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Denver Developmental Screening Test in two-year old infants delivered by vacuum extraction

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ABSTRACT The aim of this study was to determine the developmental retardation of infants of two years of age who were delivered by vacuum extraction. This cross-sectional study examined 44 infants delivered by vacuum extraction, comprising 25 males and 19 females who were born in Tembakau Deli and St. Elizabeth Hospitals, between August 1993 until February 1994. The examination included interview and physical examination in the patient's house. Chi-square statistics analysis was used with a significant level of 95% (p=0.05). The results showed that of the 44 infants delivered by vacuum extraction, 28 (32%) had had were found with mild asphyxia, while 2 infants (5%), whose mothers work as private clerk and entrepreneur, had development retardation. We concluded that there was no significant difference in development between infants delivered by vacuum extraction and those who were born spontaneously. Developmental retardation was found in infants whose mothers lack time to communicate. **[Paediatr Indones 2001;41:27-32]**

Keywords: Denver Developmental Screening Test, vacuum extraction, mental retardation

NEWBORNS HAVE A COMPLETE NERVE STRUCTURE. THE growth and association between nerve cells increase particularly in the first two years of life. Consequently, physical, cognitive, and neurological developments occur particularly in this period. Therefore, the first two years of life is often considered as a gold chance where stimulation and intervention may produce best result.[1,2] However, some factors related to brain injuries can delay the maturation process. One of the factors is intracranial bleeding in prenatal period.[3-5]

Several studies indicate that the use of vacuum extraction tends to increase from year to year. Broekhuizen found that the frequency had increased from 0.6% in 1979 to 3.1% in 1984.[6] In Pirngadi Hospital, Medan, Hady reported that the frequency was 0.7% in 1970 and 8.9% in 1982.[7] In Sardjito Hospital, Yogyakarta, Widhanartho et al found 8.7% of labors were assisted by vacuum extraction.[8] Vacuum extraction increases mechanical trauma to infant's head which may cause intracranial bleeding, leading to symptoms of brain damage such as convulsion, cerebral palsy, and mental retardation.[3,4,8-11] Plauce found that 0.35% of intracranial bleeding occurred in infants delivered by vacuum extraction.[4] Bredstruk et al reported that cerebral irritation occurred in 2.9% of infants delivered by vacuum extraction.[12] There are controversics among experts about the effects of delivery using vacuum extraction to the infants' development. Hanigan[3] and Blennow et al[13] reported neurological or developmental disorders in children who had been assisted by vacuum extraction at birth, while Dahlin,[14] Hariyono,[15] and Marbun et al,[16] found no difference in the psychomotoric activity of infants delivered by vacuum extraction and those born spontaneously. We conducted this study to see the effects

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of vacuum extraction to two years old infants' development by using Denver Developmental Screening Test (DDST),[16-18] and to analyze potential factors relating to the infants' development, i.e., Apgar-scores, educational degree, profession of mother, economic status, number of children, and gender.

Methods

This study was conducted from August 1, 1995 until February 29, 1996, using cross-sectional design, in all infants delivered at term by vacuum extraction. Vacuum extraction was indicated for those mothers who were planned for spontaneous labor but had failed to do so after one hour of complete opening, and head location was at Hodge III. The study was conducted in Tembakau Deli and Elisabeth Hospitals Medan. The control group was taken from spontaneous and full-term born infants in the same hospitals.

Subjects were exactly two years of age when they were studied; age of less 15 days was rounded downward, while age of equal or more than 15 days was rounded upward.[16,17] All data pertaining to labor history were obtained from medical records. Subjects were selected by simple random sampling which was taken from the list of infants delivered by vacuum extraction in those hospitals. The estimated sample size using formula[19] gave 44 subjects. Infants born with congenital anomaly, low birth weight (LBW), meningitis or encephalitis, head trauma, convulsion without fever were excluded from the study. Those who had changed the address were also excluded.

The developmental status of the infants was determined by a general pediatrician (one of the authors) using DDST I including sector 4, i.e. personal-social, fine motor adaptation, language, and gross motoric activity. The results were interpreted based on the following criteria:[16,17]

1. *Abnormal*, if found two sectors with two or more delays, or one sector with two or more delays and one sector with a delay, in this sector age line does not exceed an item.
2. *Delayed*, if they failed on an item, in which all of them were located on the left side of the age line.
3. *Questionable*, if found two or more delays in a sector, or one more delay in a sector and in the same sector the age line does not exceed an item.
4. *Normal*, if the test result was not questionable nor abnormal.

Determination of social economic status was based on the World Bank criteria, i.e,:[20] (1) Competent, if the income was 75.000 rupiahs/month/capita; (2) Incompetent, if the income was less than 75.000 rupiahs/month/capita.

Asphyxia was determined based on Apgar Score,[21] i.e., (1) Normal: Apgar scores of 7-10; (2) Mild or moderate asphyxia: Apgar scores of 4-6; (3) Severe asphyxia: Apgar scores of 0-3.

The parent's education degree was determined based on formal education, i.e., elementary school, junior high school, senior high school, and academy or university level. The parent's profession was determined based on the amount of salary gained, either daily or monthly. The number of children in a family was based on the number of live born children whose parents take responsibility for their needs. Staristical analysis used was chi-squared test with Yate correction and significance level is 5% ($p=0.05$).

Results

The number of infants born during the seven month period was 911, 60 infants of them were delivered full-term by vacuum extraction. Sixteen infants was excluded from this study; two because they died, ten infants with severe asphyxia, and four infants lived out of Medan District. The 44 infants became the study subjects; as the control group 44 infants born spontaneously were selected.

In Table 1 can been seen the characteristics of the infants, including sex, Apgar scores, diseases ever suffered, economic status, and parent's education and profession. The number of male subjects outnumbered female (58% vs. 42%). Three quarters of the infants had never suffered from illness, whereas 25% had suffered illnesses (diarrhea, upper respiratory tract infection) that needed no hospitalization. None of the infants suffered convulsion without fever, meningitis, encephalitis, nor head injury, so the affect to the study could be as ignored.

In this study 42 of the infants delivered by vacuum extraction (95%) developed normally and two infants (5%) developed abnormally. The developmental disturbance occurred in the language and gross motor sector (Table 2). The majority of infants delivered by vacuum extraction suffered from mild asphyxia (32%) and out of them two infants (2%) had developmental disturbance (Table 3). Sixty-three parents

TABLE 1. CHARACTERISTIC OF CHILD

Characteristic	Study	Control	Total	%
1. **Sex** : Male	25	26	51	58
Female	19	18	37	42
2. **Apgar score**				
Mild-moderate asphyxia	28	0	28	32
Normal	16	44	60	68
3. **Disease ever be suffered**				
No	30	36	66	75
Yes	0	0	0	-
Meningitis	0	0	0	-
Convulsion without fever	0	0	0	-
Others (diarrhea, URI)	14	8	22	25
4. **Economic status**				
Competence	36	29	65	74
Less competence	8	15	23	26
5. **Education of father**				
Primary school	0	0	0	-
Junior high school	0	0	0	-
Senior high school	13	17	30	34
University	31	27	58	66
6. **Education of mother**				
Primary school	0	0	0	-
Junior high school	4	2	6	7
Senior high school	26	31	57	65
University	14	11	25	28
7. **Occupation of father**				
Civil employee	10	5	15	17
Army	1	0	1	1
Private clerk	19	28	47	53
Entrepreneur	9	8	17	19
Farmer	0	0	0	-
Others	5	3	8	9
8. **Occupation of mother**				
Civil employee	8	6	14	16
Army	0	0	0	-
Private clerk	11	10	21	24
Entrepreneur	1	2	3	3
Farmer	0	0	0	-
Others	5	3	8	57

(72%) were economically competent whereas 23 parents (28%) were less competent. Two infants with economically competent parents indicated delayed development (Table 4). Table 5 indicated three stratification of mothers' education, i.e. 57 mothers (65%) from the senior high school group, 25 mothers (29%) from the higher education, and 6 mothers (7%) from the junior high school group. There was one infant suffering

cation was senior high school and higher education.

Table 6 shows that 50 mothers (57%) were housewives, 20 mothers (23%) were private clerks, 14 mothers (16%) were civil government employee, and two mothers were entrepreneurs (2%). There was 1 infant suffered from abnormal development whose mother was entrepreneur and employee.

Thirty nine families (44%) had two to three children, 35 families (41%) had one child, and 12 families (14%) had more than three children. An infant with abnormal development was a member of a family that had two to three children (Table 7). Table 8 depicts 50 infants (58%) were male and 36 female, 1 male and 1 female infants had delayed development.

Discussion

We found that 42 infants (95%) had normal development and two infants (5%) had developmental

TABLE 2. MEAN BLOOD CHOLESTEROL IN RELATION TO BODY FORM

Type of Delivery	Status of development		Total
	Normal	Abnormal	
Vacum of extraction	42	2	44
Spontaneus	44	0	44
Total	**86**	**2**	**88**

$X^2 = 2.047$ df = 1 $p > 0.05$

TABLE 3. STATUS OF DEVELOPMENT BY APGAR SCORE

Apgar Score	Status of development		Total
	Normal	Abnormal	
Vacum of extraction	26	2	28
Spontaneus	60	0	60
Total	**86**	**2**	**88**

$X^2 = 3,385$ dl = 1 $p > 0.05$

TABLE 4. STATUS OF DEVELOPMENT BY ECONOMIC STATUS

Economic status	Status of development		Total
	Normal	Abnormal	
Competence	63	2	65
Spontaneus	23	0	23
Total	**86**	**2**	**88**

$X^2 = 0,724$ df = 1 $p > 0.05$

TABLE 5. STATUS OF DEVELOPMENT BY ECONOMIC STATUS

Eduction of Mother	Status of development		Total
	Normal	Abnormal	
Junior high school	6	0	6
Senior high school	56	1	57
Academic/University	24	1	25
Total	**86**	**2**	**88**

$X^2 = 0,68$ df = 1 $p > 0.05$

abnormalities. The development disturbances were in the language and gross motor sectors. Statistically there was no significant correlation between types of labor and infants' developmental status ($p>0.05$). Dahlin indicated in the study that there was no difference in psychomotoric activities between infant delivered by vacuum extraction and spontaneously born infants.[14]

Hariyono indicated of 234 infants and six of the infants delivered by vacuum extraction had normal development.[15] Marbun found ten infants delivered by vacuum extraction who had normal development.[16] Augustine in his study on infants delivered by vacuum extraction found no permanent brain destruction.[22] The results of this study confirmed the previous reports.

Table 3 indicated 28 infants with mild-moderate asphyxia, 26 of whom were in normal development and 2 infants had abnormal development. Statistically there was no significant correlation between mild-moderate asphyxia and infants' development. ($p>0.05$). This was in accord with Lenstrup's[23] work who found that from 32 infants who were born with severe asphyxia none had mental disturbance.

TABLE 6. STATUS DEVELOPMENT BY PROFESSION OF MOTHER

Profession of Mother	Status of development		Total
	Normal	Abnormal	
Civil Government	14	0	14
Private clerk	20	1	21
Intrepreneur	2	1	3
House wife	50	0	50
Total	**86**	**2**	**88**

$X^2 = 15.105$ df = 3 $p > 0.05$

TABLE 7. STATUS DEVELOPMENT BY TOTAL NUMBER OF CHILDREN

Total child	Status development		Total
	Normal	Abnormal	
1	35	0	35
2-3	39	1	40
More than 3	12	1	13
Total	**86**	**2**	**88**

$X^2 = 2.542$ df = 4 $p > 0.05$

TABLE 8. STATUS DEVELOPMENT BY SEX

Sex	Status of development		Total
	Normal	Abnormal	
Male	50	1	51
Female	36	1	37
Total	**86**	**2**	**88**

$X^2 = 15.105$ df = 3 $p > 0.05$

The low economic status is a factor causing delayed development.[24] We observed 26% of infants with low economic status parents and 72% were economically competent. There were two infants (2%) having abnormal development with less competent parents. Statistically there was no relation between family's economic status and children's development ($p > 0.05$); see Table 4. This probably means that the parents' economic status had no apparent impact for two years old infants. In this study two infants (2%) whose mothers were entrepreneur and private clerk had development disturbance ($p<0.05$), as indicated in Table 6.

Hall stated that delayed development of infants could be caused by the lack of care given by their parents.[25] Sunarwati reported that in earlier age (six to eight months) it was important to encourage the mental stimulation to make sure that the infant would develop optimally.[2] Inadequate mental stimulation in this period may give adverse impacts to the children's development, such as disturbances in psychomotoric system. Sunoko expressed that working mother who had no time to make emotional contact with their children would affect the children's development.[26] The results of this study were relevant to the experts' opinions mentioned above, that is working mothers with less time to communicate with their children can cause inadequate mental stimulation of the children.

We conclude that there is no significant development difference between infants delivered by vacuum extraction and those by spontaneous labor. The development disturbance are found in infants whose mothers lack of time to communicate.

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