Effect of Bilateral Chronic Secretory Otitis media on Childhood Autistic Rating Score (CARS) Test.

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Abstract: The purpose of this work was to investigate the impact of bilateral chronic Secretory Otitis Media (S.O.M) on childhood autistic rating score in delayed language development children.**:** This study included 140 children having bilateral chronic secretory otitis , autistic feature and Delayed language development (DLD) in addition to 40 normal hearing, autistic feature children with DLD as a control. All children under the study came to Phoniatrics clinic in the period between 2007 to 2010, complaining from delayed language development with autistic features. Children in this study were classified into 2 groups; control and study groups. The study group was subdivided into 3 subgroups according to their hearing threshold level. All children were subjected to Childhood Autistic Rating Score (CARS) and Psychometric evaluation. Obtained results revealed that Children who had high hearing threshold level, found to be had high score at CARS with as, there was increase in the severity of CARS scores increasing hearing threshold level. In conclusion bilateral chronic Secretory Otitis Media can affect the severity of CARS results together with its obligate change borderline CARS score into autistic one.

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1. Introduction

Autism firstly is described as a complex developmental disorder characterized by severe impairment in reciprocal social interaction and communication and by a pattern of repetitive or stereotype behavior (***American Psychiatrics Association, 2000)***. Autism Spectrum Disorder (ASD) is a diverse disorder that presents symptomalogy across sensory modalities such as auditory, tactile, speech and language, cognitive, and grossmotor. Specific patterns in sensory processing deficits have been found in children with ASD and suggest the importance of investigating specific modalities/domains of sensory function ***(Lane et al., 2010).***

Autistic disorder is subsumed under the Diagnostic and Statistical Manual of Mental Disorders, 4th Edition (*DSM-IV)* category, pervasive developmental disorders (PDDs), and a group of disorders that are distinguished from other psychiatric disorders by the presence of deficits in reciprocal social behavior, variously accompanied by deficits in communication ***(Fombonne et al., 2001),*** (and/or repetitive or stereotyped behaviors (***Beglinger and Smith, 2005)***. With the exception of Rett syndrome (a rare disorder caused by a point mutation on the X chromosome) PDDs affect males more commonly than females (prevalence ratio, 4:1 ***(Fombonne et al., 2001),***

The diagnostic criteria for autism require the presence of 6 symptoms from 3 categories, impaired reciprocal social interaction (at least 2 symptoms), impaired communication, and restricted, repetitive, or stereotyped behaviors. These criteria reflect the central role of deficits in social behavior in children with (ASDs), (***Beglinger and Smith, 2005)***. One of the earliest and most important predictor of Autism is the failure to develop joint attention (***Volkmar et al., 2005)***.

Abnormal behavioral responses to auditory stimuli are frequently reported in individuals diagnosed with autism ***(Egelhoff et al., 2005)***; Abnormal behavioral responses to sound can greatly impact how a child with Autism Spectrum Disorder (ASD) performs in common tasks such as going to school, being in public with his/her family and interacting with peers ***(Dunning, 2003). Ashburner et al. (2008),*** found that tactile sensitivities and auditory filter difficulties in children with ASD were associated with inattention, hyperactivity, oppositional behavior, and academic underachievement.

Otitis Media (OM) is the most prevalent disease during childhood, next only to common cold. It is estimated that chronic OM affects 65 million to 330 million people worldwide, and 60% of them (39 million to 200 million) show clinically significant hearing impairment ***(WHO, 2004).*** There is evidence

to show that major changes in brain organization take place in the first year of life though changes continue into adolescence. SOM in the first year of life leads to negative effects on brainstem signal processing even if it has occurred only for a short duration (maximum of 3 months). In such a situation, auditory cortical structures probably show compensatory changes through central gain to offset the prolonged central conduction time ***(Sandeep and Jayaram, 2008).***

Childhood Autism Rating Scale (CARS) is a test intended for diagnosis and evaluates the severity of autism from those with other developmental delay such as mental retardation. The child is rated from 1 to 4 in each item, ranging from normal to severe and yielding a final score indicating, non autistic, mild to moderate autistic or severely autistic.

The scale is used to observe 15 items; relation to people, imitation, emotional response, body use, object use, adaptation to change, visual response, listening response, taste-smell-touch response and use, fear and nervousness, verbal communication, non verbal communication, activity level, level and consistency of intellectual response, general impression ***(Eric et al., 1988)***. This study aimed to study the impact of bilateral chronic secretory otitis in Childhood Autism Rating Scale in delayed language development children.

2. Materials and Methods:

This study was conducted on tow study groups including 140 children; 104 boys and 36 girls They had Deayed Language Development (DLD) with different autistic features reported by their parents, presented to Phoniatrics, Audiology, Neurology Unit, Pediatric Department and Otolaryngology clinics over 36 months. Their age ranged from 36 months to 54 months with means age (48.3 ± 6.7). All of them had Delayed Language Development (DLD) with history of recurrent attacks of SOM. They were 104 boys and 36 girls. Exclusion criteria include craniofacial anomalies; severe mental retardation and sensory neural hearing loss.

Control group was selected to be age and gender matched with the study group. It includes 26 boys and 14 girls their ages ranged from 36 months to 57 months with mean age (45.9 ± 5.6). Also they had Delayed Language Development (DLD) with different autistic features but they had no history of ear diseases.

All patients were subjected to:

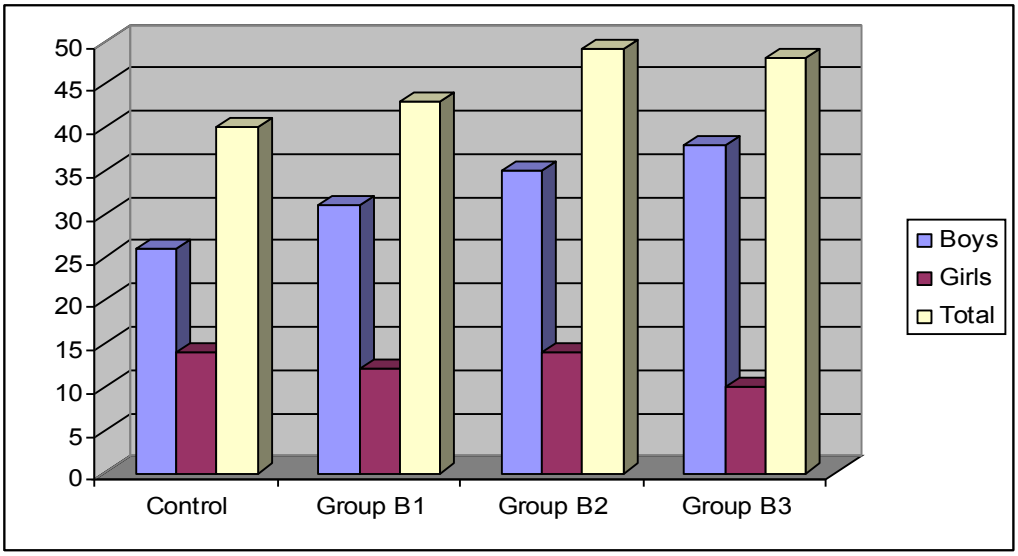
- Patient interviews (personal history, family history of consanguinity, hearing loss, DLD), pre-peri and postnatal history and developmental history
- E.N.T examination- language evaluation (eye contact, response to examiner, eye head coordination), assessment of passive and active vocabulary, Childhood Autism Rating Scale (CARS) and the degree of autistic was done as 30 serving as a cut-off for a diagnosis of autism, mild to moderate autism (30-37) and severe autism (≥ 37)
- Psychometric evaluation, using Stanford–Binet Intelligence Scales ***(Terman et al .,1960)***. & Vineland Adaptive Behavior Scales ***(Sparrow et al., 2005).***
- Neurological examination
- Audiological evaluation for threshold determination including (Immittancemetry; tympanometery & acoustic reflex), behavioral audiometry using free field test and play audiometry and auditory brain stem evoked potentials.
- Our study composed of 2 groups; control group (A), 40 normal hearing children and study group which subdivided into 3 (B1 ">15-25 dB HL", B2 ">25- 35 dB HL ", B3 >35 dB HL) subgroups according to hearing threshold level, The children were categorized into 4 groups.
- The results obtained were statistically analyzed with the help of SPSS software **(Statistical Analysis system).**

3. Results:

The results of this study revealed the incidence of delayed language development with different autistic features and bilateral conductive hearing loss affect male more than female as in table and figure (1)

Table (1): Gender and hearing level in all groups under the study.

Group / Gender	Control A	Study groups		
		B1 >15-25 dB	B2 >25-35 dB	B3 >35 dB
Boys	26	31	35	38
Girls	14	12	14	10
Total	40	43	49	48



Fig(1) Distribution of severity of hearing impairment.

In current study there were low numbers of children suffering from autism in control group than study groups and increase the number of severe cases with increase the degree of hearing impairment as showed in table and figure (2).

Table (2): Degree of autism in control and study groups.

Group / *CARS*	*Control Group*	*Group B1*	*Group B2*	*Group B3*
No-autistic < 30	36 (90%)	18 (41.9%)	15 (30.6%)	10 (20.8%
Mild to moderate autism 30 - < 37	4 (10%)	19 (44.2%)	21 (42.9%)	19 (39.5%)
Severe autism >37	0 (0%)	6 (13.9%)	13 (26.5%)	19 (39.6%)
Total	40	43	49	48

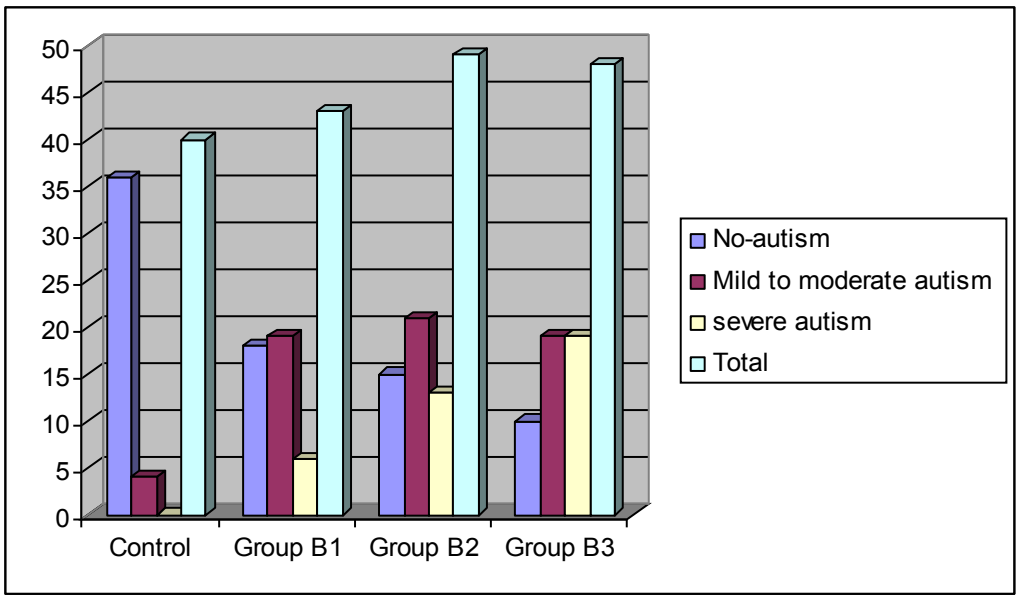


Fig. (2): The severity of autism in the different study groups.

Our results showed highly statistical significance difference between control group (A) and study groups (B1), (B2) & (B3) in Imitation , Emotional response, Object Use , Visual response and listening response parameters.

Also the results revealed highly significance difference in body use parameter in group (B1) & Adaptation to Change parameter in groups (B2) & (B3) and Taste, Smell, and Touch response and Fears parameters in group (B2) compared with the control group and level of intelligence in group (B3).

In current study there were significance difference in Adaptation to change, in group (B1) & Taste, Smell, and Touch response, parameters in group (B3) & verbal communication and Activity level parameters in groups (B2) & (B3) and General impression parameter. in group (B3) Finally there are high significance differences between control group and study group (B1) & (B2) and (B3) in total score of CARS.

4. Discussion:

The question of etiology in autism remains elusive primarily due to the fact that autism does not results from a single dysfunction, but is multi-faceted in nature. Investigations into etiology have ranged from identifying abnormalities in the genome to describing structural/functional brain abnormalities ***(Bomba and Pan,. 2004)***[.] abnormal behavioral responses to sound have been assumed to reflect a deficit in the auditory processing abilities of individuals diagnosed with autism Specific atypical behaviors were due to an overall hyper-responsiveness in the Autism Spectrum Disorder (ASD) group that resulted in hypersensitivity to sound, sensory defensiveness to tactile stimulation, sensory modulation dysfunction, aversion, and/or lack of habituation to sensory stimuli ***(Baranek et al., 2006).*** The predisposing factors for Auditory processing disorders APD include otitis media with effusion (sensory deprivation secondary to a peripheral disorder), neuro-maturational delay, and neurological insults to the central auditory system ***(DeBonis and Moncrieff, 2008).***

Secretory Otitis media (SOM) leads to significant reduction in the hearing sensitivity. The reduced auditory input, if in the early years of life when the auditory neural system is still maturing, may adversely influence the structural as well. It can also be said that if auditory processing is affected at the brainstem level because of early onset OM (reduced auditory input in the crucial periods of neural development), then, it may be said that auditory processing is also affected at the cortical level because it receives distorted input from the brainstem ***(Sandeep and Jayaram, 2008).***

. In present study the control group revealed 90% had normal CARS score (non autistic) and only 10%, 4 children had mild to moderate results while in study group only 30.7%, 43 patients out of 140, had non autistic scores and the remaining 69.3% had different degrees of autism from mild to severe degree. We attribute high incidence of autism in our study due to the impact of bilateral chronic Secretory Otitis media in auditory processing in brainstem and cortical level. The central auditory processing disorder is complicated and involved not only difficulty understanding what one hears or perceives auditorily, but also how one applies that information to different cognitive, social, and emotional tasks. Children with other leering difficulties, such as reading disorders, Attention Deficit Hyperactivity Disorders (ADHD) and mild to minimal hearing loss (loss in range of 20-30 dB) often experience similar lack of insight ***(ASHA, 1996; Keith, 1999).*** In agree with current study ***Smith and Jones, (2001)*** also reported that early-onset hearing impairment can seriously impede language development. Language can not develop normally without adequate speech stimulation so, conductive hearing loss can affect, listening response, relation to people, imitation, verbal communication, level of intellectual response, and also general impression, all these items involved can affect the CARS score. Even monaural occlusion during infancy can affect the organization of "auditory space maps" in superior colliculus, which lead to compensatory shifts in the auditory spatial tuning of superior colliculus neurons (***Knudsen1 et al., 1984; Knudsen et al., 1994; Schnupp et al., 1998).***

Chronic conductive hearing impairment can affect the central auditory processing function, ***Joseph et al (2003)*** found decrease ability to recognize speech in the presence of a masker in children with conductive hearing impairment. This was noticed before by ***Jerger et al (1983) &Gravel &Wallace, (1992)***[.] who reported poor recognition for words in sentences masked by competing talker in children with otitis media. The researches of ***Groenen et al (1996)*** **and** ***Petinou*** **et al** ***(2001)*** showed the association of poor perception of particular features in children with otitis media. So bilateral chronic SOM can affect the listening response and verbal and non-verbal communication in the CARS it may lead to false result for CARS score.

Miguel et al (2002)[)] studied ABR in autistic children ,they reported abnormal morphology in the response, there were prominence in amplitude of peak I over peak III and peak V in all examined

children .This may explain the hyperacusis and abnormal reaction to sounds often seen in autistic children and also it can show the delayed development in auditory pathway , because very early in life ,only wave I ,III,V are evident ,with wave I having much greater amplitude than that of wave V. Over time the relationship changes, with wave V becoming much more prominent than other waves in the first year of live.

Moreover we noticed that increasing the degree of autism with increasing the degree of hearing loss. So, hearing loss can increase the severity of autism or may be change the results of CARS, from non-autistic to autistic In conclusion Bilateral chronic SOM have an impact on CARS results. This is impact may be explained by the effect of bilateral chronic conductive hearing impairment in central auditory processing and may lead to central auditory processing dysfunction which affects items in CARS like listening response, verbal, non-verbal communication and also the level of activity. This CARS items were frequently affected in autistic and non-autistic children suffering from chronic hearing loss rather than control group. Also these CARS items are severely affected in children complain from bilateral mild chronic minimal hearing impairment.

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