

## EFFECTIVENESS OF INITIAL SOLUTIONS INCORPORATED INTO EARLY INTERVENTION DELIVERY SYSTEMS FOR CHILDREN WITH HEARING LOSS: EVIDENCE FROM HAI PHONG, VIETNAM

XUONG TUYET NGUYEN<sup>1\*</sup>, HA NGOC NGUYEN<sup>2</sup>, TRAM VAN TA<sup>3</sup>, VU KIEN TRAN<sup>4</sup>, HIEN THE PHAM<sup>5</sup>

<sup>1</sup>Department of Ear-Nose-Throat, Vietnam National Hospital of Paediatrics, Hanoi 100000, Vietnam. <sup>2</sup>Department of Ear-Nose-Throat, Viet Tiep Friendship Hospital, Hai Phong 180000, Vietnam. <sup>3</sup>Department of Paediatric, Tien Giang General Hospital, Tien Giang Province 860000, Vietnam. <sup>4</sup>Department of Surgery, Tra Vinh General Hospital, Tien Giang Province 860000, Vietnam. <sup>5</sup>Department of Medicine and Pharmacy, Tra Vinh University, Tra Vinh Province 940000, Vietnam. Email: [nguyenxuongnhp@yahoo.com](mailto:nguyenxuongnhp@yahoo.com)

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### ABSTRACT

**Objective:** Hearing loss is a serious disease that needs attention from society because of its considerable effects on the normal development of children. This study incorporated systematic solutions into early intervention delivery systems for children with hearing loss in Hai Phong, Vietnam, and evaluated the effectiveness of the strategies.

**Methods:** This community intervention study, which was carried out from 2013 to 2014, involved a comparison of the early intervention delivery systems before and after the implementation of the proposed solutions.

**Results:** Two years after the solutions were applied, the following results were derived: The availability of resources and the quality of service provision improved and access to and the use of services by families whose children suffer from hearing loss increased. The solutions also facilitated the creation of an early communal intervention program and significantly enhanced the situations of children with hearing loss as regards the average ages at which disease onset was suspected, the disease was definitively identified, hearing aid fitting was initiated, and language intervention was implemented (15.5, 21, 23.7, and 26.5 months, respectively). Finally, the solutions enabled detection, diagnosis, and early intervention at <12 and 24 months of age ( $p < 0.001$ ).

**Conclusion:** The strategy of reinforcing intervention programs with general and comprehensive solutions can be expanded to other Vietnamese provinces grappling with similar problems.

**Keywords:** Deaf children, Early intervention, Hearing loss, Intervention delivery service, Vietnam.

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### INTRODUCTION

The initial years of life are a very important time for the development of children, among whom those suffering from hearing impairment require early intervention as a crucial measure for helping them cultivate speech from a young age, minimizing the effects of such disability on their speech and language development, and maximizing their ability to communicate [1]. These outcomes ultimately enable hearing-impaired children to live a life of community integration [1]. The World Health Organization (WHO) estimated that in 2019, hearing loss was experienced by about 466 million people (6.1%), including 34 million children [2,3]. The organization also reported that the incidence of the condition is increasing, projecting the number of affected individuals to reach 630 million by 2030 [2,3]. Hearing loss often occurs in low-income countries, with a prevalence rate nearly four times higher than that in high-income nations [4]. The incidence of disability in children causes substantial economic burdens, which was approximated by the WHO in 2018 to be around US\$750 billion per year. These economic losses were due costs for treatment and indirect costs due to reduced labor productivity as mentioned in the research in the United States [5].

The above-mentioned problems can be resolved through early intervention, which not only changes the future of deaf children but also reduces the burdens imposed on their families and the societies to which they belong [6]. It is a comprehensive process that encompasses early detection and diagnosis to early intervention and covers children, parents, families, and the larger networks

where they interact [6-8]. In developed countries, such as the United Kingdom, the US, Australia, Canada, and The Netherlands, early detection and intervention for newborn babies with hearing loss were strongly developed into components of a national program and are constantly being updated, thereby motivating participation from many social organizations [9]. Many research projects are unified in illustrating experiences of the synchronous implementation of early intervention with newborn screening and early interventions carried out by teams of multifunctional experts in accordance with a full program. Both practical and applied studies have gained numerous remarkable achievements, demonstrating the superiority and effectiveness of an early detection system and efforts to organize early hearing-impaired treatments within a unified, synchronous, and comprehensive model.

In Vietnam, however, early intervention services are incommensurate with demand and remain inappropriately developed in relevant facilities. Specifically, hospitals and other relevant institutions in Hai Phong urgently need to identify shortcomings in the provision of early intervention services and enhance the responsiveness of existing intervention delivery systems to the needs of hearing-impaired children. These measures are necessary in advancing early detection and timely appropriate intervention for Vietnamese children with hearing disabilities. As a response to this challenge, this study was carried out, with a view to formulating solutions and implementing them in institutions that offer early intervention services. The effectiveness of the proposed solutions was then evaluated.

**METHODS**

**Study design**

This community intervention study assessed the effectiveness of solutions incorporated into the systems of facilities that deliver early intervention services to deaf children in Hai Phong. The investigated institutions were the Hai Phong Deaf School, Viet Tiep Friendship Hospital, Children’s Hospital, Hai Phong Hospital of Obstetrics and Gynecology, Cat Tuong Audiology Center, and Child Protection Fund (CPF). The evaluation was conducted from January 2013 to December 2014.

**Study stages**

This study, which involved a comparison (non-controlled) of the intervention delivery systems before and after the implementation of the proposed solutions, was conducted in two phases. Phase 1 involved the implementation of the solutions, and Phase 2 entailed assessing their effectiveness.

*Phase 1*

The solutions put forward in this work were applied from January 2013 to December 2014. The specific measures were as follows:

- (1) Strengthening coordination among agencies with respect to all the early intervention activities that they implement
- (2) Organizing information campaigns and health education activities to raise public awareness about the causes and effects of hearing loss and the benefits of early screening and intervention. For example, the television programs meant to increase awareness of hearing impairments and early intervention, meeting, and leaflets regarding early intervention
- (3) Coordinating the mobilization of resources intended for organizations and individuals
- (4) Organizing training and retraining initiatives to improve the professional capacity of teachers and health workers who participate in early intervention as well as the ability of parents to deal with the disability
- (5) Integrating screening activities for all children at the Hai Phong Hospital of Obstetrics and Gynecology and identifying children suffering from deafness
- (6) Organizing counseling and family support services
- (7) Arranging speech and rehabilitation therapies for deaf children.

*Phase 2*

The solutions were evaluated after December 2014 with the participation of a selected sample composed of health workers and teachers, employees of the facilities that provide early intervention services, and deaf children who receive these services and their parents. Information on human resources, equipment, and service application was collected from facility managers and early intervention teachers. Data regarding locations of diagnostic testing were derived through interviews with parents, with additional information on ages of detection, diagnosis, and intervention obtained from them as well. A total of 190 children with hearing impairments and whose records were maintained by the participating service providers for 2 years (2013–2014) were interviewed. Children >15 years old who are afflicted with hereditary hearing impairment and whose families declined participation in the research were excluded.

**Statistical analysis**

The collected data were entered into Microsoft Excel (version 2016), which was adopted to automatically perform descriptive statistical analysis (average, percentage, and range of values). Differences between indices were analyzed through an independent t-test, analysis of variance, and a Chi-square ( $\chi^2$ ) test, whose results were then processed using the Statistical Package for the Social Sciences (version 20.0).  $p < 0.05$  was considered statistically significant.

**Ethical considerations**

The study was approved by the ethics committee of 6 institutions as mentioned above. Consent to participate in the research was provided

by the managers of the early intervention service providers, and they allowed the authors to use their research facility archives. Permission was sought from the families to use their data stored in the research facilities. They were also informed that the collected data will be kept confidential and employed only for the purposes of research and the achievement of public health goals.

**RESULTS**

**Collaboration between agencies**

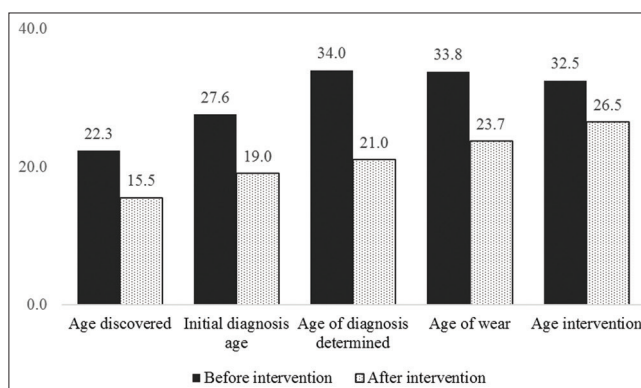
The results of interviews with manager of agencies and early intervention teachers showed that the proposed measures drove close coordination of various forms among all early intervention activities, thereby constituting a support program. Such coordination contributes to building management process with specific activities, the implementation of unified management, and the development of a common data collection form.

**Communication and social mobilization activities**

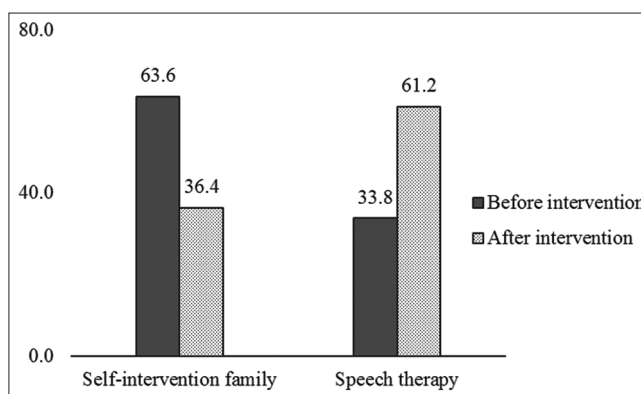
The solution program put forward in this study helped practitioners create three television programs, conduct one meeting, deliver more than 29,000 leaflets, and direct counseling on the screening of hearing impairment for 29,000 pregnant women and their families. The proposed solutions also mobilized sponsors to install a soundproofing classroom at the Hai Phong Deaf School for Speech Therapy, provide support in the procurement of hearing aids, and shoulder initial tuition for listening and speaking lessons for disadvantaged children.

**Knowledge enhancement**

The proposed solution program cleared the way for the organization of six short-term training courses for teachers of the Hai Phong Deaf School, with five early intervention educators affording the opportunity to attend two professional training courses for 2 weeks at the National



**Fig. 1: Age-related changes after solution implementation**



**Fig. 2: Changes in the percentage of hearing-impaired children receiving speech therapy**

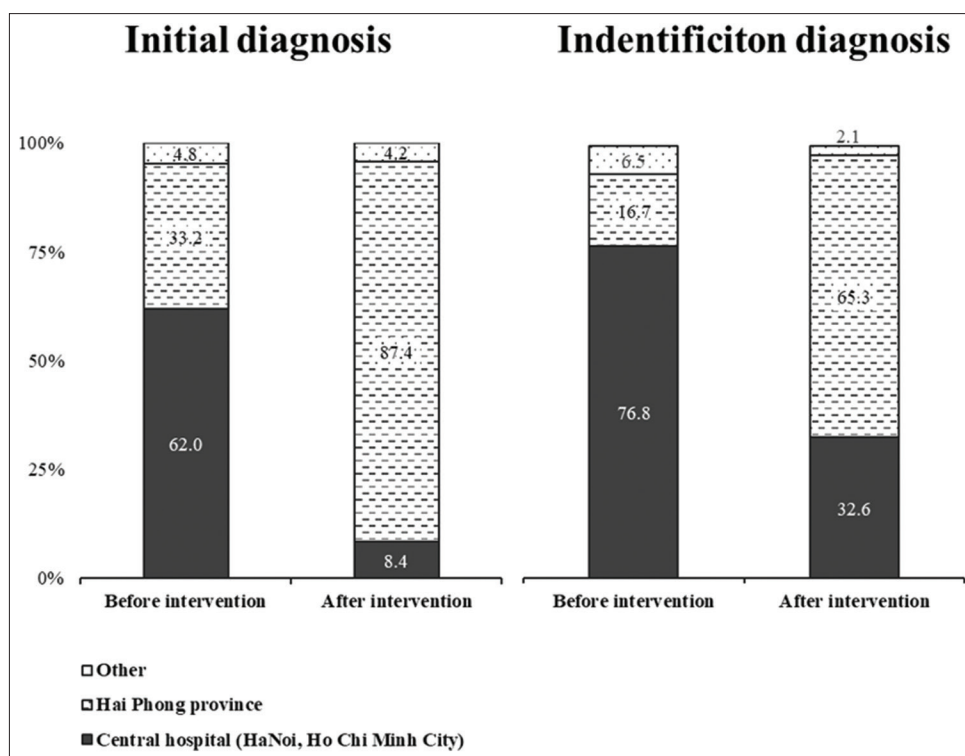


Fig. 3: Comparison of diagnostic distribution before and after solution implementation

Hospital of Pediatrics and Hanoi National University of Education. At the same time, the recommended measures brought about the provision of six humanitarian-led ear, nose, and throat examination programs; hearing screenings; and early intervention counseling for hearing-impaired children, children with speech delays, and children suspected of having hearing impairment. Earplugs were also offered free to children using hearing aids. Finally, family counseling services were organized, with health personnel accompanying parents of the deaf during the intervention process.

**Changes in availability of resources and services**

After the implementation of the solutions, the Children’s Hospital has provided screening services, early diagnostic services, and family counseling, and the Hai Phong Hospital of Obstetrics and Gynecology has offered newborn hearing screenings and family counseling. The BTTE Fund has taken on the role of an association unit that mobilizes resources and offers consultation and support to families. Activities of facilities with intervention delivery systems have been closely coordinated and integrated to create an overall comprehensive and continuous intervention service for deaf families. This endeavor is expected to ensure easy access, treatment choices, and the best development opportunities for deaf children (Fig. 1).

**Changes in deaf children after solution implementation**

The ages at which interventions were initiated significantly decreased compared with the ages of implementation before the proposed solutions were applied ( $p < 0.05$ ), that is, children with hearing loss were provided treatments, except for language intervention, at 26.5 months. At  $< 24$  months, the disease was discovered and initially diagnosed, a definitive diagnosis was made, and hearing aids were fitted. Note, however, that the ages at which these events take place continue to fluctuate substantially from 1 to 49 months (Fig. 2).

The number of deaf children who receive treatment increased (61.2% vs. 36.4%), and the number of children whose families are compelled to apply self-intervention decreased (38.8% vs. 63.6%;  $p < 0.001$ ).

The rate of hearing-impaired children initially diagnosed in Hai Phong increased significantly from 33.2% to 87.4%; at central hospitals, such

rate decreased from 62% to 8.4% ( $p < 0.001$ ). The proportion of children who received a definitive diagnosis of hearing impairment increased from 16.7% to 65.3%; at the central hospital level, this proportion decreased from 76.8% to 32.6% ( $p < 0.001$ ) (Fig. 3).

**DISCUSSION**

Research has shown that providing intervention services to deaf children exerts many positive effects on the diagnosis and treatment of hearing loss. The results of the current study indicated that the disability was discovered and diagnosed at an earlier period than that achieved in the research of Thiep *et al.* [8] in Vietnam. However, the 1-3-6 recommendations of the Joint Committee on Infant Hearing are no longer effective in guaranteeing the best early intervention effects in the real world [10]. In Vietnam today, when an entire newborn hearing screening program is rarely deployed in hospitals and medical facilities, the detection of hearing loss falls mainly on the shoulders of family members.

After 2 years of implementation, the solutions put forward in this work stimulated meaningful change among service providers in terms of resource structure, increased service availability, and improved service quality. Simultaneously, these measures elevated the early detection and intervention of hearing loss in children. The effectiveness of the solutions was reflected in the changes occurring in both the supply side and the part of service users, that is, the deaf, who are the main beneficiaries of the desired modifications to the investigated intervention delivery systems.

**Changes in resources and service availability**

After the implementation of the solutions, two more facilities were furnished with initial screening equipment used for diagnosis in children’s and obstetrics hospitals. These devices, such as otoacoustic emission testing, auditory brain stem response, and auditory steady-state response machines, are essential for diagnosing and identifying hearing impairments, increasing the average screening rate to 90.2%, and reducing the age of detection, diagnosis, and intervention for children. The solution scheme also contributed to a dramatic change in awareness and interest not only among pregnant women and their families but also among many other people in the

community. This result highlights the need for adequate funding and resource allocation for initiatives such as the solution program advanced in this research, especially for screening centers that provide newborn monitoring and intervention monitoring services, as recommended in international research [11]. In addition, Viet Tiep Hospital plans to build a hearing center at the Ear-Nose-Throat Faculty, and the Hearing Impairment School for Speech Therapy intends to enhance its human resources and therapeutic services. As previously stated, the BTTE Fund now functions as an association that deploys resources for particular purposes and provides consultation and support to families.

#### Changes in the actual situations of hearing-impaired children

The circumstances that surround early detection and intervention for deaf children reflect not only the usage of corresponding services by children with hearing impairment and their families but also the supply capacity of service providers. After 2 years of implementing the solutions, the ages of detection, initial diagnosis, definitive diagnosis, hearing aid fitting, and initiation of language intervention decreased to levels significantly lower than those observed before the solutions were applied. The percentages of hearing-impaired children diagnosed initially and definitively in Hai Phong increased to 87.4% and 65.3% compared with 33.2% and 16.7% before the solution scheme. This finding shows that the availability and accessibility of the service delivery systems improved, thereby satisfying the needs of deaf children and their families. Increases were also achieved in terms of the number of children wearing hearing aids, the number of children receiving treatment, and the number of children treated at younger than 36 months of age. The time delays in detection, diagnosis, and intervention were reduced, indicating positive effects of augmenting the availability of enhanced services experienced by parents of deaf children. Such measure is necessary to improve a child's speech, language, and participation in functional activities [12]. Despite these favorable outcomes, however, family circumstances and difficult economic conditions remain a tremendous barrier to the gradual improvement in the status of many deaf children. The BTTE Fund needs to be more active in supporting families with difficult conditions to access health services.

The in-depth interviews uncovered that numerous deaf children, particularly those mired in challenging situations, have received positive benefits from the facilitation of intervention. This finding signifies the effectiveness of solutions that afford hearing-impaired children opportunities for early detection and treatment and provide parents who care for their children properly a chance to discuss concerns with professionals. The participating parents enthusiastically joined all counseling and training sessions.

#### Practical basis and rationale for the solutions

The favorable results derived in this work were due to the following factors: (1) support from unit leaders as to the urgency and humanitarian addressing of early intervention problems, along with the enthusiasm of those who directly participated in the implementation of the solutions; (2) the consistency and comprehensiveness of the solutions related to coordination among sectors, health education and information campaigns, social mobilization, and strengthening activities for early intervention services; and (3) appropriate intervention strategies for providing screening, carrying out diagnosis, offering speech therapy interventions with counseling, extending family support, and broadening community awareness, as well as directing focus toward management, monitoring, and applying timely intervention that is suitable for each child and family. The findings also serve as a practical basis and rationale for the implementation of these three solution categories.

#### CONCLUSION

This research implemented and evaluated the effectiveness of solutions for early intervention delivery systems for hearing-impaired children in Hai Phong from 2013 to 2014. 2 years of intervention realized the following outcomes: The scheme fundamentally improved the availability of resources, the capacity for and effectiveness of service provision, and the access and use of services by deaf children and their families. It enabled the creation of an early community intervention program and significantly enhanced the ages at which the disease was detected and diagnosed and the ages at which children began wearing hearing aid machines and receiving treatment. Detection, diagnosis, and early intervention were accomplished at <12 and 24 months. The findings showed that the proposed solutions were comprehensive, highly efficient, feasible, scientific, and sustainable. The measures put forward in this work can be extended to other localities in Vietnam with conditions similar to those experienced in Hai Phong.

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#### DISCLOSURE

The authors have no conflicts of interests to declare.

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