Growth and Development of Very Low Birth Weight Infants Aged 18-24 Months at Queen Sirikit National Institute of Child Health

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Background: *The number of very low birth weight (VLBW) births is increasing worldwide. Despite better care in recent years, they have a high incidence of delayed growth and development. There are no previous studies regarding the growth and development of these infants at Queen Sirikit National Institute of Child Health (QSNICH).*
Objective: *To study growth and developmental outcome of VLBW infants, aged 18-24 months who were discharged from QSNICH.*
Material and Method: *VLBW infants who were discharged from QSNICH during the year 2007 were recruited in the study. Patients with chromosomal abnormalities, major congenital anomalies, definite congenital infections and positive maternal anti-HIV tests were excluded. At the corrected age of 18-24 months, the parents were called upon to bring their infants for complete physical examination and developmental evaluation on 2 occasions, two months apart.*
Results: *There were 111 cases of VLBW infants who were discharged from QSNICH during the year 2007. Fifty-four patients were eligible for the present study. Thirty cases (55.56%) were contacted for the first examination. During this examination, there were 3 cases (10%) with low head circumference, 1 case (3.33%) with poor weight gain, 5 cases (16.67%) with visual defect, 1 case (3.33%) with moderately severe hearing loss, 1 case (3.33%) with cerebral palsy and 7 cases (23.33%) with delayed development. Twenty-one cases could be recalled for a second evaluation. Two of the 5 cases had delayed language development. There were no cases with hydrocephalous, blindness or profound hearing loss.*
Conclusion*: VLBW infants at QSNICH had much better survival during recent years. Most of these survivors had normal growth and development. Those with delayed growth and development need aggressive intervention and long term follow-up for enhancement of quality of their lives.*

Keywords: *Very low birth weight, Growth, Development, 18-24 months*

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Despite a decline in total birth, the number of live-born very low birth weight births is increasing worldwide[1-4]. The care of these infants in recent years has improved greatly[1,3,5,6]. However, they frequently have a high incidence of delayed growth and development[2,7,8]. Queen Sirikit National Institute of Child Health is a supertertiary center responsible for hundreds of very low birth weight infants each year. There have been no previous studies regarding the growth and developmental outcome of these infants at this institute.

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Objective

To study growth and developmental outcome of very low birth weight infants who were discharged from Queen Sirikit National Institute of Child Health.

Material and Method

Very low birth weight infants who were discharged from Queen Sirikit National Institute of Child Health during the year 2007 were recruited in the present study. Patients with chromosomal abnormalities, major congenital anomalies, definite congenital infections and positive maternal anti-HIV tests were excluded from the present study. Medical records of these patients were reviewed for epidemiologic data and clinical course

during admission. At the corrected age of 18-24 months, the parents were contacted by phone and/or letter to bring their children to the QSNICH for complete physical examination including weight, height, head circumference, visual acuity, hearing and developmental evaluation. The physical examination and developmental evaluation were performed on two occasions, 2 months apart. Otoacoustic emission (OAE) was used as the hearing screening test and when hearing loss was suspected, auditory brainstem evoked response (ABR) was used to confirm the OAE. The weight, height and head circumference were converted to percentile using Infant Health and Development Program (IHDP) Growth Percentile: very low birth weight premature[9]. These parameters were validated by re-examination three months later. Developmental evaluation was performed by a single physician using the second version of the Denver Developmental Screening Test (DDST II)[10].

Data analyses and statistics

The data were collected and descriptive statistics was used for analysis.

Results

There were 111 cases of very low birth weight infants who were admitted at Queen Sirikit National Institute of Child Health during the year 2007. Of these, 88 cases (79.27%) survived and were recruited for the present study. However, 34 cases were excluded due to chromosomal abnormalities, major congenital anomalies, definite congenital infections and positive maternal anti-HIV tests.

Of the remaining 54 cases, only 30 cases (55.56%) could be contacted for the first evaluation at the average corrected age of 19.77 $\pm$ 3.32 months. Eleven of these (36.67%) were male with mean gestational age of 29.17 $\pm$ 1.98 weeks and birth weight of 1,165.17 $\pm$ 217.71 grams. In this group, morbidities during hospitalization included 12 cases (40%) with retinopathy of prematurity (ROP), 3 cases (10%) of which needed laser surgery, 9 cases (30%) with intraventricular hemorrhage (IVH), 2 cases (6.67%) with severe IVH, 6 cases (20%) with bronchopulmonary dysplasia (BPD), 5 cases (16.67%) with documented sepsis, 5 cases (16.67%) with necrotizing enterocolitis (NEC) and 1 case (3.33%) with periventricular leukomalacia. The epidemiologic and clinical data during admission of these 30 cases are shown in Table 1.

The percentiles of weight, height and head circumference of the 30 cases at the first evaluation are shown in Fig. 1. Nearly all had appropriate growth after adjusting for the corrected age. The only case with weight and head circumference under 5th percentile (case 11) had birth weight of 940 grams, was in hospital for 80 days with many complications during the hospital stay. There were two cases with head circumference under 5th percentile.

Neurological outcome of these 30 cases are shown in Table 2. The most common neurological problem was visual defect which was detected in 5 cases (16.67%). All of them needed eyeglasses. Four cases had a hearing problem from the OAE but there was only one case (case No.9), confirmed by ABR to have moderately severe hearing loss needing hearing aids.

Delayed development by DDST II was found in 7 cases (23.33%), 5 were in language skill and one case with cerebral palsy had delayed gross motor development. All the cases with delayed development were sent for infant stimulation. Of the 30 cases first evaluated, only 21 cases could be recalled for the second evaluation (average corrected age 24.38 $\pm$ 3.57 months). Of the 5 cases with delayed language development, 4 cases came in for follow-up. Two of these responded well to stimulation while the other two cases still had delayed language development. The details of developmental evaluation by DDST II are shown in Fig. 2 and 3.

Discussion

Survival of very low birth weight infants at Queen Sirikit National Institute of Child Health increased steadily from 79.09% in the year 2005 to 89.76% in the year 2009[11]. The low number of follow-up cases is attributable to the fact that most of these survivors are attended by families in urban areas and have difficulties in coming for follow-up in Bangkok. Good care and better follow-up of these patients needs good network communication of medical personnel.

Very low birth weight infants have a higher incidence of delayed growth and development[1,5,7,8,12,13]. Adequate and appropriate nutrition are of prime importance in production of normal somatic growth and development. Nearly all patients in the present study had normal growth when corrected for age. The proportion of follow-up cases was quite low and many cases with severe growth retardation may have died after hospital discharge without notice. Hospital survivors who were brought into the present study may be in higher socioeconomic status and have better access of medical care than those

Table 1. The epidemiologic and clinical data during admission of the overall 30 cases

No.	sex	GA (wk)	Birth Weight (g)	5'Apgar scores	LOS (days)	VD (days)	IVH	BPD	ROP	NEC	Sepsis
1	m	33	1,410	10	52	0	no	no	no	no	C
2	m	31	1,395	9	42	2	no	no	no	no	C
3	m	28	1,130	5	69	19	no	no	no	no	C
4	f	29	1,360	9	66	11	no	no	no	no	no
5	f	29	1,260	9	55	2	no	no	no	no	C
6	m	31	1,100	10	31	2	no	no	no	no	no
7	m	27	1,030	8	128	53	no	yes	Stage II	no	C
8	f	32	1,495	10	64	2	no	no	0	no	C
9	f	27	950	6	77	12	no	no	no	Stage 2A	no
10	f	27	980	6	91	28	grade I	no	Stage III	no	Kl
11	m	27	940	10	80	0	grade I	no	no	Stage 2A	C
12	f	30	1,008	10	65	6	no	no	Stage III	Stage 2A	no
13	f	30	1,190	6	58	2	no	no	Stage I	no	no
14	f	30	1,240	6	58	2	no	no	no	no	Kl
15	m	32	1,270	10	42	0	no	no	no	no	no
16	f	29	1,410	8	45	8	no	no	no	no	C
17	f	31	1,355	9	69	5	no	no	Stage I	Stage 2A	C
18	m	30	1,050	6	79	18	grade I	yes	Stage II	no	no
19	f	30	1,270	7	61	8	grade IV	no	Stage I	no	C
20	f	30	1,220	7	61	3	grade IV	no	Stage II	no	C
21	f	30	1,492	4	49	2	no	yes	no	no	C
22	f	26	800	NA	75	24	grade I	no	no	no	C
23	m	29	1,240	7	50	3	no	no	no	no	C
24	m	32	1,436	9	43	3	no	no	no	Stage 2A	Ps
25	f	30	1,290	10	54	0	grade II	no	no	no	C
26	f	28	960	4	78	4	grade II	no	no	no	no
27	f	27	1,024	7	55	1	no	no	Stage I	no	Ps
28	f	27	740	10	97	21	no	yes	Stage II	no	Ps
29	f	28	1,200	8	69	1	no	no	Stage I	no	C
30	m	25	710	6	119	61	grade II	yes	Stage III	no	C

LOS = length of stay, VD = ventilating day, IVH = intraventricular hemorrhage, BPD = bronchopulmonary dysplasia, ROP = Retinopathy of prematurity, NEC = Necrotizing enterocolitis, NA = not assess, C = clinical sepsis with negative blood culture, Kl = Klebsiella septicemia, Ps = Pseudomonas septicemia

Table 2. Neurological abnormalities of the overall 30 cases

No.	Cerebral palsy	Seizure	Hydrocephalus	Vision	Details of abnormalities	Hearing
1	yes	no	no	no		no
4	no	no	no	yes	myopia and astigmatism	no
7	no	no	no	yes	strabismus	no
9	no	no	no	no		yes
18	no	no	no	yes	myopia	no
19	no	no	no	yes	corneal scar, astigmatism	no
30	no	no	no	yes	astigmatism	no

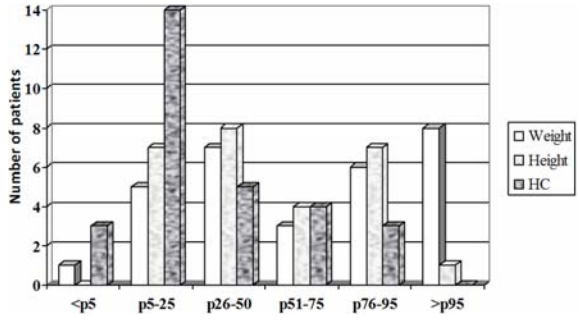

Fig. 1 Weight, height and head circumference of the 30 cases in the first evaluation

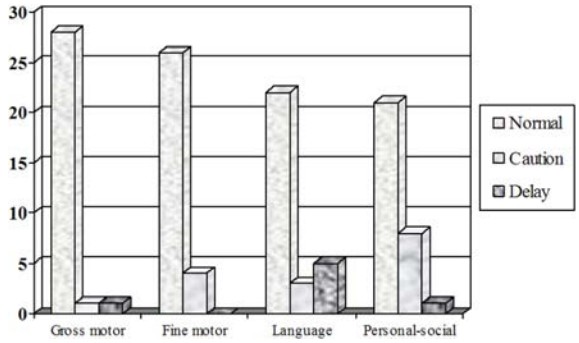

Fig. 2 Conclusion of the first DDST II test

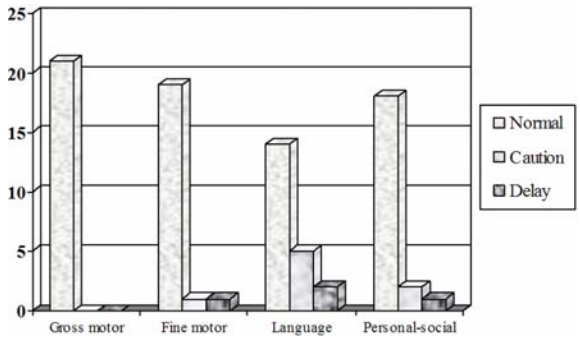

Fig. 3 Conclusion of the second DDST II test

who were not.

Most of the patients with severe handicap can be detected in the first two years. These severely handicapped patients frequently had severe IVH and abnormal ultrasonogram study of the head. Minor neurological sequel had been detected as late as 5-7 years of age[14-16]. There were no patients with severe handicap in the present study. Two of the major neurological morbidities of very low birth weight infants were hearing loss and visual complications[1,5,6]. Aggressive ophthalmologic monitoring and cryotherapy for ROP (performed in 3 cases) accounted for the low incidence of blindness. The low incidence of hearing loss can be attributable to the concern of medical personnel to avoid ototoxic drug use and better technology in caring for these patients. The low incidence of visual defects and hearing loss in the present study were comparable to other studies in developed countries[1,17].

The authors chose DDST II for developmental evaluation in the present study because it was simple and easily reproducible. The most common developmental problem in the present study was the language development. This goes along with previous studies[18,19]. Two of the 5 cases with delayed language development caught up with their peers with only 3 months-stimulation. Early intervention will greatly help these infants.

Conclusion

Very low birth weight infants at Queen Sirikit National Institute of Child Health have had much better survival during recent years. Most of these survivors had normal growth and development. The most common neuro-developmental outcomes are hearing loss and language development.

Potential conflicts of interest

None.

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การเจริญเติบโตและพัฒนาการของทารกน้ำหนักน้อยมากที่อายุ 18-24 เดือน สถาบันสุขภาพเด็กแห่งชาติมหาราชินี

วราภรณ์ แสงทวีสิน, ยุพเยาว์ สิงห์อาจ, วิบูลย์ กาญจนพัฒนกุล

ภูมิหลัง: *ปัจจุบันจำนวนทารกเกิดใหม่ทั่วโลกจะมีจำนวนลดน้อยลง แต่จำนวนทารกคลอดที่มีน้ำหนักตัวน้อยมากกลับสูงขึ้น การดูแลรักษาทารกแรกเกิดมีการพัฒนาขึ้นมาก อัตรารอดชีวิตของทารกที่มีน้ำหนักน้อยเพิ่มขึ้น แต่พบว่ามีการเจริญเติบโตและการพัฒนาการที่ล่าช้า*

วัตถุประสงค์: *ศึกษาการเจริญเติบโตและพัฒนาการของทารกแรกเกิดน้ำหนักน้อยมากที่อายุ 18-24 เดือน*

วัสดุและวิธีการ: *ทารกแรกเกิดน้ำหนักน้อยกว่า 1,500 กรัม ที่รับไว้รักษาในหน่วยทารกแรกเกิด สถาบันสุขภาพเด็กแห่งชาติมหาราชินีในปี พ.ศ. 2550 และรอดชีวิต ติดตามมาตรวจการเจริญเติบโต และพัฒนาการที่อายุ 18-24 เดือน 2 ครั้งห่างกัน 3 เดือน ทารกที่ตัดออกจากการศึกษาได้แก่ทารกที่มีความผิดปกติของโครโมโซม ทารกที่มี major congenital anomaly, definite congenital infection, positive HIV mother การประเมินการเจริญเติบโตของน้ำหนัก ส่วนสูงและเส้นรอบวงศีรษะใช้ Infant Health and Development Program (IHDP) Growth Percentile: very low birth weight premature และการประเมินพัฒนาการโดยใช้ Denver Developmental screening Test (DDST II)*

ผลการศึกษา: *ทารกน้ำหนักแรกเกิดที่มีน้ำหนักน้อยกว่า 1,500 กรัม ทั้งหมด 111 ราย รอดชีวิต 88 ราย (79.27%) เข้าเกณฑ์การศึกษา 54 ราย แต่สามารถติดตามมาได้ 30 ราย (55.56%) อายุครรภ์เฉลี่ย 29.67 $\pm$ 1.98 สัปดาห์ น้ำหนักแรกเกิดเฉลี่ย 1,165.17 $\pm$ 217.71 กรัม เป็นเด็กชาย 11 ราย (36.67%) ผลการตรวจติดตามครั้งที่หนึ่ง อายุเฉลี่ยของเด็กที่มาตรวจ (corrected age) 19 $\pm$ 13.32 เดือนพบว่ามีทารกที่มีการเจริญเติบโตช้า 3 ราย (10%) โดยมีทารกที่น้ำหนักและเส้นรอบวงของศีรษะต่ำกว่าเกณฑ์ 1 ราย ทารกที่มีเส้นรอบวงของศีรษะต่ำกว่าเกณฑ์ 2 ราย ตรวจพบความผิดปกติด้านระบบประสาท cerebral palsy 1 ราย (3.33%), visual defect 5 ราย (16.66%), moderately severe hearing loss (70 dB) 1 ราย (3.33%), ตรวจพัฒนาการพบว่ามีล่าช้า 7 ราย (23.33%) เป็นพัฒนาการล่าช้าด้านภาษา 5 ราย พัฒนาการทางสังคม 1 ราย กล้ามเนื้อมัดใหญ่ 1 ราย มาตรวจประเมินซ้ำครั้งที่ 2 จำนวน 21 ราย อายุเฉลี่ย 24.38 $\pm$ 3.57 เดือน พบว่าทารกที่พัฒนาการด้านภาษาล่าช้าดีขึ้น 2 ราย หลังจากได้รับการช่วยเหลือจากการตรวจครั้งที่หนึ่ง การศึกษาครั้งนี้ไม่พบความพิการรุนแรง เช่น หัวบาตร ตาบอด หูหนวก*

สรุป: *ทารกแรกเกิดที่มีน้ำหนักตัวน้อยมาก มีอัตราเพิ่มมากขึ้น โอกาสรอดชีวิตสูงขึ้น ทารกที่รอดชีวิตส่วนใหญ่มีการเจริญเติบโต และพัฒนาการสมวัย ส่วนน้อยที่ล่าช้าแต่จำเป็นต้องให้การช่วยเหลือ ดูแลรักษาและติดตามระยะยาวอย่างต่อเนื่องเพื่อช่วยทารกที่รอดชีวิตมีคุณภาพชีวิตที่ดีขึ้น*