



Prevalence of Ear Diseases and its Determinants in Nepal: A National Base-Line Survey

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Abstract

Background: Ear diseases are one of the commonest but under-rated problem, especially in developing countries. Most of the ear diseases leading to hearing impairment and disability are preventable. Proper history, early diagnosis and prompt treatment are the key-factors in managing the burden of ear disease. In Nepal, despite efforts to encourage preventive ear care, there is a state of high prevalence of ear diseases and disability due to overcrowding, poverty and its social implications.

Purpose: In view higher burden of ear diseases, our study aim at determining the prevalence and its determinants in Nepal.

Materials and Methods: 17059 respondents were selected by using systematic random sampling technique from all seven provinces including all three geographical regions. The questionnaire was developed as per WHO guidelines. Data were uploaded using tablets and stored in an excel sheet and finally analyzed using SPSS application.

Results: Overall prevalence of ear disease was 18.8% mostly affecting the age groups of either adolescent or older people. Ear wax (42%) was most prevalent while OM (14.7%) was the commonest ear disease. CSOM was highly prevalent (7.8%) associated with discharging (33.2%) and non-discharging ears (66.8%). OE (4.3%) and ASOM (4.7%) were also prevalent diseases followed by Otomycosis (2.7%). FB ear (0.86%), Ear mass (0.66%) and others (0.06%) were included as minor ear diseases. Occupational and personal behavior along-with ear hygiene habits of the respondents had a direct correlation with ear diseases. History pertaining to allergy, rhinitis, asthma, vaccination and drug or noise exposure were found to be significantly related with ear diseases.

Conclusions: Our study reflected the national level prevalence of ear diseases and its determinants. With a ground reality of high prevalence of ear diseases among the Nepalese population, an urgent attention to address the problem has been a major public health concern.

Keywords: Prevalence; Ear Disease; Hearing Impairment; Otitis Media; Respondents

Abbreviations

OE: Otitis Externa; OM: Otitis Media; FB: Foreign Body; AOM: Acute Otitis Media; OME: Otitis Media With Effusion; CSOM: Chronic Suppurative Otitis Media; CSD: Curative Service Division; WHO: World Health Organization; GPS: Global Positioning Satellite; NHRC: Nepal Health Research Council

Introduction

Ear disease and deafness are one of the commonest sensory disabilities in Nepal [1]. Undiagnosed and neglected ear diseases are likely to cause hearing loss/deafness or disability. There is a state of high prevalence and disability related to hearing loss globally [2].

The main areas of the world affected by disabling hearing loss are the South Asian, Asia Pacific and Sub-Saharan African regions, with a prevalence rate almost four times that of the high income regions [3]. Considering the fact that, 50% of all the ear diseases leading to subsequent hearing impairment is preventable, Cochrane review on Otolaryngological global burden update enlists hearing loss and otitis media as one of the top prioritized projects globally [4,5].

Prevalence of Otolaryngological diseases is high among the pediatric age group [6]. In view of higher burden of hearing impairment (5.73%) among the school going children in Nepal, conductive hearing loss accounted to more than two-thirds (70.47%) of these cases [7]. Conductive loss can be due to ear wax, otomycosis, otitis externa (OE), otitis media (OM), foreign body (FB) ear, ear mass etc., which are all identifiable and amenable to treatment. Ear diseases can be diagnosed by taking proper history and otoscopy [8,9]. In Nepal, most of the ear diseases are related to poverty, poor access to medical services and inadequate prevention strategies [1].

OM is a leading cause of morbidity in preschool and school going children. Its sequelae and complications are important causes of preventable hearing loss, particularly in developing countries [10,11]. Ear infections associated with hearing disability can significantly delay a child's ability to acquire speech and language therefore creating a detrimental impact on a child's learning and education [12,13]. The etiology and pathogenesis of OM are multifactorial which include genetic, infection, allergy, environmental, social and racial factors and eustachian tube dysfunction [14]. Children from developing countries face unfavourable environments witnessing an extraordinarily high incidence of severe episodes of OM [14]. It is not a single pathology, but rather a spectrum of different conditions, including: acute otitis media (AOM); otitis media with effusion (OME) and chronic suppurative otitis media (CSOM) [10,13]. At least 50% children with CSOM will have significant hearing loss, a global burden of 164 million people, 90% of whom live in low resource countries, such as Nepal [12]. CSOM is a disease of poverty and its social determinants [12,15]. Low parental education and income, malnutrition, overcrowding, lack of clean water and sanitation are all associated with increased risk of CSOM [12]. It is an important cause of preventable hearing loss, particularly in the developing world [12].

Hence, preventable ear diseases are an important health concern among the children [8]. Till date, there are no national wide

level surveys related to ear disease. However, there are few published small-scale studies on the prevalence of ear disease in Nepal. In view of the prevailing scenario of ear diseases and its possible burden, this study was carried out to explore the baseline national level of prevalence of ear diseases and to identify its determinants which may help in formulating policies on prevention of ear diseases in Nepal.

Purpose

The general objective of the study is to determine the prevalence of ear diseases and its determinants in Nepal. The specific objectives of the study are as follows:

- To estimate the prevalence of ear diseases in Nepal.
- To identify the social determinants affecting ear diseases in Nepal.
- To define the causes of ear diseases leading to deafness in Nepal.

Materials and Methods

Study design included the descriptive cross-sectional survey design. The survey (March, 1, 2021) was conducted in 28 districts as provided by Curative Service Division (CSD) of Ministry of Health and Population (MoHP) covering all seven provinces and three geographical regions (Mountainous, Hilly and Terai) in order to get to the representative sample. The study included children (5 years and above), and general age population (below 75 years). The calculated sample size provided by the CSD was 17059. Systematic random sampling technique was applied in 2 stages. On the first stage, 28 districts from seven provinces of Nepal were selected. In second stage, one municipality and one rural municipality was selected in each district by using random table. 60/40 percent of sample size was taken from municipality and rural municipality, respectively. The questionnaire was developed as per guidelines of World Health Organization (WHO) on Ear and hearing disorders. Regarding the tool development and training of enumerators and field supervisors, they were provided few days of intensive training in survey ethics, interpersonal communication, interview techniques, ear examination/ diagnosis as well as collecting tablet based data. Pilot study was conducted in 170 college students by the supervisors and field researchers with a closed monitoring by an Ear Nose and Throat expert and team leader in one of the Kathmandu College. To ensure the quality of the study, a comprehensive field data collection guideline was developed which was followed by the enumerators and field supervisors. The data analyst was also assigned to overview the database during the field data col-

lection to provide real time feedback. The primary data was collected using structured questionnaires digitized in the Kobo Toolbox and uploaded in Android tablets. Mobile based data collection was adopted for quantitative data. The unique ID numbers were provided to each of the respondents and global positioning satellite (GPS) point was taken for truthfulness of the data and location. Data were stored in google drive and managed with microsoft data excel sheet. Finally, data sheet was analyzed by using the SPSS- 22 version.

The study was conducted after taking an approval from the ethical review board of Nepal Health Research Council (NHRC) and taking consent of respondents for ensuring their rights during the data collection.

Results

Socio-economic characteristics

In the survey, sex ratio was 1.008. Among the respondents, 49.3%, 48.3%, 2.3% and 0.1% were married, unmarried, widowed and divorced or separated, respectively. Ethnical distribution of respondents was Khas-Arya (36.7%), Janajati (31.4%), Madhesi (15.7%), Dalit (13.2%) and Muslim (3.0%). Religion wise, 95.3% were Hindu and rest were Muslim (3%), Buddhist (0.9%) and Christian (0.79%). 69.8% and 30% and 1.2% of the respondents belonged from nuclear, joint, and extended family, respectively. The top three income generating occupation of respondents were business (26.5%), agriculture (22.3%) and labour (20.6%) followed by public and private desk job (12.3%), foreign employment (11%), driving (1.1%), construction workers (0.9%) and tailoring (0.5%). Few respondents (0.2%) had small scale private job while 0.3% respondents were jobless. 12.9%, 11.6% and 10.2% of the respondents had habit of smoking, drinking, alcohol and chewing tobacco, respectively. Personnel habit of ear hygiene involved were washing ear and cleaning habits. 75.2 percent of the respondents revealed that ear care and cleaning was important for health. 66.6 percent used to wash their ear regularly during bath and 75.8% used to clean their ear with various instruments. Most popular ear cleaners were cotton bud (75.5%) and metallic ear scoop (Kankarno, 44.7%) while others used quail of chicken, birds (9.1%), matchsticks, keys etc.

Regarding the ear related history, 9.8 percent of the respondents was allergic to cold (62.9%), dust (70.5%), food (10.8%) and drugs (2.0%). 4.3 percent of the respondents had a positive family history of ear disease. 59.7 percent of them had been completely vac-

inated as per the national immunization schedule. 67% percent had ear problems in the form of pain (49.4%), discharge (21.4%) and hearing loss (19.6%); however, only 11.3% had sought for ear check up.

Prevalence of ear diseases

The overall national point prevalence of ear diseases was 18.78% with individual right (15.1%) and left ear (12.6%) burden. Topographically, distribution of ear disease prevalence was 20%, 19.5% and 13.3% observed in terai, hilly and mountain region, respectively. Ear disease burden in rural and urban municipalities were 19.6% and 18.3%, respectively.

Overall burden of ear diseases province wise was significantly high (>10%) while individual prevalence are shown below in table 1.

Table 1: Province wise distribution of ear disease.

Province	Prevalence (Overall)	Districts	Prevalence (Individual)
Koshi	15.75%	Panchthar	15.9%
		Morang	16.0%
		Sunsari	11.7%
		Udayapur	19.4%
Madhesh	24.1%	Bara	21.5%
		Sarlahi	20.5%
		Dhanusha	25.0%
		Saptari	29.4%
Bagmati	10.1%	Bhaktapur	10.7%
		Nuwakot	18.9%
		Dolakha	7.5%
		Chitwan	7.6%
Gandaki	24.2%	Dhading	5.8%
		Syanja	40.1%
		Kaski	20.6%
		Baglung	19.2%
Lumbini	23.18	Gorkha	16.9%
		Arghakhachi	17.9%
		Dang	24.8%
		Kapilvastu	24.7%
Karnali	15.8%	Rolpa	17.2%
		Bardia	31.3%
		Surkhet	8.6%

		Jajarkot	21.4%
		Dailekh	17.5%
Sudurpas- chhim	24.5%	Kanchanpur	18.5%
		Achham	29.6%
		Bajhang	25.4%

Sex wise prevalence was 19.2% in females and 18.4% in males. Regarding marital status, widowed respondents (36.9%) had the highest percent of ear disease followed by unmarried (19.5%) and married (17.3%) respondents. Among the ethnical groups, Muslim respondents (22.8%) had highest percent of ear disease, followed by Madhesi (21.3%), Dalit (21.2%), Khas-Arya (18.3%) and Janajati (16.7%). The religious burden of ear disease was highest among Muslim respondents (23%) followed by Buddhist's (20.3%), Hindu's (18.7%) and Christian's (15.7%). Respondents from extended, joint and nuclear family had 22.8%, 20.5% and 18.0% burden of ear diseases, respectively. Tailoring (33%) and construction workers (29%) suffer the highest burden of ear disease. The prevalence among other professions was miscellaneous workers (25.9%), seasonal labour migration (23.9%), unemployed (22.6%), driving (22.4%), foreign employment (20.4%), and agriculture (20.1%). The least prevalence of ear issues was found among respondents working in public or private sectors (15.5%) and business job holders (17.5%).

The prevalence of ear diseases among cigarette smokers, alcohol drinkers and tobacco chewers was 21.8%, 19.4% and 16.6%, respectively. Alcohol and tobacco use was not significantly related with ear disease load but smoking was directly associated with an increased the risk of ear disease (OR = 1.239. p = 0.000). Ear hygiene included ear care, cleaning and ear washing during bath. Ear cleaning was regularly followed by 19.2% respondents with various instruments like cotton bud, metallic scoop, quill, matchstick, keys etc. Ear washing habit (water splash) during bath was followed by 20% respondents. The OR was 1.105 and 1.270 for cleaning and washing habit, respectively. Those who had an allergic history (22%) were significantly associated with an increased risk of acquiring ear diseases by a factor of 1.24. Positive history of Asthma was highly evident in 34.3% of the respondents who were clearly at higher risk (OR = 2.33) of acquiring ear diseases. A positive history of rhinitis was found in 25.1% of respondents with an associated OR of 1.47. Prevalence among the intermittent rhinitis

Table 2: Age wise prevalence of ear disease.

Age (yr)	Overall	
	n	%
5-9	376	11.73
10-19	1016	31.70
20-29	379	11.83
30-39	356	11.1
40-49	318	9.92
50-59	301	9.39
60-75	459	14.32

(fewer than 4 days a week/ fewer than 4 week a year) and persistent rhinitis (more than 4 days a week/ more than 4 week a year) respondents was 24% and 30.6%, respectively (OR = 1.397).

Past history of ear problems was found in 41.2% respondents and treatment was sought by 40.8% of the respondents. A positive family history of ear issues was seen in 22.7% of the screened people. A positive history of noise exposure was evident among 34.5% respondents. Similarly, completion of primary vaccination was significantly associated with emergence of ear diseases (p = 0.000). Long term exposure to ototoxic drugs and noise was also found significantly associated with ear diseases (p = 0.000). 29.6% of the respondents had an exposure to intravenous ototoxic drugs as per the discharge card medications provided for infective diseases, major injuries and accidents.

In general, ear diseases had a statistically significant association (p < 0.000) with various factors and determinants such as provinces, geographical region, districts, age group, marital status, ethnical groups, type of family and income source of the family, smoking and history of ear cleaning, ear wash, allergy, rhinitis, asthma, ear problem, ear treatment, ear disease in family, major injuries/accidents with admission and history of exposure of long term noise.

Causes of ear disease

Ear diseases were categorized in 9 headings as ear wax, foreign body (FB), otitis externa, acute suppurative otitis media (ASOM), serous otitis media with effusion(OME), chronic suppurative otitis media (CSOM), Otomycosis (ear fungus) and ear mass and others.

Types of ear disease	Right Ear		Left Ear		Overall	
	n	%	n	%	n	%
Ear wax	6661	39	6513	38.2	7208	42.3
Foreign body (FB)	88	0.52	70	0.41	146	0.86
Otitis externa	594	3.5	418	2.5	730	4.3
Acute suppurative otitis media (ASOM)	689	4	542	3.2	801	4.7
Serous otitis media (OME)	297	1.7	259	1.5	384	2.3
Chronic suppurative otitis media (CSOM)	1017	53.95	868	46.04	1325	7.76
Wet ear (n = 471)	244	23.99	227	26.15	440	33.2
Dry ear (n = 1414)	773	76.01	641	73.84	885	66.8
Otomycosis (ear fungus)	345	2	269	1.6	467	2.7
Ear mass	65	0.38	56	0.33	113	0.66
Others*	6	0.04	9	0.05	10	0.06

Table 3: Pattern of distribution of ear diseases.

Total = 17059; * = trauma, vertigo, neurological deficit, congenital anomalies etc.

Discussion

Sex ratio in present study was 1.008 whereas in Thakur, *et al.* study in 2015 and 2016 reported ratio of 1.2 [16,17]. There was a bimodal (10-19 yrs and 60-75 yrs) peak pattern of distribution of overall ear disease in our study whereas it was predominantly commoner below 15 years children according to Thakur, *et al.* (36.09%) and Kumari, *et al.* (35.8%) study [6,18]. This implicated that the preventive as well as curative measures would be most effective if we could focus on both extreme of ages. In the present study, prevalence of ear diseases was slightly more in the rural places (19.6%) rather than urban areas (18.3%). In the present study among school going children, OME was found to be twice as high in rural places than urban areas which was in line with Humaid, *et al.* study (2014) [19]. On the contrary, Kumari, *et al.* and Thronton, *et al.* study had found that disease burden was higher in the urban slum areas rather than the rural places [20,21]. This may be attributed to socioeconomic differences, treatment accessibility and coverage area of the study. Our study showed that, there is a definitive rise of OM burden among the poor and backward casts staying in the deprived inaccessible places of Nepal. This evidence was also similarly supported in previous studies by WHO, Thronton, *et al.* and Clarke, *et al.* [12,15,22,23].

Allergies to cold, dust and food were common among the respondents accounting to 22% in our study. Hardani, *et al.* (2020),

Dhooge, *et al.* (2003) and Aydogan, *et al.* (2004) study stated that allergic rhinitis and food allergy are directly associated with OM, more specifically OME [24-26]. In our study, respondents with history of allergy and rhinitis were significantly linked (p = 0.000) with OM with a OR of 1.24 and 1.47, respectively. Our study showed that there was a significant association of smoking with OM (P = 0.000) (OR = 1.239) which was similarly evident in Jones, *et al.* study claiming that smoking was associated with an increased risk of middle ear disease in children [27].

In 2011, Thronton, *et al.* study found that ethnicity, age, gender and geographical region was not associated as a risk factor for ear disease [23]. In contrast to Thronton, *et al.* study, present study revealed that ethnicity, age and geography were quite significantly (p = 0.000) related however, gender wise association of ear diseases was not evident (p = 0.143). In our study, religion wise Muslim population were the worst affected (23.0%) with ear disease, followed by the Buddhists (20.3%). Muslim (22.8%), Madhesi (21.3%) and Dalits (21.2%) were the most affected ethnic communities with ear diseases in Nepal. Our study showed that ethnicity and racism were significantly associated (p = 0.000) with the burden of ear disease, however, it was not the case with Thronton, *et al.* study (2011) [23]. This may be attributed to religious norms and ethnic differences in their culture and life style leading to overcrowding and unhygienic behavior favouring ear problems.

Three fourth's of our respondents admitted that ear cleaning was necessary to maintain hygienic ear practice which was similarly supported by Khan., *et al.* (2017) study [28]. Another study by Olajide., *et al.* (2019) reported that more than two thirds (68%) of respondents had the habit of ear cleaning [29]. This clearly indicated that a predominant population was engaged in unhygienic ear cleaning habits which could lead to an increased risk of acquiring ear diseases. In our study, self ear cleaners had a significant association ($p = 0.000$) to OE which was in line with the reports of Khan., *et al.* study [28]. This may be attributed to regular cleaning and micro trauma of ear canal leading to OE. As per Adhikari., *et al.* study in 2007, around two thirds (65%) reported using unhygienic and risky materials to clean their ears [30]. More than three fourths (75%) of our respondents used various unsafe methods (e.g. cotton buds, quail, metallic scoop, wood, match sticks, key etc.,) to clean ears which clearly indicated on the potential risk of having ear disease. Cotton buds were the most popular means of ear cleaning in our community followed by metallic scoop and feathers. Three fourths of our respondents used cotton buds whereas nearly half of the children used it for cleaning purpose according to Olajide., *et al.* study; (2019) [29].

Regarding the treatment seeking behavior, 52.4% responders with ear diseases did not seek for or receive any sort of treatment. 10.3% of the children with CSOM also were untreated. Among the treated ones, more than half were seen by the local paramedics and not doctors.

In Nepal, there are no studies till now conducted to establish nation-wide burden of ear diseases. However, there are published limited studies dealing with pattern of ear diseases conducted in a small scale like camps and hospitals [6,8,9,16,17,30-33]. Most of the these studies were conducted in small coverage areas of the Eastern, Central and Western region of Nepal [6,8,9,16,17,30-33]. In this respect, our study stands as a pioneer and comprehensive cross-sectional study done so far representing all provinces and geographical regions.

In our national survey of 17,059 respondents, the overall burden of ear diseases was 18.8%. All other studies conducted in Nepal reported a higher prevalence range (33-82%) as compared to ours [6,8,9,16,17,30-33]. The lowest burden (33%) was reported among the 1050 children (5 to 15yrs) by Maharjhan., *et al.* study in 2006 [14]. Thakur., *et al.* reported 36.09%, 49.5% and 48.42% multiple prevalence of ear diseases in three consecutive years (2017,

2016 and 2015) respectively, among the screened children in Eastern Nepal [6,16,17]. Adhikari., *et al.* reported a higher prevalence of 81.6% and 75.7% ear disease among the school children in 2009 and 2008; respectively [8,9]. Sigdel., *et al.* study (2012) covering the mid-western region stated the disease prevalence of 57.8% in the pediatric age group [32]. All these Nepalese showing a varied distribution of ear disease pattern could be due to incomplete, small scale coverage of the screening population [6,8,9,16,17,30-33].

The prevalence of ear wax was 42.3% in our study. Right and left ear wax prevalence was 39% and 38.2%, respectively. Several studies done in Nepal showed a varied range (24.39% - 62%) of wax prevalence [6,8,9,16,17]. Thakur., *et al.* study reported a varying trend of wax burden accounting to 29.15%, 24.39% and 45.76% in three consecutive years (2015, 2016 and 2017), respectively [6,16,17]. However, Adhikari., *et al.* had reported a much higher prevalence (60.6% and 62.0%) of ear wax, in 2008 and 2009, respectively among the school children [8,9]. Another study by Sigdel., *et al.* in Western Nepal reported a prevalence of 33.4% among the pediatric age group (2012) [32]. This showed that the prevalence of ear wax is much more common and widespread in our community.

Otomycosis or fungal infection of ear is another common entity. Its prevalence in our study was 2.7%. While Rijal., *et al.* study (2011) reported a low burden (1.7%) of fungal infection, majority of other studies reported a higher prevalence rates of 24.39%, 11.51% and 4.7% by Thakur., *et al.* and Sigdel., *et al.* respectively, in 2016, 2017 and 2012 [6,16,31]. Foreign Body (FB) ear prevalence accounted to around 0.86% in our study. The nature of FB noted in ear canal were dry mud, piece of paper, small stone, colours, rice or wheat grain, dead insect, wood chunks, etc. The lowest burden (0.15%) was reported by Thakur., *et al.* study in 2017 [6]. Sigdel., *et al.* (2012) and Rijal., *et al.* (2011) reported a higher burden with same prevalence (2.3%) of FB in the ears [31,32].

The prevalence of OE (4.3%) in our study was comparable to a study by Thakur., *et al.* (4.20%) conducted in 2015 [17]. In 2017, Thakur., *et al.* study had again reported a lower prevalence (1.19%); however, the highest burden (8.6%) was seen in Sigdel., *et al.* study in 2012 [6,32].

Otitis Media (OM) is subdivided into several sub-categories: Acute otitis media (AOM), Recurrent AOM, OM with effusion (OME)

and Chronic Suppurative OM (CSOM) [10]. AOM usually resolves with medications or can lead to OME, after an episode of upper respiratory tract infection. OME usually sets up with the background of improper middle ear ventilation, while CSOM requires at least 3 weeks of on-going middle ear inflammation with or without perforation [10,22,34]. There are a lot of several other factors associated with OM [12].

The prevalence of OM is widely distributed worldwide. In children (<6 yrs) from different developing countries, the burden was found to be 9.2% in Nigeria, 10% in Egypt, 6.7% in China, 9.2% in India, 9.1% in Iran and 5.1–7.8% in Russia [10]. The point prevalence of OM in our study was 14.76% which was higher than a study by Maharjhan, *et al.* (13.2%) [14]. In 2015, Thakur, *et al.* study found a higher prevalence (17.3%) to that of our study 17 In Nepal, there are ample studies on OM prevalence showing a widely distributed range (10.3% to 16%) [6,8,9,14,16,17,30-36]. In the present study, age-wise prevalence of ear diseases followed a bimodal distribution pattern (10-19 yrs and 60-75 yrs). However, a decrescendo pattern, with the highest burden in less than 10 year group was observed by Basnet, *et al.* and Maharjan, *et al.* study in 2017 and 2006 respectively [14,36].

ASOM prevalence in our study was 4.7%. In 2015, Thakur, *et al.* study showed a less prevalent (2.9%) rate however, various other studies by Rijal, *et al.* (2011), Sigdel, *et al.* (2012) and Thakur, *et al.* (2017) reported a higher burden rates of 24.3%, 13% and 8.84%, respectively [6,16,31,32]. The high burden rates may be due to small scale coverage focusing mainly on school going children of Nepal. SOM usually result from either unresolved AOM or eustachian tube dysfunction. SOM prevalence in our study was 2.3% which was similar to a study by Thakur, *et al.* (2.19%) in 2015 [17]. Other studies by Adhikari, *et al.* (2009), Thakur, *et al.* (2017) and Sigdel, *et al.* (2012) stated a higher prevalence rates of 4.7%, 6.84% and 9.4%, respectively [6,9,32]. This may be due to focused attention mostly on school children residing in certain districts (Eastern, Central or Western) of Nepal.

Chronic suppurative otitis media (CSOM) is, a chronic inflammation of the middle ear cleft, with recurrent ear discharge or otorrhoea through a tympanic perforation [12]. Over 90% of the burden is borne by countries in the South-east Asia and Western pacific regions, Africa, and several ethnic minorities in the Pacific rim [12]. Countries were categorized as low (1-2%) and high (3-

6%) burden of CSOM according to the prevalence rates, while some racial groups had the highest CSOM rates [12,22].

CSOM burden in our study was 7.8%, labeled as a high according to WHO standards [37]. Various studies by Adhikari, *et al.* found higher burden rates of 5.4%, 5.7% and 7.6% in 2007 and 2008 [8,30,33]. Similarly, increasing trends on CSOM prevalence with 17.7% and 24.3% was showed by Rijal, *et al.* and Sigdel, *et al.* respectively, in 2011 and 2012. However, the latest study (2017) by Thakur, *et al.* showed a comparable result of 8.18% to our study [6]. As per WHO, prevalence rate of CSOM greater than 4% in a defined population is indicative of a massive public health problem [37]. With the evidence of all Nepalese studies exceeding the WHO standard level of prevalence, an alarming high burden of CSOM was evident in our community requiring an urgent attention. Wet and dry types of CSOM in our study was 33.2% and 66.8%. The active and inactive cases of CSOM was 38.6% and 61.4% according to a study by P. Adhikari in 2008 [33]. However, another study by Adhikari, *et al.* had reported a lesser prevalence (24.1%) of active ear disease among the school children in 2007 [30]. This contrasting results of higher prevalence of wet/dry CSOM found can be attributed to the small scale and incomplete coverage of all age.

Ear mass and others disease (e.g., trauma, vertigo, neurological deficit, congenital anomaly etc.) were least prevalent (0.66 and 0.06%) group in our study. Thakur, *et al.* study in 2015 and 2017 had reported less than 1% prevalence of perichondritis, trauma, sensineuronal hearing loss, microtia and preauricular sinus [6,17]. It was evident that, ear diseases having low prevalence did not impose a burden or threat to our community.

Conclusions

In Nepal, there are no studies till now establishing the nationwide burden of ear diseases and its determinants; however, there are few small-scale studies conducted on the prevalence of ear disease. The high burden rates reflected in these studies may be due to small sample size, incomplete area coverage and focusing bias, mainly on school going children of Nepal. Our survey stands as the first nation-wide comprehensive effort in estimating the true scenario of ear diseases. Considering the present context of a predominantly high level of prevalence of ear diseases among the Nepalese population, WHO and Ministry of Health and Population (MoHP) warrants an urgent attention to address the ear related health issues.

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Conflict of Interest

There is no conflict of interest between the authors.

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