EFFECT OF PARITY, MATERNAL AGE AND
PRE-ECLAMPSIA ON BIRTH WEIGHT

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Dedicated to Daddy & Mummy for their love and support through all these years.

Summary

A case control study was carried out in Lusaka to find the effect of parity, maternal age, pre-eclampsia and its severity on birth weight.

100 pre-eclamptic cases were selected from University Teaching Hospital, department of Obstetrics and Gynaecology. 200 controls were selected from Chilenje Clinic, a peripheral Clinic in Lusaka. All samples were randomly selected.

Average birth weight for this study was 3.233kg. This was the average birth weight for controls.

From this study it was shown pre-eclampsia reduces the average birth weight of a child. Average birth weight for cases was 2.9521kg and that for controls was 3.2136kg. The difference was significant (P value >0.05). Average birth weight for mild pre-eclampsia cases was 2.978kg, for moderate was 3.016kg and severe was 2.850kg. These values were not significantly different. Average birth weight increased with maternal age but the differences were not statistically significant. Ideal maternal age for ideal average birth weight was the 20-29 year group. Birth weight increased with parity. The ideal parity for ideal average birth weight was Para 2 and Para 3.

Introduction

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Zambia is a third world country situated in Central Africa with an area of 752,600 Sq Km and a population of about 7.5 million. It is sparsley populated with a population density of 10 per sq km.

The crude birth rate in Zambia is 50/1000 and is one of the highest in the world. This is mainly due to ineffective family planning programmes which have been stepped up in recent days. It is also due to a falling crude death rate which now stands at 13.2/1000.

The perinatal mortality is 50/1000 live births, the infant mortality rate is 90/1000 live births and the maternal mortality is 20/10,000 live births. All these figures are quite high and can be attributed to factors like pre-eclampsia, high parity and extremes of age in child birth. Poor socio-economic factors are also important here. The incidence of pre-eclampsia

has not been studied formally in Zambia but from observation it is seen to
be fairly common and affects mothers of all ages. Pre-eclampsia is more
common in primiparas and results in low birth weight and poor maternal
health which results in high perinatal mortality rate and maternal mortality.
In Zambia 24.2% of the population are women in the child bearing age (14.49).
Teenage pregnancies and mothers over 35 years are at risk mothers and
contribute to high maternal mortality. These 2 groups are quite common here.
High parity is also common in Zambia and this results in high maternal
mortality and perinatal mortality due mainly to diabetic babies. 46.8% of
the Zambia population consists of children under 15 years. This shows the
importance of maternal and child health care in this country.

The University Teaching Hospital in Lusaka is the ultimate refferal
center in the country with a department of obstetrics and gynaecology,
paediatrics, surgery and medicine. Ideally only cases that cannot be treated
in the peripheral clinics and provincial hospitals are to be sent there.
Specialists clinics are also found there. The health structure in Zambia has
been reconstructed in the recent years to the policy of primary health care.

This study looks at some factors which affect birth weight and was
conducted in the University Teaching Hospital and Chilenje Clinic. It is
hoped that the results obtained here are representative of the whole country.

Review of Literature

Birth weight is affected by Parity, Maternal age, Pre-eclampsia, Smoking
in mother, Socio-economic factors and Maternal size (1).

Studies similar to this one has been carried out in different parts
of the world. A study conducted at Kansas Medical Center showed that
pregnancy outcome for woemn over 35 years is good except for increased risk
of congenital abnormalities. 35 mothers out of the 116 studied who had no
medical or behavioural problems showed no record of low birth weight. The
same study found incidence of low birth weight in teenage mothers with no
other growth retarding factors to be 3.6% and this value was not significantly
highere than the value found in the control group (20-24 years) which was 2.3%.
They also found that pregnancy outcome for black mothers of 35 years and more
was comparable to whites. Black primiparas had a high incidence of small for
dates 12.2% as compared to white primiparas 4.2%. They also found high

incidence of low birth weight in mothers with complications like pre-eclampsia (3).

The British perinatal mortality survey in 1969 showed a clear indication that first born babies had a downward shift in birth weight distribution. Most advantageous parity for average birth weight distribution was Para one. Grand multipara had an excess of heavy babies 14.7% as compared to the control group. Babies of teenagers had a general shift towards low birth weight and this was more marked than those of primiparae. In mothers over 35 years the trend was reversed and babies tended to be heavier in spite of tendency to post term deliveries. They found that birth weight in mild and moderate pre-eclampsia groups differed little from each other but reduced considerably in severe pre-eclampsia, with nearly 3 times as many babies in control group with low birth weight (2).

In another study they found a higher proportion of small for date babies in the over 35 series as compared to the control series. The ideal age for delivery of a baby in the average weight group was 25-29 years. In the case of parity, primiparae were found to have a higher incidence of small for dates and this was significant. No difference was found in grand multiparae. Even though increased parity enhances the likelihood of rapid fetal growth, it does not influence the chance of production of a small for date once primiparity has been passed. There was a drop of small for dates at para one so they concluded the possibility that one needs to have only one baby in order to greatly reduce the chance of an intrauterine growth retardation. This study also found an increased risk of low birth weight in the presence of pre-eclampsia (6).

Birth wiehgt increases with maternal age and parity but when parity is fixed there was no consistent relationship between bith weight and maternal age (16). A similar study conducted found a correlation of 0.5 between maternal age and parity and when seperated birth weight was shown to increase with advancing parity and fall with advancing age (13). In 1971 Selvin and Janerich showed that increased birth order was associated with increased birth weight for mothers older than 20-24 years but for mothers aged less than 20 years increased birth order was associated with a reduction in birth weight. The influence of maternal age with birth orders 1-5 was associated with an increased birth weight up to a maximum then there was a reduction. For infants of birth order 6 and over, increased maternal age was related only to an increase in birth weight (14).

A comparison study was done between mothers with pre-eclampsia and normal mothers. Although there was a wide variation in both fetal and placental weights in each group, there was a significant reduction in the mean fetal weights in the pre-eclamptic group (11). Others advocated ceasarian sections to save 'the poor starvlings of toxaemia'. they plotted 819 patients against curves on normal growth and commented that these demonstrated clearly that it is intrauterine deaths that are mots affected by toxaemia (10). Against this is the view that mild and moderate pre-eclampsia in general have little effect on fetal growth. Severe pre-eclampsia and heavy protienuria have a severe effect (8). Gruenwald showed that amongst infants of hypertensive mothers not only is there a high incidence of growth retarded babies but also a moderate excess of growth accelerated babies after 36 weeks of gestation (12).

The nutritional academy of sciences in Washington DC found that a disproportionately large number of babies who are of low birth weight (under 2.5kg) are born to young mothers. As maternal age increases the population of low birth weight decreases up to 40 years. The lowest proportion of low birth weight occured in the 25-29 age group (7.3%) as compared to teenagers (10.5%) and mothers of 35 years (8•7 - 9.0%) (4).

Lastly a study carried out in Salt lake city Hospital Utah, showed there was a risk of having small for date babies in adolescents. This risk can be reduced by early prenatal care. Teenage multiparous mothers are at risk regardless of when antenatal care began (5).

Objectives

1) To find effect of Parity on birth weight.
2) To find effect of maternal age on birth weight
3) To find effect of pre-eclampsia on birth weight
4) To find effect of severity of pre-eclampsia on birth weight.

Materials and Methods

This study was conducted in Lusaka. The population was women who delivered at 2 specific centers. Simple random selection was done for sample selection. 100 cases were obtained from the University Teaching Hospital, department of obstetrics and gynaecology labour ward registry

book. The files of these patients were traced for further details. Control selection was from a peripheral clinic, Chilenje clinic in Chilenje, Lusaka. They were obtained from the labour ward registry book.

The controls were selected from a different population because the women who deliver at peripheral clinics are less likely to have had complications during pregnancy.

Results

Table 1

Effect of Maternal age on birth weight in Cases and Controls

Age range in years	Average birth weight (kg)		Number of Patients	
	Controls	Cases	Controls	Cases
15-19	3.1	2.77	37	18
20-29	3.240	2.967	129	52
30-35	3.202	3.093	25	21
35+	3.504	3.002	9	9
Total			200	100

P Value $>$ 0.05

Table II

Effect of parity on birth weight in controls

Parity range	Average birth weight(kg)	Number of patients
0	3.053	41
1	3.152	52
2,3	3.286	57
4+	3.406	50
Total		200

P Value $>$ 0.05

Table III

Effect of Severity of Pre-eclampsia on birth weight

Severity of Pre-eclampsia	Average birth weight (kg)	Number of Patients
Mild	2.978	35
Moderate	3.016	17
Severe	2.850	48
Total		100

P Value $>$ 0.05

Table IV

Two Sample analysis on average birth weight between cases and controls

	Controls	Cases	Pooled
Number observed	100	100	200
Average	3.2136 kg	2.9521 kg	3.08285 kg
Variance	0.14032	0.188483	0.164402
Standard deviation	0.374593	0.43417	0.405465
Median	3.26	3.00	3.1

P Value $<$ 0.05

Table V

Two Sample analysis on average maternal age between cases and controls

	Controls	Cases	Pooled
Number observed	100	100	200
Average	24.68	25.57	25.125
Variance	28.8	38.4496	33.6579
Standard deviation	5.37273	6.20077	5.80155
Median	24.5	24.0	24.0

P Value $>$ 0.05

Comparison of study done by British perinatal mortality survey (BPMS) with present study.

Maternal Characteristics	Present Study		Study done by BPMS	
	Mean B.W. Kg	No. of Patients	Mean B.W.Kg	No. of Patients
Age 15-20	3.100	37	3.205	752
20-29	3.240	129	3.320	9011
30-35 (39)	3.202	25	3.345	4514
35+ (40+)	3.504	9	3.375	379
Parity 0	3.053	41	3.230	5413
1	3.152	52	3.375	4583
2,3	3.280	57	3.375	3420
4+	3.406	50	3.375	1248
Pre-eclampsia				
Mild (and none)	2.978	35	3.345	11573
Moderate	3.016	17	3.345	606
Severe	2.850	48	3.120	908
Sex: Male	3.316	110	3.400	7559
Female	3.133	90	3.260	7091

Items in brackets included in study done by BPMS

Interpretation of results

Effect of maternal age on birth weight is as in Table I showed that birth weight was lowest in the 15-19 age group. The average birth weight then rises with age to 35+ group where it falls slightly.

Parity with highest average birth weight is Para 2 and 3. Lowest birth weight is in para one. Birth weight increases with parity (Table II).

The definitions for mild moderate and severe pre-eclampsia are as follows:

Mild: All patients with a maximum diastolic of between 90 and 99 mm Hg provided no protienuria was recorded.

Moderate: All patients with a maximum diastolic blood pressure of between 100 and 109 mm of Hg provided no protienuria was recorded.

Severe: Patients with a maximum diastolic of 110 mm of Hg or more as well as these with a maximum diastolic of 90 mm or more together with protienuria. No account was taken of edema.

Lowest birth weight was recorded in severe pre-eclampsia cases. Highest birth weight was in the moderate pre-eclampsia group (Table III).

Average birth weight for controls (3.213 kg) was significantly higher than the average birth weight for cases (2.95 kg) (Table IV). The age between cases and controls were not significantly different (Table V).

Discussion

In Zambia no study has yet been done to determine the average birth weight. For the purpose of this study, the average birth weight was taken to be that of the control group which was assumed to be normal population. This is 3.233 kg.

It can be seen that teenagers have babies below average 3.100 kg and mothers over 35 years tend to have babies above average 3.504 kg (Table I). Teenage mothers tend to have low birth weight babies because of poor antenatal attendance and poor prenatal care (6,5). The value of birthweight in teenagers is however not significantly lower than that of the 20-29 group which is the ideal age group for ideal average birth weight. Maternal age above 35 years caused a birth weight above average. This is mainly due to maternal diabetes, multiparity and increase in parental size which normally occur with increase in age. These factors result in an over growth of the fetus (1).

Birth weight is seen to increase with parity (Table II). Birth weight generally increases with parity and one must expect the 3-4th baby to weigh more than the first (1). In this study the ideal parity for ideal birth weight is para 2 and para 3. This does not coform with other studies done in literature where ideal parity for birth weight is para 1. Primigravidae have babies below average. This is due to the fact that there is always an increased risk of low birth weight with the first baby (6). The effect of age also plays a role here. Most primigravidae are young. Grand multiparae have babies above average birth weight. This is due to age increase with increase in maternal size and complications like diabetes.

In a person of low socio-economic class birth weight reduces with
parity since mother will be undernourished and unhealthy and all the
babies she would have had will further drain her resources (1). The
effects of age, parity and maternal size are not easily disentangled
from the effect of socio-economic circumstances. They depend on each
other. These results must be taken bearing this in mind. Socio-economic
factors were not studied here. Unfortunately even though provision is
made for recording this in the obstetric record book it is never filled.
Size of mother mainly height is also never recorded.

The presence of high blood pressure in pregnancy causes a sustained
uroplacental blood flow and loss of protein into urine which may enhance
depletion of intravascular plasma volume and therefore reduction in supply
to placenta. The combination of these 2 patho-physiological conditions
result in a serious adverse effect on fetal growth and survival (9).

This study shows that severe pre-eclampsia has a more marked effect
on birth weight than mild or moderate pre-eclampsia. None of the values
showed a significant difference however (Table III). The true effect of
pre-eclampsia is not clearly seen in this study. Here, highest average
birth weight was seen in moderate pre-eclampsia group. In fact, the
pattern of fetal growth retardation appears to correlate closely with
severity of maternal pre-eclampsia. This discrepancy in this study can
be attributed to the following:

a) Small sample size: only 100 pre-eclampsia patients were studied.
This may have contributed to inconsistent results.

b) Classification of pre-eclampsia (as in results). Even a trace of
protienuria was taken to be significant protienuria and this might
not have had any link with the pre-eclampsia.

c) None of the patients had a 24 hour urine protein analysis done on
them. Protienuria is said to be significant if there is more than
300 mg/100ml sample in 24 hours. What was considered to be protienuria
here because of one urinalysis reading might not have been significant
in actual fact.

d) Maternal pre-eclampsia is not static in pregnancy. These days on one

reading of a high blood pressure patient is admitted and fully
treated and thereafter carefully monitered. This therefore
prevents the fetus from getting harmed significantly. This one
reading however is what is taken as pre-eclampsia in this study.

Table IV shows there is a significant difference between birth
weights of cases and controls. The average birth weight of cases being
significantly lower. This is the expected result. This what further shows
that due to small sample size, poor classification and other mentioned
factors the severity of pre-eclampsia did not show a consistent relation-
ship.

Occurence of pre-eclampsia does not depend on age and is not
predilected to any specific maternal age (Table V). This is contrary
to literature which says pre-eclampsia is commonly a disease of young
mothers.

Coming to the comparison of studies, firstly the sample sizes are
very varied. In this study maximum sample size was 200, in comparison
study it was 11000. Both studies show the same effect of maternal age
on birthweight, that is an increase with age. Comparison study shows
that Para has a low birth weight and after that there is no difference
in birth weight with increasing parity. In this study birth weight
increases with parity. The classification of pre-eclampsia in both
studies is the same. In comparison study there is a marked reduction
of average birth weight in the severe pre-eclampsia group. There is
no difference in birth weight between mild and moderate pre-eclampsia.
In this study the results are inconsistent.

The average birth weight for male in this study is 3.316kg and
females is 3.133kg. As expected males are heavier than females. The
figures of the comparison study are higher than this study's figures.
This is to be expected since the former was carried out in the United
Kingdom which is developed and therefore living conditions are better.

All babies studied in this study were full term babies. This
was done to exclude any low birth weights due to prematurity or post
maturity. All the babies were also a result of singleton pregnancies since
twin pregnancy results in babies of low birth weight. The control group

was assumed to have had no complications during pregnancy.

Conclusion

All the factors studied here affect birth weight. Increased parity
has effect of increasing birth weight. Maternal age has varying effects
depending on age group. Teenage group predisposes to below average birth
weight and above 35 group results in birth weight above average.
Pre-eclampsia causes low birth weight. The effect of severity of
pre-eclampsia is not clear from this study. All that can be said is
severe pre-eclacmpsia has a more marked effect on birth weight as
compared to mild or moderate pre-eclampsia.

Recommendations

1) A research to be done in Zambia to find the average birth weight of
   a child.

2) Introduction of sex education in schools. This will aim at leading
   the young children through adolescence to full psychological and
   physical maturity before they get pregnant. It also teaches them
   to abstain from sex during their teenage years. The Planned
   Parenthood Association of Zambia (PPAZ) are working towards this.

3) Family Planning should be introduced to mothers to prevent high
   parity and its problems.

4) Mothers should be educated on the importance of early antenatal care
   since it helps prevent many complications in pregnancy and at birth.
   It also reduces the incidence of low birth weight babies.

5) There should be easily accesible and adequate maternity facilities
   for all pregnant women.

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