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Original Research

The Impact of COVID-19 on the Amplification, Education, and Communication of Children with Hearing Loss: Parental Views

İclal Şan[1], Ayşenur Aykul Yağcıoğlu[2], Hatice Kavruk[3]

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Abstract

Objectives: The effects of the COVID-19 pandemic are evident in many areas, such as health, social life, economic conditions, and education. However, there is no study found in which the opinions of parents with hearing-impaired children were sought on amplification, education, and communication during the COVID-19 pandemic. This study aimed to examine the effects of the COVID-19 pandemic on amplification, aural rehabilitation, school education, and communication of children with hearing loss in Türkiye from the perspectives of parents.
Materials and Methods: The study sample consists of 135 parents between ages 18 to 65 with a child using a hearing aid and/or hearing implant. The data was collected utilizing an online form.
Results: Results indicated that problems related to school education, device use, device repair, and aural rehabilitation of their children, reported by parents before the COVID-19 pandemic, had increased during the pandemic. In addition, the needs in the fields of economic, social, and psychological support, regulation of legal rights, family education, and family counseling services regarding the hearing aid/ hearing implant and aural rehabilitation, which were determined before the pandemic, continued during the pandemic.
Conclusion: The COVID-19 pandemic has limited the diagnosis, follow-up, and rehabilitation processes of children with hearing loss. These results reveal the need for the application of innovative communication and teaching methods, such as tele-audiology, to meet the needs of children with hearing loss.

Keywords: *COVID-19 pandemic, hearing loss, communication, education, hearing aid*

[1]**İclal Şan (Corresponding Author).** (Department of Audiology, Izmir Bakırcay University, İzmir, Turkiye, e-mail: iclal_san@hotmail.com, ORCID: 0000-0002-9991-6806)
[2]**Ayşenur Aykul Yağcıoğlu.** (Department of Audiology, KTO Karatay University, Konya, Turkiye, e-mail: aysenurraykull@gmail.com, ORCID: 0000-0001-9866-2974)
[3] **Hatice Kavruk.** (Department of Speech and Language Therapy, Necmettin Erbakan University, Konya, Turkiye, e-mail: haticekavruk3@gmail.com, ORCID: 0000-0003-4235-0546)

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H.Ü. Sağlık Bilimleri Fakültesi Dergisi
Cilt:11, Sayı: 3, 2024
Doi: 10.21020/husbfd.1349433

Introduction

Hearing loss is the most common congenital sensory disorder, with an incidence of 4/1000 live births in the world (Kenna, 2015). Mild to severe hearing loss affects the language and speech, socio–emotional development, and academic development of children (Carney & Moeller, 1998). Children with hearing loss demonstrate a high prevalence of emotional and behavioral difficulties, as well as indicators of communication disorders, language and cognitive development, and motor skills. Decreased receptive language skills and increasing difficulties in comprehending others in these children are also indicators of psychosocial problems (Hogan et al., 2011). Regardless of the degree of hearing loss, it is crucial for every child to develop language skills at an early age (Gravel & O'Gara, 2003). Education and counseling through the use of aural rehabilitation and amplification are key components for optimizing communication for individuals with hearing loss (Nieman & Oh, 2020). Early intervention is particularly important because the language skills of children with hearing loss will develop similarly to the skills of their peers when a hearing aid fitting is completed during the earliest period (Tomblin et al., 2015; Tomblin et al., 2020). Furthermore, the suitability and duration of use of the hearing aid have a direct positive effect on auditory skill development and speech recognition skills (Marnane & Ching, 2015; McCreery et al., 2013; Moeller & Tomblin, 2015).

While hearing loss affects the child in many areas, parents also struggle with many difficulties as well. Families' adaptation to these challenges varies. It is observed that some families adapt well, while others show greater difficulties. Accounting for variability in family and child outcomes are important first steps in developing new family-centered interventions that support optimal outcomes (Holt et al., 2020).

Support and advice from both professionals and other parents of hearing-impaired children is both necessary and invaluable. Nowadays, as early diagnosis and intervention programs for children with hearing loss are increasing, it is crucial to understand the needs of parents in order to evaluate and adapt to these programs.

The severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), which caused the COVID-19 pandemic, has posed a serious threat to public health and safety (Tang et al., 2020). World Health Organization (WHO) declared the disease to be a pandemic on March 11, 2020, as it affected the human respiratory tract worldwide. This has resulted in an increase in issues related to limitations in access to healthcare, economic and social deterioration, increasing risk of falling into extreme poverty, an increase in the number of malnourished people, limitations

H.Ü. Sağlık Bilimleri Fakültesi Dergisi
Cilt:11, Sayı: 3, 2024
Doi: 10.21020/husbfd.1349433

to face-to-face education, and the inability of children to adapt (Joint statement by ILO, FAO, IFAD & WHO).

The effects of the pandemic have been researched intensively, as studies were carried out from the beginning of the pandemic to the present time. Hearing loss is accompanied by deficiencies in many areas, such as cognitive, social-emotional, and communicative. This study examines the effects of the COVID-19 pandemic on the use of hearing aids and/or hearing implants, aural rehabilitation, school education, and the communication of children with hearing loss from the perspectives of their parents to determine the difficulties and expectations of these parents.

Methods

Study Design

The study sample consisted of 135 parents between ages 18-65 with a child using a hearing aid and/or hearing implant. Participants' data was collected online to avoid direct contact, which is the primary route of COVID-19 transmission. Researchers distributed an online form to parents of children with hearing loss through special education and rehabilitation centers. Informed consent was obtained at the beginning of the form so that parents who agreed to participate in the study could answer the questions. Participation in this study was completely voluntary.

The approval of the Faculty of Medicine, Non-Pharmaceutical and Medical Device Research Ethics Committee was obtained (Decision no: 2022/008). The study was conducted in accordance with the Helsinki Declaration.

Procedure

Research data was collected through an online form prepared by the researchers and consisted of 32 questions. The form takes about 10–15 minutes to complete, and all questions were prepared utilizing plain language that could be easily understood.

Responses to the form were categorized into different themes, such as amplification (hearing aid/ hearing implant), education (aural rehabilitation and school education), communication, and problems and expectations before and during the COVID-19 pandemic. Some questions were presented with a Likert-type response scale in which the following options were presented: 1) Yes; 2) Sometimes; 3) No. Other questions were presented in an open-ended format. Non-standardized questions were prepared by the researchers to allow the parents of children with hearing loss to compare their children's current situation during the pandemic

Doi: 10.21020/husbfd.1349433

process with their experiences prior to the pandemic.

Statistical Analyses

SPSS Statistics 24 was utilized to analyze the data collected from the study. The percentage frequency distribution obtained from the descriptive statistical analysis was used in the analysis of likert type answers. A non-parametric chi-square analysis was conducted to analyze the percentage values of the responses received from parents regarding the problems experienced by children with hearing loss before and during the pandemic. The results were evaluated at a 95% confidence interval and at a significance level of $p < .05$ and $p < .001$.

Results

Demographic Information

The demographic information of 135 parents included in the study is given in Table 1. The demographic information of the children with hearing loss of the parents and the information about the hearing loss are given in Table 2.

Table 1. Demographic information of parents

Variable (n=135)	Frequency	Percentage (%)
Gender		
Female	102	75.6
Male	33	24.4
Age (years)		
≤ 18	2	1.5
19-30	32	23.7
31-40	73	54.1
41-50	25	18.5
51-60	2	1.5
>60	1	0.7
Education		
None	1	0.7
Primary School	40	29.6
Middle School	30	22.3
High School	31	23
University	33	24.4
Work		
Government	25	18.5
Private	20	14.8
Other	10	7.4
Not employed	80	59.3

H.Ü. Sağlık Bilimleri Fakültesi Dergisi
Cilt:11, Sayı: 3, 2024
Doi: 10.21020/husbfd.1349433

Table 2. Information about children with hearing loss

Variable (n=135)	Frequency	Percentage (%)
Gender		
Female	57	42.2
Male	78	57.8
Age (years)		
0-6	48	35.6
7-12	56	41.4
13-18	20	14.9
>18	11	8.1
Hearing loss diagnosis age		
0-6 months	64	47.4
7-12 months	19	14.1
1-2 ages	19	14.1
2-3 ages	16	11.9
3-4 ages	7	5.2
> 4 ages	10	7.3
Hearing aid/ hearing implant		
Unilateral hearing aid	4	3
Bilateral hearing aid	43	31.8
Unilateral cochlear implant	31	23
Bilateral cochlear implant	43	31.8
Hearing aid and cochlear implant	8	6
Brainstem implant	6	4.4
Hearing aid application age		
0-6 months	31	23
7-12 months	25	18.5
1-2 ages	32	23.7
2-3 ages	26	19.3
3-4 ages	5	3.7
> 4 ages	16	11.8
Hearing implant application age		
< 1 ages	3	2.9
1-2 ages	27	20
2-3 ages	27	20
3-4 ages	17	12.6
> 4 ages	16	11.2
None	45	33.3

Amplification

In the study, 60% of the parents answered no to the question, “Did the COVID-19 pandemic process negatively affect your child's hearing aid/ hearing implant usage time?”. Table 3 displays a comparison of responses to questions regarding adequate technical support and repair costs for the hearing aid/ hearing implant before and during the COVID-19 pandemic.

H.Ü. Sağlık Bilimleri Fakültesi Dergisi
Cilt:11, Sayı: 3, 2024
Doi: 10.21020/husbfd.1349433

Table 3. Comparison of responses related to technical support and repair costs of the hearing aid/ hearing implant before and during the COVID-19 pandemic

Question		Sometimes	Yes	No	Total	χ^2	*p*
Before the pandemic, did you receive adequate technical support about the hearing aid/ hearing implant, and did you reach authorized persons when the repair was required?	n	34	91	10	135	23,434	< .001
	%	39.1	63.2	25.6	50.0		
During the pandemic, do you receive adequate technical support about the hearing aid/ hearing implant, and can you reach authorized persons when a repair is required?	n	53	53	29	135		
	%	60.9	36.8	74.4	50.0		
Before the pandemic, did you have financial difficulties while covering the repair costs of the hearing aid/ hearing implant?	n	45	62	28	135	2,839	> .05
	%	57	45.3	51.9	50.0		
During the pandemic, were you having financial difficulties to cover the cost of hearing aid/ hearing implant repair?	n	34	75	26	135		
	%	43	54.7	48.1	50.0		

Education

Aural Rehabilitation

In the study, 43% of the parents answered yes to the question, “Did the COVID-19 pandemic process negatively affect your child's aural rehabilitation?”. When asked, “Did the use of masks in the COVID-19 pandemic negatively impact your child’s aural rehabilitation?” 37.8% of parents answered yes, 27.4% answered sometimes, and 34.8% answered no. A comparative chart reviewing participant responses regarding the adequacy of the aural rehabilitation program before and during the COVID-19 pandemic is given in Table 4.

When asked, “Did you work together at home to help with aural rehabilitation before and during the COVID-19 pandemic?” 75.6% of parents answered yes to before the pandemic. This rate decreased to 65.9% during the pandemic period; however, this result was not found to be statistically significant ($\chi^2(2) = 5.588$, $p > .05$).

Table 4. Comparison of the responses related to the adequacy of the aural rehabilitation program before and during the COVID-19 pandemic

Question		Sometimes	Yes	No	Total	χ^2	*p*
Before the pandemic, did you find the aural rehabilitation program sufficient?	n	41	82	12	135	6,604	< .05
	%	42.3	57.3	40	50.0		
During the pandemic, do you find the aural rehabilitation program sufficient?	n	56	61	18	135		
	%	57.7	42.7	60	50.0		

H.Ü. Sağlık Bilimleri Fakültesi Dergisi
Cilt:11, Sayı: 3, 2024
Doi: 10.21020/husbfd.1349433

School Education

More than half of the children whose parents were included in the study were at the age of compulsory education. 69.6% of the parents answered yes to the question "Did the COVID-19 pandemic process negatively affect your child's school education?". When asked, "Were you helping your child with his or her schoolwork before and during the COVID-19 pandemic?" 80.7% of parents responded yes for before the pandemic. This rate decreased to 72.6% during the pandemic, though this change was not statistically significant ($\chi^2(2) = 3,299$, $p > .05$).

Communication

In the study, 50% of the parents answered no to the question, "Did the COVID-19 pandemic process negatively affect your communication with your child with hearing loss?" Additionally, when asked, "Did the use of masks during the COVID-19 pandemic negatively affect your child's communication with his/her environment?" 41% of parents answered yes. A comparison of the responses gathered regarding communication problems with hearing friends before and during the COVID-19 pandemic is given in Table 5. When comparison of answers given to the question about communication problems with the hearing friends of the child with hearing loss before and during the pandemic was examined, there was no statistically significant difference ($p > .05$), but the communication problems they had before the pandemic continued during the pandemic process.

Table 5. Comparison of responses regarding communication problems with hearing friends before and during the COVID-19 pandemic

Question		Sometimes	Yes	No	Total	χ^2	*p*
Before the pandemic, did your child have communication problems with hearing friends?	n	39	64	32	135	2,082	> .05
	%	44.8	50.4	57.1	50.0		
During the pandemic, does your child have communication problems with hearing friends?	n	48	63	24	135		
	%	55.2	49.6	42.9	50.0		

Problems Experienced by Parents

When asked, "What problems did you experience with your child's hearing loss before and during the COVID-19 pandemic?" the highest rate of problems noted before the pandemic included economic difficulties (24.8%) and problems related to school education (24.4%). Before the pandemic, there were also problems related to device use (16%), device repair (14%), and aural rehabilitation (14%), although to a lesser extent. Similarly, economic

Doi: 10.21020/husbfd.1349433

difficulties (23.3%) and problems related to school education (30.6%) were also noted to occur during the pandemic. The data suggest that problems related to aural rehabilitation increased (to 22.3%) during the pandemic. In addition, the data indicate that problems related to device usage (7.3%) and device repair (14.3%) have also continued during the pandemic. Comparison of findings related to the parents' responses before and during the pandemic was examined, revealing no statistically significant differences ($\chi^2(8) = 101{,}325$, $p < .05$).

Expectations of Parents

In the final part, we analyzed parents' responses related to their expectations. Parents were asked, "What were your expectations for the solution to your child's hearing loss before and during the COVID-19 pandemic?" Before the pandemic, reported expectations of parents were as follows: economic support for the repair of the device/implant parts (16.4%), economic support for purchasing devices (13%), social support (12.2%), regulation of legal rights (12.5%), psychological support (11.5%), family education program implementation (10.5%), family counseling services (8.6%), and economic support for aural rehabilitation (7.1%). During the pandemic, reported expectations of parents were as follows: economic support for the repair of the device/implant parts (15.8%), social support (15.2%), economic support for purchasing devices (12%), regulation of legal rights (11.4%), psychological support (11.4%), family counseling services (9.9%), family education program implementation (11.2%), and financial support for aural rehabilitation (7%). When analyzing the comparison of responses before and during the pandemic, there were no statistically significant differences ($\chi^2(11) = 6{,}165$, $p > .05$).

Discussion

The present study aimed to identify the problems experienced by children with hearing loss and their parents in aural rehabilitation, academic education, amplification, and communication and to examine the impact of the COVID-19 pandemic on these areas. In the literature, it has been reported that individuals with hearing loss have encountered problems during the COVID-19 pandemic in terms of supply of hearing aid batteries, the repair or replacement of ear molds and tubes, the repair of malfunctions in hearing aids/cochlear implants, and in the navigation of device settings (Alqudah et al., 2021; Aschendorff et al., 2021; Ayas et al., 2020). Similarly, parents' access to authorized people for technical support and repair of hearing aids/ hearing implants decreased significantly during the pandemic compared to the pre-pandemic period in the present study.

Doi: 10.21020/husbfd.1349433

It has been reported in the literature that the COVID-19 pandemic has adversely affected the programming and troubleshooting of the speech processor (Kumari et al., 2021). Results of the study conducted by Saunders and Roughley (2021) on the audiological tests by audiologists during the pandemic process, on hearing aid settings, etc., demonstrated their inability to provide adequate services. The results of our study are similar to those of the literature. During the COVID-19 pandemic, it is thought that curfews especially affected the continuity of education provided, and services related to hearing aids/ hearing implants were limited.

In the present study, parents stated that the pandemic process did not have a negative effect on amplification usage time. Similarly, it has been reported in the literature that children using cochlear implants have continued to use their cochlear implants consistently during the COVID-19 pandemic, but they were exposed to fewer speech stimuli as a result of reduced communication with their environment (Corner, 2021).

With the negative effects of the COVID-19 pandemic on the economies of the world, families with children with hearing loss have been under even more economic pressure than before the pandemic (Baldwin & Tomiura, 2020; Yucel et al., 2008). In our study, it was determined that the economic difficulties experienced by parents in regard to repair costs of hearing aids/ hearing implants before the COVID-19 pandemic continued to increase during the pandemic period. Boss et al. (2011) concluded in their study that families of children with hearing loss live closer to the poverty level and benefit less from some health services compared to families of children without hearing loss.

The transition to online education has had negative effects with the closure of schools during the COVID-19 pandemic, as 31% of school-age children worldwide do not have the necessary technological tools and internet access to be as successful at home (UNICEF, 2020). It has been reported in the literature that there have been serious difficulties in accessing aural rehabilitation during the COVID-19 pandemic process (Alqudah et al., 2021; Saunders & Roughley, 2020; Tohidast et al., 2020). In one study, the majority (96%) of parents of children using cochlear implants stated that they had difficulty accessing aural rehabilitation training during the pandemic process (Saunders & Roughley, 2021). In our study, more than half of the parents stated that their aural rehabilitation was adversely affected during the COVID-19 pandemic, but some of them stated that it was not. This shows that there were deficiencies in aural rehabilitation in the pre-pandemic period.

Based on study results, it was observed that there were significant differences in the responses of parents regarding the adequacy of aural rehabilitation given to their children with

Doi: 10.21020/husbfd.1349433

hearing loss before the COVID-19 pandemic compared to during the pandemic. The number of parents who find aural rehabilitation sufficient has decreased during the pandemic process. Although the results of the literature indicate that there are deficiencies in many subjects in the content of aural rehabilitation of children with hearing loss, the results of this study show that there is a need for more information and awareness studies.

As the use of masks during the pandemic has required covering of the mouth and nose areas, the child with hearing loss is prevented from using visual cues and auditory sense in an adequate manner for face-to-face training. The results of our study, similar to the literature, showed that the use of masks had a negative effect on the aural rehabilitation of children with hearing loss. When the hearing-impaired child is unable to utilize speechreading with the auditory pathway, he cannot understand speech, and communication breaks occur (Atcherson et al., 2017; Davidson & Marrone, 2020; Homans & Vroegop, 2021; Ten Hulzen & Fabry, 2020). Thibodeau et al. (2021) stated that the use of transparent masks has an effect on the understanding of speech in the context of background noise and facilitates the perception of visual cues in particular.

The results of the study showed that the pandemic process negatively affected the school education of children with hearing loss in addition to aural rehabilitation. In the results of the study conducted on this subject, it was stated that distance education during the COVID-19 pandemic deprived students of their right to education, as it eliminated the opportunity to work face-to-face. In addition, the distance education activities carried out during the COVID-19 pandemic required parents to be more involved in the education of their children. However, it has been observed that the inadequacies of parents' knowledge and skills negatively affect the quality of education (Kurt & Kurtoğlu Erden, 2020; Mengi & Alpdoğan, 2020).

The COVID-19 pandemic has seriously affected communication between individuals. Protective measures such as social distancing and the use of face masks have an important effect in reducing the transmission risk of the virus (Mheidly et al., 2020). Charney et al. (2021) reported that protective and preventive measures taken due to the COVID-19 pandemic may adversely affect communication, especially in the pediatric population. However, Saunders et al. (2021) have argued that face covering materials have far-reaching effects, especially on the communication of individuals with hearing loss. In this context, the researchers have emphasized that there is a need for the development of face covering materials that facilitate communication and that it is important in the development of communication strategies and skills. In addition, it has been suggested that clinicians and parents be aware of this phenomenon

Doi: 10.21020/husbfd.1349433

and be proactive in providing the most appropriate communication environment for children (Mheidly et al., 2020; Charney et al., 2021; Saunders et al., 2021). The results of the present study showed that children with hearing loss experienced communication problems with their hearing peers before and during the pandemic. In the literature, there are many studies that show that children with hearing loss have weaker language skills than their hearing peers (Tomblin et al., 2015). The inadequacies in language and speech skills of hearing-impaired children negatively affect their communication with their hearing peers.

The results of the study presented that the economic difficulties that parents stated before the pandemic and their children's school education, device use, device repair and aural rehabilitation problems continued to increase during the pandemic period. Studies have shown that families with a disabled person need economic support and that the care of the disabled child creates additional costs, which increases the problems in the treatment of the disabled child (Doğan, 2010; Jackson et al., 2008). Sass-Lehrer (2004) states that parents of children with hearing loss do not always have access to comprehensive information and resources about their child's condition or to available programs and services. Since delays in receiving services needed by children with hearing loss, insufficient information and support will affect children and parents in many areas; starting with early diagnosis, family-centered approaches that value partnership with families and support family competence are recommended (Sass-Lehrer, 2004; Moeller et al., 2013; Rhoades, 2017). In the pandemic, applications such as tele-audiology and tele-intervention are recommended by professionals for their beneficial effects (Coco et al., 2020; Muñozet al., 2021; Yoshinaga-Itano, 2020).

Before the pandemic, the expectations regarding economic support, social and psychological support, regulation of legal rights, family education programs, family counseling services regarding hearing aid/ hearing implants, and aural rehabilitation continued during the pandemic. In the literature, the expectations of parents were examined as expectations from cochlear implant application. In these results, it is stated that mothers have relatively high expectations regarding their children's communication, social and academic skills following cochlear implantation. In addition, it was stated that professionals working in the field of audiology should focus more on the expectations of parents about their children with hearing loss (Spahn et al., 2003; Zaidman-Zait & Most, 2005).

This study has a few limitations. Information such as the type, degree, and configuration of hearing loss of their children with hearing loss from the parents participating in the study could not be obtained because they did not have audiological test results or could not express

the results correctly. The number of parents participating in the study was limited. The use of online form to prevent the risk of COVID-19 transmission may have caused families with limited internet access to be out of the study. In addition, it is possible that parents were somehow biased when answering pre-pandemic questions due to their experiences during the pandemic.

Another limitation of this study is that the findings were not analyzed according to different variables, such as the type of device the child used. In this study, we included different types of device users as we wanted to identify problems experienced by parents of children with hearing loss as many as possible. Nevertheless, a comparative analysis could not be made because the number of participants was quite different depending on the type of device used (e.g., there are only six children with brainstem implants). However, it is quite possible that children with bilateral cochlear implants, children with brainstem implants, or children using unilateral hearing aids and their parents will be affected by the pandemic at different rates. It may be useful to examine this issue in future research.

In conclusion, the COVID-19 pandemic has limited the diagnosis, follow-up, and rehabilitation processes of children with hearing loss. This has adversely affected the access to hearing care services provided to children with hearing loss using hearing aids and/or hearing implants, the aural rehabilitation process, and the technical support and communication of parents regarding hearing aids/ hearing implants. Parents reported their expectations for all the problems they experienced due to lack of access to services. The results of the present study suggest that innovative methods such as tele-audiology, tele-intervention, and family education practices need to be widespread in order to meet the needs of children with hearing loss who use hearing aids and/or hearing implants. In the future, detailed studies focusing on the wider hearing-impaired population and their special needs may be conducted.

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Declaration of Competing Interest

The authors have no competing interests to declare that are relevant to the content of this article.

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