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Factors Affecting the IQ of Preterm Born Children of 4-6 Years Old

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Abstract

***Background*:** This research was carry out with aim of study of factors affecting the IQ of children 4-6 years old born preterm.

***Materials and Methods*:** This analytical-cross sectional study was carried out on 102 premature children with age 4-6 years old during years 2004 to 2006. The tools used in this study were Wechsler intelligence scale for children and questioner including demographical characteristic. In this study we used *t*-test and spearman correlation and also SPSS-18 was used to analyze data.

***Results*:** In this study there was statistical relationship between normal child development and gestational age, birth weight, maternal education, multiple pregnancies, but there were not any statistical significant relationship between the history of preterm birth and child s gender, consanguinity parents, apgar, mother job.

***Conclusion*:** IQ in preterm babies who admitted in the NICU was lower than non-admitted preterm or term babies.

Introduction

In humans, preterm birth is the birth of a baby of less than 37 weeks gestational age [1, 2]. The cause of preterm birth is in many situations elusive and unknown; many factors appear to be associated with the development of preterm birth, making the reduction of preterm birth a challenging proposition [3]. Preterm birth cause wide range of problems [4]. One of the problems is lowering intelligence quotient (IQ) [5, 6]. Several factors such as premature birth [7], sex [8], breastfeeding [9], genetic factors, and characteristics of the parents [10] father's living conditions and maternal exposure to polycyclic aromatic hydrocarbon [11], family conflicts [12], parental education, especially maternal education [12, 13], socioeconomic status [14], gestational age [15], family size [15]. Consanguineous marriage [16] affect children's IQ. According to importance of children IQ. The current study was designed to determine IQ and related factors among children 4-6 years old born preterm that hospitalization in NICU of Najmiyeh subspecialty hospital.

Materials and Methods

This prospective, observational study was performed from January 2004 to December 2006 at the Najmiyeh subspecialty hospital in the Tehran city (capital of Iran country). Inclusion criteria were as follows: having 4 to 6 years old in time of study, preterm births or preterm infants admitted to the NICU during 2004 to 2006 years, as well as the willingness to participate, expressed through signed patient consent formulary. Exclusion criteria were the absence of a mental illness and lack of access to family child.

This study was approved by the Ethical Committee of the Baqiyatallah University of Medical Sciences, issued on 08.02.2010. Its registration number is A.8719. In this study, data has been collected using proportional stratified sampling method according to years 2004-2006. During these 3 years, respectively, 886, 747, 520 infants admitted to the NICU of whom were 44, 43, 49 of babies had died. For selecting children, at first families randomly selected from a list of hospital records and then mother and child (with a history of preterm birth) are invited to attend to our study. In this study IQ evaluated by a psychological expert team with Wechsler Preschool and Primary Scale of Intelligence (WPPSI). The WPPSI is an intelligence test designed for children ages 2 years 6 months to 7 years 3 months developed by David Wechsler in 1967.

This test provides subtest and composite scores that represent intellectual functioning in verbal and performance cognitive domains, as well as providing a composite score that represents a child's general intellectual ability. Iranian studies report the reliability coefficients for verbal, practical and intellectual

functioning 86%, 89% and 92% respectively [17]. In this study, data was presented as mean±SD. Independent samples *t*-test or Mann-Whitney *U* were chosen wherever appropriate. Also Spearman correlation was used for study association between two quantitative variables. Two tailed and *p*-value less than 0.05 were considered significant. All tests were done with SPSS-18.

Results

This study was performed on 102 children (41 (40.2%) boys and 61girls (59.8%)) with mean 4.89 years old. in this study because of twin children, number of mothers in the study was 92. Table 1 showed the descriptive results of the children and their mothers. The relationship between discrete variables (Table 2) and continuous variable (Table 3) with verbal, practical and total IQ. As you see, breastfeeding, normal growth, multi gestational pregnancy, gestational age, birth weight and maternal education showed significant relationship with verbal, practical or total IQ.

Table 1. Summary statistics of children and their mother characteristics

Type of variables Categorical Variable	N	Percent	Mean±SD
Gender (boy, girl)	(41, 61)	(40.2%, 59.8%)	
Age of child (4 years, 5 years, 6 years)	(33, 47, 22)	(32.4%, 46.1%, 21.6%)	
Multi gestational pregnancies (single, twins, triplets and more)	(7, 17, 78)	(6.9%, 16.7%, 76.5%)	
Birth order (first, second, third, fourth up)	(12, 7, 27, 54)	(11.8%, 6.9%, 26.5%, 52.9%)	
Breastfeeding (yes, no)	(42, 60)	(41.2%, 58.8%)	
Growth (normal, abnormal)	(26, 76)	(25.5%, 74.5%)	
Seizures during the first year of life (yes, no)	(94, 8)	(92.2%, 7.8%)	
Mother's occupation (housewife, Employed)	(13, 79)	(14.1%, 85.9%)	
Maternal education (high school, diploma, above)	(24, 50, 18)	(26.1%, 154% | 3% | 19.6%)	
History of Preterm birth in mother (yes, no)	(81, 11)	(88%, 12%)	
Type of delivery (cesarean, normal, without pain)	(6, 23, 72)	(5.9%, 22.8% | 71.3%)	
Family relation with husband (yes, no)	(19, 73)	(20.7%, 79.3%)	
Close affinity with the husband (yes, no)	(10, 9)	(52.6%, 47.4%)	
Apgar score less than seven (yes, no)	(94, 8)	(92.2%, 7.8%)	
Gestational age at birth (week)			33.52±2.1
Birth weight (g)			2031.52±5.9
Mean maternal age(N= 92)			27.98±5.92
Verbal intelligence			102.06±17.16
Practical intelligence			97.51±15.49
Total intelligence			100±16.23

Table 2. Relationship between discrete variables with verbal, practical and total intelligence

	Intelligence	Levels	Mean±SD	Test statistic	*p*-Value
Sex	Verbal	Boy	100.54±18.58	-1.09	0.278
		Girl	104.32±14.73		
	Practical	Boy	96.02±16.55	-1.19	0.237
		Girl	99.73±13.66		
	Total	Boy	98.62±17.46	-1.08	0.281
		Girl	102.17±14.17		
Breastfeeding	Verbal	Yes	103.80±16.45	1.23	0.222
		No	99.57±18.04		
	Practical	Yes	100.02±16.39	2.05	0.043
		No	93.93±13.49		
	Total	Yes	102.30±16.75	1.69	0.094
		No	96.83±15.09		
Normal Growth	Verbal	Yes	104.41±14.89	2.42	0.017
		No	95.19±21.44		
	Practical	Yes	99.26±13.05	1.98	0.05
		No	92.38±20.54		
	Total	Yes	102.01±13.97	2.12	0.036
		No	94.31±20.82		
Mother's Occupation	Verbal	Housewife	101.48±17.53	-0.793	0.430
		Employed	105.19±15.15		
	Practical	Housewife	97.72±15.58	0.318	0.751
		Employed	96.38±15.42		
	Total	Housewife	99.94±16.5	-0.154	0.878
		Employed	100.62±15.21		
History of Preterm birth in mother	Verbal	Yes	99.18±19.50	-0.587	0.559
		No	102.41±16.95		
	Practical	Yes	97.36±16.53	-0.033	0.974
		No	97.53±15.46		
	Total	Yes	98.37±19.42	0.382	0.703
		No	100.26±15.92		
Parent’s Consanguinity	Verbal	Yes	108.1±13.36	2.16	0.037
		No	100.49±17.76		
	Practical	Yes	97.48±10.39	-0.01	0.991
		No	97.52±16.61		

	Total	Yes No	103.43±10.16 99.17±17.41	1.07	0.287
	Verbal	Yes No	103.21±15.52 88.5±28.66	-0.841	0.401
Apgar score less than 7	Practical	Yes No	98.56±13.88 85.2±26.64	-1.03	0.304
	Total	Yes No	101.16±14.51 87±28.21	-0.691	0.481

Table 3. The correlation and *p*-Value of continuous variable with verbal, practical and total

Variable	Correlation *p*-Value	Verbal intelligence	Practical intelligence	Total intelligence
Child's age (yr)	Correlation	0.185	-0.121	0.055
	p-Value	0.063	0.227	0.585
Multi gestational pregnancy	Correlation	-0.133	-0.214	-0.220
	p-Value	0.182	0.031	0.026
Gestational age (week)	Correlation	0.225	0.226	0.246
	p-value	0.024	0.023	0.013
Birth weight (g)	Correlation	0.175	0.212	0.198
	p-Value	0.081	0.035	0.048
Maternal education	Correlation	0.276	0.273	0.292
	p-Value	0.005	0.005	0.003

Discussion

According to our result, the overall mean IQ in preterm children was 100, while Mehry-Nejad [1] reported mean IQ of term children and preterm children who have been not hospitalized in NICU 111.46 and 103.80 respectively. It means that preterm children who have been admitted in the NICU had less IQ rather than preterm children who have not been hospitalized in this unit. Our results also showed a relationship between breastfeeding and practical intelligence. This relationship was consistent with previous studies [9] and represents that IQ of children improves when they fed with breast milk [18]. In this study, practical intelligence was decreased with increasing multiple pregnancies and although this reduction was seen in verbal intelligence, but this relationship was not statistically significant. We can attribute this association with the increasing household size and lack of parental handling time. Liu et al. demonstrated that increasing the number of family size increases the probability of reducing IQ of children [15]. In this study mothers with single baby, breast-fed their babies approximately two time more than mother with twain child (68.4% vs. 26.1%) and it means that mothers with multi gestational pregnancies less compliance to breast-fed their babies. Similar to some other studies [7, 8], this study did not establish any association between mother job, child's sex and mother's history of preterm with IQ (verbal, practical and total IQ). Also this study showed that child with consanguinity parents had more verbal IQ. Although previous studies showed that consanguineous marriage increased incidence of infant mortality, congenital malformations and mental retardation [16] but increasing verbal IQ in child with parent's consanguinity can be explained with more higher frequency of family party in consanguinity couples. The results also showed a significant positive relationship between gestational age and IQ. This finding was consistent with the reports of Liu et al. [15]. Also, the results of this study showed a positive correlation between mother's education and IQ. This finding consists with previous study [12, 13]. Also, lack of access to all children because of changing address and lack of control group were two limitations of our study. According to these results, IQ in preterm babies who admitted in the NICU was lower than non-admitted preterm or term babies so it is necessary to strengthen IQ of these children before enter to school. In addition, breastfeeding and pre-marriage counseling are factors that could prevent low IQ in children.

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Authors' Contributions

All authors had equal role in design, work, statistical analysis and manuscript writing.

Conflict of Interest

The authors declare no conflict of interest.

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