Baz *et al.*
The Egyptian Journal of Otolaryngology (2024) 40:125
https://doi.org/10.1186/s43163-024-00695-1

The Egyptian Journal of Otolaryngology

ORIGINAL ARTICLE Open Access

The impact of environmental factors on Egyptian children with delayed language development

Hemmat Baz[1], May Fathi Hammad[2], Ahmed Mohamed Zayed[1*] and Ayman Amer[1]

Abstract

Background The current study was aimed at constructing a questionnaire for evaluating the role of variant environmental factors on language acquisition in the three surrounding levels of communication that include familial level, preschool or nursery level, and surrounding social environmental level among children with delayed language development (DLD) due to environmental deprivation. The current study was a retrospective case–control study that was performed on 100 Egyptian Arabic-speaking children aged from 2 to 5 years. The study was carried out among preschool age children in the Mansoura governmental and private preschools (53 males and 47 females). They were divided into 2 groups: Group I (case group) consisted of 50 children with DLD due to environmental deprivation, and group II (control group) consisted of 50 typically developed children.

Results The present study demonstrated several factors for prediction of DLD due to environmental deprivation. Univariable analysis revealed multiple factors as number of hours that parents present at home, time of the mother's job, the relation between the child and the mother, the parents select certain time to talk and play with their child, joint attention of the mother, mother asking her child what he wants, long time using multimedia, divorce as a traumatic stress, bad social performance, and low socioeconomic status. Multivariate analysis revealed that longer time of the mother's job and less time the mother select to talk and play with her child were the environmental deprivation factors which had the most precipitating effect on predicting DLD.

Conclusions The constructed Arabic questionnaire was proved to be valid, reliable, and homogenous and is likely to produce consistent responses in evaluating the variant environmental factors on language development among children with DLD due to environmental deprivation in the three surrounding communications levels.

Keywords Delayed language, Environmental deprivation

Background

Language development does not happen in a vacuum. Children acquire a sign system when they acquire language, which has significant relationships to their social and cognitive development. The potential for language is present at birth, but its development needs a dynamic interaction between the developing brain and a child's environment. In most cases, a non-stimulating (socially, emotionally, and culturally) environment may be the main causative factor of delayed language development in perfectly healthy children [1].

Within a family structure, where parents moderate their children's behaviors to help them adapt to the larger social system, environmental factors have an impact. Value systems and belief, attitudes, socialization objectives and methods for behaviors modeling, styles of

*Correspondence:
Ahmed Mohamed Zayed
drzayed91@gmail.com
[1] ORL Department, Faculty of Medicine, Phoniatric Unit, Mansoura University, Mansoura, Egypt
[2] ORL Department, Phoniatric Unit, Mansoura International Hospital, Mansoura, Egypt

communication, use of language at home, interpersonal relationships, experiences, problem-solving techniques, and stress coping techniques are examples of environmental factors [2]. This perspective shows the interaction between internal factors which represent psychological and biological domains and external factors that represent psychosocial domains and socioeconomic standard (SES) on language development among children with an average intelligence. These two principles (internal and external factors) are very beneficial for clarifying the dynamic interaction between psychosocial, biological factors, and SES that influences language acquisition. Therefore, a child's specific external environment (such as their home and family setting or the culture of their school) will either positively or negatively stimulate the child's genetic potential [3].

In clinical work, it was noticed that some delayed language development (DLD) children with an average mentality (after exclusion of cases of specific language impairment) showed different language abilities despite having the same chronological age as well as mental age. Furthermore, there were differences in the way their families accepted, understood, and handled the issues those children were facing. Thus, language development needs to be taken into account in relation to peers, the family, the school, and the community. Taking into account the psychosocial setting [4], Saleh and Baz [3] evaluated and correlated the role of psychosocial factors influencing language acquisition in children with mild mental retardation, while Safwat and Sheikhany [5] evaluated the language development that is influenced by both quantity and quality of child-parent interactions, and the factors that would influence these interactions in different socioeconomic standards should be considered while implementing the therapy program.

From this point of view, a semistructured questionnaire that applied to parents was developed by the authors to assess and correlate the role of variant environmental factors on language development among DLD children in the three surrounding levels of communication that include familial level, preschool or nursery school level, and surrounding social and environmental level.

Methods

This study was a retrospective case–control study that was carried out on 100 Egyptian Arabic-speaking children aged from 2 to 5 years. The study control group was conducted among preschool age children in the Mansoura governmental and private preschools, and case group was conducted among preschool age children attending outpatient clinic unit at Mansours University Hospital from October 2018 to November 2019. The studied preschool children were 53 males and 47 females and were divided into 2 groups: group I (case group) included 50 children with DLD due to environmental deprivation with no significant differences in chronological age, gender, mental age, or IQ, and group II (control group) included 50 typically developed children. Children with delayed language development due to other causes as intellectual disability, autism spectrum disorder (ASD), and attention deficit hyperactivity disorder (ADHD), children with sensory impairment or physical disability, and children with history of previous language therapy and neurological and psychiatric diseases were excluded from the study. All children underwent an evaluation protocol consisting of history taking and evaluating their language skills using the Preschool Language Scale, Fourth Arabic Edition [6], and psychometric evaluation using Stanford-Binet Intelligence Scale "4th Arabic version" [7] and using Vineland Social Maturity Scale [8]. The developed questionnaire (Additional file 1: Appendix) was developed taking in account the social culture and language abrupt to the Egyptian culture and society for each proposed item in the questionnaire. The questionnaire was first pilot tested with 20 Egyptian children, and their parents then amended according to their suggestions to make the phrases more clear. Three phoniatricians assessed the questionnaire twice: first prior to the test being given to the pilot study group and again following the changes recommended by the group. The study groups were shown the completed questionnaire form following the expert's opinion.

A formal written consent from children's parents was obtained. The Institutional Research Board (IRB) of Faculty of Medicine — Mansoura University accepted the study protocol (MS/16.08.45).

Parents were asked to fill in the questionnaire including the following:

I.Familial level

(A) The sociodemographic characteristics of parents: Contain (age, duration of their presence at home, education and culture domain, duration of time they spend at work, marital status, and order of the child).

(B) Parent–child interaction: Was assessed according to the semistructured psychosocial sheet developed by Saleh and Baz [3] including the following:

1. Relation between parents and their child: Neglect, warmth, hostility, dependent, independent, or overprotection

2. Select certain time to talk and play with their child: All the time, sometime, or never
3. Methods used for correcting behavior: Nothing, praising, insulting, beating, or severe punishment

(C) Language intervention strategies between the child and his parents or caregiver (i.e., the quantity and quality of intervention with their children): Quality was identified in terms of the use of various strategies by parents or caregiver that would augment their child's language development. These interventions were assessed according to an Arabic questionnaire developed by Safwat and Sheikhany [5] that was consisted of parent-directed 16 questions and was measured using a 3-point scale (never, sometimes, most of the time). They included use or practice parallel talk, vary tone while speaking, use simple short sentences, parents spend time during the weekend with child, wait for child to communicate, repeat daily routine activities, imitate child actions, use gestures to convey meaning, emphasize facial expressions, show the objects you are talking about, joint attention, model a certain behavior, use reinforcers, ask child about what he wants, correct child utterances., and expand child utterances.

(D) Exposure to multimedia: It was assessed according to the Arabic questionnaire developed by Safwat and Sheikhany [5].

1. Type of multimedia: (1 = TV, 2 = iPad, or 3 = mobile phone)
2. Number of watching hours: (1 = less than 2 h, 2 = 2–6 h, or 3 = more than 6 h)
3. Child watches multimedia: (1 = alone, 2 = with siblings, or 3 = with parents).

(E) Exposure to traumatic stresses.

(F) The socioeconomic status of the parents: Was evaluated based on the scale that is developed by El-Gilanny et al. [9] which measured six domains: a score was assigned for each item, and the total score was calculated: Class I (high social standard = 25–30), Class II (middle social standard = 20–25), Class III (low social standard = 15–20), and Class IV (very low social standard < 15).

II. Preschool or nursery level

It was assessed according to the semistructured psychosocial sheet developed by Saleh and Baz [3], including the following:

1. Child attendance: Either regular or irregular
2. Child social performance: Either good or bad
3. Child behavior in the nursery: Either normal, submissive, isolated, or aggressive
4. Child adaptation to teachers: Either adapted or not adapted

III. Social and environmental level

It was assessed according to the semistructured psychosocial sheet developed by Saleh and Baz [3], including the following:

1. .Child attendance to social events (either attendant or not attendant)
2. .Child social performance (either good or bad).
3. .Child behavior in social events (either normal, submissive, isolated, or aggressive).
4. .Child attitude towards same-age colleagues (either normal, submissive, isolated, or aggressive).

Statistical analysis

The Statistical Package for Social Science (IBM Corp., 2011) was used to edit, code, tabulate, and bring the gathered data into a PC. Armonk, NY: IBM Corp.; IBM SPSS Statistics for Windows, Version 20.0. Data was presented, and appropriate analysis was carried out based on the kind of data found for each parameter. Data was presented as mean standard deviation (± SD) for parametric numerical data plus frequency and percentage of non-numerical data. Student T, chi-square test, Monte Carlo test, and Mann–Whitney *U*-test were used to assess the statistical significance and examine the relationship among two qualitative variables. To evaluate the strength of association between two quantitative variables, we use the correlation coefficient analysis to determine the strength and direction of the linear relationship between two variables. Logistic regression analysis was used for prediction of risk factors. Using the chi-squared test, deviations from the expectations of the Hardy–Weinberg equilibrium were found. A 95% confidence interval and odds ratio were computed. Significant (S) if $p < 0.05$.

Results

Descriptive and comparative statistics

This study was done on two groups of Arabic-speaking children aged from 2 to 5 years. They were divided into 2 groups: Group I (case group) consisted of 50

children with DLD due to environmental deprivation (mean mental age = 34.52 ± 7.79 months, mean social age = 33.62 ± 6.92 months, mean IQ = 97.64 ± 8.5, mean language age (LA) = 26.08 ± 8.48 months), and group II (control group) consisted of 50 typically developed children (mean mental age = 38.34 ± 12.95, mean social age = 45.34 ± 15.26 months, mean IQ = 99.50 ± 7.93, mean LA age = 45.42 ± 14.19 months) (Table 1).

Demographic and communication data between both groups

There were statistically significant differences in social age and language age in group I when compared to group II, with no statistically significant differences in chronological age, gender, metal age, and IQ in both groups (Table 1).

Descriptive and comparative statistics of the applied questionnaire between both groups

I. At family level

A Sociodemographic data of parents

Statistically significant differences were found between group I and group II as regard the following:

- In mother's education level (illiterate, read and write, intermediate, university graduate, and post graduate degree) respectively and also in father's education level (intermediate, university graduate, illiterate, read and write, and postgraduate degree) respectively
- In number of hours that both mother and father are present at home
- In the duration of time that the mother spends at work (full time, not working, and part-time) respectively while in the duration of time that the father spends at work (full time, part-time, and not working) respectively
- In the marital status (married parents, divorced parents, and dead father)
- Conversely, there were no statistically significant differences with order of the child birth (Table 2).

B Parent–child interaction: it was assessed with both mother and father separately

Statistically significant differences were found between group I and group II as regard the following:

- In the mother relation with her child (warmth, overprotection, hostility, neglect, dependent, and in dependent) respectively.
- Also in the parent's assign certain time to talk and play with their child (never, sometimes, and all the time)
- In contrast, there were no statistically significant differences in the father's relation with his child and in the methods parents used for correction of their child's behavior (Table 3).

III. Language intervention strategies between father, mother, or caregiver and children

Statistically significant differences were detected between group I and group II regarding most of the language intervention strategies between mother and caregiver and children except the following: vary tone while

Table 1 Demographic and phoniatric data between both groups

		Group I *N* = 50		Group II *N* = 50		*P*
		Mean ± SD		Mean ± SD		
Chronological age (months)		44.78 ± 9.22		45.32 ± 11.11		0.79
		N	%	N	%	
Gender	**Male**	26	52.0	27	54.0	
	Female	24	48.0	23	46.0	0.84
Mental age/months		34.52 ± 7.79		38.34 ± 12.95		0.08
Social age/months		33.62 ± 6.92		45.34 ± 15.26		**< 0.001***
IQ		97.64 ± 8.5		99.50 ± 7.93		0.22
Language age/months		26.08 ± 8.48		45.42 ± 14.19		**0.001***

t Student *t*-test, *MC* Monte Carlo test, χ^2 chi-square test

* Statistically significant ($p < 0.05$)

Table 2 Sociodemographic data of parents in both groups

		Mother					Father				
		Group I ***N*** **= 50**		**Group II** ***N*** **= 50**		***P***	**Group I** ***N*** **= 50**		**Group II** ***N*** **= 50**		***P***
		Mean ± SD		**Mean ± SD**			**Mean ± SD**		**Mean ± SD**		
Age/years		28.36 ± 5.48		29.58 ± 4.94		0.25	35.60 ± 5.88		33.92 ± 5.09		0.13
Duration of the presence at home		7.67 ± 2.33		10.62 ± 3.05		< 0.001*	5.27 ± 1.6		8.12 ± 3.47		0.002*
Education and culture domain		***N***	**%**	***N***	**%**	***P***	***N***	**%**	***N***	**%**	***P***
	Illiterate	16	32.0	2	4.0	0.0002*	8	16.0	0	0.0	0.003*
	Read and write	13	26.0	3	6.0	0.006*	6	12.0	1	2.0	0.01*
	Intermediate	11	22.0	21	22.0	0.03*	24	48.0	15	30.0	0.01*
	University graduate	5	10.0	15	30.0	0.02*	11	22.0	30	60.0	0.03*
	Postgraduate degree	5	10.0	9	18.0	0.65	1	2.0	4	8.0	0.56
Duration of time spend at work		***N***	**%**	***N***	**%**	***P***	***N***	**%**	***N***	**%**	***P***
	Not working	16	32.0	31	62.0	0.003*	6	12.0	1	2.0	0.01*
	Part time	15	30.0	13	26.0		7	14.0	17	34.0	
	Full time	19	38.0	6	12.0		37	74.0	32	64.0	
Marital status		***N***	**%**	***N***	**%**	***P***					
Order of the child	**Married**	27	54.0	46	92.0	0.001*					
	Divorced	15	30.0	2	4.0	0.005*					
	Dead father	6	12.0	1	2.0	0.05*					
	Dead mother	1	2.0	1	2.0	1.0					
	Dead both father and mother	1	2.0	0	0.0	1.0					
		N	**%**	***N***	**%**	***P***					
	Firstborn	19	38.0	24	48.0	0.57					
	Middle child	11	22.0	11	22.0						
	Youngest	15	30.0	13	26.0						
	Twin	5	10.0	2	4.0						

t Student *t*-test, *MC* Monte Carlo test, χ^2 chi-square test

* Statistically significant ($p < 0.05$)

Table 3 Parent–child interaction in both groups

		Mother					Father				
		Group I *N* = 50		Group II *N* = 50		*P*	Group I *N* = 50		Group II *N* = 50		*P*
		N	%	*N*	%		*N*	%	*N*	%	
Relation between the parents and their child	**Neglect**	2	4.0	1	2.0	0.018*	5	10.0	1	2.0	0.07
	Warmth	34	68.0	47	94.0		22	44.0	36	72.0	
	Hostility	4	8.0	0	0.0		11	22.0	5	10.0	
	Dependent	1	2.0	0	0.0		1	2.0	0	0.0	
	Independent	0	0.0	0	0.0		8	16.0	5	10.0	
	Overprotection	9	18.0	2	4.0		3	6.0	3	6.0	
Assign certain time to talk and play with their child	**All the time**	2	4.0	32	64.0	< 0.001*	4	8.0	1	2	< 0.001*
	Sometimes	14	28.0	16	32.0		10	20.0	43	86	
	Never	34	68.0	2	4.0		36	72.0	6	12.0	
Methods used for correcting behavior	**Nothing**	17	34.0	17	34.0	0.23	22	44.0	19	38.0	0.06
	Praising	0	0.0	4	8.0		0	0.0	5	10.0	
	Insulting	0	0.0	0	0.0		7	14.0	2	4.0	
	Beating	28	56.0	25	50.0		13	26.0	18	36.0	
	Severe punishment	5	10.0	4	8.0		8	16.0	6	12.0	

t Student *t*-test, *MC* Monte Carlo test, χ^2 chi-square test

* Statistically significant ($p < 0.05$)

speaking, use gestures to convey meaning, and emphasize facial expression. Also, there were statistically significant differences of some language intervention strategies between the father and children only in the following items: use simple short sentence, spend time for weekend with his child, use joint attention, and use of reinforcers (Table 4).

IV. Exposure to multimedia

As regard kinds of multimedia that the child is exposed to which was mentioned in Table 5, it was found that the number of DLD children with exposure to iPad, mobile, and TV respectively is significantly higher when compared with control group. The duration that children spend on multimedia was discussed in Table 5 and revealed that most of them were above 6-h usage of multimedia. Most of children with DLD due to environmental deprivation used to sit alone during multimedia viewing with high significant difference in number of children in control group.

E Exposure to traumatic stresses

There were 74.0% of the children in group I which was exposed to traumatic stress. There were statistically significant differences in exposure to traumatic stresses (family and economic straggle) respectively (Table 6).

F Socioeconomic status of the parents

Statistically significant differences were found between group I and group II regarding the level of socioeconomic status (very low to low level, middle level, and high level) respectively (Table 7).

II. At preschool or nursery level The relation between the child and nursery environment

Statistically significant differences were found between group I and group II as regard one-third of the children who were attending irregularly to their nursery and had bad social performance and isolated behavior, and all of them were not adapting to teachers. Also, there were statistically significant differences regarding that the child's behavior in the preschool may be normal, isolated, submissive, or aggressive, respectively (Table 8).

III. At social and environmental level The relation between the child and the environmental social events

Statistically significant differences were found between group I and group II as regard almost of children who were irregularly attending to their nursery, have bad social performance, and have normal behavior in social events and attitude towards same-age colleagues. Also, there were statistically significant differences regarding that child behavior in social events may be normal, submissive isolated, or aggressive respectively and attitude towards same-age colleagues

Table 4 Language intervention strategies between father, mother, or caregiver and children

		Mother					Father					Caregiver				
		Group I *N* = 50		Group II *N* = 50		*P*	Group I *N* = 50		Group II *N* = 50		*P*	Group I *N* = 39		Group II *N* = 7		*P*
		N	%	*N*	%		*N*	%	*N*	%		*N*	%	*N*	%	
1. Use or practice parallel talk	**Never**	17	34.0	1	2.0	< 0.00*	27	54.0	24	48.0	0.12	8	20.5	0	0.0	0.03*
	Sometimes	33	66.0	13	26.0		23	46.0	22	44.0		31	79.5	6	85.7	
	Most of the time	0	0.0	36	72.0		0	0.0	4	8.0		0	0.0	1	14.3	
2. Vary tone while speaking	**Never**	20	40.0	19	38.0	0.08	28	56	22	44.0	0.08	12	30.8	2	28.6	0.07
	Sometimes	30	60.0	26	52.0		21	42	21	42.0		23	59.0	2	28.6	
	Most of the time	0	0.0	5	10.0		1	2	7	14.0		4	10.3	3	42.9	
3. Use simple short sentences	**Never**	15	30.0	1	2.0	< 0.001*	29	58.0	9	18.0	< 0.001*	9	23.1	0	0.0	< 0.001*
	Sometimes	21	42.0	9	18.0		20	40.0	32	64.0		30	76.9	2	28.6	
	Most of the time	14	28.0	40	80.0		1	2.0	9	18.0		0	0.0	5	71.4	
4. Parents spend time during the weekend with child	**Never**	19	38.0	1	2.0	< 0.001*	43	86.0	10	20.0	< 0.001*	15	38.5	0	0.0	0.04*
	Sometimes	17	34.0	9	18.0		7	14.0	32	64.0		24	61.5	7	100.0	
	Most of the time	14	28.0	40	80.0		0	0.0	8	16.0		0	0.0	0	0.0	
5. Wait for child to communicate	**Never**	20	40.0	1	2.0	< 0.001*	29	58.0	23	46.0	0.15	12	30.8	0	0.0	< 0.001*
	Sometimes	30	60.0	13	26.0		21	42.0	24	48.0		27	69.2	2	28.6	
	Most of the time	0	0.0	36	72.0		0	0.0	3	6.0		0	0.0	5	71.4	
6. Repeat daily routine activities	**Never**	22	44.0	1	2.0	< 0.001*	37	74.0	35	70.0	0.32	12	30.8	0	0.0	< 0.001*
	Sometimes	28	56.0	13	26.0		13	26.0	12	24.0		27	69.2	2	28.6	
	Most of the time	0	0.0	36	72.0		0	0.0	3	6.0		0	0.0	5	71.4	
7. Imitate child actions	**Never**	18	36.0	1	2.0	< 0.001*	27	54.0	21	42.0	0.38	10	25.6	0	0.0	0.02*
	Sometimes	32	64.0	13	26.0		22	44.0	26	52.0		29	74.4	6	85.7	
	Most of the time	0	0.0	36	72.0		1	2.0	3	6.0		0	0.0	1	14.3	
8. Use gestures to convey meaning	**Never**	13	26.0	14	28.0	0.2	25	50.0	22	44.0	0.74	14	35.9	0	0.0	0.08
	Sometimes	33	66.0	26	52.0		21	42.0	25	50.0		25	64.1	7	100.0	
	Most of the time	4	8.0	10	20.0		4	8.0	3	6.0		0	0.0	0	0.0	
9. Emphasize facial expressions	**Never**	17	34.0	15	30.0	0.21	28	56.0	22	44.0	0.25	14	35.9	5	71.4	0.06
	Sometimes	28	56.0	23	46.0		21	42.0	24	48.0		24	61.4	1	14.3	
	Most of the time	5	10.0	12	24.0		1	2.0	4	8.0		1	2.6	1	14.3	
10. Show the objects you are talking about	**Never**	19	38.0	1	2.0	< 0.001*	29	58.0	23	46.0	0.16	10	25.6	0	0.0	< 0.001*
	Sometimes	31	62.0	13	26.0		21	42.0	24	48.0		29	74.4	2	28.6	
	Most of the time	0	0.0	36	72.0		0	0.0	3	6.0		0	0.0	5	71.4	

Table 4 (continued)

		Mother					Father					Caregiver				
		Group I N = 50		Group II N = 50		P	Group I N = 50		Group II N = 50		P	Group I N = 39		Group II N = 7		P
		N	%	N	%		N	%	N	%		N	%	N	%	
11. Joint attention	**Never**	20	40.0	1	2.0	< 0.001*	44	88.0	12	24.0	< 0.001*	12	30.8	0	0.0	< 0.001*
	Sometimes	30	60.0	13	26.0		6	12.0	30	60.0		27	69.2	2	28.6	
	Most of the time	0	0.0	36	72.0		0	0.0	8	16.0		0	0.0	5	71.4	
12. Model a certain behavior	**Never**	21	42.0	1	2.0	< 0.001*	34	68.0	24	48.0	0.11	11	28.2	0	0.0	0.02*
	Sometimes	29	58.0	12	24.0		12	24.0	18	36.0		28	71.8	6	85.7	
	Most of the time	0	0.0	37	74.0		4	8.0	8	16.0		0	0.0	1	14.3	
13. Use reinforcers	**Never**	19	38.0	1	2.0	< 0.001*	45	90.0	12	24.0	< 0.001*	16	41.0	0	0.0	0.03*
	Sometimes	31	62.0	12	24.0		5	10.0	31	62.0		23	59.0	7	100.0	
	Most of the time	0	0.0	37	74.0		0	0.0	7	14.0		0	0.0	0	0.0	
14. Ask child about what he wants	**Never**	18	36.0	1	2.0	< 0.001*	39	78.0	28	56.0	0.06	15	38.5	0	0.0	< 0.001*
	Sometimes	32	64.0	2	4.0		10	20.0	17	34.0		24	61.5	0	0.0	
	Most of the time	0	0.0	47	94.0		1	2.0	5	10.0		0	0.0	7	100.0	
15. Correct child utterances	**Never**	23	46.0	1	2.0	< 0.001*	40	80.0	32	64.0	0.12	17	43.6	0	0.0	< 0.001*
	Sometimes	27	54.0	13	26.0		9	18.0	13	26.0		22	56.4	2	28.6	
	Most of the time	0	0.0	36	72.0		1	2.0	5	10.0		0	0.0	5	71.4	
16. Expand child utterances	**Never**	40	80.0	3	6.0	< 0.001*	36	72.0	33	66.0	0.19	17	43.6	0	0.0	< 0.001*
	Sometimes	10	20.0	11	22.0		13	26.0	11	22.0		22	56.4	4	57.1	
	Most of the time	0	0.0	36	72.0		1	2.0	6	12.0		0	0.0	3	42.9	

t Student *t*-test, *MC* Monte Carlo test, χ^2 chi-square test

* Statistically significant ($p < 0.05$)

Table 5 Descriptive and comparative statistics about exposure to multimedia in both groups

		Group I *N* = 50		Group II *N* = 50		*P*
		N	%	*N*	%	
Type of multimedia						
TV	No	26	52.0	38	76.0	0.01*
	Yes	24	48.0	12	24.0	
Mobile	No	15	30.0	28	56.0	< 0.001*
	Yes	35	70.0	22	44.0	
iPad	No	8	16.0	38	76.0	< 0.001*
	Yes	42	84.0	12	24.0	
Number of watching hours per day	Less than 2 h	0	0.0	8	20.5	< 0.001*
	2 to 6 h	7	24.1	28	71.8	
	More than 6 h	22	75.9	3	7.7	
Child watches multimedia alone or with others	Alone	47	94.0	30	60.0	< 0.001*
	With siblings	1	2.0	5	10.0	
	With parents	2	4.0	15	30.0	

z Mann–Whitney *U*-test, χ^2 chi-square test

* Statistically significant ($p < 0.05$)

Table 6 Descriptive and comparative statistics about the exposure to traumatic stresses in both groups

		Group I *N* = 50		Group II *N* = 50		*P*
		N	%	*N*	%	
Traumatic stress	No	13	26.0	34	68.0	< 0.001*
	Yes	37	74.0	16	32.0	
Causes of traumatic stress	**The child has chronic disease with recurrent hospitalization or make serious surgery**	2	5.4	1	6.25	1.0
	The absence of mother or father	6	16.2	2	12.5	1.0
	Live abroad with father and mother	6	16.2	4	25	0.45
	Family struggle	15	40.5	2	12.5	0.044*
	Economic struggle	18	48.7	3	18.8	0.04*

χ^2 chi-square test

* Statistically significant ($p < 0.05$), categories are not mutually exclusive

Table 7 Descriptive and comparative statistics of the socioeconomic status of the parents

		Group I *N* = 50		Group II *N* = 50		*P*
		N	%	*N*	%	
Socioeconomic status	**Very low to low level**	19	38.0	7	14.0	0.03*
	Middle level	16	32.0	9	18.0	0.16
	High level	15	30.0	34	68.0	0.002*

MC Monte Carlo test

* Statistically significant ($p < 0.05$)

Table 8 The relation between the child and nursery environment

		Group I *N* = 50		Group II *N* = 50		*P*
		N	%	*N*	%	
No. of child in the nursery		16	32.0	41	82.0	< 0.001*
Child's attendance	Regular	0	0.0	40	80.0	< 0.001*
	Irregular	16	32.0	1	2.0	
Child's social performance	Good	0	0.0	34	68.0	< 0.001*
	Bad	16	32.0	7	14.0	
Child's behavior in the nursery	Normal	6	12.0	33	66.0	< 0.001*
	Submissive	4	8.0	2	4.0	
	Isolated	5	10.0	4	8.0	
	Aggressive	1	2.0	2	4.0	
Child's adaptation to teachers	Adapted	0	0.0	39	78.0	< 0.001*
	Not adapted	16	32.0	2	4.0	

MC Monte Carlo test, χ^2 chi-square test

* Statistically significant ($p < 0.05$)

Table 9 The relation between the child and the environmental social events

		Group I		Group II		*P*
		N	%	*N*	%	
Child's attendance to social events	Attendant	20	40.0	41	82.0	< 0.001*
	Not attendant	30	60.0	9	18.0	
Child's social performance	Good	9	18.0	37	74.0	< 0.001*
	Bad	41	72.0	13	26.0	
Child's behavior in social events	Normal	18	36.0	33	66.0	< 0.001*
	Submissive	18	36.0	5	10.0	
	Isolated	12	24.0	6	12.0	
	Aggressive	4	8.0	6	12.0	
Child's attitude towards same-age colleagues	Normal	18	36.0	33	66.0	< 0.001*
	Submissive	18	36.0	5	10.0	
	Isolated	12	24.0	6	12.0	
	Aggressive	4	8.0	6	12.0	

MC Monte Carlo test, χ^2 chi-square test

* Statistically significant ($p < 0.05$)

may be normal, submissive, isolated, or aggressive respectively (Table 9).

Correlation analysis in case group

Correlation between language age and applied questionnaire

The sociodemographic data of the mother showed that there are significant positive correlations between the language age and duration of time that the mother spends at work, while there were significant positive correlations with language age and number of hours that both mother and father are present at home. Parent–child interactions showed that there are significant positive correlations with language age and both mother and father were assigning certain time to talk and play their child. There were positive significant correlations between language age and both marital status and socioeconomic status of the family (Table 10).

The language intervention strategies between the mother and caregiver and children showed that there was a significant positive correlation with language age and all questions except the following: vary tone while speaking, use gestures to convey meaning, and emphasize facial expression. Also, some of language intervention strategies between the father and children showed that there was a significant positive correlation with language age

Table 10 Correlation between language age and applied questionnaire

Items		Mother			Father		
		Duration of time spend at work	**Duration of the presence at home**	**Assign certain time to talk and play with their child**	**Duration of time spend at work**	**Duration of the presence at home**	**Assign certain time to talk and play with their child**
Language age	P	0.034	0.004	0.004	0.369	0.000	0.000
	R	0.212[a]	0.358[b]	0.358[b]	0.851	0.424[b]	0.424[b]
		Marital status		**SES**			
Language age	P	**0.034**		**0.003**			
	R	**0.212[a]**		**0.293[b]**			

r Spearman correlation coefficient

[a] correlation is significant at the 0.05 level (2-tailed)

[b] correlation is significant at the 0.01 level (2-tailed)

Table 11 Correlation between language age and language intervention strategies between (father, mother, or caregiver) and children

Items	R/P	Language age/month		
		Mother	**Father**	**Caregiver**
Use or practice parallel talk	P	0.024	0.037	0.024
	R	0.323[b]	0.209[b]	0.323[b]
Use simple short sentences	P	0.037	0.000	0.037
	R	0.209[b]	0.361[a]	0.209[b]
Parents spend time during the week end with child	P	0.030	0.000	0.030
	R	0.217[b]	0.476[a]	0.217[b]
Wait for child to communicate	P	0.024	0.089	0.024
	R	0.323[b]	0.171	0.323[b]
Repeat daily routine activities	P	0.024	0.0171	0.024
	R	0.323[b]	0.108	0.323[b]
Imitate child actions	P	0.024	0.177	0.024
	R	0.323[b]	0.078	0.323[b]
Show the objects you are talking about	P	0.003	0.089	0.003
	R	0.293[a]	0.171	0.293[a]
Joint attention	P	0.000	0.000	0.000
	R	0.476[a]	0.533[a]	0.476[a]
Model a certain behavior	P	0.015	0.108	0.015
	R	0.345[b]	0.177	0.345[b]
Use reinforcers	P	0.017	0.000	0.017
	R	0.239[b]	0.561[a]	0.239[b]
Ask child what he wants	P	0.003	0.049	0.003
	R	0.293[a]	0.197[b]	0.293[a]
Correct child utterances	P	0.034	0.171	0.034
	R	0.212[b]	0.108	0.212[b]
Expand child utterances	P	0.000	0.089	0.000
	R	0.533[a]	0.171	0.533[a]

r Spearman correlation coefficient

[a] correlation is significant at the 0.01 level (2-tailed)

[b] correlation is significant at the 0.05 level (2-tailed)

and the following items: use simple short sentence, spend time for weekend with his child, use joint attention, and use reinforces (Table 11).

Regression analysis

Logistic regression analysis was conducted for prediction of DLD due to environmental deprivation. Univariable analysis revealed multiple factors as duration of the parents' presence at home, the duration of time that the mother spends at work, the relation between the child and mother, the parents assign certain time to talk and play with their child, joint attention of the mother, mother asking her child what he wants, long time using multimedia, divorce as traumatic stress, bad social performance, and low socioeconomic status. Multivariate analysis was done after univariate analysis depending on significant risk factors from univariate analysis and revealed that the long duration that the mother spends at her work and the less time the mother assign to talk and play with her child were the environmental deprivation factors which had the most precipitating effect on prediction of DLD (Table 12).

Validity and reliability of the questionnaire

- Validity: Content validity was employed to validate the Arabic questionnaire. All items were found to be fully relevant to their intended aim in terms of language and cultural appropriateness by three experienced and bilingual phoniatricians.
- Reliability: The reliability of the questionnaire was assessed. Cronbach's alpha was measured across the questions. In Cronbach's alpha ($\geq 0.8 - < 0.9$), it was denoted to be satisfactory. Table 13 demonstrates the value of Cronbach's alpha coefficient if the corresponding question was removed.

Discussion

Children acquire language through interactions with parents, relatives, peers, and/or adults [10]. Children aged less than 3 years are catching what is called the sensitive period for language. Deprivation of external stimuli during this period will prevent normal development of neural circuit for the exact function [11]. Environmental deprivation is considered a major risk as it adversely affects numerous brain regions, and the sympathetic nervous system is strained due to its continual stimulation [12].

The aim of this work was to develop a questionnaire for evaluating the role of variant environmental factors on language acquisition in the three surrounding levels of communication that include familial level, preschool or nursery level, and surrounding social environmental level among children with delayed language development (DLD) due to environmental deprivation. The developed questionnaire was constructed taking in consideration social culture and language abrupt to the

Table 12 Logistic regression analysis

		Univariate		*Multivariate*	
		P	**Odds ratio**	***P***	**Adjusted odds ratio**
The sociodemographic characteristics of parents	Duration of mother's presence at home	< 0.001*	0.69 (0.56–0.85)		
	Duration of father's presence at home	0.002*	0.558 (0.403–0.773)		
	Full time spend at work	**0.014***	**4.26 (1.34–13.59)**	**0.03***	**5.46 (2.45–8.76)**
Parent–child interaction	Relation between the child and mother	0.02*	1.59 (1.06–2.39)		
	Mother assigns certain time to talk and play with her child	**< 0.001***	**10.78 (3.4–34.16)**	**0.005***	**9.87 (6.34–12.87)**
	Father assigns certain time to talk and play with his child	0.01*	1.65 (0.34–9.87)		
Language intervention strategies between father, mother or caregiver, and their child	Joint attention mother	0.02*	1.59 (1.06–2.39)		
	Mother asking her child what he/she wants	0.03*	1.87 (1.43–8.67)		
Exposure to multimedia	TV	0.01*	1.65 (0.34–9.87)		
	Number of hours > 6	0.02*	5.91 (1.20–29.18)		
Exposure to traumatic stresses	Family straggle	< 0.001*	10.7 8 (3.4–34.16)		
The relation between the child and environmental social events	Bad	0.01*	1.65 (0.34–9.87)		
SES	Very low to low level	0.03*	1.87 (1.43–8.67)		
	Overall %predicted = 84.5%				

* Statistically significant ($p<0.05$)

Table 13 Reliability assessment of applied questionnaire

Levels	Items		Cronbach's alpha if item is deleted	
			Mother	Father
At familial level	The sociodemographic characteristic data of parents	Age/year	0.503	0.572
		Education and culture domain	0.545	0.540
		Duration of time spend at work	0.869	0.862
		Duration of the presence at home	0.817	0.855
		Order of the child		0.677
		Marital status		0.766
	Parent–child interactions	Relation between the parents and child	0.857	0.855
		Assign certain time to talk and play with their child	0.879	0.870
		Methods used for correcting behavior	0.586	0.542
	Exposure to multimedia	TV	0.758	
		Mobile	0.858	
		iPad	0.856	
		Number of hours	0.868	
	Exposure to traumatic stresses		0.710	
	SES		0.850	
At preschool nursery level	The relation between the child's attitude and the nursery environment	Child's attendance	0.747	
		Child's social performance	0.844	
		Child's behavior in the nursery	0.736	
		Child's adaptation to teachers	0.846	
At social and environmental level	The relation between the child's attitude and the environmental social events	Child's attendance to social events	0.866	
		Child's social performance	0.765	
		Child's behavior in social events	0.863	
		Child's attitude towards same-age colleagues	0.762	

Egyptian culture and society for each proposed item in the questionnaire.

The present study revealed that statistically significant differences in parent's education level. This is in agreement with Safwat and Sheikhany [5] who suggested that a strong positive correlation was found between parents' access to health information and their knowledge and interaction scores. Education allows for a wider range of life experiences, which may have an impact on parenting styles and values. Statistically significant difference in number of hours that both parents were present at home and at their work and the language age of the child was found in the current study. Also, there were significant positive correlations with language age of the child and number of hours that both mother and father are present at home. This is in agreement with Glascoe and Leew [13] who supported the idea that the father plays a role in the child's learning and increases the likelihood that the child will mature in line with his age, while Al-Fadhli and Al-Bunaian [14] found that language development is significantly correlated with the child's time spent at home with their mother, but not with the father. This could be as mother–child interaction is more verbal and directed, while fathers when stay with their children they mostly play freely and physically more than talking.

A number of studies identify a link between parental divorce and lower academic achievement and poor behavioral outcomes, even at early ages. Children born to married parents who divorced have lower vocabulary and pre-reading skills and more aggressive behaviors at age 5 than children in stably married families [15, 16]. The present study revealed a statistically significant positive correlation with language delay and marital status. This is in agreement with the results of a study done by Fagan and Churchill [17] which revealed that the amount of warmth directed towards the children, affection, pride, stimulation of academic behavior, support of social maturity, and stimulation of language in divorced homes are reduced. Less financial and emotional support is provided to children of divorced families. Also, there was a statistically significant positive correlation between the language delay and the mother's relation with her child

and parent's assignment of certain time to talk and play with his/her child. This result is in agreement with Al-Fadhli and Al-Bunaian [14] that supported the assertion that the time spent with a child should involve play and storytelling as well as providing for their bodily needs, such as food, clothing, and transportation.

The present study revealed that the language intervention strategies between the mother or caregiver and children showed that there were significant positive correlations with language age and most of language intervention strategies except vary tone while speaking, use gestures to convey meaning, and emphasize facial expression. According to Raikes et al. [18], regular and consistent engagement in routine activities gives young children a structured framework for interpreting the actions and words of others, aids in their ability to predict the chronological order of events, gives them rich information about the objects and activities in their environment, and enables them to make deductions from novel experiences. On the other hand, the language intervention strategies between the father and children showed that significant positive correlations with language age and the following items: use simple short sentence, the time spent for weekend with his child, use joint attention, and use reinforcers during the time a father spends with his children are important. Rosenberg and Wilcox [19] reported fathers' play has a special function in a child's development and teaching them things like how to control their urges towards aggression and how to explore the world. Fathers' interaction with their children also has an important influence on a child's emotional, social development, and joint attention. In addition, fathers frequently encourage their children to be independent and outwardly focused. Fathers often push achievement, while mothers stress nurturing, both of which are crucial for child's proper development.

The present study showed a statistically significant positive correlation between DLD and very low to low level of socioeconomic status (SES). This is in agreement with a study done by Safwat and Sheikhany [5] which believed that parents who are overwhelmed by the stress of daily life can view their child's needs as an extra source of stress and fail to build an emotional or reciprocal relationship with them. Also, Hoff [20] found that higher SES mothers talk more to their children than do lower SES mothers. The speech of higher SES mothers more frequently is uttered for the purpose of eliciting conversation, while the speech of lower SES mother more frequently is uttered for the purpose of directing their children's behavior.

The present study also showed that there was a statistically significant difference regarding most of the relation between the child's attitude and preschool or nursery environment. In agreement with Hoff [21] who found that young children interact with peers in play groups, in child care settings, and in preschool. Peer interaction may be a significant context for language acquisition. The present study also showed that there was a statistically significant difference regarding that most of the relation between the child's attitude and environmental social events. These results are in line with Loeber and Stouthamer [22] who reported that the child's social environment has a major impact on how child manage experiences in his/her different cognitive aptitudes. Furthermore, those children were lacking the social skills experience mainly because of their complete reliance on their parents in dealing with people and colleagues; as a result, they would be submissive or aggressive or isolated socially.

Logistic regression analysis was conducted for prediction of DLD due to environmental deprivation. Univariate analysis revealed multiple significant factors as number of hours that parents are present at home, the duration of time that the mother spends at work, the relation between the child and mother, the parents assign certain time to talk and play with their child, joint attention of the mother, mother asking her child what he/she wants, long time using multimedia, divorce as traumatic stress, bad social performance, and low socioeconomic status. Multivariate analysis was done and revealed that the long duration that the mother spends at her work and the less time the mother assign to talk and play with her child were the most precipitating factors on prediction of DLD due to environmental deprivation.

The current study's findings demonstrated that the majority of the case group's parent–child communicative interactions lacked the quality and quantity needed to create the stimulating and enriching environment required for language acquisition. This was evident in the interaction's significant positive correlation with a child's total language age. Topping et al. [23] found that it was evident from the majority of parent reports that the parents failed to create the perfect environment for their interactions with their children, and their communication style and responses to their children were poor.

Conclusion

The constructed Arabic questionnaire was proved to be valid, reliable, and homogenous and is likely to produce consistent responses in evaluating the variant environmental factors on language development among children with DLD due to environmental deprivation in the three surrounding communications levels.

Recommendations

The developed questionnaire should be used as a routine to minimize the existence of undiagnosed or misdiagnosed cases of DLD due to environmental deprivation and to consider environmental factors while planning the therapy program. Future research should focus on increasing the number of cases and study the effect of trained parents-child interaction on their child language development. Further researches are needed to assess the role of environmental factors on all causes of delayed language development.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s43163-024-00695-1.

Additional file 1: An Arabic Questionnaire of environmental factors affecting language development in children.

Acknowledgements
Not applicable.

Authors' contributions
HB made the design of the work, MFH analyzed and interpreted the patient data, AA was a major contributor in revising the integrity of the work, and AMZ was a major contributor in writing the manuscript. The manuscript has been read and approved by all authors, and they all contributed substantially in the research.

Funding
No funding.

Availability of data and materials
Available (the datasets used and/or analyzed during the current study are available from the corresponding author).

Declarations

Ethics approval and consent to participate
This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the institutional research board of Mansoura University (MS/16.08.45). Formal written consent from the children's parents was obtained.

Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.

Received: 31 May 2024 Accepted: 13 September 2024
Published online: 01 October 2024

References

1. Bishop DV (2000) How does the brain learn language? Insight from the study of children with and without language impairment. Dev Med Child Neurol 42:133–142
2. Clegg J, Ginsborg J (2006) The effects of socio-economic status on children's language acquisition and use. In: Clegg J, Ginsborg J (eds) In Language and social disadvantage: Theory into Practice. John Wiley And Sons, Ltd, New Jersey, U.S
3. Saleh E, Baz H (2010) Psychological factors affecting language development among mild mentally retarded children's. Egyptian journal of Psychiatry 31(2):25–32
4. Harden BJ, Whittaker JV (2011) The early home environment and developmental outcome for young children in the child welfare system. Child Youth Serv Rev 33:1392–1403
5. Safwat R, Sheikhany A (2014) Effect of parent interaction on language development in children. The Egyptian journal of otolaryngology 30:225–263
6. Abo-Hasseba A (2011) Standardization, translation and modification of Preschool Language Scale – 4. Unpublished M.D Thesis of phoniatrics presented by A.Abu-Hasseba. Faculty of medicine,Ain Shams University
7. Malika L (1998) Stanford Binet Intelligence Scale (4th Arabic Version), 2nd edn. Victor Kirles Press, Cairo
8. Doll CA (1965) Vineland Social Maturity Scale. Manual of directions. American Guidance services, Minneapolis
9. El-Gilany A, El-Wehady A, El-Wasify M (2012) Updating and validation of the socioeconomic status scale for health research in Egypt. East Mediterr Health J 18:962–968
10. Sirad A (2013) Impacts of television watching on the young child's developing brain Somalican Outreach Newsletter; 2168 – 5363
11. Wang SSH, Kloth AD, Badura A (2014) The cerebellum, sensitive periods, and autism. Neuron 83(3):518–532
12. Schore AN (2001) The effects of early relational trauma on right brain development, affect regulation, and infant mental health". Infant Mental Health J 1(2):201–269
13. Glascoe FP, Leew S (2010) Parenting behaviors, perceptions, and psychosocial risk: impacts on young children's development. Pediatrics 125:313–319
14. Al-Fadhli K, Al-Bunaian N (2015) Prevalence and social influences of delayed language development in preschool-age Saudi children International Journal of Science and Research (IJSR) ISSN : 2319–7064 Index Copernicus Value 78.96 | Impact Factor 6.391
15. Amato PR (2000) The consequences of divorce for adults and children. J Marriage Fam 62(4):1269–1287
16. Craigie T-A, Brooks-Gunn J, Waldfogel J (2012) Family structure, family stability and outcomes of five-year-old children. Families, Relationships, and Societies 1(1):43–61
17. Fagan P, Churchill A (2012) The effects of divorce on children MARRI 801 G St, NW Washington, DC 20001 202.393.2100 marri.us/effects-divorce-children
18. Raikes H, Green BL, Atwater J, Kisker E, Constantine J, Cohen RC (2006) Involvement in early head start home visiting services: demographic predictors and relations to child and parent outcomes. Early Child Res Q 21:2–24
19. Rosenberg J, Wilcox WB (2006) The importance of fathers in the healthy development of children 2006. Page 11 section
20. Hoff E (2003) The specificity of environmental influence: socioeconomic status affects early vocabulary development via maternal speech. Child Dev 74:1368–1378
21. Hoff E (2006) How social contexts support and shape language development. Dev Rev 26(1):55–88. https://doi.org/10.1016/j.dr.2005.11.002
22. Loeber R, Stouthamer ML (1986) Family factors as correlates and predictors of juvenile conduct problems and delinquency. In: Tonry M, Morris N (eds) In Crime and justice. University of Chicago Press, Chicago, IL, pp 29–149
23. Topping K, Dekhinet R, Zeedyk S (2011) Hindrances for parents in enhancing child language. Educ Psychol Rev 23:413–455

Publisher's Note