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Socialization Program for Prevention and Early Detection of Congenital Hearing Loss in the Families of Deaf School children

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Abstract

Objective: socializing hearing loss examination and early detection to patients and their families in deaf type B schools. **Methods:** A community service program in the form of socialization was performed to the family of patients with hearing loss in deaf school type B, Surabaya, Indonesia. Pretest and posttest were conducted to determine the initial understanding and post socialization knowledge of these people. We also asked the participants to fill on a questionnaire regarding the possible causes of the hearing loss (family history, drug use, history of disease, and history of head trauma). **Results:** Based on the summary of pretest and posttest from the participants, an increase in participants' knowledge of hearing lost was found. This activity was attended by 90 family members of 37 patients with hearing loss. Pre and post test results. The results of the questionnaire showed that 94.59% of the patients came from Javanese ethnicity. As many as 21.62% of patients had a family history of hearing loss, and even 2 patients had a father, mother, and sibling with hearing loss. A total of 18.92% had a history of using ototoxic drugs, 16.22% had a history of maternal Rubella infection during pregnancy, and 2.7% had a history of head trauma. **Conclusion:** Socialization program was effective to increase knowledge of congenital hearing loss for family of deaf schoolchildren. The result of the questionnaire showed that deaf schoolchildren had several risk factors for the occurrence of hearing loss. Similar program can be performed in communities in other areas to increase prevention and early detection of hearing loss in Indonesia.

Keywords: *Socialization, hearing loss, deaf schoolchildren*

Introduction

Hearing loss is a commonly found sensory disorder, around 1/1000 births. Hearing loss can be caused by genetic factors, environmental factors and the interaction of these two factors. Genetic factors play a role in about 50% to 75% of the cause of hearing loss[1, 2]. Hearing loss can occur by sensorineural disturbances (damage to the inner ear, for example: damage to cranial nerves VIII, brain stem or cortex cerebri) or by disturbances in the conductive system (for example: outer ear anomalies or middle ear)[3]. Hearing loss greatly affects the development of language skills as it can interfere with development in children's social life and education. Hearing loss related to genetic factors (congenital hearing loss) can be found in two forms: syndromic disorders and non-syndromic disorders. About 70% of congenital hearing loss is in the form of non-syndromic disorder[4].

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Factors that contribute to hearing loss can come from: genetic, environmental or the interaction between the two factors. There are two forms of hearing loss that are influenced by genetic factors: syndromic and non-syndromic hearing loss. According to Guy Van Camp et al, 50% of hearing loss is hereditary and about 70% of congenital hearing loss is in the form of non-syndromic hearing loss (most often due to sensorineural disorders). Congenital hearing loss is very complex, as it is influenced by various genes and can be either autosomal recessive, autosomal dominant, X-linked or mutations in mitochondrial genes. Eighty percent of congenital hearing loss is autosomal recessive and is often seen prelingual[5, 6]. Environmental factors that contribute to hearing loss are: prenatal and postnatal (eg asphyxia, prematurity), exposure to infection (eg rubella virus, cytomegalovirus) and the use of cytotoxic drugs[6].

An understanding of the mechanisms associated with the onset of congenital hearing loss plays an important role in early detection and its therapeutic aspects. Genetic analysis of congenital hearing loss is an important means of tracking hereditary diseases in the patients as early as possible so that they can be treated immediately, besides tracking the presence of hearing loss in family members of sufferers and can be used as a premarital screening[7]. Considering the lack of knowledge of the public about risk factors of hearing loss and the low awareness of the community to get early detection, we conducted socialization on the family of deaf schoolchildren for early awareness and detection of hearing loss to increase knowledge and reduce the incidence of congenital hearing loss in Indonesia, especially in people with family history of hearing loss.

Methods

This socialization program targeted 90 family members of deaf schoolchildren in deafschool type B, Surabaya. The program consisted of socialization of congenital hearing loss, risk factors and early detection of hearing loss in children, screening of hearing loss in infants, and managements of children with hearing loss. Socialization was conducted by expert otolaryngologists. Pretest and posttest before and after socialization were performed to determine the increase of knowledge of the participants. Both pretest and posttest had similar questions, thus a paired t-test was performed and the results were analyzed by SPSS version 23. Representatives of each deafchild family member were asked to fill on questionnaire consisted of the child's information: age, sex, family history, race, use of ototoxic drugs, history of disease, and history of head trauma. The questionnaire used to assess the participant's knowledge was first performed validity and reliability beforehand. The validity value of the questionnaire was 0.76-0.92 and declared reliable with a value of $\alpha = 0.83$.

Results

At this program, from the results of the pretest assessment, the total average score was 62 of 100 (61.89 ± SD 14.37), with results: 50% had poor knowledge (<50 score), 32% had moderate knowledge (50-70 score) and 18% had good knowledge (>70 score). In the results of the posttest assessment, the total average score was: 87 (87.11 ± SD 7.68), with results: 90% had good knowledge and only 10% had moderate knowledge, and no participant had poor knowledge (Table 1). From the results of the evaluation of the pre-test and post-test results, it can be said that this program at deafschool type B could significantly increase participants' knowledge about the prevention and early detection of congenital hearing loss ($p < 0.001$). During the discussion, participants actively asked questions and gave responses to the problems raised.

In this program, representatives of family members of 37 deaf schoolchildren with hearing loss were asked to fill out a questionnaire about the child with hearing loss. The results of the questionnaire is displayed on Table 3. The result had almost the same distribution between children aged <10 years and ≥10 years and between female and male. The patient tribe is dominated by Javanese (94.59%). A total of 21.62% of patients had a family history of hearing loss, with 50% of them having sibling with hearing loss, and 25% of them had a

family history of complex hearing loss (father, mother, and sibling). A total of 18.92% of patients had a history of use of ototoxic drugs, with 85.71% being the drug ibuprofen. As many as 16.22% of patients had a history of maternal infection during pregnancy in the form of Rubella infection. Only 2.7% had a history of head trauma.

Table 1. Pretest and posttest results of the participants

Questions	Pretest (n = 90; %)	Posttest (n = 90; %)
What is the definition of hearing loss?	86 (96)	90 (100)
Since when human beings can hear?	51 (57)	73 (81)
What are the causes of hearing loss?	78 (87)	90 (100)
Do people with hearing loss always have speech disorder?	30 (33)	74 (82)
When should we suspect if our child has hearing loss?	29 (32)	60 (67)
How many parts do our ears have?	38 (42)	73 (81)
What is congenital hearing loss?	38 (42)	66 (73)
What should you do if your child has hearing loss?	71 (79)	85 (94)
When is the right time for screening of congenital hearing loss?	60 (67)	85 (94)
Is hearing loss a contagious disease?	80 (89)	88 (98)

Table 2. Pretest and posttest results of the participant's pair t test

Participant	t	CI 95%	p
Pretest	40,86	58.88 – 64.90	< 0.001
Posttest	107,61	85.50 – 88.72	< 0.001

Table 3. Characteristics of deaf schoolchildren in this study

Age	Percentage (n = 37)
< 10 y.o	48.65
≥ 10 y.o	51.35
Sex	
Female	48.65
Male	51.35
Race	
Javanese	94.59
Others	5.41
Family history of hearing loss	21.62
Ototoxic drugs usage	18.92
History of maternal infection during pregnancy	16.22
History of head trauma	2.7

Discussion

There are 360 million persons in the world with disabling hearing loss, in which 32 (9%) millions of these are children. The prevalence of hearing loss in children is greatest in South Asia, Asia Pacific and Sub-Saharan Africa[8]. The prevalence is also high in developing and underdeveloped countries. Hearing loss can occur at various ages. It becomes a public health problem because the population in both developed and developing countries is around 6-8%[1]. The results of the 2013 Basic Health Research showed that the prevalence of hearing loss in children aged 5-14 years was 0.8%. From these data, it is known that the prevalence of respondents with hearing loss in women tends to be slightly higher than that of men (2.8-2.4%), however the research does not differentiate by age. This result is somewhat different from our data which shows that girls with hearing loss have a higher prevalence than boys[9].

In this study, 21.62% of schoolchildren deaf students had a family history of hearing loss, there were even 2 children with multiple family history of hearing loss, in which all of the main family members were affected. Hearing loss can be caused by genetic factors, environmental factors and the interaction of these two factors. Genetic factors play a role in about 50-75% of the cause of hearing loss[1, 10]. Hearing loss related to genetic factors (congenital hearing loss) can be found in two forms: syndromic disorders and non-syndromic disorders. About 70% of congenital hearing loss is in the form of nonsyndromic disorder[11]. Previous research conducted by Purnami et al showed the prevalence of mutations in the gap junction protein beta-2 (GJB2) gene was 13.64% in schoolchildren deaf schoolchildren in Surabaya, Indonesia[12].

In this study, 18.92% of children had a history of using ototoxic drugs, namely Ibuprofen and Streptomycin. A systematic review conducted by Kyle et al showed a significant increase in the risk of hearing loss in patients taking Ibuprofen (RR = 1.13; CI = 1.06-1.19), even though Ibuprofen is an over-the-counter medicine that is often given to children[13]. Ibuprofen is a non-steroidal anti-inflammatory drug (NSAID) for the treatment of inflammation, mild-to-moderate pain and fever in children, and is the only NSAID approved for use in children aged ≥3 months[14]. The use of streptomycin is also often associated with hearing loss. Streptomycin is an aminoglycosides class of antibiotics which can cause cochlear or vestibular damage[15].

In this study, 16.22% of children had a history of pregnant women with Rubella. Rubella is a viral infection that can cause Congenital Rubella syndrome (CRS). CRS is a syndrome consisting of several congenital disorders such as deafness, cataracts and heart defects. Deafness is the most common manifestation in CRS cases and 70-90% suffer from sensorineural type deafness. The mechanism of hearing loss due to the rubella virus can be caused by hypoxia, which occurs when the endothelial damage in the cochlea is followed by cell death in the organs of the Corti and the stria vascularis[16]. Apart from Rubella, other infections in pregnant women such as mumps, measles, meningitis, and cytomegalovirus can also cause congenital deafness[8].

The World Health Organization (WHO) estimates that around 60% of childhood hearing loss could be avoided through prevention measures[8]. This program has benefits for the community to reduce the incidence of congenital hearing loss in Indonesia, especially for families with risk factors. Screening and detection of risk factors in children with congenital hearing loss also helps better management of congenital hearing loss patients in the community.

Conclusion

Socialization program could increase public awareness about hearing loss, especially for family who had children with hearing loss. Most deaf schoolchildren involved in this program had risk factors for hearing loss that could be prevented for the other family members. In general, there was an increase in the knowledge of the participants about hearing loss. Additional support from the community is needed and similar programs need to be carried out in other places, especially in families who had members with hearing loss to increase public

awareness and reduce the incidence of hearing loss, especially congenital hearing loss in Indonesia.

Conflict of Interest: The authors declare that they have no conflict of interest.

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Ethical approval : All procedures performed in studies involving human participants were in accordance declaration of Helsinki the Ethics Committee in Dr. Soetomo General Academic Hospital, Surabaya, Indonesia (510/Panke.KKE/2017).

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