Research Article

Assessment of Depression and Anxiety Disorders in Hearing Impaired Children

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Abstract
Hearing impairment is one of the commonest birth defects which may resulted in some psychological disorders in childhood. The objective of this study is to assess the psychopathological complications of hearing impaired children compared to normal hearing ones. This was a prospective study which was conducted on students of two schools (Al Amal School for the deafs and the dumbs and Copts School) at Minia city, Minia governorate, Egypt. A total of forty children aged 7:12 years were classified into two groups, group (I) patients: Included 20 male children with different degrees of hearing impairment, group (II) control: Included 20 healthy male children with normal hearing. Psychometric evaluation, electroencephalography, audiological evaluation and psychological assessment were done for all children. The results showed that cases with EEG abnormalities, different degrees of anxiety were significantly higher in patients group compared to control ($p<0.05$) however, IQ did not differ. The study revealed that hearing impairment is associated with EEG abnormalities and the presence of both anxiety and depression which are the most common psychological disorders in hearing impaired children.
Keywords: Depression, Anxiety, Psychological Disorders, Hearing Impaired, Children.

Introduction
Hearing Impairment (HI) is a broad term that refers to hearing losses of varying degrees, ranging from hard-of-hearing to total deafness, there are many classifications of hearing loss, one of these is classification according to type includes conductive, sensorineural, or mixed hearing loss[(1)]. Hearing loss is defined in terms of decibels (dB) lost, as follows: Slight hearing loss (16-25 dB), mild hearing loss (26-40 dB), moderate hearing loss (41-70 dB), severe hearing loss (71-90 dB) and profound hearing loss (> 90 dB)[(2)].

Hearing impairment is the commonest birth defect and has a significant impact on both individual and society, it is considered to be the most prevalent congenital defects in neonates and its prevalence is higher than other conditions found at birth[(3)]. Globally, it was estimated that over of 5% has different degrees of hearing loss, of these, 32 million children[(4)].

In Egypt, the prevalence of HI in children was reported as 13.8%[(5)] and 20.9%[(6)]. In addition, it has been reported that the prevalence of hearing impairment increases with increasing age[(6)].

Hearing impairment lowers the quality of life and has some bad psychological, physical and social consequences[(7)]. Many studies suggest that hearing loss is associated with reduced cognitive functioning and incident dementia[(8)]. Also, hearing impaired children are known to have more mental health problems, problems at school, experience more depression, and demonstrate more difficulties with social interactions[(9)]. In addition, there is a significant association between hearing impairment and moderate to severe depression and it is also a strong cause of anxiety in children and adolescents[(10)].

The objective of this study is to assess the psychopathological complications such as

anxiety and depression of hearing impaired children as compared to normal hearing ones.

Subjects and methods

Study design

This was a prospective study which was conducted on students of two schools (Al Amal School for the deafs and the dumbs and Copts School) at Minia city, Minia governorate, Egypt during the period from January to June 2016.

Forty children aged 7:12 years were included in this study, they were divided into two groups matched in age and sex as follow:

Group (I) Patients: Included 20 male children with different degrees of hearing impairment according to audiometry, this group was divided to two subgroups:

Group (Ia): Included 10 children with severe hearing impairment (Minimum heard sound at 71-90 dB).

Group (Ib): Included 10 children with profound hearing impairment (Minimum heard sound more than 90 dB).

Group (II) Control: Included 20 healthy male children with normal hearing.

Methods and instruments

All included children were subjected to:

a) Through history taking stressing on history of any infection, trauma or drugs, perinatal history to exclude congenital infection, full developmental history to collect important information (such as sitting up, crawling, walking and talking) and also, family history and consanguinity.

b) Clinical examination: Such as general condition, vital signs, psychological assessment and neurological examination to detect or exclude any other clinical diseases.

c) Psychometric evaluation: To measure (I.Q) of cases by an expert psychologist by using Stanford–Binet Intelligence Scale 5th Edition (Table, 1)[11].

Table (1): Stanford–Binet classification.

IQ Range (/"deviation IQ")	IQ Classification
145–160	Very gifted or highly advanced
130–144	Gifted or very advanced
120–129	Superior
110–119	High average
90–109	Average
80–89	Low average
70–79	Borderline impaired or delayed
55–69	Mildly impaired or delayed
40–54	Moderately impaired or delayed

d) Electroencephalography (EEG): To detect presence or absence of any defect in brain electrical activity.

e) Audiological evaluation: It was done detect the different degrees of hearing impairment or to prove normal hearing.

f) Psychological (Depression and Anxiety) assessment questionnaires (included 2 questionnaires):

1) Child Depression Inventory questionnaire (CDI): It is a psychological assessment that rates the severity of symptoms related to depression or dysthymic disorder in children The questionnaire was well translated into Arabic by a psychiatric expert at Minia University Hospital.

2) The State-Trait Anxiety Inventory (STAI): It is an introspective psychological inventory consisting of 40 self-report items pertaining to anxiety affect and a commonly used measure of trait and state anxiety. Higher (STAI) scores means higher levels of anxiety. It's goal was to compile a set of items that could measure anxiety at both poles of the normal affect curve (state vs. trait).

Data analysis

Data was entered and statistically analyzed using SPSS program, version 20. Quantitative data was presented as mean ± Standard deviation (SD), qualitative data was presented as frequency (%). Analysis was done by Chi-square, one-way ANOVA, t-test and Mann-Whitney U test when necessary. Probability value (P. value) of (< 0.05) was considered as a significant.

Results

Regarding EEG findings (Table, 2), there was a significant increase in EEG abnormalities in patients group compared to control, 3 cases (30%) in severe HI group and 6 cases (60%) in profound HI group versus 2 cases (10%) in control group, however there was no significant difference between severe and profound HI subgroups regarding EEG abnormalities. The same trend of EEG results was obtained in anxiety and depression, the degree of both anxiety and depression was significantly higher in HI patients (either severe and profound) compared to controls (Table, 2). The results revealed that IQ classification was not significantly affected by EEG findings, anxiety and depression in both HI patients or controls. In the same line with our findings, cases with moderate anxiety and depression had significantly higher EEG abnormalities in patients group than control. There was no significant relation between incidence of depression or anxiety and EEG abnormalities in the same group (Table, 3).

Discussion

Hearing impairment is one of the most common birth defects significantly affect persons and their relation with the society especially, in children. Globally, it is estimated that about 32 million children have hearing impairment[4], however, it was reported in studies conducted in Egypt that HI prevalence in children was 13.8%[5] and 20.9%[6]. Generally, hearing impaired children are highly vulnerable to bad psychosocial development, they face communicational deficits difficulty their social and emotional life[9].

Table (2): EEG, anxiety and depression among groups.

Variable	Group (I) Patients		Group (II) Control (n=20)	P. value (Sig.)
	Group (Ia) Severe HI (n=10)	Group (Ib) profound HI (n=10)		
EEG				
Normal	7 (70%) [b]	4 (40%) [b]	18 (90%) [a]	**0.014***
Abnormal	3 (30%)	6 (60%)	2 (10%)	
Anxiety				
Mild	4 (40%) [b]	3 (30%) [b]	15 (75%) [a]	**0.011***
Moderate	6 (60%)	7 (70%)	5 (25%)	
Depression				
Mild	7 (70%) [b]	3 (30%) [b]	17 (85%) [a]	**0.018***
Moderate	3 (30%)	7 (70%)	3 (15%)	

* Significant ($p<0.05$).

a,b Values with different superscripts are significantly different.

Table (3): Relation between anxiety, depression and EEG findings in different groups.

Variable	Group (I) Patients		Group (II) Control		P. value (Sig.)
	Normal EEG (n= 11)	Abnormal EEG (n= 9)	Normal EEG (n=18)	Abnormal EEG (n=2)	
Anxiety					
Mild	5 (45.5%) [b]	2 (22.2%) [b]	13 (72.2%) [a]	2 (100%) [b]	**0.011***
Moderate	6 (54.5%)	7 (77.8%)	5 (27.8%)	0	
Depression					
Mild	5 (45.5%) [b]	5 (55.6%) [b]	15 (83.3%) [a]	2 (100%) [b]	**0.018***
Moderate	6 (54.5%)	4 (44.4%)	3 (16.7%)	0	

* Significant ($p<0.05$).

a,b Values with different superscripts are significantly different.

Regarding the results of IQ, there was no obvious difference in IQ level between HI and normal children. Similar results were obtained by[14]. Many studies reported that children with HI had lower IQ level and also communication skills compared to normal ones[10]. Children IQ level was strongly correlated with mental health status which was affected to high extent with hearing impairment as it was reported with many authors[13,15].

The present results indicated that EEG abnormalities were significantly higher in patients group compared to control group (P-value: 0.013). Similar findings were found by Bailly et al.,[18] and Van et al.,[13] who found that EEG abnormities was higher in hearing impaired children than normal hearing ones. The reason is unclear but, it may be attributed to some adverse changes occurred in the brain function of hearing impaired children. In line with our findings, in a study by Remine and Brown;[19] to evaluate hearing loss impacts on brain function, they reported "by EEG findings" that brain function was delayed by hearing loss. Also, they added that when hearing loss occurs, brain areas which are responsible for other senses (vision or touch) will actually take over the areas of the brain which normally process hearing. On the other hand, Dammeyer,[20] reported that no differences were found between hearing impaired children and normal children in EEG results.

Our results revealed that patients group had significant increase in the presence of anxiety and depression compared to control group (P-value: 0.011) and (P-value: 0.018) for anxiety and depression respectively, however, no significant differences were found between severe HL and profound HL subgroups. Our results are in agreement with Kvam et al.,[21] who found that levels of depression and anxiety were higher in hearing impaired children as compared to control ones. Also, Theunissen et al.,[10] found similar results. The possible explanation of this result that the HI children had communication problems which make social and emotional contact be difficult and make them always worried about the others. In addition, Rostami et al.,[22] who investigated retrospectively the presence of anxiety and depression among the hearing impaired persons based on researches results, they found that hearing impaired people had high degrees of anxiety and insomnia. However, Theunissen et al.,[23] did not found significant difference between hearing impaired children and normal hearing ones as regard anxiety disorders. Also, it was reported that hearing impaired children have more depressive symptoms than normally hearing children[24].

Accordingly, Tambs,[25] found "in about 50,000 subjects" that hearing loss was associated with substantially reduced mental health ratings (greater degree of depression and selfesteem) among young persons. Also, some studies indicate that the prevalence of mental health problems is 2-3 times higher than among their hearing peers, ranging from 20 to 50%[19,20]. It is thought that the higher incidence of depression in hearing impaired children may be due to the communicative barriers within a hearing world,

different causes of hearing loss and or may be related to stigma and discrimination[21].

The present results showed a significant relation between EEG abnormalities and the prevalence of depression (P-value: 0.018) and anxiety (P-value: 0.011) in HI children. These result were supported by those of Hurt et al.,[26] and Simkin et al.,[27] who found that there are some changes in EEG were related to depression and anxiety because of nausea or abdominal distress, derealization or depersonalization and paresthesias that related to panic attacks, altered connectivity and activity in frontal and anterior cingulate cortex networks[28] or altered inflammatory cytokine and growth factor levels[29]. Also, it was reported that EEG alpha activity elevated during rest in depressed patients[30]. Furthermore, Begi et al.,.

Conclusion

In conclusion, hearing impairment is significantly associated with EEG abnormalities. Also, the presence of both anxiety and depression was significantly increased in hearing impaired children than normal healthy ones and these disorders (anxiety and depression) are the commonest psychological disorders in hearing impaired children. Also, depression and anxiety in children are preventable and curable. This study have some limitations, of these: small sample size, we could not include females. So, we recommend further studies with larger sample size to evaluate the psychopathological complications of hearing impaired children and to study the impact of other variables such as methods of education, parental factors and its effects the child.

Ethical considerations: The study protocol and all procedures performed were in accordance with the ethical standards of Faculty of medicine- Minia University, Egypt and the aim and nature of the study was explained for each parent before inclusion. An informed written consent was obtained from parents before enrollment.

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