NEONATAL OUTCOME AMONG LOW BIRTH WEIGHT AND FACTORS RELATED TO OUTCOME.

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I declare that this Dissertation has never been submitted for a degree in any other University.

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ABBREVIATIONS

ABD - Assisted breech delivery

APH - Antepartum Haemorrhage

BOH - Bad Obstetric history

CCM - Chama cha Mapinduzi

CPD - Cephalo-pelvic disproportion

EBM - Expressed Breast Milk

EPHG - Edema, Proteinuria, Hypertension during Gestation (Eclampsia)

IMR - Infant Mortality Rate

LBW - Low Birth Weight

LCVE - Low cavity vacuum extraction

LSCS - Lower Section Caesarian Section

MMC - Muhimbili Medical Centre

NEC - Necrotizing enterocolitis

RDS - Respiratory distress syndrome

SFD - Small for date

SVD - Spontaneous Vaginal delivery

TBA - Traditional Birth Attendant

TTNB - Transient Tachypnoea of New-born

ABSTRACT

Low Birth Weight contributes to a high Neonatal and Infant Mortality rate.

A study on the neonatal outcome among LBW was carried out for 4 months from September 1990 to January 1991,with the aim of finding the major causes of morbidity and mortality, and factors related to the same.784 LBW infants and 612 infants 2500 grams and above were studied.These infants were followed up for 4 to 6 weeks.

The incidence of LBW was 16%

The mean birth weight was 2854 grams,lower than that seen in developed countries.

The mortality among LBW was 37% and morbidity 55.6%, contributing to 73% of morbidity and 63.6% of mortality in general.

LBW carried a 3 fold risk of morbidity and a 7 fold risk for neonatal deaths.

The mortality was significantly related to the maturation and birth weight of the neonate.

Infections,Birth Asphyxia and Jaundice were the common causes of morbidity.The LBW were also prone to Hypothermia and Hypoglyceamia.The incidence of RDS was 2.8% and for Congenital anomalies 1.6%.

Prematurity,Birth Asphyxia and Infections were the commonest causes of mortality.RDS, hypoglyceamia, hypothermia and apnoeic attacks were significantly associated to mortality in LBW infants.

Factors significantly associated with the adverse outcome were; maternal age, antenatal care, maternal aneamia and EPHG, Breech delivery, Low Apgar score, prematurity, presence of congenital anomaly.

Deliveries conducted at home by TBA or relatives carried a high mortality.

The mortality after discharge was 12.3% i.e. 42 out of 341 deaths.

Majority of the deaths occured in the first week (83%) thus a major contribution to Early Neonatal Deaths.

Increased antenatal care, intrapartum and neonatal services are necessary for improving the outcome of LBW and reducing the Neonatal Death Rates.

INTRODUCTION AND REVIEW OF LITERATURE.

The Infant Mortality Rate (IMR) is one of the most commonly used indicator of health and economic development of a community.

Neonatal mortality rate (NMR) defined as the number of deaths occurring during the first 28 days of life per 1000 live births, contribute to about 50-70% of infant Mortality Rate(IMR).(1).

Low Birth Weight (LBW) defined as any live infant with a birth weight of less than 2500 grams (2), is the most important determinant of neonatal mortality, accounting for 20-70% of all neonatal deaths (1,3), and hence plays a major role in contributing to IMR.

LBW is a heterogeneous group and is further classified according to the gestation age, weight and sex of a particular standard in a population.Small for date (SFD) also termed as small for gestation age (SGA) are those with birth weight below 10th centile.Large for gestational age (LGA) have birth weight above the 90th centile and Appropriate for gestational age (AGA), have birth weight between 10th to 90th centile (4,5,6).LBW infants comprise both the pre-term and term infants, and are at an increased risk of perinatal and neonatal problems.Some post term infants are also LBW.Mortality varies with birth weight and gestational age, the highest risk being in those below 34 weeks of gestation

and those below 1500 grams.(7). The pre-term infant (defined as any infant born before 37 completed weeks of gestation), is more prone to intrapartum asphyxia, respiratory distress syndrome, apnoea, hypothermia, jaundice and kernicterus, feeding difficulties, increased liability to infection, bleeding tendency, intraventricular haemorrhage, necrotizing enterocolitis, whereas the SFD infant is more prone to hypoglycaemia, polycytheamia, hypothermia and pulmonary haemorrhage .Respiratory distress syndrome occurs in SFD infants only if they are extremely premature also.(8,9)

Although reliable information on birth weight is seldom systematically collected for most developing countries in Africa and elsewhere, several studies indicate that the incidence has not changed for the last two decades(16).For populations where the incidence of LBW is more than 10% majority are SFD and for those at low rates of 5-7%, truly prematures are in majority.(4,7)

Whatever the incidence of LBW infants; their contribution to mortality both in developed and developing countries is very high; being greatest during the perinatal period.In U.S.A. in 1980 ; out of 45,600 deaths, 19,544 deaths were related to LBW. They contributed to 70.6% of perinatal deaths and 42.3% of the neonatal deaths (10).

In U.K.(Hammersmith Hospital London) in 1979-80, out of 2355 live births ,329 weighed below 2500 grams constituting 14% and this contributed to 82% of the early neonatal deaths, (11) similar findings were seen in Canada(1985) where 75% of early neonatal deaths are attributable to LBW or prematurity (12).

Whereas in Kenya in 1975 among 1595 live births under study 279 were LBW (17.6%).73(26%) out of these infants died and these contributed to 73 out of 85 death which is 85% of neonatal deaths (14).

In Nigeria (1975-76) among 287 LBW infants admitted in the Special Baby Care Unit, 68 (21%) died during the neonatal period, of which 50 (68%) died during the first 2 days, although in this study less than 2000 grams was taken as LBW, giving an incidence of only 8.7% (13).In the year 1977-78,out of 336 neonatal deaths,227 (67.6%) were LBW who constituted 13% of all live births.(24)

As in most developing countries, there is very limited information on NMR in Tanzania. Most of the data which are hospital based lack reliable information on the incidence of LBW and its contribution to the neonatal outcome. However, the few available studies indicate that the incidence of LBW in Tanzania is between 13-15% (16,17,18,19,20).

Studies done in Iringa region,(Tanzania)1988,showed the incidence of LBW to be 13% and these infants contributed to 50% of the perinatal mortality (17). In Dar es Salaam,the incidence of LBW in 1990 is approximately 15.2% (21) but its contribution to mortality is not known. However in a study done at Muhimbili Medical Centre in 1975, among 973 LBW admitted to the Neonatal Unit 323 (30%) died (22). The Annual Statistics for the year 1989-1990 of the same unit show that 21.5% of admissions were LBW infants and these contributed to 40.5% of overall mortality,which included deaths due to respiratory distress syndrome.(23).

The contribution of LBW to mortality is relatively well-established, but not its contribution to morbidity.This is due to lack of population based longitudinal studies which are not likely to become available in developing countries for some time because of limited facilities (7,24).

Although most of the available information on morbidity is also hospital based, nevertheless it enlightens on the possible areas of interventions which might be needed For instance prevention of septiceamia and birth asphyxia;which were among the commonest causes of morbidity in DaresSalaam (22).These also contributed to a high mortality in Dar es Salaam and Nigeria. (22,13).Neonatal mortality was significantly reduced when selective measures for these causes were provided in Nigeria in 1977.(24).

Beside Birth weight and gestational age, several factors are associated with the incidence and adverse outcome of LBW infants. Some of these are;late or too few attendance at the antenatal clinics, maternal age, parity, antenatal complications like EPHGestosis and antepartum haemorrhage, place of delivery, method of delivery, mode of presentation and birth attendant.Others include low APGAR score at 5 minutes, the duration of transfer to the neonatal unit, sex, multiple births and presence of congenital anomalies.

Despite improved coverage of antenatal clinics, there is hardly any change in the incidence of LBW infants(19).The incidence has not changed for the last 15 years in Tanzania (16,17,18,19,20.).Antenatal care is one of the intervention for lowering the infant mortality.Perinatal morbidity and mortality are high in pregnant women who fail to obtain adequate medical care in early pregnancy.(26).Although worthwhile in other respects,antenatal care have not yet proved to be an effective means of reducing the incidence of LBW at national level, thus indicating that factors related to LBW such as adverse socio-economic factors, maternal age, multiple births, parity, high infant mortality and health education, literacy and level of antenatal care need to be considered (10,20,25).

Maternal age and parity influences the incidence of LBW and neonatal outcome, this has been documented in several studies (26).70% of primiparae were below 20 years and the incidence of LBW was high among them as compared with those between 26 and 30 years as seen at MMC hospital in Dar es Salaam in 1978.(55).In Kenya, 1975, the infant mortality rates were high (34.7%) in those born to mothers below 20 years and in primiparae (32.9%) and low among those between the age 21 to 35 years and birth order 2 to3.(14)

Among the antenatal complications the widely studied is EPHG and hypertensive disorders of pregnancy, which influence the incidence and also the outcome of LBW .One such study in Spain ,showed that intra-uterine growth retardation occurred in 41%, low APGAR Scores at 5 minutes in 12.6% and neonatal morbidity in 44% of cases with severe EPHG.(27).In Tanzania, 1984, out of 305 infants of mothers who had hypertension 121 (39.7%) were LBW as compared to 8.1% among those who were normotensive.(56)

The influence of the place of delivery depends on whether it was conducted at home or delivered in the peripheral hospital or the referral centre.This has a bearing on the time taken for the transportation of the infant and the distance from the centre.

However, in Nigeria(1974),although 30% of the neonates admitted in the unit came from a distance of more than 10 miles this had no apparent effect on the early mortality.Infants are brought here from as far as Bunju and Kisarawe which are 20 and 50 miles respectively.(29).Among 50 infants admitted at the Kenyatta National Hospital from outside the hospital, 22 died(44%) whereas only 63 out of 1545 (4.1%) among those delivered at the same hospital died thus the deliveries from outside posed a ten fold risk of death.However among LBW infants, 53 out of 230 born at the hospital died(22.6%),while 21 out of 49 (43%) from outside the hospital died which shows only a two fold risk.(14)

It is known that the method of delivery and presentation play a role in the outcome (31,32).Apart from LBW,breech deliveries accounted for 34% of deaths while only 11% among the others in Nigeria.(13)

Low APGAR score (indicating the level of birth asphyxia), also influences the outcome (33).

The mortality in multiple gestation is higher than in singleton gestation, the relative risk of early neonatal deaths for twins was seven times that of singleton infants in Jamaica in 1986 (34).

Perinatal and Neonatal intensive care has had a significant impact on lowering the infant mortality and increasing survival of LBW infants, there is sufficient information in this regard from developed countries (7,35,36). In New York, U.S.A., depending on the level of intensive care, those who received intensive care whereby entire spectrum of medical and surgical services were available, the mortality rates were 128.5 per 1000 as compared to lower levels of care with a mortality of 168 per 1000 (36).

Even among developing countries , for example, in Libya, the Perinatal Mortality Rate declined from 37.4% to 27.5% after the introduction of intensive neonatal care although the study does not indicate the level of care (15).

However no intervention programme has yet been able to decrease deaths among neonates born with a birth weight of less than 1200 grams .(7,36,37).

Intensive Neonatal care is extremely expensive, for instance a neonatal incubator costs approximately 1.2 m T.Shs.and an incubator for below 2000 gram infant costs 0.32 m T.Shs(personal communication), besides it needs more trained personnel and many developing countries cannot afford.

Nevertheless, the survival of LBW infants can be improved by simple principles of nursing, warmth, cleanliness, breast feeding, control of sepsis and early identification of problems which can be remedied promptly such as that seen in Colombia 1985. (38,53).

Even small improvements in this care will be of importance as over 140,000 LBW are born each year in Tanzania where neonatal care is still in its infancy and neonatal intensive care still very far (38).

This study aims at determining the contribution of LBW to mortality and morbidity, to find out the relationship of various factors mentioned above to the outcome and provide information on possible interventions within our reach to increase the survival of these infants and thus reduce the IMR.

STUDY OBJECTIVES

BROAD OBJECTIVE.

To study the Neonatal Outcome among Low Birth Weight (LBW) babies admitted in the Neonatal Unit at the Muhimbili Medical Centre (MMC).

SPECIFIC OBJECTIVES.

1. To determine the birth weight in relation to Gestation Age.
2. To determine the outcome in terms of morbidity and mortality in relation to Gestation Age and Birth Weight
3. To find the relationship between maternal factors and other factors to the outcome of Low Birth Weight infants.
4. To assess the average duration of stay in the unit and the age at death.
5. To compare the outcome among LBW babies born at Muhimbili Medical Centre and those born outside.

MATERIALS AND METHODS.

The study was a prospective study carried out for 4 months between September 1990 and January 1990 at the Neonatal Unit and High Risk Neonatal Clinic (Special Baby Care Clinic) at the Muhimbili Medical Centre, Dares Salaam.

Dar es Salaam has a population of about 2-2.5 million, (39) mostly of Bantu descent,and an area of 1393 square kilometres, with 3 districts, namely Ilala, Kinondoni, and Temeke (40). Each district has a Government Maternity Unit. The number of deliveries annually are approximately 20,000 at MMC, 12,000 in Ilala district, 9000 in Kinondoni district and 12,000 in Temeke district. Approximately 3600(7%) deliveries take place in private charitable hospitals and clinics.(21)

MMC is the only referral and teaching hospital and the neonatal unit is the only special baby care unit in Dares Salaam. The Neonatal Unit has a 70 bed Ward which admits newborns babies from within the hospital and those who have problems requiring special care from outside the hospital. The annual admissions to the unit is about 5000 infants with a substantial proportion (45%) of babies admitted for routine care often for 1-2 days. The unit

offers special baby care which includes resuscitation measures feeding the newborn and monitoring their growth,encouraging the mothers to lactate, health education of mothers to care for their newborn babies,teaching them simple procedures like nasogastric tube feeding suction,stimulating apnoeic attacks and detecting signs and symptoms of illness.The unit also provides measures for prevention and early treatment of sepsis,control of temperature and institutes specific measures where indicated,for example phototherapy and exchange transfusion for hyperbilirubinaemia or surgical intervention in conditions like duodenal atresia and other malformations which requires surgery.Total Parenteral Nutrition, Mechanical Ventilation and Incubator care is not available at the unit.

<u>The criteria for admission to the Neonatal Unit.</u>

1. All infants with a birth weight of less than 2500 grams.
2. Infants with low APGAR Scores of less than 7.at 5 minutes.
3. Infants born by Caesarian section, Vacuum extraction and breech delivery, abandoned babies and orphans.
4. Infants with feeding problems due to various reasons for example cleft palate.
5. Sick newborns.

SAMPLE SIZE ESTIMATION.

The prevalence of LBW in the unit per month is about 20-30% (According to the monthly statistics). For the purpose of this study 20% was assumed in the study population. Prevalence of morbidity (disease) is about 15%. Taking a case control of 1:1 and alpha level of 0.1, 579 cases were required to detect a risk ratio of 1.5 with 80% power. Based on the 1:1 ratio 579 controls were required. Assuming 10% loss between discharge and follow up, 639 cases and 639 controls were required for study.(41)

This has been obtained from the formula:

$$n = \frac{[\, Zb\sqrt{2pq} + Zb\sqrt{piqi + poqo}\,]^2}{[pi - po]^2}$$

p = prevalence of exposure to cases.

po = prevalence of exposure to controls

pi= combined prevalence

qi = 1-pi;qo=1-p;Za =precision;Zb =power;n = sample size.

Selection of Cases.

The study sample comprised all infants below 2500 grams admitted at the unit, which included those delivered at the maternity unit, those referred from other centres and those delivered at home.

Selection of controls.

Equal number of infants above 2500 grams admitted for various reasons, admitted during the same time, born at the maternity unit.These outnumbered the cases and therefore only simultaneous admissions were taken.

ON ADMISSION.

The details of antenatal, intrapartum care and relevant history was obtained from the mother, the antenatal clinic card, partograms and concerned medical personnel (or relatives) attending the delivery.

All the newborns under the study were seen by the author himself and supervised by the neonatologists working in the unit.Every neonate was examined thoroughly by the attending doctor.Clinical criteria were utilised for diagnosis and relevant investigations carried out when needed (44).

Gestation Age assessment was done at 4 to 6 hours after delivery and within 24 hours, to the nearest 2 weeks using the Dubowitz method,for sick babies only the external criteria by Parkins was used.(Appendix I,II).The clinical criteria was considered more reliable because there was a high discrepancy when menstrual dates were considered.

Weight of the undressed baby was taken using a standard beam balance (seca) to the nearest 10 grams.

Daily clinical progress was noted and the management reviewed accordingly.

The following Discharge criteria was used:

1. When the mother and the infant are well.
2. For LBW infants, when the infant tolerates feeds and is gaining weight.
3. When there are no signs of active illness, with a stable temperature and good activity.
4. For those below 1000 grams, when the weight is 1200 grams or more.

FOLLOW-UP.

Babies were seen between 4 and 6 weeks at the High Risk Neonatal Clinic and aimed at checking the growth in terms of weight, length, and head circumference.The aim was to identify problems,initiate immunization and iron suplementation. Those who failed to turn up were followed up at home.

Deaths.

In case of death occurring in the unit, cause of death was established on clinical judgement, relevant laboratory information, circumstances of death and underlying cause. For deaths occurring at home the cause of death was established in similar lines.Causes of death were classified according to WHO Manual of the International Statistics Classification of Diseases.(2).No post-mortems were done because of social reasons.Some infants were brought in moribund state.The exact time of death was not possible to be recorded in all cases, but the nearest time of death was recorded.Duration of days lived was noted. This allowed classification of deaths as Early Neonatal Deaths and Late Neonatal Deaths.

Data collection and Analysis.

All data was gathered in a questionnaire (Appendix II). Record on the total number of live birth with sex and weight distribution was obtained from the midwifery book of the Maternity unit.

Data was entered and analysed in the computer using the SPSS/PC+ (Statistical Package for Social Sciences/Personal Computer). The Chi square test,Correlation coefficient and Odds Ratio were used to analyse the data.

Limitations.

Since the controls comprised of admissions to the unit, most of them had an underlying maternal problem but considering that the LBW infants will also had underlying problems they will thus neutralise.

Most normal neonates are discharged from the postnatal wards even before completing 12 hours, whereas only 111 out of 730 (15%) of LBW were discharged from the postnatal wards, most of them were admitted to the neonatal unit, hence the weight recording interviewing and gestation age assessment would not be uniform, therefore the controls in study were found to be suitable, although biased to some extent.

RESULTS.

Total number of live births during the study period at the MMC Maternity unit were 4561,of which 730 were LBW,thus the incidence of LBW at the centre was 16% .

Total number of admissions at the Neonatal Unit during the same period was 1706,with 46% being LBW infants.Among these 784 LBW infants,105 were delivered at the district Maternity units and 62 were home deliveries;619 were fro the hospital's Maternity unit.

1396 infants were studied;784 LBW and 612 control infants.

The mean birth weight in the general population was 2290 grams;1942 grams for LBW infants and 2854 grams among term infants.The range was 320 - 5290 grams.

The mean gestation age was 36 weeks,the range was 20 - 44 weeks.3.8% of infants in the control group were preterm infants between 33and 36 weeks.12% of LBW were below 28 weeks,60% were preterm infants and 28% were term infants.

Although male infants showed a slightly higher adverse outcome this was not significant and therefore both sexes were studied together.The characteristics of infants by sex, weight and outcome are shown in Table 1.

The characteristics of 1315 mothers of the infants' under study in respect to age and parity are shown in Table 2.The mean maternal age was 24 years ,the youngest mother was 14 and the eldest was 43 years.It was the first delivery for 65% of the mothers.265 (20.1%) of the mothers were teenagers.

Mothers of 86 infants(6%) did not attend Antenatal clinics.44% of those who attended had one or more problems.

Table:1.

Characteristics of the infants by sex, weight and mortality.

	Male			Female			Total		
	Adm	Died	%	Adm	Died	%	Adm	Died	%
LBW	348	144	41	436	147	34	784	291	37
Control	353	33	9.3	259	17	6.6	612	50	8
Total	701	177	25.2	695	164	23.6	1396	341	24.4

Table:2

Characteristic of mothers by age and parity.

Age	parity			Total	%
	1	2-4	>=5		
14-18	262	3	-	265	20.1
19-35	589	307	70	969	73.7
36-43	1	13	67	81	6.2
				1315	100

The average duration of transfer of the neonate from place of delivery to the neonatal unit was 4 hours 36 minutes.(maximum 24 hours,minimum 5 minutes.).The average duration of transfer was the same irrespective of the place of delivery.

291 (37%) of the LBW infants and 50 (8%) of the control infants died during the neonatal period;contributing to 63.7% and 11% respectively of the overall 457 deaths in the unit during the study period.

Among those who died, 31 (10.6%) LBW and 11 (22%) of the control infants died at home.

Of the 1097 infants discharged,the mean duration of stay was 4.2 days and a range of 0 - 38 days.9.6% did not turn up for follow up and could not be traced for various reasons

141 (14%) from those who were followed up had some problems.94 were LBW and 47 control infants,thus giving a morbidity of 19.4% and 8% of morbidity in each group respectively with an Odds Ratio of 2.58.

Readmission was needed for 27 LBW and 26 infants from control groups.

The mean weight gain at the end of the neonatal period was 910 grams and the range was 190 - 1160 grams.

BIRTH WEIGHT DISTRIBUTION WITH GESTATIONAL AGE:

The Birth Weight distribution with Gestational Age is shown in the table 3 and figure 1.The mean weights for each gestation is shown below.

Table:3

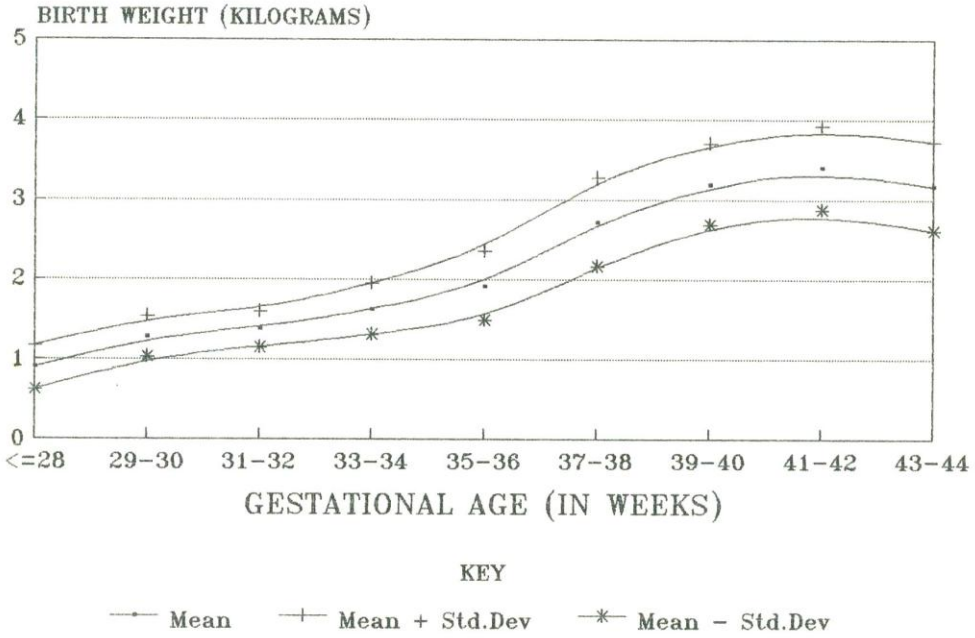
Birth Weight distribution with Gestational Age

Gestation in weeks.	Mean weight	Std dev	Cases
<=28	0.89947	0.27338	94
29-30	1.27868	0.25103	68
31-32	1.37422	0.22228	83
33-34	1.62420	0.32065	138
35-36	1.91386	0.43085	207
37-38	2.71491	0.55451	587
39-40	3.18916	0.50935	154
41-42	3.39273	0.52496	55
43-44	3.16250	0.56181	4

Correlation coefficient r=0.812.

It can be observed in figure 1 that a steep rise in weight occurs at 34 to 37 weeks.

BIRTH WEIGHT AND GESTATIONAL AGE



CORRELATION COEFFIENT=0.812

MORBIDITY PATTERN.

Total number of infants with one or more problem/s(morbidity) were 598.Thus,43% of all infants were found to be morbid.31%(436) were LBW and 11.6%(162) were control infants.p<0.001.Odds ratio of 3.48 .

Table:4

Morbidity in relation to the Birth weights

	Weight in grams.					
Morbidity	<1000 (%)	<1500 (%)	<2000 (%)	<2500 (%)	>=2500 (%)	Total (%)
present	67 (100)	158 (74)	113 (45)	98 (39)	162 (26)	598 (43)
absent	-	56	137	155	450	798

Table:5

Morbidity in relation to Gestational Age.

	Gestation age in weeks				
Morbidity	<=28 (%)	29-32 (%)	33-36 (%)	>=37 (%)	Total (%)
present	52 (55)	127 (84)	161 (46)	258 (32)	598 (43)
absent	42	24	186	543	

p<0.005.

LBW are thus 3.48 times at a higher risk of morbidity as compared to the controls.The risk is 2.8 times as high when Gestation age of is compared ,i.e between preterm and term infants.(Odds ratio=2.8)

The causes of morbidity and their relation with birth weight and Gestational age is shown in table 6.In general infections were the commonest cause of illness,followed by Birth Asphyxia,Respiratory Distress Syndrome,Jaundice and Hypothermia.

Table:6

Cause Specific morbidity in relation to birth weight and gestational age

:

	Cases n=436 (%)	Cntrl n=162 (%)	OR*	<37 wks (%)	>=37 wks (%)	OR*	Total n=598 (%)
Infections*	341 (78)	92 (57)	4	210 (62)	133 (51)	1.5	433 (72.4)
BirthAsphyxia	214 (49)	122 (75)	1.5	181 (53)	144 (56)	0.9	336 (56)
RDS	126 (26)	-		127 (37)	2		126 (21)
Jaundice	126 (26)	30 (18)	36	105 (31)	48 (18.6)	2.0	153 (25.2)
Convulsions	23 (5.3)	32 (19.7	0.5	19 (5.6)	34 (13)	0.4	54 (9)
Hypoglyceamia	23 (5.3)	14 (8.6)	1.3	17 (5)	19 (7.4)	0.66	37 (6.2)
Hypothemia	66 (15)	5 (3)	11	54 (16)	17 (6.6)	0.18	71 (1 2)
Haemorrhage	15 (3.4)	14 (8.6)	0.8	11 (3.2)	18 (7)	0.44	29 (4.8)
Apnoea	24 (5.3)	1 (0.6)	19	16 (4.7)	9 (3.5)	1.36	25 (4)
TTNB	3 (0.7)	6 (3.7)	2.5		9 (1.5)		9 (1.5)
Others*	78 (18)	31 (21)	2	44 (13)	65 (25)	0.44	109 (18)

* OR:Odds ratio.

Hypothermia,Apnoea, RDS and Infections are much commoner in the LBW infants as compared to the control infants.There is no specific pattern however when considering the gestational age although again RDS,Jaundice,Infections and Apnoea were common in the preterm infants.

*Infections pattern is indicated in table .7

**Others include Congenital anomalies(Table 8),Birth trauma, Bruises, intra-uterine infections, cephal heamatoma, Necrotizing enterocolitis, meconium aspiration, extra-uterine pregnancy.The number of cases in each were 74,18,6,4,2,4,1,respectively.

Table:7

Pattern of Infections

Type1-9	1	2	3	4	5	6	7	8	9
Cases	39	658	17	122	13	30	7	34	8
Controls	21	40	-	30	10	34	6	12	19

(Conjunctivitis=1,Umbilical sepsis=2,Meningitis=3, Septiceamia=4,Pneumonia=5,Septic spots=6,Abscess=7, Snuffles=8,Amnionitis=9)

Commonest infection;Umbilical Sepsis=33.4%

Septiceamia =26 %

Septic spots =10%

Conjuctivitis =10%

Except for conjuctivitis and septic spots which occurred more among the control infants,all other infections occurred 4 times more often in LBW infants.Congenital anomalies were reported more frequently in LBW infants and carried a higher mortality. It carried a 6 fold risk among LBW, with Odds ratio of 5.98..The congenital anomalies were more severe and incompatible with survival

Table:8

Congenital anomalies in relation to birthweight and mortality

	n	died	(%)
Cases	50	23	(46)
Controls	24	3	(12.5)
Total	74	26	(35)

$p<0.005$,Odds ratio=5.98

among the LBW infants.These comprised of Amniotic Band Disruption syndrome ,intestinal atresia,tracheo-esophageal fistula,Achondroplasia,Congenital progressive hydrocephalus,while those who survived had minor anomalies like Giant heamangiomas,sebaceous adenoma,polydactyly,cleft palate.Some had congenital heart disease viz PDA and VSD.

Problems on follow up:67 LBW and 21 control infants had minor ailments like poor weight gain,mild conjuctivitis,umbilical granuloma,oral thrush.

There were 53 re-admissions:27 LBW,26 controls infants. The common causes of readmission in order of frequency were Umbilical sepsis,Conjunctivitis,Septiceamia,Failure to Thrive as noted by a poor weight gain or loss of weight,Severe skin infections,Bronchopneumonia, Severe anaemia requiring blood transfusion and Congestive heart failure.The causes of admission among control infants were skin sepsis ,conjuctivitis and umbilical infection.

MORTALITY PATTERN:

Table:9

Mortality in relation to Gestational Age and Birth Weight.

Gest.Age in weeks	n	died	(%)	Weight grams	n	died	(%)
<= 28	93	91	(97)	<1000	67	63	(94)
29-30	68	40	(59)	<1500	212	109	(51)
31-32	83	42	(50)	<2000	250	74	(30)
33-34	138	45	(32)	<2500	252	45	(19)
35-36	207	49	(23.7)	<3000	254	26	(10)
37-38	587	66	(11.2)	<3500	228	20	(8.8)
39-40	154	7	(4.5)	<4000	104	4	(3.8)
41-42	55	1	(3.6)	<=4000	23	-	-
43-44	4	-	-				

p<0.0001 p<0.0001

Table:10

Mortality in relation to both Gestational age and Birth Weight.

Gest Age in weeks	Weight in grams <1000 (%)	<1500 (%)	<2000 (%)	<2500 (%)	>=2500 (%)	Total (%)
<=28	58	30	2	1	-	91
	(100)	(91)	(67)	-	-	(97)
29-32	4	58	20	-	-	82
	(57)	(57)	48)	-	-	(54.3)
33-36	1	20	44	25	4	94
	-	(27)	(27)	(27)	(24)	(27)
>=37	-	1	8	19	46	74
	-	-	(19)	(12)	(3)	(9)
Total	63	109	74	45	50	341
	(94)	(51)	(30)	(45)	(50)	(24)

Percentages indicated are by the total number of infants in that group.

There is an association between the increase in weight and gestation age with a positive outcome.Thus in a given gestation age the outcome improves as the birth weight increases.Odds ratio between LBW and control infants was 6.633.In a given birth weight the outcome improves as the infant matures by gestation age.Odds ratio for preterms and term infants was 8.068.

Cause specific mortality.

Extreme prematurity,Birth Asphyxia,RDS and Infections were the commonest causes of death among the LBW infants (Table 11).

61% of infants with Birth Asphyxia died among LBW and 30% among the controls,while 91% of LBW infants with Hypoglycaemia died,although it was common in both groups.Infections was common cause of death in both groups and carried a higher mortality among LBW infants as seen below.

Table:11

Causes specific mortality in relation to Birth Weight.

Causes.	Cases n=291(%)	Control n=50(%)	O.R
Birth asphyxia	132(45)	37(74)	3.7
RDS	78(26)	-	
Hypoglyceamia	21(7.2)	5(10)	19
Infections	84(29)	14(28)	2
Prematurity	192(66)	-	
Hypothermia	22(7.6)	-	
Kernicterus	8(2.8)	1(2)	2
Fail to thrive	12(4)	1(2)	
Others	32(11)	15(30)	
Not Known.	11(3.8)	1(2)	

The percentages indicated above are from the total number of deaths in that particular group.The case fatality among LBW infants was 61% for Birth Asphyxia,61% for RDS,91% for hypoglyceamia,33% and 25% for hypothermia and Infections respectively.Among control infants ,the case fatality was 30% for Birth Asphyxia,35% for hypoglyceamia and 15% for Infections.

OTHER FACTORS RELATED TO THE OUTCOME:

i. **Maternal age:** Infants of mothers between 14-18 years and those above 36 years had an increased risk of adverse outcome.The Odds ratio between each of these groups withthose of 19-35 years was 2.

Table:12

Maternal Age in relation to adverse outcome.

Age in years	14-18 Died (%)	19-35 Died(%)	36-43 Died(%)
Cases	(n=182) 91 (50)	(n=552) 176 (32)	(n=50) 24(48)
Controls	(n=388) 13(12.4)	(n=464) 31 (6.7)	(n=43) 6 (14)

p value (cases) <0.0001
(control)<0.06

ii. Parity:Parity was not related to adverse outcome in both the group of infants.

Table:13

Parity in relation to adverse outcome

	1 Died (%)	2-4 Died(%)	>=5 Died(%)
Cases	(n=539) 196(36.4)	(n=182) 71(39)	(n=63) 24(38)
Controls	(n=388) 26(6.7)	(n=149) 13(8.7)	(n=75) 11(14.6)

p value:(cases)<0.9
(controls)=0.07

iii. Antenatal care: The attendance of **antenatal clinic** has a significant contribution to the outcome of LBW infants whereby those who had not attended had a poor outcome with a four fold risk, with an Odds ratio between those who attended and those who did not being 4.

Table:14

Antenatal care in relation to outcome.

	Attended			Not Attended		
	n	died	(%)	n	died	(%)
Cases	705	245	(34.8)	79	54	(68)
Controls	602	42	(7)	7	-	-

p value<0.0001 for cases.

iv. Among the 615 (40%) mothers who had Antenatal problems, anaemia was the commonest problem constituting 40% and EPHG followed with 30%.These also contributed significantly to mortality.The Odds ratio between LBW and control infants for aneamia was 8.6 and for EPHG 3.

Table:15.

Antenatal problems:incidence and the relation to adverse outcome.

	Anaemia		EPHG		APH		Others		Total	
	n	died (%)	n	died (%)	n	died (%)	n	died (%)	n	died (%)
Cases	150	52 (34.6)	83	17 (20)	27	6 (22)	10	41 (39)	365	110 (30)
Cntrl	94	5 (5.3)	103	8 (17.8)	9	- -	81	10 (9)	287	23 (8)

p<0.0001 p<0.02

v. **Multiple pregnancy:** There were 75 pairs of twins,95 twins but not in pairs,one set each of triplets and quadruplets.The mortality was not affected by this.179 out of 537(33%) singleton infants and 84 out of 224 (37.5%) twin infants died.Thus there was no difference This applied to both the cases and controls (p value=0.9477).Among the twins there was also no difference between the first and the second twin with 36 being 1st twins (43%) and 48 being 2nd twin(57%).(p value=0.001).

vi. Low **Apgar Scores** have higher mortality.p<0.0001. Among the LBW with a score of 0-3,17 were below 1000 grams,i.e.Extreme LBW. Among the 122 with score 4-7 who died ,19 were below 1000 grams,51 weighed between 1000 and 1500 grams, 31 weighed below 2000 grams and 21 were below 2500 grams.The LBW infant was 7 times at greater risk to have Low Apgar scores and was 6 times at a risk of death compared to controls with the same score.The Odds ratio calculated for the two groups was 6.

Table:16

APGAR Score at 5 minutes in relation to the outcome.

	Score 0-3		Score 4-7		Score >=8	
	n	died (%)	n	died (%)	n	died (%)
Cases	24	24 (100)	220	122 (55.5)	451	69 (15.3)
Control	9	9 (100)	106	18 (17)	481	11 (2.3)

vii. Presentation: Breech presentation carried a higher mortality among the LBW infants.($p<0.001$).There was not any significant difference among the control infants.

Table:17.

Presentation of the infant and relation to adverse outcome

	Vertex/cephalic		Breech		Other	
	n	died(%)	n	died(%)	n	died(%)
Cases.	624	217(34.7)	128	66(51.6)	32	8(25)
Controls	501	44(8.8)	24	3(12.5)	87	3(3.5)

Cases :p value=0.001 Control:p value=0.2

viii. Mode of delivery:Assisted Breech Delivery(ABD) carried a two fold risk of mortality as compared with SVD in the LBW infants(Odds ratio=2).The risk was three times when compared to Caesarian section in both the group of infants.Odds ratio was 3 in each case.

Table:18

Mode of delivery in relation to the outcome.

	SVD		ABD		LSCS		LCVE	
	n	died(%)	n	died(%)	n	died(%)	n	died(%
Cases	669	241(34.5)	70	38(53)	45	12(26.7)		
Control	203	32(15.8)	42	5(12)	334	13(4)	33	4(12)

Cases:$p<0.005$ Controls:$p<0.0001$.

The Indications of LSCS:

Of the 379 caesarian sections there were 462 indications,some having more than 2 indications.These are listed as follow:

Fetal Distress and Prolonged Labour	112	24.2%
C.P.D	82	17.7%
Previous Caesarian	77	16.7%
E.P.H.G	44	9.5%
Other indications:Anaemia,elderly mother,A.P.H,Bad Obstetric History, Diabetic mother, Cardiac illness, polyhydramnious.	147	32%

ix. Birth Attendant:There were 62 (4.5%) deliveries conducted by TBA or relatives at home.30 (48.4%) among these died indicating a high risk ($p < 0.05$) there was no significant difference among those delivered by midwife or doctor.

AGE AT DEATH:

285 out of total 341 (83.7%) were **Early neonatal deaths** (first seven days)

Late Neonatal deaths (beyond 8 days)occurred in 66 (19.3%). LBW contributed to 291(63.7%) out of total 457 deaths in the unit during the study period.Deaths occurring within 24 hours of deliveries were 40% in each of the two groups of infants.Death within the 2nd to 7th day were 128 (44%) among the LBW infants while these were 14 (27%) in the control group..Late neonatal deaths accounted for a total of 66 (19.4%) of the deaths,being slightly lower among the LBW but not statistically significant.Whereby 50 died among LBW infants and 16 among the control infants.

42 infants died at home.24 males,18 females.31 died among the LBW and 11 among the control infants.6 died in the 1st week,18 died in the 2nd week,16 in the 3rd week and 2 at 4 weeks and beyond.

Table:19

Age at death.

	<24 hours n (%)	2-7 days n (%)	8-28 days n (%)
Cases	113 (39)	128 (44)	50 (17)
Controls	20 (40)	14 (27)	16 (33)

PLACE OF DELIVERY:

This was studied only for the LBW infants.Those delivered at home were 62, those referred from peripheral maternity units and other hospitals were 105, while 619 were infants delivered in the hospital's Maternity Unit.The mortality of these were 48.4%,42%,and 35% respectively indicating that those delivered at home carry a high risk, with an Odds ratio of 2.

Table:20

Place of Delivery.

	MMC		OTHER UNITS		HOME	
	n	died (%)	n	died (%)	n	died (%)
Cases	619	217 (35)	105	44 (42)	62	30 (48.4)
Controls	612	50 (8.5)				

p=0.056.

The relation of the duration of transfer from place of delivery could not be correlated because often infants were transferred to the unit even after 6 hours even among those delivered in the hospital's Maternity unit.In general the average time taken for transfer was 4-6 hours.

DISCUSSION

INCIDENCE OF LBW:

The incidence of LBW in the study was 730 out of 4561 (16%).Various studies from 1955-1984 in Tanzania indicate an incidence of 10-15.3%(48).Bantje ,has reported in 1987 the incidence to be between 14-30%.The incidence has not changed for the last 15 years.(16-20).The high incidence in this study can be ascribed to the following reasons,first this is a referral hospital hence difficult deliveries and those with complications are delivered here,secondly prematures and LBW are also referred from other centres to this unit,thirdly, this study did not exclude twin deliveries as in previous study.(22)

BIRTH WEIGHT DISTRIBUTIONS:

Birth weight increases with gestational age.A correlation coefficient of 0.812 was obtained.However the increment is not uniform ,with a steep rise between 35-40 weeks where the increase was 330-800 grams.

The mean birth weight of term infants in this study was 2854 grams with a standard deviation of 544 grams.This is comparable to findings in other studies .(20,48).The National figure in 1984 was 2978(48).In 1985, the mean birth weight was reported by UNICEF to be between 2942-3138.(45).In 1989-90 Ngowi reported a mean birth weight

of 2807 grams.(50).These weights are lower than those reported in developed countries for instance Denmark,France and Netherlands to mention a few ,with mean birth weights of 3375,3335,and 3474 grams respectively.(48)

The mean birth weights increased in each gestational age and correspond to the ones obtained in 1979 by Boersma et al,(20), for constructing a standard chart for Tanzanian infants.The highest weight gain occurred during 34 to 37 weeks of gestation,which is the critical period for brain development and also is the time when the fetus builds up his energy stores.The mean birth weight in each gestation age are lower than those obtained in developed countries.(49).Considering that the incidence of LBW being high and the mean birth weights are same for the 15 years redefining the limit for LBW may be need,as suggested by workers in India were the trends are similar.(46).Perhaps we could lower the limit to below 2200 grams.Although worth considering ,this could have a negative effect and also would create confusion when comparing with other international standards of birth weight.

OUTCOME:

Between 4 and 6 weeks on follow-up,the average weight gain was 910 grams with a range of 190 - 1160 grams. A previous study indicated a mean gain of 1126 grams for term babies.(20).The lower values in this study is because all infants are considered together.

MORBIDITY

Morbidity in relation to birth weight. In this study 598 infants had one or more problems,436 (73%) were LBW infants.The risk was 3.5 times higher in this group.

After discharge 141 infants had some problems,94 (66.6%) were LBW infants with a 2.5 times the risk.

The commonest causes of morbidity were infections, Birth asphyxia and jaundice in both group of infants. LBW carried a 4 fold risk for infections and a 3.6 fold risk of jaundice.

RDS, APH, Hypothermia and Apnoeic attacks occurred almost exclusively in the LBW infants.

Assuming that all infants with RDS were admitted,the incidence is thus 2.8% whereby 126 infants out of a total 4561 live births had RDS.This is lower than those seen in developed countries and this could be due to the fact that our infants are relatively more mature in terms of gestational age.(13,22)

Morbidity in relation to gestation age:

The risk of preterm infants to morbidity was 2.8 times higher than the term infants.The trend was similar to what was observed in LBW infants .The risk appears lower compared to that of birth weight ,indicating that birth weight is a more important factor than gestational age in morbidity.(7)

MORTALITY:

Mortality in relation to birth weight:

291 out of 784 LBW infants died during the study period,thus 37% mortality. 50 out of 612 among the control infants died giving a mortality of 8.5% The mortality among the LBW is high and contributes to 63.6% of the total 457 deaths in the unit.

LBW carried a 6.6 fold risk of adverse outcome and this risk continued even after the infant was discharged in apparent good health,whereby the risk was 3 fold.

Those below 1500grams and before 34 weeks gestation had a higher mortality.The outcome significantly improves as the weight increases in a given gestational age and as the gestation age increases in a given birth weight..

Weight specific Mortality:

The weight specific mortality are comparable with those seen in other studies as seen in table 21 below.In Ibadan (Nigeria), 78% of admissions to the unit were LBW and contributed to 77% of the mortality.(13).In Libya, where the incidence of LBW is low at 4%, it contributed to 60% of the mortality.In Wales (U.K) the incidence in 1980 was 14% and this contributed to 82% of all neonatal deaths.

In this study the trend is similar to the ones seen above although slightly higher than those seen in Nairobi(Kenya) but comparable when infants delivered from outside the unit, were included.

Table:21

Comparison of Weight specific mortality.*

Weight in grams	Present study:	Kenya 1978 (14)	U.K. 1980 (11)	Nigeria 1980 (13)	Libya 1988 (15)
<1000	94	80	83.4	87.8	100
<1500	51	73.3	30	19.2	88
<2000	30	14	5	8.2	35
<2500	19	3	3.4	2.5	10
>=2500	8.5	11	0.5	0.7	8

*The figures indicated are in percentages.

Considering that the outcome amongst the infants weighing <1000 grams is the poorest and the overall contribution is also high, weight specific mortality can give a better picture.For instance in the present study the contribution to mortality of infants below 1000 grams was 63 (21%) and 109 (37.4%) for those below 1500grams.Thus 59.4% of all neonatal deaths among LBW were in those with weight below 1500 grams.The efforts should therefore aim at improving the birth weights to above 1500grams by good antenatal care and increase survival of those above 1500 grams by improved neonatal services.Even in developed countries the outcome of infants below 1000 grams is poor and neonatal services for them have been found not to be cost effective and useful in the long run.(7,10)

Mortality in relation to Gestation age:

The mortality in relation to Gestation show a similar trend.Those born before or at 28 weeks carried the highest mortality(97%) and the outcome improved as the gestational age increased,with the lowest mortality in 41-42 weeks age group.The findings in this study are similar to those reported in Ibadan, Nigeria in 1976 and in the same unit in 1975.Preterm infants carried an 8 fold risk in this study.

CAUSE OF DEATH:

There was often more than one cause of death ,each related or contributory.The causes of death were enumerated and then each one was analysed.

Extreme Prematurity contributed to 66% of the 291 deaths among the LBW infants.When this is excluded the commonest causes of death were due to Birth Asphyxia ,Infections , RDS and Hypothermia.Whereas Birth Asphyxia and Infections contributed to mortality in control groups,RDS,Hypoglyceamia and Hypothermia were highly contributory to deaths in LBW infants.Other causes like kernicterus,birth injuries were not statistically significant.

Failure to Thrive and Congenital anomalies were both significantly high in the LBW infants.The incidence of congenital anomalies in the general population was 1.6%,much lower than those seen previously(20).

They occurred more among the LBW infants and carried a higher mortality ,being 2 fold higher in incidence and 7 fold higher in mortality.

The finding in this study are similar to those reported in other countries (11,13,14,15),comparison for each cause is difficult because of lack of uniformity in reporting the causes of death. When comparing the deaths using Wiggleworths classification in to 5 major groups (11),viz:

1 Prematurity;[this includes RDS];270.....(79%)

2.Asphyxia;169.....(49%)

3.Perinatal factors,[includes hypothermia and hypoglyceamia];48.....(14%)

4.Congenital anomalies;26.....(7.6%)

5.Others,[which include infections,failure to thrive kernicterus];163.....(45%).

(Out of 341 deaths)

Prematurity and Birth Asphyxia contributed to 75 (88%) and 58 (68%) out of 85 deaths respectively,in Nairobi ,Kenya (14)while other causes contributed to only 13%.In Hammersmith hospital,Wales U.K,prematurity contributed 56% and Birth Asphyxia to 22% of the 55 deaths ,and only 0.6%of deaths due to other causes.(11)

There are no studies to compare the causes of death specific for the LBW infants and normal weight infants in Tanzania.Birth asphyxia was 3-4 times higher in LBW and Infections 2 times commoner while RDS,Hypothermia and Prematurity were exclusively seen amongst the LBW infants.Hypoglyceamia was common in both the groups ,but carried a 19 fold risk of death among the LBW infants.It is known that the glycogen reserves are poor in these infants either due to prematurity or inadequate storage in the last trimester.(8,9)

FACTORS RELATED TO THE ADVERSE OUTCOME:

1.Maternal Age.

This is a significant factor in LBW infants.The incidence of LBW in those below 18 years was 23.2%,similar to those seen in 1978 for those below 20 years with incidence of 24.7%.(55).Infants of mothers between 14-18 years and those beyond 36 years did not fair well.There was a 2 fold risk. This factor was not significant in the control group.In a study in Jamaica which included all the neonates,mothers' below 15 years carried a relative risk of 4.08.

2.Parity.

The parity did not affect the outcome in the present study,with mortality being almost same in all parity groups and in both the LBW as well as the control group.The effect of parity on perinatal morbidity and mortality is less significant than maternal age .(26)

3.Attendance to the Antenatal Clinic.

89 (6%) out of 1396) did not avail antenatal care,79 LBW and 7 control infants.In 1975 in the same unit ,7.5% of the 868 LBW infants did not receive antenatal care(20)

54 (68%) of LBW whose mother did not avail antenatal services died carrying a 4 fold risk similar to that seen in Louisiana in 1975.(56).The number in controls is not statistically significant to comment upon.The figures in

this study are high and indicate a need for more efforts in motivating mothers for attending the clinics.The reasons in majority of these mothers' was an attempt to conceal the pregnancy due to social reasons ,while others thought it was not yet time.It is not enough to attend the clinic,the quality of care and the number of visits are equally important and where possible should be considered in more details ,the present study has not taken this factor in detail.The early provision of antenatal care seems extremely important as it has been estimated that approximately 70% of medical complications can be anticipated at the initial examination.(26)

4.Antenatal problems

615 (44%) out of 1315 mothers under study had antenatal problems.The incidence of antenatal problems in each group was same.However those infants among LBW whose mothers' had antenatal problems had a poor outcome with a mortality of 30% as compared to a mortality of 8% among the control infants.

Whereas Anaemia and EPHG were the commonest problems in both the group of infants ,APH was more common in those with LBW,perhaps being the reason of early termination thus LBW. Infants of mothers having anaemia carried a higher mortality and this was significantly higher among the LBW indicating perhaps a cause and effect relationship.

EPHG similarly carried a high mortality with infants among LBW being at a greater risk.The incidence of LBW was not high as expected from previous study in 1985, due to several reasons.Firstly there were many LBW admitted for various reasons,secondly since more than one antenatal problem is considered ,this masks that due to EPHG only.Third,only live births are considered and lastly possibly antenatal care paid some part in improved outcome.

5.Twin and Multiple Gestation.

The study included 75 pairs of twins, 95 twins but not in pairs , one set each of triplets and quadruplets. The risk of adverse outcome did not matter whether it was a multiple gestation or singleton.However when considering the order of the twins ,second twin had a poorer outcome as compared to its counterpart.Although not so significantly,with only a 1.3 times risk.

The study in Jamaica showed a 7 fold risk between singleton and twins but since it did not consider the LBW and other infants separately it is difficult to comment.

6.Presentation.

The neonatal outcome depends on the intrapartum management of the delivery which in turn can be dictated by the presentation of the fetus in utero at delivery.

Those LBW who presented as breech had subsequently adverse outcome as seen in this study whereby 51.6% of LBW infants who had breech presentation died.The presentation had no significant bearing in the outcome among the control group .This finding is similar to the one seen in Ibadan(Nigeria) among the LBW infants.(13).

7.Mode of delivery.

When comparing SVD ,ABD carried a 2 fold higher risk of death among LBW infants.While the risk was 3 fold when compared to Caesarian section.

Among the control group there was a higher mortality in those delivered by LCVE but the number of infants under study are not significant to comment upon.LSCS did not carry a high risk and infact could be a very safe procedure. The findings in U.S.A by Paul et al (32) indicate that infants who had undergone Caesarian section were at a high risk is biased because it has considered only a selected group who had already antenatal predisposing factors.

8.Birth Attendant.

The birth attendant and place of delivery are closely related.Those who were born at home were either delivered by a TBA or by relatives.The mortality was higher among these infants with a mortality of 48.4% in those delivered at home by the TBA or relatives.Although this was only among LBW infants,these findings are similar to those seen in Tanzania in 1986 for all newborns in which 53% of infants delivered by TBA died.(30).

9.Low APGAR score at 5 mins.

The Apgar score at 5 minutes is an index useful to predict the neurological outcome of the newborn Often those with Low Apgar scores at 1 min turn up also to have lower scores at 5 mins.(Though not always true) Infants who had scores of 0 to 3 had a 100% mortality in both the group of infants. LBW infants were 2 times more likely to have a score between 4 and 7,perhaps because of their intrinsic poor neurological behaviour.The mortality was 6 times higher in the LBW infants.

This findings are similar to other large scale studies(33) however since several factor are related to the adverse outcome of the infants with Low Apgar scores more detail studies are necessary to this effect.

Duration of Stay.

The duration of stay in the neonatal unit was 0 to 38 days The average duration being 4.2 days. Early neonatal deaths are associated with a poor intranatal and antenatal care (obstetricians)while the Late neonatal outcome is dependent on the neonatal services(pediatricians) as well as the state of the infant. In this study 84% of the LBW infants and only 27% among the controls died in the 1st week (Early Neonatal Deaths),indicating that LBW is a major contributor of perinatal deaths as seen in several studies.(10-12,14,22).

In order to survive the first year of life the average lenght of stay in the neonatal period was 3.5 days for normal birth weight infants,24 days for those between 1500 to 2000 grams,57 days for those below 1500 grams and 89 days for those below 1000 grams in U.S.A in 1978.(53).However it is difficult to achieve similar results in our set up due to lack of adequate facilities,where infants are discharged much earlier similar to the famous Bogota study of home care programme in 1979-1981.(54).

Place of Delivery.

Among LBW infants, those delivered at home carried a two fold risk of adverse outcome.This is obviously so because the environment of delivery and the birth attendant at home are not conducive for a safe delivery and immediate care of LBW baby.The reasons of home deliveries were concealed pregnancy leading to premature labour, some had premature labour with precipitate delivery .There is a need for health education to train adequately the TBA and to motivate safe hospital delivery.

DIFFICULTIES ENCOUNTERED DURING THE STUDY:

1. The Neonatal Unit being the only unit in Dar es Salaam, is always busy with a very high rate of admissions.Thus a higher responsibility during the study period, as a major part of the time had to be given to the sick neonates.
2. There was an unnecessary burden for the already overworked staff by admitting infants of mothers delivered by Caesarian Section "for care",this also creates a delay in establishing Breast feeding.
3. It was difficult to follow the infants at home due to lack of proper addresses.This was accentuated when mothers left for their maternal residence for after care as is the custom here.
4. There was a heavy work load for the doctors and nurses at the High Risk Neonatal Care clinic.

CONCLUSIONS

1. The incidence of LBW was 16% among the hospital deliveries.
2. The Mean Birth Weight was 2854 grams at term.The mean birth weights for each gestational age in weeks were lower than those seen in developed countries.
3. LBW contributed to 63% of the Neonatal Deaths.37% of LBW died in the neonatal period.
4. The risk of Neonatal death in LBW infants is 6.6 times higher as compared to those weighing 2500 grams and above.
5. Morbidity was 3.4 times high in the LBW infants.
6. Extreme Prematurity,Birth Asphyxia and Infections were the commonest causes of death .
7. The outcome of infants below 1000 grams was extremely poor.
8. Young maternal age between 14-18and those beyond 36 years was associated with adverse outcome among the LBW infants. The risk was 2 fold.
9. Antenatal care plays a role in the outcome of LBW infants 6.2% of the infants whose mothers' did not attend antenatal clinics had a poor outcome,with a mortality of 54% and carried a 4 fold risk of Neonatal Death.

10. Anaemia and EPHG were the commonest antenatal problems and carried a higher mortality among the LBW.Anaemia carried an 8.6 times risk and EPHG carried a 3 fold risk.
11. Breech presentation and ABD were associated with adverse outcome among the LBW infants.The risk was 2 fold.
12. Multiple gestation in this case Twins ,did not carry a significant risk,though the 2nd twin was 1.3 times more vulnerable.
13. Low Apgar Scores were associated with a high mortality in both the group of infants with a higher mortality among the LBW.The incidence was 2times higher and mortality 6 times higher in the LBW infants.
14. 83% of deaths in the LBW infants and 68% of control infants accounted for Early Neonatal deaths.(Thus the greatest contribution of Neonatal deaths during the perinatal period).Late Neonatal deaths were more common among the control infants who contributed 32%,whereas LBW infants who died were 17%.Among those who died at home 80% died in the second or third week.
15. Infants delivered at home carried a 2 fold risk of adverse outcome,as compared to those delivered at hospital/dispensary.The risk between those delivered in the dispensaries or hospital outside MMC carried a small risk of 1.3.

RECOMMENDATIONS

1. Large scale studies which are community based are needed to determine the weight specific neonatal outcome.This will allow to formulate strategies of intervention.
2. Health education for all children ,but girls particularly,is critically important,especially in family planning,pregnancy and care of the newborn and breast feeding.
3. Anaemia and EPHG should be given the first priority in the antenatal clinics,since these were a high association with adverse outcome among LBW.
4. Prematurity and Birth asphyxia were the commonest cause of mortality therefore there is a need to strengthen and improve the quality of antenatal and intrapartum care.Simple resuscitation procedures must be learned at all levels,down to the TBA level.
5. Improved neonatal services for the survival of these infants is needed.This can be achieved by increasing neonatal units whereby the duration of stay for LBW infants can be increased in order to train the mothers more.

6. There is a need to consider re-classification of the definition of LBW,depending on the mean birth weight of our infants.
7. Breech delivery carried a higher risk of death.LSCS is a safer procedure,thus LBW infants with breech presentation should be delivered by Caesarian whenever possible.
8. Home visits for those discharged will help to re-enforce the health education given and identify problems.This can be achieved by involving local authorities and MCH aides.

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