Diyala Journal of Medicine

ORIGINAL RESEARCH
Published: 25 April 2025
DOI: 10.26505/djm.v28i1.1419

Assessment of Development of Children in Diyala Province

Haider Asad Mohammad [1], Najdat Sh. Mahmood [2], Jalil I. Alezzi [3]

[1] Diyala Health Directorate, Diyala, Iraq.

[2,3] College of Medicine, University of Diyala, Diyala, Iraq.

OPEN ACCESS

Correspondence: Haider Asad Mohammad
Email: haider1991asad@yahoo.com

Website: https://djm.uodiyala.edu.iq/index.php/djm

Received: 09 July 2023
Accepted: 06 August 2024
Published: 25 April 2025

Abstract

Background: Developmental assessment is a systematic and comprehensive process that evaluates a child's progress across multiple domains of development to identify potential developmental delays or disabilities.

Objective: This study aimed to assess the development of Iraqi children aged 2-60 months residing in Diyala province, compare it to other states, and estimate the prevalence of developmental delay.

Patients and Methods: A total of 330 samples from children were recruited from Al-Batool Teaching Hospital for Maternity and Children over a six-month period, from October 2022 to March 2023. The Ages and Stages Questionnaire (ASQ3) was used to assess the children's development. The ASQ3 is a standardized tool used to screen for developmental delays in children aged 2-60 months. The ASQ3 scores are divided into three areas: white (normal development), black (delayed development), and gray (critical zone).

Results: The study results showed that most of the children (97.6%) had normal development across all domains of development. However, 2.42% of the children had developmental delay, including two children (0.6%) with delayed speech and communication only and six children (1.8%) with global developmental delay in all areas. In addition, a proportion of children were situated within the gray area of the ASQ3 system, which indicates the need for further assessment to evaluate specific aspects of a child's development that may warrant closer attention. The proportion of children in the gray area ranged from 0% to 34.5%, depending on the development domain.

Conclusion: The results of this study suggest that most children in Diyala province have normal development. However, a small percentage of children have developmental delays, and a proportion of children are situated in the critical area and need further assessment.

Keywords: Developmental assessment, Developmental delay, Diyala, ASQ3.

Introduction

Child development is a complex and intricate process involving biological, psychological, and emotional changes that occur predictably and continuously from birth through adolescence. Some children may face developmental delays, failing to acquire skills and reach milestones according to the expected timeline (1,2). A combination of biomedical and socio-cultural factors influences child development. Some factors, such as nutrition, emotional support, and education, are modifiable and can be actively addressed. On the other hand, certain factors like child gender, consanguinity between parents, parents' ages, and educational level are non-modifiable. Socio-cultural factors, including poverty and exposure to violence, can also significantly impact a child's development (1). Developmental evaluation plays a critical role in assessing a child's progress in achieving age-appropriate developmental milestones and identifying any potential concerns or delays. Healthcare professionals, such as pediatricians or developmental psychologists, conduct these evaluations using

ORIGINAL RESEARCH
Published: 25 April 2025
DOI: 10.26505/djm.v28i1.1419

standardized tools to measure various aspects of a child's development, including cognitive, motor, communication, and social-emotional skills (3,4). The American Academy of Pediatrics recommends conducting regular developmental evaluations throughout a child's early years to identify and address any delays or concerns as early as possible. Early detection and intervention for developmental delays can significantly improve a child's outcomes and increase their chances of success in school and life. Parents and caregivers also play a crucial role in the developmental evaluation process by monitoring their child's progress and sharing any concerns with their healthcare provider (5,6). According to the Global Burden of Disease Study, approximately 52.9 million children under 5 worldwide experience delayed development, with 95% living in low- and middle-income countries (7). The American Academy of Pediatrics (AAP) recommends the routine and periodic use of standardized tools during each well-child clinic visit, with specific screenings conducted at 9, 18, and 24 or 30 months of age. The Ages and Stages Questionnaire (ASQ-3) is one of the screening tools chosen for its cultural sensitivity and availability in the native spoken language (8). Primary healthcare professionals, particularly family physicians, are critical in promoting child development. They are well-positioned to monitor children's growth and development and educate mothers or caregivers on providing the optimum environment for their child's growth.

Patients and Methods

Using a convenient sampling method, this cross-sectional study was conducted at the College of Medicine, University of Diyala, in the Pediatric Department. The study included 330 children from various socioeconomic backgrounds, selected from AlBatool Teaching Hospital for Maternity and Children over a period of six months. The study utilized the Ages and Stages Questionnaire (ASQ-3) system to categorize the enrolled children as normally developed or experiencing abnormal development. The ASQ3 is a parent-completed developmental screening instrument for children aged 2 to 60 months. Each questionnaire consists of 30 questions covering five developmental areas: communication, gross motor skills, fine motor skills, problem-solving, and personal-social skills. For each item, parents provide responses of "Yes," "Sometimes," or "Not yet," which are scored as 10, 5, or 0, respectively. The overall domain scores are obtained by summing the scores of all items within each domain, with a maximum score of 60 points per domain. Based on these domain scores, children are classified as normally developed (white area), developmentally delayed (black area), or at risk (gray area). Completing the ASQ-3 questionnaire typically takes 10-15 minutes for each child (Figure 1).

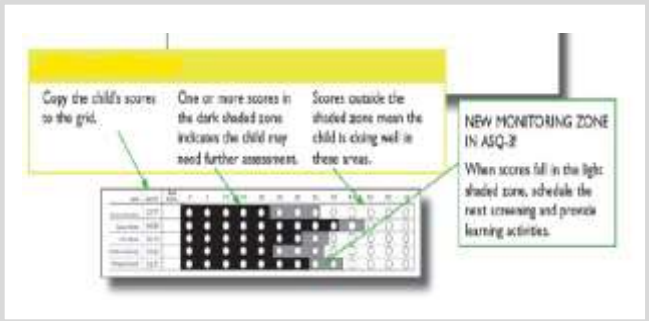

Figure 1. ASQ3 summary score (9).

Statistical analysis

Excel version 2021 and SPSS (Statistical Package for the Social Sciences) version 26 - 2022, were used for statistical analysis, t-test and chi-square was applied to calculate p value between variables, a level below 0.05 was considered significant (10), in addition to basic calculations of numbers and percent.

Results

Demographic criteria: A total of 330 children were enrolled in the study, distributed into 12 age groups (260 months), 140 (42.2%) were

ORIGINAL RESEARCH
Published: 25 April 2025
DOI: 10.26505/djm.v28i1.1419

males and 190 (57.8%) were girls with a ratio of 0.7:1 of male: female (Table 1).

Table 1. Demographic criteria for the study sample.

Gender		Age(months)												Total
		2	4	6	9	12	14	18	24	30	36	48	60	
Male	no.	11	12	10	9	12	5	12	13	14	15	12	14	140
	%	31.4	46	33	36	42.8	33.4	50	46.4	45.2	42.8	44.4	48.2	42.2
Female	no.	24	14	17	16	16	10	12	15	17	20	15	15	190
	%	68.6	54	63	64	57.2	66.6	50	53.6	54.8	57.2	55.6	51.8	57.8
Total	no.	35	26	27	25	28	15	24	28	31	35	27	29	330
	%	10.6	7.9	8.2	7.6	8.5	4.5	7.3	8.8	9.4	10.6	8.1	8.8	100

The data indicates that the 14-months age group had the lowest number of children, with a total of 15(4.5%), consisting of 5 boys (33.3%) and 10 girls (66.6%). In contrast, the 36-month and 2-month age groups had the highest number of children, with a total of 35(10.6%), consisting of 15 boys (42.8%) and 20 girls (57.2%), 24 girls and 11 males, respectively.

Developmental delay according to domain: It was found that most enrolled children (n= 322, 97.6%) were having normal development across all domains of development (speech and communication, gross motor, fine motor, problem solving and personal- social) while developmental delay was detected in 8 (2.42%) children, including 2 children (0.6%) were having delayed in speech and communication only and 6 children (1.8%) were having global developmental delay in all areas (speech and communication, gross motor, fine motor, problem solving and personal-social). These results imply that, overall, the developmental screening outcomes were similar across most domains for the studied group, with slight differences observed in communication skills and global developmental delay (Table 2).

Table 2. Developmental delay in each domain for the study sample.

Development Achievement	Domain	No. (%)
Developmental Delay	Communication	2 (0.6%)
	Gross motor	0
	Fine motor	0
	Problem solving	0
	Personal-social	0
	Global DD	6 (1.8%)
	Total	8 (2.4%)
Normal development	322 (97.6%)	
Total	330 (100%)	

ORIGINAL RESEARCH
Published: 25 April 2025
DOI: 10.26505/djm.v28i1.1419

Distribution according to white/gray area in ASQ3: The majority of children who underwent assessment using the Ages and Stages Questionnaires, Third Edition (ASQ-3), demonstrated developmental achievements within the white area, indicating age-appropriate attainment of developmental milestones across multiple domains. These results provide evidence of positive developmental progress among the assessed children, implying that they are meeting or surpassing the anticipated developmental expectations for their respective age groups. However, it is important to note that a proportion of children were classified within the gray area, these were: regarding communication (0-16.1%) the highest percentage in 30-month age group, gross motor (0-22.6%) the highest percentage in 30-month age group, fine motor (0-20.7%) the highest percentage in 60-month age group, problem solving (3.8-34.5%) the highest percentage in 60-month age group and personal-social (3.8-16.1%) the highest percentage in 30 –month age group. The gray area on the ASQ-3 typically signifies the need for further assessment to evaluate specific facets of a child's development that may warrant closer attention. This subset of children may exhibit potential areas of concern or require additional monitoring to gain a more comprehensive understanding of their developmental trajectory, (Table 3).

ORIGINAL RESEARCH
Published: 25 April 2025
DOI: 10.26505/djm.v28i1.1419

Table 3. Distribution of normal developed children according to white/gray area in ASQ3.

Age	area	Communication		Gross motor		Fine motor		Problem solving		Personal-social	
		number	%	number	%	number	%	numbers	%	numbers	%
2 mo.	white	30	90.9	30	88.2	29	85.3	32	94.1	31	91.2
	Gray	3	9.1	4	11.8	5	14.7	2	5.9	3	8.8
	Total	33		34		34		34		34	
4 mo.	white	22	91.7	23	92	22	88	23	92	22	88
	Gray	2	8.3	2	8	3	12	2	8	3	12
	Total	24		25		25		25		25	
6 mo.	white	24	92.3	25	96.2	24	92.3	25	96.2	23	88.5
	Gray	2	7.7	1	3.8	2	7.7	1	3.8	3	11.5
	Total	26		26		26		26		26	
9 mon.	white	23	92	23	92	22	88	23	92	24	96
	Gray	2	8	2	8	3	12	2	8	1	4
	Total	25		25		25		25		25	
12 mo.	white	24	85.7	26	92.9	27	96.4	26	92.9	27	96.4
	Gray	4	14.3	2	7.1	1	3.6	2	7.1	1	3.6
	Total	28		28		28		28		28	
14 mo.	white	14	93.3	15	100	15	100	13	86.7	14	93.3
	Gray	1	6.7	0	0	0	0	2	13.3	1	6.7
	Total	15		15		15		15		15	
18 mo.	white	24	100	23	95.8	21	87.5	21	87.5	22	91.7
	Gray	0	0	1	4.2	3	13.5	3	13.5	2	8.3
	Total	24		24		24		24		24	
24 mo.	white	22	84.6	21	80.8	22	84.6	25	96.2	24	92.3
	Gray	4	15.4	5	19.2	4	15.4	1	3.8	2	7.7
	Total	26		26		26		26		26	
30 mo.	white	26	83.9	24	77.4	28	90.3	28	90.3	26	83.9
	Gray	5	16.1	7	22.6	3	9.7	3	9.7	5	16.1
	Total	31		31		31		31		31	
36 mo.	white	31	91.2	29	85.3	31	91.2	28	82.4	30	88.2
	Gray	3	8.8	5	14.7	3	8.8	6	17.6	4	11.8
	Total	34		34		34		34		34	
48 mo.	white	23	85.2	21	77.8	22	81.5	24	93.1	25	92.6
	Gray	4	14.8	6	22.2	5	18.5	3	6.9	2	7.4
	Total	27		27		27		27		27	
60 Mo.	white	29	100	27	93.1	23	79.3	19	65.5	29	100
	Gray	0	0	2	6.9	6	20.7	10	34.5	0	0
	Total	29		29		29		29		29	
Total		322		324		324		324		324	

ORIGINAL RESEARCH
Published: 25 April 2025
DOI: 10.26505/djm.v28i1.1419

Developmental delay according age and gender: Among all the participating children, 8 were identified as having developmental delay, with a higher percentage in boys (3.57%) than in girls (1.58%), (Table 4).

Table 4. Developmental delay according to age and gender.

Age (months)		2	4	6	9	12	14	18	24	30	36	48	60	Total	p value
Normal	male	9	10	10	9	12	5	12	13	14	13	12	14	135 (42.4%)	0.245
	female	24	14	16	16	16	10	12	13	17	20	15	15	187 (57.6%)	
Developmental delay	male	2	2	-	-	-	-	-	-	-	1	-	-	5(1.5%)	
	female	-	-	1	-	-	-	-	2	-	-	-	-	3(0.9%)	
		35	26	27	25	28	15	24	28	31	35	27	29	330	

Overall, the differences between males and females regarding the mean calculated score for each age group from the 12 age groups in the study were found to be non-significant for most age groups. However, in 12 specific age-domain sub-groups, notably in the fine motor domain at 12 (p value: 0.02), 48(p value= 0.001), and 60(p value=0.002) months of age, girls displayed significantly higher scores compared to boys. Additionally, girls exhibited significantly higher scores in two age-domain subgroups, specifically in the gross motor domain at 48 (p value= 0.01) months of age and the communication domain at 60 (p value= 0.02). The findings suggest that while the gender differences in mean scores were not statistically significant for most age groups, distinct patterns were observed in specific age-domain subgroups. Girls consistently outperformed boys regarding mean scores in the fine motor domain and at specific ages, highlighting their superiority in these areas. Furthermore, girls also displayed higher scores in the gross motor domain at 48 and the communication domain at 60 months of age, indicating their advantage in these specific age-domain sub-groups (Table 5).

Diyala Journal of Medicine

ORIGINAL RESEARCH
Published: 25 April 2025
DOI: 10.26505/djm.v28i1.1419

Table 5. Relationship between gender and development according to the calculated score. (* significant, ** very significant).

Age	Gender	number	Speech and Communication			Gross motor			Fine motor			Problem solving			Personal - social		
			mean	SD	p value	mean	SD	p value	mean	SD	p value	mean	SD	p value	mean	SD	p value
2 mo.	male	11 (31.4%)	49.09	15.6	0.4	53.18	15.9	0.8	47.7	8.8	0.4	50.2	14.5	0.9	46.8	16.5	0.6
	female	24(68.6%)	50.6	4.24		54.17	5.1		50.8	2.43		50.4	9.67		49.5	3.56	
	total	35															
4 mo.	male	12(46.2%)	50.8	17.3	0.1	55	9.4	0.2	52.92	10.9	0.2	52.5	8.7	0.5	50.42	8.4	0.2
	female	14 (53.8%)	55	4.22		54.3	2.9		50	7.5		53.9	5.5		56.97	3.89	
	total	26															
6 mo.	male	10(37%)	56.5	4.69	0.4	53.8	6.4	0.1	57.7	6.4	0.4	57.7	6.5	0.2	52	6.2	0.2
	female	17 (63%)	57.3	8.67		56.8	10.6		54.7	6.5		54.7	6.1		54.7	6.1	
	total	27															
9 mo.	male	9 (36%)	51.1	8.2	0.2	50	8.3	0.1	50	7.5	0.1	51.1	7.6	0.5	51.1	6.6	0.3
	female	16)(64%)	54.7	7.4		54	7.9		54.2	4.5		49.6	10.8		53.3	6.4	
	total	25															
12 mo.	male	12(42.9%)	56.7	7.1	0.4	56.4	4.7	0.1	51.6	6.3	0.02*	50.4	6	0.6	50	6.5	0.9
	female	16(57.1%)	56.5	6.2		54.7	10.1		56.5	7.5		49.7	7.1		50.2	7	
	total	28															
14 mo.	male	5(33.3%)	49	10.9	0.3	50	13.7	0.2	50	8.3	0.5	53	5.1	0.07	50	7.4	0.2
	female	10(66.7%)	54.5	5.7		57	6.2		47.5	6.2		47.5	14.9		55	7.6	
	total	15															
18 mo.	male	12(50%)	58.3	6.7	0.5	54.9	9.8	0.6	52.9	6.3	0.5	49.1	7.5	0.2	54.6	5.18	0.7
	female	12(50%)	57	7.6		56.2	7.8		54.1	6.9		46.2	7.7		55	4.6	
	total	24															
24 mo.	male	13(46.4%)	54.6	5.4	0.5	50.3	6.3	0.08	53.8	5.1	0.02	54.2	6.2	0.3	56.6	5.6	0.3
	female	15(53.6%)	53.6	10.3		47	12.8		49.4	9.9		52.3	13.7		55	11.6	
	total	28															
30 mo.	male	14(45.2%)	50.3	8.9	0.1	47	8.3	0.8	50.7	11.6	0.3	49.6	9.1	0.4	53.2	10.9	0.9
	female	17(54.8%)	53.8	9.3		47.5	8		54	11.6		47.9	7.1		53.5	11.6	
	total	31															
36 mo.	male	15(42.9%)	55.6	14.2	0.6	53	5.4	0.1	56.6	7.9	0.9	48.6	10.3	0.3	55.6	8.7	0.8
	female	20(57.9%)	57.3	7.9		50.7	10.9		56.5	13.1		45.8	13.2		55.2	9.7	
	total	35															
48 mo.	male	12(44.4%)	52.2	6.4	0.5	47.3	7.6	0.01*	58.7	4.6	0.001**	56.6	5.9	0.1	56.7	4.4	0.19
	female	15(55.6%)	53.4	5.8		53.5	10.4		51.3	11.8		54	6.1		55.3	4	
	total	27															
60 mo.	male	14(48.3%)	54.6	4.9	0.02*	50.3	8.1	0.2	41.8	6.8	0.002**	43.6	8.2	0.1	58.9	2.4	0.7
	female	15(51.7%)	58	2.1		53.3	7.8		48.7	7.7		47.3	9.7		59.3	2.3	
	total	29															
Total		330															

ORIGINAL RESEARCH
Published: 25 April 2025
DOI: 10.26505/djm.v28i1.1419

Relationship between maturity and developmental delay: Of the 301 (91.2%) children, 301 (91.2%) were born at term and 29 (8.8%) were born preterm. Among the term babies, 295 (98%) were found to be normal, and 6 (2.0%) were found to be developmentally delayed. For the preterm-born children, 2 (6.9%) were developmentally delayed, while the remaining 27 (93.1%) were normal. A chi-square test showed no statistically significant association between preterm birth and developmental delay (p value = 0.9) (Table 6). It's worth mentioning that the corrected age was used for preterm babies instead of the actual age. When measuring the association between maturity and development, no significant differences were found in all five domains of communication, gross motor, fine motor, problem solving, and personal-social across all 12 age groups. This suggests that maturity and development are not directly related and that other factors may play a more significant role in determining an individual's developmental trajectory (Table 7).

Table 6. Relationship between maturity and developmental delay.

Maturity	Development		Total No (%)	p value
	Normal children No. (%)	Delayed children No. (%)		
Term	295 (98)	6 (2)	301(91.2)	0.9
Preterm	27 (93.1)	2 (6.9)	29 (8.8)	
Total	322(97.58)	8(2.42)	330	

ORIGINAL RESEARCH
Published: 25 April 2025
DOI: 10.26505/djm.v28i1.1419

Table 7. The relationship between maturity and development.

Age	Maturity	number (%)	Speech and communication			Gross motor			Fine motor			Problem - solving			Personal - social		
			mean	SD	p value	mean	SD	p value	mean	SD	p value	mean	SD	p value	mean	SD	p value
2 mo.	preterm	5(14.3%)	41	17.2	0.1	47	16.9	0.4	48	14.7	0.8	48.2	11.3	0.6	55	4.5	0.5
	term	30(85.7%	54.3	7.4		52.8	14.9		49.3	7.6		49.6	9.1		51.5	10.2	
	total	35															
4 mo.	preterm	2(7.7%)	55	7.0	0.6	57.5	2.5	0.2	52.5	2.5	0.3	50	10	0.1	55	2.5	0.3
	term	24(92.3%)	51.6	6.3		51.2	7.7		48,7	7.7		52.2	9.8		51.5	6.4	
	total	26															
6 mo.	preterm	4(14.8%)	48.7	8.5	0.2	56.2	5.6	0.8	53.7	6.8	0.3	51.2	8.1	0.2	50	5.4	0.1
	term	23(85.2%)	42.3	6.5		55.6	6.5		57.6	11.3		56.9	10.3		55.6	4.6	
	total	27															
9 mo.	preterm	3(12%)	45	10.8	0.3	48.3	9.1	0.4	46.7	6.1	0.2	48.3	9.2	0.7	51.7	6.4	0.6
	term	22(88%)	54.7	10.9		53.4	9.9		52.3	8		50.5	10.3		49.8	11	
	total	25															
12 mo.	preterm	1(3.6%)	50	-	-	55	-	-	50	-	-	55	-	-	45	-	-
	term	27(96.4%)	57.8	15.2		54.4	15.1		50.7	11.9		49.1	7.4		49.2	8.4	
	total	28															
14 mo.	preterm	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	term	15(100%)	53.3	7.9		56	10.7		45.3	6.3		49.3	6.1		55	8.2	
	total	15															
18 mo.	preterm	2(8.3%)	50	10	0.7	57.5	2.5	0.1	45	5	0.4	35	5	0.2	47.5	2.5	0.3
	term	22(91.7%)	53.5	9.3		45.5	10.6		50	10.4		46.6	10.6		53.2	5.8	
	total	24															
24 mo.	preterm	3(10.7%)	38.3	20.1	0.4	36.7	23.2	0.6	45	21.2	0.6	36.6	26.2	0.4	41.6	22.5	0.4
	term	25(89.3)	49	11.7		44	13.2		53.3	10.8		52.2	7.84		55.6	10.5	
	total	28															
30 mo.	preterm	3(9.7%)	48.3	7.8	0.8	45	8.7	0.4	43.3	3.6	0.5	46.7	11.5	0.9	41.7	12.9	0.2
	term	28(90.3%)	49.6	4.2		49.6	4.5		44.8	9.4		45.5	2.6		56.2	4.5	
	total	31															
36 mo.	preterm	4(11.4%)	43.7	12.9	0.1	48.7	7.4	0.7	51.2	12.8	0.7	42.5	8.3	0.9	56.2	10.2	0.7
	term	31(88.6%)	57.6	8.8		47.5	6.2		53.8	3.3		42.7	4.5		58.5	0.8	
	total	35															
48 mo.	preterm	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	term	27(100%)	52.1	7.6		48.3	7.9		50	10.1		53.7	7.3		54.1	5.2	
	total	27															
60 mo.	preterm	2(6.9%)	55	7	0.7	47.5	3.5	0.3	50	14.2	0.6	42.5	1.25	0.2	55	3.5	0.4
	term	27(93.1%)	52.6	6.6		51.6	8.1		43.5	8.9		44.8	9.5		58.5	5.8	
	total	29															
Total	330																

ORIGINAL RESEARCH
Published: 25 April 2025
DOI: 10.26505/djm.v28i1.1419

Relationship between consanguinity and developmental delay: Regarding consanguinity, of 330 children, 70 (21.2%) were born to consanguineous parents, and 260 (78.8%) were born to non-consanguineous, among the consanguineous group, 3 (4.3%) were found to be developmentally delayed while the remaining 67 (95.7%) were not, in contrast, only 5 (1.9%) children among the non-consanguineous group were found to be developmentally delayed while the remaining 255 (98.1%) were not. A chi-square test showed no statistically significant association between consanguinity and developmental delay (p value = 0.7) (Table 8).

Table 8. Relationship between consanguinity and developmental delay.

	Normal children no.(%)	Delayed development children no. (%)	Total	p value
+ve consanguinity	67 (95.7)	3 (4.3)	70(21.2%)	0.7
-ve consanguinity	255 (98.1)	5 (1.9)	260 (78.8%)	
Total	322 (97.58)	8 (2.42)	330 (100)	

Discussion

The first years of a child's life are critical for physical and cognitive development. As such, it is imperative to establish a comprehensive developmental monitoring and screening program. In the current study conducted in Diyala Province, Iraq, the Arabic version of the Ages and Stages Questionnaire, third edition (ASQ-3), was used to screen for developmental delay in children aged 2 to 60 months. There was a significant difference in the number of children across different age groups, with the 14-month age group having the lowest number of children. In contrast, the 36-month and 2-month age groups had the most children. The study found that among all participating children, 8 were identified as having DD, with a higher percentage in boys than in girls (75% vs 25%), the prevalence of developmental delay was 2.42% which is comparable to a study conducted in Menoufia Governorate, Egypt in 2017, which reported a prevalence of 2.9%. However, the prevalence of developmental delay in the present study was lower than that reported in a study conducted in Iran in 2017 on 500 children aged 4 to 60 months 8.5% (11), and in multiple primary health care centers in Saudi Arabia in 2020 on 948 children 16.4% (12,13). The speech and communication domain had the highest number of delayed children, 2.4%, in the present study. This finding is consistent with a study conducted in Saudi Arabia, where the speech and communication domain was found to have the highest prevalence of delayed children, 3.8% (13). However, in a study conducted in Iran 2011 on 114 children, the speech and communication domain had the highest prevalence of developmental delay, 20% (14). The percentage of children in the gray area who need monitoring regarding speech and communication was 0-16.1%, the highest percentage was found in the 30-month age group. Regarding the gross motor domain, the percentage of delayed children was 1.8%. This finding is inconsistent with a study conducted in Cairo, Egypt, which reported a prevalence of 3.11% in gross motor skills (15). The percentage of children in the gray area who need monitoring

ORIGINAL RESEARCH
Published: 25 April 2025
DOI: 10.26505/djm.v28i1.1419

regarding gross motor (0-22.6%), the highest percentage was found in the 30-month age group. The differences in prevalence could be attributed to various factors, such as variations in the screening tool used, differences in sample sizes, or disparities in cultural factors. It is worth noting that cultural beliefs can influence parental priorities and expectations regarding child development. For example, in some cultures, motor development milestones like sitting and walking may be considered the most critical indicators of a child's health, leading parents to focus more on helping their children develop these skills. In contrast, other cultures may emphasize early sociability and speech, considering children who are sociable and talk early as clever and healthy. Consequently, parents in these cultures may prioritize fostering these skills in their children (16). Regarding the fine motor domain, the percentage of delayed children was 1.8%. This finding is consistent with a study conducted in Saudi Arabia, which showed the prevalence of developmental delay in fine motor skills of 1.9% (13). Moreover, it is nearly consistent with a study conducted in Cairo, Egypt, which reported a prevalence of 1.04% delay in fine motor skills (15). The highest percentage of children in the gray area who need monitoring regarding fine motor skills (0-20.7%) was found in the 60-month age group. In the problem-solving and personal-social domains, the prevalence of developmental delay was 1.8% for both. This finding is nearly approximate to the study conducted in Cairo, Egypt, which reported an average prevalence ranging from 1.04% to 3.11%. The percentage of children in the gray area who need monitoring regarding problem solving (3.8-20.7%) and personal-social (3.8-34.5%), the highest percentage was found in the 60-month and 30-month age groups, respectively.

Most children scored within the white area on the ASQ-3, indicating age-appropriate development. However, a significant proportion fell into the gray area, suggesting potential areas of concern requiring further assessment. The highest percentages of children in the gray area varied across domains and age groups: communication and gross motor (30 months), fine motor and problem-solving (60 months), and personal-social (30 months). These findings emphasize the importance of targeted monitoring and further evaluation for children in the gray area to ensure timely intervention. In terms of gender differences, there were no significant gender differences across most age groups when considering various domains. However, we did observe notable patterns in specific age-domain subgroups. Specifically, females exhibited significantly higher scores than males in the fine motor domain at 12 and 60 months, while males at 48 months had higher scores than females. Additionally, females had significantly higher scores in the gross motor domain at 48 and the communication domain at 60 months of age. These findings indicate that while gender differences in mean scores were not statistically significant for most age groups, distinct variations were observed in specific age-domain subgroups. A related study by Sajedi and colleagues found similar trends, where the gender differences were mainly non-significant across most age-domain subgroups. However, in 20 age-domain subgroups, females demonstrated significantly higher scores than males, particularly in the personal-social and fine motor domains, and at 36 and 48 months of age. On the other hand, males had significantly higher scores in two age-domain groups, specifically in the gross motor domain at 20 and 22 months of age (17). The findings in previous studies differ from those reported by Richter and Janson in their studies conducted on a Norwegian sample of children using the ASQ. Richter and Janson found that, on average, girls had a higher developmental stage

ORIGINAL RESEARCH
Published: 25 April 2025
DOI: 10.26505/djm.v28i1.1419

than boys in all areas except for gross motor function, where no significant differences were observed (18,19). On the other hand, a study by Kapci showed that there were no significant developmental differences between females and males. However, there were two exceptions, namely the 24-month personal-social development domain and the 42-month communication domain, where gender differences were observed (20). The observed differences across populations in various studies may be attributed to several factors. Some studies include gross developmental disorders in their prevalence statistics, while others do not. Different studies may focus on different age ranges, leading to developmental patterns and outcomes variations. According to the association between maturity and development across five domains: communication, gross motor, fine motor, problem solving, and personal-social. Our findings revealed no significant differences in these domains across all 12 age groups. This result aligns with a study conducted in central Iran, which found no association between ASQ domains and premature birth (21). The findings are consistent with a study conducted at the University of Minnesota, which concluded that no significant correlation exists between maturity and development in any of the five domains (22). Therefore, based on the results of this study, it can be concluded that there is no substantial association between maturity and development in the assessed domains. This study had no significant relationship between consanguinity and child development in healthy children under five (p-value of 0.9). These results align with several previous studies that reported no significant relationship between consanguinity and child health and development (24). However, it is essential to note that other studies have reported significant adverse effects of consanguineous marriages on child health and well-being (25). Notably, the detrimental effects of consanguineous marriages on child health seem to be more prominent in low-income and developing countries (26). It should also be acknowledged that the risks associated with consanguineous marriages extend beyond child health outcomes, encompassing the potential for genetic disorders and disabilities (27). Nevertheless, it is essential to consider the limitations of this study, including its use of cross-sectional data, which restricts the ability to establish causality, as well as the limited geographical scope of the study sample, potentially limiting the generalizability of the findings. Consanguinity has an important role in autosomal recessive disorders, which were excluded from the study, and this might make consanguinity not a significant factor in this study.

Conclusion

The prevalence of developmental delay in healthy children aged 2 to 60 months in Diyala Province, Iraq, was 2.42%. Some children were in a critical area and needed further evaluation, monitoring, and management to avoid progressing to developmental delay. There was no effect of maturity on development, and no significant association between consanguinity and developmental delay. Early intervention is essential for children with developmental delays.

Recommendations

It is crucial to promote the timely identification and intervention for children with developmental delays in Diyala Province, Iraq, to help all children reach their full potential. Well-trained personnel should screen children during routine health visits to identify those at risk. The government and stakeholders must ensure access to early intervention services. Introducing a validated, standardized assessment tool like the ASQ3 (Ages and Stages Questionnaire) in health centers for

ORIGINAL RESEARCH
Published: 25 April 2025
DOI: 10.26505/djm.v28i1.1419

routine developmental screening is recommended. Additionally, a special clinic or committee should be established within the neuropediatric consultation unit to evaluate, follow up, and manage children with developmental delays. Lastly, further research should investigate risk factors, including socioeconomic influences, contributing to children being at risk for developmental delay.

Source of funding: No source of funding.

Ethical clearance: Ethical approval to perform the research acquired from the scientific and ethical committees / College of Medicine / University of Diyala (No:2023HAM766 Date:18/5/2023).

Conflict of interest: None.

Acknowledgments:

The authors would like to extend my sincere gratitude to the University of Diyala – College of Medicine for their academic support and for providing a stimulating learning environment that greatly contributed to the completion of this research. Also wish to express my deep appreciation to Al-Batool Hospital for their kind cooperation and for granting access to their valuable expertise and practical experience, which significantly enriched the content of this study.

References

1. Kiserud T, Benachi A, Hecher K, Perez RG, Carvalho J, Piaggio G, Platt LD. The World Health Organization fetal growth charts: concept, findings, interpretation, and application. American journal of obstetrics and gynecology. 2018 Feb 1;218(2):S619-29.

2. Centers for Disease Control and Prevention. Developmental milestones. Atlanta: Centers for Disease Control and Prevention; 2021.

3. Child development: An observational South African birth cohort. PLoS Med. 2019;16(9):e1002920. https://doi.org/10.1371/journal.pmed.1002920.

4. Stuart M, Ottenbacher K. Pediatric rehabilitation: Principles and practice. 4th ed. New York: Demos Medical Publishing; 2012. Available from:https://dokumen.pub/pediatric-rehabilitation-principles-and-practice-4nbsped-1933864370-9781933864372.html.

5. Shonkoff JP, Boyce WT, McEwen BS. Neuroscience, molecular biology, and the childhood roots of health disparities: building a stronger foundation for health equity. JAMA. 2012;308(8):823-824. https://doi.org/ 10.1001/jama.2009.754.

6. American Academy of Pediatrics, Section on Ophthalmology, Council on Children with Disabilities, American Academy of Ophthalmology, American Association for Pediatric Ophthalmology and Strabismus, American Association of Certified Orthoptists. Joint Statement-Learning Disabilities, Dyslexia, and Vision. Pediatrics. 2009;124:837. https://doi.org/ 10.1542/peds.2009-1445.

7. Kassebaum NJ, et al. Global, regional, and national levels and causes of maternal mortality during 1990-2016: A systematic analysis for the Global Burden of Disease Study 2016. Lancet. 2018;390(10100):1684-1735. https://doi.org/ 10.1016/S0140-6736(16)31470-2.

8. Squires J, Potter LW, Bricker D. The ASQ User's Guide for the Ages and Stages Questionnaire: A Parent-Completed, Child Monitoring System. 2nd ed. Baltimore: Paul Brookes Publishing Co; 1990. Available from: https://www.researchgate.net/publication/232498425_The_ASQSE_user's_guide_For_the_Ages_Stages_Questionnaires_Social-emotional.

9. Kerstjens JM, Bos AF, Ten Vergert EM, et al. Support for the global feasibility of the Ages and Stages Questionnaire as a developmental screener.

ORIGINAL RESEARCH
Published: 25 April 2025
DOI: 10.26505/djm.v28i1.1419

Early Hum Dev. 2009;85(7):443-447. https://doi.org/10.1016/j.earlhumdev.2009.03.001.

10. Spiegelhalter D. The Art of Statistics: How to Learn from Data. New York: Basic Books; 2019.

https://doi.org/ 10.5038/1936-4660.13.1.7.

11. Ahmadipour S, Mohammadzadeh M, Mohsenzadeh A, Birjandi M, Almasian M. Screening for developmental disorders in 4 to 60 months old children in Iran (2015–2016). J Pediatr Neuroradiol. 2017;17(1):8-12. https://doi.org/ 10.1055/s-0037-1612620.

12. El-Ella SSA, Tawfik MAM, Barseem NF, Elatabany AMAM. Assessment of intellectual development in preschool children in the East of Menoufia Governorate, Egypt. Menoufia Med J. 2017;30:741-747. https://doi.org/ 10.4103/1110-2098.218257.

13. Shatla MM, Goweda RA. Prevalence and risk factors of developmental delays among preschool children in Saudi Arabia. J Health Popul Nutr. 2020;50(1):10-17.

https://doi.org/ 10.21608/jhiph.2020.79318.

14. Dorre F, Bayat GF. Evaluation of children's development (4–60 months) with a history of NICU admission based on ASQ in Amir Kabir Hospital, Arak. J Ardabil Univ Med Sci. 2011;11(2):143-150. Available from: https://jarums.arums.ac.ir/browse.php?a_id=183&sid=1&slc_lang=en.

15. Abdelbaky OA, Deifallah S, Amin G, Marzouk D. Screening for developmental delays in children 2-36 months of age in a primary health care center in Cairo, Egypt. J Health Popul Nutr. 2013;31(1):12-17. https://doi.org/10.21608/JHIPH.2022.254505

16. Bornstein MH, Lansford JE, editors. Cultural Perspectives on Parenting. Psychology Press; 2010.

https://doi.org/10.1080/15295192.2012.683359.

17. Sajedi F, Vameghi R, Kraskian Mujembari A. Prevalence of undetected developmental delays in Iranian children. Child Care Health Dev. 2014;40(3):379-388.

https://doi.org/ 10.1111/cch.12042.

18. Richter J, Janson H. A Validation Study of the Norwegian Version of the Ages and Stages Questionnaires. Acta Paediatr. 2007;96(7):1040-1044.

https://doi.org/10.1111/j.1651-2227.2007.00246.x.

19. Janson H, Squires J. Parent completed developmental screening in a Norwegian population sample: a comparison with U.S normative data. Acta Paediatr. 2004;93:1525–1529.https://doi.org/10.1111/j.16512227.2004.tb02641.x.

20. Kapci EG, Kucuker S, Uslu RL. How applicable are age and stages questionnaires for use with Turkish children? Top Early Child Special Educ. 2010;30(3):176–188.

https://doi.org/ 10.1177/0271121410373149.

21. Yaghini O, Kelishadi R, Keikha M, Niknam N, Sadeghi S, Najafpour E, et al. Prevalence of developmental delay in apparently normal preschool children in Isfahan, central Iran. Iran J Child Neurol. 2015;9(3):17-23. PMCID: PMC4577694.

22. Degnan JM, Masten JM, Cicchetti D. The association between maturity and development: A longitudinal study of children and adolescents. J Child Dev. 2011;82(3):715-733.

https://doi.org/ 10.1111/jcpp.12927.

23. Chowdhury I, Rahman KM. Consanguineous marriage and child health in Bangladesh: A comparative analysis. J Biosoc Sci. 2012;44(5):607-620.

https://doi.org/ 10.1017/s001216220300104x.

24. Bener A, Hussain R. Consanguineous unions and child health in the State of Qatar. Paediatr

ORIGINAL RESEARCH
Published: 25 April 2025
DOI: 10.26505/djm.v28i1.1419

Perinat Epidemiol. 2006;20(5):372-378.

https://doi.org/10.1111/j.13653016.2006.00750.x.

25. Kabir S, Rahman M. The effect of consanguinity on child mortality and morbidity in Bangladesh. J Biosoc Sci. 1997;29(3):331-340.

https://doi.org/10.1371/journal.pone.0241610

26. Bittles AH, Black ML. Evolution in health and medicine Sackler colloquium: Consanguinity, human evolution, and complex diseases. Proc Natl Acad Sci. 2010;107(suppl_1):1779-1786.

https://doi.org/10.1073/pnas.0906079106.

27. Hamamy H. Consanguineous marriages: Preconception consultation in primary health care settings. J Community Genet. 2012;3(3):185-192. https://doi.org/ 10.1007/s12687-011-0072-y.

Diyala Journal of Medicine

ORIGINAL RESEARCH
Published: 25 April 2025
DOI: 10.26505/djm.v28i1.1419

التأثير الكبير لتعدد اشكال جين موت الخلية المبرمج ـ١ على عدوى فيروس التهاب الكبد نوع ب والحمل الفيروسي

[١] حيدر أسد محمد ، [٢] نجدت شكر محمود ، [٣] جليل إبراهيم كاظم

الملخص

الخلفية: تقييم تطور الأطفال هو عملية تهدف الى تقييم تقدم الطفل عبر عدة مجالات تطورية، بهدف تحديد التأخيرات أو الاعاقات المحتملة. يُجرى هذا التقييم من قبل كوادر الرعاية الصحية مثل أطباء الأطفال وعلماء النفس وخبراء الطفولة المبكرة، ويتضمن مراقبة دقيقة واختبارات منهجية لتقييم تطور الطفل في المجالات البدنية والعقلية واللغوية والاجتماعية والعاطفية.

الأهداف: يساعد التقييم في تحديد العمر التطوري للطفل والمجالات التي يعتقد أنه متأخر فيها، مما يمكن من التعرف عليها والتدخل لعلاجها مبكرا.

المرضى والطرق: أُجريت هذه الدراسة في محافظة ديالى لتقييم تطور الأطفال العراقيين الذين تتراوح أعمارهم بين ٢ و٦٠ شهرًا، باستخدام استبيانات الأعمار والمراحل وهي أداة فحص موثوقة تم تكييفها ثقافيًا.

النتائج: أجريت الدراسة على ٣٣٠ طفلًا في مستشفى البتول التعليمي وكانت نسبة ٩٧,٦٪ تُظهر تطور طبيعي عبر مجالات التطور المختلفة، بما في ذلك الكلام والتواصل والمهارات الحركية الكبرى والمهارات الدقيقة وحل المشكلات والمهارات الشخصية والاجتماعية. ومع ذلك، كان لدى ٢,٤٢٪ تأخيرات تطورية، حيث كان ٠,٦٪ يعانون من تأخر في الكلام والتواصل و١,٨٪ يواجهون تأخيرات تنموية عامة.

كما تم تحديد أطفال في "المنطقة الرمادية" للتقييم، مما يشير إلى الحاجة إلى تقييم إضافي في مجالات مثل الكلام والتواصل (٠-١٦,١٪) والحركة الكبرى (٠-٢٢,٦٪) والحركة الدقيقة (٠-٢٠,٧٪) وحل المشكلات (٣,٨-٣٤,٥٪) والمهارات الشخصية والاجتماعية (٠-١٦,١٪).

فيما يتعلق بزواج الأقارب، وُلد ٢١,٢٪ من الأطفال لوالدين أقارب، حيث واجه ٤,٣٪ منهم تأخيرات تطورية. بينما عانى ١,٩٪ من الأطفال الذين لم يكن والديهما أقارب من تأخر في مجالات التطور المختلفة. أظهرت نتائج الدراسة أن لا علاقة بين القرابة والتأخير التطوري ($p = 0.7$).

أما فيما يتعلق بحالة الولادة، وُلد ٩١,٢٪ في موعدها المحدد، حيث كانت نسبة ٩٧,٣٪ تُظهر تطور طبيعي و٢,٧٪ يعانون من تأخر تطوري. أما الأطفال الذين وُلدوا قبل الموعد المحدد فيكونوا ٨,٨٪، حيث واجه ٦,٩٪ منهم تأخيرات تطورية وأظهر ٩٣,١٪ تطور طبيعي. أظهرت نتائج الدراسة أن لا علاقة بين الولادة المبكرة والتأخير التطوري ($p = 0.9$).

الاستنتاج: إجمالا، أظهرت الدراسة أن نسبة صغيرة من الأطفال في محافظة ديالى يعانون من تأخر في التطور في مجالات مختلفة. وكانت نسبة أخرى من الأطفال في المنطقة "الرمادية" وفي حاجة لمتابعة. بشكل عام، لم يكن للجنس أو الولادة المبكرة أو القرابة أي تأثير على التطوري.

الكلمات المفتاحية: التقييم النمائي، التأخر النمائي، ديالى، ASQ3.

المؤلف المراسل: حيدر أسد محمد

الايميل: haider1991asad@yahoo.com

تاريخ الاستلام: ٩ تموز ٢٠٢٣

تاريخ القبول: ٦ اب ٢٠٢٤

تاريخ النشر: ٢٥ نيسان ٢٠٢٥

[١] مديرية صحة ديالى ـ ديالى ـ العراق.

[٢،٣] كلية الطب ـ جامعة ديالى – ديالى ـ العراق.