

ORIGINAL ARTICLE

Association between Delayed Speech in Children and Allergy

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ABSTRACT

Key words:

Allergy, delayed speech, immunotherapy

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Background: Speech and language delay in children present with delayed milestones and therefore difficulty with expression initially, as well as social skills, reading and writing. The cause of delayed speech is difficult to determine in many cases. **Objective:** to study the role of allergy that would influence the speech delay in children. **Methodology:** This study was conducted at the Pediatrics Department in Suez Canal University Hospital, Faculty of Medicine, Ismailia, Egypt from June 2016 to March 2019 on 52 children from both genders suffering from delayed speech. Sublingual immunotherapy was given for all patients for 5 months. Skin Prick test, serum Immunoglobulin E and speech assessment were performed before and after treatment. **Results:** There was a significant improvement in the number of words children used as well as the number of phrases they produced. **Conclusion:** There is a relationship between allergic inflammation and delayed speech.

INTRODUCTION

Speech is defined as verbalization, or production of language whereas the actual processing of communication is referred to as language, which may be receptive (understanding) or expressive (ability to convey thoughts and feelings)¹. The process of speech development starts by age of 6 months till the age of 5 when the child has the ability to count, name colors and compose clear phrases².

Developmental speech and language delay, expressive language disorder, and receptive language disorder are all examples of primary speech and language delay include⁽¹⁻²⁾. Children suffering from delayed speech need medical consultation if at the age of 18 months just say less than 6 words, at age of 2.5 years no more than 3 sentences and at the age of 4 remain unintelligible³.

Slow speech and language acquisition is a very common presentation that causes concern to parents and caregivers. The diagnosis of this complaint is very complex because of multiple factors that may be involved, including extremes within normal variation, presence of more than one etiology involving both primary and secondary delay, as well as an extensive list of differential diagnosis. Advanced diagnostic testing including cranial imaging and genetic analysis have also enhanced the possibilities of early diagnosis and management⁴.

In our setting where only basic testing is feasible, the exact cause of speech delay was very difficult to determine. In this study we focused on patients who had both speech delay and confirmed allergies. An

association between food allergies has been linked to other disorders. With increasing prevalence of allergies and asthma, there are emerging theories of correlation between allergies and autistic spectrum disorders (ASD)⁵⁻⁶. A recent study found a high correlation rate in 92,642 children between atopic dermatitis (AD) and ASD⁷. Theoharides⁸ suggested that the mechanism for this association may involve brain mast cells in Broca area that are activated allergens, resulting in local brain inflammation.

There is less research on a potential association between allergies and speech delay. A recent cross-sectional study was conducted on 639 children with speech and language delay. The authors reported that children with language delay had a higher incidence of AD symptoms. The question is whether allergy plays a role in the occurrence of speech and language delay⁹.

Cow's milk allergy (CMA) is IgE-mediated that occurs within minutes up to an hour after the exposure to milk proteins (caseins)¹⁰. It is considered one of the major constituent to food allergy that affect infant and may persist to adulthood¹¹⁻¹². The prevalence of CMA ranges between 1 and 17.5%, 1 and 13.5%, and 1 to 4% in preschoolers, at children 5 to 16 years of age and adults respectively¹³.

Sublingual immunotherapy (SLIT) plays a pivotal role in treating allergy as it switches the immune response to Th2, increases T regulatory cells (Treg) production, and as a consequence decreases mast cells and basophils, decreases food specific IgE antibodies and increases food-specific IgG4 antibodies¹⁴.

Considering the possible association between allergies and delayed speech, we conducted this study whereby we assessed whether the management of

diagnosed allergies with SLIT would result in an improvement in speech.

METHODOLOGY

This study was design conducted in the Pediatrics Department, Faculty of Medicine , Suez Canal University Hospital; Ismailia, Egypt from June 2016 to March 2019. As a pilot study we chose a convenience sample of 52 children. Inclusion criteria included age 1.5 to 5 years, both genders, a diagnosis of speech delay made by their pediatrician, no improvement over the past 6 months, and a diagnosed allergy.

We excluded expressive language disorder, receptive language disorder, cleft lip, tongue tie, cerebral palsy, deafness, maturational delay, environmental deprivation and neglect, autism and those with had past history of SLIT.

A control group of 52 children with an age range from 1.5 to 5 years suffering from delayed speech and on speech therapy only were included in the study. Neurological examination and ENT examination are conducted to all patients to exclude any mental disorder or deafness. Informed consent was obtained from all parents. The patients were not exposed to any unnecessary testing or treatment.

Skin Prick Test:

Allergy was diagnosed via a skin prick test for the following allergens was performed: house Dust (HD) , House dust Mite (HDM), Cockroach, Mix pollen, Mix feather, Pigeon, Aspergillus Fumigatus, Timothy Grass, Sheep Wool, Hay Dust, Latex, Tobacco, Mix Mould, Dog Epithelium, Cat Epithelium, Bermuda grass, Alternaria Tenuis, Aspirin, Banana, Egg, Strawberry, Salonecea, Mix fish, Mango, Maize, Soya bean, Wheat, Cocoa, Mix nuts, Olive leave, Spices, Milk was performed and the serum level of total Immunoglobulin (Ig) E were performed prior to and after five months of treatment.

Assessment of Speech and Language

A baseline basic speech and language assessment was performed. There was focus on two aspects: number of spoken words understood by parents and family members, as well as number of phrases made of at least 2 words, once again understood by parents and family members.

All patients received SLIT drops for five months according to skin reactivity. Allergen extracts were serially diluted to five concentrations according to weight /volume (w/v) ratio into:(1:50000 w/v,1:5000 w/v,1:500 w/v,1:50 w/v,1:5 w/v).

This assessment was repeated once again after the treatment for allergy was completed.

Statistical analysis

Gathered data was processed using SPSS version 20 (SPSS Inc., Chicago, IL, USA). Quantitative data was expressed as means \pm SD while qualitative data was expressed as numbers and percentages (%). Student t test and ANOVA test used to test significance of difference for quantitative variables and Chi Square used to test significance of difference for qualitative variables. A probability value of p -value $<$ 0.05 was considered statistically significant.

RESULTS

The demographic characteristics of the children in this study showed that the age range from 1.5 yrs. and 5 yrs. with a mean of 2.8 ± 1.4 and with a predominance of male children: 44 versus 8 female children (84.6% versus 15.3%, respectively). 30.7% (16 children) of the studied population were from rural areas, while most of them (36) 69.2% were from urban areas. For the maternal history, 20 (38.4%) mothers delivered via caesarian section (CS) and 32(61.5%) delivered normally. All the children were breast fed, took colostrum and continued their schedule of immunization.

For all the children, there was no family history of speech problem or delay in their families. All of them had normal growth and development apart from speech delay with no history of medical problems, hospital admission, hearing problems or treatment for any other conditions besides the allergy.

As part of our history we asked parents how much of the time they and their family members understood their child's speech. As seen in (table 1), the highest percentage of parents could understand the words pronounced by their children in 50-75% of the time, while other family members could only understand the children in 25-50% of the time.

Table 1: Percentage of understood speech by parents and family members

	Number and Percentage of Parents understanding child speech	Number and Percentage of family members understanding child speech
0-25%	0	0
25-50%	8(15.3%)	32(61.53%)
50-75%	7(53.8%)	20(38,46%)
75-100%	16(30.7%)	0

Table 2 demonstrates that many children had multiple allergies with the most common ones being salonecea, soya beans, milk and straw.

Table 2: Type of allergens among the studied patients (n=52):

Allergen	Studied population (n=52)	
	No.	%
Salonecea	24	46.1
Soya Bean	20	38.4
Straw	20	38.4
HDM	20	38.4
Milk	20	38.4
Latex	12	23.1
Mix Feather	12	23.1
Pigeon	12	23.1
HD	12	23.1
Mix Nut	12	23.1
Hay Dust	12	23.1
Sheep Wool	8	15.4
Cockroach	8	15.4
Tobacco	8	15.4
Cat Epithelium.	8	15.4
Mix Mould	8	15.4
Olive Leave	8	15.4
Bermuda Grass	4	7.6
Peach	4	7.6
Cocoa	4	7.6
Wheat	4	7.6
Mix Pollen	4	7.6
Dog Epithelium	4	7.6
Maize	4	7.6
Mix Fish	4	7.6
Timothy Grass	4	7.6
Banana	4	7.6

After 5 month of sublingual immunotherapy there was a significant improvement in the level of total IgE as well as the number of words and phrases spoken by children (table 3). The mean number of words used by the children increased in all our patients with varying rates of improvements. The spoken words increased from 11.8 to 23.6 words with a statistically significant *p* value of 0.02. Similarly, the number of phrases increased from 13.2 to 38. This contrasts with the 6 months prior to initiation of SLIT where there was no improvement in number of words and phrases.

Table 3: Effect of immunotherapy on speech improvement and total serum level of IgE (n=52):

	Before Immunotherapy	After Immunotherapy	<i>P</i> value
Total IgE	18.2	25.1	0.01*
Number Of Words Used By Child	11.8	23.6	0.02*
Number Of Phrases Child Produce	13.2	38	0.02*

*Statistically significant: <0.05

DISCUSSION

Although the results of this study cannot be generalized, they not only support a possible association between allergy and speech delay, but also suggest a possible causal relationship in that alleviation of allergy, as measured by total IgE levels, also improved language acquisition.

Speech delay as a disorder warrants further study, foremost because it is more common than previously expected, with an Australian study conducted on 12,388 children aged 0–14 years reporting a rate of 1.7%¹⁵ and an American study conducted on 337,285 children aged 2–17 years reporting a rate of 2.4%¹⁶.

Another reason that these results may be of clinical significance. There is a postulation of an association between childhood allergy and speech disorder due to the effect of allergic reaction mediated through IgE production and Th2 cytokine profile¹⁷⁻¹⁸. These cytokines induce behavioral and emotional neurocircuitry as they cross the blood–brain barrier¹⁹ through increasing activation of the anterior cingulate cortex (ACC)²⁰ that is active during speech process²¹ as repeated inflammatory reaction can increase the risk of speech disorders in children who suffer from allergy²²⁻²³.

In our assessment of children on speech therapy only without SLIT, there was no improvement in their condition over the past 6 months. Our results are in agreement with those reported by Strom and Silverberg¹⁵ where they found that speech disorders are significantly associated with asthma, hay fever and food allergies. With asthma, there was also a dose-response pattern. This association was present independent of associated sleep disturbance or ADD (attention deficit disorder), although these cofactors did increase the risk of a speech disorder. The authors postulated that the relationship between food allergy and speech disorders may occur either directly because of increased allergic inflammation or indirectly via chronic otitis media²⁴⁻²⁶.

Immunotherapy is the one of the best solutions for treatment of allergic manifestations in addition to other medical treatment. Several case reports recorded the improvement of vocal quality of a patient after taking immunotherapy by lowering prevalence of vocal symptoms than those who have not²⁷. From these findings as well with our results it is clear that allergic inflammation has an impact on speech-related neurocircuitry. Future experimental and prospective clinical studies are still needed to determine the precise relationship between speech disorders and allergic disease.

CONCLUSION

Our results suggest that there is a causal relationship between allergic inflammation and speech delay. This is the first study we could find in the literature that reports improvement of speech delay with immunotherapy for allergies.

Conflict of interest:

- The authors declare that they have no financial or non financial conflicts of interest related to the work done in the manuscript.
- Each author listed in the manuscript had seen and approved the submission of this version of the manuscript and takes full responsibility for it.
- This article had not been published anywhere and is not currently under consideration by another journal or a publisher.

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