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Impact of Hearing Loss and Restricted Access to Care on the Karen People Living in a Conflict Setting Near the Thai-Burma Border

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Purpose: The rate of moderate-to-severe hearing loss in Southeast Asia is 5.8%, among the world's most prevalent. However, it is difficult to measure for people whose healthcare access is limited by the ongoing civil war. Therefore, a cross-sectional study of the impacts of hearing loss was incorporated with ongoing vision/cataract clinics along the Thai-Burma border.

Patients and Methods: In this cross-sectional observational study, culturally sensitive informed consent was obtained from patients presenting to a regionally promoted hearing clinic in Karen State, Burma (Myanmar) with a chief complaint of hearing loss. They were then administered a standardized survey derived from the Hearing Handicap Inventory for Adults/Elderly (HHI), then assessed based on history, otoscopy, Weber and Rinne testing, and portable audiometry.

Results: Twenty-two adults and children presented with a chief complaint of hearing loss, and 26 others came seeking vision care needing cataract surgery. HHI survey showed 41% had mild-to-moderate, and 34% had moderate-to-severe hearing impairment. On a 0–4 Likert scale, prominent complaints due to hearing loss were feeling upset (2.4 ± 1.8), limited social life (2.2 ± 1.6), using the phone less (2.1 ± 1.8) and needing to be warned of the danger by others (2.1 ± 1.9). Seventy-three percent had no prior hearing care. Access was limited due to financial (59%), limited travel (50%), and military conflict (41%). Pure-tone averages were 55.3 ± 22.1 dB and 67.9 ± 14.5 dB for the right and left ears, respectively. Pure tone averages are negatively correlated with HHI survey score (R = −0.53). Chicken feathers were a common mechanism of ear drum trauma. Twenty patients received Solar Ear hearing aids.

Conclusion: Ongoing military conflict in the Karen State leaves the internally displaced people with high prevalence of hearing loss and fear of additional injury due to inability to hear danger. Surveys such as this appear more useful to assess the individual impact of hearing loss rather than severity. Efforts by regional medics to provide hearing care should be supported.

Plain Language Summary: Residents in a war zone in Karen State, Burma, had survey, ear exam and audiometry showing high prevalence of hearing loss including tympanic membrane perforation by chicken feathers.

Keywords: internally displaced persons, hearing loss, audiometry, chicken feather injury, tympanic membrane perforation, health care access

Introduction

Hearing loss is a common and significant problem worldwide. According to the 2019 Global Burden of Diseases, Injuries, and Risk Factors report (GBD), hearing loss >20 dB affects 20.3% of the global population,[1] and accrued an estimated global cost of $981 billion USD.[2] Disabling hearing loss requiring rehabilitation currently affects 430 million people.[3] Presbycusis is the leading cause of adult-onset hearing loss, which occurs primarily due to chronic damage to

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cochlear hair cells[4] with potential contributions from reduced functioning of the stria vascularis.[5] Other notable etiologies include acute and chronic noise exposure, ototoxic medications, traumatic eardrum perforation from foreign body insertion[6] or head trauma,[7] genetic mutations, and vertically transmitted infections.[8]

Hearing loss has profound effects on the lives of affected individuals. In elderly populations, it has been identified as an independent risk factor for the development of cognitive decline,[9] dementia,[10] feelings of social isolation,[11] depressive and anxiety disorders,[12] and decreased overall quality of life.[13] It also increases their risk of frailty and the odds of falling over time.[14] All adults with hearing loss are more likely to be unemployed, and earn less income on average compared to adults with intact hearing.[15] In children, hearing loss is known to be associated with impairment of speech, language, cognition, and other developmental milestones.[16] Especially in developing countries, children with hearing loss are less likely to receive or complete primary education, are at greater risk of remaining in extreme poverty.[17]

Compared to the global population, the burden of hearing loss in Southeast Asia appears to be especially high. According to the 2019 GBD, the age-standardized prevalence of moderate-to-complete hearing loss in that region of the world was the highest at 5.8%.[1] This is compared to a low of 3.5% in European countries and a global average of 5.1%.[1] In terms of financial burden, the combined costs of hearing loss in the Southern and Eastern Asian regions in 2019 accounted for 30.3% of the global cost.[2] While the risk factors in the region are the same as the rest of the world, occupational noise exposure has been consistently identified as a major contributor to hearing loss by multiple Southeast Asian countries.[18–21]

Hearing loss in Burma (Myanmar) stands out even among the whole region of Southeast Asia. Out of 204 participating countries and territories in the 2019 GBD, the overall age-standardized prevalence rate of hearing loss in Burma was the second highest at 22.5%, second only to Kenya at 23.3%.[1] While this is significant, it may not reflect the true prevalence of hearing loss in the country due to difficulty counting many internally displaced persons (IDPs). Because of the ongoing civil war, ethnic minorities fleeing from conflict have had reduced access to healthcare, likely resulting in the exclusion of their health data from the GBD. In general, hearing loss in refugee populations is not well studied, with most studies investigating newborn hearing screening.[22,23] Data on Burmese refugees specifically appear to be absent or very limited.

This paper focuses primarily on some Burmese-minority in eastern Karen State, with the primary goal of providing a descriptive assessment of how ongoing military conflict has affected their hearing and access to hearing-related healthcare. We also chose to assess the performance of survey questions derived from the Hearing Handicap Index for Adults (HHI) and independently added survey questions assessing safety issues related to hearing loss, with the hypothesis that certain HHI questions pertaining to the use of technology may generate a comparatively lower number of affirmative responses. Lastly, we chose to investigate whether the total survey score on HHI questions correlates with the severity of hearing loss based on pure tone averages (PTA) in the better-hearing ear.

Methods

In this cross-sectional observational study, participants were selected from a clinic held in the rural village of Klaw Taw for Karen ethnic people along the southern border of Thailand and Burma in December, 2023. The clinic during which this study was conducted was approved by the regional Karen health authority and promoted by local medics through word-of-mouth in K4 and K6 Brigades as a combined hearing clinic and vision clinic. During the concomitant vision clinic, some other patients received reading and/or custom sphero-cylinder spectacles and 21 had cataract extraction with posterior chamber intraocular lenses. This investigation focuses solely on patients who presented for evaluation of their hearing. The only inclusion criteria for participation in the study was a chief complaint of hearing loss.

The research, covered by the institutional review board of Providence Alaska Medical Center considered minimal-risk, is a comparison of non-invasive screening methods. It follows the Declaration of Helsinki and is compliant with HIPAA, GDPR, and PDPA (Personal Data Protection Act 2019). Consent documentation was translated from English into four local languages: Thai, Burmese, Sgaw Karen, and Poh Karen. After direct, private explanation by local language speaking medics, adults signed consent and parents signed for their children. De-identified data can be viewed at https://www.abcd-vision.org/references/Burma%20Hearing%20Clinic.pdf.

Data was collected from participants using a 2-page questionnaire administered during the initial portion of the patient encounter. Survey questions comprised the independent variables with the dependent variables being patient responses. Page 1 includes questions from the Hearing Handicap Inventory for Adults (HHI) to screen for the situational

and emotional impacts of hearing loss, as well as 5 independently added questions to assess potential safety issues attributed to hearing loss. Patients could respond to questions with "Yes", "Sometimes", or "No", corresponding to a point value of 4, 2, or 0, respectively. The number of HHI questions was reduced to 17 in order to maintain efficiency of the survey, with 22 questions in total on page 1. Only the HHI questions were used for categorization into "referral", "mild-to-moderate handicap", and "moderate-to-severe handicap" groups, and threshold values were adjusted to maintain consistent percentages of total possible score with the original questionnaire. Page 2 provided an area for patients to state their chief complaint, questions regarding potential exposure to common hearing loss risk factors, and questions regarding access to hearing and ear-related health care.

The survey was translated from English to 4 languages used by the target population: Thai, Burmese, Sgaw Karen, and Poh Karen. The Thai translation was produced and verified by a native English speaker in Thailand fluent in Thai, as well as a native Thai speaker with a college degree in English. The Burmese translation was produced and verified by a fluent Burmese speaker. After completion of the questionnaire, patients provided a history and were evaluated with otoscopy, tuning fork exam, and pure-tone screening audiometry. The portable Hear-X (Camden, Delaware) hearTest Diagnostic Hardware Set A (Samsung Tab A7 and Sennheiser HD280 Pro headphones) was used according to manufacturer instructions.

An estimate of the prevalence of hearing loss in this area of the Karen State can be inferred by the community response to village-promoted new hearing clinic compared to the annual, established village promotion for vision (spectacles and cataract surgery) clinics.

Statistical Analysis

Results of the HHI survey questions were analyzed for mean point value and standard deviation using Microsoft Excel. Percentages of the total sample were calculated for the different referral statuses and questions pertaining to access to care. Independent sample, 2-tailed *T*-testing was conducted to compare audiogram results for the left and right ears. Correlation analysis was conducted to determine if relationships exist between severity of hearing loss (based on the PTA of the better hearing ear) and participant scores on HHI and safety-related questions.

Results

Demographic Info and Baseline Characteristics

Twenty-two patients presenting with a chief complaint of hearing loss were identified over the course of 2 days, after which no more patients presented for evaluation of hearing loss. Demographics and baseline characteristics of the sample are presented in Table 1. Degree of noise exposure from everyday life compared to military conflict is represented in Figure 1.

Table 1 Patient Demographics and Baseline Characteristics

Characteristic	Sample (n = 22)
Age; mean (SD) Gender; n (%)	55 (26)
Males Females	13 (59%) 9 (41%)
Prior Hearing Aid Experience; n (%) Physical Injury; n (%) Prolonged Noise Exposure; n (%)	2 (9%) 5 (23%)
Everyday Life Military Conflict Both	11 (50%) 5 (23%) 4 (18%)
Family History of Hearing Loss; n (%)	5 (23%)

Figure 1 Reported exposure to chronic noise due to everyday life and military conflict.

HHI Survey results

Descriptive statistics of individual questions on page 1 of the survey are represented in Table 2. HHIA questions with the highest mean ± standard deviation scores pertained to feeling upset due to hearing difficulty (2.4±1.8), feeling limited in social or personal life due to hearing difficulty (2.2±1.6), and using the phone less frequently than desired due to hearing loss (2.1±1.8). The question with the highest average score in the safety category pertained to needing to be warned of danger by somebody else because they were unable to hear it (2.1±1.9).

Table 3 contains results of referral status and mean question performance for HHIA and safety-related questions. Sixteen patients (73%) met referral criteria based on their total score on questions derived from the HHIA, with 9 (41%) and 7 (32%) patients falling into the Mild-to-Moderate Handicap and Moderate-to-Severe Handicap groups, respectively. The mean score for questions derived from the HHIA was 1.6±1.7, compared to a mean of 1.1±1.7 for safety-related

Table 2 Descriptive Data from Questions Derived from the Hearing Handicap Index for Adults/Elderly and Questions About Safety Issues Attributed to Hearing Loss

Question	n	Mean (SD)	Median	Range	Assigned "0" Response; n (%)
S-1 Does a hearing problem cause you to use the phone less often than you would like?	22	2.1 (1.8)	2	0–4	8 (36%)
E-2 Does a hearing problem ever cause you to feel embarrassed or uncomfortable?	22	1.7 (1.7)	2	0–4	9 (41%)
S-3 Does a hearing problem cause you to avoid groups of people?	22	1.5 (1.6)	2	0–4	10 (45%)
E-4 Does a hearing problem cause you to feel frustrated when talking to other people?	22	1.7 (1.4)	2	0–4	7 (32%)
E-5 Do you feel handicapped or limited by a hearing problem?	22	1.3 (1.7)	0	0–4	13 (59%)
S-6 Does a hearing problem cause you difficulty when visiting friends, relatives, or neighbors?	22	1.7 (1.8)	2	0–4	10 (45%)
E-7 Does a hearing problem ever make you feel nervous?	22	1.6 (1.7)	2	0–4	10 (45%)
S-8 Does a hearing problem cause you to visit friends, relatives, or neighbors less often than you would like?	22	1.7 (1.8)	2	0–4	10 (45%)
E-9 Does a hearing problem cause you to have arguments with family members?	22	1.1 (1.5)	0	0–4	13 (59%)
S-10 Does a hearing problem make it difficult to listen to the television or radio?	22	1.1 (1.7)	0	0–4	15 (68%)
E-11 Does any problem or difficulty with your hearing make you feel upset?	22	2.4 (1.8)	3	0–4	7 (32%)
S-12 Does a hearing problem cause you to talk to family members less often than you would like?	22	1.6 (1.9)	0	0–4	12 (55%)
E-13 Do you feel that any difficulty with your hearing limits or hampers your personal or social life?	22	2.2 (1.6)	2	0–4	6 (27%)

(*Continued*)

Table 2 (Continued).

Question	n	Mean (SD)	Median	Range	Assigned "0" Response; n (%)
S-14 Does a hearing problem cause you difficulty when in a restaurant with relatives or friends?	22	1.2 (1.5)	0	0–4	12 (55%)
E-15 Does a hearing problem cause you to feel depressed?	22	2.0 (1.7)	2	0–4	8 (36%)
S-16 Does a hearing problem cause you to listen to TV or the radio less often than you would like?	22	1.4 (1.8)	0	0–4	13 (59%)
E-17 Does a hearing problem cause you to feel left out when you are with a group of people?	22	1.5 (1.8)	0	0–4	12 (55%)
H-18 have you ever felt unsafe because of a hearing problem?	22	1.4 (1.8)	0	0–4	13 (59%)
H-19 Compared to other people with normal hearing, have you ever had problems avoiding danger because of a hearing problem?	22	1.3 (1.6)	0	0–4	12 (55%)
H-20 have other people had to warn you of danger that you were unable to hear because of a hearing problem?	22	2.1 (1.9)	2	0–4	9 (41%)
H-21 have you ever been in physical danger as a direct result of a hearing problem? (Yes or No)	22	0.5 (1.4)	0	0–4	19 (86%)
H-22 have you ever suffered a physical injury as a direct result of a hearing problem? (Yes or No)	22	0.2 (0.8)	0	0–4	21 (95%)

Table 3 Results of categorization based on responses to questions derived from the Hearing Handicap Index for Adults/Elderly with comparison of average performance on these questions to that on questions regarding safety issues attributed to hearing loss

Result	Sample (n = 22)
HHI Score Category; n (%)	
No Referral	6 (27%)
Mild-to-Moderate Handicap	9 (41%)
Moderate-to-Severe Handicap	7 (32%)
Score on Question Category; mean (SD)	
HHI	1.6 (1.7)
Safety	1.1 (1.7)

Abbreviations: HHI, Hearing Handicap Index; SD, Standard deviation.

questions. Any amount of safety issue attributed to hearing loss was endorsed by 20 patients (91%), with 10 patients (45%) endorsing positive responses to 2 or more safety-related questions.

Access to Care Results

The results of questions pertaining to access to hearing and ear-related healthcare on page 2 are represented in Figure 2. Sixteen patients (73%) denied having received care for hearing nor ear-related issues. The primary factors endorsed by the participants as interfering with access to healthcare were financial reasons (59%), lack of adequate transportation or ability to travel the required distance to receive care (50%), and military conflict (41%).

Audiogram Data

Pure-tone averages of the sample are represented in Table 4. Audiogram data from day 1 of the clinic was excluded due to recognized inaccuracies, which was corrected on the second day. As a result, 11 patients had reliable audiogram data. For these patients, an apparent difference was noticed in the mean pure-tone averages for the right (55.3±22.1 dB) and left (67.9±14.5 dB) ears, but this difference was not statistically significant ($p = 0.13$). Moderate negative correlations

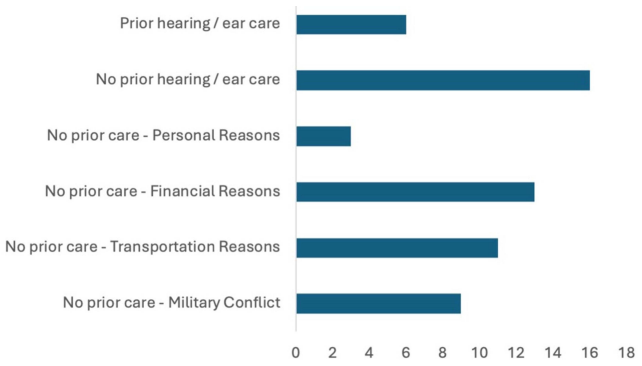

Figure 2 Reported access to hearing and ear-related healthcare.

were found between pure-tone averages in the better hearing ear with total survey score (R = −0.53) and score on safety-related questions (R = −0.56). A weak negative correlation was seen between pure-tone averages in the better hearing ear and score on HHI questions (R = −0.50). Correlation analysis is represented in Figure 3.

Discussion

Access to Care in the Midst of Civil War

The civil war in Burma has persisted for over 70 years. There have been waxing and waning levels of conflict over this time, with occasional peaceful periods allowing for greater healthcare access for the ethnic minorities frequently needing to flee oppression. However, as is the case currently during the drafting of this manuscript, there have been periods of time during which the conflict severely limits their access to healthcare and other necessary services. The ongoing conflict has also exposed this population to repeated loud noises from explosives and artillery rounds, a well-known risk factor for debilitating hearing loss documented back to World War I.[24]

The most important purpose of the clinic during which this study was conducted was to offer hearing and ear-related healthcare to a population that has persistently struggled with gaining access to it. As highlighted in the introduction, the burden of hearing loss in Burma is already substantial compared to the rest of the world.[1] If it is assumed that burden also applies to the over 2.6 million internally displaced persons currently within Burma and a significant portion of the 1.1 million refugees and asylum-seekers in neighboring countries,[25] then there are potentially hundreds of thousands of people in the region whose hearing loss is not being addressed. The provision of hearing aids in this population should prove helpful; even over-the-counter hearing aids can provide benefits similar to audiologist-fitted devices.[26] Wireless auditory training might further improve hearing in this region.[27]

Table 4 Mean Pure-Tone Averages for the Right, Left, and Better-Hearing Ears

Ear	Mean (SD), dB
Right	56 (22)
Left	68 (15)
Better-Hearing	54 (19)

Notes: De-identified data sharing: https://www.abcd-vision.org/references/Burma%20Hearing%20Clinic.pdf.

Abbreviations: dB decibel, GBD global burden of disease, HHI Hearing Handicap Index, HIPAA Health Insurance Portability and Accountability Act, IDP internally displaced person(s), PDPA personal data protection act, SD standard deviation.

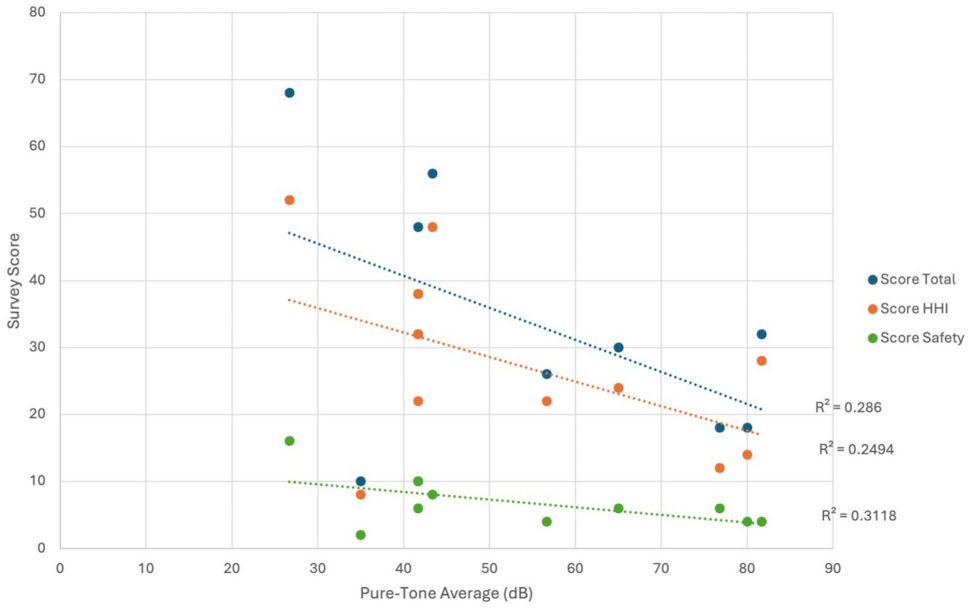

Figure 3 Survey scores compared to pure-tone averages in the better-hearing ear.

The combined vision/hearing clinic during which this study was conducted with 22 hearing tests and 26 cataract surgeries gathered the largest group of Karen people presenting for evaluation and treatment of hearing loss in the experience of the authors, as well as what has so far documented in the literature. As these clinics have historically been made aware to the patients by word-of-mouth, the number of patients who have presented in the past has been variable. However, the focus on providing audiologic screening and a higher availability of hearing aids at this particular clinic was emphasized more than previously, which is likely responsible for the larger group of patients.

Survey Performance

The results of the survey from this sample are consistent with the fact that hearing loss is not being adequately addressed for this population, exhibited by 73% of the respondents denying receiving healthcare for hearing and ear-related complaints. Their current situation has led to multifactorial barriers to receiving this care, as moving through the jungle to avoid military conflict makes finding and maintaining employment very difficult. Thus, gaining the funds necessary to pay for transportation to the closest provider, and the out-of-pocket cost of evaluation and treatment of their hearing loss is also very difficult.

The weakly negative correlation of scores on HHI-derived questions with pure tone averages suggests that the severity of the impact of a person's hearing loss may depend on factors other than the objective degree of impairment. While other, larger studies have yielded positive correlations between survey scores and pure-tone averages, they too have suggested that audiometry alone is insufficient in fully describing how patients interpret and respond to their hearing loss, and other factors such as age, mental health, language, and culture need to be considered.[28–30]

The questions about safety issues attributed to hearing loss were added based on the hypothesis that some of the HHI questions might not apply to our sample. While some of the original questions appear universal (such as those about family and interpersonal dynamics), the questions about the use of phones, television, radio, and the effects of hearing loss in the workplace imply universal access to technology and employment. This turned out to be variable – the questions pertaining to watching the television or listening to radio scored below average, but the question about using the phone less frequently than desired scored above average.

In general, HHI questions produced higher average scores compared to safety questions. This was to be expected –the HHI questions asked about situations that may occur daily, while feelings and experiences of being unsafe due to hearing loss are more likely to be intermittent, seldom, or not occur at all. This may be the case even when residing in or near an

active war zone. However, nearly every patient in the sample indicated hearing loss caused them to feel or be unsafe at some point in time.

Other Clinic Information

The clinic during which this study was conducted gathered the largest group of Karen people presenting for evaluation and treatment of hearing loss in the experience of the authors, as well as what has so far documented in the literature. As these clinics have historically been made aware to the patients by word-of-mouth, the number of patients who have presented in the past has been variable. However, the focus on providing audiologic screening and a higher availability of hearing aids at this particular clinic was emphasized more than previously, which is likely responsible for the larger group of patients.

Specific Impacts in Our Sample

The impact of hearing loss on the patients in this sample was clear to the authors, both in observing the results of the surveys and when talking with patients. The effects were particularly noticeable in pediatric patients. One male patient aged 11-years-old reported great difficulty in participating and succeeding in school. He reported embarrassment regarding his hearing loss and would occasionally not go to class out of frustration and the want to avoid embarrassment from his peers. Another female patient aged 14-years-old had not gone to school for 2 years for similar reasons. She had a life-long history of hearing loss and bilateral preauricular appendages. Her audiogram demonstrated a low-frequency hearing loss that sloped up to normal hearing at 8k Hz in both ears, confirmed with repeated testing. The presence of accessory auricular appendages is associated with a higher prevalence of permanent hearing impairment,[31] and it is likely that this patient's hearing loss would have been identified if she had been assessed with childhood audiologic screening.

Another issue with the lack of access to ear and audiologic care in this population is an inability to participate in further necessary workup of their conditions. The provision of hearing aids in a community with no access to such care should prove helpful; even over-the-counter hearing aids can provide benefits similar to audiologist-fitted devices.[26] Wireless auditory training might further improve hearing in this region.[27] The patient with accessory preauricular appendages and bilateral low-frequency hearing loss would have been referred to an audiologist for formal audiologic assessment, but she would not have been able to travel the necessary distance nor afford the appointment. Another patient presented with progressive unilateral sensorineural hearing loss and had apparent ipsilateral facial muscle weakness on exam. Weber and Rinne tests were consistent with ipsilateral > contralateral sensorineural hearing loss. This patient ideally should have also received evaluation with formal audiometry and an MRI to investigate the cerebellopontine angle for a tumor, most commonly vestibular schwannoma.[32] However, this patient identified multiple barriers to receiving healthcare (financial reasons, transportation/distance, and military conflict) and was not able to obtain these services.

One final unique finding discovered throughout the course of this clinic was the widespread use of chicken feathers in place of cotton swabs. This was first brought to light by one patient who presented for unilateral hearing loss. She was found to have a tympanic membrane (TM) perforation secondary to using a chicken feather to clean her ear. This prompted screening for chicken feather use in all subsequent patients, with every patient endorsing the use of chicken feathers to clean the ears. Some also described rotating the soft end of the feather inside the external ear canal to provide a relaxing sensation. The use of chicken feathers to clean the ears has only been documented in the literature once upon review of the PubMed and ScienceDirect databases, in relation to children with chronic suppurative otitis media.[33] Review of the literature was not able to find documentation of tympanic membrane perforation secondary to feather insertion into the external ear canal. While foreign body insertion is a well-known mechanism of tympanic membrane perforation, it was an interesting finding that was used for culturally sensitive counselling regarding avoidance versus safe use of chicken feathers in and around the ears. Further, if more of this population had access to receive this counselling, a number of TM perforations may be prevented.

Weaknesses and Limitations

Limitations of this study include the small sample size, likely due to a single-site in an active conflict setting. Regarding the screening questions in the survey, while alteration to the number of HHIA-derived questions was deemed necessary for efficient patient turnover, this may have had an effect on overall survey performance compared to the original. Questions focusing on safety issues were independently added to assess how hearing loss might affect persons in an active warzone but have not been validated. Results of those questions should be gathered from a control group of people with hearing loss that live in an environment free of military conflict, as it is likely that people with hearing loss may feel unsafe in situations outside of war.

Other limitations were the use of pure tone audiometry as opposed to more extensive testing to assess bone conduction and tympanography. In addition, the environment in which the screening was conducted was not perfectly controlled for noise pollution. There was no access to a noise-controlled room due to the nature of the architecture of the community in which the clinic was held and occasional disruption by inevitable motorized transport and livestock. While the level of noise pollution was acceptable for all completed tests, it would have been preferable to have access to a room in which background noise could be more minimized. It may also have contributed to the apparent difference in pure-tone averages between the left and right ears in most subjects. Finally, the audiogram errors from day 1 of the clinic unfortunately required the authors to discard much of the audiographic data, limiting the power of correlation analysis of pure-tone averages to survey scores.

Future Directions

One focus of constructing the questionnaire for this clinic was maintaining efficiency while adequately demonstrating the impact of hearing loss on participating patients. For future clinics, some alterations to the questionnaire will likely be implemented to improve on these goals. Shorter, validated versions of screening questionnaires derived from the HHIE and HHIA exist that are 18 and 10 questions long, which could be administered on page 1.[34] This way, the entirety of a validated survey could be incorporated with even more improved efficiency. Also, an aspect of the survey could be provided for patients to extrapolate on any identified feelings or experiences of unsafety. This would both provide patients with an opportunity to share their experience if desired, as well as the investigators to see if the safety issue was related to military conflict or other factors.

As mentioned above, it would be useful to administer the survey to a control group of patients presenting for initial evaluation of hearing loss. The performance of both the validated survey questions as well as those independently added to assess potential safety concerns could then be compared to a population in relative safety. Finally, a method of controlling for noise pollution in the rural mission field should be sought out, or the location of the clinic moved to a place that had greater potential for isolating audiographic assessment from background noise.

Conclusions

The burden of hearing loss in Burma is significant, especially for IDPs and ethnic minority groups like the Karen living in and around active war zones. The survey in this study was useful for assessing the perceived impact of hearing loss by affected Karen individuals and helped demonstrate the great need for audiologic care in a population with significant healthcare barriers. Future clinics in this setting should account for the difficulties of performing audiometric assessment in environments with the potential for noise pollution and aim to provide services as close to formal audiology as possible. Most importantly, efforts being made by local medical providers to care for patients with untreated hearing loss should continue to be supported in an effort to address its high prevalence in the area.

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Disclosure

Dr Robert W Arnold is a board member of PDI Check with patent reported, coordinator for Alaska Blind Child Discovery which has received discounted vision screening technology from several vendors, and he is an investigator and protocol developer for PEDIG during the conduct of the study. The authors report no other conflicts of interest in this work.

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