

Evasion in the retest and follow-up stages of specific neonatal hearing screening during the COVID-19 pandemic

Evasão nas etapas de reteste e acompanhamento da triagem auditiva neonatal específica no período da pandemia do COVID-19

Evasión en las fases de repetición de la evaluación y seguimiento del cribado auditivo neonatal específico durante la pandemia de COVID-19

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Abstract

Introduction: Newborn Hearing Screening (NHS) is one of the main allies in comprehensive child hearing health care, as it enables early diagnosis of hearing loss and timely intervention. With the SARS-CoV-2 virus pandemic, access to health care in general has been reduced, which has aggravated the issue of NHS dropout, which was already a concern. **Objective:** To verify the dropout rate of babies with risk factors for hearing loss (RFHL) at a NHS referral service during the COVID-19 pandemic. **Methods:**

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The sample consisted of 565 medical records of children with RFHL undergoing NHS. Evasion was considered when the child did not show up for the scheduled appointment, when the contacts informed in the medical records did not answer, when the contacts did not belong to those responsible for the child or did not exist. **Results:** There was a higher dropout rate in the follow-up stage after the retest than in another study prior to the pandemic and a high dropout rate in the follow-up stage in general. In the retest, the dropout rate was lower than that found in other studies. The dropout rate in the follow-up stage was higher than in the retest. **Conclusion:** The importance of analyzing NHS data during the pandemic period is evident, given that access to health, information and economic resources has been reduced. In this case, there was an increase in the dropout rate during the period studied, especially at the follow-up stage.

Keywords: COVID-19; Effective Access to Health Services; Neonatal Screening; Hearing Tests; Absenteeism; Early Diagnosis

Resumo

Introdução: A Triagem Auditiva Neonatal (TAN) é um dos principais aliados na atenção integral à saúde auditiva infantil ao viabilizar o diagnóstico precoce de perda auditiva e possibilitar a intervenção em tempo oportuno. Com a pandemia pelo vírus SARS-CoV-2, o acesso à saúde em geral foi reduzido, o que agravou a questão da evasão da TAN, que já era uma preocupação. **Objetivo:** Verificar a taxa de evasão de bebês com indicadores de risco para deficiência auditiva (IRDA) em um Serviço de Referência em TAN durante o período da pandemia da COVID-19. **Métodos:** A amostra foi composta por 565 prontuários de crianças com IRDA submetidas à Triagem Auditiva Neonatal Específica. Foi considerada evasão quando a criança não compareceu à consulta marcada, quando os contatos informados no prontuário não atenderam, quando os contatos não pertenciam aos responsáveis pela criança ou não existiam. **Resultados:** Foi evidenciada taxa de evasão na etapa de acompanhamento após o reteste maior que a presente em outro estudo prévio ao período da pandemia e alta taxa de evasão na etapa de acompanhamento em geral. Já no reteste, a taxa de evasão foi menor que a encontrada em outros estudos. A taxa de evasão na etapa de acompanhamento foi maior do que a do reteste. **Conclusão:** Evidencia-se a importância da análise dos dados da TAN durante o período da pandemia visto que o acesso à saúde, à informação e aos recursos econômicos foi reduzido. Neste caso, nota-se o aumento da taxa de evasão, durante o período estudado, principalmente na etapa de acompanhamento.

Palavras-chave: COVID-19; Acesso Efetivo aos Serviços de Saúde; Triagem Neonatal; Testes Auditivos; Absenteísmo; Diagnóstico Precoce

Resumen

Introducción: El cribado auditivo neonatal (CAN) es uno de los principales aliados en la atención integral de la salud auditiva infantil, ya que permite diagnosticar precozmente la pérdida de audición e intervenir a tiempo. Con la pandemia del virus SARS-CoV-2, se ha reducido el acceso a la atención sanitaria en general, lo que ha agravado el problema del abandono de la CAN, que ya era preocupante. **Objetivo:** Verificar la tasa de abandono de bebés con indicadores de riesgo de hipoacusia (IRH) durante la pandemia de COVID-19. **Métodos:** La muestra estuvo constituida por 565 historias clínicas de niños con IRH ingresados en el CAN. Se consideró evasión cuando el niño no acudió a la cita programada, cuando los contactos informados en la historia clínica no contestaron, cuando los contactos no pertenecían a los responsables del niño o no existían. **Resultados:** Hubo una mayor tasa de abandono en la etapa de seguimiento después de la etapa de repetición de la evaluación que en otro estudio anterior a la pandemia, y una alta tasa de abandono en la etapa de seguimiento. La tasa de abandono en la fase de seguimiento fue mayor que en la etapa de repetición de la evaluación. **Conclusión:** Es evidente la importancia de analizar los datos del CAN durante el periodo pandémico, dado que se ha reducido el acceso a los recursos sanitarios, informativos y económicos. En este caso, se produjo un aumento de la tasa de abandono durante el periodo estudiado, especialmente en la etapa de seguimiento.

Palabras clave: COVID-19; Acceso Efectivo a los Servicios Sanitarios; Cribado Neonatal; Pruebas de Audición; Absentismo; Diagnóstico Precoz



Introduction

Universal Neonatal Hearing Screening became mandatory in Brazil in 2010 through the Law 12,303, that stipulated the requirement to perform the test Evoked Otoacoustic Emissions in all children born in hospitals and maternity hospitals¹. Since then, the hearing screening has become the main ally in comprehensive care for children's hearing health by enabling early diagnosis of hearing loss and enabling appropriate intervention in a timely manner. It is important to note that children who receive a late diagnosis of hearing loss may experience delays in the development of language and speech, school difficulties and socio-emotional effects².

The prevalence of congenital hearing loss is estimated to be about 1.7 per thousand live births, and the presence of Risk Factors for Hearing Loss (RFHL) can increase this prevalence by up to ten times³. Thus, a protocol for Specific Neonatal Hearing Screening (SNHS) was created in a public maternity hospital linked to a university hospital in the state of Minas Gerais. Among other objectives, the program aims to make more efficient care of infants with RFHL⁴, thus ensuring that these newborns have access to screening even before discharge from hospital.

The SNHS protocol consists of three steps: the first step, the screening, consists of carrying out reception and anamnesis or medical record search to survey children with risk factors in maternity and the Automated Auditory Brainstem Response (AABR) examination with the results "pass" and "fail" in all these children, before discharge. Depending on the screening result, the baby is sent for follow-up or retest.

In the retest phase, the screening exam is repeated after about 30 days to confirm or refute the "fail" result and is essential to avoid misdiagnosis that can be influenced by factors such as the presence of vernix in the middle ear or the presence of noise during the examination at the maternity hospital.

The follow-up phase is performed six to nine months after the result "pass" in the screening or retest and consists of a monitoring of the children's auditory development and language, being essential to identify possible late hearing loss.

It is important to emphasize that the protocol used for children with RFHL should be differenti-

ated in order to ensure a longitudinal follow-up, given the high incidence of hearing loss in this population. In addition, the use of ABR in Specific Neonatal Hearing Screening is essential due to the higher prevalence of retrocochlear hearing loss not identifiable on the Evoked Otoacoustic Emissions exam⁶.

Since the implementation of the Neonatal Hearing Screening (NHS), some difficulties have been noted regarding its effectiveness and implementation in the country, such as the lack of standardization of protocols for carrying out the NHS, the Program's data management, the maintenance of the equipment used in the examinations, the lack of speech therapists and audiologists assistance in the Brazilian Unified Health System (SUS) and its poor distribution and the interruptions in the flow of the NHS.

In March 2020, the World Health Organization officially declared the SARS-CoV-2 outbreak a global pandemic⁸. With this, access to health in general was drastically reduced due to the need for social distancing, the urgency of relocating professionals and resources for COVID-related care, in addition to the population's fear and insecurity to access spaces such as hospitals and clinics, fearing contracting the virus⁹. Furthermore, the pandemic highlighted socioeconomic, cultural and psychological issues, especially present in a developing country like Brazil, such as unemployment, misinformation, symptoms of anxiety, lack of access to education and social isolation, which are intrinsically linked to the full right to health and the use of services.

The evasion in Neonatal Hearing Screening, at different stages, is a long-standing concern, evidenced in other studies^{5,10-13} and warned by the Joint Committee on Infant Hearing (JCIH)², given the severity of the loss of children in the care flow and the late diagnosis of hearing loss, evasion of NHS may have become an even greater problem.

Due to the importance of health data registration for effective actions planning that allow full right to health, specifically to child hearing health through neonatal hearing screening, and the consequent full development of these children, this study aimed to verify the rate of dropout of infants with RFHL in a Neonatal Hearing Screening Referral Service (NHSRS) of a University Hospital during the period of the COVID-19 pandemic.



Methods

This study was approved by the Federal University of Minas Gerais' Research Ethics Committee (COEP-UFMG) under the number 5.517.841.

This is a retrospective descriptive cross-sectional study conducted in a Neonatal Hearing Screening Referral Service (NHSRS).

The selected sample consisted of 565 medical records of children with Risk Factors for Hearing Loss (RFHL) born between June 2020 and February 2022, submitted to SNHS. All children who had one or more risk factors and who underwent hearing screening at the NHSRS in the determined period were included. Children with missing data in the database, children unable to undergo hearing tests due to health reasons, and deceased children were excluded from the study.

The study data were collected in a registry database in Microsoft Excel® software, which was maintained by the audiologist responsible for the SNHS at the NHSRS with information from the anamnesis and medical records and the results of each stage of the screening. Then, a descriptive analysis of the data was performed in the same software.

The categorical variables gender, risk factors, screening results ("pass/fail") and evasion were analyzed by frequency distribution. The continuous variable of age was analyzed using central tendency (mean and median) and minimum and maximum.

The following risk factors were considered: family history of early, progressive or late permanent hearing loss in childhood, stay in the Intensive Care Unit for more than five days, hyperbilirubinemia with exchange transfusion, extracorporeal membrane oxygenation (ECMO), TORSH group (toxoplasmosis, rubella, syphilis, herpes and cytomegalovirus) and/or Zika virus infection during pregnancy, syndromes associated with hearing loss, neurodegenerative disorders and malformations, postnatal infections, chemotherapy, traumatic brain injuries, family suspicion of hearing loss and/or speech and language disorders and/or developmental delay or regression in development and use of ototoxic medications^{2,3}.

The NHSRS screening protocol consists of performing the Automated Auditory Brainstem Response (A-ABR) test in the first stage.

The A-ABR consists of a test in which the equipment automatically identifies wave V, taking into account the patient's chronological age, ges-

tational age at birth and the latency of appearance of wave V. The equipment used to perform the A-ABR of SNHS was the Elios from the ECHODIA® brand.

The criterion for the result to be considered "pass" in the screening was the presence of wave V at 40 dBnHL in two bilateral scans, and these children were then referred to the follow-up phase. Absence of wave V at 40 dBHL in two unilateral or bilateral scans was considered a "fail" in the screening, and these children were referred to the retest phase, scheduled one month after the first stage of the screening.

In the retest phase, the A-ABR test was repeated, and if the result remained "fail", the child was referred for an otorhinolaryngological appointment and/or an audiological diagnosis. If the result was "pass", these children were also referred for follow-up.

In the follow-up phase, carried out between six and nine months after the screening, depending on the child's risk factor, the Questionnaire for Monitoring Auditory and Language Development in the First Year of Life¹⁴ or the Hearing Screening Questionnaire for children aged 12 to 48 months¹⁵ were applied via telephone call. This first stage of the follow-up phase was carried out in this way to avoid unnecessary trips to the hospital environment during the COVID-19 pandemic.

In cases where there was no suspicion of hearing loss, the caregivers received guidance on hearing and language development and the child was discharged from the hearing screening program.

On the other hand, in cases where there was a sign indicating hearing loss, an appointment was scheduled for an in-person speech-language pathology evaluation, where Auditory Behavior Assessment¹⁶ and A-ABR were performed. If the child obtained as a result the absence of wave V at 40 dBnHL in two scans unilaterally or bilaterally and/or auditory behavior incompatible with the auditory development milestones expected for the age, the child was also referred for audiological diagnosis. Otherwise, if the result was considered "pass", the caregivers received guidance on hearing and language development and the child was also discharged from the hearing screening program.

The retest and follow-up appointments were scheduled by the speech-language pathologists responsible for the NHSRS by telephone. Evasion or abandonment of the Service was considered when

the child did not attend the scheduled appointment or when it was not possible to contact the family by telephone for the following reasons: the telephone numbers provided in the medical records did not answer three calls made for contact within three days, or the telephone numbers did not belong to the child's caregivers or did not exist. Cases in which it was impossible to contact the caregivers by telephone were considered evasion, because at the time of the screening/retest appointment the family was instructed to inform the Service of a change in their telephone number or to contact the Service if they did not receive a call from them to schedule the follow-up, with printed information attached to the Child's Health Booklet, thus being considered abandonment of the Specific Neonatal Hearing Screening Program. The town's Hearing Health Regulatory Board was notified of cases in which it was not possible to contact the caregivers.

Results

From June 2020 to February 2022, 565 medical records were selected according to the inclusion and exclusion criteria, of which 321 (56.81%) were male children and 244 (43.19%) female. The maximum age was 127 days, the minimum age was 0 days, with an average age of 14.26 days and a median of 6 days.

Regarding the risk factors, 53 children had a family history of permanent childhood hearing loss; 53 were born with syndromes associated with hearing impairment; 83 were born with neurological disorders and/or malformations; 42 contracted infections after birth; 23 experienced hyperbilirubinemia with exchange transfusion; 78 used ototoxic medications; 108 used extracorporeal ventilation; 255 remained in the ICU for more than five days; six contracted rubella; six contracted cytomegalovirus; 39 contracted toxoplasmosis; nine contracted herpes and 62 contracted syphilis (Figure 1).

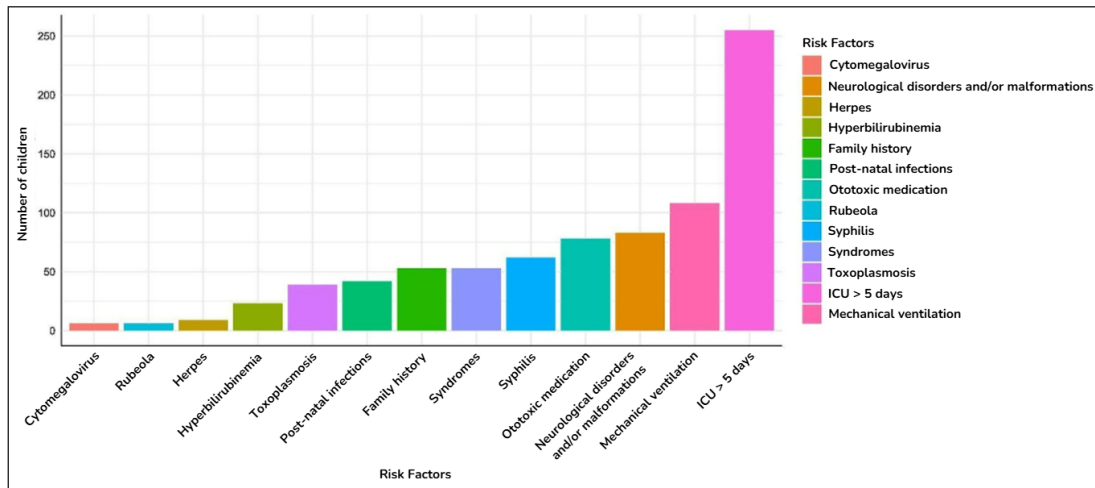


Figure 1. Risk factors of babies screened in Specific Neonatal Hearing Screening

Regarding the Neonatal Hearing Screening, of the 565 children tested, 518 “passed” (91.68%) and 47 “failed” (8.32%). Of the children who received a “pass” result, 117 attended the follow-up (22.59%) and 401 evaded (77.41%). Of the 117 who attended, 108 “passed” (92.31%) and nine “failed” (7.69%), and then were referred for otorhinolaryngological and/or audiological diagnosis and treatment.

Of the children who received a “fail” result, 40 attended the retest (85.11%) and seven dropped out (14.89%). In the retest stage, 27 “passed” (67.5%) and were referred for follow-up and 13 “failed” (32.5%) and were referred for diagnosis and treatment.

In the follow-up stage after the retest, 11 attended (40.74%) and 16 dropped out (59.26%). Of the 11 who attended, all “passed” (100%) (Figure 2).

In total, 545 children were referred for follow-up, including children who received a “pass” result in the first stage of the screening and those who received this result in the retest stage. Of this total, 128 attended (23.49%), of which 119 “passed” (92.97%) and nine “failed” (7.03%), and 417 dropped out (76.51%) (Figure 3).

In total, 22 children were referred for diagnosis, which represents 3.89% of the total tested in the first phase.

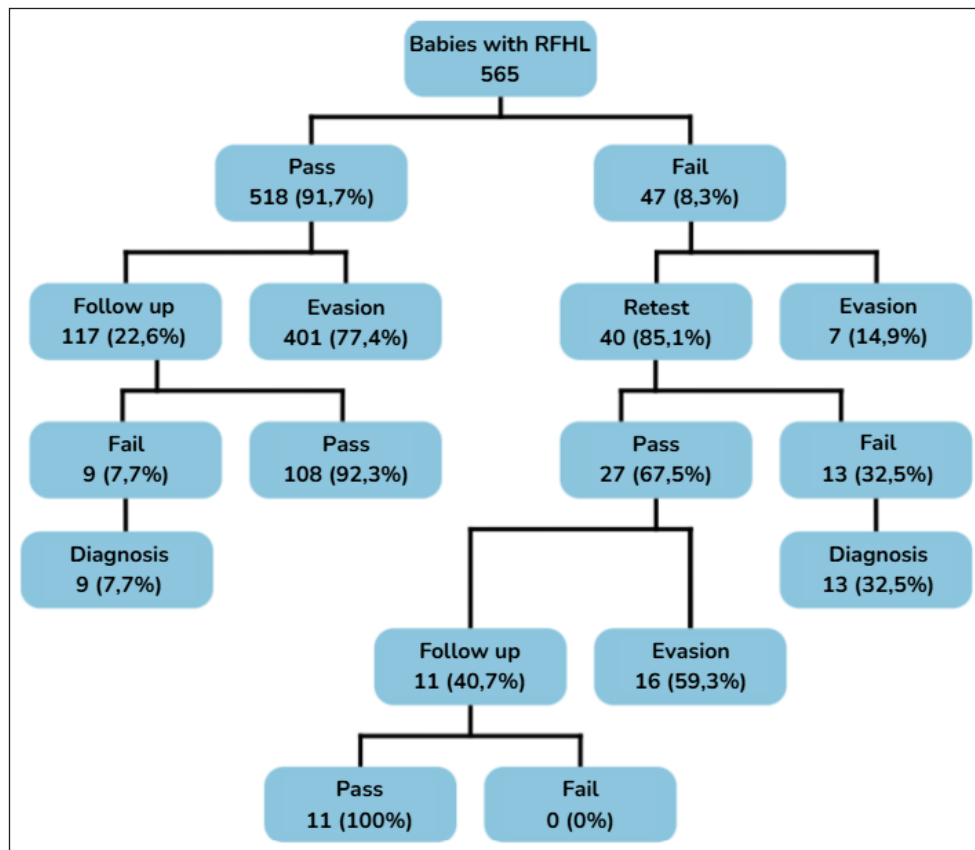


Figure 2. Stages of Neonatal Hearing Screening at the Service with the number of “passes”, “fails” and evasions.

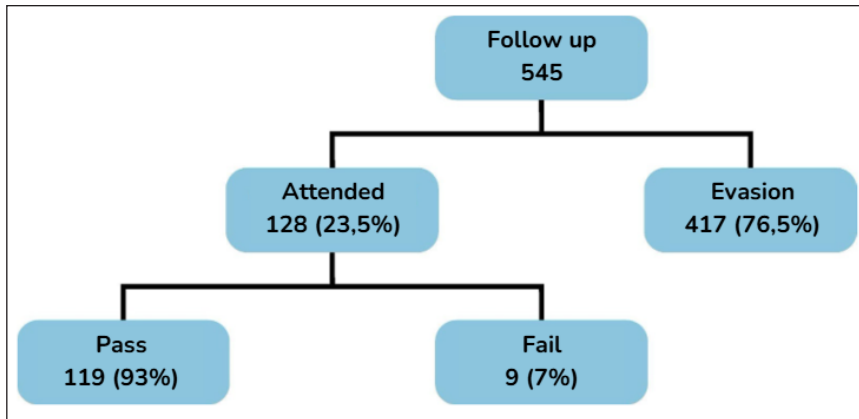


Figure 3. Neonatal Hearing Screening follow up stage with the total number of “passes”, “fails” and evasions.

Discussion

The sample of children selected in the studies, who underwent Neonatal Hearing Screening, varies according to the inclusion and exclusion criteria chosen by each author, however the proportion between female and male gender is in accordance with previous literature describing the profile of the population submitted to the SNHS^{10,17}.

The competent health authorities recommend that all babies should undergo the first stage of hearing screening within one month of life^{2,3,6}, therefore the average age of 14.26 days is in accordance with the hearing health guidelines recommended for early and adequate diagnosis. It is noteworthy that the NHSRS where the study was conducted is located in a university hospital and is linked to a maternity hospital that is a reference for high-risk pregnancies and, therefore, has a large number of babies who are born with health-related complications and need to stay in the neonatal ICU for a long time. Thus, the maximum age of 127 days can be explained by this factor.

The higher incidence of ICU stays of more than five days and the use of extracorporeal membrane oxygenation, rather than other risk factors, can also be explained by the context of the NHSRS mentioned above. Likewise, these indicators appear to be more frequent in other studies that described their distribution in the population tested^{17,18}.

Regarding the first stage of the Neonatal Hearing Screening of babies with RFHL, the “fail” percentage of 8.32% is similar to the percentage found

in another national study, which indicated a “fail” of 7.2% in 2016 and 7.0% in 2017¹⁹. However, this result differs from other national studies, which found a “fail” percentage of 26.3%¹⁰ and 27.3%¹⁷. It should be noted that this rate may vary because it is influenced by factors such as the evaluation protocol used, the experience of the professional performing the exam, the age of the child at the time of the test, and the anatomical and physiological conditions of the baby’s external ear¹¹.

In the follow-up stage, after receiving the “pass” result in the screening, the evasion rate of 77.41% was much higher than that found in another study prior to the COVID-19 pandemic period, which showed a rate of 47.4%¹⁰.

The hypothesis that the increase in dropout rates in the follow-up stage is related to the COVID-19 pandemic due to parents’ anxiety about returning to the hospital environment for fear of contracting the virus has already been presented by other authors^{20,21} and should be further investigated in other studies, since it may have been a factor that further aggravated the problem of dropout rates in Neonatal Hearing Screening.

The research revealed an overall dropout rate of 76.51% in the follow-up stage, which means that only 128 of the 545 babies referred attended this essential phase for evaluating the children’s hearing.

The description of evasion from the Neonatal Hearing Screening follow-up stages varies according to the protocol used and the service flow of each place. A Brazilian study¹¹ showed a 67.7% rate of absenteeism in the follow-up stages. The small difference between the rates found may be



due to the sanitary and health situation due to the pandemic, as mentioned above.

In the retest stage, the dropout rate of 14.89% was lower than that found in other studies, which showed absences of 20%⁵ and 24.8%¹². However, these rates were obtained from the analysis of the Universal Neonatal Hearing Screening, considering the dropout of both babies with and without RFHL.

Thus, the presence of one or more risk factors may have contributed to the greater presence in this stage due mainly to the caregivers' concern of the development of the child after birth and of possible diagnosis of hearing loss.

Still, the dropout rate found in the retest is high, since a crucial quality characteristic of a Neonatal Hearing Screening service is its ability to ensure that all babies who presented results different from those expected in the first stage undergo the retest as soon as possible, in order to guarantee early diagnosis and timely intervention².

In addition to the fear of the caregivers and the uncertainty of the period in which the data were collected and the presence or absence of risk factors, other factors may be related to evasion in the retest and follow-up stages. A study¹³ described some of these factors: maternal marital status, the number of children the mother has and the lack of family and social support, the mother's level of education, the number of prenatal consultations performed, lack of knowledge of the importance of Neonatal Hearing Screening and the procedures performed, lack of material resources to travel to the service, among others.

Similarly, socioeconomic factors may have had a major influence on the absenteeism evidenced by this research, given that the NHSRS responsible for the SNHS is associated with a reference hospital, located in a metropolis and linked to the Brazilian Unified Health System (SUS), which meets the demand of the metropolitan region and is a reference in the state for high-risk pregnancies.

Some of these socioeconomic conditions, such as lack of resources and lack of a support network to help with children, may have been even more evident during the COVID-19 pandemic due to the increase in unemployment²² and social distancing.

A difference between dropout rates in the follow-up and retest stages was also found in the study by Januário et al.¹¹: 67.7% and 29%, respectively. In the case of the present study, the hypothesis is that, due to the shorter time elapsed

between appointments and the imminent diagnosis of hearing loss after a "fail" result, attendance at the retest stage is higher.

The Multiprofessional Committee on Auditory Health recommends a rate between 2% and 4% of newborns referred for audiological diagnosis⁶. Thus, the percentage of children referred (3.89%, n=22) demonstrates the quality of the NHSRS in terms of comprehensive hearing health care. However, due to the large number of absences in the follow-up and retest stages, this percentage may be underestimated.

Overall, the large number of babies who evaded the Neonatal Hearing Screening, totaling 424 out of 565 children tested, shows the difficulty of the NHSRS in fulfilling its commitment to comprehensive hearing health care in childhood. Based on this difficulty, it is possible to plan actions to ensure greater coverage of the retest and follow-up stages, regardless of the adversities caused by the pandemic.

Primary Care within the scope of SUS²³ can be a good ally in terms of comprehensive health care. It can serve as the main agent, together with the Health Secretariats and the Ministry of Health, to provide information to the population, especially mothers, through advertising materials, booklets and social networks about the development of language and hearing in children, the relevance of performing the NHS, how the exams are performed and the flow of the Neonatal Hearing Screening, the importance of carrying out prenatal consultations, among other pertinent subjects to raise awareness among families about the importance of fulfilling all stages of the NHS.

The Community Health Agent²⁴, supported by the Primary Care guidelines, can serve as an operator in the active search for children who did not attend retest or follow-up appointments during home and community actions, as well as carry out individual and collective actions in order to transmit knowledge to the population about children's hearing health and to expand screening to the largest possible number of babies throughout the territory.

The Family Health Support Center (NASF)²³ can also contribute to reducing dropout rates by serving as a space that provides a prepared and trained multidisciplinary team. This team can inform families about the importance of the NHS, monitor children's attendance at follow-up and



retest appointments, and provide the necessary psychosocial assistance to ensure the continuity required in the screening and diagnostic process.

Conclusion

Early diagnosis of hearing loss and timely intervention for children are the pillars on which Neonatal Hearing Screening is based. Specifically, babies who have risk factors for hearing loss should undergo screening based on a solid and effective Specific Neonatal Hearing Screening program in order to ensure comprehensive access to health care.

Although the evasion in stages of NHS has already been studied in the period before the COVID-19 pandemic, it is important to analyze data at this specific adverse time since access to health, information and economic resources was drastically reduced, bringing serious consequences to the use of services and, consequently, to the range of the screening itself.

It was evidenced an increase in the dropout rate, in general, in Neonatal Hearing Screening during the period studied, especially in the follow-up stage. Based on this, further studies are needed focusing on the factors associated with absenteeism in NHS flow appointments so that there is a more efficient targeting of intervention actions.

Finally, it is important to highlight the importance of completing all stages of the screening process in order to verify the full development of language and hearing and the socio-emotional well-being of all children, even in the face of the endemic situation faced by the country.

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