was recorded. There was no maternal death and the mean hospital stay was 18 days (range 4-45 days) during admission. CONCLUSION: Viral hepatitis, malaria and sickle-cell anaemia are the leading causes of jaundice in pregnancy. These should be promptly diagnosed, investigated and appropriate management instituted as most of the perinatal deaths can be avoided by close fetal monitoring especially in the third trimester and with ***recourse to early delivery before fetal demise occurs.***

PMID: 19803025 [PubMed - indexed for MEDLINE]

**Mayi-Tsonga S, Ndombi I, Oksana L, Methogo M, Diallo T, Mendome G, Mounanga M. [Maternal mortality in Libreville, Gabon: assessment and challenges] [Article in French] Sante. 2008 Oct-Dec;18(4):193-7.**

OBJECTIVE: To analyze the course over time of the rates and causes of maternal mortality in Libreville, Gabon. MATERIAL AND METHODS: This prospective descriptive study covers the 6-year period from January 1, 2001, to December 31, 2006. It was performed at the Libreville Hospital Center (LCH) maternity ward, the leading obstetrical care facility in the country. A maternal mortality registry began recording deaths on January 1, 2001. All maternal deaths are listed there, and a department meeting focusing on the death is organized after each. In this study, we analysed the epidemiologic characteristics, circumstances and cause of each death. RESULTS: In all, 136 women died. Their mean age was 25 +/- 5 years with a range of 16 to 41 years. Mean parity was 4 +/- 3, and ranged from 1 to 7. Most of the women were not employed (86%), but had at least some secondary schooling (88%). There were 126 cases (93%) of intrapartum deaths. They occurred more often at night (72% versus 28% during the day) and during the week (77% versus 23% on weekends). The maternal mortality rate was cut in half between 2000 and 2006 ( $p < 0.005$ ), dropping from 444 to 248 per 100 000 live births. Hemorrhages and eclampsia were the two principal causes of mortality. CONCLUSION: ***Faster access to care and improvement in the quality of emergency obstetrical care are essential conditions for reducing maternal mortality.***

PMID: 19810613 [PubMed - indexed for MEDLINE]

**Kanyighe C, Channon A, Tadesse E, Madise N, Changole J, Bakuwa E, Malunga E, Stones RWDeterminants of post-partum maternal mortality at Queen Elizabeth Central Hospital, Blantyre, Malawi: a case-control study 2001-2002. Afr J Reprod Health. 2008 Dec;12(3):35-48.**

The aim of this research is to identify the clinical, demographic and service-based determinants of postpartum maternal mortality within Queen Elizabeth Central Hospital, Blantyre, Malawi, during 2001 and 2002. The study uses a case-control design using all postpartum maternal deaths in 2001 and 2002 as

cases, with analysis conducted using conditional logistic regression. The results indicate that the mothers' reason for admission into hospital and the outcome of the birth were significantly related to maternal death when analysing all potential explanatory variables in one model. A group of high-risk mothers can be identified using these factors. If these criteria were applied as a predictive tool in the clinical setting the resulting sensitivity and specificity would be over 85%.

**Identification within the hospital setting of a group of very high-risk mothers in whom serious complications are aggressively managed in a coordinated way across the medical specialties may reduce maternal mortality.**

PMID: 19435011 [PubMed - indexed for MEDLINE]

**Ordi J, Ismail MR, Carrilho C, Romagosa C, Osman N, Machungo F, Bombí JA, Balasch J, Alonso PL, Menéndez C. Clinico-pathological discrepancies in the diagnosis of causes of maternal death in sub-Saharan Africa: retrospective analysis. PLoS Med. 2009 Feb 24;6(2):e1000036.**

BACKGROUND: Maternal mortality is a major public-health problem in developing countries. Extreme differences in maternal mortality rates between developed and developing countries indicate that most of these deaths are preventable. Most information on the causes of maternal death in these areas is based on clinical records and verbal autopsies. Clinical diagnostic errors may play a significant role in this problem and might also have major implications for the evaluation of current estimations of causes of maternal death. METHODS AND FINDINGS: A retrospective analysis of clinico-pathologic correlation was carried out, using necropsy as the gold standard for diagnosis. All maternal autopsies (n = 139) during the period from October 2002 to December 2004 at the Maputo Central Hospital, Mozambique were included and major diagnostic discrepancies were analyzed (i.e., those involving the cause of death). Major diagnostic errors were detected in 56 (40.3%) maternal deaths. A high rate of false negative diagnoses was observed for infectious diseases, which showed sensitivities under 50%: HIV/AIDS-related conditions (33.3%), pyogenic bronchopneumonia (35.3%), pyogenic meningitis (40.0%), and puerperal septicemia (50.0%). Eclampsia, was the main source of false positive diagnoses, showing a low predictive positive value (42.9%). CONCLUSIONS: Clinico-pathological discrepancies may have a significant impact on maternal mortality in sub-Saharan Africa and question the validity of reports based on clinical data or verbal autopsies. **Increasing clinical awareness of the impact of obstetric and nonobstetric infections with their inclusion in the differential diagnosis, together with a thorough evaluation of cases clinically thought to be eclampsia, could have a significant impact on the reduction of maternal mortality.**

PMID: 19243215 [PubMed - indexed for MEDLINE]

**Vork FC, Kyanamina S, van Roosmalen J. Maternal mortality in rural Zambia. Acta Obstet Gynecol Scand. 1997 Aug;76(7):646-50**

OBJECTIVE: To assess maternal mortality. DESIGN: Sisterhood method survey and hospital data. SETTING: Communities in Kalabo District, a very remote rural area in western Zambia; Kalabo District Hospital. RESULTS: The number of respondents in the sisterhood method survey was 1,978. The estimated maternal mortality ratio derived from this survey was 1,238 per 100,000 live births. The hospital study involved 2,474 deliveries of 2,374 live babies. The official number of maternal deaths was 13. Further investigation of files revealed an additional 15 maternal deaths, bringing the institutional maternal mortality rate from 548 to 1,179 per 100,000 live births. The major causes of direct maternal deaths were obstructed labor and sepsis. In 71% of all cases substandard care factors contributed. CONCLUSIONS: Maternal mortality in rural Zambia is among the highest as reported in the world. **Official hospital data tend to underestimate maternal mortality in the community due to underreporting.** The sisterhood method survey is an efficient indirect method to assess maternal mortality in rural areas of developing countries.

PIP: The only prospective population-based study of maternal mortality in rural Zambia recorded a ratio of 889 per 100,000 births, about 8 times higher than that found in an urban hospital-based study. To obtain an accurate assessment of maternal mortality in Zambia's rural Kalabo district, both the sisterhood survey method and a review of hospital data were utilized. The maternal mortality ratio derived from the sisterhood survey (August-September 1994) of 1978 respondents was 1238 per 100,000 live births. Data from Kalabo Hospital on 2474 deliveries during 1990-94 revealed a ratio of 548 per 100,000 live births; however, when the latter ratio was corrected for an additional 15 maternal deaths that were not recorded as such, it rose to 1179 per 100,000 live births. The major causes of the 20 (71%) direct maternal deaths were obstructed labor and sepsis. Substandard hospital care factors (primarily inappropriate choice and/or lack of antibiotics, poor monitoring of vital signs, and poor provision of blood products by the laboratory) contributed to 71% of maternal deaths. Delay in seeking care played a role in 29% of all maternal deaths, and poor accessibility to the hospital was implicated in at least 25% of cases. These findings indicate that maternal mortality in rural Zambia is among the highest in the world. **The sisterhood method survey appears to be an efficient indirect means of assessing maternal mortality in rural areas of developing countries.**

**Bell JS, Ouédraogo M, Ganaba R, Sombié I, Byass P, Baggaley RF, Filippi V, Fitzmaurice AE, Graham WJ. The epidemiology of pregnancy outcomes in rural Burkina Faso. Trop Med Int Health. 2008 Jul;13 Suppl 1:31-43.**

OBJECTIVES: To describe levels and causes of pregnancy-related mortality and selected outcomes after pregnancy (OAP) in two districts of Burkina Faso. METHODS: A household census was conducted in the two study districts, recording household deaths to women aged 12-49 years from 2001 to 2006. Questions on pregnancy outcomes in the last 5 years for resident women of reproductive age were included, and an additional method - direct sisterhood - was added in part of the area. Adult female deaths were followed-up with verbal autopsies (VA) with household members. A probabilistic model for interpreting

VA data (InterVA-M) was used to determine distributions of probable causes of death. An OAP survey was conducted among all women with an experience of pregnancy during the prior 12 months. It aimed to document physical and psychological disabilities, economic and social consequences and discomfort that women may suffer as a result of a pregnancy. RESULTS: The maternal mortality ratio (MMR) was 441 per 100 000 live births (95% CI: 397, 485), significantly higher in Diapaga [519 per 100 000 (95% CI: 454, 584)] than Ouargaye [353 per 100 000 (95% CI: 295, 411)]. MMRs were associated with wealth quintile, age and distance from a health facility. The causes of death showed higher than expected rates of sepsis (30%) and lower rates of haemorrhage (7%). A substantial proportion of all women had difficulty performing day-to-day tasks as a consequence of pregnancy. Women who had experienced stillbirths or Caesarean sections reported symptom-related indicators of poor physical health more frequently than women reporting uncomplicated deliveries, and were also more likely to be depressed. CONCLUSIONS: Expectations on the levels and causes of pregnancy-related mortality in Burkina Faso may need to be re-examined, and this could have programmatic implications; for example high levels of sepsis could prompt **renewed efforts to reach women with skilled attendance at delivery and follow-up during the postpartum period. Further documentation of how complication-induced disabilities affect women and their families is needed.** For mortality and morbidity outcomes, demonstrating variation between study districts is important to empower local decision makers with evidence of need at a subnational level.

PMID: 18578810 [PubMed - indexed for MEDLINE]

**G. K. Adam<sup>1</sup>, K. H. Bakheit<sup>2</sup>, I. Adam<sup>2\*</sup> Maternal and perinatal outcomes of eclampsia in Gadarif hospital, Sudan. Journal of Obstetrics & Gynaecology 2009, Vol. 29, No. 7, Pages 619-620 , DOI 10.1080/01443610903150802**

This study aimed to investigate the incidence of eclampsia and its maternal and perinatal outcome in the Hospital of Obstetrics and Gynecology at Gadarif, Sudan from March 2007 to April 2009. There were 45 cases of eclampsia in 8,894 deliveries (5/1,000). Some 62% of first convulsions occurred antepartum, 15.5% occurred intrapartum, and the rest (11.1%) occurred postpartum. **Ten patients died and there were 16 (35.5%) perinatal deaths; eight of these were stillbirths and eight were early neonatal deaths.**

**Abate M, Lakew Z. Eclampsia a 5 years retrospective review of 216 cases managed in two teaching hospitals in Addis Ababa. Ethiop Med J. 2006 Jan;44(1):27-31.**

OBJECTIVE: to measure the magnitude of eclampsia and its maternal and perinatal outcome. METHODS: A 5 years retrospective descriptive study was conducted on 216 eclamptic cases diagnosed, admitted and managed from October 1994 to September 1999 in the two teaching hospitals of Addis Ababa; namely Tikur Anbessa and St Paul's Hospitals. RESULTS: There were 257 mothers with eclampsia treated in the given period and 35741 deliveries making

the incidence of eclampsia 7.1/1000 deliveries. Eighty-four women (38.9%) had any antenatal care, 157 (72.7%) were nulli-parous and 69 (31.8%) were aged below 20. Convulsion occurred ante-partum in 133 (61.6%), intrapartum in 49 (22.7%) and postpartum in 34 (15.7%) mothers. The most frequently sited symptoms before convulsion include headache in 83.8%, visual disturbance in 41.6% and epigastric pain in 38.4% of the cases. Ninety nine (45.8%) women were delivered by cesarean section making the cesarean section rate among eclamptic mothers significantly higher than the rate among the general population, which was 16.6% at the same period. (P = 0.0001). The multiple pregnancy rate was 5.7%, which was significantly higher than the rate among the general population of 1.5% at the same time. Seventy-four mothers had repeated convulsion after admission to the hospitals and initiation of the standard treatment. Twenty-eight mothers with eclampsia died making the case fatality rate 13%. Seven mothers (3.2%) died before delivery. Forty-four Stillbirths and twenty-five early neonatal deaths occurred making the perinatal mortality rate 312.2/1000 deliveries. CONCLUSION: **Eclampsia is a common complication still associated with high level of maternal and perinatal mortality as well as morbidity.** ANC coverage should be strengthened to detect preclampsia, and prevent eclampsia. Management in the hospital should be optimized to prevent recurrent convulsions and complications after admission.

PMID: 17447360 [PubMed - indexed for MEDLINE]

**Afolabi BB, Iwuala NC, Iwuala IC, Ogedengbe OK. Morbidity and mortality in sickle cell pregnancies in Lagos, Nigeria: a case control study. J Obstet Gynaecol. 2009 Feb;29(2):104-6.**

Women with sickle cell disorder are historically known to have significant maternal and perinatal complications but recent studies from developed countries show a change in this trend. This study was a retrospective, case-controlled study of 75 women with haemoglobin SS (HbSS) and 150 with haemoglobin AA (HbAA). Data were analysed using chi(2)-test and independent t-test as appropriate. There were more perinatal (18.7 vs 8.8, p<0.05) and maternal (5.3% vs 0, p<0.05) deaths in HbSS women compared with HbAA. Birth weight, gestational age at delivery and 1 and 5 min Apgar scores were also significantly lower in the HbSS women. There was no significant difference in the incidence of pre-eclampsia and urinary tract infection between the two groups. Pregnancy in HbSS women is still fraught with maternal and fetal complications. **Prospective studies may help clarify the relationship between SCD and specific maternal complications.**

PMID: 19274540 [PubMed - indexed for MEDLINE]

**Small R, Gagnon A, Gissler M, Zeitlin J, Bennis M, Glazier R, Haelterman E, Martens G, McDermott S, Urquia M, Vangen S. Somali women and their pregnancy outcomes postmigration: data from six receiving countries. BJOG. 2008 Dec;115(13):1630-40.**

OBJECTIVE: This study aimed to investigate pregnancy outcomes in Somali-born women compared with those women born in each of the six receiving

countries: Australia, Belgium, Canada, Finland, Norway and Sweden. DESIGN: Meta-analyses of routinely collected data on confinements and births. SETTING: National or regional perinatal datasets spanning 3-6 years between 1997 and 2004 from six countries. SAMPLE: A total of 10 431 Somali-born women and 2 168 891 receiving country-born women. METHODS: Meta-analyses to compare outcomes for Somali-born and receiving country-born women across the six countries. MAIN OUTCOME MEASURES: Events of labour (induction, epidural use and proportion of women using no analgesia), mode of birth (spontaneous vaginal birth, operative vaginal birth and caesarean section) and infant outcomes (preterm birth, birthweight, Apgar at 5 minutes, stillbirths and neonatal deaths). RESULTS: Compared with receiving country-born women, Somali-born women were less likely to give birth preterm (pooled OR 0.72, 95% CI 0.64-0.81) or to have infants of low birthweight (pooled OR 0.89, 95% CI 0.82-0.98), but there was an excess of caesarean sections, particularly in first births (pooled OR 1.41, 95% CI 1.25-1.59) and an excess of stillbirths (pooled OR 1.86, 95% CI 1.38-2.51). CONCLUSIONS: This analysis has identified a number of disparities in outcomes between Somali-born women and their receiving country counterparts. The disparities are not readily explained and they raise concerns about the provision of maternity care for Somali women postmigration. **Review of maternity care practices followed by implementation and careful evaluation of strategies to improve both care and outcomes for Somali women is needed.**

PMID: 19035939 [PubMed - indexed for MEDLINE]

**Kamanu CI, Onwere S, Chigbu B, Aluka C, Okoro O, Obasi M. Fetal macrosomia in African women: a study of 249 cases. Arch Gynecol Obstet. 2009 Jun;279(6):857-61. Epub 2008 Nov 19.**

OBJECTIVES: To determine the incidence and risk factors of macrosomia in a Nigerian centre, and to assess the relation of maternal body mass index (BMI) at birth and of the total weight gain during pregnancy to macrosomia and adverse pregnancy outcome. DESIGN: A retrospective review of fetal macrosomia over a 5-year period. SETTING: Abia State University Teaching Hospital, Aba in Southeast Nigeria. SUBJECTS: A total of 9,970 parturients managed from 1 January 1999 to 31 December 2003. Out of 249 documented cases of infants with birth weights  $\geq$  4,500 g, 240 (96.4%) maternal and neonatal records of macrosomia were available for review. Maternal and neonatal characteristics of the 240 cases were compared with 8,800 other parturients with singleton fetuses in vertex presentation. RESULTS: Macrosomic babies represented 2.5% of the infants delivered (249 of 9,970). Most of the mothers (92.5%) were multiparous. Maternal median weight gain was 11 kg (7-15), while the mean weight gain was 12.5 kg. Maternal median BMI was 28.1 kg/m<sup>2</sup> at delivery, while the mean BMI was 30.3 kg/m<sup>2</sup> (range 23-40) at delivery. Macrosomia was suspected in 80% on the basis of clinical examination, sonography, and the presence of the following risk factors in association: previous delivery of an infant weighing  $>$ 4,000 g (62.5%), maternal weight at booking of more than 80 kg (90%), maternal BMI before delivery of  $\geq$  28 kg/m<sup>2</sup> (50%), gestational diabetes

mellitus (2.5%), and weight increase of more than 13 kg during pregnancy (5%). The mean birth weight of the babies was 4,750 g (4,500-5,000). The overall CS rate was 15%. The difference in the CS rate between these mothers and the control was not significant ( $P = 0.41$ ). Only 9 (3.8%) mothers were successfully delivered with the aid of ventouse due to delayed second stage of labor. There was a significant difference in the complication rates between the mothers of large infants and the control ( $P < 0.001$ ). Four maternal deaths were associated with macrosomia for a maternal mortality rate of 1667/100,000. Four infants had shoulder dystocia and associated injuries. The perinatal mortality rate was 112.5/1,000 births. CONCLUSIONS: The higher the total body weight at birth, the higher the rate of macrosomia. Macrosomia had implications for high morbidity and mortality in the mothers and their infants. Delivery methods need to be evaluated. **Caesarean section should be more readily used.**

PMID: 19018549 [PubMed - indexed for MEDLINE]

**Tebeu PM, Ngassa P, Kouam L, Major AL, Fomulu JN. Maternal mortality in Maroua Provincial Hospital, Cameroon (2003-2005). West Indian Med J. 2007 Dec;56(6):502-7.**

BACKGROUND: In September 2000, the Heads of States of the 191 countries of the United Nations approved the Millennium Declaration in which reduction of pregnancy-related deaths to a quarter by 2015 was one of its goals. However, before the middle of the first decade of this millennium, there were no reports on the status of maternal mortality in Maroua, Cameroon. OBJECTIVE: The aim of this study was to establish baseline data on maternal mortality for future evaluation of pregnancy-related mortality trends in this city. SUBJECTS AND METHODS: Maternal deaths that occurred from 2003 to 2005 in Maroua City, Cameroon, were analyzed. Mortality ratios were determined by comparing the number of the deaths related to pregnancy with that of women with safe deliveries. Mortality risks were determined by comparing the characteristics of women with pregnancy-related deaths to those of women with safe deliveries. RESULTS: The overall maternal mortality ratio was 1266 maternal deaths per 100,000 live births. **The leading causes of death were hypertension (17.5%), obstetric infections (14.3%), uterine rupture (14.3%), anaemia (12.7%) and HIV complications (9.5%).** Among the women who died, 28.6% were teenagers and 14.3% were at their sixth delivery (or above). Compared with women aged 20 to 24 years, those aged 25 to 29 years were more than twice as likely to die from pregnancy-related causes (HR: 2.34; CI: 1.07,5.08;  $p = 0.029$ ). A similar trend was also found in those aged 30 to 34 years (HR: 2.26; CI: 1.02,5.00;  $p = 0.042$ ). CONCLUSION: The findings suggest that Maternal Mortality Ratio in Maroua, City Cameroon, is very high. Since most of the causes of death were preventable, we propose that the current maternal and Family Planning strategies be reviewed with the view to reducing the current trend. Such a strategy would enable the Maroua city to meet the Millennium goals by 2015.

PMID: 18646493 [PubMed - indexed for MEDLINE]

**Lawoyin TO. Infant and maternal deaths in rural south west Nigeria: a prospective study. Afr J Med Med Sci. 2007 Sep;36(3):235-41.**

Baseline data on neonatal, infant and maternal deaths including factors associated with infant mortality in a rural community are needed to assess the progress being made towards achieving lower rates in Nigeria. In this community-based prospective study, baseline data on births and deaths were collected as they occurred for 6 consecutive years and perinatal risk factors associated with these deaths identified. There were 972 live births in the study period. Maternal mortality ratio (MMR) for the period was 2160 per 100,000 and infant and neonatal mortality rates of 65.8 and 32.9 per 1000 live births were obtained. MMR was highest in mothers aged 40 years and above and lower in mothers 15-34 years. Of infants deaths, 18.8% occurred on the first day of life and 32.8% of deaths occurred within one week of birth. Malaria/fever (23.4%), LBW (17.2%), and Vaccine preventable diseases (neonatal tetanus and measles) (12.5%) were the commonest known causes of infant deaths. Perinatal risk factors for infant deaths included being first birth order (RR = 3.1, 2.1-4.7), birth outside the health care facility (RR = 2.5, 1.4-4.3), no attendant at delivery (RR = 2.5, 1.4-4.4); low weight at birth (RR = 2.46 1.01-5.9) and traditional birth attendants at delivery (RR = 1.7, 1.2-2.6). Babies born to fathers who were between the ages of 25-34 years had borderline protection (RR = 0.76, 0.6-1.01). Delivery and perinatal events have a significant impact on infant survival and more needs to be done to integrate infant survival with maternal survival strategies and this should be done at the primary care level. **The community must also be educated and empowered to use the facilities for promotive, preventive and curative care.**

PMID: 18390063 [PubMed - indexed for MEDLINE]

**Nyamtema AS, Urassa DP, Massawe S, Massawe A, Lindmark G, van Roosmalen J Partogram use in the Dar es Salaam perinatal care study.**

**Int J Gynaecol Obstet. 2008 Jan;100(1):37-40. Epub 2007 Sep 27.**

**OBJECTIVE:** To assess the quality of partograms used to monitor labor in Dar es Salaam hospitals, Tanzania. **METHODS:** The study team reviewed the records of the parameters of labor, and maternal and fetal conditions in 367 partograms, and interviewed 20 midwives. **RESULTS:** All midwives interviewed had been previously trained to use the partogram. Of all partograms reviewed, 50% had no records of duration of labor. Although cervical dilation and fetal heart rates were recorded in 97% and 94% of the partograms respectively, 63% and 91% of these were judged to be substandard. Substandard monitoring of fetal heart rates was strongly associated with poor fetal outcome (P<0.001). Blood pressure, temperature, and pulse rates were not recorded in 47%-76% of partograms. **CONCLUSION:** These findings reflect poor management of labor and indicate urgent in-service training to address the importance of documentation and regular **partogram audit in order to reduce maternal and perinatal deaths.**

PMID: 17900578 [PubMed - indexed for MEDLINE]

**Gessesew A. Maternal complications--in a zonal hospital. Ethiop Med J. 2007 Jan;45(1):47-54.**

BACKGROUND: The maternal mortality ratio in developing countries is still very high. The causes of maternal mortality varies in different parts of the world. Knowledge of the incidence of maternal complication and associated maternal mortality is vital in designing preventive strategies. There are only few reports about their issue in Ethiopia. OBJECTIVES: To describe the frequency of maternal complications and associated maternal mortality in Adigrat zonal hospital. PATIENTS AND METHODS: A retrospective review of the delivery registration book of all labouring mothers admitted to the labour ward from April 1, 1993 to March 30, 2003 was carried out. RESULTS: A total of 7249 mothers delivered in the above mentioned hospital and 16.5% of the mothers were below the age of 20, 44.9% were nulliparous, and grandmultiparity accounted for 12.5% of them. Most (56.2%) had Antenatal care (ANC). The complications identified were. preterm labour (7.2%), premature rupture of the membranes (PROM) (6%), pre-eclampsia (5.2%), malpresentation (8.7%), Antepartum hemorrhage (APH) (2.7%), obstructed labour (3.5%) and postpartum hemorrhage (PPH) (6.7%) . There were 32 maternal deaths and the presumed causes of deaths were: Ruptured uterus (25%), obstructed labor (78.8%), hemorrhage (28.1%), eclampsia (15.6%), and sepsis (12.5%). The highest case fatality ratio was found with ruptured uterus (11.8%), eclampsia (11.1%) and hemorrhage (9.3%). The prevalence of severe obstetric morbidity was 6.4% and the case fatality ratio 6.1%. The caesarean section rate was 8.5% and maternal indications contributed for majority of the indications (58.8% of the cases). Low birth weight was found in 11.2% of the neonates. CONCLUSION: The frequency of severe maternal morbidity is high & is associated with high case fatality ratio. This indicates the need of improvement in the **quality of obstetric care** to prevent maternal complications. Community based studies are recommended to establish the real picture of the situation.

PMID: 17642157 [PubMed - indexed for MEDLINE]

**Prual A, Huguet D, Garbin O, Rabé G. Severe obstetric morbidity of the third trimester, delivery and early puerperium in Niamey (Niger). Afr J Reprod Health. 1998 Apr;2(1):10-9.**

Epidemiological data about maternal morbidity are rare. The present study, carried out in Niamey, capital of Niger, was designed to measure the incidence of maternal morbidity among women delivering in hospital. Severe complications occurred in 232 of the 4,081 deliveries during the study period (6,450/100,000 live births). Maternal morbidity ratio was 11 times higher than the maternal mortality ratio. Incidence rates of the major morbidities (per 100,000 live births) were: obstructed labour 3,614, hypertensive disorders of pregnancy 1,159, haemorrhage 855, and puerperal sepsis 220. **The incidence and case fatality rates of severe complications were both high, suggesting a lack of efficiency of maternal health services in spite of a high concentration of health personnel and a large accessibility to services in Niamey.**

PMID: 10214424 [PubMed - indexed for MEDLINE]

**Pruhal A, Bouvier-Colle MH, de Bernis L, Bréart G. Severe maternal morbidity from direct obstetric causes in West Africa: incidence and case fatality rates. Bull World Health Organ. 2000;78(5):593-602.**

Data on maternal morbidity make it possible to assess how many women are likely to need essential obstetric care, and permit the organization, monitoring and evaluation of safe motherhood programmes. In the present paper we propose operational definitions of severe maternal morbidity and report the frequency of such morbidity as revealed in a population-based survey of a cohort of 20,326 pregnant women in six West African countries. The methodology and questionnaires were the same in all areas. Each pregnant woman had four contacts with the obstetric survey team: at inclusion, between 32 and 36 weeks of amenorrhoea, during delivery and 60 days postpartum. Direct obstetric causes of severe morbidity were observed in 1215 women (6.17 cases per 100 live births). This ratio varied significantly between areas, from 3.01% in Bamako to 9.05% in Saint-Louis. **The main direct causes of severe maternal morbidity were: haemorrhage (3.05 per 100 live births); obstructed labour (2.05 per 100), 23 cases of which involved uterine rupture (0.12 per 100); hypertensive disorders of pregnancy (0.64 per 100), 38 cases of which involved eclampsia (0.19 per 100); and sepsis (0.09 per 100).** Other direct obstetric causes accounted for 12.2% of cases. Case fatality rates were very high for sepsis (33.3%), uterine rupture (30.4%) and eclampsia (18.4%); those for haemorrhage varied from 1.9% for antepartum or peripartum haemorrhage to 3.7% for abruptio placentae. Thus at least 3-9% of pregnant women required essential obstetric care. The high case fatality rates of several complications **reflected a poor quality of obstetric care.**

PMID: 10859853 [PubMed - indexed for MEDLINE]

**Onuh SO, Aisien AO. Maternal and fetal outcome in eclamptic patients in Benin City, Nigeria. J Obstet Gynaecol. 2004 Oct;24(7):765-8.**

Eclampsia is a well-recognised major cause of maternal death and perinatal morbidity and mortality. The incidence of eclampsia, its presentation patterns, maternal and perinatal outcomes were investigated in a retrospective study conducted at the University of Benin Teaching Hospital, Nigeria over an 8-year period, 1995 - 2002. There were 103 cases of eclampsia of 7835 deliveries, giving an incidence of one in 76 (1.32%). The mean age of the women was 27.1 +/- 5.6 years. Eclampsia significantly (P < 0.001) occurred in nulliparous and unbooked mothers. Eighty-nine (86.4%) of the patients developed fits in the pre-delivery stage; 85 (83%) of the patients had at least one premonitory symptom including headache (82.4%) visual disturbance (10.6%) and epigastric pain (7%). There were nine stillbirths and 16 early neonatal deaths for a perinatal mortality rate of 214/1000. The major causes of perinatal mortality were prematurity and birth asphyxia. Eleven maternal deaths occurred with a maternal case fatality rate of 10.7% and a maternal mortality ratio from eclampsia of 140/100 000. The clinical causes of deaths were cardiopulmonary failure, acute renal failure, haemolysis, elevated liver enzymes, low platelet count (HELLP)

syndrome and cerebrovascular accident. **Timely referral of high-risk patients coupled with availability of emergency obstetric and neonatal care services** would reduce the incidence eclampsia associated mortality and morbidity in our facility.

PMID: 15763783 [PubMed - indexed for MEDLINE]

**Makinde ON, Adegoke OA, Adediran IA, Ndububa DA, Adeyemi AB, Owolabi AT, Kuti O, Orji EO, Salawu L. HELLP syndrome: the experience at Ile-Ife, Nigeria. J Obstet Gynaecol. 2009 Apr;29(3):195-9.**

Between 1 January and 31 December, 2006, 34 consecutive cases of severe pre-eclampsia (12), imminent eclampsia (10) and eclampsia (12) who were admitted at the Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife in the south-western part of Nigeria, were investigated for the development of HELLP (haemolysis, elevated liver enzymes and low platelet count) syndrome in a prospective study. The ages of the women ranged from 18 to 38 years, parity 0-5 and the estimated gestational age from 18-41 weeks at presentation. A total of 26 (76.5%) of the patients were unbooked, six (17.6%) of the 34 cases developed HELLP syndrome. Four (33%) of the 12 eclamptics developed HELLP syndrome, while only one (10%) of the cases of imminent eclampsia and 1 (8.3%) of severe pre-eclamptic cases developed the syndrome. Using the Mississippi Triple class system, none of the HELLP syndrome cases belonged to Class I; 4 were categorised in Class II while 2 were in Class III. All of the four eclamptic cases with HELLP syndrome died giving a 100% fatality rate while none of the imminent eclamptic and severe pre-eclamptic patients with the syndrome died. Furthermore, there were six (15.8%) perinatal deaths among the 38 infants delivered by the 34 mothers with severe pre-eclampsia/eclampsia. Our data suggest that the development of HELLP syndrome is more likely in eclamptic patients and when it occurs in them, it is highly fatal. Most of the cases in this study were unbooked. Substandard care may have contributed to the progression of the disease state and consequently, to maternal mortality. It is imperative to draw up an action plan for the identification of the risk factors for the development of pre-eclampsia/eclampsia at peripheral hospitals and maternity centres and for prompt referral of such cases afterwards. **Efforts should also be geared towards the minimising of treatment delay in all phases, so as to minimise both perinatal and maternal morbidity and mortality.**

PMID: 19358023 [PubMed - indexed for MEDLINE]

**Obi SN, Ozumba BC. Pre-term premature rupture of fetal membranes: the dilemma of management in a developing nation. J Obstet Gynaecol. 2007 Jan;27(1):37-40.**

This study aims at evaluating the outcome of pregnancies complicated by pre-term premature rupture of membrane (PPROM) in a developing country and to highlight the problems of managing such cases and ways of improving future management. This was a retrospective review of 344 patients with PPRM at a University of Nigeria Teaching Hospital Enugu, Nigeria over a 10-year period

(January 1994-December 2003). The prevalence of PPRM in this study was 25 per 1,000 births and patients of low parity (para 0-2) accounted for the highest number (56.4%). Previous abortion was significantly more among these women of low parity and may be a factor in the aetiology of PPRM. The gestational age range 28-30 weeks recorded the highest incidence (29.7%) of PPRM. The most common associated aetiological factor was cervical incompetence (11.6%), while chorioamnionitis, a major complication in the patients showed a statistically significant reduction with early antibiotic administration ( $p < 0.05$ ). About 72% ( $n = 248$ ) of the patients arrived at the hospital within 24 h of membrane rupture. Perinatal mortality was high (520 per 1,000 births) due to prematurity and perinatal infections. Better fetal outcomes were recorded among patients with PPRM at gestational age above 30 weeks, fetal weight above 2 kg, normal delivery, absence of maternal infection and latent period of not more than 5 days ( $p < 0.05$ ). The parity of the women did not significantly affect fetal outcome ( $p > 0.05$ ). Two (0.6%) maternal deaths were recorded. **Prompt patient referral, early institution of antibiotics and improvement of neonatal facilities in tertiary health institutions in developing countries is advocated as a way of improving fetal survival in PPRM.**

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**Mbaruku G, van Roosmalen J, Kimondo I, Bilango F, Bergström S. Perinatal audit using the 3-delays model in western Tanzania. Int J Gynaecol Obstet. 2009 Jul;106(1):85-8. Epub 2009 May 12.**

OBJECTIVE: To audit intrapartum fetal and early neonatal deaths of infants weighing  $\geq 2000$  g in a regional hospital in western Tanzania. METHODS: The 3-delays methodology was applied to a cohort of perinatal deaths from July 2002 to July 2004. RESULTS: The overall perinatal mortality rate in the hospital was 38 per 1000 live births, and in just over half of these cases the birth weight was  $\geq 2000$  g. **The leading clinicopathologic causes of death were birth asphyxia (19.0%), prolonged or obstructed labor (18.5%), antepartum hemorrhage (11.5%), and uterine rupture (9.0%). First delays occurred in 19.0% of the cases, second delays occurred in 21.5%, and third delays occurred in 72.5%.** CONCLUSION: For women who delivered in this hospital, most of the substandard care occurred after admission to the health facility. The improvement of institutional health care may have a significant impact on the decision to attend health institutions and, thereby, reduce first delays.

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