Thai Journal of Obstetrics and Gynaecology
JULY 2011, Vol. 19, pp. 90-96

OBSTETRICS

Neonatal Survival Co-efficient of Very Low Birthweight Infant

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ABSTRACT

Objective: The aim of this study was to determine the survival co-efficient of very low birthweight (VLBW) infant (weighing < 1500 grams) at the age of 28 days and examine the survival ratios of infant at different birthweights.

Materials and Methods: This retrospective cohort study included all live-born VLBW infants who delivered at Lampang Regional Hospital from January 1, 2005 – December 31, 2009. The maternal and neonatal medical records were reviewed. Data were analyzed using descriptive and inferential statistics.

Results: There were 223 VLBW live-born infants during this period (11.7/ 1,000 live births). Mean (SD) of gestational age was 28.7 (3.4) weeks. Most of them had vaginal delivery. The mean (SD) birthweight was 1,124.8 (236.8) grams. The most common neonatal complication in this study was respiratory distress syndromes. Survival ratios at 28 days of VLBW infants stratified by 100 grams birthweight were ranging from 0-94.9%. Regression analysis showed survival co-efficient (OR) at 1.64 (95% CI 1.40-1.92).

Conclusions: The incidence of VLBW infants and survival ratios at Lampang Regional Hospital were comparable to the other hospitals in Thailand. The survival co-efficient was 1.64 meant that a VLBW infant had 64% increased chance of survival for every 100 grams gained. The figure of survival co-efficient could very much help obstetric personnel in counseling a pregnant woman about the prognosis of her unborn child.

Keywords: Very low birthweight infant, survival, survival co-efficient, incidence

Introduction

Very low birthweight (VLBW) infants have high mortality and morbidity[1, 2]. Survival rate is varied from decade to decade, country to country, and it also varies from hospital to hospital[3]. Survival to discharge rate in Thailand is approximately 63.4-81.0%[4-6] while it is 84-89% in western countries[7-9].

The common complications in VLBW infants are respiratory distress syndromes (RDS), sepsis, apnea, pneumonia, bronchopulmonary dysplasia (BPD), necrotizing enterocolitis (NEC), retinopathy of prematurity (ROP) and intraventricular hemorrhage (IVH)[4,6,10,11]. Major causes of death usually were RDS, severe sepsis and congenital abnormalities[5,11].

Survival rate of extremely low birthweight (ELBW) infants (birthweight < 1,000 grams) was less and more difficult to predict. This group comprised of one third of VLBW infants born[4].

The improvement of intensive neonatal care unit and medical technologies plays major role in increase survival rate of VLBW infants in recent decades[12, 13]. Nevertheless, it is still difficult for obstetricians to counsel about the outcome especially in extremely low birthweight (ELBW) infants. Moreover, this group of preterm infants poses complex medical, social, and ethical considerations in daily practice[14].

Lampang Regional Hospital, located in the northern part of Thailand, is responsible for pregnant women in Lampang province and nearby provinces. Counseling about survival rate of VLBW infants remains the difficult issue. This study was to examine the survival rate of VLBW infants which may be helpful in this difficult situation. Although other factors may effect survival rate of VLBW infants, this study was focused on the relationship between birthweight and survival rate. This study aimed to determine the survival co-efficient of VLBW infants at the age of 28 days and the survival ratios of infants at different birthweights.

Materials and Methods

This retrospective cohort study included all live-born VLBW infants (weighing < 1,500 grams)[15] who delivered at Lampang Regional Hospital from January 1, 2005 to December 31, 2009. Their maternal and neonatal records were reviewed. Gestational age was calculated from last menstrual period or by ultrasonography. Neonatal survivals were also checkedfrom medical records of the neonates. If they were discharged before 28 days and no evidence of hospital visit was found, hospital staffs would make phone calls to confirm their survivals. Neonatal complications that were examined in this study were, jaundice, pneumonia, sepsis.

Data were analyzed by statistical software. Descriptive analysis was used for general characteristics, morbidity and mortality of VLBW infants. Stratified survival ratios by birthweight were calculated. Regression analysis and Kaplan Meier survival analysis were also used for inferential statistical analysis at 95% confidence interval.

Results

There were 223 VLBW live-born infants from total 19,125 live-births during the study period. The incidence of VLBW infant was 11.7 cases per 1,000 live-births. General characteristics of all VLBW infants were shown in Table 1. Mean gestational age (GA) was 28.7 weeks (SD 3.4).There were 30% of VLBW infants with GA less than 28 weeks of gestation. Of 223 VLBW infants, 48.9% were male, 7.2% had meconium- stained amniotic fluid, 26.5% had membrane ruptured before admission and 2.7% had congenital anomaly. Most of them were delivered vaginally.

Characteristics of the infants at birth were shown in Table 2. Mean Apgar score at 1 minute and 5 minutes were 6.6 (SD 2.5) and 7.6 (SD 2.2), respectively. Mean birthweight of these VLBW infants was 1,124.8 grams (SD 236.8). Mean body temperature at NICU of 204 infants recorded was 36.2 degree Celsius (SD 0.6). One hundred ninety one infants received neonatal resuscitation at the time of birth. And the median of the duration used for resuscitation was 3 minutes with 25^{th} and 75^{th} percentile at 1 and 5 minutes, respectively.

Neonates in this study suffered from RDS, jaundice, pneumonia, sepsis, (Table 3).

Table 1. General characteristics of VLBW infants (N= 223)

Characteristics	n (%)
Gestational age <28 weeks	67 (30.0)
Male infants	109 (48.9)
Meconium-stained amniotic fluid	16 (7.2)
Membrane ruptured before admission	59 (26.5)
Congenital anomaly	6 (2.7)
Mode of delivery	
Vaginal delivery	139 (62.3)
Cesarean section	62 (27.8)
Vaginal breech delivery	18 (8.1)
Vacuum extraction	1 (0.4)
Forceps extraction	3 (1.4)

Table 2. Characteristics at birth of VLBW infants (N= 223)

Characteristics	X (SD)	Min-Max
Apgar scores at 1 minute	6.6 (2.5)	0-10
Apgar scores at 5 minutes	7.6 (2.2)	1-10
Birthweight (grams)	1,124.8 (236.8)	560-1490
Body temperature (degree celsius) at NICU (N=204)	36.2 (0.6)	34-38

Table 3. Neonatal complications of VLBW infants (N= 223)

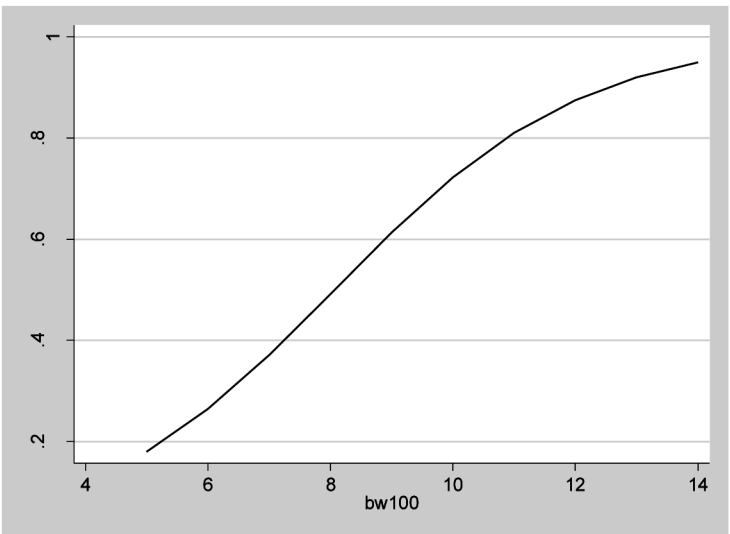
Complications	n (%)
RDS	164 (73.5)
Jaundice	113 (50.7)
Pneumonia	83 (37.2)
Sepsis	62 (27.8)
BPD	54 (24.2)
ROP	35 (15.7)

RDS=respiratory distress syndromes, BPD=bronchopulmonary dysplasia, ROP=retinopathy of prematurity

Table 4. Survival ratios stratified by 100 grams of birthweight (N= 223)

Birthweight (grams)	N (cases)	Survival ratio (%)
500-599	2	0
600-699	8	25
700-799	18	44.4
800-899	12	33.3
900-999	24	66.7
1000-1099	27	74
1100-1199	28	78.6
1200-1299	41	87.8
1300-1399	24	91.7
1400-1499	39	94.9

Table 4 shows survival ratios at 28 days of VLBW infants stratified by 100 grams of birthweight. Regression analysis was done to find survival co-efficient (Graph 1). The odds ratio (OR), thus the survival co-efficient, was 1.64 with 95% confidence interval of 1.40-1.92 (p-value < 0.001). This means a VLBW infant had 64% increased chance of survival for every 100 grams gained. Overall, 167 or 74.9% of these infants survived beyond 28 days.

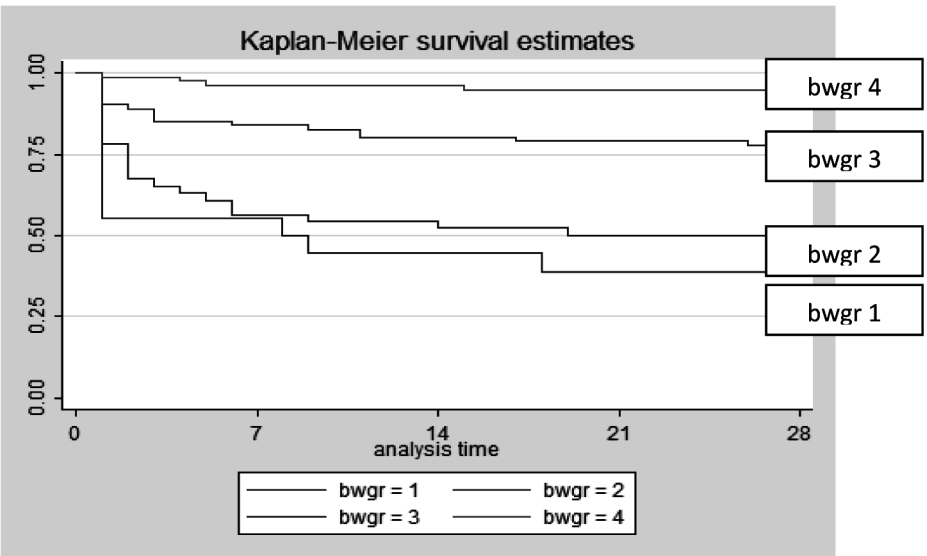


Graph 1. Chance of survival for every 100 grams of birthweight gained

Table 5 shows weight group distribution and among VLBW infants which 28.7% were ELBW. Result of Kaplan-Meier survival analysis of these infants was shown as Graph 2.

Table 5. Distribution of birthweight in groups (N= 223)

Weight group	Birthweight	N (%)
bwgr 1	500-749 grams	18 (8.1)
bwgr 2	750-999 grams	46 (20.6)
bwgr 3	1000-1249 grams	81 (36.3)
bwgr 4	1250-1500 grams	78 (35.0)



Graph 2. Survival ratio of each weight group

Discussion

The incidence of VLBW infants at Lampang Hospital (11.7/ 1,000 live-births) was higher than of Thammasart University Hospital (4.9/ 1,000 live-births) [5]. It was comparable to 14.0/1,000 live-births incidence of Prapokklao Hospital which was comparable size. This should prompt the personnel involved with lowering the incidence of low birthweight, small for gestational age and second trimester (near viable) criminal abortion to deploy measures effectively to prevent these unwanted condition.

Survival ratio used in this study is slightly different from that used in other studies. This study used the ratio of survival at 28 days (neonatal period) while most reports frompediatricians used ratio of survival to discharge[4-6]. Survival ratio at 28 days means more for obstetricians and patients in counseling of their unborn children. It gives an exact time reference and usually reflects obstetrics complications rather than pediatrics care. In this study, survival ratio of 74.9% was comparable to 63.4-81.0% from other hospitals in Thailand[4-6].

Almost one-third of VLBW infants were born at GA less than 28 weeks which is considered as abortion according to MOPH (Ministry of Public Health) criteria. Obstetricians at Lampang Regional Hospital are now using threshold of viability of fetuses at 26 weeks or 750 grams from ACOG Recommendation[1]. The ratio of extremely low birthweight (ELBW) infants in this study was 28.7% which was comparable to other reports of 25.8-31%[4, 6]. Other characteristics of VLBW infants shown in this study e.g. male infants, anomaly, Apgar

scores and sub-temperature were similar to other studies in Thailand[4,5]. However, cesarean section rate was only 27.8% comparing to 47.2-56% in other institutes[4,5]. This may be due to the different concept about viability.

Kaplan-Meier analysis of survival ratios of each birthweight group in this study was comparable to previous studies[1, 4, 5, 8-11]. The survival ratio in this study for the group of 500-749 grams was 30% which was comparable to other studies. For 750-999 grams infants, the survival ratio was 0-88% in other studies while it was 50% in our study. In the group of 1,000-1,249 grams infants, the figures were comparable between other studies and our report (64.7-94% and 76% respectively). In the last group of 1,250-1,499 grams, Lampang Hospital had more than 95% survival comparing to 82.3-97% from of the others[1, 4, 5, 8-11]. This may be the results of improved standard of obstetric and pediatric care at Lampang Regional Hospital. Neonatal morbidity found in this study was similar to other reports[4, 10]. RDS was the most common complication apart from jaundice, pneumonia, sepsis, BPD and ROP[4,10].

This is the first study to report the survival co-efficient of VLBW infants. The survival co-efficient or OR in this study was 1.64 which means a VLBW infant had 64% increased chance of survival for every 100 grams gained. This figure should be helpful for counseling pregnant woman about the prognosis of her unborn child (Graph 1.) By deferring the delivery of a fetus for 3-5 days in order to gain a hundred grams may chance of survival by 60%.

While the Kaplan-Meier analysis showed expected survival ratio of each weight group, survival co-efficient could give more precise figure. The family of a pregnant woman could be involve in the decision-making. This will help the health- care provider to plan the management. The results from this study can be used in other obstetric units with the same facilities. Nevertheless, continuing audit of VLBW neonatal survival ratio should improve the quality of care.

The limitations of this study are the confounders such as obstetric complications, induction of labor, sub-temperature, giving steroid, gestational age or even admission of the neonate to NICU. However, birthweight was the most common factor used to counsel pregnant woman regarding her fetal survival prognosis. We plan to analyze the effect of these factors on survival of VLBW infants. Long term follow up after 28 days will also be investigated.

In conclusion, the incidence of VLBW infants at Lampang Hospital was comparable to the other Thai hospitals. The survival ratios of different weight group were also comparable to other institutes. While Kaplan Meier analysis showed expected survival ratio of each weight group, neonatal survival co-efficient could provide more precise figure. Obstetric care provider will have benefit from this study when counseling a pregnant woman and her relatives regarding the prognosis of the unborn child.

Acknowledgements

This research was granted by research grant support of Lampang Regional Hospital. We thank Dr Songwut Subthaweesin, Director of Lampang Regional Hospital for his support, Dr. Jayanthorn Pathumanond for consultation on research methodology and Dr Rungthiwa Meunpa for statistical analysis.

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สัมประสิทธิ์การรอดชีวิตของทารกแรกเกิดน้ำหนักตัวน้อยมาก

รายิน อโรร่า, วันลิกา แก้วสุริยา, อินธิรา จงภู่

วัตถุประสงค์ *: การศึกษานี้เพื่อหาค่าสัมประสิทธิ์การรอดชีวิตของทารกแรกเกิดน้ำหนักตัวน้อยมาก อายุ 28 วัน และศึกษาสัดส่วนของทารกที่รอดชีวิตในแต่ละช่วงน้ำหนักแรกคลอด ผลลัพธ์การศึกษานี้สามารถช่วยผู้ให้บริการทางสูติกรรม ในการให้คำปรึกษาแนะนำแก่หญิงตั้งครรภ์และญาติได้แม่นยำมากขึ้น*

วัสดุและวิธีการ *: งานวิจัยนี้เป็นการศึกษาแบบ cohort เก็บข้อมูลย้อนหลัง เก็บข้อมูลทารกแรกเกิดน้ำหนักตัวน้อยมากทุกคนที่คลอดในห้องคลอด โรงพยาบาลศูนย์ลำปาง ตั้งแต่วันที่ 1 เดือนมกราคม พ.ศ.2548 ถึง วันที่ 31 เดือนธันวาคม พ.ศ.2552 ค้นข้อมูลจากบันทึกการรักษาของมารดาและทารก วิเคราะห์ข้อมูลทางสถิติแบบพรรณนาและเชิงอนุมาน*

ผลการศึกษา *: มีทารกน้ำหนักตัวน้อยมากคลอดในช่วงเวลาการศึกษา 223 คน คิดเป็นอุบัติการณ์ 11.7/ 1,000 การคลอดมีชีพ ค่าเฉลี่ย (ค่าเบี่ยงเบนมาตรฐาน) ของอายุครรภ์เท่ากับ 28.7 (3.4) สัปดาห์ ส่วนใหญ่คลอดทางช่องคลอด แต่มีร้อยละ 27.8 คลอดโดยการผ่าตัดคลอด ค่าเฉลี่ย (ค่าเบี่ยงเบนมาตรฐาน) ของน้ำหนักแรกคลอดเท่ากับ 1,124.8 (236.8) กรัม ภาวะแทรกซ้อนที่พบบ่อยที่สุดในทารกกลุ่มนี้คือ respiratory distress syndromes สัดส่วนทารกรอดชีวิต ที่อายุ 28 วัน จำแนกตามน้ำหนักทุก 100 กรัม เท่ากับร้อยละ 0-94.9 การวิเคราะห์ด้วยสถิติถดถอย พบว่า ค่าสัมประสิทธิ์การรอดชีวิตของทารกแรกเกิดน้ำหนักตัวน้อยมาก เท่ากับ 1.64 (95% CI 1.40-1.92)*

สรุป *: อุบัติการณ์ของทารกแรกเกิดน้ำหนักตัวน้อยมาก และสัดส่วนการรอดชีวิต ที่โรงพยาบาลลำปางค่อนข้างใกล้เคียงกับโรงพยาบาลอื่น ค่าสัมประสิทธิ์การรอดชีวิตของทารกแรกเกิดน้ำหนักตัวน้อยมาก 1.64 หมายถึง ทุกๆ 100 กรัมของน้ำหนักทารกที่เพิ่มขึ้น มีการเพิ่มโอกาสรอดชีวิต ร้อยละ 64 ค่าสัมประสิทธิ์การรอดชีวิตนี้สามารถช่วยผู้ให้บริการทางสูติกรรม ให้คำแนะนำแก่หญิงตั้งครรภ์เกี่ยวกับพยากรณ์โรคของทารกได้ดีขึ้น*