Original Article

Evaluation of Evolutionary Status of 4–60-Month-Old Children in Kashan and Aran-Bidgol and Its Related Factors in 2016–2017

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Abstract

Background: Paying attention to Children's evolutionary status help to improve their mental capacity and make them more intelligent and creative adults. The present study aimed to investigate the developmental status in 4–60-month-old children of Kashan and Aran-Bidgol and its related factors in 2016–2017. **Methods:** This descriptive cross-sectional study was performed on 656 children aged 4–60 months in Kashan and Aran-Bidgol that were recruited by a stratified random sampling method. Data were collected through self-report using Ages and Stages Questionnaire (ASQ) and demographic and clinical questionnaire. The ASQ consists of 30 questions in five domains including communication, gross motor, fine motor, problem-solving, and personal-social skills. The inter-rater agreement coefficient of 93%, the Cronbach's alpha coefficient of 0.51–0.87, and the 2-week test–retest correlation of 0.75 are reported for this questionnaire. Data were analyzed using descriptive statistics as well as Chi-square, ANOVA, and *t*-test. The significance level was considered <0.05. **Results:** The results showed that 527 (80.3%) of the 656 children were healthy, and the rest had a disorder at least in one of the developmental domains, including 1.5% disorders in communication skills, 6.2% in gross motor, 1.2% in fine motor skills, 1.2% in problem-solving, and 0.9% in the personal-social area. There was a significant relationship between developmental disorders with the child's gender and birth weight. Among maternal characteristics, there was a significant relationship between the mother's job and age with developmental delay. **Conclusion:** Despite the normal evolution in most children of Kashan and Aran-Bidgol, a significant number of them had a disorder at least in one of the evolutionary domains. It is essential to sensitize the families about the developmental process of their children and encourage them to alleviate the risk factors to prevent early complications of these disorders in the future.

Keywords: Ages and Stages Questionnaire, developmental disorder, evolution, pediatrics

Introduction

Discussing the growth and development of children is very important.[1] Evolution or development is defined as the changes that human gain for the promotion of physical, mental, and social health during their life.[2] Early childhood development (ECD) includes cognitive, speech, emotional, social, physical, mental, and spiritual functions that are widely influenced by genetic and environmental factors.[3] It has a significant impact on learning, academic achievement, the possibility of physical-mental illness, and economic and social performance in the future.[4]

Around the world, there are at least 200 million children under 5 years of age that do not reach their maximum level of cognitive, social, and emotional performance.[5,6] In the United States, there are about 2 million children with evolutionary disabilities (one in every six children) that costs about $ 40 billion annually.[7]

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Given that children are a huge capital of a nation and they have the potential to become innovative and active adults in the future, therefore, a suitable condition must be provided for their growth and development, and it is necessary to identify and resolve the physical, social, and environmental problems that cause the evolutionary delay.[3,8] For only 30% of children with behavioral and evolutionary problems are identified by primary health-care providers, the American Academy of Pediatrics recommends screening for healthy children.[9]

Shahshahani *et al*. conducted a study on 197 healthy children aged 4–60 months and the results of Ages and Stages Questionnaire (ASQ) and Denver Developmental Screening Test-II tests reported that 37% and 18% of children had developmental delay, respectively. About 24% of these children had problems in gross motor skills, 18% in speaking skills, 6% in the personal-social skills, and 5% had problems in fine motor skills.[5] Another earlier study conducted on 129 children with an average age of 22 months in Peru, reported that 38.7% of the children had suspicious results for at least one of the five subscales of ASQ. The results demonstrated 15.5% of evolutionary disorder in communication skills, 3.8% in gross motor skills, 10% in fine motor skills, 13.9% in problem-solving, 4.5% in personal-social skills, and 13 children with delay in more than one area.[6] The results of another study conducted in Iran showed that the prevalence of growth and developmental delay among children aged 4–60 months was 18%.[7]

The national program of the ECD is designed only for children with severe and unknown developmental problems and does not consider the evolutionary status of healthy children. Several studies have been conducted to assess the evolutionary status of children in different cities of Iran,[7,8,10-13] but considering that the environmental and socioeconomic factors highly affect the evolutionary status of children in different cultures;[2] and since no study has been carried out in Kashan and Aran-Bidgol so far, this study aimed to investigate the developmental status in 4–60-month-old children of Kashan and Aran-Bidgol and its related factors in 2016–2017.

Methods

This is a descriptive cross-sectional study that was carried out on 690 children aged 4–60 months in health-care centers of Kashan and Aran-Bidgol in 2016–2017.

To determine the sample size, for estimating the proportion (P) of evolutionary disorders in different areas of ASQ, with considering the α = 95% and d = 10%–20% and based on the proportion of the developmental disorders in the study of Shahshahani *et al*., finally with considering the proportion of 10%–15%, α = 95%, and d = 0.003, and considering the attrition rate 3%, the sample size was calculated 690.

To select the study individuals, a list of children aged 4–60 months in health-care centers of both cities was provided (from the Children's Healthcare Registry office). A stratified sampling method was used. The children were randomly selected from the sampling frame based on the age groups of 4–60 months according to the population of each group in each health center. Therefore, the number of samples from each health center was obtained.

In this study, the second edition of the ASQ screening test was used for 19 age groups (4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 27, 30, 33, 36, 42, 48, 54, and 60 months, respectively). This questionnaire is used to assess the developmental status of the children in different ages and identify the probable developmental disorders. It consists of 30 questions in five areas including communication skills, gross motor skills, fine motor skills, problem-solving, and personal-social skills. Each area consists of six questions that score as yes = 10, not yet = 0, and sometimes = 5 concerning whether the child can perform the activity. The total score for each area ranges between 0 and 60. The calculated scores of the areas were compared to cutoffs that indicate whether the child's development appears to be on schedule. In different studies, the inter-rater agreement coefficient was 93%, the Cronbach's alpha coefficient was 0.51–0.87, and the 2-week test–retest correlation was 0.75 for this questionnaire. The test also has 92% sensitivity, 95% property, 92% positive predictive value, and 95% negative predictive value for examining the development status.[7-11]

Demographic and clinical characteristics questionnaire included the child's characteristics (gender, birth weight, and growth level) and maternal characteristics (mother's age, job, and level of education).

Inclusion criteria were children aged 4–60 months that were covered by the health-care centers (100% of the children will be covered by one health-care center on the 3rd day after birth) and parent's written consent to participate in the study. Children with known congenital physical or psychological disorder that were under treatment, and also children diagnosed with a disorder during this study were excluded from the study.

For collecting the data, the number and name of the children were determined for each age group. Before delivering the questionnaires, families were informed about the aim of the study and necessity of answering all of the questions and returning the questionnaires in the specified time frame. The questionnaire was delivered to the parent by the health-care provider to complete and return it to the center within 1 week. If parents were illiterate, any literate person in the family could complete it. All the questionnaires were returned.

Data analysis

The data were analyzed and corrected of probable errors. Statistical analysis was carried out using SPSS Software (Version 16). Descriptive statistics are presented as means and standard deviations (Mean ± SD) for quantitative variables and as frequencies and percentages for categorical variables. To investigate the probable relationship between variables and appropriate tests were carried out according to the type of variables such as Chi-square test for qualitative variables and ANOVA or *t*-test for quantitative variables. The significance level is considered <0.05.

Ethical considerations

This study was approved by the Research Council and Ethics Committee of Kashan University of Medical Sciences (approved research code: 93,162). All the individuals participated in the research with written consent. The parents were assured that there is not going to conduct a therapeutic intervention on their child and the results do not have any interference with receiving a synthetic milk coupon, and the information would be completely confidential.

Results

Most of the children were boys (51.3%) and also had a birth weight of 3500–3000 g (40.3%). In terms of growth status, most children (87.5%) had a normal condition. The results showed that 80.3% of the children were healthy and 19.7% had a disorder in at least one of the domains, which is presented in Table 1.

The results of the study indicated that among the demographic and clinical variables of the children, birth weight had a significant relationship with communication (P = 0.019) and gross motor skills (P = 0.005). Furthermore, gender had significant relationship with communication (P = 0.028), fine motor skills (P = 0.009), and personal-social skills (P = 0.002). Detailed reports are presented in Table 2.

The results of the present study showed that among the maternal variables, mother's age had significant relationship with problem-solving (P = 0.001), gross motor (P = 0.01), and fine motor skills (P = 0.035). Furthermore, the job had a significant relationship with problem-solving, fine motor, and personal-social skills (P = 0.001). Detailed reports are also presented in Table 3.

Discussion

In the present study, the developmental status of children aged 4–60 months in Kashan and Aran-Bidgol was investigated in 2016. The results indicated that among 656 children, 80.3% were healthy and only 19.7% had a disorder at least in one of the developmental areas. Similarly, Karimi *et al*. found that the prevalence of developmental delay among children aged 4–60 months in Tehran was 18%.[8] In another study conducted by Karami *et al*. it was reported that 7.9% of 1-year-old children in Khorramabad had disorders in all of the developmental areas and 16.3% of them had a disorder at least in one of the areas.[11] Furthermore, Shahshahani *et al*. (2017) reported that the prevalence of developmental delay among children aged 0–60 months was estimated 12%.[7] In the study of Kazeroono *et al*. conducted in Yasooj, 37.5% of the studied children had a disorder at least in one of the developmental areas.[10] The difference between the prevalence of developmental disorders in different studies may be due to the different environmental[14] and socioeconomic condition[2] in various contexts. This should be pointed that as a comparison between the results of the earlier studies,[5,8] and the present study, a rising trend is observed in the prevalence of disorders, despite the advancements in screening methods. The present study showed that the highest percentage of developmental disorders (6.2%) was related to gross motors skills. Similarly, Shahshahani *et al*. reported that the most prevalent disorders (24%) were related to the gross motors skills.[5] However, Ghorbanzadeh *et al*. indicated that most of the children aged 4–60 months in Jahrom had delayed evolution in communication skills.[14] Furthermore, Zareipour *et al*. reported that the highest and lowest incidence of the developmental delay was related to the communication (7.1%) and gross motors skills (0.9%).[12]

In the present study, among all of the studies characteristics of the children, only there was a significant relationship between child's gender and disorders in communication, fine motor, and personal-social skills. Furthermore, birth weight was significantly related to the disorders in the areas of communication and gross motor skills. Karami *et al*. also reported that birth weight is correlated to developmental disorders.[11] In another study, Karimi *et al*. indicated that the disorders in the areas of gross and fine motor skills and problem-solving were significantly higher in the low birth weight (LBW) children.[8] Furthermore, Ali Abadi *et al*., and Sajedi and Ali-Zadeh showed that infants with LBW are significantly more incapable than normal infants in terms of disorders in gross motor skills[15] and it is one of the most effective risk factors for the developmental disorder.[16] In the study of Ruiz in Spain, a 2-year follow-up of infants with a history of the Neonatal Intensive Care Unit admission, the incidence of cerebral palsy has been reported 6.8%, with more chance in the weights <1500 g.[17] Developmental disabilities in LBW infants include cognitive disorder (lower IQ), speech difficulties, and sustained motor neurological disorders, including difficulty in balance, coordination, and perceptual problems.[2] The agreement of the results of the studies in this area indicates the high sensitivity of the issue. LBW

Table 1: Frequency distribution of disorders in different areas of the Ages and Stages Questionnaire

Domain	Evolutionary situation, *n* (%)		
	Healthy (> −1SD)	Has a disorder (< −2SD)	Need to re-check (2SD < … < −1SD)
Communication skills	614 (93.6)	10 (1.5)	32 (4.9)
Gross motor skills	612 (93.3)	17 (2.6)	27 (4.1)
Fine motor skills	615 (93.8)	14 (2.1)	27 (4.1)
Problem-solving	625 (95.3)	8 (1.2)	23 (3.5)
Personal-social skills	633 (96.5)	6 (0.9)	17 (2.6)

Table 2: Distribution of disorders in different areas of the Ages and Stages Questionnaire in terms of demographic and clinical variables of the children

Developmental domain	Demographic and clinical variables											Total
	Gender			Growth level			Birth weight					
	Girl, *n* (%)	Boy, *n* (%)	*P*	Normal, *n* (%)	Abnormal, *n* (%)	*P*	>2500, *n* (%)	2500-3000, *n* (%)	3000-3500, *n* (%)	<3500, *n* (%)	*P*	
Communication skills												
<−2SD	1 (0.3)	9 (2.7)	0.028	6 (1)	1 (3.3)	0.162	1 (2.3)	1 (6)	3 (1.1)	5 (3)	0.019	10 (16)
−2SD< … <−1SD	13 (4.1)	19 (5.6)		24 (4.2)	2 (6.7)		7 (15.9)	6 (3.6)	14 (5.3)	5 (3)		32 (5)
>−1SD	305 (95.6)	309 (91.9)		544 (94.8)	27 (90)		36 (81.8)	160 (95.8)	248 (93.6)	156 (94)		600 (93.5)
Gross motor skills												
<−2SD	10 (3.1)	7 (2.1)	0.344	15 (26)	1 (3.3)	0.476	6 (13.6)	5 (3)	5 (1.9)	1 (6)	0.005	17 (26)
−2SD< … <−1SD	10 (3.1)	17 (5)		25 (4.4)	0 (0)		1 (2.3)	8 (4.8)	12 (4.5)	5 (3)		26 (4)
>−1SD	299 (93.7)	313 (92.9)		25 (4.4)	29 (96.7)		37 (84.1)	154 (92.2)	248 (93.6)	160 (96.4)		599 (93.3)
Fine motor skills												
<−2SD	5 (16)	9 (2.7)	0.009	13 (2.3)	1 (3.3)	0.818	2 (4.5)	3 (1.8)	5 (1.9)	4 (2.4)	0.544	14 (2.2)
−2SD< … <−1SD	6 (1.9)	21 (6.2)		23 (4)	1 (3.3)		2 (4.5)	3 (1.8)	11 (4.2)	8 (4.8)		24 (3.7)
>−1SD	308 (96.6)	307 (91.1)		538 (93.7)	28 (93.3)		40 (90.9)	161 (96.4)	249 (94)	154 (92.8)		604 (94.1)
Problem-solving												
<−2SD	2 (6)	6 (1.8)	0.393	7 (1.2)	0 (0)	0.733	1 (2.3)	1 (6)	4 (1.5)	2 (1.2)	0.593	8 (1.2)
−2SD< … <−1SD	10 (3.1)	13 (3.9)		21 (3.7)	0 (0)		2 (4.5)	3 (1.8)	12 (4.5)	5 (3)		22 (3.4)
>−1SD	307 (96.2)	318 (94.4)		546 (95.1)	30 (100)		41 (93.2)	163 (97.6)	249 (94)	159 (95.8)		612 (95.3)
Personal-social skills												
<−2SD	4 (1.3)	2 (6)	0.002	6 (1)	0 (0)	0.215	1 (2.3)	0 (0)	4 (1.5)	1 (0.6)	0.086	6 (9)
−2SD< … <−1SD	2 (6)	15 (4.5)		15 (26)	0 (0)		4 (9.1)	3 (1.8)	6 (2.3)	4 (2.4)		17 (26)
>−1SD	313 (98.1)	320 (95)		533 (96.3)	30 (100)		39 (88.6)	164 (98.2)	255 (96.2)	161 (97)		619 (96.4)
Total	319 (100)	337 (100)	-	574 (100)	30 (100)	-	44 (100)	167 (100)	265 (100)	166 (100)	-	642 (100)

SD: Standard deviation

infants need to be monitored more sensitively in terms of developmental growth. However, Dorre and Fattahi Bayat reported no significant relationship between gender and birth weight with different developmental delays.[13] However, the results of Karami *et al*. study showed no significant relation between gender and evolutionary disorders.[11] These discrepancies may be due to the differences in samples of different studies in terms of demographic and clinical characteristics.

The present study showed that along with the clinical characteristics of the child, there are other factors contributing to the developmental disorders. The results indicate that there is a significant relationship between gross and fine motors skills and problem-solving with the mother's age. Similarly, Karami *et al*. indicated the relationship between mother's age and child developmental delay.[11] Undoubtedly, the mother's physical and mental health is very important for the child growth, especially in children under the age of 3 who are more vulnerable and are highly dependent on their mother for nutrition and stimulation.[18] These results are also consistent with the results of Soleimani *et al*. In this review study, the mother's age is mentioned as one of the important factors affecting developmental disorders in children. Increasing the age of the mother increases the prevalence of chromosomal anomalies and developmental disorder in infants.[2] Studies show that mothers under the age of 20 years and over 35 years give birth babies with LBW more than women aged 20–29 years, which is directly related to developmental disorders.[19] Furthermore , in the present study, a significant relationship was observed between disorder in fine motor skills, problem-solving, and personal-social development with mother's job. Another study confirms the strong relationship between mother's exposure to stressful situations such as social postures and incidence of developmental delay in her child.[20] However, no significant relation was found in this area in the study of Karami *et al*.[11]

Conclusion

The results of the present study indicate that despite the normal developmental status of most children in Kashan, a

Table 3: Distribution of disorders in different domains of Ages and Stages Questionnaire in terms of maternal demographic variables

Developmental domain	Maternal variables											Total
	Mother's job			Mother's level of education			Mother's age					
	Employed, *n* (%)	Housewife, *n* (%)	*P*	Diploma>, *n* (%)	Diploma<, *n* (%)	*P*	≤25, *n* (%)	26-30, *n* (%)	31-35, *n* (%)	>35, *n* (%)	*P*	
Communication skills												
<−2SD	0 (0)	10 (1.6)	0.785	7 (1.4)	3 (2.1)	0.56	4 (2.6)	5 (2.1)	1 (6)	0 (0)	0.617	10 (1.6)
−2SD< … <−1SD	2 (6.7)	30 (4.8)		27 (5.4)	5 (3.4)		7 (4.5)	14 (6)	8 (4.9)	3 (3.3)		32 (5)
>−1SD	28 (93.3)	585 (93.6)		470 (93.3)	137 (94.5)		143 (92.9)	216 (91.9)	153 (94.4)	89 (96.9)		601 (93.5)
Gross motor skills												
<−2SD	0 (0)	16 (2.6)	0.472	13 (2.6)	4 (2.8)	0.703	4 (2.6)	3 (1.3)	13 (8)	1 (1.1)	0.01	17 (2.6)
−2SD< … <−1SD	1 (3.3)	27 (4.3)		23 (4.6)	4 (2.8)		7 (4.5)	5 (2.1)	9 (5.6)	2 (2.2)		27 (4.2)
>−1SD	29 (96.7)	582 (93.1)		463 (92.9)	137 (94.5)		143 (92.9)	227 (96.6)	140 (86.4)	89 (96.7)		599 (93.2)
Fine motor skills												
<−2SD	0 (0)	14 (2.2)	0.001	12 (2.4)	2 (1.4)	0.329	2 (1.3)	3 (1.3)	6 (3.7)	3 (3.3)	0.035	14 (2.2)
−2SD< … <−1SD	1 (3.3)	26 (4.2)		24 (4.8)	3 (2.1)		3 (1.9)	6 (2.6)	11 (6.8)	7 (7.6)		27 (4.2)
>−1SD	29 (96.7)	585 (93.6)		468 (92.9)	140 (96.6)		149 (96.8)	226 (96.2)	145 (59.5)	82 (89.1)		602 (93.6)
Problem-Solving												
<−2SD	0 (0)	8 (1.3)	0.001	8 (1.6)	0 (0)	0.383	0 (0)	1 (4)	4 (2.5)	3 (3.3)	0.001	8 (1.2)
−2SD< … <−1SD	1 (3.3)	22 (3.5)		19 (3.8)	4 (2.8)		3 (1.9)	2 (9)	11 (6.8)	7 (7.6)		23 (3.6)
>−1SD	29 (96.7)	595 (95.2)		477 (94.6)	141 (97.2)		151 (98.1)	232 (98.7)	147 (90.7)	82 (89.1)		612 (95.2)
Personal-social skills												
<−2SD	0 (0)	6 (1)	0.001	5 (1)	1 (7)	0.831	2 (1.3)	0 (0)	3 (1.9)	1 (1.1)	0.127	6 (9)
−2SD< … <−1SD	0 (0)	17 (2.7)		12 (2.4)	5 (3.4)		6 (3.9)	3 (1.3)	4 (2.5)	4 (4.3)		17 (2.6)
>−1SD	30 (100)	602 (96.3)		487 (96.6)	139 (95.9)		146 (94.8)	232 (98.7)	155 (95.7)	87 (94.6)		620 (96.4)
Total	30 (100)	625 (100)	-	504 (100)	145 (100)	-	154 (100)	235 (100)	162 (100)	92 (100)	-	643 (100)

SD: Standard deviation

significant number of them had a minimal disorder in one of the developmental areas. Factors such as child's gender and birth weight and maternal factors such as mother's age and job contribute to the developmental delay in children. Therefore, it is essential to sensitize the families about the developmental process of their children and encourage them to alleviate the risk factors to prevent early complications of these disorders in the future.

Limitations

One of the limitations of this research was the lack of willingness of families to cooperate due to the belief that it was unnecessary. Mothers were informed about the importance of identifying the developmental disorders and timely treatment for having an intelligent, innovative, and creative child, and finally, they became eager to cooperate and complete the questionnaire. Another limitation of the study was that some parents who refused to cooperate due to concern about identifying a possible developmental disorder in their child and fearing to reveal this issue to the public. By explaining to the mother that the information is completely confidential they were encouraged to participate in the study.

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Conflicts of interest

There are no conflicts of interest.

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