THE UNIVERSITY OF ZAMBIA

SCHOOL OF MEDICINE

ECLAMPSIA AT THE UNIVERSITY TEACHING HOSPITAL

DR PHILLIMON J. M. MUKOSA

Dip. in Science (Ed), MB ChB, Degree in Acupuncture

DISSERTATION SUBMITTED IN PARTIAL FULFILMENT

OF THE REQUIREMENT AND FOR THE DEGREE OF MASTER OF

MEDICINE IN OBSTETRICS AND GYNAECOLOGY

2003

DEDICATION

Dedicated to my wife, Chanda and my children, Kalunga, Ngosa and Natasha-Chabala

ACKNOWLEDGEMENTS

I would like to thank my supervisor Dr. Y. Ahmed for the advice and comments received in putting my thoughts and ideas in a refined manner.

My special thanks go to Professor A. Agboola for his supportive role in shaping my thoughts.

I would also like to show sincere appreciation to Dr. Operance Munachitombwe, Ms Moonga Simuyandi, and Ms Rose Willombe for the help they rendered to me during the writing of this dissertation.

Lastly but not the least, I thank all those who helped me in one way or another.

STATEMENT

I HEREBY STATE THAT THIS DISSERTATION IS ENTIRELY THE RESULT OF MY OWN PERSONAL EFFORT. THE VARIOUS SOURCES TO WHICH I AM INDEBTED HAVE BEEN CLEARLY INDICATED IN THE BIBLIOGRAPHY AND ACKNOWLEDGMENTS.

SIGNED _____

DR. PHILLIMON JOSEPH MUMBA MUKOSA

DECLARATION

I HEREBY DECLARE THAT THIS DISSERTATION HEREIN PRESENTED FOR THE DEGREE OF MASTER OF MEDICINE IN OBSTETRICS AND GYNAECOLOGY HAS NOT BEEN PREVIOUSLY SUBMITTED EITHER WHOLLY OR IN PART FOR ANY OTHER DEGREE AT THIS OR ANY OTHER UNIVERSITY, NOR IS IT BEING CURRENTLY SUBMITTED FOR ANY OTHER DEGREE.

SIGNED:_____

DR. PHILLIMON JOSEPH MUMBA MUKOSA

APPROVED BY_____

Dr Y AHMED (SUPERVISOR)

APPROVAL

THE DISSERTATION OF **DR PHILLIMON JOSEPH MUMBA MUKOSA** IS APPROVED AS FULFILLING PART OF THE REQUIREMENT FOR THE AWARD OF THE DEGREE OF MASTER OF MEDICINE IN OBSTETRICS AND GYNAECOLOGY BY THE UNIVERSITY OF ZAMBIA.

SIGNATURE

_____

_____

_____

ABSTRACT

During 1997, there were 41,449 deliveries in Lusaka. Of these 29, 991 (72.4%) were at nine Lusaka maternity clinics, 878 (2.1%) were from Chainama maternity clinic, while 10,580 (25.5%) were University Teaching Hospital (UTH) deliveries. During the same period, (January 1st to December 31st 1997) a total number of 101 eclamptic patients were treated at UTH, giving an incidence of eclampsia at UTH of 0.96% of deliveries. Overall incidence of eclampsia taking all Lusaka deliveries was 0.24% in 1997. The incidence of eclampsia in multiple pregnancy was 1.21% (compared to 0.23% in singletons). This incidence is comparable to figures from other developing countries. It was found in this study that eclampsia occurred more often in the primigravidae (59.4% of all eclamptics, mean parity 1.1) with the highest number of cases occurring in those aged between 17 and 19 years of age (mean age 22.2 years, SD 5.6).

Treatment of eclampsia, invariably was delivery. This was achieved soon after the blood pressure and seizures were controlled. If delivery was feasible within hours after presenting to UTH, induction or argumentation with oxytocin was carried out to achieve spontaneous vaginal delivery (SVD) as long as there were no obstetrical contraindications to the use of oxytocin. Nevertheless, 73.3% of all cases were delivered by caesarean section

There were 144 maternal deaths in UTH during the study period of 1997. Five maternal deaths (3.5%) were due to eclampsia, (mean parity 2.6). Four of the five maternal deaths were found to have had pulmonary edema as a complication. One of these maternal deaths occurred in a patient with moderate hypertension while four of the five had severe hypertension. One of the deaths occurred in a case that had a caesarean section, two after instrumental delivery and two after spontaneous vaginal delivery. Four of the deaths were clinic referrals and had marked proteinuria. One had been unbooked. No maternal deaths were observed in those booked at UTH.

A perinatal loss (stillbirths and early neonatal deaths – within one week of birth) of 17.8% was recorded in cases of eclampsia. The perinatal loss was inversely proportional to parity. 68.4% of fetuses delivered by caesarean section resulted in perinatal deaths, whereas 26.3% and 5.3% were perinatal losses recorded after SVD and instrumental delivery, respectively. Illustrating the severity of the eclampsia, 79% of these perinatal deaths were from eclamptic mothers who received diazepam more than once and 57.9% were from eclamptic mothers who received hydralazine intravenous boluses more than once.

The incidence of eclampsia in Lusaka and at UTH has remained the same at 2.4 cases per 1000 deliveries since the early 1980s (Thakkar and Wacha, 1982). Maternal case-fatality was 5% in this study compared to 6.5% in 1982, but believed to be higher in the immediate past years (closer to 10%). The perinatal death rates in the corresponding years has dropped from 30.4% to 17.8% in this study. Improved antepartum care, and good case management of pre-eclampsia and eclampsia are important to reduce the incidence and case fatality associated with eclampsia.

CONTENTS

LIST OF TABLES

ABBREVIATIONS

A/P	Antepartum
ARF	Acute Renal Failure
BP	Blood Pressure
CVA	Cerebral Vascular Accident
DIC	Disseminated Intravascular Coagulopathy
DBP	Diastolic Blood Disease
eNND	Early Neonatal Death (within 7 days of birth)
FSB	Fresh Stillbirth
HELLP	Haemolysis Elevated Liver Enzymic and Low Platelets
I/P	Intrapartum
IUFD	Intrauterine Fetal Death
IUGR	Intrauterine Growth Restriction
MAP	Mean Arterial Pressure
$MgS0_4$	Magnesium Sulphate
MSB	Macerated Stillbirth
MMR	Maternal Mortality Rate
NND	Neonatal Death
OR	Odds Ratio
p	statistical 'p' value
PE	Pulmonary Edema
PGI	Prostacyclin
P/P	Postpartum
SD	Standard Deviation
SVD	Spontaneous Vaginal Delivery
SBP	Systolic Blood Pressure
TXA_2	Thromboxane
UK	United Kingdom
USA	United States of America
UTH	University Teaching Hospital

INTRODUCTION

Eclampsia is defined as the occurrence of convulsions, not caused by any coincidental disease such as epilepsy, in a pregnant woman who may have had pre-eclampsia. Eclamptic convulsions are a major complication of pregnancy with a perinatal mortality of up to 30-40% and a maternal case mortality of 3-4% that may be substantially higher, up to 10-15%, in developing countries.

Eclampsia occurs in all parts of the world. However, the incidence differs from developed countries and developing countries. Eclampsia is rare in Britain, USA and Europe where there is high standard of antenatal care and enhanced management of pre-eclampsia. A typical incidence in USA is 1 in 1600 pregnancies (Sibai, 1990). However, in sub-Saharan African countries, eclampsia may be as frequent as 1 in 300 pregnancies.

Eclampsia can occur in the antepartum period, during labour (intrapartum) or postpartum. Eclampsia rarely occurs beyond 48 hours and other causes of convulsions should be actively sought in these cases. Initial presentation of patients is similar to those with pre-eclampsia that have hypertension and variable degrees of proteinuria and edema. Management of eclampsia consists of control of convulsions and prevention of their recurrence, control of blood pressure and expeditious delivery of the fetus and placenta (if not already delivered).

Many questions regarding incidence of eclampsia, risk factors, management and determinants of maternal and perinatal mortality remain unanswered.

LITERATURE REVIEW

Pre-eclampsia and Eclampsia

Definition, Clinical manifestations and Diagnosis

Pre-eclampsia is a hypertensive disorder in pregnancy that typically only occurs after the twentieth week of pregnancy. The triad of hypertension, proteinuria and edema traditionally defines pre-eclampsia, though blood pressure and proteinuria are more relevant. For a diagnosis of pre-eclampsia the blood pressure is required to be greater than 140/90 mmHg, or mean arterial pressure, (MAP) greater than 105 mmHg or an increase in systolic blood pressure (SBP) of more that 30 mmHg or an increase in diastolic blood pressure (DBP) of 15mmHg from baseline. The proteinuria should be greater than 3-5g albumin/24hours, or over 2+ by dipstick). Edema, particularly of the face and the hands are often noticed. Untreated, pre-eclampsia can progress to eclampsia.

The symptoms and signs of imminent eclampsia include: "aura" with increasing apprehension, anxiety and nervousness, severe increasing headache, usually frontal, visual disturbances (flashes of light, diplopia, dimness of vision, blindness), epigastric pain and vomiting (probably due to subcapsular haemorrhages or necrosis of the liver), a rapid rise in blood pressure, marked increase in proteinuria, rapidly increasing generalised edema, oliguria, hyper-reflexia or clonus. It is often claimed that eclampsia is a preventable condition though patients may not have had premonitory signs or symptoms. The convulsions of eclampsia, when they occur, are tonic-clonic in nature. In the literature convulsions, fits and seizures are used interchangeably. In this presentation of the results and discussion, the term 'eclamptic fits' or 'fits' will be used.

Pre-eclampsia/eclampsia is said to be a disease of unknown etiology although the pathophysiology is well established. There is evidence that there is an imbalance in the production of the vasoconstrictor thromboxane A2 (TXA2) and vasodilatory prostacyclin (PGI), with thromboxane being relatively higher. There is generalised vasoconstriction, accompanied by intravascular fibrin deposition and platelet adherence with thrombocytopenia in some cases. The manifestation of pre-eclampsia/eclampsia cuts across many systems in the body. Hypertension (increased peripheral resistance, variable in cardiac output), hypovolemia, arterial injury, cardiac necrosis and haemorrhage in cardiovascular system. In the renal system it is manifest by glomerular endotheliosis, impaired tubular and glomerular function, hypereuricaemia, proteinuria, acute renal failure with tubular or cortical necrosis, hypoalbuminaemia and sodium/potassium retention contributing to edema. Haematological changes include thrombocytopaenia, abnormal platelets, abnormalities of clotting factor, disseminated intravascular coagulopathy (DIC) and microangiopathic anaemia. The hepatic system is also involved and can manifest as abnormal liver enzymes, periportal haemorrhage, portal tract thrombosis, and infarction. Neurological changes include the convulsions or fits defining eclampsia, intracerebral edema, and haemorrhage. Placental infarction, abruptio placentae, fetal intrauterine growth retardation (IUGR), and fetal death are common manifestations as a result of the fetal-placental unit being involved. Eclampsia is traditionally defined by the addition of convulsions/fits to the above scenario of pre-eclampsia. However 20% of cases may not have preceding proteinuria and 40% may not have any edema.

Modern obstetric management has reduced the incidence of eclampsia to less than 0.1% of pregnant women. Eclampsia occurs at various times during the pregnancy - in the

antepartum period, in the intrapartum period or in the postpartum period (most of which present within 48 hours after birth).

Diagnosis of eclampsia is easier than that of pre-eclampsia. In the latter none of the signs may be specific and the diagnosis is made by the presence of more than one component. Hypertension is an early sign, whereas proteinuria, coagulopathy, liver and placental dysfunction may occur later. However, when a patient with pre-eclampsia develops generalised convulsions (grand-mal type) a diagnosis of eclampsia is then made. The differential causes need to be ruled out and typically these would include epilepsy (usually a past medical history) or cerebral malaria.

Management

The principles of management of eclampsia include:

i. First aid principles (positioning of the patient to prevent injury and also maintain a patent airway)
ii. Control seizures by using effective anticonvulsants
iii. Control blood pressure by using effective antihypertensives
iv. Correct electrolyte balance
v. Empty the uterus to get rid of the placental etiological factor.

History of pre-eclampsia/eclampsia

The following account is researched based on review

Through ancient times pre-eclampsia has been surrounded by uncertainties and controversies concerning its etiology, pathophysiology and treatment. The condition now known as eclampsia (from the Greek meaning 'shining forth') has been alleged to be

mentioned in ancient Egyptian, Chinese, Indian, and Greek medical literature (reviewed by Chesley, 1978).

Towards the end of the 19th century, German and Dutch obstetricians advocated prompt delivery (by caesarean section), which they recognised as necessary to stop and prevent further progression of pre-eclampsia to eclampsia with seizures. In the early twentieth century, however, it was found that conservative management, with subsequent vaginal delivery as opposed to operative delivery, gave far less maternal mortality although it was still termination of delivery, which stopped the progression of pre-eclampsia/eclampsia (Chesley, 1984). To this day the one consistent finding in the treatment of pre-eclampsia/eclampsia is that the disease regresses after delivery regardless of any prior treatment.

Geographical distribution of eclampsia

Eclampsia occurs everywhere in the world, however, the incidence differs between developed and developing countries. Eclampsia is rare in places like Britain, USA and Europe where there is a high standard of antenatal care and adequate management of pre-eclampsia. However, in places like Africa and Asia where proper antenatal care is available to only a smaller percentage of the population, eclampsia continues to be a major cause of maternal and perinatal mortality. Regional differences in availability, standard and utilisation of medical care appear to have a profound effect on geographical distribution and may be the factor for differences in incidence in pre-eclampsia between countries and, on occasion, between different parts of the same country.

Age and Parity

Eclampsia and pre-eclampsia are commoner in primigravidae than in multigravidae (Chesley, 1984) although age is also an important factor - most primigravidae are young. There is a gradual increase in incidence with age in multiparae and the extremes of age show a higher rate of eclampsia, especially that in the older primigravidae. This is further elaborated in the literature review.

Race

Although it is generally believed that black women are more susceptible than white women to the development of pre-eclampsia, careful studies by Chesley (1984) have not shown any differences. It is possible that there is an increased susceptibility of certain races to hypertensive disorders in pregnancy, but there is no clear proof and it would be necessary to tease out racial differences from environmental ones that could easily confound them.

Association with other conditions

The association between hydatidiform mole and pre-eclampsia has been reported by Chesley et al (1964) and also (Chun et al, 1964). The characteristic renal lesion has been described in renal biopsies from patients with hydatidiform mole and pre-eclampsia (Sanchez-Torres and Santamaria, 1965). This lends support to the belief that pre-eclampsia has its origins in the uterus and that the trophoblast is the disordered tissue. Similarly, pregnancies that have a larger volume of placental tissue (hyperplacentosis) such as those associated with diabetes mellitus, rhesus disease, or multiple gestation have a higher propensity for pre-eclampsia (Halushka et al, 1983).

Maternal mortality

UK and USA

Maternal mortality from eclampsia, and hypertensive disorders in pregnancy in general, has shown a marked drop in most countries during recent years. In England and Wales maternal deaths from pre-eclampsia/eclampsia fell from 43.8/million maternities in 1952-54 to 9.4/million maternities in 1972-75 (HMSO, 1981). It is important to note that 'toxaemia of pregnancy' was the commonest cause of maternal death in England and Wales in 1976-78 and that avoidable factors were present in 89% of deaths from pre-eclampsia and 62% from eclampsia. Complications that resulted in death included placental abruptio, cerebral haemorrhage or renal failure (HMSO, 1981). For the 1994-6 triennium (the last reported triennium in UK) the main trends, compared to the previous triennia, were a marked increase in thromboembolism, partly but not wholly due to increased case ascertainment, and increases in sepsis and amniotic fluid embolism. There were smaller increases in the rates of death from pregnancy-induced hypertension (including eclampsia) and uterine rupture. Decreases were reported in haemorrhage and deaths in early pregnancy. Pritchard (1984) reported only one maternal death in 245 women with eclampsia (4/1000) treated by a standard protocol in Dallas, Texas, over 30 years.

Zambia maternal mortality

A number of studies have shown that hypertensive disorders of pregnancy (including pre-eclampsia and eclampsia) are the three commonest and important causes of maternal mortality, though the causes are not broken down specifically for eclampsia.
Hickey and Kasonde (1977), Mhango et al (1986), Ahmed et al (1999).

Maternal mortality due to eclampsia in other countries of the world

The literature cited in the following sections illustrates the maternal mortality due to eclampsia in different parts of the world.

Perinatal mortality

Perinatal death accompanying eclampsia depends strongly upon where the patient is delivered, the care given and whether the eclampsia occurred antenatally or in the intrapartum period. In Cardiff, Wightman (1978), in a series of 43 women with eclampsia found a perinatal mortality of 213/1000 cases. Templeton and Campbell (1979) in Aberdeen found a perinatal mortality from antepartum and intrapartum eclampsia of 136/1000. Most of the deaths where associated with IUGR, preterm delivery and the perinatal mortality depended mainly on how quickly the infant was transferred to hospital and given intensive neonatal care.

In 84 cases delivered between 1975 and 1983 reported by Pritchard in USA (1984) there were five intrauterine deaths (IUD) before admission and eight stillbirths or neonatal death in infants who were alive on admission, giving a perinatal mortality of 154/1000 births (101/1000 in infants alive on admission). Although eclampsia causes a significant perinatal mortality fetal survival is still of the order of 90-95%.

SUMMARY OF LITERATURE ON ECLAMPSIA WORLDWIDE

In order to understand the epidemiology of eclampsia, including the incidence, risk factors, outcome (maternal and perinatal) and strategies to reduce adverse outcome, a number of studies from all over the world, including previous studies from Zambia, are reviewed. These are presented in order of publication, with the author(s) and country where the study took place.

The references are summarised with respect to the following:

- Country of study
- Year study was published
- Incidence of eclampsia
- Percentage of maternal mortality due to eclampsia
- Case fatality of eclampsia cases
- Perinatal mortality in cases of eclampsia
- Age of eclamptic patients
- Parity of eclamptic patients
- Gestation distribution
- Booking status of eclamptic patients
- Timing of eclamptic fits (antenatal, intrapartum, postnatal)
- Number of eclamptic fits
- Type of delivery (SVD, instrumental or caesarean)
- Caesarean section rate
- Complications
- Recommendations

The following studies on eclampsia are reviewed:

Africa	USA, Europe and Australia	Mid East and Asia	Latin America
Zambia (Mphahlele, 1975)	USA (Sibai et al, 1981)	Peoples Republic of China	Chile (Perucca
Zambia (Davies, 1976)	UK (Redman, 1988)	(Luan Ji-qing, 1989)	et al, 1994)
Zambia (Chatterjee et al, 1978)	UK (Douglas & Redman,	India (Swain et al, 1993)	
Zambia (Thakkar and Wacha, 1981)	1994)	Singapore (Low& Yeo, 1995)	
South Africa (Boes, 1987)	Bulgaria (Porozhanova	India (Giri, 1995)	
Nigeria (Rehan and Sani, 1982)	and Bozhinova, 1996)	Turkey (Taner et al, 1996)	
Nigeria (Ekwempu, 1982)	Australia (Cincotta and	Kuwait (Makhseed and	
South Africa (Moodley et al, 1983)	Ross, 1996)	Musini, 1996)	
Zimbabwe (Crowther, 1985i)		Pakistan (Sapre and Joshi,	
Zimbabwe (Crowther 1985ii)		1996)	
Nigeria (Adetoro, 1989)		Pakistan 1997 (Jamelle,	
Zambia (Sinclair, 1989)		1997)	
Nigeria (Adetoro, 1990)			
Nigeria (Odum et al, 1990)			
Nigeria (Odum, 1991)			
Nigeria (Konje et al, 1992)			
Nigeria (Ozumbia and Ibe, 1993)			
Ghana (Obed et al, 1994)			
South Africa (Moodley & Daya, 1994)			
South Africa (Moodley et al, 1996)			
South Africa (Mwinyoglee et al, 1996)			

Zambia (Mphahlele, 1975)

A review of 50 cases of eclampsia in Lusaka between 1971 and 1973 (32,011 deliveries, giving an incidence of 0.16%) showed that only 8 were booked and received antenatal care. Forty cases were primigravidas and the number of fits ranged from 1 to 6. The timing of fits for the 50 cases was as follows: 4 were not in labour, 34 were in labour and 12 had postpartum fits. Regarding the mode of delivery, the 50 cases were delivered as follows: 20 had a vaginal delivery, 11 had a vaginal delivery assisted by vacuum, 17 had a caesarean delivery, 1 case had a primary forceps delivery (as opposed to assisted), the remaining 2 were delivered by symphysiotomy together with instrumental assistance. One woman died. Of 51 babies, there were 4 stillborn and 7 early neonatal deaths.

Zambia (Davies, 1976)

Davies (1976) from the Kitwe Mine hospitals showed that there were 5 cases of eclampsia amongst 14,430 deliveries (incidence of 0.04%). Four of the 5 cases were booked cases. The one maternal death occurred in a young primigravida who was allowed home from clinic despite having moderate pre-eclampsia. She fitted in the next 24 hours and died 4 hours following caesarean section after having been in labour for 18 hours. Davies points out there was high uptake of antenatal care but that the maternal mortality occurred despite antenatal care and could have been avoided.

Zambia (Chatterjee et al, 1978)

A review of 79 cases of eclampsia observed during a two-year period (1975-1976) at the University Teaching Hospital in Lusaka and reported in 1978 by Chatterjee et al (1978) was conducted to assess the factors affecting maternal and perinatal outcome. Of the 79 cases, 13 mothers died, giving a mortality rate (case fatality) for those who received

treatment to be 13%. The perinatal mortality rate was almost 29%. Both rates of mortality were directly related to such factors as the number of fits, the severity of eclampsia, delay in onset of treatment, and duration of labor. Although eclampsia was common in young primigravid patients, mortality was much higher among multiparous women over 35. Intrapartum eclampsia was more common, but both maternal and perinatal mortality was higher in cases of antepartum eclampsia and in severe cases. Patients who received immediate treatment fared best. Women who were delivered vaginally had a 23% mortality rate, while those delivered by caesarean section had a mortality rate of 8.6%, suggesting that active rather than conservative obstetric management was preferable. The infant mortality rate was unaffected by the method of delivery.

Zambia (Thakkar and Wacha, 1981)

Thakkar et al (1981) reviewed 46 cases of eclampsia comprising 0.24% of 19,272 deliveries at UTH during 1979. 72% of cases were under 20 years of age and 51% of all cases had received no antenatal care. The ratio of antepartum: intrapartum: postpartum eclampsia was 28%:35%:37%. Two thirds of antepartum cases were delivered by caesarean section. Three of the 46 patients died (case fatality of 6.5%). The perinatal mortality rate was 30.4%. The authors point out that early hospitalization on development of symptoms is important as is better transport facilities to the hospital.

South Africa (Boes, 1987)

Records submitted by hospitals participating in a study of maternal mortality in South Africa were reviewed as part of an effort to improve prenatal care and to educate both physicians and the public about the causes and prevention of deaths associated with

pregnancy (Boes, 1987). Of the 737 maternal deaths reviewed, 660 were classified as direct obstetric deaths. Hypertension, at times associated with proteinuria, edema, convulsions, or coma, was associated with 224 (30%) of the maternal deaths. Of these patients, 99 were classified as having eclampsia (13.4% of all maternal deaths). The association between age and parity and the cause of maternal death was particularly strong in deaths from eclampsia (high risk in young and primigravid mothers) and obstetric haemorrhage (high risk in older and multigravid mothers).

USA (Sibai et al, 1981)

Sibai et al (1981) report on 67 cases of eclampsia that were managed from 1977-80, giving an incidence of 1 in 310 deliveries. 84% of patients were nulliparous and 82% had received some prenatal care. Prior to convulsion, 14 patients (21%) had a diastolic blood pressure below 90 mmHg, 39% had no edema, and 21% had no proteinuria. 37 patients (55%) had their first convulsions while receiving magnesium sulfate therapy. Convulsions occurred postpartum in 25 patients (37%). In 11 patients, the onset of eclampsia occurred 3-11 days after delivery. The total perinatal mortality was 8.6% for all cases of eclampsia. Excluding postpartum cases, perinatal mortality was 13.3%, but was only 5% for those fetuses alive on admission to the perinatal center. Abruptio placentae was present in 9 cases and accounted for 4 of 6 perinatal deaths. The high incidence of eclampsia at the authors' center has not decreased over the past 20 years, but maternal mortality has been reduced from 2.1 to 0%. They report that it was disturbing to find that management error played some role in the development of eclampsia in 50% of the cases. Significant errors, including ineffective magnesium sulfate therapy, failure to treat adequately prior to transport, and lack of communication with a perinatal center, are discussed.

Nigeria (Rehan and Sani, 1982)

The incidence of Eclampsia was studied among 7,456 Hausa women who delivered at a hospital situated in Sudan zone of Savanna in Nigeria (Rehan and Sani, 1982). The incidence was 18.6/1,000 deliveries. In the majority of the cases (79.9%) eclampsia developed rapidly during labour at relatively low blood pressure. In 89.9%, the pregnancy was more than 37 weeks gestation. Although age of patients ranged from 14 to 32 years, 70.5% were between 15-19 years. 80.2% were primipara. 16.5% of eclampsia patients died. Of those who died, 13% died before delivery, while in the rest death was postpartum. The fetal death rate was 30.9%. The birthweight of infants born to eclamptic women [illegible] lower than that of infants born to women with [illegible] ion between eclampsia and multiple

[illegible] rd most common cause of maternal [illegible] Ekwempu 1982). In order to identify [illegible] eath from eclampsia in this region, 9 [illegible] eclamptics in 1979 were reviewed. [illegible] often in those under 16 and in [illegible] y rate among multiparous [illegible] presence of some other [illegible] ality rate of 11.1%) was more [illegible] sia. There was no [illegible] d maternal mortality, [illegible] r than 110mmHg at the

time of the fits. Abdominal delivery was associated with a lower mortality (3.1%) than vaginal delivery (10.4%). Mortality rose 10-fold if eclampsia was associated with sepsis. It was concluded that factors in this environment, with early marriage, intrapartum fits, and sepsis playing significant roles in contributing to maternal mortality, differed somewhat from those in more industrialized communities

South Africa (Moodley et al, 1983)

Physicians at King Edward VIII Hospital in Durban, South Africa treated 67 eclamptic patients during a 12-month period in which 8 patients died (11.9% case fatality) (Moodley et al 1983). The eclampsia rate was 2.3/1000 deliveries. The overall perinatal mortality rate was 16.4%. 44 of the women (65%) were primiparas. 50% of the patients who had experienced 5 or more pregnancies died. Five of the 10 patients older than 30 years died. The remaining 3 deaths occurred to women less than or equal to 23 years. Of the 8 patients that died, 7 had no antenatal care, and the 8th made only 1 antenatal visit. Overall, 43 patients made no antenatal visits to a health facility. 90% of the patients were of more than 30 weeks gestational age. The level of consciousness at admission was a predictor for prognosis. For example, 5 of the patients who died were completely unconscious at admission and the remaining 3 were responsive, but not fully conscious. In addition to lack of antenatal care, age, parity, and unconsciousness at admission, other risk factors included prolonged labor, polypharmacy, and a greater number of convulsions. Physicians administered no anesthesia to women who delivered vaginally. As for the 37 who had a caesarean section, 35 underwent general anesthesia because their consciousness was impaired and 2 received an epidural anesthesia. The authors suggest that the level of consciousness of an eclamptic patient that deteriorates markedly in the absence of excessive sedation or a recent convulsion suggests raised intracranial pressure

and must be treated prudently. Since the etiology and pathophysiology of eclampsia are unknown, treatment can only be symptomatic. The basic principles of eclampsia management consisted of provision of intensive care, control of convulsions, cautious lowering of blood pressure, early delivery, and continuation of sedation and blood pressure control for at least 48 hours after delivery. A detailed protocol on management of eclampsia, based upon these physicians' experience was drawn up.

Zimbabwe (Crowther, 1985i)

The management and pregnancy outcome in eclampsia at Harare Maternity Hospital was reported by Crowther (1985i). The 34 eclamptic patients treated at Harare Maternity Hospital during 1982 were managed by the use of diazepam to control convulsions, Nepresol to control the hypertension and followed by prompt delivery. The average dose of diazepam given prior to delivery was 45.8 mgs. 80% of patients were delivered by emergency caesarean section. The maternal mortality rate was 4% and the perinatal mortality rate 12%. The major factor contributing to maternal mortality in the cases reviewed was lack of antenatal care or lack of acceptance of antenatal advice. The perinatal mortality was higher for unbooked patients and in those patients with a long first fit to delivery interval. Perinatal mortality was also related to gestational age at delivery, mortality being greater in those patients delivered before 34 weeks gestation. Crowther suggests that reduction in perinatal mortality could be achieved by having all patients booking for antenatal care, aiming for a shorter first fit to delivery interval, and providing expert neonatal care for the pre-term infant.

Zimbabwe (Crowther 1985ii)

Crowther similarly reports on the epidemiology of the 34 women with eclampsia in 1982 at Harare (Crowther 1985ii, also reported above). 25 of these women lived within the Greater Harare Obstetric Unit (GHU), which included the hospital and 13 maternity clinics in residential suburbs, and the remaining 9 lived in outlying districts or in the provinces from where they were referred. The incidence rate for eclampsia among the 25 from Harare stood at 0.6%. 18 (72%) of the 25 women were nulliparous and 7 (28%) were multiparous. Their ages ranged from 15-32 years with the mean age being 19.7 years. Overall, the referred patients were older. 21 (84%) of the GHU patients received antenatal care at least by 34 weeks gestation. The blood pressure of 66.7% of the GHU patients registered normal, no pitting edema was evident, and no protein was present in the urine 7 days or less before the first convulsion. 9 of these 14 were next seen at admission after the convulsion. 3 were normotensive and had no proteinuria. The remaining 2 had only a slight increase in blood pressure (140/90 mmHg) and minimal proteinuria within 4 hours of the first convulsion. Incidence increased during the second half of the year. Consistent with earlier research showing an increase of eclampsia when temperature is low and relative humidity high, the month of highest incidence, August 1982, had a high relative humidity (73%) and was one of the coolest months (16.3 degrees Celsius) in Harare. Eclampsia occurred in 16 (64%) of the GHU patients before labor, 8 (32%) during labor, and 1 (4%) after labor. It occurred before labor in all referred cases. The majority of the women had their first convulsion after 34 weeks gestation. 10 (40%) patients had their first convulsion after being admitted to the hospital, yet 30% showed no signs of eclampsia 4 hours before the convulsion.

UK (Redman, 1988)

Redman (1988) in an early commentary in 1988 entitled 'Eclampsia still kills' stated that detecting and managing imminent eclampsia are important skills for practitioners even though eclampsia rarely is a complication of pregnancy. The following are a number of other statements from his commentary: In Britain, the incidence of eclampsia is estimated at less than 1/1000 deliveries. In the Western world (including the US), the Nordic countries, and England and Wales, eclampsia and pre-eclampsia are the most important obstetric causes of maternal mortality. Cerebral hemorrhage is the lethal result in 50-60% of cases. Eclampsia usually occurs in the second half of pregnancy, toward the end of term; the convulsions in half the cases begin before labor. Those who die have significantly higher blood pressures than those who survive but not more proteinuria or worse renal function. Equal numbers of deaths occur from eclampsia and pre-eclampsia. It is a disease of young women having first babies, but the older and parous women die. Immediate admittance to the hospital is recommended and cure depends on elective delivery.

Peoples Republic of China (Luan Ji-qing, 1989)

Luan (1989) reports on 106 eclamptic patients over a 15-year period from January 1973 to December 1987 in a hospital setting in Shandong, Peoples Republic of China. All patients were treated for eclampsia by delivering infants as early as possible, either vaginally or by caesarean section. The authors state that by use of this method, as opposed to prolonging the pregnancy and the administration of magnesium sulfate, the outcome for both mothers and newborns was acceptable. Of the 106 cases, caesarean sections were performed on 59 women with antenatal eclampsia. There were no

maternal deaths but the perinatal mortality rate of infants was 2.78%. This study is a profile of cases where early delivery was chosen as the means of treatment for eclampsia.

Nigeria (Adetoro, 1989)

Adetoro (1989) analysed determinants apart from prenatal care that are responsible for maternal death from eclampsia. During the 16-year study period (January, 1972 to December, 1987), there were 169,200 deliveries at the University of Ilorin Teaching Hospital in Nigeria. Of these, there were 651 cases of eclampsia (incidence of 3.8 per 1000 deliveries) with 94 maternal deaths (14.4% case fatality). The 94 maternal deaths due to eclampsia were from among a total number of 748 maternal deaths during the 16-year study period (12.6%). Maternal deaths were high in very young primigravida and elderly women of higher parity. Postpartum eclampsia was recorded in 20 (21.3%) cases and 74% were emergencies. Perinatal mortality was 4 times the overall crude perinatal mortality rate for the hospital. Operative delivery was performed in 35 (37.2%) of the 94 cases. Over the 16-year period, eclampsia-related maternal deaths remained high. The authors recommendations for prevention of maternal death from eclampsia included: 1) encouraging high-risk women to eat a high protein diet with unrestricted sodium intake at the normal recommended daily allowance; 2) an improvement in the knowledge, attitudes, and practices of the community and those who make policy in regards to eclampsia; 3) a national program on family health education; 4) improvement of the socioeconomic status of women; and 5) a change in national education policy in support of literacy.

Zambia (Sinclair, 1989)

Sinclair et al (1989) reported a series of 170 non-traumatic coma cases over a 16-month period and reported a mortality of 36.4% in those patients with eclampsia that had required intensive care treatment (usually requiring ventilation). Not all cases of eclampsia are treated in the intensive care unit and those that do have had a more severe eclampsia. In comparison, coma cases due to cerebral malaria had a mortality of 22.7%.

Nigeria (Adetoro, 1990)

A series of 788 cases of eclampsia treated at the University of Ilorin Teaching Hospital, Nigeria, from 1968-1987 was analyzed to detect any pattern in incidence, management or patient outcome (Adetoro 1990) (see also Adetoro, 1989 – previously reported above). 67.9% of cases of eclampsia were primigravidae, (1.1% of all primiparas, compared to 0.2% of all multiparas). There was a 3.5-fold higher incidence in the wet season, and the author suggests that dehydration protects against eclampsia. Headaches, epigastric pain and blurred vision occurred in 51.2% before convulsions. Blood pressure was 150/100 in 37.5%, under 180/130 in 49.3% and >180 in 13.2%. There was no correlation between blood pressure and either albuminuria or edema. Eclampsia occurred antepartum in 41.4%, intrapartum in 32.7% and postpartum in 25.9%. Seizure control was best with continuous diazepam infusion, rather than the 'lytic cocktail'. Most were also treated with methyldopa and hydralazine. The perinatal mortality was 43.9%, compared to 10-15% for the general unit population. Septicemia was the most common cause of fetal death. There were 121 maternal deaths. The most common causes of maternal morbidity were fever, heart failure, hemorrhage, herbal drug intoxication, acute renal failure, abruptio, tetanus and hemiparesis. Late maternal complications most often reported were amenorrhea, infertility, epilepsy and blindness. The incidence of eclampsia in the

hospital maternity patients was 4.2/1000, 10 times that seen in industrialized nations. The author states that improved antenatal care, availability of neonatal intensive care facilities, appropriate referral of 'at risk' women and aggressive management of pre-eclampsia would probably reduce the incidence of this disorder.

Nigeria (Odum et al, 1990)

Over the 10-year period, January 1977-December 1986, a total of 572 eclamptic patients were treated at the Lagos University Teaching Hospital (LUTH) (Odum et al, 1990). 384 of these women (66.4%) were pre-delivery eclamptic while 188 (33.6%) were postpartum eclamptics. The great majority of these cases (448, 98.3%) were unbooked patients. The overall maternal deaths from eclampsia or its complications during the period were 62 (10.8% case fatality) while the known perinatal deaths associated with the condition numbered 100 (24%). The caesarean section rate in the pre-delivery eclamptics was 30.2% while the caesarean section rate in all eclamptic patients treated in LUTH during this period was 22.2%. Comparisons of the data from the recent decade to the previous one show that the number of eclamptic patients treated at the LUTH had more than doubled. The overall maternal mortality rate due to eclampsia had remained unchanged (10.6% vs. 10.8%) while the perinatal mortality rate increased from 11.7% to 24.0% over the two decades. The caesarean section rate in the pre-delivery eclamptics increased during the period from 21.3% in the previous decade to 30.2% in the recent decade. The unbooked eclamptic patients remain the dominant group in the two decades.

Nigeria (Odum, 1991)

A retrospective study of a large number of eclamptic patients (n=845) treated in the Lagos University Teaching Hospital over a 20-year period (1967-86) was carried out

using available inpatient records (Odum, 1991). The areas of interest included the clinical profile of eclampsia as seen in Lagos, prognostic outcome in eclampsia in relation to treatment modalities, caesarean delivery, maternal and perinatal mortality, maternal morbidity and primary causes of maternal deaths. There was a continuous increase in the number of cases seen from the first through the last study period. The average maternal age, mean parity, and mean gestational amenorrhea for the series were of 24.0 years, 2.8 and 36.7 weeks respectively. Common causes of maternal death included renal failure, hemorrhage and cardiopulmonary failure. There was a very limited overall influence of treatment modalities (medication and mode of delivery) on the final outcome on eclampsia during the period under review. The authors state that it is impossible to improve the morbidity and mortality figures with this condition unless a concerted effort is made to effect early diagnosis and treatment.

Nigeria (Konje et al, 1992)

Konje et al (1992) reported data from 347 cases of eclampsia in 15-44 year olds at the University College Hospital (UCH) in Ibadan, Nigeria covering the years 1975-86 which were analyzed to study incidence, presentation, and different ways to manage eclampsia. The overall incidence was 9.3/1000 deliveries. Incidence among women receiving prenatal care at UCH was only 1.7/1000 deliveries, which was comparable to that of developed countries. Of those cases of eclampsia, 63.7% had received no prenatal care. Eclampsia occurred as early as 22 weeks gestation and as late as 3 weeks postpartum though 79.9% occurred between 37-42 weeks gestation. Risk factors included primiparity (in 73.1% of cases), no prenatal care (63.7%), prolonged labor (17.8%), and multiple pregnancy (13.2%). Symptoms included: headaches (in 90.6% of cases), visual disturbances (51.4%), epigastric pain (20.5%), irritability (17.6%), and diarrhea (8.5%).

Considerable proteinuria was a feature in 89%. The seizures of 61% of cases of eclampsia were treated with a 'lytic' cocktail (chlorpromazine, phenergan, and pethidine), though seizures recurred in 50.5% of the cases. The recurrence rates for seizures when different medications were used were: 46.2% for paraldehyde, 35% for sodium amylobarbitone, and 9.2% for diazepam. Mothers of 80% of the asphyxiated newborns received either the lytic cocktail or diazepam. The few women (3.5%) treated with bromethol experienced no recurrences. Major complications included sepsis (20.5%), cerebrovascular accident (3.5%), persistent hypertension (2.9%), acute renal failure (2.9%), and postpartum hemorrhage (2.9%). A low maternal mortality of 2.9% was found and perinatal mortality was 19.3%. The authors conclude that prevention of avoidable factors (absent or poor antenatal care and prolonged labor) by the provision of comprehensive antenatal care would reduce the incidence of eclampsia. Furthermore, improvement in management facilities prior to transfer to referral centers, the use of magnesium sulfate or diazepam to control seizures and the avoidance of hypotonic solutions and 50% glucose during therapy would reduce morbidity and mortality.

India (Swain et al, 1993)

In 1988, in India, 44 cases of eclampsia were admitted to the University Hospital Institute of Medical Sciences of Banaras Hindu University in Varanasi (Swain et al, 1993). The eclampsia incidence was 22/1000 deliveries (44/205 deliveries). This was much higher than that in developed countries (1/1150). This eclampsia rate had not changed in 10 years, suggesting that poor maternal and child health (MCH) services were operating. 84% of eclampsia cases developed eclampsia after delivery. 84% were primigravidae. Eclampsia was more common in adolescent mothers than in older mothers (5.2% vs. 1.5-1.6%; $p < 0.001$). 43 of the 44 eclampsia cases had received no prenatal care. During

1988, there were a total of 45 maternal deaths and eclampsia accounted for 13 of them (28.9%). The case fatality rate for eclampsia was 29.5%. Maternal death was more common among cases delivered vaginally than those who delivered by caesarean section (39.1% vs. 15%). One eclampsia case died undelivered. 23 newborns suffered severe birth anoxia (1-minute Apgar, <3) and six of these newborns died within one week. There were 11 fetal deaths, indicating delayed referral. Total perinatal mortality rate was 38.6%. Eclampsia-related deaths were much higher if the mother had more than 15 convulsions (63.6%) compared to 26.1% for 6-15 convulsions and 0% for <5 convulsions. These findings suggest that delayed referral and lack of prenatal care contributed to a high rate of eclampsia and of maternal and perinatal mortality. The authors conclude that MCH services need to improve prenatal care, monitor blood pressure, refer eclamptic cases to a higher level health facility to minimize the interval between first convulsion to delivery, and effectively control convulsions so as to increase maternal and perinatal survival.

Nigeria (Ozumbia and Ibe, 1993)

Researchers analyzed the 83 cases of eclampsia that were treated at the University of Nigeria Teaching Hospital in Enugu from January 1977 to December 1986 (Ozumbia and Ibe, 1993). The 49,883 delivered during this decade gave an eclampsia rate of 1.7/1000 deliveries. Of the 47,638 women who received prenatal care at the hospital (booked women), 51 experienced eclampsia (1.1/1000); the 2245 referred deliveries included 32 cases of eclampsia (14.3/1000). This difference is significant ($p < .0.05$). Some booked patients, however, had only 1 prenatal consultation. The mean parity of eclampsia patients was 1.6, and median age was 27 years. In 4 cases eclampsia occurred at a gestation of less than 28 weeks, in 37 cases at between 29-36 weeks, at term in 38, and

postpartum in 13 women. Blood pressure at time of occurrence ranged from 130/95-250/160 mmHg. Most of the complications and 7 of the 9 deaths occurred with a systolic pressure > 200 mmHg. The comparatively high overall case fatality of 10.8% in this series included 15.6% of those eclamptic cases referred and 7.8% of cases that were booked patients. This difference was not significant. The perinatal mortality rate was 33% for referred patients and 11% for booked (not statistically significant), for a combined rate of 18.5%. Diazepam was most often used in treatment because it was available, however, the caesarean rate was highest with this drug. Magnesium sulfate was not available. Most of the perinatal deaths occurred in those with caesarean section. Two of the deaths occurred to women who had postpartum eclampsia after they left the hospital. The authors recommend that high-risk cases should receive early referral and hospitalization and also consider the use of magnesium sulfate.

Ghana (Obed et al, 1994)

In another retrospective study analysis of all 134 cases of eclampsia in 1991 at the Karle Bu Teaching Hospital, Accra, Ghana, the risk factors for the development of eclampsia included: young age, delivery in the rainy season, multiparity, multiple pregnancy, prolonged labour, and lack of prenatal care (Obed et al, 1994).

South Africa (Moodley and Daya, 1994)

In South Africa, physicians at MRC/University of Natal Pregnancy Hypertension Research Unit at the Faculty of Medicine in Natal compared hospital records of all patients suffering from eclampsia (135 cases) in 1990 at King Edward VIII hospital in Durban with those of 67 eclamptic patients at the same hospital in 1980 (Moodley and Daya, 1994). They wanted to determine whether improvement of antenatal facilities

resulted in a reduction in eclampsia-induced maternal mortality and morbidity. The rate of eclampsia per 1000 deliveries at King Edward VIII Hospital was higher in 1990 than it was in 1980 (6 vs. 2.8). On the other hand, the case fatality for maternal deaths due to eclampsia fell from 11.9 to 8.9%, reflecting introduction of a standardized patient management protocol and improved intensive care facilities. Although 80% of women with eclampsia were no older than 26 years, women over age 30 years accounted for 50% of all eclampsia-induced maternal deaths. Most eclamptic patients were primiparous women (65.7% in 1980 and 64.4% in 1990). In both 1980 and 1990, maternal mortality was most common in mothers who had 5 or more children. The percentage of patients who had prenatal care was higher in 1990 than in 1980 (53.4% vs. 35.8%). Lack of prenatal care was associated with eclampsia-induced maternal mortality (75% and 87.5% of maternal deaths had no prenatal care in 1990 and 1980, respectively). At the time of admission in 1990, 59% of patients were either semiconscious or unconscious and 32% had a Glasgow Coma Scales less than 10, illustrating the severity of the disease process at admission. Magnesium sulphate was the most common drug to prevent convulsions (96%) followed by diazepam. The most common antenatal complication was renal failure (21%). In summary, the prevalence of eclampsia increased, but improvement in intensive care at King Edward VIII Hospital reduced eclampsia-induced maternal mortality.

Chile (Perucca et al, 1994)

Perucca et al (1994) reviewed 81 cases of eclampsia managed between 1985 and 1993 at the Department of Obstetrics and Gynaecology and Neonatology of Barros Luso-Trudeau Hospital, Santiago, Chile. The incidence was 1.0 per 1,000 deliveries. Primiparas accounted for 84.6% of eclamptic patients and 45.7% were less than 20 years of age. Convulsions occurred during pregnancy in 61.7% of patients, during labour in 22.2% and

in the postpartum period in 16.1% of cases. Eleven cases (13.6%) had convulsions while receiving magnesium sulphate therapy. Prior to convulsions 21.3% of patients had a blood pressure below 140/100mmHg while 25.9% of patients had normal urine protein. Caesarean section was performed in 75.3% and the most frequent indication was because of poor cervical conditions. Respiratory distress and intrauterine growth retardation were the most frequent neonatal morbidities. The perinatal mortality was 13.2% and the maternal case fatality was 3.7%.

UK (Douglas and Redman, 1994)

In a descriptive study of every case of eclampsia in the UK that occurred in 1992 (Douglas and Redman 1994), it was noted that there were 383 cases of eclampsia giving an incidence 0.49/1,000 deliveries (95% confidence interval 0.45 to 0.54). Most convulsions occurred despite antenatal care (70%) and within one week of the woman's last visit to doctor or midwife (85%). Three quarters of the first seizures occurred in hospital of which 38% developed before both proteinuria and hypertension has been documented. Forty percent of cases occurred postpartum, more than a third (38%) antepartum and the remainder (18%) intrapartum. Nearly one in 50 women (1.8%) died and 35% of women had at least one major complication. The rate of stillbirths and neonatal deaths was 2.2% and 3.4% respectively.

Singapore (Low and Yeo, 1995)

In Singapore (Low and Yeo, 1995) a retrospective analysis was reported of cases of eclampsia occurring over four years from January 1990 to December 1993 managed at the Kandang Kerbau hospital with respect to incidence, management, and maternal and perinatal outcome. They were 27 cases of eclampsia among 57 599 deliveries during the

study period, giving an overall incidence of 0.453 per 1000 deliveries. Sixteen patients were nulliparous and the mean age was 29 years. Two thirds of the cohort included booked patients and more than half of the cohort (55.6%) had their first eclamptic fit despite being in hospital. The majority of all seizures recorded (86.2%) occurred either in the antepartum or intrapartum period. Fifteen patients (55.6%) had significant proteinuria and this was strongly associated with neonatal morbidity. The mean gestational age was 35.9 weeks and the mean birthweight was 2320g. Major areas of substandard management included failure to administer anticonvulsant prophylaxis and antihypertensive agents when indicated, failure to assess for proteinuria, and failure to closely monitor the hypertensive and proteinuric patient. Seven patients developed convulsions despite anticonvulsant prophylaxis. Twenty-four patients were delivered by caesarean section. There were 26 live-born infants (singletons) and one abortus. However there was no perinatal mortality. Neonatal morbidity was frequent and attributable to prematurity (51.9%) and birth asphyxia (29.6%). The majority of infants were well neurologically on long-term follow-up. There was no maternal mortality but significant morbidity was present in eight patients (29.6%). High uric acid levels were associated with intrauterine fetal death (IUFD), prematurity, and intrauterine growth retardation. It was noted by the authors in their conclusion that the incidence of eclampsia at Kandang Kerbau hospital had shown an unsteady decline over the past four years. They also noted that eclampsia carried significant fetal mortality (3.7%) as well as neonatal (74.1%) and maternal (29.6%) morbidity. The observation that neither the occurrence of antenatal office visit, nor hospitalization, prevented eclampsia, and that substandard management was identified in most of the cases (77.8%) showed that there was no room for complacency. They end by stating that improvement in patient assessment, institution of appropriate preventive therapy, a high index of suspicion, even

in apparently low-risk patients, coupled with a disease notification system and regular audit may be the key strategies to reduce the incidence of eclampsia.

India (Giri, 1995)

Giri (1995) made editorial comments on eclampsia in India and makes the following points: The incidence of maternal mortality due to eclampsia varied from 2% to 10% in India. Early detection of pregnancy induced hypertension (PIH) was essential for the prevention and treatment of eclampsia. In severe PIH the pregnancy should be terminated. In primary health care centers suction machines and airway tubes should be available for treatment along with the necessary medicines and oxygen. The control of fits comes first, with anticonvulsive agents. Chlorpromazine-type drugs are effective in 80% of cases. Diazepam is also used intravenously with an 80% success rate; dilantin sodium is similarly effective, while the use of magnesium sulphate has been reestablished with a 90% success rate. Hydralazine is more promising than chlorpromazine for the control of hypertension and maintenance of sustained pressure. The induction of labor with artificial rupture of membrane (ARM) hastens delivery. Caesarean section is preferred when the labor has not started in spite of ARM, in prolonged labor, when the cervix is not ripe, and for some absolute obstetrical indications. Complications that contribute to maternal mortality are: cerebral hemorrhage or edema, pulmonary edema, cardiac failure, oliguria, anemia, sepsis, and thromboembolism. Giri ends his editorial by stating that maternal mortality in eclampsia can be reduced to less than 2% with suitable prenatal care and prompt hospital treatment.

Australia (Cincotta and Ross, 1996)

A retrospective review of all cases of eclampsia diagnosed at obstetric teaching hospitals in Melbourne from January 1978 to December 1992 was undertaken and reported by Cinotta and Ross (1996). There were 90 cases identified with five maternal deaths (case fatality of 5.6%) and 17 perinatal deaths (18.9%). Severe maternal morbidity such as pulmonary edema, acute renal failure or HELLP (Hemolysis, Elevated Liver enzymes and Low Platelets) syndrome was found in 26%. Significant thrombocytopaenia (<100 $x10^{12}/l$) was found in 50% of cases and 35% had abnormal maternal liver function tests. Three of forty-six women (6.5%) who received magnesium sulphate and 4 of 18 (22.2%) who received phenytoin had repeat seizures.

Bulgaria (Porozhanova and Bozhinova, 1996)

Porozhanova and Bozhinova (1996) in Bulgaria studied 19 adolescent patients with eclampsia in the course of six years. In 68% of the cases, eclampsia occurred in the antepartum period, in 5% during the intrapartum period. Maternal mortality was 5.3% (one patient with HELLP syndrome). Serious maternal morbidity included 2 cases (10.5%) with disseminated intravascular coagulation (DIC). Abruptio placentae was strongly correlated with the development of DIC and acute renal failure. Eclampsia and the HELLP syndrome were the most dangerous complications in adolescent pregnancies. The authors state that they were associated with serious maternal morbidity, especially when eclampsia occurred in the postpartum period.

Turkey (Taner et al, 1996)

Obstetricians treated 444 cases of eclampsia at Dicle University Medical School Hospital in Diyarbakir, Turkey, between January 1987-December 1994 (Taner et al, 1996). These

cases comprised 7.71% of all deliveries at the hospital during the study period. None of the eclampsia cases had received prenatal care in the hospital's obstetrics-gynecology clinic. Most had received no formal education. Nullipara accounted for 40.8% of the cases of eclampsia cases while 27.9% had more than five children. 41.7% of all cases were less than 25 years old. The physicians used magnesium sulfate for treatment and prophylaxis. Almost 90% of the cases first experienced convulsions before delivery, with the remaining 10% experiencing them after delivery. Among the women who had ante- and intrapartum eclampsia, 50.1% underwent caesarean section. The most common complication in ante- and intrapartum eclampsia cases was abruptio placentae (19.6%). 18 women (4.1%) developed acute renal failure. The most serious complication was intracerebral hemorrhage (2.03%). Overall 30.9% of all eclampsia cases suffered from some complication as a result of eclampsia. The overall perinatal mortality rate was 59.2%. Most perinatal death cases were stillborns. For ante- and intrapartum eclampsia cases, the perinatal mortality rate was even higher (64.5%). 42 women died (9.5% case fatality), and most of them came from remote villages. A delay between the start of seizures and admission to the hospital and inadequate or lack of treatment prior to transportation were the leading factors of maternal and perinatal deaths. Diuresis and a reduction in blood pressure within 48 hours generally effected a good response. The authors highlight that eclampsia is a serious obstetric complication, especially in uneducated women who receive no prenatal care.

Kuwait (Makhseed and Musini, 1996)

Makhseed and Musini (1996) studied the maternal and fetal outcome and the risk factors for developing eclampsia in Kuwait. The study included all patients with eclampsia observed at the maternity hospital Kuwait during the period from 1981-93. It revealed

that the risk factors predisposing to eclampsia were primiparity, young maternal age, multiple-pregnancy and the presence of pre-eclampsia. The pregnancy outcome in terms of stillbirth rate, neonatal death and low birthweight babies was significantly higher in mothers with eclampsia than in non-eclamptic mothers. The operative and maternal mortality rates were also significantly higher in these patients.

South Africa (Moodley et al, 1996)

In a two-year retrospective analysis of 147 maternal deaths in South African urban and rural hospitals in Kwazulu Natal, the maternal mortality ratio (MMR) was estimated to be 144/100,000 live births (Moodley et al 1996). MMR was significantly higher in urban hospitals (160/100,000) and the main cause of death was hypertensive disease in pregnancy (33%). Of these, eclampsia contributed to 70% of the deaths. It was found that only 47.7% of the women who died had attended antenatal clinic.

South Africa (Mwinyoglee et al, 1996)

A prospective study of the epidemiology and outcomes of eclampsia was made of all affected patients admitted to a tertiary care hospital in Pretoria, South Africa, during 1994 and 1995 (Mwinyoglee et al 1996). The incidence of eclampsia was 3.6/1000 deliveries (66 cases/18,145 deliveries), and 14 of these patients died (38.9% of all maternal deaths) giving a case fatality rate of 21.2%. The 36 women who were emergency admissions were responsible for 78.6% of the deaths; all 4 eclampsia patients over age 35 died; 12 of the 22 women with multiple fits died; and the 21 multigravidas were responsible for 67.1% of the deaths. The age of affected women ranged from 14 to 43 with a mean of 22.3 years. Eclampsia occurred in the presence of high diastolic blood pressure, and most occurred at home before 37 weeks gestation. Eclampsia occurred in

77.3% in the antepartum period and postpartum in 4.5% of cases. Three patients died undelivered (fetal heart rate was absent upon admission), and the caesarean section rate among the remaining 63 patients was 66.7%. The perinatal mortality rate of 47.7% ranged from 100% for infants of birthweight less than1000g to 53% for infants of birthweight greater than 2500g. Maternal complications were varied and severe but responded well to the timely intervention of other specialists (e.g. evacuation of 2 intracranial hematomas by the neurosurgeons and administration of 2 tracheostomies by the surgeons). The authors recommend that the dosage of magnesium sulphate used at this facility be reviewed in patients with recurrent fits, that women be educated about the importance of prenatal care, and that health personnel in district hospitals undergo refresher courses in the management and referral of eclamptic patients.

Pakistan (Sapre and Joshi, 1996)

In Pakistan, Sapre and Joshi (1996) analyzed the records of 110 maternal deaths that occurred between 1981 and 1991 at Kamla Raja Hospital in Gwalior to determine whether implementation of essential prenatal, intranatal, and postnatal care; early detection of complications by training physicians and paramedical staff; and efficient emergency services by trained physicians and better transport facilities (the 3 E's) reduced the maternal mortalities. The maternal mortality ratio (MMR) for Kamla Raja Hospital fell from 20.8 to 10.9 per 1000 live births over the period. The relative proportion of causes of maternal deaths did not change considerably, however. The two leading causes of death in both years were eclampsia (19.6 and 24.1% in 1981 and 1991 respectively) and anemia (21.4 and 22.2%) followed by sepsis (19.6-13.1%) and hemorrhage (9.4-14.3%). The lack of obstetrical care, lack of transport facilities, and non-availability of emergency obstetric services in rural areas contributed to the high

MMR among rural women. Improvement in the educational status of females during the decade resulted in a lower MMR. The number of women who benefited from prenatal care was higher in 1991 than 1981, contributing to a lower MMR. The authors conclude that improvement in the 3 E's and in the use of family planning methods reduced maternal deaths at Kamla Raja Hospital.

Pakistan 1997 (Jamelle, 1997)

Jamelle (1997) reports that in Pakistan, eclampsia is the third leading cause of maternal deaths. To assess the impact of eclampsia on maternal health, the 35,232 deliveries registered at Jinnah Postgraduate Medical Center in Karachi, Pakistan, during 1990-94 were reviewed. There were 609 cases of eclampsia (17.3 per 1000 deliveries). 64.3% of eclampsia cases involved women 15-25 years of age. 92.8% were non-booked patients and 80% had received no prenatal care. 334 patients (54.3%) developed antepartum convulsions; in 167 women (27.4%) convulsions were intrapartum and postpartum in 111 (18.2%). 369 women (60.5%) had spontaneous vaginal deliveries. There were 49 maternal deaths (case fatality rate of 8%) during the 5-year study period. Cerebrovascular accidents were the most common cause of death (78.1%). There were 205 perinatal deaths (33.1%), including 180 stillbirths (29.0%). Since only 5-10% of Pakistani women have hospital deliveries, these findings cannot be considered nationally representative. The authors state that some of the measures recommended to prevent eclampsia in developing countries are: access to ambulance transport, universal prenatal care, training programs for midwives and traditional birth attendants, availability of equipment for basic management of convulsions and hypertension at the first referral level, research on an economical eclampsia screening test or marker, and coordination among the different levels of the health-care system.

Summary

The literature review illustrates the main issues that are reported in the various studies. The incidence varies markedly between countries and is relatively low in developed countries. Similarly the case fatality reflecting the access to care and subsequent management varies but may be typically 10% or more in developing countries. High rates of perinatal mortality are recorded in all countries (though somewhat less in developed countries) reflecting both stillborns and also prematurity. The young and primiparous are over-represented in most series reported (as they also have the greatest incidence of pre-eclampsia). Not having registered for antenatal care appears to be a major risk factor, although eclampsia occurs even in the presence of such care. There is variation in the breakdown of when eclampsia occurs – whether in the antenatal period, during labour or after delivery. There are different maternal and fetal risks and management implications. Caesarean section seems to be a common mode of delivery in the event that eclampsia occurs before delivery.

The use of an effective anticonvulsant, particularly for prevention of subsequent fits is very variable. Use of magnesium sulphate as an anticonvulsant prophylaxis only became widespread in the 1990s but there are still many centers that do not use the drug. Complications frequently mentioned in the literature include acute renal failure (ARF), cerebrovascular accidents (CVA), pulmonary edema (PE), and disseminated intravascular coagulation (DIC).

There is a large amount of literature reported from Nigeria and South Africa relating to eclampsia. This enables a framework to be drawn when studying eclampsia in a Zambian setting. Most articles on the subject end with a set of recommendations that address

community understanding of the signs and symptoms of eclampsia in order to achieve early referral, improvements in the access to services, the benefit of provision of antenatal care particularly to detect pre-eclampsia, improved case management, availability of equipment (e.g. suction machines and medications), training of both midwives and doctors on management of eclampsia and regular audits of cases of eclampsia.

Thakkar and Wacha (1981) were the last authors to report on eclampsia at UTH (based on cases managed during 1979). In order to update on the studies reported previously from UTH, descriptions from other studies in the region and worldwide have been included in a design of the study for the audit of eclampsia. A discussion of further studies published after the study period (1998) is presented in the discussion section.

OBJECTIVES

General Objective: To determine the incidence, demographics, associated risk factors and predictors of outcome of eclampsia at UTH in order to better manage the condition and minimise adverse maternal and perinatal outcomes.

Specific Objectives:

1. To establish the case incidence of eclampsia over a one-year period.
2. For the cases of eclampsia, to determine:
   a) the demographic characteristics
   b) the obstetrics and clinical presentation
   c) the clinical management, including mode of delivery
   d) the maternal and perinatal outcome (including maternal complications)
   e) the maternal and perinatal case fatality
3. Use the above information to highlight potential positive and negative management practices to obtain a favourable maternal and perinatal outcome.

METHODOLOGY

1. Research design

The study included a prospective case-file review of all patients with eclampsia managed at the Department of Obstetrics and Gynaecology of the University Teaching Hospital, Lusaka, in 1997.

2. Research setting

Lusaka, Zambia's capital city has a population of over 1.5 million people. Over 40,000 babies are born there each year. The University Teaching Hospital in Lusaka is the largest health institution in the country. It has a bed capacity of 1,800 and serves as a referral centre for patients from all over the country and as a teaching centre for various health professions, including medical students, postgraduate doctors, nurses, midwives, and paramedicals.

Since the mid-1980s there has been a decentralised maternity care system in Lusaka resulting in twenty-three health centers in addition to UTH that provides antenatal and postnatal care. In ten of these, trained midwives also provide twenty-four hour labour and delivery services. With a three-year nurse training followed by a post-basic midwifery qualification, the midwives have considerable autonomy in their clinical practice, providing care in uncomplicated cases and making referral as necessary. University Teaching Hospital provides comprehensive obstetric care services including blood transfusions, instrumental deliveries, and augmentation of labour and caesarean section. Clinics are linked by radio to an ambulance service running a 24-hour service for emergency transfers. The furthest clinic is approximately 7km from the University Teaching Hospital.

A quarter of all births in the city per year take place at the University Teaching Hospital. The Obstetrics and Gynaecology department comprises four teams of medical staff (consultants, residents from a 4-year Masters of Medicine and interns) as well as nurse-midwifery staff. There is 24-hour theatre and anaesthetic cover.

3. The sample: Selection and recruitment

Cases of eclampsia were identified by the author through a regular daily review of the following: labour ward admissions register, labour ward delivery register and theatre register. Maternal and neonatal cases records were scrutinised on discharge. Information was obtained from files of eclamptic patients using a data collection instrument (see Appendix). The instrument also included the working definitions that were used in the study. The sample consisted of all consecutive eclamptic cases that occurred from 1st January to 31st December in 1997. These included booked and unbooked cases referred to UTH.

4. Data Collection

Data collection was performed throughout the year between January 1st to December 31st, 1997 and 2 weeks beyond to collect the remaining perinatal data and maternal discharge information on the last cases of eclampsia at the end of the year.

5. Data Presentation and Analysis

Data was entered in Epi Info 6 for subsequent analysis. The primary goal was description of the data and there was also a limited amount of statistical inference that was made. It was recognised that there could be a number of ways data that could be presented e.g.:

Univariate form: e.g. frequency distribution of single variables, e.g. age, or parity, or number of fits, or timing of eclampsia of patients who had eclampsia etc.

Bivariate form: e.g. distribution of: i) complications by ii) parity, or

distribution of: i) maternal outcome by ii) booking status etc.

It was decided to present both maternal and perinatal outcome within the same categories where appropriate: e.g.:

- gestation and outcome (maternal and infant) (see Table 6)
- timing of fit and outcome (maternal and infant) (see Table 8)

Similarly demographic information on the patients with eclampsia was not presented separately as unvariate data but usually with another variable e.g. age with maternal mortality (see Table 3); or timing of eclampsia with maternal complications (see Table 9). Where appropriate, comparative analysis was performed using Odds Ratio and 95% confidence intervals. Significance was set at 0.05 (5%).

The results are presented in tabular form only, without figures. The first page of the Results section summarises the exposure and outcome variables in the result tables that follow.

6. Ethical Considerations

There were no ethical issues identified. All data was obtained from the case files without name identifiers. However formal ethics approval for the study was obtained from the Research Ethics Committee of the University of Zambia.

RESULTS

Exposure or risk variable	(Table) Outcome variable(s)
1. Month of presentation of eclampsia	• **(T1)** MDs and case fatality
2. Plurality (singleton/multiple)	• **(T2)** MDs and perinatal loss
3. Age	• **(T3)** MDs
4. Parity	• **(T4)** Maternal complications (including MDs)
	• **(T5)** Perinatal outcome (A/SB/eNND)
5. Gestation	• **(T6)** MDs and perinatal loss
6. Booking status (UTH/Clinic/unbooked)	• **(T7)** Maternal complications (inc MDs) **and** Timing of first eclamptic fit (AP/IP/PP)
7. Timing of eclampsia (AP/IP/PP)	• **(T8)** MDs and perinatal loss **and** booking status
	• **(T9)** Maternal complications (including MDs)
8. Frequency of fits	• **(T10)** MDs and Perinatal loss
	• **(T11)** MDs and Perinatal loss **and** Timing of first eclamptic fit (AP/IP/PP)
9. Mode of delivery	• **(T12)** MDs and Perinatal loss
	• **(T13)** Specific Perinatal outcome (A/SB/eNND)
	• **(T14)** Maternal complications (inc MDs)
10. Severity of hypertension	• **(T15)** Maternal complications (inc MDs)
	• **(T16)** Perinatal outcome (A/SB/eNND)
11. Severity of proteinuria	• **(T17)** Maternal complications (inc MDs)
12. Frequency of maternal hydralazine	• **(T18)** MDs and Perinatal loss
13. Frequency of diazepam	• **(T19)** MDs and Perinatal loss

MDs – Maternal deaths
Maternal Complications:
CVA (Cardiovascular accidents) **ARF** (acute renal failure) **PE** (Pulmonary edema)
SB - Stillbirth
eNND - early neonatal death (within 7 days of birth)
AP - Antepartum
IP - Intrapartum
PP - Postpartum
T - Table number

Table 1: Monthly cases of eclampsia and incidence, Lusaka 1997

Month	Deliveries UTH,Clinics and Chainama	Cases of Eclampsia	Incidence per 1000 deliveries	Maternal Deaths Due to eclampsia
January	3,216	8	2.49	-
February	3,035	9	2.97	1
March	3,369	5	1.48	-
April	3,406	6	1.76	-
May	3,506	5	1.43	-
June	3,407	7	2.05	-
July	3,539	13	3.67	-
August	3,679	11	2.99	-
September	3,727	9	2.41	-
October	3,495	10	2.86	1
November	3,395	10	2.95	2
December	3,675	8	2.18	1
Total	**41,449**	**101**	**2.44**	**5**

Incidence of eclampsia **2.44 per 1000 deliveries**

Case fatality (see text) **5/101 = 5%**

All UTH	10,580	(25.5%)
All district and Chainama	30,869	(74.5%)
Total	**41,449**	**(100%)**

During 1997 there were 101 patients who presented with eclampsia at the University Teaching Hospital (UTH). The total number of recorded deliveries in Lusaka province was 41,449 (25.5% at UTH and the other 74.5% in the clinics). The monthly breakdown of deliveries and cases of eclampsia is presented in Table 1. Also included are the 5 cases of eclampsia that died within the time interval. The incidence of eclampsia was 2.44 per 1000 deliveries with a case fatality of just under 5%.

Table 2a: Eclampsia cases and outcome (maternal and perinatal) by plurality

Number of Fetus	Maternal	Alive Died	Number of maternal cases n (%)	Infants	Alive Died	All infants n (%)
Singleton	90	5	95 (94.1)	76	19	95 (89)
Twin	6	0	6 (5.9)	12	0	12 (11)
Triplets or higher order	-	-	0 (0)	-	-	-
Total	**96**	**5**	**101 (100)**	**88**	**19**	**107 (100)**

Of the 101 cases of eclampsia, there were 95 who had a singleton pregnancy and 6 who had a twin pregnancy. There were no higher order births in this series. This gives a total of 107 infants born. All 12 infants from the 6 sets of twins were born alive. All the maternal deaths were from those with singleton pregnancies. Perinatal deaths included stillbirths and those infants that died within one week of birth.

The maternal case fatality was 5/101 = 5%

The perinatal case fatality was 19/107 = 17.8%

Table 2b: Incidence of eclampsia cases by plurality

Number of Fetus	Total number of deliveries n (%)	Number of eclampsia cases n (%)	Eclampsia cases / 1000 deliveries
Singleton	40,999 (98.9)*	95 (94.1)	2.3
Twin	496 (1.1)*	6 (5.9)	12.1
Triplets or higher order	4 (0)	0 (0)	0
Total	**41,449 (100)**	**101 (100)**	**2.4**

* rounded off to one decimal point

Twin pregnancies accounted for 1.1% of all deliveries, yet they accounted for 5.9% of cases of eclampsia. The incidences were: 2.3 cases/1000 singleton deliveries (1 in 435) and 12.1 cases/1000 twin deliveries (1 in 83).

Table 3: Age distribution of eclampsia cases and maternal deaths

Age Range (years)	Cases of eclampsia n (%)	MDs N
<16	11 (10.9)	-
17-19	34 (33.7)	-
20-24	25 (24.8)	1
25-29	19 (18.8)	3
30-34	9 (8.9)	-
>35	3 (2.9)	1
Total	**101 (100)**	**5**

(ages of maternal mortalities: 20, 25, 27, 28 and 40 years)

Of the 101 cases of eclampsia, 11 were in those who were younger than 16 years of age. Most were within the age-group 17-24 year group (33.7%). Only 3 (2.9%) were older than 35 years. Four of the maternal deaths occurred in those who were 20-29 years old but one was aged 40 years old.

Table 4: Distribution of eclampsia cases and maternal outcome (complications and death) by parity

Parity	Complications			No Complications n (%)	All Cases n (%)	Maternal Deaths n
	CVA n	ARF n	PE n			
0	0	2	7	51 (57.3)	60 (59.4)	2
1	0	0	0	13 (14.6)	13 (12.9)	0
2	2	0	0	12 (13.5)	14 (13.9)	2
3	0	0	0	7 (7.9)	7 (6.9)	0
5	0	0	0	3 (3.4)	3 (3.0)	0
7	0	0	0	2 (2.3)	2 (2.0)	0
8	0	0	0	1 (1.1)	1 (1.0)	0
9	1	0	0	0 (0)	1 (1.0)	1
Total	**3**	**2**	**7**	**89 (100)**	**101(100)**	**5**

Note that CVA+ARF+PE+ no complications = all cases.

Sixty (59.4%) of the eclamptic patients were primiparous but only a few were of parity more than 5, including one of para 9. It is noted that all cases of pulmonary edema occurred in the primiparas. Two of the 5 maternal deaths due to eclampsia were primiparas (out of 60 primiparas), 2 were of parity 2 (out of 14 of para 2) and one (who had a CVA) was of parity 9. The numbers are too small to make any parity-related mortality analysis due to eclampsia (e.g. as to whether primiparas or multiparas are more at risk of maternal death after eclampsia). Furthermore the contingency table fails to show a relationship between parity and maternal mortality

Contingency table

Para	MM	Alive	total
0	2	58	**60**
1-9	3	38	**41**
Total	**5**	**96**	**101**

Odds ratio of 0.44 0.05<OR<3.43 p=.36 ns.

Table 5a: Perinatal outcome in relation to parity (separate parities)

Parity	Stillbirths	Early neonatal deaths	Perinatal deaths*	Alive	Total**
	n (%)	n (%)	n (%)	n (%)	N (%)
0	4 (36.4)	5 (62.5)	9 (47.4)	53 (60.2)	62 (57.9)
1	1 (9.1)	1 (12.5)	2 (10.5)	13 (14.8)	15 (14.0)
2	3 (27.3)	0 (0)	3 (15.8)	12 (13.6)	15 (14.0)
3	1 (9.1)	0 (0)	1 (5.3)	5 (5.7)	6 (5.6)
5	1 (9.1)	0 (0)	1 (5.3)	1 (1.1)	2 (1.9)
7	0 (0)	1 (12.5)	1 (5.3)	2 (2.3)	3 (2.8)
8	0 (0)	1 (12.5)	1 (5.3)	1 (1.1)	2 (1.9)
9	1 (9.1)	0 (0)	1 (5.3)	1 (1.1)	2 (1.9)
Total	**11 (100)**	**8 (100)**	**19 (100)**	**88 (100)**	**107 (100)**

* Perinatal deaths = stillbirths (SBs) + early neonatal deaths (eNNDs)
** Total = perinatal deaths + alive

Table 5b: Perinatal outcome in relation to parity (grouped as primiparas or multiparas)

Parity	Stillbirths	Early neonatal deaths	Perinatal deaths	Alive	Total
	n (%)	n (%)	n (%)	n (%)	N (%)
0	4 (36.4)	5 (62.5)	9 (47.4)	53 (60.2)	62 (57.9)
1-9	7 (63.6)	3 (37.5)	10 (52.6)	35 (39.8)	45 (42.1)
Total	**11 (100)**	**8 (100)**	**19 (100)**	**88 (100)**	**107 (100)**

More perinatal deaths in primiparas with eclampsia were represented by early neonatal deaths (62.5 vs. 37.5%). By contrast the multiparas had more stillbirths (63.6 vs. 36.4%). However, as shown in the contingency table below, nulliparity was not associated with a better or worse perinatal outcome compared to multiparas.

Contingency table

Para	**PNM**	**Alive**	**total**
0	9	53	**62**
1-9	10	35	**45**
Total	**19**	**88**	**107**

Odds ratio of 0.59 0.2<OR<1.79 p=.33 ns.

Table 6: Eclampsia cases and outcome (maternal and infant) by gestation

Gestation (weeks)	Alive n (%)	Maternal deaths n (%)	All eclampsia cases n (%)	Infants alive n (%)	Infants dead n (%)	All infants n (%)
<12	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
13-28	6 (6.7)	2 (40)	8 (7.9)	3 (3.6)	5 (26.3)	8 (7.5)
28 to term	90 (93.3)	3 (60)	93 (92.1)	85 (96.6)	14 (73.7)	98 (93.5)
Total	**96 (100)**	**5 (100)**	**101 (100)**	**88 (100)**	**19 (100)**	**107 (100)***

*note that there were 95 babies from singletons and 12 babies from 6 sets of twins.

Maternal case fatality by gestation:

2/8 before 28 weeks (25%)

3/93 after 28 weeks (3.2%)

There were no cases of eclampsia in women in the first trimester (<12 weeks) (e.g. due to trophoblast disease or essential hypertension that became complicated with eclampsia). Eight of the 101 cases (7.9%) occurred before 28 weeks gestation and accounted for 2 of the 5 deaths (40%). Pre-eclampsia leading to eclampsia in early gestation was found to be more dangerous. The odds ratio of maternal death associated with gestation less than 28 weeks, compared to maternal death in an eclamptic after 28 weeks gestation, was 10.0, [95% CI (0.68<OR<101.8), p=0.06]. It appeared as though there was a 10 fold increase in maternal mortality for those less than 28 weeks gestation, though because of the small numbers, this was not statistically significant (n=0.06 ns).

Contingency table:

	dead	alive	Total
<28 weeks	2	6	**8**
>28 weeks	3	90	**93**
total	**5**	**96**	**101**

Odds ratio 10.0, 95% CI (0.68<OR<101.8), p=0.06 ns

Table 7: Timing of first eclamptic fit and maternal outcome by booking status

	Timing of first eclamptic fit				Maternal complications				
Booking Status	**A/P**	**I/P**	**P/P**	**All cases n (%)**	**CVA**	**ARF**	**PE**	**(Maternal Deaths*)**	**No Complications**
Clinic	27	41	12	**80 (79.2)**	2	2	3	(4)	73
UTH	11	6	3	**20 (19.8)**	0	0	4	(0)	16
Not booked	0	0	1	**1 (1)**	1	0	0	(1)	0
Total	**38**	**47**	**16**	**101 (100)**	**3**	**2**	**7**	**(5)**	**89**

Note that CVA+ARF+PE+ No complications = all cases.
***Maternal deaths from within those that had a complication.**

Most of the cases of eclampsia occurred in patients who were booked in the clinics and this is a reflection of the number of deliveries taking place there (see Table 1). Accordingly most eclamptic fits that occurred either in the antenatal, intrapartum or postpartum period were from clinics. More of the UTH booked eclampsia cases were antepartum cases compared to intrapartum. Conversely, in the clinic booked eclampsia cases more of the cases were intrapartum compared to antepartum. The complications and deaths are recorded on the same table. Four of the 5 maternal deaths occurred in patients who had been booked in clinics and the remaining one had been unbooked.

Table 8: Booking status and outcome (maternal and perinatal) by timing of first eclamptic fit

Timing	Not booked n	Clinic Booked n	UTH Booked n	Alive n (%)	MD n (%)	Number of Cases N (%)	Perinatal loss N (%)
Antepartum	0	27	11	37 (38.5)	1 (20)	**38 (37.6)**	12 (63.2)
Intrapartum	0	41	6	44 (45.8)	3 (60)	**47 (46.5)**	6 (31.6)
Postpartum	1	12	3	15 (15.6)	1 (20)	**16 (15.8)**	1 (5.2)
Total	**1**	**80**	**20**	**96 (100)**	**5 (100)**	**101 (100)**	**19 (100)**

Timing of first eclamptic fit: Ratio 2:3:1 (Antepartum:Intrapartum:Postpartum)

The timing of the first eclamptic fit occurred in 38 cases in the antepartum period (37.6%), 47 (46.5%) in the intrapartum period and 16 (15.8%) in the postpartum period. This is a ratio of 2:3:1. More of the clinic-based patients had their first eclamptic fit in the intrapartum period (41 cases out of 80), compared to UTH booked who had more in the antepartum period (11 out of 20). Three of the 5 maternal deaths had their first eclamptic fit in the intrapartum period while most of the perinatal loss occurred in cases where the first fit was in the antepartum period (12 of 19 cases). One perinatal death was as a result of an early neonatal death in a woman who had an eclamptic fit in the postpartum period.

Table 9: Maternal outcome (including complications) by timing of first eclamptic fit

Timing of first eclamptic fit	Maternal Complication						Maternal Condition		
	CVA	ARF	PE	Any	None	Total	MD	Alive	Total
Antepartum	2	2	2	*6*	*32*	**38**	*1*	*37*	**38**
Intrapartum	0	0	5	*5*	*42*	**47**	*3*	*44*	**47**
Postpartum	1	0	0	*1*	*15*	**16**	*1*	*15*	**16**
Total	**3**	**2**	**7**	*12*	*89*	**101**	*5*	*96*	**101**

Those who first fitted in the intrapartum period were more likely to have pulmonary edema, while those who first had an eclamptic fit in the antepartum period had a range of complications.

It appears that eclampsia first occurring in the intrapartum period has a higher case fatality rate. However, complications may have occurred antenatally but patients subsequently died in either the intrapartum or postpartum period.

Table 10: Cases of eclampsia and outcome (maternal deaths and perinatal loss) by frequency of eclamptic fits

Number of Fits	Number of Cases n (%)	Maternal Deaths n (%)	Perinatal Loss n (%)
<3	79 (78.2)	3 (60)	13 (68.4)
3-5	18 (17.8)	2 (40)	4 (21.5)
>5	4 (4)	0 (0)	2 (10.5)
Total	**101 (100)**	**5 (100)**	**19 (100)**

Most of the cases (79, 78.2%) had less than 3 eclamptic fits and 3 of the maternal deaths were from that category. Of these three, 2 had 1 fit each and 1 had 2 fits. However 18 (17.8%) cases had between 3 and 5 eclamptic fits each. Two of the 5 maternal deaths were from that category. Four cases had 5 fits each but none resulted in a maternal death.

The frequency of fits did not appear to have a bearing on maternal mortality.

(OR 0.4, 95% CI 0.05<OR<3.66, p=.31)

Contingency table

	Maternal Death	No maternal deaths	Total
1 or 2 fits	3	76	79
3 or more fits	2	20	22
Total	5	96	101

OR 0.4 0.05<OR<3.66 p=.31 ns

Contingency table of maternal deaths after 1 eclamptic fit compared to more than 1 fit - no difference

Similarly – frequency of fits and perinatal deaths

- Contingency table of perinatal deaths after 1 or 2 fits compared to more than 2 fits - no difference

- Contingency table of perinatal deaths after 1 fit compared to more than 1 fit - no difference

Table 11: Timing of first eclamptic fit, maternal and infant condition by frequency of fits

Freq. of fits	Timing of first eclamptic fit			All fits	Maternal condition			Infant condition		
	A/P	I/P	P/P	Total	MD	Alive	Total	Loss	Alive	Total
1	9	28	4	41	2	39	41	6	36	42
2	8	14	5	27	1	26	27	3	24	27
3	4	1	6	11	0	11	11	4	8	12
4	15	2	1	18	2	16	18	4	16	20
5	2	2	0	4	0	4	4	2	4	6
Total	**38**	**47**	**16**	**101**	**5**	**96**	**101**	**19**	**88**	**107**

It is noted that in those who had only one fit, the majority were those who had their first eclamptic fit in the intrapartum period (28 of 41). Two of the 5 cases of maternal deaths were in this category of 1 fit only, as were 6 of the 19 perinatal losses. Most of those who had 2 eclamptic fits also had the first fit in the intrapartum period (14 of 27). The remaining 2 maternal deaths had occurred out of the 18 cases that had 4 eclamptic fits (most of whom had their first fit in the antenatal period: 15 of the 18). As can be noted, the proportion of perinatal loss tended to increase as the number of fits increased.

Table 12: Maternal and perinatal outcome by mode of delivery

Mode of delivery	Type	n (%)	Cases n (%)	MDs n (%)	Infants alive	Perinatal N (%)	All infants N (%)
Caesarean	Before labour	41 (55.4)					
	In labour	33 (44.6)					
	All caesarean	74 (100)	74 (73.3)	1 (20)	61	13 (68.4)	74 (69.2)
Instrument	Forceps	6 (42.9)					
	Vacuum	8 (57.1)					
	All instruments	14 (100)	14 (13.9)	2 (40)	13	1 (5.3)	14 (13.1)
SVD	**SVD**	13 (100)	13 (12.9)	2 (40)	14	5 (26.3)	19 (17.8)
TOTAL		**101 (100)**	**101 (100)**	**5 (100)**	**88 (100)**	**19 (100)**	**107 (100)**

Seventy four (73.3%) cases of eclampsia were delivered by caesarean section. Of these, 41 (55.4%) were before labour had commenced and 33 (44.6%) in cases already in labour. Fourteen (13.0%) were delivered by instrumental delivery. Of these six (42.9%) were by low cavity forceps and eight (57.1%) were by ventouse (vacuum). Only 13 (13.0%) cases of eclampsia had delivered as spontaneous vaginal delivery (SVD).

Most of the 19 perinatal losses occurred in those delivered by caesarean (13 of 19, 68.4%). Also the 13 of the 74 infants delivered by caesarean represented a perinatal loss at caesarean of 17.6%. By contrast 1 of the 14 delivered by instrumental delivery resulted in a perinatal loss (5.3%) and 5 of the 19 (26.3%) delivered vaginally were perinatal losses. The infant associated with the maternal death after caesarean section was born alive, one of the 2 infants associated with the 2 maternal deaths after instrumental delivery was alive but both infants born in those who had a vaginal delivery were perinatal losses.

Maternal outcome in relation to type of labour

Of the 16 cases of eclampsia that were induced, 12 (75%) were eventually delivered by caesarean section. There were 3 maternal deaths in this category that were induced (though one had a caesarean section). Two of the maternal deaths had a CVA.

Of the 23 cases that were augmented, 14 (60.9%) ended up having a caesarean section and there were no maternal deaths.

The remaining 2 maternal deaths were in those who had a spontaneous vaginal delivery (4 cases of which had been complicated by pulmonary edema).

It may appear to be worthwhile augmenting patients who are in labour and have had an eclamptic fit. Induction is associated with a higher caesarean section rate.

As noted on Table 11, 38 cases of eclampsia first occurred in the antepartum period and 47 in the intrapartum period. These 85 cases were either delivered by caesarean or by instrumental delivery. Of the 16 cases that had a spontaneous vaginal delivery, 3 had an instrumental delivery to shorten the third stage due to pre-eclampsia.

Table 13: Maternal outcome (including complications) by mode of delivery

Mode of delivery	Maternal Complication						Maternal Condition		
	CVA	ARF	PE	Any	None	Total	MD	Alive	Total
Caesarean	2	2	1	**5**	**69**	**74**	1*	73	74
Instrument	1	0	2	**3**	**11**	**14**	2	12	14
SVD	0	0	4	**4**	**9**	**13**	2	11	13
Total	**3**	**2**	**7**	**12**	**89**	**101**	**5**	**96**	**101**

***neither induced nor augmented**

Specifically looking at the maternal complications (in addition to maternal deaths) by mode of delivery:

- 5 of 74 (6.8%) cases delivered by caesarean section had complications (2 of which were CVA and 2 were ARF).
- 3 of the 14 (21.4%) who had an instrumental delivery had complications (1 CVA and 2 PE)
- 4 of the 13 (30.8%) who had spontaneous vaginal delivery, had complications, all of which were pulmonary edema.

Table 14: Perinatal outcome (SB and early NND) in relation to mode of delivery

	Perinatal Outcome			
Mode	**SB N (%)**	**eNND n (%)**	**Alive n (%)**	**Total n (%)**
Caesarean	7 (63.6)	6 (75.0)	61 (63.3)	74 (69.2)
Instrument	0 (0)	1 (12.5)	13 (14.8)	14 (13.1)
SVD	4 (36.4)	1 (12.5)	14 (15.9)	19 (12.3)
TOTAL	**11 (100)**	**8 (100)**	**88 (100)**	**107 (100)**

The 19 perinatal deaths (11 as stillborn and 8 as early neonatal deaths) out of 107 represented a perinatal mortality rate of 17.8%. Most stillbirths and early neonatal deaths were in cases delivered by caesarean section (which also was the commonest mode of delivery).

Table 15: Maternal complications (including deaths), in relation to severity of hypertension

Severity of Hypertension*	Maternal Complication						Maternal Condition		
(mmHg)	CVA n	ARF n	PE n	Any n	None n	Total n	MD n	Alive n	Total n (%)
Normal	0	0	0	0	12	12	0	12	12 (11.9)
Mild	0	0	2	2	8	10	0	11	11 (10.9)
Moderate	1	0	1	2	24	26	1	24	25 (24.7)
Severe	2	2	4	8	45	53	4	49	53 (52.5)
Total	**3**	**2**	**7**	**12**	**89**	**101**	**5**	**96**	**101 (100)**

Hypertension

Normal <140/90 mmHg

Mild 140-150/90-100 mmHg

Moderate 150-170/100-110 mmHg

Severe >170/>110 mmHg

Of the 101 cases of eclampsia, over half (n=53, 52.5%) occurred in women who had severe hypertension at some stage during their stay. By contrast 11.9% and 10.9% had normal or mild blood pressure, respectively, despite having had an eclamptic fit - nevertheless they had proteinuria. None of the 12 cases with normal blood pressure had any complications, compared to 2/10 (20%), 2/26 (7.7%) and 8/53 (15.1%) of those with mild, moderate and severe hypertension respectively.

Of the 5 cases of eclampsia that resulted in maternal mortality, 4 had severe hypertension while 1 had moderate hypertension.

Table 16: Perinatal outcome in relation to severity of hypertension

Severity of Hypertension	Perinatal Outcome				
	SB n (%)	**NND n (%)**	**Any PNM n (%)**	**Alive n (%)**	**Total n (%)**
Normal	1 (9.1)	1 (12.5)	2 (10.5)	9 (4.6)	11 (10.3)
Mild	1 (9.1)	1 (12.5)	2 (10.5)	9 (4.6)	11 (10.3)
Moderate	2 (18.2)	1 (12.5)	3 (15.8)	25 (28.4)	28 (26.2)
Severe	7 (9.1)	5 (62.5)	12 (63.2)	45 (51.1)	57 (53.3)
Total	**11 (100)**	**8 (100)**	**19 (100)**	**88 (100)**	**107 (100)**

Worse perinatal outcome was associated with increasing severity of hypertension. Stillbirths and early neonatal deaths were similarly distributed among the hypertension categories.

Table 18: Maternal and perinatal outcome in relation to number of times hydralazine administered

Number of Times Hydralazine administered	Perinatal Loss	All Perinatal cases	percent of perinatal loss	Maternal Loss	All maternal cases
	n (%)	n (%)	n (%)	n (%)	n (%)
Nil	8 (42.1)	58 (54.2)	8/58 (13.8)	0	13 (12.9)
>once	11 (57.9)	49 (45.8)	11/49 (22.5)	5	88 (87.1)
Total	**19 (100)**	**107 (100)**	**19/107 (17.8)**	**5**	**101 (100)**

There was more perinatal loss in those who had required at least one dose of intravenous hydralazine (13.8% vs. 22.5%), however this was not statistically different as seen in the contingency table. The odds ratio suggests that not having hydralazine would lead to better perinatal outcome – but this was not significant. The need for requiring hydralazine is related to the degree of hypertension and its persistence. In these cases there would expected to be a worse outcome. Regarding maternal deaths – all cases occurred in those who had required hydralazine. This is also reflected in Table 15 that showed that maternal deaths only occurred in those with moderate and severe hypertension.

Contingency table

Hydralazine	Perinatal loss	No perinatal loss	Total
Nil	8	50	58
>once	11	38	49
Total	19	88	101

OR 0.55 0.18<OR<1.67 p=.24 ns

Table 18: Maternal and perinatal outcome in relation to number of times hydralazine administered

Number of Times Hydralazine administered	Perinatal Loss	All Perinatal cases	percent of perinatal loss	Maternal Loss	All maternal cases
	n (%)	n (%)	n (%)	n (%)	n (%)
Nil	8 (42.1)	58 (54.2)	8/58 (13.8)	0	13 (12.9)
>once	11 (57.9)	49 (45.8)	11/49 (22.5)	5	88 (87.1)
Total	**19 (100)**	**107 (100)**	**19/107 (17.8)**	**5**	**101 (100)**

There was more perinatal loss in those who had required at least one dose of intravenous hydralazine (13.8% vs. 22.5%), however this was not statistically different as seen in the contingency table. The odds ratio suggests that not having hydralazine would lead to better perinatal outcome – but this was not significant. The need for requiring hydralazine is related to the degree of hypertension and its persistence. In these cases there would expected to be a worse outcome. Regarding maternal deaths – all cases occurred in those who had required hydralazine. This is also reflected in Table 15 that showed that maternal deaths only occurred in those with moderate and severe hypertension.

Contingency table

Hydralazine	Perinatal loss	No perinatal loss	Total
Nil	8	50	58
>once	11	38	49
Total	19	88	101

OR 0.55 0.18<OR<1.67 p=.24 ns

Table 19: Maternal and perinatal outcome in relation to number of times diazepam administered

Number of Times Diazepam given	Perinatal Loss	All infants	Maternal loss	All cases
	n (%)	N (%)		
Nil	4 (21.1)	35 (32.7)	0	0
>once	15 (78.9)	72 (67.3)	5	101
Total	**19 (100)**	**107 (100)**	**5**	**101**

The number of times diazepam had to be given was indicative of the frequency of fits. There was greater perinatal loss in those who had required diazepam more than once (32.7 vs. 67.3%).

Contingency table

Diazepam	Fetal loss	No fetal loss	Total
Nil	4	31	35
>once	15	57	72
Total	19	88	107

OR 0.49 0.12<OR<1.77 p= 0.23 ns

DISCUSSION

This discussion focuses on highlighting important points presented in the results and also reviewing and clarifying them in light of potential interventions to reduce maternal and perinatal mortality and morbidity. Emphasis is made on relating these results to the previous studies on eclampsia reported from UTH.

There were 144 maternal deaths recorded at UTH in 1997. Five were due to eclampsia (3.4% of all maternal deaths), a further 7 (4.9%) were due to complications of pre-eclampsia (but excluding eclampsia). Most series on maternal mortality report the proportion of maternal mortality due to a combination of pre-eclampsia and eclampsia.

Incidence

Eclampsia occurs everywhere in the world, however, the incidence varies from one country to another depending of the availability of proper antenatal care. There seems to be a decline in the incidence throughout the world particularly in developed countries. The incidence of 0.24% (2.4 per 1000 births) in this present study compares favourably with figures from other countries. The previously published Zambian studies are summarised overleaf with respect to incidence:

Study and Year of Publication	Period	Deliveries	Cases of eclampsia	Eclampsia/ 1000 deliveries	Maternal deaths due to eclampsia	Case fatality
Mphahlele (1975) UTH, Lusaka	1971-3	32,011	50	**1.6**	1	2%
Davies (1976) Kitwe Mines	1971-5	14,430	5	**0.4**	1	20%
Chatterjee et al (1978) UTH, Lusaka	1975-6	35,024	79	**2.3**	13	16%
Thakkar and Wacha (1982) UTH, Lusaka	1979	19,272	46	**2.4**	3	6.5%
This study (Mukosa) UTH and Lusaka District	1997	41,449	101	**2.4**	5	5%

It may appear that the incidence of eclampsia has remained steady since the mid 70's, although there may have been deliveries not accounted for and do not appear in the denominator (deliveries). The Kitwe Mine hospitals had an incidence much lower than in Lusaka and again it is unclear whether this had to do with better maternity coverage in that city.

In developed parts of the world the incidence is much lower (often less than 1 per 1000 births). In Nigeria, Rehan (1982) had reported a high incidence of 18.6/1000 deliveries among Hausa women. Other Nigerian reports were intermediate: 9.3 per 1000 deliveries reported by Konje et al (1992) in Ibadan between 1975-86 and 4.2 per 1000 reported by Adetoro (1989). The incidence in Natal, South Africa was comparable to Lusaka (2.3 per 1000 deliveries – Moodley et al, 1983). Crowther (1982ii) in Harare, Zimbabwe had reported a lower incidence of 0.6 per 1000 deliveries. The trends in different countries and centres need to be reviewed to be able to state what is happening in their settings.

It is believed that access to maternity services and the ability to detect pre-eclampsia and intervene before eclampsia occurs has an important bearing on the incidence.

No obvious pattern could be detected regarding deaths and incidence at UTH in different months of the year. This has been previously addressed by Mphahlele (1975) and Crowther (1982ii) though the authors made no definite association.

DETERMINANTS OF MATERNAL MORTALITY

Case fatality

The maternal mortality due to eclampsia depends to a large extend on its severity and the willingness to deliver the fetus and placenta (if undelivered) within a reasonable time. In this study at UTH, the case fatality for eclampsia was 5% (5 maternal mortalities out of 101 cases of eclampsia). Mphahlele (1975) had reported one case fatality among the 50 cases of eclampsia at UTH (case fatality of 2%). Chatterjee (1978) had reported 13 maternal mortalities in the 79 cases at UTH between 1975-6 (case fatality of 16%). By contrast, Thakkar at UTH (1982) reported a case fatality of 6.5 % (3 mortalities of 46 cases). In Durban, South Africa, Moodley and Daya (1994) reported a case fatality of 8.9%. Douglas and Redman (1994) reported a lower case fatality of 1.8% in UK.

Plurality

As shown in Table 2, twin pregnancies had a higher incidence of eclampsia in this study (2.3 vs. 12.1 cases of eclampsia per 1000 singleton or twin deliveries, respectively). This is largely due to the higher incidence of pre-eclampsia occurring in multiple pregnancies. The case for vigilance of monitoring for pre-eclampsia is even higher in multiple pregnancies. It is interesting that, in this study, none of the perinatal mortality occurred

in the twin pregnancies and neither were there any maternal mortalities in this category. The multiple pregnancies are however at greater risk of all complications and other series reflect this.

Age distribution

As illustrated in Table 3, almost 45% of cases of eclampsia occurred in those aged below 20 years. In-fact, 11 of the 101 cases (10.9%) were in those younger than 16 years of age. The results on parity (Table 4) show that approximately 60% were primiparas (also young), who are known to be at risk of pre-eclampsia and eclampsia. This trend of young eclampsia patients has been shown in the other Zambian studies on eclampsia. Furthermore, Wadhawan (1982) had shown that 6% of those between 12-15 years old had 'toxaemia' as opposed to 0.3% of those between 12-19 years, illustrating that the younger the patients the more cases of pre-eclampsia and eclampsia that occurred. In this study, however, none of the maternal deaths occurred in those less than 20 years of age. This is different from the series reported by Chatterjee (1978) in which of the 13 cases of maternal mortality from the 79 cases, 8 were under 20 years of age.

Parity

Seven of the 9 complications in the primiparas were due to pulmonary edema (Table 4) and in-fact all cases of pulmonary edema occurred in primiparas. Primiparas also accounted for 2 of the 5 mortalities. However the analysis showed that, in this series, primiparity was not associated with an increased risk of maternal mortality compared to multiparas. Perhaps the numbers were too small for a meaningful comparison.

Gestation

Most of the cases of eclampsia occurred in those over 28 weeks gestation (Table 6), although 2 of the 5 cases of maternal death were in those less than 28 weeks gestation when they had eclampsia. In cases of severe pre-eclampsia presenting at lower gestation, the tendency to try and gain time for fetal maturity may result in a worse maternal outcome for those who eventually proceed to eclampsia. The disease process may also be more aggressive in those who get eclampsia at a lower gestation.

Booking status

Most cases of eclampsia (and 4 of the 5 deaths) occurred in those booked at clinics. This is also a reflection of the greater number of cases booked at clinics (Table 7). Only one case had not been booked. Interestingly, the complications of those cases of eclampsia booked at clinic were varied with CVA, ARF and PE all occurring. However in those cases that had been booked at UTH, PE was the main complication in those who had eclampsia. Compared to other studies, it appeared that there were very few cases that had not been booked for antenatal care. The data collection had not noted when the last antenatal visit was or whether the patient had been an inpatient at the time eclampsia occurred. Although data had been collected on residential status, this information proved difficult to quantify as the address may not necessary have had a bearing on 'high density or low density'. Other markers of socio-economic status may be more desirable.

Timing of first eclamptic fit

Table 8 shows that most cases of eclampsia occurred in the intrapartum period (46.5%) followed by the antepartum period (37.6%). However 15.8% of the cases still occurred in the postnatal period and continued care and vigilance of those with pre-eclampsia is

necessary. In cases of antepartum and intrapartum eclampsia, though fetal considerations are present, maternal considerations take priority. Although numbers are small, 3 of the 5 cases of maternal deaths after eclampsia occurred in those who had an intrapartum fit, and 1 each in those who had a fit in the antepartum and postpartum period. Although cases of eclampsia occurred in those who were booked at UTH (Table7), they did not result in maternal deaths. Table 9 shows, however, that the cases that had the first fit in the antepartum period had more complications (6 of 38 – 15.8%) as opposed to those in the intrapartum period (5 of 47 – 10.6% - all of which were pulmonary edema). This feature of the danger in the intrapartum period has been reported in other series as well (e.g. Ekwempu, 1982).

The table below shows that the risk of eclampsia in the postpartum period, compared to the antepartum and intrapartum periods, has decreased in Lusaka over the decades. However the risk is much greater in the intrapartum period.

Ratios of timings of eclampisa. Normalised to antepartum period

Study and publication	Period	Cases of eclampsia	A/P	I/P	P/P
Mphahlele (1975) UTH, Lusaka	1971-3	50	**1**	8.5	3
Chatterjee et al (1978) UTH, Lusaka	1975-6	7	**1**	2.7	1.3
Thakkar and Wacha (1982) UTH, Lusaka	1979	46	**1**	1.5	1.6
This study UTH and Lusaka District	**1997**	**101**	**1**	**1.2**	**0.4**

Midwives should be trained and prepared to deal with eclampsia occurring in labour and an emergency trolley should be readily available. Particular attention should be paid to the appropriate use of fluid regimens in the antepartum period and labour (e.g. for induction or augmentation) and postpartum in cases of pre-eclampsia and eclampsia. Apart from volume infused, electrolyte free fluids (e.g. dextrose) are particularly dangerous and can lead to pulmonary edema.

Fit frequency

Although 41 of the 101 cases had only one eclamptic fit 18 had between 3-5 fits and in-fact 4 had more than 5 fits. 2 of the 5 fits occurred in those who had only one fit but 3 in those who had between 3-5 fits (Table 10-11). This illustrates the need for enhanced care for those who have their first eclamptic fit, but also to consider prevention of further eclamptic fits. The drug of choice to treat and prevent further fits is magnesium sulphate (Manyemba, 2001; Duley and Gulmezoglu, 2002) though this is not routinely available at UTH.

Mode of delivery and management

Most obstetrician no longer believe in complete non-interference of pregnancy in eclampsia. It has been suggested that to improve the chances of the patient to survive eclampsia (in the event of it occurring in the antepartum or intrapartum period), the removal of the causative factor (fetus and placenta) must be effected expeditiously, before irreversible changes are produced in the vital organs. Artificial rupture of membranes followed by oxytocin or caesarean section, if labour is slow to progress, is now a common practice in some settings. Immediate caesarean section to decrease maternal and fetal mortality had been advocated by others. The current practice at UTH

is to stabilise the patient and to expedite (augment) if already in labour. If the cervix is unfavourable for induction and particularly in primiparas, caesarean section is often the common mode of delivery.

As noted in Table 12, there is a high proportion of cases that are delivered by caesarean (73.3%), including those cases that were in labour at time of eclampsia. Whereas most of the perinatal mortality was in this group, this was not so for maternal mortality (only 1 of the 5 cases who died had a caesarean section) (Tables 13 and 14). It appears that induction of labour is an important risk factor in cases of eclampsia. The decision for mode of delivery after eclampsia (if the fetus is not delivered) should be addressed seriously because of the implications for both fetal and maternal outcome.

Hypertension and Proteinuria

It was noted in Table 15 that 23 cases of eclampsia had normal or mild hypertension. This had previously been described by Thakkar and Wacha at UTH (1982) and by other authors. Maternal complications (including maternal deaths), not surprisingly, increased with increasing hypertension (Table 15). Similarly all cases of maternal mortality after eclampsia had 2+ or more of proteinuria (Table 17). Increased number of fits, uncontrolled hypertension and marked proteinuria lead to more adverse effects.

DETERMINANTS OF PERINATAL LOSS

Based on Table 2b, the 40,999 singletons, 496 twins and 4 sets of triplets constituted a total of 42,003 infants born. There were 728 stillbirths at UTH in 1997 and 305 in the clinics. The 11 stillbirths associated with eclampsia represent approximately 1% (11/1033) of stillbirths due to all causes, even though the cases of eclampsia only represent 0.24% (101/41,449) of all deliveries. Another 8 infants were early neonatal deaths (within 7 days of birth). The 19 deaths represent a perinatal mortality of 17.8% for the 107 infants born of eclamptic women.

Statistics are not routinely collected in all clinics and at UTH for an assessment of the overall perinatal mortality rate (stillbirths plus deaths within one week) to compare them with that due to eclampsia alone.

Regarding other centers and studies, the perinatal mortality is high in developing countries and generally lower in developed countries. It is difficult to compare between studies as there is wide variation in reporting. Some studies report perinatal mortality and neonatal mortality separately, corrected and/or uncorrected etc. None of the eclampsia cases had a fetus with a lethal congenital abnormality. There is a much higher perinatal mortality compared to maternal mortality. This is due, in part, to the need to deliver a premature infant in a case of eclampsia and the subsequent poor outcome in such infants. Stillbirths also feature prominently due to the effects of hypertension. In view of the potential for serious maternal morbidity and high incidence of maternal mortality, management decisions are made predominantly for maternal considerations.

Plurality

In this study, none of the cases of twin pregnancy complicated by eclampsia had an adverse perinatal outcome. The potential for this happening is high in view of the effects of eclampsia and also prematurity. The numbers may have been small in this series to reflect this. However, the potential is there in light of the fact that the incidence of eclampsia was 2.3 cases/1000 singleton deliveries, but 12.1 cases/1000 twin deliveries.

Parity

Overall, parity did not seem to have any impact on perinatal outcome (e.g. comparing primiparity vs. multiparity). However primpara had more early neonatal deaths than stillbirths and the converse was true for the multiparas. This could be accounted for by the fact that more of the primiparas were of earlier gestation and more of the multiparas had longer standing hypertension before eclampsia.

Mode of delivery

It was noted from Table 12 that there were 13 perinatal deaths of the 74 (17.4%) infants born after caesarean section. Also 1 of the 14 infants (5.3%) born after instrumental delivery, and 5 of 19 (26.3%) after vaginal delivery resulted in a perinatal death. It appears that vaginal delivery is unsafe for infants in women who have eclampsia, or that there was already an intrauterine death. However, other factors have to be taken into consideration e.g. timing of eclampsia (12 of the 19 perinatal deaths occurred in cases where the eclampsia occurred in the antepartum period), gestation, severity of hypertension and number of fits, in addition to the mode of delivery. Only one of the 19 infants died that had been born in a case where the eclampsia had taken place postpartum.

What the results do show is the high percentage of fetal and neonatal loss associated with eclampsia. Other series reflecting this are shown in the table below. Note that stillbirths were commoner than early neonatal deaths in Chatterjee's study of 1978 and also in this study.

Study and publication	**Period**	**Cases of eclampsia**	**Uncorrected perinatal deaths (ratio of SB:eNND)**
Mphahlele (1975) UTH, Lusaka	1971-3	50	21.6% 4:7 **(0.6:1)**
Davies (1976) Kitwe Mines	1971-5	5	Not stipulated
Chatterjee et al (1978) UTH, Lusaka	1975-6	79	(32.9%) 21:5 **(4.2:1)**
Thakkar and Wacha (1982) UTH, Lusaka	1979	46	30.4% 6:8 **(0.75:1)**
This study UTH and Lusaka	1997	101	17.8% 11:8 **(1.4:1)**
Rehan and Sani (1982 Nigeria	1982	138	30.9%
Moodley et al (1983) South Africa	1983	67	16.4%
Luan (1989) PR China	1973-87	106	2.8%
Cinotta and Ross (1996) Australia	1978-92	90	18.9%
Sibai (1981), USA	1977-80	67	8.6%
Douglas and Redman (1994) UK	1992	383	Approx 3%

Improved case management of eclampsia and preventing eclampsia in the first place is an effective strategy in reducing such a perinatal loss.

LIMITATIONS OF THE STUDY

Despite that the fact that charts were reviewed on a daily basis, there was still incompleteness of records, particularly of antenatal cards, partogramme and maternal cases records. Some were missing even after a day or so. This could have been minimised by having a standard sheet available for the attending midwife and doctor to fill in as soon as an event of eclampsia were to take place.

Furthermore, the discussion had provided an opportunity to assess factors that contribute to and determine the outcome in cases of eclampsia at the UTH. The instrument for collecting the data was based on the literature review but could still have been improved upon. There were still aspects of eclampsia that were not fully explored. This included factors like events at the last antenatal care, decision making by patient and relatives regarding symptoms and signs suggesting pre-eclampsia and eclampsia, decision making by the midwives and doctors, grade of staff making decisions on management, availability of drugs and resuscitation equipment, analysis of factors that led to pulmonary edema (e.g. fluid overload or use of inappropriate fluids) and the role of intensive care.

CONCLUSIONS

The study of eclampsia in Lusaka for 1997 showed the incidence to be 2.4 per 1000 deliveries with a case fatality of approximately 5%. There was no consistent month-to-month trend in incidence of cases of eclampsia. Twin pregnancies had a five-fold increased risk of eclampsia, although there was no increased maternal or perinatal mortality. Almost 11% of cases were less than 16 years of age and a further 33.7% were between 17-19. Maternal deaths occurred more frequently in those who were older. Parity did not appear to affect maternal or perinatal outcome though earlier gestation affected both maternal and perinatal outcome adversely. Cases presented more commonly in the intrapartum period and this was associated with a higher case fatality. Most cases had less than 3 fits though fit frequency was not associated with adverse outcome. Almost 75% of cases were eventually delivered by caesarean section, though only one maternal mortality (20%) occurred in this group. Nevertheless, almost 70% of perinatal losses were in those who had a caesarean section. Induction of labour was found to be associated with a worse outcome. The commonest type of complication was pulmonary edema, followed by cardiovascular accident and acute renal failure. Over half the cases had severe hypertension and 4 of the 5 deaths (and over half of the perinatal deaths) and most of the complications occurred in this group. The study has shown that the incidence of eclampsia has not decreased since 1979 in Lusaka although the perinatal deaths have decreased but still remain high at 17.8%.

RECOMMENDATIONS

1. All pregnant women, and particularly primigravidas, should be encouraged to book at the hospital or clinic and to have regular blood pressures taken. Early detection of pre-eclampsia should lead to consideration of admission to hospital.
2. There should be increased vigilance of hypertension in cases of multiple pregnancies to monitor for the development of pre-eclampsia and potential for subsequent eclampsia.
3. Transport of cases of eclampsia from the district should be expeditious. A trained member of staff should accompany the patient and take precautions of keeping the airway open and limiting intravenous fluids.
4. The decision for mode of delivery should be discussed with senior obstetricians. Vaginal delivery should be allowed in cases of progressing labour, unless the obstetrical condition requires caesarean section.
5. Effective anticonvulsants must be available and used in times of eclampsia. Consideration should be made of constant use of magnesium sulphate.
6. A fully stocked emergency trolley should be available in strategic areas of the labour ward and theatre.
7. A regular audit should be made of any case of eclampsia to improve management. Staff should be familiar with protocols to manage eclampsia. Findings of audit should be regularly provided to staff to show strengths and weaknesses in management.

REFERENCES

Adetoro OO. A sixteen-year survey of maternal mortality associated with eclampsia in Ilorin, Nigeria. International Journal of Gynaecology and Obstetrics. 1989;30(2):117-21.

Adetoro OO. The pattern of eclampsia at the University of Ilorin Teaching Hospital (UITH) Ilorin, Nigeria. International Journal of Gynaecology and Obstetrics. 1990;31(3):221-6.

Ahmed Y, Mwaba P, Chintu C, et al. 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. International Journal of Tuberculosis and Lung Disease. 1990;3(8):675-80.

Boes EG. Maternal mortality in southern Africa, 1980 - 1982. Part II. Causes of maternal deaths. South African Medical Journal. 1987;71(3):160-1.

Chatterjee TK, Hickey MU, Chikamata DM. A review of 79 cases of eclampsia at University Teaching Hospital, Lusaka. Medical Journal of Zambia. 1978;12(3):77-80.

Chesley LC. Hypertensive Disorders in Pregnancy. Appleton Century Crofts, New York, 1978.

Chesley LC. History and Epidemiology of Pre-eclampsia-Eclampsia. Clinical Obstetrics and Gynecology. 1984;27(4):801-20.

Chesley LC, Cosgrove SA, Preece J. Hydatidiform mole, with special reference to recurrence and associated eclampsia. American Journal of Obstetrics and Gynecology. 1964;32:311-20.

Chun D, Braga C, Chow C, Lok L. Clinical observations on some aspects of hydatidiform moles. Journal of Obstetrics and Gynaecology of the British Commonwealth. 1964;71:180-4.

Cincotta R and Ross A. A review of eclampsia in Melbourne: 1978 - 92. Australian and New Zealand Journal of Obstetrics and Gynaecology. 1996;36(3):264-67.

Crowther CA (i). Management and pregnancy outcome in eclampsia at Harare Maternity Hospital. Central African Journal of Medicine. 1985;31(6):107-9.

Crowther CA (ii). Eclampsia at Harare Maternity Hospital: an epidemiological study. South African Medical Journal. 1985;68(13):927-9.

Davis VE. Antenatal care and eclampsia. Medical Journal of Zambia (letter). 1976;10(4):115-6.

Douglas KA and Redman CW. Eclampsia in the United Kingdom. British Medical Journal. 1994;309(6966):1395-400.

Duley L and Gulmezoglu AM. Magnesium sulfate compared with lytic cocktail for women with eclampsia. International Journal of Gynaecology and Obstetrics. 2002;76(1):3-8.

Eden JW. Eclampsia: A commentary on the reports presented to the British Congress of Obstetrics and Gynaecology, June 29, 1922. Journal of Obstetrics and Gynaecology of the British Empire. 1922;29:386-401.

Ekwempu CC. Maternal mortality in eclampsia in the Guinea Savannah region of Nigeria. Clinical and Experimental Hypertension. Part b, Hypertension in Pregnancy. 1982;B1(4):531-7.

Giri AK. Prevention of maternal mortality in eclampsia. Journal of The Indian Medical Association. 1995;93(3):85-6.

Halushka PV, Dollery CT, MacDermott J. Thromboxane and prostacyclin in disease: a review. Quarterly Journal of Medicine. 1983;208:461-70.

Hickey MU and Kasonde JM. Maternal mortality at the University Teaching Hospital, Lusaka. Medical Journal of Zambia. 1977;11(3):74-8.

HMSO. Reports on confidential enquiries into maternal deaths in England and Wales, 1957, 1977, 1981. HMSO, UK.

HMSO. Reports on confidential enquiries into maternal deaths in UK, (1994-6). HMSO, UK. 1998.

Jamelle RN. Eclampsia -a taxing situation in the Third World. International Journal of Gynecology and Obstetrics. 1997;58(3):311-2.

Konje JC, Obisesan KA, Odukoya OA, Ladipo OA. Presentation and management of eclampsia. International Journal of Gynecology and Obstetrics. 1992;38(1):31-5.

Low JJ, Yeo GS. Eclampsia - Are we doing enough? Singapore Medical Journal. 1995;36(5):505-9.

Luan JQ. The treatment of eclampsia by early interruption of pregnancy: a 15-year review. Asia Oceania Journal of Obstetrics Gynaecology. 1989;15(1):33-5.

Makhseed M, Musini VM. Eclampsia in Kuwait 1981-93. Australian and New Zealand Journal of Obstetrics and Gynaecology. 1996;36(3):258-63.

Manyemba J. Magnesium sulphate for eclampsia: putting the evidence into clinical practice. Central African Medical Journal. 2000;46(6):166-9.

Mhango C, Rochat R, Arkutu A. Reproductive mortality in Lusaka, Zambia, 1982-1983. Studies in Family Planning. 1986;17(5):243-51.

Moodley J; Naicker RS; Mankowitz E. Eclampsia - a method of management. A preliminary report. South African Medical Journal. 1983;63(14):530-5.

Moodley J and Daya P. Eclampsia: a continuing problem in developing countries. International Journal of Gynecology and Obstetrics. 1994;44(1):9-14.

Moodley D, Payne A J, Moodley. Maternal mortality in Kwaazulu/Natal. Journal of Tropical Doctor. 1996;26(2):50-54.

Mphahlele M. Clinical experience of eclampsia at the University Teaching Hospital, Lusaka. An analysis of 50 cases. South African Medical Journal. 1975;49(3):82-4.

Mwinyoglee J, Amoko DH, Simelela N, Marivate M. Eclampsia at Ga-Rankuwa Hospital. South African Medical Journal. 1996;86(12):1536-9.

Obed SA, Wilson JBB, Ellins TE. The analysis of Eclampsia at Karle Bu Teaching Hospital Accra Ghana in 1991. International Journal of Gynecology and Obstetrics. 1994;45(2):97-103.

Odum CU, Akinkugbe A, Emuveyan EE. Mortality in eclampsia in the Lagos University Teaching Hospital (LUTH); comparison of the recent 10-year period (1977-1986) with the previous 10-year period (1967-1976). West African Journal of Medicine. 1990;9(3):157-63.

Odum CU. Eclampsia: an analysis of 845 cases treated in the Lagos University Teaching Hospital, Nigeria over a 20-year period. Journal of Obstetrics and Gynaecology of Eastern and Central Africa. 1991;9(1):16-20.

Ozumbia BC, Ibe AI. Eclampsia in Enugu, Eastern Nigeria. Acta Obstetricia et Gynecologica Scandinavica. 1993;72(3):189-92.

Perucca E, Cazenave H, Fernandez A, Barrera C. Eclampsia: 8-year experience. Revista Chilena de Obstetricia y Ginecologia. 1994;59(2):79-86.

Porozhanova V and Bozhinova S. The perinatal outcome in adolescents with eclampsia and the HELLP syndrome. Akush Ginekol (Sofia). 1996;35(1-2):14-16.

Pritchard JA, Cunningham FG, Pritchard SA. The Parkland Memorial Hospital protocol for treatment of eclampsia: evaluation of 245 cases. American Journal Obstetrics and Gynecology. 1984;148(7):951-63.

Redman CW. Eclampsia still kills. British Medical Journal. 1988;30;296(6631):1209-10.

Rehan N and Sani S. Eclampsia in Hausa women. Journal of Obstetrics & Gynaecology of Eastern and Central Africa. 1982;1(4):152-5.

Sanchez-Torres F and Santamaria A. Histopalogia renal en la gestacion molar. Rev Obstet Ginecol Venezuela. 1965;25:657-69.

Sapre S and Joshi V. 3 E's for safe motherhood. Journal Of Obstetrics, Gynaecology and Family Welfare. 1996;2(10):7-11

Sibai BM, McCubbin JH, Anderson GD, Lipshitz J, Dilts PV Jr. Eclampsia. I. Observations from 67 recent cases. Obstetrics and Gynecology. 1981;58(5):609-13.

Sibai BM. Pre-eclampsia-Eclampsia. Current Problems in Obstetrics Gynecology and Fertility. 1990;13:1-45.

Sinclair JR, Watters DA, Bagshaw A. Non-traumatic coma in Zambia. Tropical Doctor. 1989;19(1):6-10.

Swain S, Ojha KN, Prakash A, Bhatia BD. Maternal and perinatal mortality due to eclampsia. Indian Pediatrics. 1993;30(6):771-3.

Taner CE, Hakvedi AU, Aban M, Erden AC, Ozelbayakal U. Prevalence, management and outcome in Eclampsia. International Journal of Gynecology and Obstetrics. 1996;53:11-15.

Templeton AA. and Campbell DM. A retrospective study of eclampsia in the Grampian region, 1965-1977. Health Bulletin (Edinb.). 1979;37(2):55-9.

Thakkar U and Wacha DS. Eclampsia in Lusaka. Medical Journal of Zambia. 1981;15(4):59-64.

Wadhawan S, Narone RK and Narone JN. Obstetric Problems in the Adolescent Zambian Mother Studied at the University Teaching Hospital, Lusaka. Medical Journal of Zambia. 1982;16(3):65-68.

Wightman H, Hibbard BM, Rosen M. Perinatal mortality and morbidity associated with eclampsia. British Medical Journal. 1978;22;2(6132):235-7.

APPENDIX

DATA COLLECTION INSTRUMENT

1. Study identification number:.....

2. Residential Area.....

   a. High density

   b. Low density

3. Age.....

4. Parity 0, 1, 2 etc.....

5. Booking status.....

   a. Clinic referral

   b. UTH booked

   c. Not booked

6. Blood pressure (highest recorded) :.....

   a. Normal: <140/90 mmHg

   b. Mild: Systolic 140-150 or diastolic blood pressure 90-100 mmHg

   c. Moderate: Systolic 150-170 or diastolic pressure 100-110 mmHg

   d. Severe: Systolic > 170 or diastolic blood pressure 110 mmHg

7. Proteinuria (highest recorded)

   a. Trace

   b. 1+

   c. 2+

   d. 3+

   e. 4+

8. Edema

   a. Ankle

   b. Knee level

   c. Abdominal wall

9. Gestational Age: .....

   a. 13-28 weeks

   b. 28 weeks+

10. Plurality (number of fetuses):

   a. Singleton

   b. Multiple

11. Number of eclamptic fit(s)

   a. 1

   b. 2

   c. 3

   d. 4

   e. 5 or more

12. History of epilepsy

   a. Yes

   b. No

   If Yes, year of last fit:.....

13. Number of times diazepam given:.....

14. Number of times hydralazine (intravenous) given.....

15. Type of Labor

    a. Spontaneous

    b. Augmented

    c. Induced

16. Mode of delivery

    a. SVD

    b. Instrumental

        i Forceps

        ii Vacuum

    c. Caesarean Section

17. Fetal outcome

    a. Alive

    b. Stillbirth

18. Maternal outcome

    a. Alive

    b. Dead

19. Maternal complication

    a. Cardiovascular accident (CVA)

    b. Pulmonary edema (PE)

    c. Acute renal failure (ARF)

    d. Other

    e. No complication