



Contents lists available at ScienceDirect

International Journal of Pediatric Otorhinolaryngology

journal homepage: www.elsevier.com/locate/ijporl

Prevalence of ear disease and associated hearing loss among primary school students in the Solomon Islands: Otitis media still a major public health issue

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ARTICLE INFO

Keywords:

Otitis media
Hearing loss
School ear and hearing screening
Pacific Islands

ABSTRACT

Objective: The present study aimed to assess the prevalence of otitis media and associated hearing loss among primary school students in the Solomon Islands.**Methods:** A total of 604 primary school students (280 males, 324 females) aged 4–15 years were assessed in two primary schools (government, nongovernment) in the capital city Honiara. School-based ear examinations were performed, including otoscopy and tuning-fork tests. Students were referred to the ENT Clinic for medical intervention and/or pure-tone audiometry assessment.**Results:** A total of 342 students (56.6%) did not pass their ear examination, with a significantly higher fail rate among younger students ($p < 0.001$). The most common ear pathology was Otitis Media with Effusion (OME) (34.2%), followed by impacted wax (22.8%), and Chronic Suppurative Otitis Media (3.1%). The follow-up attendance rate at the ENT Clinic was 81.1%. Among students with OME in at least one ear, 50% failed audiometry screening in the affected ear. While age was a significant factor for OME, it was not a significant factor for OME-associated hearing loss.**Conclusions:** Ear diseases with associated hearing loss are a significant public health problem among primary school students in the Solomon Islands. The implementation of routine School Ear and Hearing Programs could be beneficial, and should reduce the national burden of ear diseases.

1. Introduction

According to the World Health Organisation (WHO), more than two-thirds of the global burden of hearing loss is found in Low and Middle Income Countries (LMICs), with approximately half of these hearing disorders considered preventable [1]. There are 34 million children worldwide living with hearing loss, and 60% of childhood hearing loss is known to be preventable [1]. Infectious diseases and middle ear disorders are recognised as the leading causes of avoidable hearing loss in children. Given the well-known adverse effects of hearing loss on child development, the WHO is leading global efforts to address the major causes of preventable childhood hearing loss, whilst advocating for national programs that enable early detection and intervention for children with hearing impairment [2]. The recent WHO World Hearing Day campaigns promoted school-based hearing

screening programs as a major public health initiative to achieve these aims [3,4]. These programs should reduce the global burden of paediatric hearing loss, as well as contribute to major international health and education initiatives under the United Nations Sustainable Development Goals.

The early audiology literature from developing countries largely consists of school-based prevalence studies. In these landmark papers, otitis media was well-established as a leading cause of hearing loss among children attending primary schools [5–9]. Recent reports focus on the implementation of routine school hearing screening programs, and investigating methodologies that are suitable to resource-limited contexts [10–12]. Current research is focused on appropriate equipment, human resource considerations, as well as ensuring acceptable school hearing screening referral rates [13–16]. These efforts should reduce the well-known burden of childhood hearing loss in LMICs, and

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Received 9 June 2018; Received in revised form 3 August 2018; Accepted 4 August 2018

Available online 07 August 2018

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optimize educational outcomes for these children.

There is very limited research on childhood hearing loss in the Pacific Islands [17]. Yet, the World Health Organization estimates that this region has among the highest global burden of hearing loss worldwide [1]. An early landmark paper from the Solomon Islands indicated that a significant proportion of hearing loss among children was due to otitis media (OM) [18]. More recently, the Oceania region was reported to have the second highest overall prevalence of hearing loss caused by OM worldwide, as well as the highest global mortality rate due to complications of Chronic Suppurative Otitis Media (CSOM) [19].

There is also very limited information on hearing health services and school-based hearing screening in the Pacific Islands. An early landmark paper from Guam, however, reported the positive impact of such programs on reducing the burden of otitis media [20]. This study found that, although the incidence of hearing loss remained high, the school-based hearing screening program facilitated early diagnosis and treatment of acute episodes of otitis media, and minimized the number of cases progressing to advanced and chronic stages of middle ear disease. The lack of access to health services continues to be a major contributing factor to advanced stages of ear disease in children in the Pacific Islands, as reported in recent studies from Papua New Guinea [21,22].

In view of the current status of childhood hearing loss and hearing healthcare in the Pacific Islands, school-based ear examinations have been recommended as a public health measure to reduce the prevalence of ear disease and associated hearing disorders [17]. The WHO Global School Health Initiative offers an attractive public health platform for routine ear health assessments. The key aim of such assessments is to facilitate medical, surgical, and educational interventions for children identified with ear disease and hearing loss. Depending on equipment and human resource availability, the school-based ear health examinations could evolve to include hearing screening, diagnostic audiology, and amplification options for students with hearing loss. Another benefit of the WHO Global School Health Initiative is that it presents an opportunity for health promotion activities where one public health message (e.g., Nutrition) may target numerous health conditions, including otitis media and associated hearing loss.

The first author (AK) was invited by the National Referral Hospital ENT Clinic in the Solomon Islands to collaborate in the development of their school outreach services (Fig. 1). This is the only ENT Clinic in the country, and it is currently staffed by four senior and two junior ENT registered nurses. For ENT Specialist consultation or surgical intervention, the Solomon Islands is dependent on an annual 10-day visit from the Royal Australasian College of Surgeons Pacific Island Program

ENT Visit [23]. Audiology services at the clinic currently consist of pure-tone audiometry assessment in conjunction with ENT Clinic consultation, and are performed by one of the senior ENT nurses with a formal audiometrist qualification (second author, ON). The ENT Clinic is exploring the implementation of community outreach programs and health promotion activities, in order to reduce the number of patients presenting to the ENT Clinic with advanced stages of ear disease and complications due to poorly managed OM. A previous study showed that there is high parental support for a school-based ear and hearing program in the Solomon Islands [24].

In order to recommend a suitable protocol for the ENT Clinic outreach service for schoolchildren, the present study was conducted to assess the prevalence of OM and associated hearing loss among primary school students in Honiara, the capital city of the Solomon Islands. The aims of the study were to (1) provide current data on the prevalence and nature of OM in this population, (2) provide current data on the prevalence and nature of hearing loss associated with Otitis Media with Effusion (OME) in this population, and (3) assess community engagement with the ENT Clinic school outreach program.

2. Methods

Ethical approval for the study was obtained from the National Health Research and Ethics Committee of the Solomon Islands Ministry of Health and Medical Services, and the University of Queensland Medical Research Ethics Committee. Gatekeeper approval for the study was also obtained from the Solomon Islands Ministry of Education and Human Resource Development, and the management committees of the participating schools.

2.1. Participants

One government and one non-government primary school in the capital city Honiara were approached for participation in the study. These schools were conveniently chosen because of a pre-existing relationship with the ENT Clinic. According to the most recently available statistics from the Solomon Islands Ministry of Education and Human Resources, there are 515 primary schools in the country, where 79% are government schools, 20% are non-government schools, and 1% are international schools [25]. The distribution is different in the capital city Honiara where there are 12 primary schools: 3 are government-run, 4 are non-government, and 5 are under private education authorities (e.g. International School). The total enrolment of primary school students in Honiara is 9814 students (4768 female, 5046 male) [25].

All students attending the selected schools on the days of data collection were eligible for the study. Students were issued an Information Sheet about the study, as well as Consent Forms for their parents/guardians. Students who returned a signed parent/guardian consent form for participation were included in the study (N.B. Parents/guardians could choose to receive the ENT & Audio Clinic service for their child but have the result excluded from the research study).

A total of 621 students were seen for an ear examination at their school. There were 17 students who were excluded from the study (14 parents/guardians who did not wish their child's result included in the research project; 3 students were older than 15 years). A total of 604 students were, therefore, included in the data analysis (Table 1). The age range of students was 4–15 years, with a mean age of 10.0 years (SD = 2.4). Among students seen at the government school (n = 401), the age range was 6–15 years, with a mean age of 10.6 years (SD = 2.1). Among students seen at the non-government school (n = 203), the age range was 4–15 years, with a mean age of 8.9 years (SD = 2.6).

2.2. School-based ear examination procedure

All ear examinations were performed by the senior ENT Registered

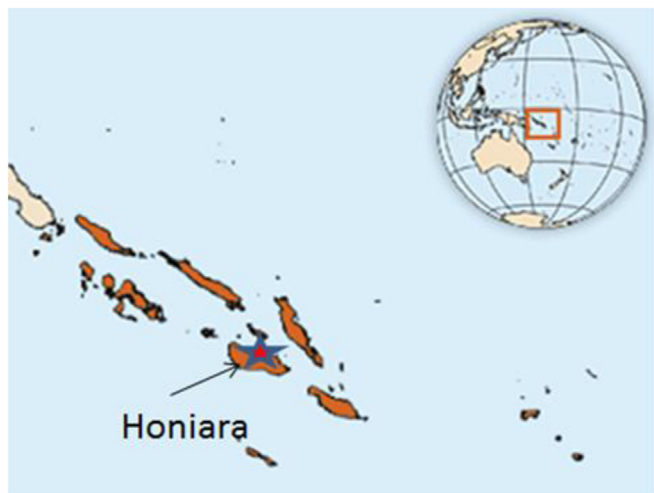


Fig. 1. Map of the Solomon Islands.

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