

Obstetric Factors Influencing the Outcome of VLBW Babies Admitted to Level 3 Malaysian Nurseries

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Summary

The Malaysian Paediatric Association Very Low Birthweight (VLBW) Study was carried out over a 6 month period in Level 3 nurseries in 23 centres in Malaysia. Data from 868 VLBW infants were analysed pertaining to various obstetric factors. Of these, mode of delivery, hypertension in pregnancy and use of prenatal steroids had significant influence on the outcome of these infants, measured in terms of survival to discharge. Infants delivered by Caesarean section (LSCS) had the best survival rates while breech and instrumental deliveries fared poorly. Infants of mothers with hypertension in pregnancy fared better than those of normotensive mothers. Finally, administration of prenatal steroids resulted in better outcomes. While these findings are subject to many variables, they concur with other studies and should help obstetricians establish management strategies.

Key Words: VLBW infants, Level 3 nursery, Survival, Hypertension in pregnancy, Neonatal mortality, Antenatal steroids

Introduction

Increasing survival of very low birth infants is largely the result of improved neonatal intensive care¹⁻⁵. In Malaysia over the past decade neonatal intensive care has been developing rapidly. Although published data on the outcome of intensive care does not exist, annual reports produced by major government hospitals show that there has been an improvement in survival of very low birth weight babies admitted to these hospitals. Over this period when neonatal intensive care has been developing there has also been marked improvement in the general standard of living and the health status of the population. Obstetric management has also markedly improved, in particular, access to proper antenatal care with identification and monitoring of at-risk pregnancies and delivery in an appropriate facility. However, it is not possible to define the exact role of each of these factors⁶.

Morbidity and mortality information on VLBW infants,

collected in a standardised way, ideally in whole populations, would not only provide information pertaining to infant care but also form a basis for looking at obstetric care, in order to optimise management of the individual at-risk pregnancy. The Malaysia Paediatric Association Very Low Birth Weight Study was carried out because of the concern amongst paediatricians over the lack of published data on the outcome of neonatal intensive care. Data from this study was used to examine obstetric factors and their influence on the outcome of VLBW infants, bearing in mind the limitation that no one single factor operates independent of other variables in influencing the survival of the VLBW infant. The aim is to present findings which would provide obstetricians some food for thought in establishing management strategies, particularly if these findings are in agreement with those of established studies.

Materials and Methods

All babies 1500g or less at birth who were admitted

into the participating level 3 nurseries between January 1 and June 30, 1993 were studied.

Level 3 nurseries were identified from government, university, and private hospital lists compiled by the Ministry of Health. All level 3 nurseries were invited to participate. There were 23 participating centres. These included 3 university centres, 13 general hospital centres, 3 district hospitals with a resident pediatrician and 4 private hospitals. One university did not participate and replies were not received from 20 private hospitals. Of these 20 private hospitals only 5 were major hospitals with comprehensive facilities. It is not known how many VLBW babies were managed in non-participating private hospitals but the numbers are likely to be very small. It is estimated that the study represents 90-95% of newborns admitted to level 3 nurseries throughout Malaysia. The study did not identify the number of babies less than 1500g who were not admitted to a level 3 nursery.

A data centre was set up to handle the receiving and computing of all data. A standardised data sheet was sent to all participants along with a detailed protocol for completing the data sheet. The data sheet was completed at discharge or death of each baby and sent to the data centre. Incomplete data sheets were returned for completion before being entered into the central database. A code number was randomly assigned to each participating centre to ensure confidentiality between centres. Analysis of this data was used for the present study.

For this study, a level 3 nursery was defined as a nursery which ventilates newborns and is under the control of a pediatrician. In order to minimise interference with current practices the diagnosis of hypertension in pregnancy, maternal diabetes mellitus, placenta praevia and abruptio placenta was not standardised but taken according to the individual diagnostic criteria of each obstetric unit. Premature rupture of membranes was defined as rupture before onset of labour before 37 weeks gestation. Prolonged rupture of membranes as rupture for more than 12 hours; anaemia as significant when Hb < 6gm/dl; Infection as pyrexia during labour and delivery, as well as specific infections; Prenatal steroids as 2 or more doses administered within 7 days and more than 12 hours before delivery.

Statistical analysis was performed using the software statistical test package Epi.info. The chi squared test was applied and results expressed as odds ratios (OR) with 95% confidence intervals (95% CI). A p value of less than 0.05 was accepted as significant.

Results

Data from 868 babies from 23 centres were analysed. All the main ethnic groups in the country were represented in the study (Table I). The proportions of males and females were almost equal with a slight preponderance of males (Table I).

Place of Delivery

The place of birth was classified into one of 8 categories. A total of 670 (77%) were born in hospitals with resident paediatricians, 32 (4%) babies were born in the private sector, of which 18 (2%) were in hospitals and 14 (2%) in maternity homes. Six-three (7%) were home deliveries, while 31 (4%) were born in other places, mainly while on the way to hospital (Table III).

Table I
Demographic data

Ethnic groups	Number (%)
Malays	526 (60.6)
Chinese	127 (14.6)
Indians	102 (11.8)
Indigenous	53 (6.1)
Others	60 (6.9)
Total	868 (6.9)
Gender	Number (%)
Male	471 (54.3)
Female	396 (45.6)
Ambiguous	1 (0.1)
Total	868 (100%)

Table II
Place of delivery

Place of delivery	Number (%)
Maternal Hospital, Kuala Lumpur and University Hospital	183 (21)
Other Government General Hospitals	402 (46)
Government District Hospitals with Paediatrician	85 (10)
Government District Hospitals without Paediatrician	72 (8)
Private Hospitals	18 (2)
Private Maternity Homes	14 (2)
Home	63 (7)
Others	31 (4)
Total	868 (100)

Overall survival

The overall survival to discharge was 543 (63%). There was no significant difference in the survival rates between the various ethnic groups as well between males and females.

Survival by gestation and birthweight

There was improved survival with increasing gestational age as well as with increasing birthweight (Table III).

Obstetric factors

A total of 12 obstetric factors were analysed with respect to outcome in terms of survival. These were maternal age, parity, mode of delivery, hypertension in pregnancy, maternal diabetes mellitus, maternal anaemia, placenta praevia, abruptio placentae, premature rupture of membranes, maternal infection, prolonged rupture of membranes and use of prenatal steroids. Of these, 9 obstetric factors did not have any significant influence on the outcome. The obstetric factors which showed significant influence on outcome were mode of delivery, hypertension in pregnancy and use of prenatal steroids (Table IV).

Table III
Survival of VLBW

Factor	VLBW			
	Survived	Died	Total	Survival rate (%)
Gestation (weeks)				
0 - 24	2	17	19	11
25 - 28	54	118	172	31
29 - 32	294	154	448	66
33 - 36	148	29	177	84
37 - 42	41	6	47	87
Unknown	4	1	5	90
Total	543	325	868	63
Birthweight (gms)				
501 - 740	3	35	38	8
751 - 1000	36	84	120	30
1001 - 1250	161	103	264	61
1251 - 1500	343	103	446	71
Total	543	325	868	63

Mode of delivery

Infants delivered by Caesarean section had the best survival rates followed by spontaneous vaginal deliveries (SVD). Breech deliveries and instrumental deliveries did not fare as well. This difference was found to be statistically significant (OR 1.54 CI.1.10-2.17) (Table IV).

Hypertension in pregnancy

VLBW infants of mothers with hypertension in pregnancy had a better survival rate than those whose mothers did not have hypertension in pregnancy. This difference was found to be significant (OR 2.00 C.I. 1.37-2.91) (Table IV).

Use of prenatal steroids

Only 6.7% of mothers were given prenatal steroids. The survival rate among infants of mothers given prenatal steroids was 79.3% as compared to a rate of 62.5% among those not given prenatal steroids. This difference was found to be statistically significant (OR 2.30 C.I. 1.16-4.67) (Table IV).

Discussion

The Malaysian Paediatric Association Very Low Birth Weight Study provides representative data on the outcome of VLBW babies admitted to level 3 Malaysian nurseries which serve the major hospitals where deliveries take place. Therefore, data pertaining to obstetric factors would be relevant to obstetric management, in particular, management of the individual at-risk pregnancy. In our study, analysis of data with respect to obstetric factors influencing outcome showed that 3 factors, namely, mode of delivery, hypertension in pregnancy and the use of prenatal steroids, had significant influence on the outcome measured in terms of survival to discharge. The overall survival for VLBW infants of 63% is below that of developed countries where it is generally around 70-80%³⁻⁵. As expected, survival rates are developed in the country, the survival rates are expected to improve.

From our study, it was found that infants delivered by Caesarean section (LSCS) had the best survival rates followed by spontaneous vaginal deliveries (SVD). Breech deliveries and instrumental deliveries did not

fare as well as LSCS or SVD. This difference is statistically significant (OR 1.54 C.I. 1.10-2.17). It may be that pregnancies which were considered likely to have viable outcomes would have been subjected to LSCS while those with expected poor outcomes would have been allowed vaginal deliveries. Several other groups of investigators have presented data that suggest that caesarean section may be beneficial⁷⁻¹⁰, although they found that improvement in survival associated with caesarean section reached statistical significance only for those infants in non-vertex presentation^{7,9}. Elective low forceps delivery over a wide episiotomy has been advocated for delivery of low birth weight infants in vertex presentation¹¹ but the benefit of this has been questioned^{7,8}. Schwartz and associates showed no significant differences in neonatal mortality and morbidity between low birth weight infants in vertex presentation, delivered by low forceps or spontaneously¹². An in-depth analysis of the study data is probably required before advocating any particular mode of delivery. Perhaps an individualised approach needs to be taken to each delivery.

Our study showed the VLBW infants of mothers with hypertension in pregnancy had significantly better outcomes as compared to those infants of mothers who did not have hypertension in pregnancy (OR 2.00 C.I. 1.37-2.91). The occurrence of Hyaline Membrane Disease (HMD) was also lower in the infants of mothers with hypertension in pregnancy as compared to those infants of mothers without hypertension in pregnancy (OR 0.66 C.I. 0.47-0.93). At first glance this appears to be in keeping with the widely accepted view that the stress of hypertension in pregnancy probably enhances fetal pulmonary maturity thereby reducing the incidence of HMD¹³⁻¹⁵, which in turn probably leads to better survival rates. However, other investigators have shown that if adjustments are made for gestational age, in particular excluding infants above 32 weeks gestation, the incidence of HMD was greater in infants of mothers with hypertension in pregnancy than in those whose mothers did not have hypertension in pregnancy¹⁶. The investigators concluded that the ameliorating effect of maternal hypertension occurred predominantly in the more mature preterm infants¹⁶⁻¹⁷. The results of our study, showing a lower occurrence of HMD among infants of mothers with hypertension in pregnancy as

Table IV
Summary of analysed obstetric factors

	Survivors	Died	Total	Odds Ratio (95% confidence interval)	p value
Maternal Age (years)					
19 or below					
20 - 40	45	38	83		0.11
41 and above	466	255	721		
Unknown	14	12	26		
Parity					
Primiparous	196	96	292	1.38 (1.00-1.90)*	0.12
Parity 2-5	261	176	437		
Parity >5	80	49	129		
Unknown					
Mode of Delivery					
LSCS	181	73	254	1.54 (1.10-2.17)**	<0.01
Instrumental	1	2	3		
Breech	57	56	113		
Normal	304	189	493		
Hysterotomy	0	1	1		
Unknown			1		
Hypertension in pregnancy					
Present	146	49	195	2.00 (1.37-2.91)	0.002
Absent	394	264	658		
Unknown	3	12	15		
Maternal diabetes mellitus					
Present	9	7	16	0.73 (0.25-2.21)	ns
Absent	532	304	836		
Unknown			16		
Maternal anaemia					
Present	7	3	10	1.34 (0.31-6.59)	ns
Absent	535	308	843		
Unknown			15		
Placenta praevia					
Present	26	21	47	0.69 (0.37-1.30)	ns
Absent	516	288	804		
Unknown			17		
Abruptio placentae					
Present	22	8	30	1.6 (0.67-3.95)	ns
Absent	520	302	822		
Unknown			16		
Premature rupture of membranes					
Present	79	53	132	0.83 (0.56-1.23)	ns
Absent	462	256	718		
Unknown			18		
Maternal infection					
Present	48	18	66	1.16 (0.99-1.36)	ns
Absent	493	292	785		
Unknown			17		
Prolonged rupture of membranes					
Present	43	26	69	0.99 (0.55-1.16)	0.1
Absent	497	282	779		
Unknown			20		
Use of prenatal steroids					
Yes	46	12	58	2.30 (1.16-4.67)	<0.01
No	494	297	791		
Unknown			19		

* Comparing primiparous to parity 2-5

** Comparing LSCS to normal delivery

compared to those infants of mothers without hypertension in pregnancy, could possibly also be explained by the inclusion of a sizable number of more mature infants. When the VLBW infants in our study whose mothers had hypertension in pregnancy were analysed for gestational age, it was found that 41% (80 out of 194) were of gestational age above 32 weeks. Therefore, intervention for delivery in cases of mothers with hypertension in pregnancy with gestational maturity greater than 32 weeks, could be considered with more confidence in view of the fact that those infants, although VLBW, may be spared from severe HMD due to their gestational maturity.

Only 58 out of the 868 study VLBW infants were exposed to prenatal administration of steroids (6.7% of study population). In spite of this small sample, analysis showed that these infants fared significantly better than those whose mothers were not administered prenatal steroids (OR 2.30 C.I. 1.16-4.67). Thus our study showed prenatal steroids to be beneficial. This is in keeping with what has been established by various investigators¹⁸⁻¹⁹. In a comprehensive review by Crowley and others²⁰, the following were reported.

There was an overall reduction of about 50% in the odds of developing neonatal respiratory distress. Even in sub-groups of cases of prolonged rupture of membranes and pre-labour rupture of membranes, steroids reduced the occurrence of neonatal respiratory distress. Among infants born between 24 hours and 7 days after steroids administration, the reduction in the odds of developing neonatal respiratory distress was 70% and this protective effect was also seen in those born outside this limit. There was significant reduction in HMD in infants of gestation less than 31 weeks, and this effect was also seen to a lesser extent in the group 31-34 weeks as well as among the very small number of infants above 34 weeks. There were significant reductions in early neonatal mortality, periventricular haemorrhage and enterocolitis. As a result of all these the mean duration of hospital stay was reduced thus reducing cost for the hospital. Considering maternal and fetal risks to steroid administration it was noted that stillbirths were not increased and there was no association with maternal, fetal, or neonatal infection. Thus, it is concluded that

the benefit of prenatal steroids outweighs the possible unwanted effects on mother and fetus.

Although only 6.7% of our study population was exposed to prenatal steroids, it was noted that some hospitals had greater numbers than others. This is perhaps related to policies in individual obstetric departments. Another reason could be failure in implementing departmental policy by doctors and other staff, either due to ignorance or a high turnover of staff with no continuity of implementation of policy. It is also not uncommon for mothers to come in late in labour and deliver before steroids can be administered. Still, it is worthwhile to note that in view of the definite benefit of prenatal steroids, active implementation of a policy of administering prenatal steroids to relevant antenatal cases would contribute to improve neonatal survival.

Conclusion

Reduction in mortality among VLBW infants will have an impact on national perinatal and neonatal mortality as prematurity is the commonest cause of death in the first month of life²¹. Data from this study though preliminary, is in agreement with findings elsewhere and should prove useful in planning obstetric management. However, as mentioned in the introduction, the limitations of the analysis, where each obstetric factor is examined singly, should be borne in mind before firm conclusions are made. The confounding effect of the various obstetric factors as well as other variables on one another has not been accounted for statistically.

Acknowledgements

The Director General of Health, Ministry of Health for permission to publish this paper. Malaysian Medical Association Foundation and Malaysian Paediatric Association for funding of the Collaborative Very Low Birth Weight Study. Dr. Kok Chin Leong, Johor Bahru for invaluable assistance rendered in data analysis by computer. Dr. Jackie Ho, Ipoh for invaluable advice, support and assistance as co-investigator. Mdm. Suseela Nair/Hajariah bt Mohd Soaid, for typing of manuscript.

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