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Evaluation of Developmental delay in children referred to Ali-Asghar Child Development Center

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Abstract

Background and Aims: The issue of children development is one the subjects which should be considered along with their physical growth. By timely diagnosis and necessary follow-ups, developmental impairments can be prevented. Aim of current study was to evaluate developmental delay in children referred to Ali-Asghar child development center during 2019.

Method: Current study is a descriptive cross-sectional study in which 77 children aged 12-24 months who were referred to development center, where evaluated according to their developmental delay. All of them were screened by Ages and Stages Questionnaire (ASQ) and their status of developmental delay in different domains was assessed. Data were analyzed with SPSS-16 using descriptive statistics and chi-squared test.

Findings: We showed that 89.7% of 12-month-old children, all 18-month-old children and 92.3% of 24-nmonth old children with developmental delay weighted more than 2.5 kilograms at birth. Respectively 31%, 44.4% and 46.2% of these children had the history of some risk factors during their neonatal period. These results indicated that the effect of delivery method in 12-month-old children on the areas of developmental delay such as communication and problem solving is significant (for both of mentioned developmental domains, P-value was 0.049 and 0.044 for fine motor activity).

Conclusion: We showed that developmental evaluation for all children, even seemingly healthy ones who didn't have any risk factors in neonatal period, can be a valuable measure to detect those ones with developmental delay. Therefore, paying attention to all children's development is an essential matter.

Keywords: Development, Children, Screening, ASQ

Abbreviations: ASQ: Ages and Stages Questionnaire

Introduction

One of the criteria for children's health status is moving on the developmental pathway appropriate to their age. In addition to monitoring children's physical growth, it is also important to monitor their appropriate development. During first years of life, the brain is in its golden age, and it grows rapidly like all the body parts [1-4]. However, in some conditions the child's development velocity is lower than his or her physical growth. Developmental delay is seen even in children who appear to be healthy according to their appropriate and regular physical growth [5-7]. Developmental delay is a common problem in infancy and childhood period which occurs in 10% to 15 % of

preschool children. Developmental delays are identified during routine follow-up examinations or when the parents raise concerns. Moreover, developmental delay can be associated with some other important comorbidities like seizures and so it is very critical to recognize developmental delay in early months and years of life [8-10]. Developmental monitoring of children helps to identify problems that, if left unchecked, may not be detected until school age [8]. By recognizing these problems early in life, some of them can be treated with simple methods, even by parents [11]. Achieving these aims is one of the important goals of developmental screening. Developmental screening shows how much support a child needs in order to guide family and prevent further injuries by timely intervention when it is most effective. On the other hand, this will significantly reduce the costs that may arise due to delay in identifying children's needs [12-14].

Some studies considered these factors as risk factors of developmental delay:

Gestational age and birth weight under 37 weeks and 2500 grams, respectively. History of NICU admission, neonatal jaundice treatment and delivery mode [13,15,16].

Current guidelines from American Academy of Pediatrics recommend screening children for developmental problems by using a standardized screening tool and referring at-risk patients to early intervention or subspecialties. Pediatricians reported use of a standardized screening method has increased from 2002 to 2016, and more pediatricians are self-reporting for children with problems in developmental screening [17].

Today, children's developmental screening is included in health care program of almost all countries. Different measures are used for developmental screening and there are some questionnaires with developing editions for this purpose [18,19]. In Iran developmental screening is also performed by Ages and Steps Questionnaire (ASQ) which is used as a basic children's developmental screening tool [20,21]. This questionnaire, currently used for early developmental screening is a simple tool for identifying children with developmental delay in early stages. This is a user-friendly questionnaire, which its ease of use has made it accepted by many centers around the world [22]. ASQ screening results identify the child's need for further evaluation. In advanced cases, the child may be referred for neuromotor, speech and occupational therapy. In this study, the screening results of children who were examined with ASQ test and were referred to Ali-Asghar comprehensive developmental center, were analyzed. The purpose of this study was to investigate the developmental delay status of children referred to the center.

Materials and Methods

This is a descriptive cross-sectional study. The study population of this research were children under two years' old who were referred to development center of Ali-Asghar educational pediatric hospital, affiliated to Iran university of Medical Sciences in 2019 for comprehensive developmental evaluations. After obtaining necessary authorization from Iran university of Medical Sciences, the required data was collected. Children who were evaluated by ASQ

tool for the first time at the age of 12,18 or 24 months and were referred to this center with their completed questionnaire forms were assessed in this study. Due to the importance of timely intervention in this age group, the developmental questionnaire of these infants was evaluated. Data collection tool in this study was ASQ questionnaire of 82 children who referred to Ali-Asghar comprehensive development center. Five questionnaires were excluded because of their incomplete data and finally 77 questionnaires were analyzed by recording the code.

This questionnaire includes questions in five areas of communication skills, fine and gross motor skills, personal and social skills, and problem solving which is designed for different age groups. This questionnaire was rendered to parents along with an instruction guide on how to complete it. In addition to its simple questions, this questionnaire was completed easily by parents and then it was returned to the center for evaluating the results. One of the great advantages of this test is that since the parents observe their child's behaviors directly, test results have a high validity. After scoring each of the developmental domains, each domains scores were compared with the cutoff point announced in the standard sheet for the same developmental domain in different age groups. If the score in one developmental domain was equal or more than two standard deviations below the average, the developmental delay was considered as mild, if two domains' scores were equal or more than two standard deviations below the average, the developmental delay was considered as moderate developmental delay. If three domains or more had scores equal or more than two standard deviations below the average, the developmental delay was considered as sever developmental delay. If developmental delay was detected in any domains, the child was referred for further follow-up and evaluation.

In this study children's developmental delay status were compared according to the number of domains in which the child's score is more than two standard deviations below the average, between three groups of children who aged 12months, 18 months and 24 months. Data were analyzed by SPSS 16 using descriptive statistics. Also, Chi-Square test and Exact Fisher test were done to evaluate the correlation between qualitative variables and developmental delay scores in different domains. P-Value less than 0.05 was considered significant.

Results

During this study, from 82 ASQ questionnaires of children who were referred to Ali-Asghar development center, five of them were excluded because of incomplete data. From 77 children who were referred to development center because of their inappropriate ASQ results, 29 children were at the age of 12 months. 9 children

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were at the age of 18 months and 39 children were at the age of 24 months. In all three age groups a higher percentage of children were boys, most of them had gestational age more than 37 weeks and birth weight more than 2500 gr. Cesarean section was the predominant delivery mode in all age groups. 31% of 12-month-old children, 44.4% of 18-month-old children and 46.2% of 24-month-old children had a history of jaundice and NICU admission in their neonatal period (Table 1). The number of domains in which children had developmental delay, i.e., domains whose mean scores were two standard deviation or more less that the average, is given in Table 2. In 29 12-month-old children who were referred to development

Table 1: Frequency distribution of demographic variables in 12, 18 and 24 month old children.

age / Variable			12 month		18 Month		24 month	
			Frequency	percentage	Frequency	percentage	Frequency	percentage
Gestational Age	<37 w		9	31	2	22.2	8	20.5
	>=37 w		20	69	7	77.8	31	79.5
Birth weight	< 2500 gr		3	10.3	0	0	3	7.7
	>=2500 gr		26	89.7	9	100	36	92.3
Gender	male		20	69	5	55.6	28	71.8
	female		9	31	4	44.4	11	28.2
Birth Mode	NVD		10	34.5	2	22.2	18	46.2
	C/S		19	65.5	7	77.8	21	53.8
Feeding type in first 6 month of life	Breast milk		11	37.9	3	33.3	15	38.5
	formula		14	48.3	2	22.2	12	30.8
	Breast milk & formula		4	13.8	41	44.4	12	30.8
Neonatal Risk Factors	Icter	yes	6	66.7	2	40	91	39.1
	NICU Admission	yes	3	33.3	3	60	14	60.9
	NO Risk factor		20	69	5	55.6	21	53.8

Table 2: Frequency distribution of each domain of developmental delay in 12, 18 and 24 month old children.

Age / Domain	12 Months		18 Months		24 Months	
	Frequency	percentage	Frequency	percentage	Frequency	percentage
Communication skills	13	17.1	6	21.3	19	27.6
Gross motor	24	31.6	7	25	6	8.7
Fine motor	10	13.1	5	17.9	9	13
Social Individual skills	16	21	5	17.9	171	24.7
Problem Solving	13	17.1	5	17.9	18	26
Total	76	100	28	100	69	100

center, a total of 76 developmental delays were detected. Among the five developmental domains, the most frequent delays were detected in gross motor skills. Nearly one third (31.6%) of detected developmental delays in this age group (12 months) were related to gross motor skills. Out of a total of 28 developmental delays in 9, 18-month-old children, the most frequent delays were seen in gross motor skills (25%). In 39 children at the age of 24-month with a total of 69 developmental delays in different domains, the highest rate of developmental delay (more than 25%) was related to communication skills (Table 2).

Approximately one-third of 12-months-olds and 18-month-olds were retarded in all five developmental areas. 31% and 33.3% respectively. Nearly 90% of 18-month-olds and 40% of 24-month-olds had delays in more than one developmental domain (Table 3).

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Table 3: Frequency of total developmental delays in different domains in 12, 18 and 24 months old children.

Total number of develop-mental delays	Developmental delay in one domain		Developmental delay in two domain		Developmental delay in three domain		Developmental delay in four domain		Developmental delay in five domain	
	Frequency	percentage	Frequency	percentage	Frequency	percentage	Frequency	percent-age	Frequency	percentage
12 months	13	44.8	4	13.8	2	6.9	1	3.4	9	31
18 months	1	11.1	3	33.3	2	22.2	0	0	3	33.3
24 months	24	61.5	6	15.4	6	15.4	0	0	3	7.7

The highest number of areas with developmental delay was observed in boys. This rate was 72.4%, 60.7 % and 71% in 12-month-old, 18-month-old and 24-month-old children respectively (Table 4).

Table 4: Relationship between demographic variables and the frequency of developmental delay in 12, 18 and 24 months old children.

Status of developmental / **variables**		**12 month**		**18 month**		**24 month**	
		developmental delay		**developmental delay**		**developmental delay**	
		Frequency	**percentage**	**Frequency**	**percentage**	**Frequency**	**percentage**
Gestational Age	<37 w	24	31.6	7	25	12	17.4
	>=37 w	52	68.4	21	75	57	82.6
Birth weight	<2500 gr	10	13.2	28	50	5	7.3
	>=2500 gr	66	86.8	28	50	64	92.7
Gender	Male	21	27.6	11	39.3	20	29
	Female	55	72.4	17	60.7	49	71
Birth Mode	NVD	16	21	7	25	39	56.5
	C.S	60	79	21	75	30	43.5
Feeding type in first 6 month of life	Breast milk	24	31.6	8	28.6	23	33.3
	formula	38	50	8	28.6	22	31.9
	Breast milk& formula	14	18.4	12	42.8	24	34.8
Neonatal Risk Factor	Yes	18	23.7	15	53.6	31	45
	NO	58	76.3	13	46.2	38	55

In 12-month-old children, a significant correlation was reported between delays in communication (value=0.049), problem solving (value = 0.049) and fine motor skills (p value = 0.44), and mode of delivery.

Discussion

Normal development of children is one of the issues that should be considered along with their normal physical growth. The aim of this study was to evaluate the developmental delay status in children referred to the developmental center of Ali-Asghar educational pediatric hospital in Tehran during 2019. In this study, 77 children aged 12-24 months were assessed by ASQ questionnaire. The results of this study showed that the assessment of developmental status for all children, even those with seemingly healthy appearance and without history of neonatal risk factors, can play a significant role in

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identifying children with developmental delay. Gestational age was 37 weeks or more, in more than two-thirds (69%) of children who were referred to development center. The result was also similar for 18-month-old (77.8%) and 24-month-old children (92.3%). This issue highlights the importance of this point that not only premature infants but also all term infants should be evaluated and monitored for developmental delay and all of the children should be followed carefully according to their developmental status. Studies by Aziminejad and his colleagues and also zareipur and his colleagues showed that even in term infants some degrees of developmental delay may occur [5,6]. At the same time the research of Boskabadi et al. [15], showed that more development delay is observed in neonates with gestational age under 37 weeks [16].

In children aged 12 and 18 months, the highest rate of developmental delay was in the area of gross motor skills. The result was similar in the studies of Fallah et al. [23] and Afraz et al. [24]. Children at 24 months of age have the highest rate of developmental delay in the field of communication skills which is similar to the results of other studies [5,15,25].

About one-third (31%) of 12-months old children in this study had developmental delay in all five domains. This rate was 33.3% in 18 months old children. In Boskabadi et al. [15] study 16% of 12-months old children had developmental delay in all developmental fields of ASQ. This result demonstrates the importance of careful attention and monitoring to prevent delays in each of the five developmental domains. Also, more than two thirds of all 24-months old children had developmental delay in one area. This highlights the importance of closely monitoring children's developmental status and states that all children should be closely monitored and be under regular follow-up programs and the parents also should be provided with special supports and training to prevent future delays in other developmental areas and so that the child can grow and develop

appropriately. The importance of this issue is that in different studies, the correlation between developmental delay in one domain and occurrence of delay in other developmental domains has been reported [6].

Approximately one-third of 1-month-olds in this study had risk factors for developmental delay in their neonatal period, of which two-thirds had a story of jaundice. However, no correlation was detected between history of neonatal risk factors and developmental delay, which could be due to small sample size. So, it is recommended that studies be performed on a larger sample size. In Boskabadi et al. [15] study, children with history of neonatal jaundice had developmental delay at the age of 24 months. In Ferrerira et al. [26] and Hentges et al. [27] studies children with the history of NICU admission, had motor skills delay at the age of 12 months. In this study no significant correlation was detected between gender and developmental delay or even cumulative cases of developmental delay. These results were similar to Dare and Fattahi studies [28]. In 18-month-old children, no significant correlation was found between gender and birth weight with delay in each of the developmental domains and their sum. These results were also confirmed in Boskabadi. et.al. [15], Dare and Fattahi studies [28]. In Moraveji et al. [29] studies they found a significant correlation between gender and developmental delay. This difference may be due to the small sample size in the current study.

From 12-month-old, 18-, and 24-month-old children, 90% had birth weight more than 2,500 grams. In the study of Karimi et al. [30], birth weight less than 2500 g was significantly associated with developmental delay in fine and gross motor skills and problem solving. No similar correlation was found in this study which could be due to the small number of children in each group.

In 12-month-old children, there is a significant correlation between delays in three developmental areas of communication and problem solving ($p = 0.049$ for both) and fine motor skills ($p = 0.044$) with delivery mode (chi-Square test). In the study of Kazeruni et al. [31], The correlation between delay of fine motor skills and the mode of delivery was Significant. In this study, no significant correlation was observed between different feeding methods and delay in each of the developmental domains, which is similar to the results of the other studies [31,32].

In one cross-sectional study by Shahshahani et al. [17] on 648 children aged 4 to 60 months were assessed according to developmental delay and the method of diagnosing this delay. This study showed that PEDS (Parents' Evaluation of Developmental status) and ASQ have acceptable agreement, thus it seems that PEDS can be used for children's developmental screening especially in childcare visits.

In Other descriptive cross-sectional study by Fatollahpour et al. [33], 397 infants aged 4-24 months were examined by ASQ screening tool. The prevalence of developmental delay in infants 4 to 24 months on average was 3.7 % in girls and 5.7% in boys. The prevalence of developmental delay was 11.4% in four months' infants in four domains, 5.7% in six months infants in two domains. 34.4% in 18 months' infants in three domains and 5% in 24 months' infants in one domain. The highest level of developmental delay was observed in fine4 motor in this study.

Differences in the results of this study with other studies can be due to screening age differences, study population and the method, but this does not diminish the importance of screening programs. In most studies, the focus was on having a high-risk history in neonatal period. The results of this study showed the possibility of developmental delay can also be present in children who have a normal birth weight and gestational age with no history of neonatal hospitalization. Detection of such cases is one the benefits of this test and reveals the importance of paying attention to the child development before the age of two and to prevent the occurrence of developmental delay in cases that may even be irreversible. Because early diagnosis and intervention have a direct impact on the prognosis. In this study, developmental

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delay in more than one domain was detected in children who were referred to development center in each age group, this emphasizes the importance of paying attention and complete assessment of each of the developmental domains in children, because by detecting delay in one domain and beginning its management, delays in other areas of development will be prevented. One of the limitations of this study was the small number of samples in different age groups. We recommended to design future studies with more samples. Also, issues such as parents' level of education can be a factor in the follow-up process

To identify children's needs to developmental interventions, this issue also should be considered in future studies. It is suggested to design future research using other available developmental screening tools at the same time to identify the children who need intervention more quickly. It is expected that even in children who have not yet been developmentally screened, this screening should be performed at the first visit along with assessment of their physical growth. Also, the results of this study can be valuable to establish centers for clinical follow-up and referral of children for occupational therapy, speech therapy and other neurodevelopmental support centers.

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Conflict of Interest

There is no conflict of interest in this manuscript.

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