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Original Article (Pages: 4975-4984)

The Relationship between Developmental Growth of Children and Anthropometric Indices in Urmia City, North West of Iran

Moradali Zareipour[1], Ali Sadaghianifar[2], Mousa Ghelichi Ghojogh[3], Hamideh Ebrahimi[4], Parvin Asgharzadeh[5], Rohollah Valizadeh[6], *Hamidreza Farrokh-Eslamlou[7]

[1]PhD Student of Health Education and Health Promotion, Reproductive Health Research Center, Urmia University of Medical Sciences, Urmia, Iran. [2]MD, MPH, Urmia Health Center, Urmia University of Medical Sciences, Urmia, Iran. [3]MSc of Epidemiology, Urmia Health center, Urmia University of Medical Sciences, Urmia, Iran. [4]MSc Student of Nursing, Student Research Committee, Shahid Beheshti University of Medical Sciences, Tehran, Iran. [5]Bachelor of Public Health, Urmia Health Center, Urmia University of Medical Sciences, Urmia, Iran. [6]MSc Student of Epidemiology, Student Research Committee, Urmia University of Medical Sciences, Urmia, Iran. [7]Professor of Maternal and Child Health, Reproductive Health Research Center, Department of public health, Urmia University of Medical Sciences, Urmia Iran.

Abstract

Background

The developmental delays of children, is one of the most important sources of information to detect the developmental delays of children. The aim of this study was to investigate the developmental delays and its relationship with anthropometric indices in Urmia city, Iran.

Materials and Methods

This is a descriptive analytical study that conducted on 422 children who had 6-12 months old and were selected randomly with cluster sampling from 10 Health Center. Anthropometric indices (weight, height and head circumstance) were collected from recorded files, and development of children was measured using developmental test of Ages and Stages Questionnaires (ASQ). The data were analyzed using SPSS version 18.0 software.

Results

The results showed that the prevalence of the developmental delays of children was 18.8% and the highest and the lowest prevalence was related to the area of communication (7.1 %), and the area of gross motor (0.9 %), respectively. The developmental delays of children in boys, was more than girls ($P< 0.05$). The mean weight, height and head circumference of children at birth time were 3222.6±469 grams, 49.07±6.68 cm and 34.01±5.3 cm, respectively. There was no significant relationship between height and head circumference at birth time and the developmental delays of children ($P> 0.05$).

Conclusion

Considering the significant number of the developmental delays of children and its relationship with birth weight in this study, it is recommended to consider appropriate interventions at pregnancy period for the prevention of low birth weight and the constant programs about the developmental delays.

Key Words: Anthropometric Indices, Children, Developmental Delays, Iran, Growth.

*Please cite this article as: Zareipour M, Sadaghianifar A, Ghelichi Ghojogh M, Ebrahimi H, Asgharzadeh P, Valizadeh R. The Relationship between Developmental Growth of Children and Anthropometric Indices in Urmia City, North West of Iran. Int J Pediatr 2017; 5(5): 4975-84. DOI: **10.22038/ijp.2017.22214.1857**

Corresponding Author:

Hamidreza Farrokh-Eslamlou, Professor of Maternal and Child Health, Reproductive Health Research Center, Department of public health, Urmia University of Medical Sciences, Urmia Iran.

Email: hamidfarrokh@gmail.com

Received date: Feb.12, 2017; Accepted date: Mar.22, 2017

1- INTRODUCTION

Nowadays, human force is considered as the basic part of development, in order to achieve this base, paying attention to children should be noted (1). The term of "growth and development" refers to the process that zygote cell transforms to adult person in several years. The growth implies the changes in body size (all or parts of it), while the development is a set of changes caused by environmental and emotional biological factors in the structure of thinking and behavior of the child that occurs during times. These changes occur with especial and organized regularity and somewhat predictable. Growth and development depend on very factors (2).

The development of the children begins from the embryonic period and with care and proper nutrition during pregnancy, the child's optimal growth and development opportunities will be provided as a natural right. The most important period of brain growth is the first 2 years of the child's life that has a significant role on the performance of the mental, physical, mental, social, and safety aspect of child (3). Approximately 95% of the 140 million children are born each year in the world, are related to developing countries, although the chances of survival of these children has grown by 50% in the last 20 years, but the first hours, days and months of life is still a high-risk period (4). Developmental delay is a term that generally refers to children that did not emerge developmental characteristics in accordance with their age (5).

The developmental and behavioral problems are the most common problems in pediatric medicine after infections and trauma, and approximately 15% to 18 % of children had developmental and behavioral disorders in the United States (6). It is estimated to be about 200 million children with developmental disorders in all over the world (4).

According to previous studies, the prevalence of development disorders in developing countries is more than other parts of the world and in most of these countries, the physical growth of children and infants are less than international standards (7). This amount has been reported 15% in Jamaica, 8% in Bangladesh, 10% in Pakistan, 15% in Iraq, 3.3% in Brazil, and 12.5% in Netherlands (3, 8, 9, 10). As well as, this amount has been reported 18% to 22% in different cities of Iran (11, 12, 13). Glasson et al. in Australia (2004) (14,) did not report the relationship between anthropometric indices and development disorders. While Hediger et al. in the United States (2002) (15), reported the significance relationship between low birth weight and the social and physical development. In the study of Piek et al. in Australia (2007) (16), the results showed that birth weight was significantly related to only fine motor skills. Children can be considered as the most valuable wealth of any society (11).

Due to several problems with having a child who has developmental delays, early detection and timely referral is essential and very important and the maximum profit can be provided for children with developmental disorders and their families (4) Given that the family, plays an important role in the timely detection and prevention of behavioral problems and their social abilities (17), therefore, the monitoring of the development of the child and the screening of such a problems especially in the first visits is necessary for child’s health and five area including fine motor, gross motor skills, personal-social, communication and problem solving should be examined (6). In order to promote the development of children and early diagnosis of developmental disorders in children under eight years, Ages and stages questionnaire (ASQ) screening tests, is used.

Considering the irreparable effects of developmental disorders in children's lives and the need to early intervention in elementary years of life and effectiveness of these interventions in early diagnosis, this study aimed to determine the evolutionary development and its relationship with anthropometric indices of children in the first year of life in Urmia city. Clarification of the risk factors affecting evolutionary development can be an important step to refer for diagnosing this problem in the early stages and increase the attention and closer monitoring.

2- MATERIALS AND METHODS

2-1. Study design and population

This is a descriptive analytical study and conducted in the second quarter of 2016. Considering that the prevalence of the developmental delays of children was obtained 10.5% in previous studies (11,12,13) and confidence level (0.95) that Z is 1.96 and d accuracy rate (0.03), sample size was calculated 400 according to the following formula and it was obtained equal to 422 children (divided into 211 children with 6 months old and 211 children with 12 months old) taking into account the number of exclusions.

$$n = \frac{(z_1 - \alpha/2)(s)^2}{(d)^2}$$

Where, confidence interval (CI) of 95%, standard deviation (s) and estimating error (d) and Z shows standard normal distribution.

2-2. Methods

This study conducted on 422 children who had 6-12 months old and multi-stage sampling was done and 10 urban health centers from 17 health centers of Urmia city, were selected and as well as sampling days in centers were selected randomly and according to the number of visitors, sample size of each cluster was determined.

2-3. Measuring tests

ASQ questionnaire included 19 questions at ages 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 27, 30, 33, 36, 42, 48, 54, and 60 months. There were 30 questions for each age group that consists of six questions for each of the five areas such as gross motor skills, fine motor skills, problem-solving skills, communication skills and personal–social skills. Communication skills include sounding, calling, hearing and understanding the meaning of words; Gross motor area include the movements of the body, arms and legs; Fine motor area include the fine movements of hands and fingers; Personal-social skills include individual games, social activities such as playing with toys; Problem-solving skills include learning and playing with toys (18). In this study, ASQ questionnaire was used in the age group of 6-12 months old. Three options were available for each of the 30 questions: "Yes" for when the baby was fully able to perform the activity in the question, "Not yet" for the activities in question that have never been done, and "Sometimes" for the ability to perform the activity in some cases. The answer "Yes" had 10 points, the answer "Sometimes" had 5 points, and the answer "No" had zero points. After completing the questionnaires, the scores were compared with predetermined cut-off points based on standardization.

Adaptation and standardization of this questionnaire in Iran was performed from the years 2002 to 2007 under the supervision of the Iranian Ministry of Health and Medical Education, United Nations Children's Fund, International Council for the Education of Exceptional Children, Office of Population and Family Health, and Institute for Exceptional Children. The validity and reliability of the questionnaire have been established as

0.84 and 0.94, respectively, and its ability to determine developmental disorders is reported as 96% (12, 18, 19). Anthropometric measurements were collected from the child's health records in health centers including weight, height and head circumference at birth.

2-4. Inclusion Criteria

Inclusion criteria included children who had all records since birth time, had no congenital abnormalities, had 6-12 months old during study and lived with two parents. As well as their parent were satisfied to participate in the study.

2-5. Exclusion Criteria

Exclusion criteria included having disease related to obstetrics, failure to fulfill the records correctly and completely, lack of parental consent and failure to register anthropometric indices in health records.

2-6. Ethical Considerations

This study was approved by the Ethics Committee of Urmia University of Medical Sciences and the goals of the study were explained to all parents and all of them accepted to participate and were assured consider the confidentiality of their individual information as well as the voluntary nature of participating in the study.

2-7. Data Analyses

All statistical analyses were performed at a confidence level (CI) of 0.05 using SPSS version 17.0 software. Collected data were analyzed using the descriptive statistics including the percentile and frequency. In this study, Chi square and independent t-test, were used to evaluate the relationship between the developmental delays and anthropometric indices.

3- RESULTS

This study was conducted on 422 children (6-12 months old), which in terms of gender, 209 children (45.5%) were male and 213 children (50.5%) were female. The mean weight, height and head circumference of children at birth time were 3.222.6±469 grams, 49.07±6.68 cm and 34.01±5.3 cm, respectively. The results showed that the prevalence of the developmental delays of children was 18.8%, and the highest prevalence of developmental delays was related to the area of communication (7.1 %), and the lowest prevalence of developmental delays was related to the area of gross motor (0.9 %). The prevalence of low weight of children was 8.5 % that its relationship with the developmental delays of children has been shown in **Table.1**.

The results showed that 62 (16.06%) children with normal weight at birth time and 17 (48.5%) children with low weight at birth time had developmental delays.
According to **Table.1**, there was a significant difference between problem solving area and normal weight and low weight at birth time, so that 33.4 % of children with developmental delays in the problem solving area were in low weight group that was significant (P=0.001). As well as there was a significant difference between gross move and communication with normal and low weight at birth time, so that 25 % of children with developmental delays in gross move area were in low weight group that was significant (P=0.001).

According to **Table.2**, the mean circumference of head at birth time in all areas of developmental delays in children who had developmental delays, were less than the children with normal development (P=0.001). According to **Table.3**, the mean height of children in all area of developmental delays in children who had developmental delays compared to the natural development were less that in the fine move area was also statistically significant (P = 0.036). Of a total of 79 (18.2%) children with developmental delays in different area, 38 (48.1%)

children were female and 41 (51.9 %) children were male. The highest prevalence in females was related to the area of communication with 12 children (31.5%), and as well as the highest prevalence in males was related to the area of communication with 18 children (44%). In terms of the developmental delays, all children with developmental delays in the area of gross move, were female that was statistically significant (P=0.047). As well as according to **Table.4**, there was a significant positive correlation between gross move and communication (r=0.209, P = 0.001). There was a significant positive correlation between communication with problem solving (r=0.216, P = 0.001), and personal social (r=0.122, P = 0.012).

Table-1: The relationship between birth weight and the developmental delays of children participating in this study

Variables		Weight at birth time, Frequency (%)					P-value
		<1000 grams	1001-1500 grams	1501-2500 grams	>2500 grams	Total	
Personal-Social	Natural Development	1(0.2)	1(0.2)	33(8)	380(91.6)	415(100)	0.94
	Developmental Delays	0(0)	0(0)	1(14.3)	6(85.7)	7(100)	
Problem Solving	Natural Development	1(0.2)	0(0)	30(7.4)	376(92.4)	407(100)	0.001
	Developmental Delays	0(0)	1(6.7)	4(26.7)	10(66.7)	15(100)	
Fine Motor	Natural Development	1(0.3)	1(0.3)	29(7.3.)	368(92.2)	399(100)	0.101
	Developmental Delays	0(0)	0(0)	5(21.7)	18(78.3)	23(1000	
Gross Motor	Natural Development	1(0.2)	0(0)	34(8.1)	383(91.6)	418(100)	0.001
	Developmental Delays	0(0)	1(25)	0(0)	3(75)	4(100)	
Communication	Natural Development	1(0.3)	0(0)	30(7.7)	361(92.1)	392(100)	0.002
	Developmental Delays	0(0)	1(3.3)	4(13.3)	25(83.3)	30(100)	

Table-2: The relationship between head circumference and height with developmental delays of children participating in this study

Variables		Head Circumference (cm)		P-value	Height (cm)		P-value
		Mean	SD		Mean	SD	
Personal-Social	Natural Development	34.01	5.34	P= 0.676 Z= -0.418	49.08	6.72	P= 0.56 Z= -0.583
	Developmental Delays	34.28	1.79		48.42	3.72	
Problem Solving	Natural Development	34.1	5.11	P= 0.067 Z= -1.834	49.22	6.31	P= 0.231 Z= -1.197
	Developmental Delays	31.6	8.93		45.13	12.99	

Fine Move	Natural Development	34.08	5.16	P= 0.166 Z= -1.387	49.2	6.39	P= 0.036 Z= -2.093
	Developmental Delays	32.8	7.32		46.82	10.43	
Gross Move	Natural Development	34.01	5.32	P= 0.315 Z= -1.004	49.08	6.71	P= 0.177 Z= -1.349
	Developmental Delays	33.8	1.84		48.25	2.36	
Communication	Natural Development	34.06	5.2	P= 0.572 Z= -0.56	49.18	6.42	P= 0.237 Z= -1.18
	Developmental Delays	33.4	6.52		47.63	9.42	

Table-3: The relationship between gender and the developmental delays of children participating in this study

Variables		Female		Male		Total	P-value
		Frequency	Percent	Frequency	Percent		
Personal-Social	Natural Development	201	51.3	191	48.7	392(100)	0.94
	Developmental Delays	12	40	18	60	30(1000	
Problem Solving	Natural Development	207	50.9	200	49.1	407(100)	0.001
	Developmental Delays	6	40	9	60	15(100)	
Fine Move	Natural Development	202	50.6	197	49.4	399(100)	0.101
	Developmental Delays	11	47.8	12	52.2	23(100)	
Gross Move	Natural Development	209	50	209	50	418(100)	0.001
	Developmental Delays	4	100	0	0	4(100)	
Communication	Natural Development	201	51.3	191	48.7	392(100)	0.002
	Developmental Delays	12	40	18	60	30(1000	

Table-4: The correlation of the areas of developmental delays of children participating in this study

Variables	Communication	Gross Move	Fine Move	Problem Solving	Personal-Social
Communication		R=0.209 P=0.001	R=0.049 P=0.313	R=0.216 P=0.001	R=0.122 P=0.012
Gross Move	R=0.209 P=0.001		R=0.047 P=0.336	R=0.257 P=0.001	R=0.124 P=0.011
Fine Move	R=0.049 P=0.313	R=0.047 P=0.336		R=0.042 P=0.393	R=-0.092 P=0.059
Problem Solving	R=0.216 P=0.001	R=0.257 P=0.001	R=0.042 P=0.393		R=0.017 P=0.722
Personal-Social	R=0.122 P=0.012	R=0.124 P=0.011	R=-0.092 P=0.059	R=0.017 P=0.722	

4- DISCUSSION

The results of the present study showed that the prevalence of developmental delays was 18.8% which was consistent with the study of Akbari et al. in Isfahan (13), and Shahshahani et al. in Tehran (20) with 18.7% and 18% prevalence, respectively. In the study of Boskabadi et al. in Mashhad (21), the prevalence of developmental delays was 50%, as well as in the study of Dorre et al. in Arak (22), and Fernández et al. in Mexico (23), that conducted on infants with a history of hospitalization in neonatal intensive care unit (NICU), the prevalence of developmental delays was 35%. Also, studies have shown that the inappropriate and abnormal conditions for neonate were considered as risk factors for developmental delays, so that premature delivery and low birth weight particularly as less than 1.500 grams have been identified as risk factors (24).

According to the results, the highest and the lowest prevalence was related to the area of communication (7.1 %), and the area of gross motor (0.9 %), respectively that was inconsistent with the study of Bryant t al. (25), and Shahshahani et al. (20). In the study of Grossman et al. (26), and Dorre et al. (22), the highest prevalence was related to the area of communication that was consistent with present study. Given that motor disorder is showing in older ages and children less than one year-old were studied, then the prevalence of developmental delays in gross move was low. The prevalence of low birth weight (LBW) is different in different regions such as 15% in sub-Saharan Africa, 11% in the Middle East and North Africa, 10% in East Asia, 9% in Latin America, 6% in developed countries, 18% in developing countries, 17% in the world and 10% in Iran (27, 28). In the present study, 8.5% of children had low birth weight less than 2,500 grams that was consistent with the study of Zahed Pasha et al. (29) in Sharekord (8.5%), Akbari et al. (13) in Isfahan (8%), and was inconsistent with the study of Hashemian Nejad et al. (30) in Sabzevar (3.6%), and Wannous et al. (31) in Syria (6.6%). The prevalence of LBW in different regions may be associated with race, differences in levels of social and economic prenatal care and nutritional status. Low birth weight is an important determinant of the rate of infant mortality. In addition, it is related to serious complications such as cerebral palsy, mental retardation and other cognitive and sensory impairments. These babies have less accommodation in terms of social, mental and physical with their environment. The results showed that children who were low birth weight at birth time, had low developmental growth in all area compared to children with normal weight. Kerstjens et al. (32), stated that children with low birth weight and preterm less than 32 weeks in all area of developmental growth, had a significant difference with control group and their developmental delays was in high level. Hediger et al. (15), found that low birth weight affect the fine and gross motor and social area, and also Akbari et al. (13), and Sajedi et al. (33), showed a significant relationship between birth weight and developmental delays in children.

Golombok et al. (34), found that low birth weight does not affect the behavioral and emotional development, but children are weak in the development of language. So that in the study of Piek et al. (16), the results indicated that birth weight is significantly associated with fine motor skills of school-age period and Glasson et al. (14), stated that children with impaired cognitive development in terms of weight at birth time had no significant difference with children in the control group. Generally, factors that reduces the development of fetus in the uterine, can cause some problems in neonatal period such as lower blood sugar, hypothermia,

polycythemia and dysmorphology, as well as because of low birth weight and its complications, hospitalization of these children is more in the ICU that led to developmental disorders (35). On the other hand, the results showed that the mean circumference of head and height at birth time of children who have had developmental delays were less than children who had natural development, but exception of the relationship with fine move and height at birth the rest areas were not statistically significant. In the study of Glasson et al. (14), there was no significant relationship between height and head circumference with autism disorder. Hediger et al. (15), declared that low birth weight was the most important risk factor in the development of girls, and both of low birth weight and pregnancy duration in boys had significant relationship with the social and physical development, but height and head circumference at birth time had no significant relationship with the developmental growth.

According to the results, developmental delays in male children, was more than female children. In the study of Hediger et al. (15), the results showed that developmental delays in the field of fine and gross motor and social were significantly more in males. In the study of Akbari et al. (13), the authors also found that male gender had a significant correlation with developmental delays in children. On the other hand in the study of Piek et al. (16), gender had no relationship with developmental delays that these results were inconsistent with our study. In the study of Lin et al. (4), the results showed that males are more likely to have developmental delays than female. Unlike the above results, the study of Soleimani et al. (12), showed no significant relationship with gender. Also, in the study of Sajedi et al. (33), gender was not influencing factors for children's motor development.

4-1. Limitations of the study

The small sample size of study, are potential limitation of this study. There is still need to further studies to access additional information about this subject. Another limitation of the current study, were low of the same study in this field in Iran society.

5- CONCLUSION

Considering the significant number of the evolutionary delay of children and its relationship with birth weight, it is recommended to consider appropriate interventions at pregnancy period for the prevention of low birth weight neonates and the constant programs in terms of the developmental delays of the children. Then on time prevention and rehabilitation lead to their health and reduce a huge spiritual and economic burden of family and society.

6-AUTHORS CONTRIBUTIONS

Study design: HFE, MZ, AS and MGG.

Data Collection and Analysis: MZ, AS, RV and PA.

Manuscript Writing: SN, MGG and SN.

Critical Revision: HFE, MGG and MZ.

7- CONFLICT OF INTEREST: None.

8-ACKNOWLEDGMENTS

The authors would like to thank the financial support of Urmia University of medical science and also health department of the city of Urmia and especially of the parents participating in the study

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