

# Documentation of delayed language development in Upper Egypt

## Original Article

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### ABSTRACT

**Purpose:** To identify the magnitude of delayed language development (DLD) cases, impairment-subtypes, and main risk factors within children referred to phoniatic and Neuropediatric Unit at Sohag University (PNUSU), Egypt. This will help in planning and implementing primary prevention strategies and in organizing public and health care awareness campaigns.

**Methods:** It is a hospital-based descriptive study where hospital records of all cases diagnosed as a language delay presented to PNUSU from January 1<sup>st</sup>, 2015 to December, 31<sup>st</sup>, 2015 were analyzed.

**Results:** Among 800 cases, DLD due to intellectual disability (ID) is the commonest type (34.4 %) followed by below average borderline intellectual (28.5 %). Risk factors study reveals that 66.7 % of studied children are males, 48.9 % of cases show a history of consanguineous marriage between parents and 20 % of studied children had a positive family history of language, speech, or learning problems. Perinatal and neonatal period risk factors appear most frequently as 54.3 %, and the predominant factor is Hyperbilirubinemia.

**Conclusion:** Reported data reflect the magnitude of language disorders problem in Upper Egypt that necessitates special attention from multi-disciplines toward consanguineous marriage and neonatal Hyperbilirubinemia as both are the highest incidence within investigated cases.

**Key Words:** Delayed language development, early identification, risk factors, sub-types

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## INTRODUCTION

Language development is a central feature of cognitive and social development in humans. Failure of normal language development interferes with a child's ability to understand the code, to produce the code, or both<sup>[1]</sup>. Children with expressive language disorders have difficulty in express their ideas using language. Children with receptive language disorders have difficulty understanding messages, while children with expressive-receptive language disorders have difficulty in both understanding and producing messages. These types of disorders are one of the most frequent developmental disabilities in pediatric populations to the extent that up to 5 % – 15 % of the children have delayed language development (DLD)<sup>[2, 3]</sup>. In actuality, DLD in children is a wide set of disorders with heterogeneous outcomes. Some of these children may have other developmental, sensory, or physical problems that explain their language difficulties, such as intellectual disabilities, hearing loss, brain damage, autism spectrum disorders (ASD), Attention deficit hyperactivity disorder (ADHD), environmental/

psychosocial deprivation or combination of two or more of these factors. Others have a primary delayed that no specific explanation for language delay is identified; these children are generally diagnosed as specific language impairment (SLI)<sup>[4]</sup>.

Studies have been exploring possible contributing biological and environmental factors as a way of predicting which children are most likely to have ongoing language problems. Thus, identifying the main risk factors related to the children and their parents associated with language pathology may provide a useful guide for the early identification of children who may someday develop any kind of language disorder. Moreover, developmental screening and early identification is critical in minimizing the adverse long-term consequences and in optimizing speech and language development<sup>[5-7]</sup>. As language development provides a central role in learning and social relationships, children with language delays are at increased risk for different type of learning disabilities<sup>[8-10]</sup>, emotional, social, and behavior problems<sup>[11]</sup>. In adulthood, children who had language delayed may hold lower skilled jobs

or unemployed compared to control children<sup>[12]</sup>. There are also economic impacts of rehabilitation, special education services, underemployment, and unemployment<sup>[4, 13]</sup>.

Unfortunately, reliable data with respect to the magnitude, the categories, the nature of language disorders, as well as the possible risk factors are not available in most of the developing countries. A condition that constrains planning prevention and early rehabilitation services of these children. These services and plans are, in fact, pivotal for improve the language skills and reduce the functional impact of persistent disorders. This issue is very severing in Upper Egypt due to the scarcity of proper awareness and health care programs pertaining to this type of disorders. Thus, the prime objectives of this study are: (i) to collect reliable data about the number of children referred to the phoniatic and Neuropediatric Unit at Sohag University (PNUSU), Egypt during the physical year 2015; (ii) to identify the percentage of different language disorders subtypes; (iii) to detect the socio-demographic characteristics and their possible risk factors. Identifying risk factors that may predispose to communication delays or disorders in infants is an important priority to strengthen primary prevention strategies.

## MATERIAL AND METHODS

### 1. Research design

The current research is a hospital-based descriptive study where hospital records of all cases of language delay presented to the PNUSU from January 1<sup>st</sup> 2015 to December 31<sup>th</sup> 2015 were reviewed to determine trends, causes and determinants of their language delay among these patients. Choosing the hospital records of such year was based on completeness of the patients' data in these records.

### 2. Participants

The hospital records of all children who were definitely diagnosed as DLD during 2015 were reviewed and included in the study.

### 3. Study instrument

A structured form of two sections was designed to extract the needed information from the selected hospital records. The first section included socio-demographic data of the children and their parents (i.e., age, gender, residence, maternal age and job, parental consanguinity, number of children in the family, and birth order of the studied child). The second section included detailed prenatal, natal, and postnatal history especially the potential risk factors for language presence of neonatal disorders such as postnatal hyperbilirubinemia (serum bilirubin level, treatment), history of hypoxia, respiratory distress, infections, seizures, admission to a neonatal intensive care

unit (NICU) (causes and duration of admission), milestone of development and illnesses of early childhood. Detailed data about the parent-child language interaction were also included. More specifically, the second section also included the following: (i) language assessment using a standardized tests for language scale and quantitative measures of communication difficulties, determined by age<sup>[14]</sup>; (ii) formal testing for psychometric evaluation that was done using the Vineland social maturity<sup>[15]</sup>; (iii) cognitive performance that was routinely evaluated by Stanford Binnet Intelligence Scale 4<sup>th</sup> Arabic version for determination of intelligence quotient (IQ) (scores are given for verbal, performance, and global IQ<sup>[16]</sup>); (iv) a battery of selected investigations (e.g., childhood autism rating scale (CARS) and Attention Deficit Hyperactivity disorder Test (ADHDT)<sup>[17]</sup> and based on Diagnostic and Statistical Manual Disorders, Fourth Edition (DSM-IV)<sup>[18]</sup>; (v) hearing sensitivity evaluated in audiological department at Sohag University, Egypt; (vi) electroencephalography and neuroimaging (CT and MRI) computed tomography; and (vii) thyroid function and other laboratory assessment done when only indicated.

### 4. Ethical considerations

This work complies with the ethical standards of the relevant regional and institutional guidelines on human studies and with the Declaration of Helsinki.

### 5. Statistical analysis

All statistical analyses of the current study were carried out using the SPSS software for Windows (version 16.0, Chicago, IL, USA). Sample characteristics mean and standard deviation (SD) were used in summarizing variables while percentages were used for categorical variables.

## RESULTS

A total of 800 Arabic speaking Egyptian children with DLD presented to the clinic through a year were enrolled in the present study. The children's ages ranged between 18 months to more than 60 months. As shown in (Table 1), 66.7 % of the studied children were males (533 cases) and 75.9 % were residing in urban areas (607 cases). The data presented in (Table 1) indicates that only 13.6 % of the studied cases presented for medical advice in the first two years while 30.8 % of the cases presented at age between 2 and 3 years and 55.6 % presented after 3 years of age.

A closer look to the distribution of different types of DLD in those children (Table 2), revealed that, the commonest type (275 cases; 34.4%) was DLD due to Mental Retardation (MR) or intellectual disability/intellectual developmental disorder (ID/IDD). The ID/IDD is a new

terminology introduced by the American Psychiatric Association diagnostic and statistical manual, 5<sup>th</sup> Edition (DSM-5)<sup>[1]</sup>. Other delayed language subtypes of the studied samples were: below average borderline intellectual functioning, hearing impairment, environmental, SLI, brain damaged motor handicapped, autism spectrum disorders were 28.5 %, 21.5 %, 7.5 %, 3.5 %, 2.4 %, 1.75 %, respectively. The lowest reported cases were for ADHD (0.5 %). In general, all different language delayed subtypes showed a clear predominance of male over female as shown in (Figure 1) and the corresponding data listed in (Table 2).

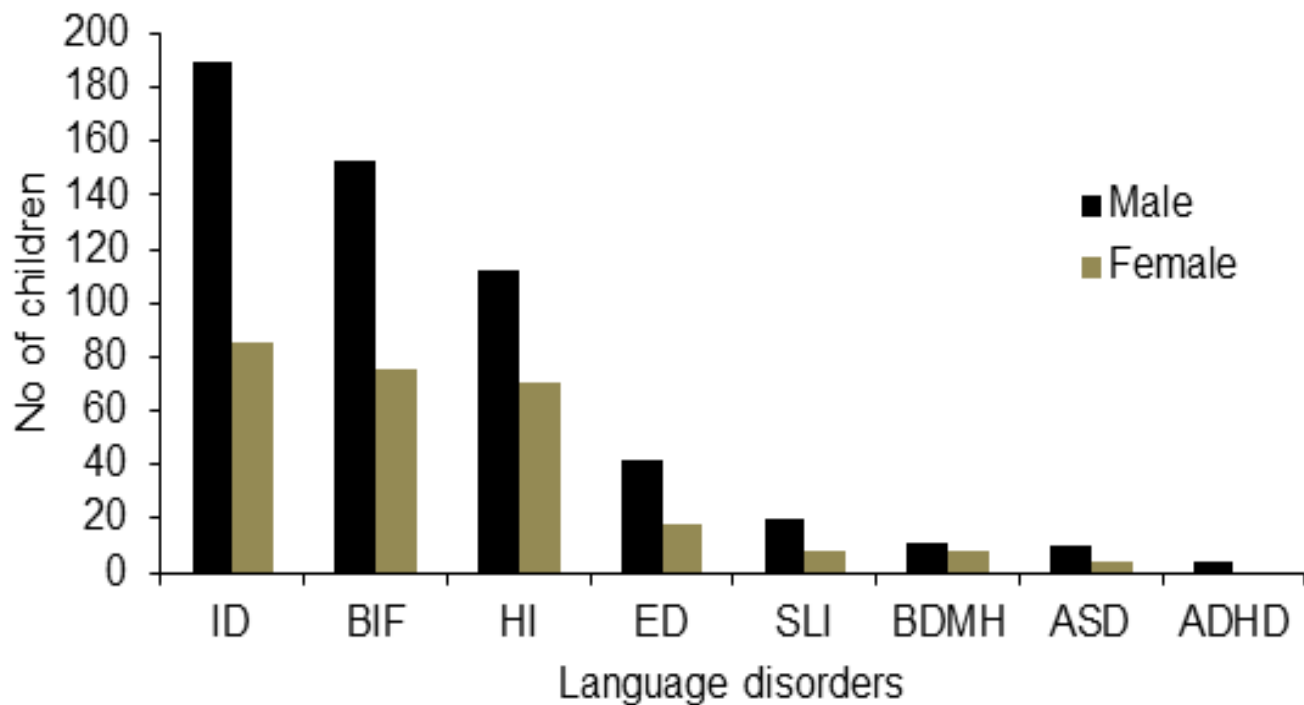
**Table 1:** Socio-demographic data of the studied cases of delayed language

Characteristic	Summary statistics, Number (%)
Age	
≤ 2 years	109 (13.6)
Between 2 and 3 years	246 (30.8)
Between 3 and 5 years	280 (35.0)
≥ 5 years	165 (20.6)
Gender	
Male	533 (66.7)
Female	267 (33.3)
Locality	
Urban	607 (75.9)
Rural	193 (24.1)

**Table 2:** Distributions of the studied cases of language delay with respect to subtypes and gender

Subtypes	Male		Female		Total	
	No	%	No	%	No	%
Intellectual disability	190	69.1	85	30.9	275	34.4
Below average mentality	153	67.1	75	32.9	228	28.5
Hearing impairment	112	65.1	70	40.7	172	21.5
Environmental deprivation	42	70.0	18	30.0	60	7.5
Specific language impairment	20	71.4	8	28.6	28	3.5
Brain damaged motor handicapped	11	57.9	8	42.1	19	2.4
Autism Spectrum Disorders	10	71.4	4	28.6	14	1.8
ADHD	4	100	0	0.0	4	0.5

According to the performed IQ tests values, intellectual disability (ID) cases had been further classified into mild, moderate, severe, and profound. (Figure 2) shows that the percentage of the ID of mild-type (160 cases from a total of 275 MR cases) is 58.2 %, the moderate is 24.7 % (68 cases), the severe is 11.6 % (32 cases), and the profound is 5.5 % (15 cases).



**Fig. 1:** Distribution of the studied cases of language delay with respect to subtypes and gender; Intellectual disability (ID); Borderline intellectual functioning (BIF); Hearing Impairment (HI); Environmental Deprivation (ED); Specific Language Impairment (SLI); Brain Damaged Motor Handicapped (BDMH).

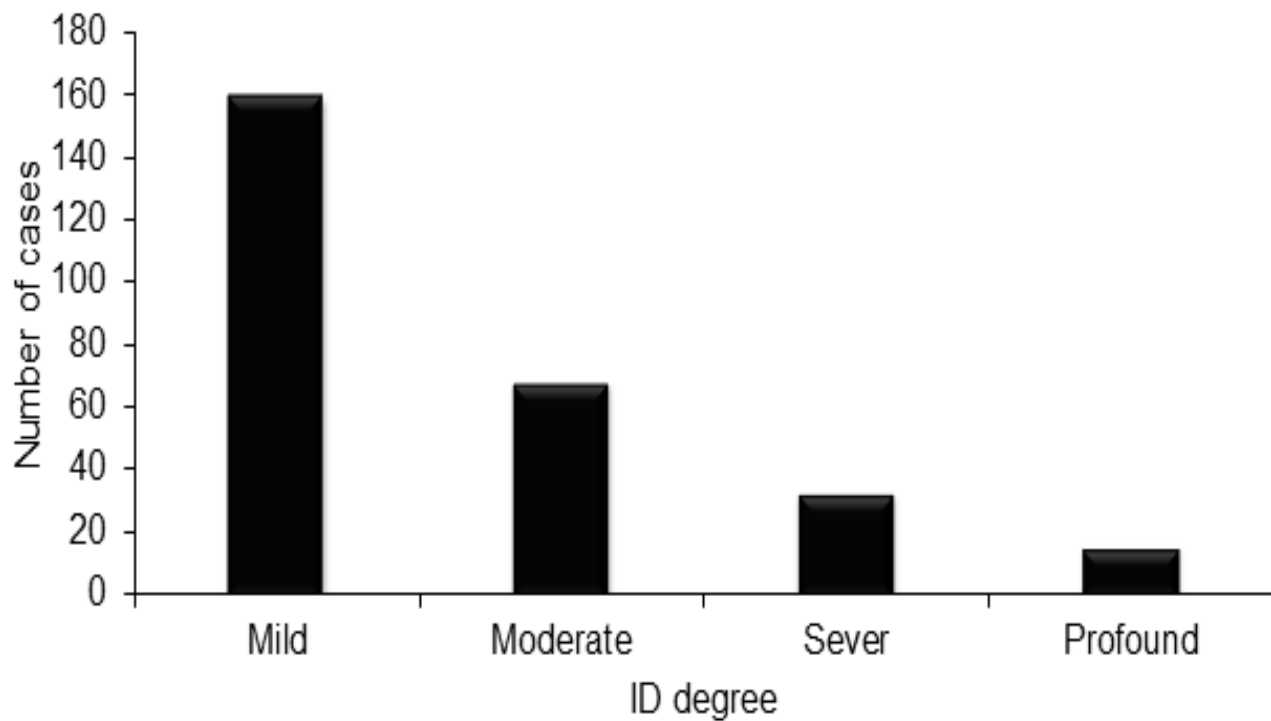


Fig. 2: Intellectual disability (ID) cases classified into mild, moderate, severe and profound according to intelligence quotient (IQ).

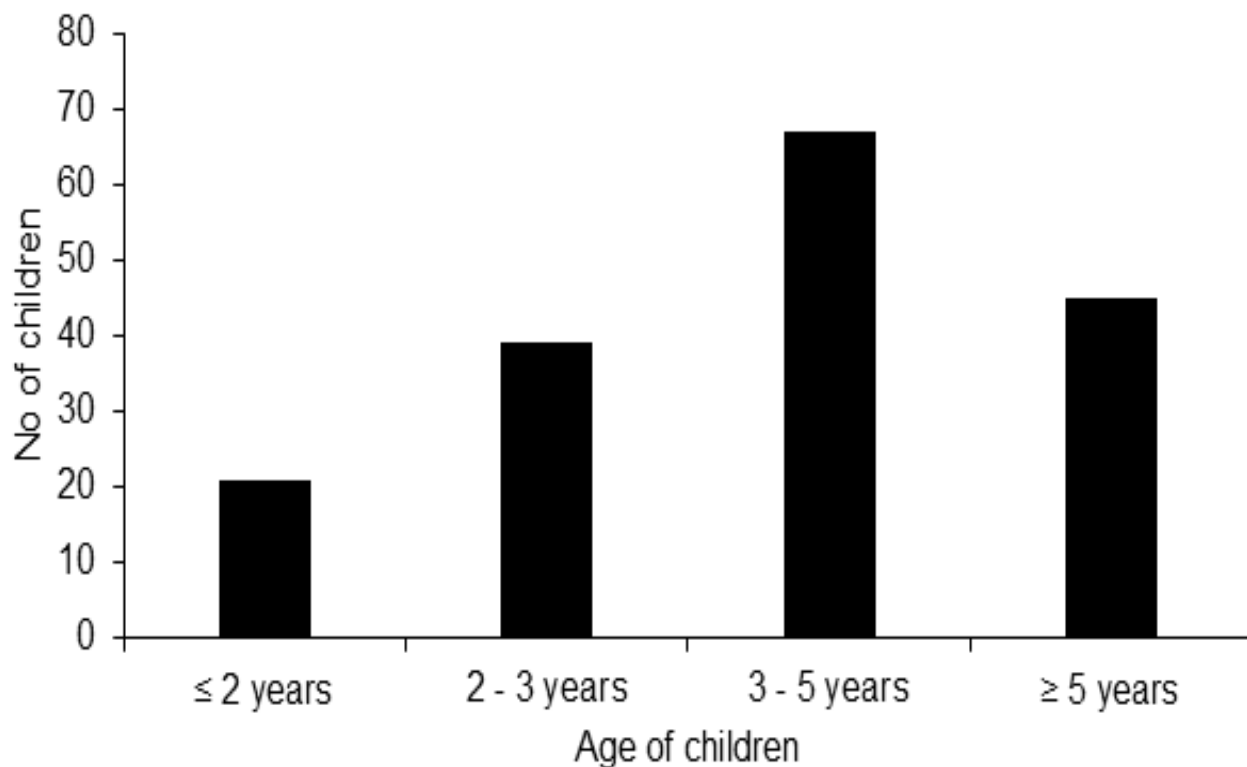


Fig. 3: Distribution of the ages of the studied cases of hearing impairment.

Specific concern had been paid for the presentation age of hearing impaired cases (Figure 3). Among the 172 cases (Table 2) of hearing impairment, 67 cases (39.0 %) were presented between 3-5 years, 45 cases (26.2 %) after 5 years, 39 cases (22.7 %) between 2-3 years, and only 21 cases (12.2 %) before two years.

Another domain of this study was to identify the possible contributing biological and environmental risk factors related to the children and their parents associated with language delayed. (Table 3) displays distribution of the studied cases of language delay with respect to possible familial risk factors. 48.9 % (391) of cases had a history consanguineous marriage between parents and 20 % of

studied children had positive family members who were late to talk or had language disorders, speech problems, or learning problems. Referring to the number of children in the family, more than half of the cases (53 %) belonged to families having between 2-3 children, 38 % of them had more than 4 children while 9 % of the families had only one child. It was observed that 90.2 % of the mothers were housewives, and only 9.8 % were working.

**Table 3:** Distributions of the studied cases of language delay with respect to familial possible risk factors

Characteristic	Summary statistics	
	No.	%
Consanguinity		
Yes	391	48.9
No.	409	51.1
Presence of sisters and brothers		
Alone	71	9.0
With sisters and brothers	729	91.0
Birth order of the child		
First	260	33.0
In between	232	29.5
Last	298	37.3
Twins	10	1.25
No of children in the family		
1	71	9.0
2 – 3	424	53.0
≥ 4	305	38.0
Family history		
Yes	164	20.0
No	636	80.0
Maternal age		
14 – 24 years	354	44.4
25 – 35 years	394	49.4
≥ 36 years	52	6.2
Working status of the mother		
housewife	719	90.2
Working mother	81	9.8

The pre, the peri, and the postnatal period's risk factors were also analyzed and the pertaining data were illustrated in (Table 4). It was interesting to notice that in these periods, the perinatal and neonatal risk factors appeared most frequently in the studied cases as 54.3 % (434 cases) of the total number of cases. Moreover, the predominant risk factor in this period was the Hyperbilirubinemia that had been reported in 264 cases (61.8 %). Weak or no crying after birth or slow to cry was the second detected risk factors, followed by mixed factors (where more than one risk factor were evident). At a lower percentage, there were vacuum assisted vaginal, placental complications, cord complications and precipitate delivery. Referring

to the postnatal period, history of seizures and surgery were the commonest factor among other factors. For the maternal risk factor, pre-eclampsia and oligohydramnios or polyhydramnios were noted to be the most frequent factors.

**Table 4:** Maternal, Perinatal and neonatal and postnatal risk factors in the study group

Factors	Number	% from the total		
Maternal	Pre-eclampsia	13		
	Oligohydramnios or polyhydramnios	9		
	Hypertension	3		
	Anemia	2		
	Diabetes Mellitus	1		
	Bronchial asthma	1		
	Heart disease	1		
	Convulsion	1		
	Fever	1		
	Drugs (anti-depressant)	1		
		Total = 33	4.13 %	
	Perinatal and neonatal	Hyperbilirubinemia ( kernicterus)	264 (4)	61.8 %
		Weak or no crying after birth or slow to cry	45	
Mixed risk factors		33		
Abnormal presentation		18		
Prolonged labor (obstructed labor)		17		
Birth weight and size		14		
Twins or multiple birth		10		
Respiratory distress (RDS)		8		
Premature rupture of membranes (PROM)		7		
Prematurity		5		
Vacuum assisted vaginal		3		
Placental complications		3		
Cord complications		2		
Precipitate delivery	1			
	Total= 434	54.3 %		
Postnatal	Seizures	16		
	Surgery	9		
	Hypothyroidism	4		
	Anemia	4		
	Heart defect	3		
	Total = 36	4.5 %		

## DISCUSSION

Actually, there are no available data about the magnitude, sub-types, as well as the possible risk factors related to delayed language development in most of the developing countries, especially Upper Egypt. Having reliable data considered to be the main stone to constrain planning prevention and early rehabilitation services of these children.

Among the 800 cases of DLD presented through a year, 533 cases (66.6 %) were boys to be more prone to language disorders and to different language delayed subtypes, in agreement with both national and international literature [6, 17, 19-24].

In fact, being male is considered as an important risk factor for language disorders. This may be explained by the slow maturation of the nervous system, the effect of testosterone that stops cell death and makes the proper connections difficult<sup>[25]</sup>. Therefore, boys might have a more severe language difficulty than girls and have a higher rate of referral<sup>[21-22]</sup>.

In fact, early identification and intervention of a child's language problems are internationally well-acknowledged as they prevent the negative impact and offers better quality of life for the children and their parents which also cost the government less in the long run. In this study, more than half of cases (55.6 %) were presented for our clinic after 3 years of age while 13.6 % of the cases only were presented in the first two years. Thus majority of the children presented while the critical period for language acquisition and development due to greater neuronal plasticity, has already passed.

Researches confirmed that regardless of the cause of language delay, early identification of speech-language delayed (below 3 years old) is a precondition for early intervention and therefore preventing and/or minimizing the associated problems in communication, literacy and cognition and optimizing speech and language development<sup>[5-7]</sup>.

In the current study, it is noticed that the parents often wait until the child reach 3 years or even more before asking an evaluation for a child who is not talking which is regretfully advised by clinics and/or relatives. Therefore, we urgently need to increase the knowledge of general population and health professionals, such as pediatricians, nurses about normal and impaired language development and confirm the great importance of early identification and early intervention for DLD.

Another worthy finding in this study is that high percentage (75.9 %) of children were from urban areas while only (24.1 %) from rural areas. In contrast,

Aboul-Oyoun epidemiological study of communication disorders in Assiut, Upper Egypt, found that the communication disorders were more common in rural areas than urban areas<sup>[26]</sup>. However, we cannot generalize or compare their findings with our results as the current study directed their survey to the children with language problem that referred to our clinic seeking professional advice and treatment. It stills the low percentage of cases from rural areas may indicate a lack of education and or availability of services. Brown *et al.* Stated that poverty, lack of knowledge, is a risk factor for both language delay and failure to access appropriate therapies<sup>[27]</sup>. Thus, more attention should direct for the rural areas with respect to the services and planning to raise awareness about DLD.

A closer look to the distribution of different types of DLD reveals that delayed language due to mental retardation or intellectual disability (ID) was the most common clinical diagnosis encountered in the current cases in agreement with the recent study by Abou-Elsaad *et al.*<sup>[24]</sup>. In fact, it is an important issue for services to estimate the severity of ID cases. According to Salvador-Carulla *et al.*, (2011) ID can be further classified into mild, moderate, severe and profound according to intelligence quotient (IQ)<sup>[25]</sup>. In this study, sever and profound ID was of 17.1 % (47 cases out of a total of 275 children presented in a year with ID). Actually, severe and profound levels have a higher risk of developing health problems and medical complications, and most of them need pharmacological treatments for long term<sup>[26-27]</sup>, as well as a high prevalence of them are severely limited in their ability to understand or comply with requests or instructions, and require intensive constant training and support in various life aspects.

The second common reported subtype was the DLD due to borderline intellectual functioning (BIF) or below average mentality. In fact, delayed language with borderline or below average IQ is barely used as a separate subtype of DLD. In the current study, BIF was viewed as a separate entity as it was noticed that it expresses independent language affection and prognosis. BIF is a controversial and a marginal clinical entity that remains to be clearly defined and for that targeted diagnostics and therapeutic approaches do not exist<sup>[28,29]</sup>. Abou-Elsaad *et al.* reported that below average DLD subtype was the third commonest cause of DLD among studied children and their study is considered one of the very few papers used the term below average mentality language delayed as a separate entity<sup>[24]</sup>.

The third commonest DLD subtype was that due to hearing impairment. It is interesting to notice that more than two-thirds of the children with hearing impaired were using cochlear implant (125 child 72.7 %), while only 47 children (27.3 %) were using hearing aids. The aforementioned high number of hearing-impaired cases compared to previous studies<sup>[24-30]</sup> focused on Upper Egypt children may be attributed to the recent establishment of a specialized cochlear implant unit at Sohag that offers

services to most of the Upper Egypt governorates including Sohag, Assuit, Qena, Luxor, Aswan, and Red sea.

Nevertheless, even with continuous improving medical services applied for hearing impaired child, the late presentation of children is still a problem that hampers better prognosis. The current study shows that about 65% of children presented above 3 years of age. This would direct the attention to the importance of the early identification by hearing screening. It was also noticed in a good percentage of hearing impaired cases that the parents have no idea that if the child diagnosed early and wear hearing aids regularly with language rehabilitation lead to better prognosis and the child can developed near normal hearing child. Some parents have false believes that child with hearing loss mostly will be deaf mute child. In fact, the increase of the awareness of the parents as well as the health professionals about the importance of the early identification and intervention is urgently needed.

Identifying the main risk factors related to language pathology is mandatory for early identification and important priority to strengthen primary prevention strategies. Consanguinity was the most reported associated risk factor after male gender in the present work. Forty-nine percent (392) of cases showed history of consanguineous marriage between parents in agreement with the results of Meliegy and Sabbagh who reported that positive consanguinity was of 43 % of the total considered cases<sup>[30]</sup>. In comparison between different DLD subtypes, 68 % of the total hearing impaired children were from consanguineous parents. The great incidence of consanguineous marriage in our cases highlight the importance of increase the public awareness on congenital and genetic disorders in offspring derived from consanguineous marriage and the importance of genetic counseling.

In similar to previous studies, the current study showed that more than 20 % of studied children have a positive family history<sup>[19, 31]</sup>. Moreover, the positive family history incidence is higher among hearing impaired children in comparison to other DLD cases as 38 % from total hearing impaired cases (66 of 172 hearing impaired cases) showed positive family history. The impact of family history may be related to genetic or environmental influences, or to a combination of both.

Interestingly, 90 % of the mothers were housewives. However, this fact does not guarantee the quality of the time spent in situations of mother-child interaction. Most of the women did not report playing with their children, or telling them stories, for instance. Time is spent with physical care: food, and hygiene. The lesser occurrence of being the only child was observed (9 %). Some studies pointed out that the only child becomes both the target of high parental expectations, usually oriented to the first-born, and receives typical favors and care<sup>[32]</sup>. In the present

study, later born children were more likely to have DLD than children of first born in agreement with previous studies<sup>[33-34]</sup>.

Among the various risk factors examined in the current study, the risk factors of the pre, peri, and postnatal periods were considered. The higher incidence reported here were the perinatal and neonatal risk factors (52.5 %). Moreover, hyperbilirubinemia was the major reported factor. Bhutani and Johnson-Hammerman reported a significant correlation between neonatal hyperbilirubinemia in the absence of classical kernicterus and speech and language abnormalities in their review. Also they stated that the total serum/plasma bilirubin (TB) level is not the most precise indicator of neurotoxicity<sup>[35]</sup>. Thus, extensive study correlates bilirubin exposures to language development of children are needed as the available data are markedly limited. Moreover, the current study showed that in the pregnancy period, pre-eclampsia was the highest elicited risk factor among maternal causes.

## CONCLUSIONS

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A total of 800 Arabic speaking Egyptian children with DLD referred to the Phoniatic and Neuropediatric Unit at Sohag University, Egypt during the physical year 2015 were examined and investigated to determine causes and determinants of their language delay. The most consistently identified risk factors among participated cases were male gender, consanguinity, hyperbilirubinemia, family history of speech and language delay. Such factors should be taken into account during educational programs and services and to help for early identification and intervention of language problems.

Besides, the reported data could explain how much we need a crucial plan for multilevel and integrated programs to raise awareness about the language development disorders in Upper Egypt. It is important to emphasize the great importance of early identification that permits enrollment in an early intervention programs and never wait until children are  $\geq 3$  years of age to evaluate their delayed language.

### *Future directions*

Further study including control group are needed to better understand the strength of association and possible causative factors and their relationship with the different language disorders subtypes.

## CONFLICT OF INTEREST

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There are no conflict of interest.

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