

# Screening of Psychiatric Disorders among Hearing-Impaired Children and Adolescents Aged 4 - 16 Years Attending Special Education Institutions in Karachi

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## Abstract

**Aim:** The aim of this study was to estimate the prevalence of psychiatric problems and to identify associated factors among hearing-impaired children and adolescents (aged 4 - 16 years) attending special education institutions in Karachi, Pakistan. **Methods:** A cross-sectional study, using stratified random sampling was conducted in two special education institutions in Karachi from September 2010 to July 2011 on 272 hearing-impaired children aged 4 - 16 years. Multi-informant rating (responding parent and teacher) was used to assess the prevalence of psychiatric problems on Strengths and Difficulties Questionnaire (SDQ). Kappa statistic was computed to assess agreement between parents/teachers ratings. Multivariable logistic regression analysis was conducted to identify the factors associated with psychiatric problems of children. **Results:** An overall parent-rated prevalence of psychiatric problems among hearing-impaired children was estimated as 18% and teacher-rated prevalence as 32.7%; poor inter-rater agreement was found between the two raters (Kappa statistic = 0.09). Multivariate model indicated protective effect of child's age greater than 6 months at the time of diagnosis AOR: 0.49; 95% CI (0.25, 0.96). Depression among responding parents AOR: 2.61; 95% CI (1.34, 5.11) was identified as a risk factor. Children with good performance AOR: 3.09; 95% CI (1.04, 9.25) and fair/poor performance AOR: 3.43; 95% CI (1.17, 10.04) were more likely to have psychiatric problems compared to children with outstanding/excellent performance. Cronbach's alpha of 0.71

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on overall SDQ indicated an acceptable internal consistency. **Conclusion:** Awareness programs should be held for parents and teachers for better dealing with hearing-impaired children.

### Keywords

Screening, Psychiatric Illness, Children and Adolescent, Pakistan

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## 1. Introduction

Psychiatric disorders of children are a recognized public health problem which has contributed significantly to disability and mortality, as well as an exacerbation of other medical conditions [1]. According to the Global Burden of Disease (GBD), mental illnesses constitute 10.5% of GBD, which may rise up to 15% in the year 2020 [2]. According to the World Health Organization (WHO), mental health disorders are one of the leading causes of disability worldwide [2]. In developing countries like Pakistan, one percent of the population suffers from severe and 10% from mild mental disorders, although epidemiological data regarding mental illnesses is lacking in Pakistan [3].

In Pakistan, only two epidemiological studies have been conducted which addresses behavioral problems in children and adolescents. A mainstream-school based study estimated 34% prevalence of behavioral problems among 5 - 11 years children in Karachi [4], whereas the other study was conducted in orphanages of Karachi among 4 - 16 years old children and indicated a prevalence of behavioral problems as 33% [5]. Literature suggested that, people do not seek treatment for psychiatric illnesses in Pakistan, and one of the reasons is being taboo/social stigma attached with it, or people consider psychiatric problems as supernatural evil forces [3] [4] [5] [6]. Therefore, even if mental health facilities are available, these are underutilized. However, in case of children, mental health services are scarce in Pakistan [7]. The other reason for ignorance of children's psychiatric conditions in Pakistan might be due to child's inability to explain their feelings/problems as compared to adults. Furthermore, if a child has communication problems such as hearing-impairment, it will be more difficult to express his/her feelings [8].

Literature suggests that hearing impairment has its medical as well as social aspects. It can slow down children's progress in schools and can place them in social isolation [2]. There is a correlation between hearing impairment and psychiatric disorders among children and adolescents [8].

However, the aspect of mental health among hearing-impaired children has not been given due attention in Pakistan, and there is no established prevalence of psychiatric disorders among this population in the country [7] [8]. It is possible that in Pakistan, population with deafness could be large, because consanguinity is common in the country. Consanguinity is a dominant cause of profound sensorineural deafness in Pakistan. Evidence shows that profound hear-

ing-impairment is more prevalent in countries where consanguineous marriages are common. In Khyber Pakhtunkhwa province of Pakistan, prevalence of consanguinity is reported to be 60%, but unfortunately there is little published information on deafness in Pakistan [9]. Therefore, the aim of this study was to estimate the prevalence of psychiatric disorders among hearing-impaired children aged 4 - 16 years attending special education institutions in Karachi and to identify associated socio-demographic characteristics of children and parents.

## 2. Methods

### 2.1. Study Design and Settings

This was a cross-sectional study conducted in Karachi from September 2010 to July 2011 at the special education schools (for hearing impaired children), in Karachi. The city of light, Karachi is the most populated city of Pakistan with a population of approximately 16 million. The list of five special schools were provided by the Government of Sindh (the province in which Karachi is situated) and Citizens-Police Liaison Committee (CPLC); these were Ida Rieu School for Deaf, Absa School for Deaf, Islamic School for Deaf, Dewa Academy and The School for Deaf. After detailed meetings with officials and stakeholders, we were finally granted permission from the largest special education schools of Karachi Dewa Academy and Ida Rieu that have a major number of hearing-impaired students; both the institutions have 700 hearing-impaired students each.

### 2.2. Sampling Strategy and Sample Size

Stratified random sampling technique (with proportional allocation) was used for the selection of study participants. The two special education schools were considered as strata and the students as sampling units. From each stratum a simple random sample of students was selected. Permission and written consent was sought from the administration of each school and an updated list of all the hearing-impaired students was obtained that included name, class and age of each child. Using that list, we prepared another list that included all the children aged 4 - 16 years (Montessori till class 8th) with all levels of hearing-impairment, while excluded those children who had hearing-impaired siblings, mental retardation or autism and whose parents did not give consent. The total number of eligible children in Ida Rieu  $N_1 = 350$  and in Dewa Academy  $N_2 = 460$ . We calculated a sample of 270 children to estimate the prevalence of psychiatric disorders among hearing-impaired children with 5% error bound; we used 50% prevalence of psychiatric disorders in children as this will give a maximum possible sample size [10]. After 10% inflation for non-response, a sample of  $n = 300$  children was required; using proportional allocation  $n_1 = 130$  (Ida Rieu) and  $n_2 = 170$  (Dewa Academy). Systematic sampling was done by using the updated list from each school. Taking a random start using a random number table, we then selected every third child from each class by using the formula  $K = N_i/n_i$ , [10] [11].

### 2.3. Pretesting

Pre-testing was done in J.S. Academy on 25 children that were 9% of total sample size. This institution has approximately 150 hearing-impaired children and was referred by Ida Rieu-academy. We found 16% parent-rated prevalence of psychiatric problems among hearing-impaired children and 28% teacher-rated prevalence.

### 2.4. Questionnaire

A structured questionnaire was used comprised of four sections. The first section contained questions regarding socio-demographic characteristics of children, the second section included questions on parent's characteristics, and the third section included information on family characteristics of parents while the fourth section included 25 item Strengths and Difficulties Questionnaire (SDQ) to assess child mental wellbeing (psychiatric disorders) among hearing-impaired children including; Attention Deficit Hyperactivity Disorder ADHD, anxiety, depression etc. by asking emotional symptoms, conduct problems, hyperactivity, and peer problems in the tool) [12].

SDQ is a brief questionnaire, comprises of psychological attributes, that has a total difficulties score from 0 - 40. These scores can be classified as normal (0 - 13), borderline (14 - 16) and abnormal (17 - 40) [12] [13]. The overall behavioral problems are assessed using the composite SDQ scores on four subscales (*emotional symptoms, conduct problems, hyperactivity, and peer problems*) [13]. SDQ (Urdu version for parents) [13] is validated in Pakistan; this study proposed a binary cut-off; normal (0 - 17) and abnormal (18 - 40). We used the validated Urdu version of SDQ in the present study.

We also used Aga Khan University Anxiety and Depression Scale (AKUADS, (Urdu version) to assess anxiety and depression among parents; AKUADS (Urdu version) has been validated in Pakistan [14]. Data was collected from either parent (mother/father) of each selected hearing-impaired children by interview, and from teacher of the child.

### 2.5. Data Analysis

Data was analyzed using SPSS version 21 [15]. Descriptive statistics was performed for socio-demographic variables, and Chi square test of independence or t-test for two independent samples were applied to assess the statistical significance of differences of selected variables between the two selected institutions. All statistical analysis was performed with a confidence level of 95% and P-value of 0.05 was considered significant. Multi-informant rating (responding parent and teacher) was used to assess prevalence of psychiatric problems on SDQ total difficulties score and its five subscales, and kappa statistic was computed to assess agreement between parent/teachers ratings. A value of <0.4, 0.4 - 0.75 and >0.75 denotes poor, good and excellent agreement respectively between two ratings [16]. Using Multivariable logistic regression, factors independently associated

with psychiatric problems of hearing-impaired children were also identified. To assess whether subscale structure was retained by data obtained in this study, factor analysis of 25 item SDQ was performed. Principle components estimation was used as the extraction method for factor analysis, and varimax rotation was applied [17]. Internal consistencies were also computed for SDQ composite score and subscales. Internal consistencies were measured by Cronbach's alpha. The closer Cronbach's alpha coefficient is to 1.0, the greater the internal consistency of the items in the scale [18].

## 2.6. Ethical Consideration

The study was approved by Aga Khan University Ethical Review Committee (ERC). Prior to data collection, written consent were taken from administrators of special education institutions, all the parents, teachers, and all the children who fit in our inclusion criteria.

## 3. Results

(Table 1) A total of 272 hearing-impaired-children aged 4 - 16 years were selected from two special education institutions, Ida-Rieu-academy ( $n = 113$ ) and Dewa-academy ( $n = 159$ ), with the response rate of 91%, Children in Ida-Rieu

**Table 1.** Socio demographic characteristics of hearing-impaired children and parents in Ida Rieu and Dewa Academy, Special Education Institutions of Karachi, Pakistan ( $n = 272$ ).

| Characteristics  | Ida Rieu Academy<br>( $n = 113$ ) | Dewa Academy<br>( $n = 159$ ) | P-Value <sup>1</sup> |
|--|-----------------------------------|-------------------------------|----------------------|
| <b>Age of children (year) (Mean <math>\pm</math> SD)</b> | 11.3 $\pm$ 3.4                    | 10.1 $\pm$ 3.1                | 0.005                |
| <b>Gender</b>  |                                   |                               | 0.079                |
| Male   | 69 (61.1)                         | 80 (50.3)                     |                      |
| Female   | 44 (38.9)                         | 79 (49.7)                     |                      |
| <b>Children's Educational Class</b>                      |                                   |                               | 0.650                |
| Pre-Primary  | 30 (26.5)                         | 41 (25.8)                     |                      |
| Primary  | 57 (50.4)                         | 88 (55.3)                     |                      |
| Middle   | 26 (23.0)                         | 30 (18.9)                     |                      |
| <b>Children's performance in class</b>                   |                                   |                               | 0.001*               |
| Outstanding/excellent                                    | 33 (29.2)                         | 36 (22.6)                     |                      |
| Good   | 53 (46.9)                         | 51 (32.1)                     |                      |
| Fair/poor  | 27 (23.9)                         | 72 (45.3)                     |                      |
| <b>Degree of hearing impairment</b>                      |                                   |                               | 0.023*               |
| Mild (27 - 40 dB)  | 05 (4.4)                          | 14 (8.8)                      |                      |
| Moderate (41 - 70 dB)                                    | 33 (29.2)                         | 30 (18.9)                     |                      |
| Severe (71 - 90 dB)                                      | 41 (36.3)                         | 45 (28.3)                     |                      |
| Profound (>91 dB)  | 34 (30.1)                         | 70 (44.0)                     |                      |
| <b>Use of Hearing Aid</b>                                |                                   |                               | 0.334                |

## Continued

|  |               |               |         |
|--|---------------|---------------|---------|
| Yes  | 15 (13.3)     | 28 (17.6)     |         |
| No   | 98 (86.7)     | 131 (82.4)    |         |
| <b>Child's age at diagnosis of hearing-impairment (months) (Mean ± SD)</b> | 14.46 ± 14.07 | 18.11 ± 16.26 | 0.055   |
| <b>Mother's hearing status</b>   |               |               | 0.317   |
| Normal   | 112 (99.1)    | 153 (96.2)    |         |
| Mild/Moderate  | 0 (0)         | 04 (2.5)      |         |
| Severe/Profound  | 001 (0.90)    | 2 (1.30)      |         |
| <b>Father's hearing status</b>   |               |               | 0.831   |
| Normal   | 108 (95.6)    | 151 (95.0)    |         |
| Mild/Moderate  | 3 (2.7)       | 6 (3.8)       |         |
| Severe/Profound  | 2 (1.8)       | 2 (1.3)       |         |
| <b>Blood relation between Father and Mother (Consanguinity)</b>            |               |               |         |
| No blood relation  | 28 (24.80)    | 46 (28.90)    | 0.774   |
| First cousin   | 72 (63.70)    | 94 (59.10)    |         |
| Second cousin  | 13 (11.50)    | 19 (11.90)    |         |
| <b>Mother's education level</b>  |               |               | <0.001* |
| No education   | 43 (38.1)     | 26 (16.4)     |         |
| Primary-Matric <sup>2</sup>  | 59 (52.2)     | 66 (41.5)     |         |
| Above matric   | 11 (9.7)      | 67 (42.1)     |         |
| <b>Father's education level</b>  |               |               | <0.001* |
| No education   | 25 (22.1)     | 14 (8.8)      |         |
| Primary-Matric   | 63 (55.8)     | 67 (42.1)     |         |
| Above matric   | 25 (22.1)     | 78 (49.1)     |         |
| <b>Mother's employment status</b>  |               |               | 0.151   |
| Employed   | 11 (9.7)      | 25 (15.7)     |         |
| Unemployed   | 102 (90.3)    | 134 (84.3)    |         |
| <b>Father's employment status</b>  |               |               | 0.901   |
| Employed   | 107 (94.7)    | 150 (94.3)    |         |
| Unemployed   | 6 (5.3)       | 9 (5.7)       |         |
| <b>Depression status of responding parent</b>                              |               |               | 0.266   |
| Depressed  | 38 (33.6)     | 64 (40.3)     |         |
| Not depressed  | 75 (66.4)     | 95 (59.7)     |         |
| <b>Total no of children/family (Mean ± SD)</b>                             | 4.7 ± 2.1     | 3.9 ± 1.7     | 0.001*  |
| <b>Total monthly income from all means (rupees)<sup>3</sup></b>            |               |               | 0.009*  |
| Not known/disclosed  | 13 (11.5)     | 25 (15.7)     |         |
| <7000  | 21 (18.6)     | 15 (9.4)      |         |
| 7000 - <14,000   | 38 (33.6)     | 43 (27.0)     |         |
| 14,000 - <28,000   | 35 (31.0)     | 49 (30.8)     |         |
| ≥28,000  | 6 (5.3)       | 27 (17.0)     |         |

<sup>1</sup>Tests P-value of continuous variables was obtained from t-test for two independent samples, and P-value for categorical variables was obtained from Pearson's Chi Square Test or Fisher's Exact Test, where appropriate. \*P-value significant at 5% significance level; <sup>2</sup>Matric is 10 years of school education in Pakistani educational system, and primary is 5 years of school education in Pakistani educational system. <sup>3</sup>One US Dollar = 86.45 Pak Rupees at the time the study was conducted.

were older ( $11.3 \pm 3.4$  years vs.  $10.1 \pm 3.1$  years) and had better school performances (24.0% poor performance) as compared to children in Dewa-academy (45.3% poor performance). Parents of Dewa-academy (42.1% mothers & 49.1% fathers had qualification above matric) were more educated than those of Ida-Rieu (9.7% mothers & 22.1% fathers had qualification above matric). Likewise 17.0% parents in Dewa-academy and 5.3% in Ida-Rieu had monthly income of  $\geq 28,000$  Pak rupees. Other demographic characteristics of study population are summarized in **Table 1**.

(**Table 2**) Parent and teacher ratings of children for psychiatric problems on SDQ composite scale, and on its subscales are reported in **Table 2**. On SDQ-composite scale, teacher-rated prevalence 32.7% 95% CI (30%, 36%) is greater than parent-rated prevalence 18%; 95% CI (15%, 21%). Kappa statistics and its P-value indicates poor agreement (Kappa = 0.094, P-value = 0.095). Similarly on conduct problems subscale, parents rated 37.1% (95% CI: 32, 42) children, whereas teachers rated 40.4% (95% CI: 36, 44) children as abnormal; although P-value is highly significant but Kappa statistic value denotes poor agreement (Kappa = 0.173, P-value = 0.004). P-values of Kappa statistic for emotional symptom scale, hyperactivity scale, peer problem scale and pro-social symptom scale indicated no significant agreement between parent and teacher ratings.

(**Table 3**) Multivariable logistic regression model was made to assess an association of various predictors to parent-rated psychiatric problems of children. We found that the odds of psychiatric problems in hearing-impaired-children with poor class performance AOR: 3.43; 95% CI (1.17, 10.04) and good performance AOR: 3.09; 95% CI (1.04, 9.25) are about 3-folds than that for an outstanding/excellent class performance. Furthermore, late diagnosis of hearing impairment after 6 months of age had a protective effect on psychiatric problems

**Table 2.** Number and percentage of children rated abnormal by teacher and responding parent on SDQ subscales and composite ratings in Ida Rieu and Dewa Academy, Special Education Institution of Karachi, Pakistan ( $n = 272$ ).

| Categories   | Parent rated<br>( $n = 272$ )<br>N (%) | Teacher rated<br>( $n = 272$ )<br>N (%) | Kappa <sup>1</sup><br>statistics | P-value <sup>2</sup> |
|--|--|---|----------------------------------|----------------------|
| Emotional Symptom Scale (ESS)                                  | 35 (12.9)                              | 54 (19.9)                               | 0.081                            | 0.166                |
| Conduct Problem Scale (CPS)                                    | 101 (37.1)                             | 110 (40.4)                              | 0.173                            | 0.004*               |
| Hyperactivity Scale (HS)                                       | 20 (7.4)                               | 42 (15.4)                               | 0.068                            | 0.219                |
| Peer Problem Scale (PPS)                                       | 86 (31.6)                              | 133 (48.9)                              | 0.059                            | 0.303                |
| Prosocial Symptom Scale (PSS)                                  | 37 (13.6)                              | 198 (72.8)                              | -0.010                           | 0.711                |
| [Composite Scale <sup>3</sup><br>Overall psychiatric problems] | 49 (18.0)                              | 89 (32.7)                               | 0.094                            | 0.095                |

<sup>1</sup>Kappa Statistics, <0.4 denotes poor/marginal agreement/reproducibility, 0.4 - 0.75 denotes good agreement/reproducibility, >0.75 denotes excellent agreement/reproducibility; <sup>2</sup>P-value is testing the null hypothesis Ho: Kappa = 0, \*P-value significant at 5% significance level; <sup>3</sup>Composite Scale comprised of ESS, CPS, HS, and PPS.

**Table 3.** Crude and adjusted Odds ratio for composite SDQ (parent ratings) for children's and parents' characteristics ( $n = 272$ ).

| Characteristics   | OR (95% CI)         | AOR (95% CI)         |
|---|---------------------|----------------------|
| <b>Child's Performance in class*</b>                              |                     |                      |
| Outstanding/Excellent   | 1                   | 1                    |
| Good  | 3.05 (1.09 - 8.56)  | 3.09 (1.04 - 9.25)*  |
| Fair/Poor   | 4.10 (1.48 - 11.36) | 3.43 (1.17 - 10.04)* |
| <b>Child's age (in months) at diagnosis of hearing-impairment</b> |                     |                      |
| ≤6 months   | 1                   | 1                    |
| >6 months   | 0.98 (0.96 - 1.01)  | 0.49 (0.25 - 0.96)*  |
| <b>Mother's education</b>   |                     |                      |
| Above Matric  | 1                   | 1                    |
| Primary-Matric  | 0.52 (0.25 - 1.07)  | 0.33 (0.13 - 0.82)*  |
| No regular education  | 0.65 (0.29 - 1.47)  | 0.27 (0.10 - 0.76)*  |
| <b>Father's education</b>   |                     |                      |
| Above Matric  | 1                   | 1                    |
| Primary-Matric  | 1.44 (0.70 - 2.95)  | 2.63 (1.06 - 6.52)*  |
| No regular education  | 2.50 (1.02 - 6.12)  | 4.05 (1.36 - 12.07)* |
| <b>Depression status of responding parents</b>                    |                     |                      |
| Not depressed   | 1                   | 1                    |
| Depressed   | 2.67 (1.43 - 5.04)  | 2.61 (1.34 - 5.11)*  |

\*It was assessed by class teacher. Adjusted for; child age, child gender, child educational class, child hearing impairment degree, child cause of hearing impairment, child use of hearing aid, parent marital status, parent (mother and father) age, parent (mother and father) hearing impairment status, parent (mother and father) employment status, blood relation with spouse, number of children/family, number of hearing impaired children/family, total members at home, responding parent, earning members at home, institution.

as compared to children diagnosed at or before 6 months AOR: 0.49; 95% CI (0.25, 0.96). Interestingly, mother's lack of education showed a protective effect for psychiatric problems as children of illiterate mothers AOR: 0.27; 95% CI (0.10, 0.76) and primary-matric educated mothers AOR: 0.33; 95% CI (0.13, 0.82) were at lesser risk for psychiatric problems relative to children of above matric-qualified mothers. On the other hand, odds of psychiatric problems in children with illiterate fathers AOR: 4.05; 95% CI (1.36, 12.07) and primary-matric educated fathers AOR: 2.63; 95% CI (1.06, 6.52) were considerably greater than that for above-matric qualified fathers. Moreover, odds of psychiatric problems in children of a depressed parent were about 3 times AOR: 2.61; 95% CI (1.34, 5.11) the odds of psychiatric problems of in children of a non-depressed parent.

(Table 4) Factor analysis was performed for parent-rated SDQ. Principle components estimation was selected as the extraction method for factor analysis, and varimax rotation was applied. Out of five specified factors which explained 42.37% of overall variance, we were able to reproduce three subscales; emotional,

**Table 4.** Factor analysis of SDQ filled by responding parent of hearing-impaired children in Ida Rieu and Dewa Academy, Special Education Institutions of Karachi, Pakistan ( $n = 272$ ).

| Variables                                      | Factor 1 | Factor 2 | Factor 3 | Factor 4 | Factor 5 |
|--|----------|----------|----------|----------|----------|
| <b>Emotional Problems</b>                      |          |          |          |          |          |
| Somatic  | 0.54     |          |          |          |          |
| Worries  | 0.65     |          |          |          |          |
| Unhappy  | 0.68     |          |          |          |          |
| Nervous/clingy                                 | 0.30     |          |          | 0.64     |          |
| Fears  | (0.25)   |          |          | 0.47     |          |
| <b>Conduct Problems</b>                        |          |          |          |          |          |
| Temper tantrums                                |          | 0.61     |          |          |          |
| Obedient                                       |          | 0.38     | -0.44    |          |          |
| Fights/Bullying                                |          | 0.51     |          |          | 0.36     |
| Lies/cheats                                    | 0.39     | (0.28)   |          |          |          |
| Stealing                                       | 0.45     | (0.11)   |          |          | 0.57     |
| <b>Hyperactivity</b>                           |          |          |          |          |          |
| Restless/overactive                            |          | 0.33     |          | -0.44    |          |
| Fidgeting/Squirming                            | 0.63     |          |          |          |          |
| Distractible                                   |          |          |          |          |          |
| Reflective                                     |          | 0.41     |          |          |          |
| Persistent                                     |          | 0.41     |          |          |          |
| <b>Peer problems</b>                           |          |          |          |          |          |
| Solitary                                       | 0.60     |          |          |          | -0.30    |
| Good friend                                    |          |          |          |          | -0.62    |
| Popular  |          | 0.50     |          |          |          |
| Bullied  | 0.52     | 0.66     |          |          |          |
| Better with adults                             |          |          |          | -0.48    |          |
| <b>Pro-social behavior</b>                     |          |          |          |          |          |
| Considerate                                    |          |          | 0.60     |          |          |
| Shares things                                  |          |          | 0.41     |          | 0.43     |
| Helps out                                      |          |          | 0.69     |          |          |
| Kind   |          |          | 0.32     |          |          |
| Caring   |          |          | 0.80     |          |          |
| <b>Percent of variance explained (Rotated)</b> | 10.80    | 10.44    | 9.37     | 6.11     | 5.65     |

Note: Principal components analysis, showing all varimax-rotated loadings  $\geq 0.30$ .

conduct and pro-social to a reasonable extent. Percentage of total variance accounted for by these three factors were 10.80, 10.44 and 9.37 respectively. How-

ever, we were unable to reproduce hyperactivity and peer problem subscale.

(Table 5) Internal consistencies were also computed for SDQ composite score and subscales. Cronbach's alpha for SDQ composite score was 0.71 indicating acceptable reliability

#### 4. Discussion

To the best of our knowledge, this is the first study in Pakistan that has been conducted to estimate prevalence of psychiatric disorders among hearing-impaired children and adolescents.

In our study, parents rated 18%, whereas teachers rated about 33% children as abnormal. In the two other studies conducted in Pakistan, prevalence of behavioral problems rated by parents in mainstream schools and orphanages respectively in Karachi was found to be about 33% [4] [5]. However, in our study parents-rated prevalence was only 18%. In one study, a thorough review of literature from different countries was done to determine the association of hearing-impairment and psychiatric disorders in children and adolescents [19]; it suggested that the prevalence of psychiatric disorders among hearing-impaired children varies from 15% - 60%. Moreover, the latter study suggested that the children with impaired hearing as well as children with normal hearing experience the same range of psychiatric disorders if hearing-impaired children do not have autism. This indicates that autism exacerbates psychiatric problems among children with impaired hearing.

Most of the studies reported 10% - 20% prevalence of behavioral problems among general population of normal children [20] [21]. All these studies were different in terms of study tools, study design and source of sample (samples were drawn from community, schools, institutions or primary care setting) that might contribute to differences in prevalence estimates. Our sample was drawn from special education schools and we did not have comparable data because no study has been conducted in Pakistan. However, our study findings were consistent with the reported literature regarding behavioral problems.

Furthermore, a study was conducted in Finland regarding hearing-impaired school-age children, and it also indicated no remarkable difference with regards

**Table 5.** Internal consistencies (Cronbach's alpha) of SDQ Total Difficulties score and subscale.

| SDQ Scales                                  | (Cronbach's alpha) |
|---|--------------------|
| <b>Total Difficulties (Composite Score)</b> | 0.71               |
| <b>Emotional Problems</b>                   | 0.65               |
| <b>Conduct problems</b>                     | 0.59               |
| <b>Hyperactivity</b>                        | 0.24               |
| <b>Peer problems</b>                        | 0.15               |
| <b>Pro-social behavior</b>                  | 0.62               |

to psychiatric disorders between deaf and hearing children. According to the latter study, prevalence among deaf children was 18.7% whereas it was 15.8% in hearing children [22]. This prevalence rate is comparable to parent-rated prevalence in our study; in our study, all the hearing mothers and fathers were expert in sign language. Literature suggests that attitudes towards deaf children and effective communication within the family plays a significant role towards mental health of hearing-impaired children; especially relation of effective communication and low prevalence of psychiatric problems has been seen [22] [23]. Our study also supports this finding because in our study all parents were proficient in sign language. Our prevalence on SDQ composite score rating is comparable with that of a study conducted in Germany among hearing-impaired children [24]; they also used SDQ although their cut off scores for SDQ were same as those of Goodman (normal, borderline, and abnormal) [13]. For SDQ subscales, only parent rated prevalence of emotional problems in our study is comparable with that of the German study (in our study, this prevalence is 12.9%, whereas in the German study mothers rated 15% and fathers rated 11% children as abnormal on Emotional problems).

In our study as well, parents and teachers showed poor agreement not only on composite score but on subscales as well. Although we found highly significant agreement on conduct problem scale and marginally significant agreement for composite scale, but measure of agreement (kappa statistics) showed a poor/marginal agreement that suggests lack of concordance between two informants for presence of symptoms in the same subject [25].

Our analysis indicated that risk of having psychiatric disorders is higher among children who are poor performer in class. As performance decreases, children are at higher risk of having psychiatric disorders.

Although child's gender is associated with psychiatric problems of children, in our study it was not significant both in the univariate and multivariable analysis. Literature suggests that hearing-impaired boys are more prone to socio-emotional problems than girls especially on conduct scale e.g. aggression etc.) [26].

In addition to child's characteristics, there are parental risk factors that can have detrimental effects on mental health of hearing-impaired children. In this study, parents' education is significantly associated with children's psychiatric disorders. Mother's lack of education shows protective effect that is children of mothers with less education have lesser psychiatric problems. On the contrary, lesser degree of father's education is putting children at higher risk of psychiatric problems. Literature suggests that children belonging to a family with low Socio-Economic Status (SES) tend to have their parents more stressed; that stress can lead to harsh and abusive parenting which is a risk factor for children's socio-emotional problems [27].

Parental anxiety and depression has a significant role in development of children. In this study we found a highly significant association between children's psychiatric problems and the responding parents' depression status. In this

study, we recorded depression status of the responding parent, and found that 37.5% parents were depressed; number of depressed mothers is more than that of depressed fathers. Literature suggests that maternal depression and anxiety is associated with children's behavior problems [28]. In combination with other risk factors, maternal depression and anxiety hinders child's early development especially in low income countries [28].

We used multi-informant rating (parents & teachers) for SDQ. We performed factor analysis and internal consistencies of overall SDQ and subscales as it has not been validated in Pakistan for hearing-impaired children. We controlled biases by giving extensive training to data collectors, especially by providing training in sign language by an expert of sign language and by conducting mock interviews in sign language in presence of that expert. Response rate was high (91%); due to the high response rate there should not be any serious limitation with regards to the selection bias.

However, there were few limitations in our study. We used cross-sectional study design, and this design in itself has limitations. We cannot establish temporality and there can be recall limitations in measurement of some variables such as child's age at diagnosis of hearing-impairment. We did not interview only the mothers given the fact that they are closer to their children; instead, we interviewed either parent whoever was available. We used only screening tool, and did not verify children's psychiatric problems against a diagnostic tool. We used parent version of SDQ for teachers as well because teacher version SDQ has not been validated in Urdu. AKUADS does not provide separate cut offs for anxiety and depression; therefore, we could not assess association of parental anxiety and depression separately for children's psychiatric problems. SDQ has not been validated among hearing-impaired children in Pakistan. As our study is special school-based, its generalizability is also limited to special education institutions only. According to our knowledge, there were about seven special education schools in Karachi. However, we were unable to include all the schools either due to logistic/safety problems or permission issues from the schools management.

## 5. Conclusion

This study is important from the public health perspective. Since the prevalence of behavioral problems among hearing-impaired children in the special education schools was estimated to be considerable, school-based behavioral intervention programs for hearing-impaired children should be made part of their curriculum. In addition, teachers of special education schools should be provided special training and refresher programs for behavioral interventions. Poor class performance of hearing-impaired children is a strong indicator of psychiatric problems; therefore, hearing-impaired children with poor to fair class performance should be screened regularly. Parents should be screened regularly for anxiety and depression and intervention provided if found positive.

## Ethical Consideration and Consent to Participate and of Conflict of Interest

Informed consent was taken from parents and an assent form was signed by the child in accordance with the Declaration of Helsinki. Approval for this study was taken from the Ethics Review Committee of Aga Khan University and prior permission was also taken from community leaders or representatives of the study area.

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## Conflicts of Interest

None for any author.

## References

- [1] Jaju, S., Al-Adawi, S., Al-Kharusi, H., Morsi, M. and Al-Riyami, A. (2009) Prevalence and Age-of-Onset Distributions of DSM IV Mental Disorders and Their Severity among School Going Omani Adolescents and Youths: WMH-CIDI Findings. *Child and Adolescent Psychiatry and Mental Health*, **3**, 29.  
<https://doi.org/10.1186/1753-2000-3-29>
- [2] Merikangas, K.R., Nakamura, E.F. and Kessler, R.C. (2009) Epidemiology of Mental Disorders in Children and Adolescents. *Dialogues in Clinical Neuroscience*, **11**, 7-20.
- [3] Afridi, M.I. (2008) Mental Health: Priorities in Pakistan. *Journal of Pakistan Medical Association*, **58**, 225-226.
- [4] Syed, E.U., Hussein, S.A. and Mahmud, S. (2007) Screening for Emotional and Behavioural Problems amongst 5-11 Year-Old School Children in Karachi, Pakistan. *Social Psychiatry and Psychiatric Epidemiology*, **42**, 421-427.  
<https://doi.org/10.1007/s00127-007-0188-x>
- [5] Lassi, Z.S., Mahmud, S., Syed, E.U. and Janjua, N.Z. (2011) Behavioral Problems among Children Living in Orphanage Facilities of Karachi, Pakistan: Comparison of Children in an SOS Village with Those in Conventional Orphanages. *Social Psychiatry and Psychiatric Epidemiology*, **46**, 787-796.  
<https://doi.org/10.1007/s00127-010-0248-5>
- [6] Karim, S., Saeed, K., Rana, M.H., Mubbashar, M.H. and Jenkins, R. (2004) Pakistan Mental Health Country Profile. *International Review of Psychiatry*, **16**, 3-92.  
<https://doi.org/10.1080/09540260310001635131>
- [7] Tareen, A., Mirza, I., Minhas, A., Minhas, F. and Rahman, A. (2009) Developing a Child and Adolescent Mental Health Service in a Low-Income Country: A Global Partnership Model. *Psychiatrist*, **33**, 181-183.  
<https://doi.org/10.1192/pb.bp.108.020487>
- [8] Lichtig, I. and Wirz, S.L. (1998) Rehabilitation in Practice: The Use of Non-Specialist Personnel in Providing a Service for Children Disabled by Hearing Impairment. *Disability and Rehabilitation*, **20**, 189-194.  
<https://doi.org/10.3109/09638289809166080>
- [9] Sajjad, M., Khattak, A., Bunn, J. and Mackenzie, I. (2008) Causes of Childhood

- Deafness in Pukhtoonkhwa Province of Pakistan and the Role of Consanguinity. *The Journal of Laryngology & Otology*, **122**, 1057-1063.  
<https://doi.org/10.1017/S0022215108002235>
- [10] Daniel, W.W. and Cross, C.L. (1995) *Biostatistics: A Foundation for Analysis in the Health Sciences*. John Wiley & Sons, New York. <https://doi.org/10.2307/2533362>
- [11] Kahn, H.A. and Sempos, C.T. (1989) *Statistical Methods in Epidemiology (Monographs in Epidemiology and Biostatistics)*. Oxford University Press, Oxford.
- [12] Goodman, R., Ford, T., Simmons, H., Gatward, R. and Meltzer, H. (2000) Using the Strengths and Difficulties Questionnaire (SDQ) to Screen for Child Psychiatric Disorders in a Community Sample. *The British Journal of Psychiatry*, **177**, 534-539.  
<https://doi.org/10.1192/bjp.177.6.534>
- [13] Goodman, R. (1997) The Strengths and Difficulties Questionnaire: A Research Note. *Journal of Child Psychology and Psychiatry*, **38**, 581-586.  
<https://doi.org/10.1111/j.1469-7610.1997.tb01545.x>
- [14] Samad, L., Hollis, C., Prince, M. and Goodman, R. (2005) Child and Adolescent Psychopathology in a Developing Country: Testing the Validity of the Strengths and Difficulties Questionnaire (Urdu Version). *International Journal of Methods in Psychiatric Research*, **14**, 158-166. <https://doi.org/10.1002/mpr.3>
- [15] Brosius, F. (2013) SPSS 21. MITP-Verlags GmbH & Co. KG, Frechen.
- [16] Rosner, B. (2006) *Fundamentals of Biostatistics*. Thomson-Brooks/Cole; BioMed Central Publishes under the Creative Commons Attribution License (CCAL), Belmont.
- [17] Jolliffe, I. (2011) Principal Component Analysis. In: *International Encyclopedia of Statistical Science*, Springer, Berlin, 1094-1096.  
[https://doi.org/10.1007/978-3-642-04898-2\\_455](https://doi.org/10.1007/978-3-642-04898-2_455)
- [18] Cortina, J.M. (1993) What Is Coefficient Alpha? An Examination of Theory and Applications. *Journal of Applied Psychology*, **78**, 98.  
<https://doi.org/10.1037//0021-9010.78.1.98>
- [19] Bailly, D., Dechoulydelenclave, M. and Lauwerier, L. (2003) Hearing Impairment and Psychopathological Disorders in Children and Adolescents. Review of the Recent Literature. *L'Encephale*, **29**, 329-337.
- [20] Srinath, S., Girimaji, S.C., Gururaj, G. and Seshadri, S. (2005) Epidemiological Study of Child & Adolescent Psychiatric Disorders in Urban & Rural Areas of Bangalore. *Indian Journal of Medical Research*, **122**, 67.
- [21] Verhulst, F.C. (1995) *The Epidemiology of Child and Adolescent Psychopathology: Strengths and Limitations*. Oxford University Press, Oxford.
- [22] Sinkkonen, J. (1994) Evaluation of Mental Health Problems among Finnish Hearing Impaired Children. *Psychiatria Fennica*, **25**, 52-65.
- [23] Hindley, P. (1997) Psychiatric Aspects of Hearing Impairments. *Journal of Child Psychology and Psychiatry*, **38**, 101-117.  
<https://doi.org/10.1111/j.1469-7610.1997.tb01507.x>
- [24] Hintermair, M. (2007) Prevalence of Socioemotional Problems in Deaf and Hard of Hearing Children in Germany. *American Annals of the Deaf*, **152**, 320-330.  
<https://doi.org/10.1353/aad.2007.0028>
- [25] Ferris, M.H.-H.C. (2007) Mahnom County Rural Mental Health Outreach Project: Evaluation Report. Wilder Research, Saint Paul.
- [26] Hintermair, M. (2006) Parental Resources, Parental Stress, and Socioemotional De-

velopment of Deaf and Hard of Hearing Children. *The Journal of Deaf Studies and Deaf Education*, **11**, 493-513. <https://doi.org/10.1093/deafed/enl005>

- [27] Gaspar, M. and Paiva, P. (2003) Parenting Practices and Children's Socio-Emotional Development: A Study with Portuguese Community Preschool Age Children.
- [28] Knitzer, J., Theberge, S. and Johnson, K. (2008) Reducing Maternal Depression and Its Impact on Young Children: Toward a Responsive Early Childhood Policy Framework.