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History of Birth Complications, Having Chronic Diseases and Children's Intelligence Quotient (IQ) at Age 7-8 Years Old in Baghdad City, Iraq

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Abstract - History of birth complications may affect cognitive development of children later in life. The main objective of this study was to determine the level of IQ and to assess its relationship with birth complications history and chronic diseases. A cross-sectional study was done in Baghdad city among 450 primary school children aged 7 to 8 years old. Translated questionnaires were distributed to mothers to answer, also Raven IQ tool was used to obtain children IQ level. A total of 22.2% children have low IQ score. The prevalence of birth complications history was 20.9%. There was a significant association between birth complications history, having chronic diseases and parents working status with child's IQ status ($p=0.001$,$p=0.041$ and $p<0.001$) respectively. After adjusting for confounders, history of birth complications remain a strong factor affecting children IQ status at age 7-8 years old in Baghdad city, Iraq. As a conclusion, having a history of birth complications during child delivery may affect IQ level later in life.

Keywords - Birth complications, Chronic diseases, Baghdad city, Iraq, Children

1. Introduction

Intelligence quotient (IQ), a quantitative measure of intelligence, was once thought to be a definitive way to measure cognitive capability within a specified range. Children's IQ development is a complicated process involving the environment where the child live, the food being consumed and also genetics inherited from parents.

Birth complications are defined as any difficulties or problems that occurred after the onset of labour. Some complications are potentially life-threatening, especially if they impaired the baby's oxygen supply. According to some studies, maternal complication accounted for 9-10% of all pregnant women or about 14 million women per year suffer from acute maternal complications (Hogan et al. 2010; Fillipe et al. 2006).

Investigations into the association between birth complications and low intelligence have been inconclusive. Many studies that use markers of asphyxia conclude that below-normal intelligence does not occur as a consequence of prenatal brain injury in the absence of cerebral palsy (Korkman et al. 1994; Paneth & Starh 1983; Viggedal et al. 2002). On the other hand, in a large prospective study, risk factors for asphyxia were associated with difference in IQ at the age of 7 years old. Whereas one study found that the level of initial arterial acidosis was inversely related to IQ at early school age (Stevens et al. 1999).

Mariëlle van Handel et al. (2007) in their review about long-term cognitive and behavioral consequences of neonatal encephalopathy following perinatal asphyxia concluded that children with severe neonatal encephalopathy appeared to be impaired in every cognitive domain. They are less intelligent and perform worse at school at neuropsychological tests than both healthy controls and children with mild or moderate neonatal encephalopathy.

Chronic non-communicable diseases previously were exclusive to older adults, but their trend nowadays among children is on the rise. According to a study done by Antônio A Silva et al. in 2011 among Brazilian chidren, the prevalence of hypertension in Ribeirão Preto area was 10.9%. They concluded that some non-communicable diseases were highly prevalent, especially in the more developed cities. Studies suggested that children with type 1 diabetes may be at risk of cognitive deficits, especially those diagnosed at earlier ages, those with lower socioeconomic status, and boys (Wysocki et al. 2003).

Moonie et al. (2008) concluded that children with asthma experienced more absenteeism from school compared to their

no asthma peers. Excessive absenteeism is related to lower student grades, psychological, social, and educational adjustment.

The objective of this study was to determine the level of intelligence quotient (IQ) and to assess its relationship with birth complications history and chronic diseases among 7-8 years old school children in Baghdad city, Iraq.

2. Materials & Methods

A cross- sectional study was carried out in Baghdad city Iraq among 450 primary school children aged 7-8 years old in 2011. The children were chosen from 4 primary schools representing different socio-economic status of people living in Baghdad City. The chosen schools were selected by simple random sampling.

Translated questionnaires were used in this study. Back-to-back translation was done to ensure the validity of the questions, and a pre-test was carried out. The questionnaires consist of 2 parts, socio-demographic data namely children's gender, parents educational level and working status. The second part consists of questions regarding history of birth complications during child delivery and also if the child suffer from any chronic non-communicable diseases. The questionnaires were self-administered to children's mothers during the monthly meeting at school.

Raven's Colored Progressive Matrices was used in this study to obtain children's IQ. It consists of 36 items in three sets of 12: A, AB and B. It is a cultural free intelligence tool to overcome the effect of translation from other languages to Arabic language. It is an internationally standardized tool and has been used before among Iraqi children (Raven et al. 1998). It was administered to the children by well-trained co-researchers using one-to-one technique.

Data was analyzed using SPSS version 21. Chi-square test was used for categorical data, and binary logistic regression was used in multivariable analysis.

This study was approved by the Research and Ethics Committee of Universiti Kebangsaan Malaysia Medical Centre with code number FF-180-2011. This study was also approved by the Iraqi Ministry of Education. Consent form from the parents was taken.

3. Results

Regarding IQ level, 22.2% of children have low IQ compared to 77.8% having high IQ score as shown in Table1. The prevalence of birth complication history was 20.9%, and the most common complication was difficult birth (85.1%) followed by birth asphyxia (8.5%). Regarding chronic diseases, only 8.0% suffer from them with majority suffering from asthma (37.8%) and followed by heart diseases (16.3 %). A total of 35.6% reported taking extra learning other than school hours and the most common source was either mother or father at home.

There was no difference between male and female in term of IQ score ($p=0.378$) although the high IQ rate was higher among male compared to female. Mother and father educational level was not associated with child's IQ but working status was significantly associated with children's IQ ($p<0.001$) as shown in Table 2.

There was an association between having birth complications history and child's IQ ($p=0.001$) in which children with birth complications history have 2.2 times more risk of having low IQ compared to those with no such history. Having chronic diseases were significantly associated with child's IQ ($p=0.042$) as shown in Table 3.

Table 4 represents multiple logistic regression analysis. After adjusting for gender, mother's education and father's education, the history of birth complications, chronic diseases and parents working status still appear to be the most important factors influencing child IQ at age 7-8 years old in Baghdad city, Iraq.

4. Discussion

The main finding of our study is that having history of birth complications during delivery may affect children cognitive development in the future. Having chronic non-communicable diseases was also significantly associated with child's IQ status.

The limitations of our study include the cross-sectional design which measures prevalence at a limited time in specific population, and the recall bias of the mothers especially regarding the history of birth complications. On the other hand, the strength of this study is the large sample size, and the fact that the children came from four different areas in Baghdad, providing information about conditions for people of different socioeconomic status and using international standardized tool in IQ measurements.

Many previous studies examined the consequences of either preterm or very preterm birth and they demonstrated that preterm delivery is associated with a number of long-term sequelae, including lower intelligence quotient (IQ) (Kerr-Wilson et al. 2011) and higher risk of specific impairments, including motor, behavioural, and language (De Kieviet et al.2009; Johnson 2007; Barre et al. 2010).

Some other studies explored the relationship between IQ, school performance and week of gestation. It was concluded that week of gestation demonstrated a dose-response relationship, in which risk of low IQ and poor school performance tend to reduce as mothers approaching to 40 weeks of gestation (Eide et al. 2007; Lagerstrom et al. 2001; Yang et al. 2010; Kirkegaard et al. 2006).

In a cohort study done by Mackay et al. (2012) regarding obstetric factors and different causes of special educational need, they concluded that "strong, consistent, and dose-dependent associations for sensory impairments, physical or motor disabilities, and intellectual disabilities,

suggesting that obstetric factors may be causal and changes in obstetric practice and improvements in obstetric outcome could potentially have a significant impact on these conditions".

Children who are suffering from chronic illness may not show their abilities due to stay in hospitals, overprotection by parents or other factors (Pinquart & Teubert 2012). The possible reason why sick children perform poorer than normal colleagues is first repeated school absence may affect and restrict academic success (Madan-Swain et al. 2004). In addition, prolonged stays in hospital and frequent doctor's visits may also affect child performance and finally pain and fatigue limit physical function (Garralda & Rangel 2004).

5. Conclusion

History of birth complications during delivery can affect children's IQ later in life. Having chronic diseases was also associated with child's IQ status.

Recommendations

The Ministry of Health and other relevant ministries should try various methods to disseminate knowledge on birth complication happening during delivery to members of the community, for example through the media, workshops etc. More precautions should therefore be taken to avoid any trauma or injury to the child during delivery, and workshops should be given to health specialists and workers about the consequences of such trauma.

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Competing interests

The authors declare that they have no competing interests.

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Table 1. History of birth complications, chronic diseases and IQ level of the children

Variables	N	%
History of birth complications		
Yes	94	20.9
No	356	79.1
Having chronic diseases		
Yes	36	8.0
No	414	92.0
Intelligence Quotient (IQ)		
Low	100	22.2
High	350	77.8

Table 2. Relationship between socio-demographic characteristics and Intelligence Quotient (IQ) of the children

	Low IQ	High IQ	P value[a]	POR	95% CI
	N (%)	N (%)			
Sex					
Male	97 (42.0)	134 (58.0)	0.378	1.182	0.815 – 1.716
Female	101 (46.1)	118 (53.9)		1.000	
Family Working Status					
Both spouse work	54 (34.2)	104 (65.8)	**<0.001**	1.000	
One spouse work	120 (46.3)	139 (53.7)	**<0.001**	1.663	1.104 - 2.504
Neither working	24 (72.2)	9 (27.3)	**0.015**	5.136	2.231 – 11.821
Mother Education					
Low	43 (50.6)	42 (49.4)	0.171	0.718	0.447-1.154
High	153 (42.2)	208 (57.6)		1.000	
Father Education					
Low	24 (43.6)	31 (56.4)	0.813	0.933	0.526-1.654
High	151 (41.9)	209 (58.1)		1.000	

[a] Pearson Chi Square test was performed; level of significant is at $p < 0.05$, POR= prevalence odds ratio, CI=confidence interval

Table 3. Relationship between birth complications history, chronic diseases with Intelligence Quotient (IQ) of the children

	Low IQ	High IQ	P value[a]	POR	95% CI
	N (%)	N (%)			
Birth complications History					
Yes	56 (59.6)	38 (40.4)	**0.001**	2.221	1.397 – 3.530
No	142 (39.9)	214 (60.1)		1.000	
Chronic Diseases					
Yes	10 (27.8)	26 (72.2)	**0.041**	0.462	0.217 – 0.963
No	188 (45.4)	226 (54.6)		1.000	
Extra Learning					
Yes	59 (36.9)	101(63.1)	**0.024**	0.635	0.427 – 0.942
No	139 (47.9)	151(52.1)		1.000	

[a] Pearson Chi Square test was performed; level of significant is at $p < 0.05$, POR= prevalence odds ratio, CI=confidence interval

Table 4. Multiple logistic regression analysis to predict low IQ among 7-8 years old school children in Baghdad city, Iraq

Variable	B	Wald	P value	Adj OR[a]	95% CI
Sex	0.017	0.007	0.993	1.017	0.686 – 1.507
Chronic disease	-1.029	6.110	**0.013**	0.357	0.158 – 0.808
Birth complication	0.793	9.979	**0.002**	2.209	1.351 – 3.612
Extra learning	-0.343	2.510	0.113	0.710	0.464 – 1.085
Family working			**0.003**		
One spouse work	0.380	2.947	0.086	1.462	0.948 – 2.255
Neither working	1.463	11.069	**0.001**	4.320	1.824 – 10.230
Mother education	0.073	0.052	0.820	1.075	0.575 – 2.011
Father education	0.382	1.219	0.270	1.466	0.743-2.889

[a] Binary logistic regression was performed, Adj OR: Adjusted odds ratio, CI: Confidence interval.