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Hearing Loss in São Tomé e Príncipe: One Year of Humanitarian Missions

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Introduction

São Tomé e Príncipe is an archipelago located in equatorial Africa with economic and political autonomy since 1975. The resident population of about 155,000 inhabitants has a low average age distribution (17-18 years) with low socioeconomic conditions and poor sanitary conditions.

The IMVF (Institute Marquis of Valle Flor) is an NGO (nongovernmental organization) with the objective of implement in this country the **Health for All – Medical Specialities**, supported by Portuguese Institute to Development Support and Calouste Gulbenkian Foundation in partnership with the Ministry of Health of São Tomé e Príncipe

This project was embraced by doctors from the University Clinical Center of Hospital CUF Infante Santo, since February/2011. Humanitarian missions in this country consist in observation of patients by consultation, surgery and hearing assessment for periods of one week, three or four times per year.

Purpose of Missions

The aim would be to participate in the Project Health for All – Medical Specialities and implementing on the islands of São Tomé e Príncipe consultations and surgical interventions, which were our priority. Due to absence of audiological exams for more than 30 years in the islands, they were also brought by our team.

The first team arrived on February of 2011 and was composed by five elements: two ENT doctors, two nurses and one clinical audiologist with audiometric equipment (**Figure 1**).

Each team stays one week in São Tomé e Príncipe, with the objectives of surgical procedures, ENT consulting and audiometry (pure tone audiogram and tympanogram) in Ayres de Menezes Hospital (**Figures 2 and 3**).

Figure 1. First ENT team in Feb. 2011



Figure 2. Children from Prince Island waiting surgery in Ayres de Menezes Hospital



Figure 3. Audiometric test



In addition to the screening tests done at Ayres de Menezes Hospital, screening was conducted in schools in the city of São Tomé (**Figure 4**) to confirm and assess the extent of the problem encountered when carrying out audiometric tests in patients who sought ENT consultation— high prevalence of sensorineural hearing loss (SNHL).



Figure 4. Screening in a primary school, the initial moments are devoted to explaining how the tests are conducted and the mechanism of hearing

Since then, there were four missions. After the 3rd mission, there was the need to involve more elements in the team. Another clinical audiologist with experience in hearing aid implants and a speech therapist were added (**Figures 5 and 6**).

Figure 5. Evaluation after hearing aid fitting



Figure 6. Speech Therapy after the fitting of hearing aids to improve oral language



Mission Report

The records of one year of missions are described in **Table 1**. Please note that the tests marked with an asterisk are those performed after February 2012.

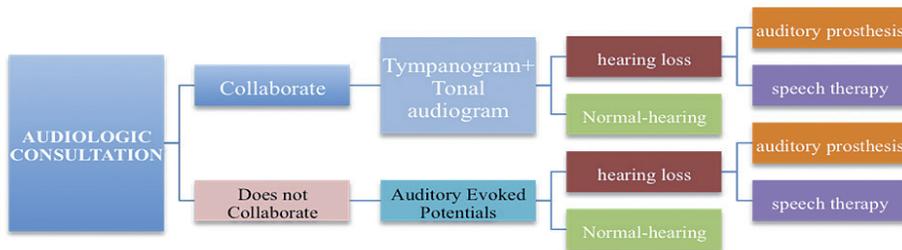
Table 1. Table relating to the Missions Feb/2011 to Feb/2012 (* performed only in Mission - Feb/2012)

		TOTAL
Consultations		364
Surgeries		86
Audiometric tests	Tympanogram	285
	Pure Tone audiogram	221
	Child tonal audiometry *	18
	Free field audiometry *	8
	Auditory Evoked Potentials*	15
Hearing aids	Evaluation *	16
	Adaptation *	14
	Follow-up*	7
Speech Therapy	Evaluation & follow-up*	20

Planning

In order to provide a better service with the means available it was necessary to organize and structure the access to audiology evaluations. For this reason we built a chart to simplify the access to evaluations and examinations (**Diagram 1**).

Diagram 1. Chart of an audiology evaluation



Results of 1 year of Missions

During one year (4 missions) 267 patients were evaluated in audiology evaluation. The age distribution of the population observed is shown in **Chart 1**.

For statistical purposes and data analysis of all the observed patients, those who did not collaborate with the audiometric tests and those being reevaluated were excluded. At the end we had a total of 167 patients, meaning 334 ears examined (**Diagram 2**).

Chart 1. Age distribution of patients observed

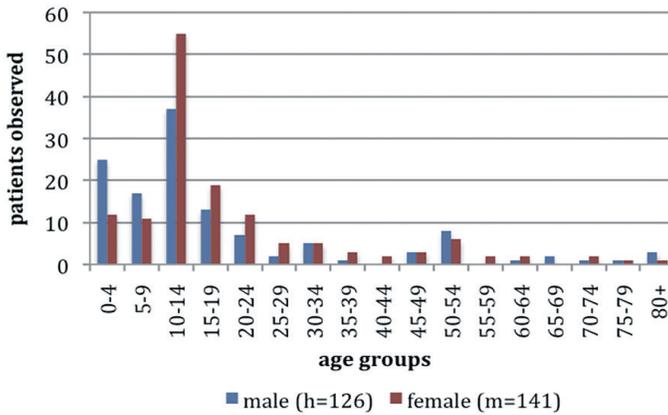
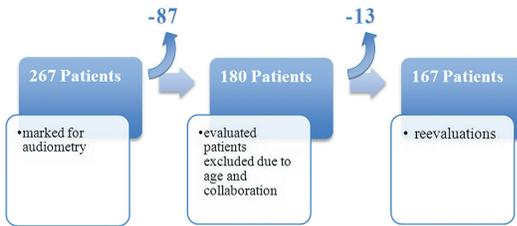


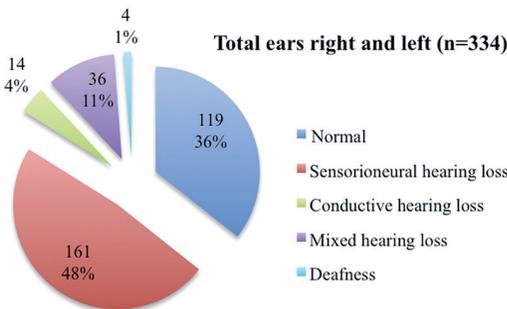
Diagram 2. Flowchart of patients for the study



In the early missions the younger patients were excluded from the study due to the inexistence of auditory evoked potentials. Only since Feb/2012 it was possible to integrate those patients and also those elderly who didn't collaborate with pure tonal audiogram.

Of all the examined ears (334) only 36% had normal hearing, 48% had sensorineural hearing loss, followed by 11% of mixed hearing situations corresponding to chronic ear disease, 4% of conductive hearing loss and 1% of deafness (Chart 2).

Chart 2. Distribution by type of hearing loss



After analyzing the data concerning the different sexes it was evident that there was a higher prevalence of sensorineural hearing loss in females (Chart 3).

In the ears with hearing loss (215) there was a predominance of slight degree hearing loss (41%) and moderate hearing loss (37%), followed by

profound hearing loss (13%), severe (7%) and deafness (2%) (Chart 4), BIAP classification (Bureau International d'Audio Phonologie).

After analyzing all patients identified with hearing loss they were distributed according to age groups and types of hearing loss (Chart 5). It was found that in

the age groups above 20 years the number of patients with sensorineural hearing loss (SNHL) was always greater than the number of patients with normal hearing.

Chart 3. Distribution of types of hearing loss in accordance with the genres.

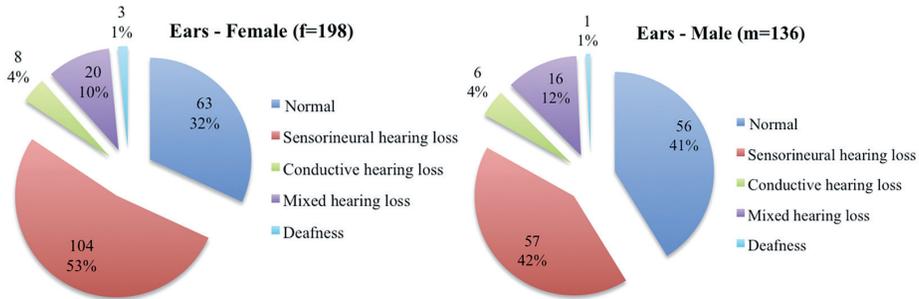
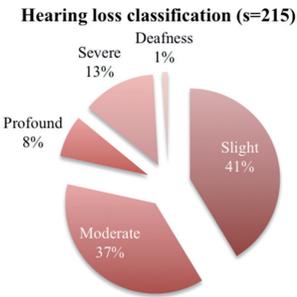


Chart 4. Distribution of degrees of deafness in patients with deafness



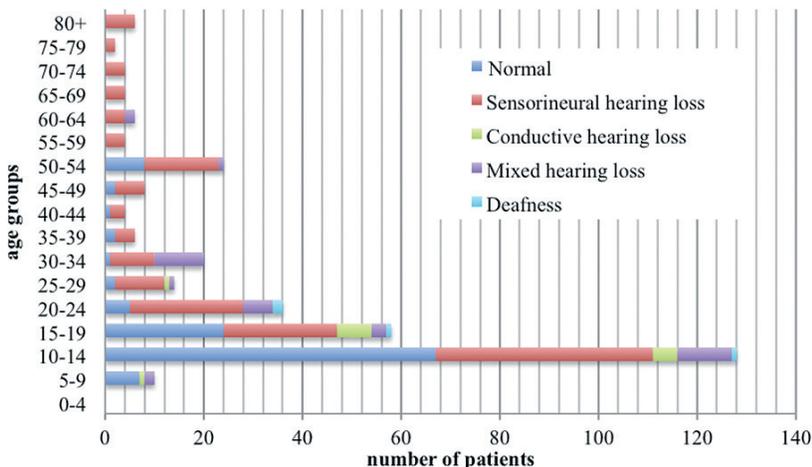
Analysis and Discussion

The causes of hearing loss can be either congenital or acquired after birth.

Causes of congenital disease can be of genetic inheritance or acquired *in utero* as a result of infectious diseases that the mother was exposed during pregnancy: rubella, cytomegalovirus, toxoplasmosis and syphilis.

Acquired causes can be situations that trigger changes in the normal ear. They may occur in the peripartum period such as neonatal asphyxia, prematurity and hyperbilirubinemia, as well as situations that occur in postnatal period and can interfere with the mechanism of hearing: cerumen, ear infections, trauma, etc.

Chart 5. Age distribution by type of hearing loss



According to the probable causes of hearing loss, it is thought that there will be an underlying cause for the population of São Tomé e Príncipe that can explain such high prevalence.

One of the characteristics associated with São Tomé e Príncipe is the high incidence of **malaria** on the islands due to *Plasmodium falciparum*, responsible for a high mortality and morbidity in children.

Malaria therapy is commonly associated with bilateral sensorineural hearing loss with symmetric sloping, or drop in high frequencies.

A bibliographic research on hearing loss and treatment of malaria was conducted. Results showed that **drugs used in malaria treatment, particularly quinine had an impact in hearing, but after cessation of the treatment, patient reverts to normal hearing.**^{1, 2} The same effect was observed with new drugs available^{3,4,5,6}.

Bibliographic research was also conducted trying to associate malaria per se and hearing loss

It was found an **association between cerebral malaria and hearing loss.**^{7 9 8} However there's still no sufficient data to establish a causal relationship between malaria and hearing loss⁷.

According to other articles, there seems to be a relationship between malaria and hearing loss. There is a prospective study that shows that malaria leads to a significant hearing loss in mices¹⁰. This hearing loss affects low and mid frequencies, often making an upward curve on pure tone audiogram^{10, 7}. This feature has been attributed to microvascular disturbances and decreased perfusion of the cochlea, affecting mainly the apical turn of the cochlea. Moreover, **malaria leads to the release of inflammatory mediators affecting the inner ear.**

Although there seems to be a strong association between malaria and hearing loss, it is important to remember that **there are other causes of hearing loss that may be undervaluated, including consanguinity and ototoxicity by other drugs (e.g. gentamycin).**¹¹

Conclusions

From the analysis of the results of the audiometric screening:

- **High prevalence of bilateral sensorineural hearing loss in children and adolescents;**
- **High percentage of deaf-mutes**, much more that could be expected in a population of this size;
- **Hearing problems in children leads to social impairments, cognitive and affective disorders and lack of social integration.** It's a problem not only to them, but also to the families that don't have the resources and means to solve the problem.
- **National Public Health authorities were unaware of the problem** due to the fact that this was the first time that audiometric tests were conducted in the country for more than 30 years.

Suggestions

Given the presented data several actions were taken in the Missions:

- Adequate treatment to the children and adolescents with hearing loss that were found using suitable hearing aids;
- Create special learning facilities to cope with these children.
- Implementation of a program of Speech Therapy in patients with hearing aids in order to acquire or improve speech;
- Try to understand why this phenomenon occurs and seek to correct it, conducting a cohort study in the population of São Tomé e Príncipe in which there will be analyzed the cases of hearing loss in relation to case-control (without hearing loss) and exposure to malaria or not (this study should be conducted for children up to 10 years because there is only record of patients with malaria since 2003);
- Inform local authorities sensitizing them to this issue and its correction
- Continued analysis of audiometric results and given the scale of the problem, include it and make them mandatory through the CENSUS to be held in May / June 2012;
- Add to the next missions the Portuguese Sign Language in order to promote communication among the affected population.

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