Nutritional Reflection on Growth and Development among Intellectual Disabled Children

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Abstract

Background: There are many factors contribute with process of CNS development, starting from fetus stage. Many studies revealed that there is a strong relationship between neurodevelopmental delay, neuro-disability, and malnutrition. Socioeconomic and demographic factors have an impact on children growth and development. This clinic-based study aimed to detect nutritional problems and its reflection on growth and mental development through determination of the nutritional profile among disabled children.

Methods: All subjects underwent specified inclusion and exclusion criteria. All subjects were exposed to the following clinical assessment: history taking include age, sex, onset and duration of disorder and family history.

Assessment of nutritional status using developmental nutritional questionnaire which includes: Demographic and socioeconomic data: age, gender. WHO anthropometric measurement protocol used: BMI were calculated as the weight in kg divided by the height square in meters (WHO, 1996) 24 hr dietary recalls were collected using the Multiple Pass Food Recall (MPR) method which is a 5 step approach, developed by the United State Department of Agriculture (USDA). Sheet of 24hour recalls were collected for each participant. Full clinical examination was carried out. Complete blood count with differential leucocytic count, IQ test: using Stanford-bennet 5th edition was carried out.

Results: Significant difference in the residential places between the two groups of lower and higher IQ. The birth order is significantly related to level of IQ in children. The gross motor development is delayed in the lower IQ group of children, increased hyperactivity tends to be more prevalent in higher IQ children. The TLC level is inversely proportional with IQ value. p=0.01 the correlation is highly significant. By applying food analysis there is significant difference in the elements they get between the two groups of children (of lower and higher IQ). Multiple analysis showed significant relationship between orientation and zinc intake with IQ of children.

Conclusion: Intellectual disability is more prevalent in rural and popular residential. As the birth order increase the percentage of lower IQ increase. The gross motor development is directly proportional with IQ. The total leukocytic count was higher value for low IQ children group. Dietary profile for Intellectual disabled children (of lower IQ) is regarded to be richer with dietary elements and vitamins than that for higher IQ children. According to the multiple analysis orientation and zinc intake are the most effective variables on the IQ scores.

Keywords: Intellectual disability • Nutritional factors • IQ level • Socioeconomic impacts

Introduction

Low socioeconomic level was highly related to some sorts of disabilities such as mental retardation, delayed language and behavior disorder, on the other side some studies revealed that there is significant association between cerebral palsy and severe preterm maternal hypertension, antepartum hemorrhage, and preterm uterine activity.

Many studies have revealed that there is Negative relationship between birth order and intelligence level. The explanation for this association is not well known, and several there are many suggested explanations. Such as that the relation is due to more-preferable family interaction and stimulation of low-birth-order children, whereas others claim that the effect is caused by prenatal gestational factors. We show that Intelligence Quotient (IQ) score levels among nearly 250,000 military conscripts were dependent on social rank in the family and not on birth order as such, providing support for a family interaction explanation [1].

Many studies were applied to assess the association between gross motor development and IQ level for children. The relationship between gross motor development and cognition is not strong enough to allow the use of one to predict the other [2].

Anemia is one of the probable health problems that appear in intellectual disabled children due to malnutrition, according to previous study it reaches 11.6%. The health impacts of anemia are usually noticed during infancy and early childhood as they are periods of significant growth and development of the central nervous system [3].

The human brain passes through consecutive changes in structure and functional connectivity throughout childhood and adolescence [4] so many studies were applied to detect the factors that influence cognitive function and brain health during development. Many studies revealed that Diets consumed by children plays an important role in the neurodevelopmental process, [5].

Although there were a lot of studies and intervention applied, anemia regarded to be one of the main nutritional deficiency disorders in the world today, as it is most prevalent in pregnant women and young children. previous studies have showed that anemia is prevalent among children at age of 5 or less in Southern Asia and Africa, which regarded to be developing countries. In developing countries about 30-80% of preschool children were anemic [6], according to a study applied on Chinese preschool children to detect the relationship between anemia and the development of these children. It revealed that children who were exposed to developmental delays at infancy exhibited behavioral anomalies, [7].

Anemia is defined as the condition of less than the normal quantity of blood hemoglobin (Hb) which has physiological and psychological impacts on health. Anemia has serious consequences as it causes decreases in oxygen level in the body, including tissues and major organs, such as the brain. As a result, there are many symptoms associated with anemia, including physiological symptoms, such as cerebrovascular infarction (stroke), and psychosocial symptoms, such as decreased cognitive abilities and adverse behavioral outcomes, because of impairments in normal brain functions [8].

Fat is one of the main constituents in infants and young children diet, as they need an extraordinary energy to compensate their limited dietary capacity. Moreover, essential fatty acids such as arachidonic acid, docosahexaenoic acid, and their metabolites which plays an important role in children growth and development and its deficiency may affect maturation of the central nervous system, visual development and intelligence [9].

Aim of the Study

To determine the nutritional profile among disabled children to detect nutritional problems and its reflection on growth and mental development

Methodology

Subjects

The study group of special need children age (3-6) years were recruited from the general pediatric clinic referred to center of children with special needs, faculty of post graduate childhood studies, in shams University.

A cross sectional study was carried out for 100 children (65 male and 35

Birth order		IQ test ≤ 75	IQ test >75	χ2	p
≤ 2	no	24	40		
	%	55.8%	70.17%	3.280	0.070
> 2	no	19	17		
	%	44.2%	29.83%		
total	no	43	57		
	%	100%	100%		

Carbohydrate	177.1 ± 77.4	143.9 ± 61.1	158.8 ± 70.5	-2.193	0.028
Protein	44.8 ± 22.3	+	39.6 ± 19.6	-2.186	0.029
Fat	54.1 ± 28.5	41.4 ± 21.8	47.1 ± 25.7	-2.512	0.012
Fiber	3.9 ± 1.8	3.1 ± 1.9	3.5 ± 1.9	-2.287	0.022
Sodium	1775.8 ± 1142.0	1365.6 ± 705.9	1550.2 ± 945.2	-2.047	0.041
Potassium	1566.6 ± 744.6	1113.6 ± 610.0	1317.5 ± 707.6	-3.101	0.002
Calcium	476.4 ± 45	357.3 ± 282.9	410.9 ± 375.8	-1.784	0.074
Phosphorus	534.0 ± 300.8	467.2 ± 253.3	497.3 ± 276.3	-1.646	0.1
Magnesium	78.2 ± 61.7	59.5 ± 38.9	68.1 ± 51.2	-1.736	0.083
Iron	7.0 ± 3.3	5.8 ± 2.9	6.3 ± 3.1	-1.777	0.076
Zinc	5.3 ± 2.4	4.4 ± 2.3	4.8 ± 2.4	-2.065	0.039
Cupper	0.5 ± 0.4	0.5 ± 0.4	0.5 ± 0.4	-0.792	0.429
Vitamin A	681.2 ± 2227.7	665.7 ± 2614.7	672.9 ± 2428.3	-0.902	0.367
Vitamin C	41.0 ± 80.2	29.1 ± 40.3	0.9 ± 1.1	-0.046	0.963
Vitamin B1	0.4 ± 0.3	0.4 ± 0.3	0.6 ± 0.8	-0.064	0.949
Vitamin B2	0.9 ± 1.1	0.6 ± 0.8	0.7 ± 1.0	-2.098	0.036

Table 7: Multiple analysis of the independent variables (age, diagnosis, gross motor, height, birth order, orientation, hyperactivity, TLC, education, BMI, water, CHO, protein, fat, Na, K, Ca, Mg and Zn) on IQ score.

Model	B	Std	Beta	t	Sig
Constant	67.441	24.676			

K	-0.001	0.005	-0.031	-0.165	0.869
Ca	0.003	0.01	0.066	0.324	0.747
Mg	0.001	0.071	0.002	0.012	0.99
Zn	2.838	1.343	0.333	2.113	0.038

Discussion

In the present study the distribution of children in the first group according to their residential places as follow: rural area of 14%, popular area of 74.4% and non-popular area of 11.6%. Rural areas and popular areas had higher ID prevalence rate than urban areas which matches with study by Lai, et al. 2011, which revealed that Rural areas had higher incidence than urban areas. On the other hand, it goes against the study applied on Indian children by Lakhan, et al. 2015 showed that the Intellectual disability prevalence rate in children is slightly higher in urban than rural areas. So, it needs further study.

In the present study the distribution of the group of lower IQ is higher percentage of birth order more than 2, according to the results of previous study IQ scores were negatively associated with both birth order and social order [1].

In the present study there is significant relationship between IQ and gross motor development, which goes with a study by Rintala and Loovis M. [6]

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