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Profile of frequency modulation system users of a hearing healthcare service

Perfil dos usuários do sistema de frequência modulada de um serviço de atenção à saúde auditiva

Cristiane Bueno Sales¹ , Ellen Mara de Souza Almeida¹ , Guilherme Kretli Silva¹ , Luciana Mendonça Alves² 

ABSTRACT

Purpose: To describe the profile and the prevalence of type and degree of hearing loss of frequency modulation system users, as well as the electronic device used by them, attended in a auditory healthcare service. **Methods:** This was a retrospective cross-sectional study, in which 309 medical records of patients in use of the frequency modulation system were analyzed. The variables considered were: age group, gender, type and degree of hearing loss, electronic device used, oral language (either established or in the process of development), and speech-language-hearing therapy (whether the patients did it or not). Descriptive analysis of the data was conducted, as well as Pearson's chi-squared test, or Fisher's exact test. **Results:** The sample was comprised of participants from five to 17 years old, with mean age of 11.7 years and prevalence of males. The most prevalent hearing loss type was the sensorineural, and the most prevalent degree was the moderate one. Regarding the electronic device used, there was greater number of users of hearing aids. The highest percentage of patients in the analyzed group was verbal and had done speech-language-hearing therapy. **Conclusion:** This study emphasized the importance of knowing the profile of patients with hearing loss who use the frequency modulation system granted by the Sistema Único de Saúde (SUS). It is hoped that this study has contributed to a review of the Regulatory Law nº 1.274/2013, in order to benefit future patients who will receive the frequency modulation system from the SUS.

Keywords: Speech; Language and Hearing Sciences; Hearing; Hearing loss; Hearing aids; Wireless technology

RESUMO

Objetivo: Descrever o perfil e a prevalência do tipo, grau de perda auditiva e dispositivo eletrônico utilizado pelos usuários do sistema de frequência modulada de um Serviço de Atenção à Saúde Auditiva. **Métodos:** Estudo transversal retrospectivo. Foram analisados 309 prontuários de pacientes usuários de sistema de frequência modulada. As variáveis consideradas foram: faixa etária, gênero, tipo e grau da perda auditiva, dispositivo eletrônico utilizado, linguagem oral estabelecida ou oralização parcial e realização, ou não, de terapia fonoaudiológica. Foi feita análise descritiva dos dados e o teste Qui-quadrado de Pearson ou teste exato de Fisher. **Resultados:** Participantes com idade entre 5 e 17 anos compuseram a amostra, com faixa etária média de 11,7 anos e predominância do gênero masculino. O tipo de perda mais prevalente foi a neurosensorial e o grau foi o moderado. Sobre o dispositivo eletrônico utilizado, houve maior número de usuários do aparelho de amplificação sonora individual. A maior porcentagem de pacientes do grupo analisado foi oralizada e fez terapia fonoaudiológica. **Conclusão:** Este estudo ressaltou a importância de se conhecer o perfil dos pacientes com deficiência auditiva que fazem uso do sistema de frequência modulada concedido pelo Sistema Único de Saúde (SUS). Espera-se que a pesquisa tenha contribuído para revisão da Portaria nº 1.274/2013, a fim de beneficiar os futuros pacientes que irão receber o sistema de frequência modulada pelo SUS.

Palavras-chave: Fonoaudiologia; Audição; Perda auditiva; Auxiliares de audição; Tecnologia sem fio

Study carried out at Curso de Fonoaudiologia, Centro Universitário Metodista Izabela Hendrix – CEUMIH – Belo Horizonte (MG), Brasil.

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Conflict of interests: No.

Authors' contribution: CBS was responsible for guiding each stage of the research and of the review of the manuscript's writing; EMSA and GKS were responsible for collecting and analyzing the data, as well as for the development of the study; LMA was responsible for developing the research project, submitting it to the Ethics Committee, aiding in data analysis and final review of the manuscript.

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INTRODUCTION

Hearing is a fundamental sense for communication of human beings. It is through it that oral language development takes place⁽¹⁾, and both hearing and language are capable of promoting to mankind communicative skills⁽²⁾.

Hearing loss (HL) happens when there is a permanent or temporary alteration in the functioning of the peripheral and/or central auditory system, which can be of congenital, perinatal or postnatal origin. In many cases, it is a multifactorial illness, caused by genetic and environmental factors. There are also other etiologies, as infectious diseases, use of ototoxic drugs, among many others^(3,4).

Hearing loss in children may cause some impairments that will interfere with their linguistic, educational and psychosocial development. Auditory privation may trigger delay in acquisition and development of oral language and, for this reason, the early diagnosis and intervention are of utmost importance⁽⁵⁾.

Among the devices available to assist in hearing, the hearing aid (HA) and the cochlear implant (CI) can be mentioned. The HA is an electronic device whose function is to amplify speech sounds, environmental sounds, and danger and warning alarms. Depending on residual hearing, this device makes speech sounds audible, making better quality of life and psychosocial and intellectual conditions possible for the person⁽⁶⁾. The CI is an electronic device surgically inserted in the cochlea, capable of providing electric impulses directly to the auditory nerve. Its components pick up, select and code sounds, transmitting small electric currents that activate the nerve and send a signal to the brain. Thus, the CI enables the person with hearing loss to have the hearing sensation and, most of all, the recognition of sounds⁽⁷⁾.

The frequency modulation system (FM system) is a device used especially in school environment, and it is composed of two elements: a microphone/transmitter and a receptor. The microphone/transmitter is used by the speaker, as it has the function of picking up the sounds, coding them into electric signals and converting them into frequency modulation signals. The FM signal is decoded by the receptor, which can be attached to the HA or to the CI used by the listener, and is then transformed back into acoustic energy. The FM and its transmission diminish the noise and reverberation effect upon speech signals and, consequently, increase the effectiveness of communication between users⁽⁸⁾.

The auditory assistive technology (HA and CI) provide significant improvement for hearing perception of patients with hearing loss; such perception loses quality in noisy environments, in which auditory competition is very great. The FM system is an additional resource to aid the individual, as it furnishes a signal/noise relation favorable to the person with hearing loss, making it possible for speech to reach them more completely and with more constant intensity^(9,10).

The use of the FM system in school children with hearing loss has shown to be effective as an aid in academic performance, especially for the children learning how to read and write. This happens due to this resource allowing better access to the content being taught, as it minimizes adversities, such as the distance from the sound source and the background noise⁽¹¹⁾.

Great benefits had already been achieved by the people with hearing loss by means of the HA and the CI made available by the Sistema Único de Saúde (SUS) (Portuguese for the

Brazilian's publicly funded healthcare system). However, the use of the FM system was an important milestone achieved, since it was included by the Regulatory Law no. 1,274, from June 25, 2013⁽¹²⁾. The use of this resource started offering better learning conditions in the academic life of these people. According to this regulatory law, the requirements for the FM system to be provided are: having from mild to profound sensorineural hearing loss; being a HA and/or CI user; presenting performance in the assessment of recognition skills of speech in silence; having thorough knowledge of oral language, or being in the process of developing it; being a student enrolled in Elementary, Middle or Secondary School; and, being between 5 and 17 years old⁽¹³⁾.

The auditory healthcare services ensure the audiologic diagnosis, the selection and indication of use of HA and/or CI surgery, besides auditory habilitation or rehabilitation, as well as the supply of the FM system to better include the users who are students. Hence, knowing epidemiologic data of these services is fundamental to the planning process and the adequate decision-making regarding the attention given to the population, the actual needs of the community, and the determining factors for complications and illnesses, or even difficulties in the process of social and educational inclusion^(14,15).

This paper aimed at describing the profile of FM system users of an auditory healthcare service (AHS), as well as the prevalence of type and degree of hearing loss, and electronic device used.

METHODS

The study was designed as retrospective cross-sectional, conducted with frequency modulation system users of the auditory healthcare service (AHS) of the Clínicas Integradas de Saúde do Centro Universitário Metodista Izabela Hendrix.

The study was approved by the Research Ethics Committee of the Centro Universitário Metodista Izabela Hendrix, under protocol nº 33723414.7.0000.5096.

The research was conducted through the analysis of a data bank of the FM system users in a high-complexity AHS, accredited by SUS. The activities of this AHS began in January 2010. The Regulatory Law nº 1.274/2013, which includes the FM system, was put into effect by SUS on June 25, 2013. Thus, the patients who had already been previously fitted with HA and/or CI, since 2010, and who fit the profile set by the abovementioned regulatory law, were fitted with the FM system.

The data of the patients who received the FM system were included in an Excel 2010 spreadsheet, with the information necessary for this study. Therefore, the analysis of the information includes all FM system users, fitted from January 2014 to March 2016, adding up to 309 participants.

The variables analyzed were: age group, gender, type and degree of hearing loss, electronic device used (PSP and CI), oral language established or in development, and whether the patients had done speech-language-hearing therapy.

The data obtained, such as age group, information on being verbal or nonverbal, and having or not done speech-language-hearing therapy, were fed into the system at the moment when the FM system was granted.

The information on the patient's being verbal or nonverbal was recorded by the speech-language-hearing therapist responsible for attending the user, by means of interactions and informal assessment of language. The user classified as verbal (who

communicated using oral language) interacted with verbalized responses, resulting from the process of expressing thoughts, ideas and feelings. Such responses should contain complete words (even if not properly articulated), in meaningful sentences (even if syntactically limited). The users classified as partially verbal were those who could not communicate exclusively through oral language. They presented restricted vocabulary and difficulty to interact with organized and articulated verbal answers.

The AHS where the study was conducted follows, as classification criteria, the type of hearing loss (conductive, sensorineural and mixed)⁽¹⁶⁾ and the classification of degree of hearing loss differently for users under seven years old (considered normal for quadrilateral averages - 500 Hz, 1000 Hz, 2000 Hz and 4000 Hz - equal or inferior to 15 dB HL, slight or minimal hearing loss between 16 and 25 dB HL, mild to medium degree between 26 and 40 dB HL, moderate between 41 and 65 dB HL, severe between 66 and 95 dB HL, and profound when the loss is equal or superior to 96 dB HL)⁽¹⁷⁾ and those over seven years old (considered as nonsignificant for thresholds equal or inferior to dB HL, mild degree hearing loss for tritonal averages - 500 Hz, 1000 Hz and 2000 Hz - between 26 and 40 dB HL, moderate between 41 and 70 dB HL, severe between 71 and 90 dB HL, and profound when the loss is superior to 91 dB HL)⁽¹⁸⁾.

The signing of the Informed Consent Form (ICF) was dismissed by the Ethics Committee, since an employee of the AHS had previously blinded the data bank.

The information collected was compiled in a data bank established on Excel 2010. The consolidated data were analyzed through the SPSS statistical program (Statistical Package for the Social Sciences), version 16.0. Frequency, central tendency and variability measurements were taken for the descriptive analysis.

Table 1. Distribution, by age group and gender, of patients of a high complexity Auditory Healthcare Service in the state of Minas Gerais, users of the FM System (n = 309)

Age group	Attendants	Percentage (%)
From 5 to 9 years old	97	31.4
From 10 to 14 years old	137	44.3
From 15 to 17 years old	75	24.3
Total	309	100.0
Gender		
Female	131	42.5
Male	177	57.5
Total	309	100.0

For the association assessment between oral language (either established or in development), age group, device, gender and speech-language-hearing therapy, Pearson's chi-squared test, or Fisher's exact test, was applied.

RESULTS

The study consisted in the analysis of the data of 309 FM system users of an auditory healthcare service from the municipality of Belo Horizonte, in Minas Gerais. Students between five years old and 17 years and 11 months old, mean age of 11.77 years, made up the sample. The age group considered in the study was that of the moment when the FM system was fitted.

The ages were classified into age groups, according to the established by the Instituto Brasileiro de Geografia e Estatística (IBGE)⁽¹⁹⁾. The age group with greater concentration of individuals was that of 10 to 14 years old, with 137 participants (44.3%). The age group of 15 to 17 years was composed of 75 individuals (24.3%). Of the participants, 57.3% (177) were male (Table 1).

It was noted that the most frequent type of hearing loss was the sensorineural, followed by mixed loss; and, the less frequent type was the conductive loss. It is important to highlight that, for this variable, multiple responses were considered (i.e., more than one type of loss in the same individual), since the losses in each ear were assessed (Table 2).

Regarding the electronic device used, there was greater number of HA-only users (89.9%). The fitting of all HA users was bilateral, except for those who presented auditory threshold within standards of normality in one of the ears. As for the occurrence of unilateral CI users, without use of HA in the contralateral ear, it was of only 1% (Table 3).

Most of the individuals of the analyzed group was verbal (81.2%); hence, 18.8% had not reached a thorough knowledge oral language. There was no statistical significance between being partially verbal and being verbal and gender ($p = 0.365$) (Figure 1).

Concerning distribution by age, it was noted that the partially verbal patients were concentrated in the age group of 5 to 9 years (63.8%). Of the verbal patients, 48.8% were on the age group of 10 to 14 years. Age influenced the results of oral language, indicating that, the older the age, the greater the percentage of verbal individuals ($p < 0.001$) (Figure 2).

The occurrence of patients who did speech-language-hearing therapy as a means of treatment was of 57.3%. The interventions took place in the AHS outpatient center for (Re)habilitation of People with Hearing Loss, for Oral Language and, in the sequence, for written language, in the cases of impact on academic life.

Table 2. Prevalence of type and degree of hearing loss of patients of a high complexity Auditory Healthcare Service in the state of Minas Gerais, users of the FM System (n = 309)

Degree of loss	Left Ear - n (%)				Right Ear - n (%)			
	Conductive	Mixed	Sensorineural	Normal threshold	Conductive	Mixed	Sensorineural	Normal threshold
Normal threshold	0 (0)	0 (0)	0 (0)	16 (100)	0 (0)	0 (0)	2 (0.8)	21 (100)
Mild	0 (0)	2 (5.6)	40 (16.0)	0 (0)	1 (14.3)	0 (0)	40 (16.0)	0 (0)
Moderate	6 (100)	22 (61.0)	116 (46.2)	0 (0)	6 (85.7)	18 (58.1)	122 (48.8)	0 (0)
Severe	0 (0)	11 (30.6)	41 (16.3)	0 (0)	0 (0)	8 (25.8)	43 (17.2)	0 (0)
Profound	0 (0)	1 (2.8)	54 (21.5)	0 (0)	0 (0)	5 (16.1)	43 (17.2)	0 (0)
Total	6 (100)	36 (100)	251 (100)	16 (100)	7 (100)	31 (100)	250 (100)	21 (100)

Table 3. Distribution of patients of a high complexity Auditory Health-care Service in the state of Minas Gerais, by electronic device used (n = 309)

Device	Attendants	Percentage (%)
HA only	277	89.6
CI only	3	1.0
CI and HA	29	9.4
Total	309	100.0

Subtitle: HA = hearing aid; CI = cochlear implant

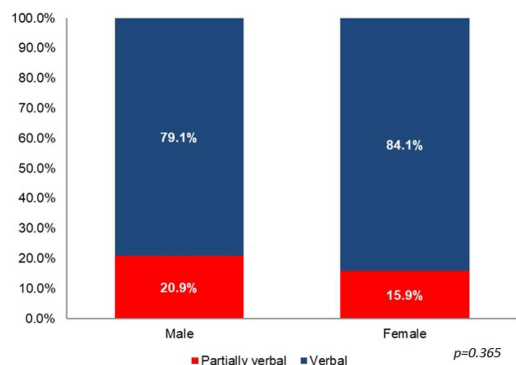


Figure 1. Distribution graph of partially verbal and verbal patients cared for at an auditory health service, by gender

Subtitle: p = significance probability, chi-square test

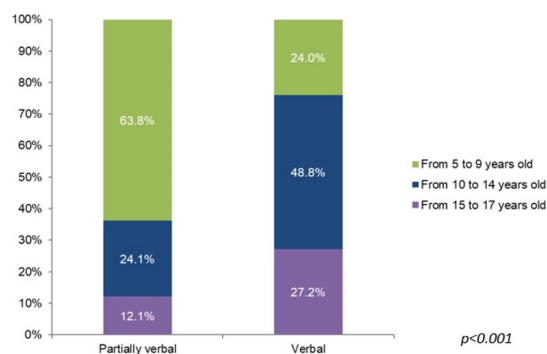


Figure 2. Distribution of partially verbal and verbal patients cared for at an auditory health service, users of the Frequency Modulation (FM) System, according to the age group variable

Subtitle: p = significance probability, chi-square test

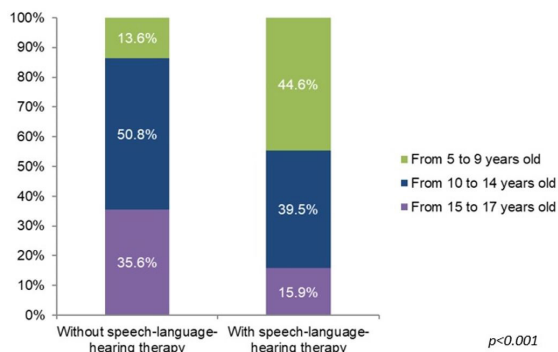


Figure 3. Distribution of patients cared for at an auditory health service, users of the Frequency Modulation (FM) System, either having or not undergone speech-language-hearing therapy, by age group.

Subtitle: p = significance probability, chi-square test

The percentage of therapy among females (60.6%) was superior to that observed among males (54.8%).

By means of the distribution by age group of the patients who did speech-language-hearing therapy, it was possible to observe that 50.8% of those who did not do speech-language-hearing therapy were concentrated in the age group of 10 to 14 years. Among the people assessed who had done therapy, 44.6% were concentrated in the age group from 5 to 9 years. It is important to highlight that 86.2% of the partially verbal patients did speech-language-hearing therapy. However, among the verbal, the percentage of those who did not do therapy was of 49.4%. There was difference with statistical significance in the association between the speech-language-hearing treatment and the age group. The older the person is, smaller is the percentage of subjects that did speech-language-hearing therapy ($p < 0.001$) (Figure 3).

DISCUSSION

In this study, the prevalence of males among FM system users was in agreement with some studies conducted in the country, and in disagreement with others. An epidemiologic research on population with HL, from the same state where this study was developed, indicated prevalence of female users⁽¹⁴⁾. On the other hand, there is a study from another state, also conducted in public auditory healthcare service, which indicated the prevalence of males⁽¹⁵⁾.

Similarly, the population of FM system users from 10 to 14 years old represented a great proportion in this research (44%). The finding leads to the perspective of greater efforts towards the support to this population. Such public was already on Middle School and, probably, presented requirements related to school and social inclusion, subject to being supported with the FM system and guidance by the team linked to the fitting of the device.

Regarding the type and degree of hearing loss, respectively, it was noted a predominance of the sensorineural type, and greater concentration of the moderate degree, among those assessed. Hearing loss of the sensorineural type is described, through the Regulatory Law n° 1.274/2013, as the main clinical indication for receiving the FM system, which justifies its greater occurrence in the study. Nevertheless, other types of hearing loss are mentioned in the codes of the International Classification of Diseases (ICD). In this study, there were identified FM system users with loss of the conductive and mixed type, and auditory thresholds within standards of normality in one of the ears and sensorineural hearing loss on the other.

The participants in this study who had the unilateral or bilateral sensorineural component became candidates for fitting with the FM system, as stipulated by the regulatory law.

It is important to highlight that, after assessment and conduct by the otorhinolaryngologist, in some cases of bilateral conductive and mixed losses, there was no indication for surgical or medicated treatment. Thus, it is suggested that the Regulatory Law n° 1.274/2013 be reappraised regarding the indication of the FM system only in sensorineural hearing loss, as there are other types of losses to which the only treatment is the HA fitting. Hence, individuals diagnosed with bilateral irreversible conductive or mixed hearing loss may be benefitted and also granted the concession of the FM system.

In the sensorineural type, the greater impairment of hearing loss happens in the level of auditory comprehension. The moderate degree hearing loss may cause great damage to comprehensive and expressive language, especially in the perception and/or comprehension of speech. The severe and/or profound degree of hearing loss may cause speech sound to be inaudible. A study⁽²⁰⁾ showed the benefit of patients with mild to moderate sensorineural hearing loss, users of HA associated with FM system, in the classroom, with improvement of 15 dB in the signal/noise relation when the children made use of device at school.

All the patients in this study, bilateral device users - either bilateral HA or unilateral CI with HA on the contralateral ear -, were fitted with FM system receptors on both ears. Binaural has the advantage of sound localization, binaural summation, and the improvement in comprehending speech, both in silent and in noisy environments, which favors communication and learning⁽²¹⁾. This conduct reflects the attempt to promote binaural hearing and its benefits, not only in the daily situations, but also in the school environments.

In this study, 89.6% ($n = 277$) of the individuals were HA users, 9% ($n = 29$) made use of CI and HA on the contralateral ear, and 1% ($n = 3$) of the subjects used unilateral CI. These three patients had little auditory residue on the ear contralateral to the CI, with responses only in the 250 Hz and 500 Hz frequencies. Furthermore, the parents reported auditory discomfort and the children's resistance in the attempt to use contralateral HA. A study⁽²²⁾ concluded that the amount of auditory residue is also determining for the good HA fitting as an associated resource with CI.

This research revealed a high rate of verbal patients (81.2%). Of these, 48.8% were in the age group of 10 to 14 years. On the other hand, 63.8% of the partially verbal children were concentrated in the age group between 5 and 9 years. There was difference with statistical relevance, which indicates that, the older the age, the greater the percentage of verbal individuals. These data confirm the literature that studied the expressive vocabulary of children with hearing loss in the process of becoming verbal. In general, older children showed greater knowledge of words, indicating greater control over the linguistic code⁽²³⁾.

A study⁽⁹⁾ conducted with children users of HA or CI, with at least six months of fitting with FM, concluded that the perception of speech was significantly better with the use of the FM system in situations of exposure to noise, to reverberation, and of distance between listener and speaker. Another study⁽²⁴⁾ revealed that the FM system favored the perception of speech in CI users, in children and in adults, not only in nonacademic environments, but also in professional, social and leisure activities.

Another Brazilian research⁽²⁵⁾, which aimed to assess, based on the relative's perspective, the benefit of using FM system fitted in children with sensorineural hearing loss, demonstrated statistical relevance when comparing the answers in a questionnaire with and without the use of FM, for all the situations (silence, noise, only auditory pathway, distance). Better performance and changes in behavior were observed, in relation to attention and learning, with the use of the FM system. It was verified that, from the parents' point-of-view, the use of the FM system improves the performance of the person with hearing loss in various acoustic situations, more evidently in environments with speech in noise, and when there the distance from the sound source is increased. In spite of the FM system being used in different situations, the greatest benefits for the child were in school, according to the parents' report.

Based on the benefits of the use of the FM system in schools, the importance of deepening the knowledge on the effective use of the device is emphasized, being thus indicated as object of study for future researches. Actions directed to the parents and teachers of the users must be developed, with the purpose of ensuring the effectiveness of this implemented public policy, particularly in the age group in which is concentrated the majority of the users - which, in this study, was from 10 to 14 years. The directing of public health and education policies is essential to inform and enable all the people involved.

In a study⁽²⁶⁾ on auditory changes in Elementary School children, between seven and nine years old, the authors reported that one of the consequences of auditory privation is the bad school achievement; therefore, there are high rates of failure in this population, which reinforces the importance of using the FM system with school follow-up, in order to minimize this situation.

In this research, there was difference with statistical relevance between the patients who did speech-language-hearing therapy and the age group. The older the age, the smaller was the percentage of subjects who had been in speech-language-hearing therapy. The hypothesis raised is that, with a minimum of satisfactory development in the process of becoming verbal, the parents do not keep their children in the process of therapeutic intervention, many times due to financial barriers, or the logistic of taking to the appointments, and even the lack of believing in a better prognosis.

Even though the research has revealed high rates of verbal patients, 42.7% of the total of participating users did not do speech-language-hearing therapy. This finding correlates with a study⁽²⁷⁾ that investigated the etiology, the diagnostic characteristics, and the hearing loss intervention in children of a non-governmental organization. In relation to the habilitation or rehabilitation process, 32% did not have speech-language-hearing follow-up, even with therapeutic indication.

The auditory healthcare service where this study was conducted offers speech-language-hearing treatment to all patients enrolled in the program. It is considered a high-complexity service and a reference for other smaller municipalities of the metropolitan area which do not have auditory healthcare services. Even with this offer, there have been evasions from the speech-language-hearing treatment. The hypothesis raised is that the difficult access for families that live in more distant municipalities may have made it difficult for them to adhere to the systematic treatment. The ideal would be that each municipality ensured the access to the speech-language-hearing therapy, which does not happen in many areas of the state.

Even though the numbers of this study indicated that the majority of the partially verbal individuals (those that most need rehabilitation through therapy) were in therapeutic programs, the continuous encouragement to and investment in such access is emphasized. There would be greater benefit if all the patients using the FM system, still in the process of becoming verbal, were in the therapeutic process. There are various factors that may influence the prognosis in language skills development in children with hearing loss⁽²⁶⁾. Thus, in the HL context, there is the possibility that these patients present delay in oral language development, in comparison to children without auditory privation, and that the process of learning how to read and write be more difficult. Therefore, the speech-language-hearing therapy would be an effective indication to potentialize the communicative process in many aspects.

In the service where the data were collected, the FM users have been increasingly seeking for the written language outpatient center, due to complaints of bad academic performance. The cases that were being followed up obtained better results in the therapeutic process, and they progressed also in the academic performance in the long run. Such factors should be controllably investigated in future researches. Clinical interventions, in these cases, are obligatorily articulated with Education. They should be accompanied by visits to the school environment in order to offer guidance to the educational team on the proper use of the device. The therapist-school-family interaction is essential for the adequate use of the FM system as an important tool serving towards the inclusion of this population. In view of this ample context of support, the importance of public policies allowing quicker access to the FM system, and to more and more users, is reinforced.

A Brazilian study⁽²⁸⁾ verified the effectiveness of the adherence to auditory rehabilitation of children with hearing loss, and the factors that influenced the family's involvement in the therapeutic process. The results showed that the non-adherence to the treatment may be related to the difficulties with the effective use of the electronic devices, and to the parents' expectations regarding a good prognosis in the short term. Different prognosis, based on the different degrees of hearing loss, also interfered with the process, which caused disinterest of parents with different demands. It was concluded that the setting up of a family support group was a facilitator in the process and, if the groups are created more homogeneously, this would lead to greater empathy between participants, and to a greater probability of adherence.

It is known that many factors must be taken into account for the good prognosis of the person with hearing loss to be achieved. The early diagnosis and intervention, with the systematic and effective use of the hearing aids, associated with an adequate therapeutic process and the family's and educators' involvement, are some of determining factors in the development of auditory and communicative skills in children with HL⁽²⁹⁾.

It is important to highlight that, in spite of the technological resources (HA, CI, and FM system) enabling access to sound information, their effectiveness takes place only with therapeutic intervention. The connection of the electronic resources with speech-language-hearing therapy aids in the verbal skills of these individuals, enables their quality of life to improve, and contributes as a differential in the development of these children, particularly in the reading and writing skills⁽³⁰⁾.

Considering such situation, it is suggested that the services be very attentive, from the diagnosis and during the whole process of caregiving to the child with HL, to the patient's and their relatives' engagement and motivation concerning the therapeutic process. It is important to profile the singularities of each auditory healthcare service and to know the factors that make family adherence to the therapeutic process difficult. From that, it is possible to develop specific support measures with the purpose of developing more assertive strategies, directed to the individual factors of the specific public being attended.

The relatives should be constantly updated, not only on the evolution of the clinical condition, but also on the prognosis and benefits of the therapeutic intervention in the short- and long-term. Keeping open an information channel, especially to listen to the relatives and the patient themselves, however young, is essential to maintain adherence to the therapeutic process.

This is an initial study, which profiled the FM system users of a high-complexity AHS. Similar studies in other regions of the country, as well as longitudinal researches, should be developed, as they would offer the means to a better understanding of the Brazilian population with hearing loss in school age.

This study presented descriptive data on the population attended. It is believed that the greater knowledge about the profile of FM system users in the different regions of the country can contribute to a better targeting on the part of health teams and competent authorities, and aid in creating and/or reformulating public policies related to auditory health. The need of an intensive work to promote auditory health should be emphasized, especially for children and adolescents with HL in school age, in order to ensure the effective social and educational inclusion process.

This study was not meant to exhaust the subject. Therefore, new researches should be conducted to fill in the gaps in field of study, with so much more yet to be explored, such as the description of the difficulties found by parents and teachers after having received the FM system, longitudinal observation of improvement in school after the device has been received, fitting and adequate usage of the device, and impact of reading and writing therapy along with the use of the device. Such deepening is essential for public policies targeting this population to be adjusted and strengthened.

CONCLUSION

The study revealed that the FM system users attended at the AHS researched presented in their profile predominance of male children and adolescents, with greater prevalence of sensorineural hearing loss of moderate degree, and HA users. Most of the patients researched were verbal and had attended speech-language-hearing therapy.

The concession of the FM system by the Sistema Único de Saúde was a great advance regarding the inclusion of people with hearing loss. In order to maintain and broaden such benefit, attention is called to the need of new studies analyzing the possible associations between the sociodemographic profile and the effective use of the device.

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