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Original Article

Screening for Developmental Delays in Children 2-36 Months of Age in a Primary Health Care Center in Cairo, Egypt

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Abstract

Background: Developmental delays (DDs) in children are rising and necessitate routine screening for early recognition and management.
Objective(s): To estimate the prevalence of developmental delays among children 2-36 months of age in a Primary Health Care (PHC) center in Cairo, Egypt.
Methods: This cross-sectional study was conducted in Saraya El-Koba PHC center involving 193 children 2-36 months of age. Data were collected using Ages and Stages Questionnaire (ASQ-3) to assess five domains of development: communication, gross motor, fine motor, problem-solving, and personal-social. Some parents' characteristics were also included.
Results: Frequency of developmental delays was 9.3%. The domains with the most frequent delays were the communication and gross motor (3.1% each) and the least was the fine motor domain (1.04%). Girls scored significantly higher than boys in the problem-solving domain (p=0.037). First to third order of birth had higher communication and social scores (p=0.025, p=0.003 respectively). Highly educated mothers had children with higher fine motor and total developmental scores (p<0.001 and 0.014 respectively), while highly educated fathers had children with higher communication scores (p=0.009). Duration of breast feeding was positively correlated with gross motor and social scores (p=0.001, p=0.042 respectively).
Conclusion: The frequency of DDs was 9.3%. This prevalence is considered high compared to previous studies. It showed several associated factors and recommended early screening of preschool children for prompt recognition and timely intervention.
Keywords: Developmental disability, infants and toddlers, ASQ-3

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INTRODUCTION

Child development refers to the continuous but predictably sequential biological, psychological, and emotional changes that occur in human beings between birth and the end of adolescence. The sequence of development is the same for all children and can be described in terms of developmental milestones.(1) Developmental delay is a condition in which the child is not developing and or does not reach skills in accordance with the sequence of predetermined stages.(2)

Child development is influenced by bio-medical and socio-cultural factors that are in a continuous interaction. Some of these factors are non-modifiable including child gender, consanguinity between parents, parents' ages, and educational level.(3) Other risk factors are modifiable like nutrition (including breast feeding), providing emotional support and educating mothers.(4)

According to a systematic analysis for the Global Burden of Disease Study carried out in 195 countries and territories through 1990-2016, worldwide 52.9 million children under 5 years of age have delayed development. Additionally, about ninety-five (95%) of the children with developmental delay and disabilities were found to be living in low and middle-income countries.Egyptian children under 5 years are the 7th most common to suffer from developmental disabilities worldwide (more than any middle eastern country) with an overwhelming prevalence of 10%.(5)

Even though childhood developmental delay is a worldwide problem of significant importance, it has been estimated that only about 30% of children with developmental disabilities are diagnosed before they enter school.(4) This data , coupled with the fact that

pediatricians' clinical judgment is not always sufficient to identify delays during health checkups because they fall short of detecting about 30-50% of psychomotor development deficits[6,7] ,highlights the importance of creating a systematized screening program for children's developmental delays.

Screening programs should target children in their first 3 years of life as the utmost brain development occurs at this age. Children at that age range encounter health care professionals the most and will benefit the most from interventional programs.[1]

The AAP (the American Academy of Pediatrics) recommends routine and periodic use of standardized tools throughout each well child clinic visit, and at least at three specific child ages (at 9, 18, and 24 or 30 months of age).[8]

Many screening tools were considered before carefully choosing the ASQ-3 (Ages and Stages Questionnaire-3). It is one of the most used developmental screening tools cited in research and one that was an excellent fit for this study because of its cultural sensitivity, and availability in the native spoken language by targeted participating parents.[9]
Several studies using the Ages and Stages Questionnaire-3 were conducted in the Middle East. An Egyptian study using this questionnaire was conducted by Abou El Ella in Menofia governate that enrolled 510 kindergarten children who aged 6-24 months. The prevalence of developmental delays was 2.9%, among the factors recognized to affect child development was the child's gender, parental education and consanguinity.[10] Another study done by Ahmadipour used the ASQ to screen for developmental delay in Iran included 500 children from 4 to 60 months of age. The prevalence of developmental delay was 8.6%, There were correlations between developmental delay and the child's age, birth order, mother's education, and father's education. [11]

The family physician role is crucial in child development. Primary healthcare professionals are better placed than any other occupational group in terms of frequency of contact with individuals in society. These practitioners therefore play a key role in monitoring children's growth and development as well as educating mothers or caregivers about how to provide the optimum environment for their child's growth. [1]

The objective of this study was to estimate the prevalence of developmental delays among children 2-36 months of age in a Primary Health Care center in Cairo, Egypt. Also, to determine factors associated with developmental delay in these children.

METHODS

A cross sectional study was conducted in Saraya El-Koba primary health care center from September 2019 to March 2020. It enrolled 193 children 2-36 months of age who attended the center and their caregivers. This study sample represents the catchment population of this PHC center, which is mostly of low socioeconomic status. However, middle to high socioeconomic status families occasionally attended to vaccinate their children. Children with apparent congenital or genetic abnormalities (e.g. cerebral palsy, Down syndrome), children with chronic illnesses and children with history of NICU admission were excluded. Participants were drawn by systematic random sampling technique and collected from Family Medicine and Vaccination clinics. Every tenth child who matched the selection criteria was chosen to participate. This rate was chosen after calculating the total sample frame (about 80 patients per day) then calculating the sample size with sampling rate = 80 x 26 (number of working days per month)/ 193 = every 10^{th} child.

Sample size calculation:
Sample size was calculated using PASS 11.0 based on alpha error at 5 %, margin of error at 2.5%, confidence interval width at 0.05 and according to a previous study that found the prevalence of suspected developmental delay to be 2.9%.[10] This yielded a sample of 193 children taking in account 10% dropout rate.

Study tools:
The official Arabic translated version of the Ages and Stages Questionnaire-3 was used in this study.[12] The ASQ-3 consists of 30 simple, straight forward questions regarding five skill sets of childhood development: communication, gross motor, fine motor, problem-solving, and personal-social. There are 6 questions in each category. To answer each question, parents selected from three Likert scale possible responses: "yes," "sometimes," or "not yet". "Yes" responses add 10 points, "some- times" responses add 5 points, and "not yet" responses add 0 points. The scores were added in each domain and compared to cutoff scores of each corresponding domain. The cutoff scores of the Arabic version have been adjusted according to a study done on approximately 8000 Middle Eastern children from Egypt, Saudi Arabia, Yemen and Morocco. According to the ASQ's guidelines, the development of a child is considered to be at risk when one or more of the domain scores are below the cutoff scores of ≤ 2 standard deviations (SDs) below the population mean for 1 or more domains. A pilot study was conducted on 10 children to estimate the time taken to administer the test, to space out the sampling rate, as well as to make sure all questions are understandable. Caregivers were asked about their age, educational level and working status.

As for the validity of the Ages and Stages Questionnaire-3, it was found that sensitivity ranged between 70-90%, specificity 76-91%, 94% testing-retesting reliability, 44-83% internal consistency, 76-91% concurrent validity and testing-retesting reliability: 0.91, inter-rater reliability: 0.92 according to various research.[6]

Data management and analysis:

Data were tabulated and statistically analyzed using SPSS, version 20 (SPSS Inc., Chicago, IL). Qualitative data were expressed as frequencies (n) and percentage (%). Quantitative data were described as mean ± standard deviation and median (IQR). Normality test "Kolmogorov-Smirnova" was done and revealed different scores were not normally distributed; therefore, nonparametric tests as Mann Whitney test and Kruskal Wallis test were used for comparing quantitative variables between groups. Spearman's rho correlation coefficient was used to measure relationship between two quantitative variables. Multiple linear regression analysis was done for the different scores for detecting the effect of each variable after controlling for the other factors. P-value <0.05 was considered significant.

Ethical considerations:

The study was conducted after obtaining oral informed consent, as the questionnaire was anonymous, from each child's caregiver after explaining the purpose of the study. The study was approved by the Research Ethics Committee of Faculty of Medicine, Ain shams University.

RESULTS

A total of 193 children and their parents were included in this study. Sociodemographic data of participating children is presented in (table 1).

The mean age of children included in this study was 16.1 ± 6.71 months. More males participated in this study (57.5%) than females (42.5%). The majority of enrolled children (86.53%) were in the first to third order of birth, 81.3% of the sample had non consanguineous parents. More than half of the children were born by CS (64.8%). The mean period of exclusive breast feeding was 4.163 ± 2.643 months, while the mean total period of breast feeding was 10.415 ± 6.207 months.

Table 1: Sociodemographic data of studied 2-36 months old children

Sociodemographic data		Children (n=193)	
		No.	%
Gender	Male	111	57.51
	Female	82	42.49
Order of birth	1st to 3rd	167	86.53
	Above 3rd	26	13.47
Consanguinity	No	157	81.35
	Yes	36	18.65
Method of delivery	CS	125	64.77
	Vaginal	68	35.23
Child's age (months)	Range	2-36	
	Mean ± SD	16.135 ± 6.712	
Period of exclusive breast feeding (months)	Range	0-15	
	Mean ± SD	4.163 ± 2.643	
Total period of breast feeding (months)	Range	0-25	
	Mean ± SD	10.415 ± 6.207	

The prevalence of developmental delay (table 2) among the studied children aged 2-36 months is 9.3%, 14.5% of the children were at risk of developmental delay and 76.2% showed normal development. The domains with the highest number of delayed children were the communication and gross motor domains (3.11% of the sample) each, while fine motor domain is the least delayed domain (1.04%).

Table 2: Developmental delay among children 2-36 months old

Development	Children	
	No.	%
Normally developing children	147	76.2
Children at risk of developmental delay	28	14.5
Delayed children	18	9.3
Total	193	100.0

Girls (table 3) scored significantly higher in the problem-solving domain than boys (p=0.006). Children born 1st to 3rd order of birth (table 4) have significantly higher mean scores in social domain than children above 3rd order of birth (p=0.049).Children of fathers (table 5) with high education have significantly higher mean communication score (p=0.004). Multiple linear regression analysis was used showing that mothers' education was the only significant factor affecting the total score (p=0.009) (table 6).Mother's working status affected the communication score (p=0.036)(table 7).The child's age and gender affected their problem-solving score(p=0.014,p=0.017 respectively)(table 8).

Table 3: Distribution of the studied children by gender and the mean scores of developmental domains

	Gender				P
	Males (n=111)		Females (n=82)		
	mean ± SD	median (IQR)	mean ± SD	median (IQR)	
Communication score	51.4 ± 10.2	50 (50-60)	52.7 ± 8.3	55 (50-60)	.439
Gross motor score	51.1 ± 8.6	50 (45-60)	49.6 ± 12.1	50 (45-60)	.754
Fine motor score	51.5 ± 7.9	50 (50-60)	50.4 ± 10.1	50 (50-55)	.636
Problem-solving score	50.9 ± 8.8	50 (50-60)	53.5 ± 8.2	55 (50-60)	.006*
Social score	50.9 ± 8.8	50 (45-60)	51.2 ± 8.8	50 (50-60)	.689
Total Score	255.7 ± 31.8	260 (240-280)	257.3 ± 32.4	265 (245-280)	.590

Mann Whitney test was used, (*) P-value < 0.05 is considered statistically significant.

Table 4: Distribution of the studied children by order of birth and the mean scores of developmental domains

	Order of birth				P
	1st to 3rd order		more than 3rd order		
	mean ± SD	median (IQR)	mean ± SD	median (IQR)	
Communication score	52.5 ± 8.3	55 (50-60)	48.1 ± 14.4	50 (45-60)	.238
Gross motor score	50.3 ± 10.7	50 (45-60)	51.3 ± 7	50 (45-60)	.842
Fine motor score	51 ± 8.7	50 (50-60)	51.5 ± 10.3	52.5 (50-60)	.575
Problem-solving score	52.3 ± 8.5	55 (50-60)	50 ± 9.5	50 (40-60)	.696
Social score	51.7 ± 8.1	55 (45-60)	46.3 ± 11.5	50 (45-50)	.049*
Total Score	257.8 ± 29.6	265 (240-280)	247.3 ± 44	255 (240-280)	.700

Mann Whitney test was used, (*) P-value < 0.05 is considered statistically significant.

Table 5: Relation between fathers' educational level and all five developmental domain scores

	Fathers' educational level						P
	Low education (n=22)		Middle education (n=38)		High education (n=133)		
	mean ± SD	median (IQR)	mean ± SD	median (IQR)	mean ± SD	median (IQR)	
Communica-tion score	44.2 ± 10.2	45 (40-50)	52.2 ± 10.5	55 (50-60)	52.6 ± 8.7	55 (50-60)	.004*
Gross motor score	49.2 ± 9.3	50 (45-60)	50.4 ± 12.4	50 (45-60)	50.6 ± 9.6	50 (45-60)	.653
Fine motor score	52.3 ± 8.8	55 (50-60)	49.7 ± 12.8	50 (50-60)	51.4 ± 7.2	50 (50-60)	.702
Problem- solving score	49.6 ± 10.1	55 (50-55)	52 ± 7.8	50 (50-60)	52.2 ± 8.8	55 (50-60)	.657
Social score	51.5 ± 13.3	60 (50-60)	51.3 ± 10	52.5 (50-60)	50.9 ± 7.9	50 (45-60)	.329
Total Score	246.9 ± 41.7	255 (250-270)	255.5 ± 35.7	262.5 (240-285)	257.6 ± 29.7	265 (245-280)	.696

Kruskal Wallis test was used, (*) P-value < 0.05 is considered statistically significant.

Table 6: Multiple regression analysis of factors affecting total developmental scores

	Unstandardized Coefficients		Standardized Coefficients	t	P	95.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
(Constant)	199.546	15.387		12.969	.000	169.191	229.901
Gender	2.660	4.544	.041	.585	.559	-6.304	11.623
Mother education	10.204	3.890	.211	2.623	.009*	2.531	17.878
Father education	-.129	4.104	-.002	-.032	.975	-8.226	7.967
Mother working status	11.725	6.806	.123	1.723	.087	-1.701	25.152
Child's age (Months)	.440	.310	.133	1.419	.157	-.172	1.051
Total period of breast feeding	.625	.486	.121	1.287	.200	-.333	1.583

ANOVA test for the model is statistically significant (P-value = .001), R square= .113, adjusted R square = .085

Table 7: Multiple regression analysis of factors affecting communication scores

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
(Constant)	36.327	4.618		7.866	.000	27.217	45.438
Gender	1.414	1.364	.074	1.037	.301	-1.277	4.104
Mother education	.666	1.167	.047	.571	.569	-1.637	2.969
Father education	2.304	1.232	.149	1.870	.063	-.126	4.734
Mother working status	4.318	2.043	.155	2.114	.036*	.288	8.348
Child's age (Months)	-.112	.093	-.116	-1.209	.228	-.296	.071
Total period of breast feeding	.260	.146	.172	1.784	.076	-.028	.548

ANOVA test for the model is statistically significant (P-value = .022), R square= .076, adjusted R square = .046

Table 8: Multiple regression analysis of factors affecting problem- solving scores

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
(Constant)	36.528	4.195		8.707	.000	28.252	44.804
Gender	3.074	1.239	.176	2.481	.014*	.630	5.518
Mother education	1.895	1.060	.145	1.787	.076	-.197	3.987
Father education	.198	1.119	.014	.177	.860	-2.009	2.405
Mother working status	2.476	1.856	.096	1.334	.184	-1.185	6.136
Child's age (Months)	.203	.085	.227	2.398	.017*	.036	.369
Total period of breast feeding	-.042	.132	-.030	-.313	.754	-.303	.220

ANOVA test for the model is statistically significant (P-value = .003), R square= .100, adjusted R square = .071

DISCUSSION

The first 3 years of a child's life are the most crucial years in developing their mind and body. Creating a well-established developmental monitoring and screening program should be a priority. In the current research the Arabic version of the Ages and Stages questionnaire, the third edition, was used to screen for developmental delay in children 2-36 months of age in Saraya El-Koba primary health care center. The prevalence of developmental delay in this study was 9.3%. This is in alignment with a study done in Iran in 2017 on 500 children aged 4 to 60 months the prevalence of developmental delay was 8.5%.[11] While it is lower than the frequency found in a study conducted in multiple PHC centers in Saudi Arabia in 2020 done on 948 children 16.4%.[13] These differences could be attributed to differences in the screening tools used as well as the study setting. The present study revealed a prevalence of 9.3% developmental delay, which is higher than that reported in the study conducted in Menoufia governorate in Egypt in 2017 (2.9%).[10] This difference might be because the latter study included a different age range it included children from 24-60 months while the present study included children 2-36 months of age. They also used a different version of the ASQ-3 mention; they self-translated the English version into Arabic while in the present study, we used the officially published and translated Arabic version of the ASQ-3.

In the present study, out of the five developmental domains those with the greatest number of delayed children were communication and gross motor domain at 3.11% each, while the domain with the least number of delayed children was fine motor domain at only 1.04%. This finding agrees with the study of Saudi Arabia [13] that revealed that communication and language domain was the domain with the most delayed children (3.8%), while fine motor was the second least domain with delayed children (1.9%). Similar findings were reported by a study done in Iran in 2011 on 114 children were communication presented as the domain with the highest number of delayed children at 20%.[14] However, in a study conducted by Ahmadipour in Iran the fine motor domain revealed the largest number of delayed children.[11] These differences could be attributed to difference in cultural factors. Some cultures believe motor development (like sitting and walking) is the most important indicator of a child's health thus focusing on helping their children develop these skills. Other countries believe clever and healthy children are children who are sociable and talk early so parents focus on their children developing these skills.

In the present study, girls scored higher than boys in the problem-solving domain, as did the study by El-Ella which showed that girls had higher scores compared to boys for communication and problem-solving domains. [10] While some studies [15] reported no gender difference when it comes to childhood development, some studies [16] showed the reverse; boys had a higher total developmental score than girls. In the current study children born first to the third order of birth have higher social score .These findings agree with a study in Iran that concluded that developmental delay is more prevalent in children with higher order of birth.[11] This may be attributed to

the fact that parents spend more time teaching and engaging with the first couple of children but as the order of birth increases so does the mother's load to care for her children. Children with a higher order of birth typically have older, more tired, and more busy mothers.

Mother's education was a factor that affected the total developmental score. Surprisingly, fathers' education also influenced their children's developmental scores. Fathers with higher education levels had children with a higher communication score. These findings are supported by the fact that parents with higher education may be more aware to invest more money, resources, and time in their children than parents with lower education. They use more complex language and vocabulary with their children and invest more in their children's health.[16,17] A study done in 2017 has shown that highly educated mothers provide more stimulating activities and engage in higher-quality interactions with their children than mothers from low-educated mothers.[18]

Interestingly enough, mother's working status was shown to affect their children's development. Children of working mothers had higher communication scores. While some studies [13] showed that whether mothers work or not and the type of their job did not affect the developmental scores of their children, other studies suggested a multidimensional relationship between these factors. A study suggested that the amount of "quality time" a mother spends with her child is more accurate than the mother's working status or type of job in affecting child development. [19]

CONCLUSION AND RECOMMENDATIONS

The frequency of developmental delays was 9.3% in children 2-36 months of age attending Saraya El-Koba PHC center. Child's gender, order of birth , maternal and paternal education as well as the mothers' working status were all found to affect the ASQ-3 developmental score. Regular and routine screening for developmental delays is recommended using standardized and validated questionnaires to achieve early diagnoses and timely intervention. Also, primary care providers should educate caregivers on techniques and activities that can stimulate their child's mental and physical development when their children are at risk of developmental delay and follow up after a few months to evaluate the effectiveness of the education program.

CONFLICT OF INTEREST

No conflict-of-interest to declare.

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