

Hearing and Balance Survey in Thai Elders

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ABSTRACT

Objective: To survey hearing and balance problems of a sampling group of Thai elders in the central region of Thailand.

Methods: A population study was people aged 60 and over who agreed to join the survey at the 14 elderly social associations. The questionnaires were used as a self-report for hearing and balance problems. After ears examination by ENT specialists, the participants underwent air-conduction audiometry for hearing screening.

Results: 828 participants 259 (31.3%) males and 569 (68.7%) females, age ranged from 60 to 97 (median=68, mean \pm SD = 69.65 \pm 6.89 years), had completed screening program for hearing and balance problems using both questionnaires and examinations. There was a statistically significant correlation between self-report hearing loss and severe or profound hearing loss in both ears ($P < 0.05$). All age groups reported dizziness and vertigo but the elderly over 75 years reported more falls with a statistical significance ($P = 0.021$). The elderly who did not report dizziness or vertigo had a 1.1-1.6 times higher fall histories than those who reported ($P < 0.001$). The participants who had hypertension and dyslipidemia reported more falls with statistical significances ($P = 0.025$ and 0.036 respectively).

Conclusion: Our hearing and balance questionnaires may be used as a tool for screening at a primary care for the elderly > 70 years old especially in those with underlying diseases. Hearing and balance screening will provide early detection and primary intervention to minimize the negative impact in the elderly's daily life.

Keywords: Balance; hearing loss; falls; elderly; ear pathology; aging; screening (Siriraj Med J 2019;71: 131-142)

INTRODUCTION

Definition of older or elderly persons varies depending on definition among countries or organizations. Gorman M.¹ defined 'old' as 'the aging process is biological reality which has its own dynamic, largely beyond human control. However, it is also subject to the constructions by which each society makes sense of old age.' In the developed country, age of retirement is about 60 to 65 years old, nevertheless, the United Nations (UN) agreed age over 60 years to be the older population.² Age of retirement in Thailand depends on organization in which private employees average about 55 and government officers are about 60 years old.³ Thai elderly are defined according to Elderly Act, Article 3 and the Department of Older

Persons, which was 60 years old and over. In 2015, UN reported 12% of the global population aged 60 and over was expected to rise to be a quarter of the global population by 2050.⁴ Asia contains about 56% of the global elderly population.⁵ Help Age international global network reported elderly population in Thailand in 2012 was about 13.7% of population and was expected to reach 31.8% in 2050.⁶

Hearing loss in elderly was called 'presbycusis' (or age-related hearing loss), which literally means 'hearing in the older age'.⁷ According to WHO classification, hearing impairment was classified into normal (0-25 dB), mild (26-40 dB), moderate (41-60 dB), severe (61-80dB) and profound (>80 dB) hearing loss.⁸ Hearing disability in

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Received 21 September 2017 Revised 25 May 2018 Accepted 30 June 2018

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<http://dx.doi.org/10.33192/Smj.2019.21>

Thailand was defined as pure tone average at 0.5,1,2 KHz \geq 40 dB on the better ear. Overall prevalence of presbycusis in the United states, was defined as hearing loss $>$ 25 dB which was about 23% at age range between 65-75 years and 40% of people over 75 years old.⁹ Otological center, Bangkok Unit (1991)¹⁰ reported hearing loss 40.4% of Thai elderly at age more than 60 years. Bunnag C. (2002)¹¹ reported 52% hearing loss in Thai elders. Hearing loss can affect elderly daily life especially communication and socialization.

Dizziness and vertigo are the common complaints in the elderly. Falls are common causes of injuries among elderly and led to many serious consequences in older people. Elderly over 65 years of age have risk around one-third of older people living in the community of falling at least once per year.¹² One in ten of Thai elderly experienced falls accidentally both inside and outside their home.⁵ Falls prevention by early detection and intervention will decrease serious injuries.

The Otological Center, Bangkok Unit (OCBU) was the first International Federation of Otorhino-laryngology Society and International Society of Audiology (IFOS/ISA) recognized center for prevention of hearing impairment and deafness. The mission of OCBU is 'better hearing and balance for all'. As mentioned above, elderly is a major healthcare problems, so screening of hearing and balance problems in terms of ENT specialist are primary community preventive intervention for hearing loss and falls. After retirement, the elderly in Thailand usually join the elderly social association nearby their houses. These gatherings create proper activities for their own sake, group and community as well as the health promotion to both update proper knowledge and activities such as group exercise at the associations, so we surveyed hearing and balance problems to find out their hearing and balance problems that could be treated and rehabilitated to prevent disability that might happen.

Objective: to survey hearing and balance problems of sampling group of elderly in the central region of Thailand.

Outcome measurement

Prevalence of ear pathology, hearing and balance problems in older population in the central region of Thailand.

Setting

Fourteen elderly social associations in Samutsakorn province as a sampling group for central region of Thailand, which is around 100 kilometers far from Siriraj Hospital.

MATERIALS AND METHODS

The study was approved by the Institutional Review Board and Ethical Committee of Faculty of Medicine Siriraj Hospital (Si 463/2014).

Population study

The population study were people age 60 and over who agreed to join the survey at elderly social associations in Samutsakorn province. The entire sampling population was conducted at 14 elderly social associations: Tung Kralok, Kanchana, Rong Khae, Wat Rang Nin Pradit, Yok Krabud, Lak Sam, Am Phang, Don Sakae, Lak Song, Nong Song Hong, Prathumthong Pattana, Khong Tan, Kaset Pattana, and Jet Rew.

Exclusion criteria

Elderly who did not agree to join survey.

Methods

The representatives of the elderly social society announced the 'screening days for hearing and balance'. The study was conducted during January to December, 2014. All volunteers had to finish questionnaires as a self-report for hearing and balance problems designed by OCBU for elderly survey in 2002.¹¹ There were 16 questions, which were occupation, underlying diseases, hearing, ear and balance problems. After ear examination by ENT specialists, they underwent air-conduction audiometry for hearing screening. The specialists filled the ear examination and audiological testing forms (Appendix).

Trained audiometricians performed air conduction hearing thresholds measuring both ears in a silent room which ambient noise less than 50 dBA¹³ with a portable audiometer and headphone.

After ear, hearing and balance screening, participants with ear, hearing or balance problems received the referral forms to access the direct channel to the ENT clinics in the hospital affiliations.

Statistical analysis

We used IBM® SPSS Version 20 to analyze data. Descriptive statistic was used for characteristics of patients, pathological ear findings, hearing and balance problems. Self-report hearing, degree of hearing loss, hearing disability and falls were analyzed using Pearson Chi square test. Continuous data more than 2 groups was analyzed by Krusal-Wallis test. $P < 0.05$ was considered as statistical significance.

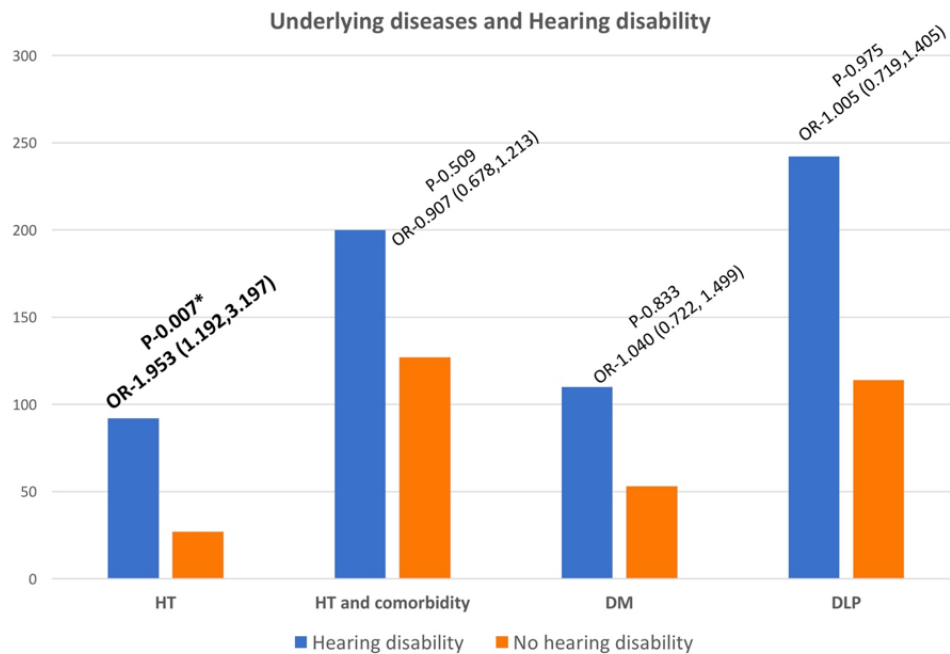


Fig 1. Underlying diseases and hearing disability

RESULTS

There were 1,560 out of 5,888 members (26.5%) of 14 elderly social associations who participated in service survey. The hearing and balance screening questions as well as examination were completed in 828 members. Demographic information showed 259 males (31.3%) and 569 females (68.7%); with age range 60 - 97 (median: 68, mean \pm SD: 69.65 \pm 6.89) years old. Past occupation was divided into not working and working in noisy area at least 20 years. Elderly who did not work in noisy areas were 9 (1.08%) as office workers, 19 (2.29%) as house workers and 800 (96.9%) as others (e.g. freelancers, businessmen, farmers) and those who worked in noisy areas were 9 noisy area workers (1%), and 1 soldier (0.1%). Two hundred and eighty (33.8%) participants had underlying chronic diseases, which were 118 (14.3%) hypertension (HT), 314 (37.9%) HT and other comorbid diseases (diabetes mellitus; DM, dyslipidemia; DLP, chronic renal failure; CRF), 19 (2.3%) DM, 72 (8.7%) DLP, and 5 (0.6%) other diseases.

Questionnaires about ear and hearing problems demonstrated that elderly had three common complaints which were ear itching, hearing loss and tinnitus; 449 (54.2%), 278 (33.6%) and 158 (19.1%), respectively. They had reported balance problems, which were vertigo 299 (36.1%), dizziness 89 (10.7%) and fall 59 (7.1%), [Table 1](#).

Pathological findings were 133 (16.1%) earwax impaction, 19 (2.3%) otitis externa, 18 (2.2%) ear drum perforation, 12 (1.4%) ear drum bulging, 8 (1%) foreign body in the ear, 4 (0.5%) auricular malformations ([Table 1](#)).

Elderly had 159 (19.2%) unilateral and 442 (53.4%) bilateral hearing loss. This study classified elderly people into three age ranges for hearing problems, which were 60-70, 71-80 and >80 years. PTA of better hearing were (Mean \pm SD) 31.44 \pm 11.6, 36.52 \pm 12.91 and 41.83 \pm 11.37 dBHL, respectively, [Table 2](#). There were statistically significant differences in each age group as age increased ($P < 0.001$). Hearing disability found 293 (58.5%), 208 (41.5%), and 652 (15.1%) in 60 -70, 71- 80 and > 80 years, respectively. There were statistical significances in PTA and hearing disability in each age group ($P < 0.001$) ([Table 2](#)). Hypertension (N-92, 34.1%) showed a statistical significance ($P=0.007$, OR-1.953 (1.192, 3.197)) in hearing disability group, but not in DM, DLP and HT with other comorbidities, [Fig 1](#). Self-report hearing problems showed statistical significance to severe and profound hearing loss in both ears ($P < 0.05$) ([Table 3](#)). Elderly reported balance problems 131 (15.8%), 128 (15.5%), 91 (10.9%) and 74 (8.9%) in age group of 60-65, 66-70, 71-75 and > 75 years, respectively. There was no statistical significance in each group except falls in age group of > 75 years ($P= 0.021$) ([Table 4](#)). Fifty-nine fallers did not have history of vertigo nor dizziness with statistical significance ($P < 0.001$). Fallers had underlying diseases, which were 5 (8.5%) DM, 6 (27.3%) HT, 26 (61.9%) HT with comorbidity and 34 (57.6%) DLP ([Table 5](#)). There were statistical significances in underlying diseases between fallers and non-fallers in DM and DLP ($P= 0.025$ and 0.036).

TABLE 1. Questionnaires on hearing and balance problems.

Questions	Number (%) (N=828)
Family History of hearing loss	90 (10.9%)
Ever exposure to noise	453 (54.7%)
Duration of exposure (years)	
Often got cold	211 (25.4%)
Ear and hearing problems	
Ear itching	449 (54.2%)
Self-report Hearing loss	278 (33.6%)
Duration of hearing loss (years) (Mean±SD)	0.36 ± 2.86
Tinnitus	158 (19.1%)
Otagia	92 (11.1%)
Otorrhea	35 (4.2%)
Ear trauma	20 (2.4%)
Ear surgery	1 (0.1%)
Balance problems	
Vertigo	299 (36.1%)
Dizziness	89 (10.7%)
Fall	59 (7.1%)
Ear pathology	
Earwax impaction	133 (16.1%)
Otitis externa	19 (2.3%)
Ear drum perforation	18 (2.2%)
Foreign body	8 (1%)
Ear drum bulging	12 (1.4%)
Auricle malformation	4 (0.5%)

DISCUSSION

This study recruited participants from age of 60 years who met the criteria. There were 828 out of 1560 (53.08%) elderly who participated the hearing and balance screening. From demographic data women attended screening test about 2 times than men (female: male-569:259), which meant that female elderly are more likely to be member of elderly social association and took care of their health more than men. Report of Thai elderly showed women had life expectancy longer than men^{5,14} (mean age; female-79 and male-72 years), which were elderly sex ratio of 80 males for every 100 females.

The most common ear and hearing problems from questionnaires was ear itching (54.2%), which might be caused by local or systemic diseases. The most common pathological otologic finding was earwax impaction (133 out of 828; 16.1%) which may associate with hearing loss, tinnitus, itching, otalgia, discharge or dermatologic diseases.¹⁵ Our report showed earwax impaction about 16.1%, which was the same as previous reports (19 to 65% of patients over 65 years old).^{11,15}

This study classified participants into 3 groups (60-70, 70-80, > 80 years) to clarify hearing problems in each decade of life. It can be seen that PTA increased as

TABLE 2. Pure tone average and hearing disability in each age group.

Age (years)	Right (dBHL)		Left (dBHL)		Hearing disability (Better ear \geq 40 dB)	OR
	Mean	SD	Mean	SD		
60 - 70	31.44	11.6	32.16	12.33	293 (58.5%)	1
71 - 80	36.52	12.91	37.03	14.15	208 (41.5%)	2.18 (1.57, 3.03) P < 0.001*
> 80	41.83	11.37	45.04	16.45	52 (15.1%)	6 (2.53, 14.24) P < 0.001*
P value	< 0.001*		< 0.001*			
Overall	33.2	12.33	34.1	13.71		
Min	0		10			
Max	85		100			
Median	32.25		32.5			
Mean (SD)	33.85 (12.45)		34.67 (13.74)			

Median ambient noise (dBA) 48.8 dB, *statistical significance $P < 0.05$, Kruskal-Wallis test, Chi-square test

TABLE 3. Self-report and degree of hearing loss.

Degree of hearing loss (dB)	Self-report hearing loss		Crude OR (95%CI)	P-value
	No	Yes		
Right ear				
Normal	153 (27.8%)	73 (26.3%)	1	
Mild (26-40)	276 (50.2%)	118 (42.4%)	0.896 (0.63,1.28)	0.542
Moderate (41-60)	111 (20.2%)	71 (25.5%)	1.341 (0.89,2.02)	0.159
Severe (61-80)	0 (0%)	3 (1.1%)	2.73 (1.14,6.5)	0.002*
Profound (>80)	0 (0%)	3 (1%)	0.32 (0.27,0.39)	0.013*
Left ear				
Normal	146 (26.5%)	66 (23.7%)	1	
Mild (26-40)	270 (49.1%)	123 (44.2%)	1.00 (0.70,1.45)	0.967
Moderate (41-50)	113 (20.5%)	65 (23.4%)	1.27 (0.84,1.94)	0.262
Severe (61-80)	20 (3.6%)	20 (7.2%)	2.21 (1.12,4.39)	0.021*
Profound (>80)	1 (0.2%)	4 (1.4%)	8.85 (0.97,80.7)	0.021*

*Statistical significance $P < 0.05$, Pearson Chi-square test, Fisher's exact for cell < 5

TABLE 4. Age and balance problems.

Age (years)	Balance problems			Total (424 out of 828)
	Dizziness	Vertigo	Falls	
60 - 65	29 (22.1%) OR-1	88 (67.2%) OR-1	14 (10.7%) OR-1	131 (15.8%)
66-70	17 (13.3%) OR-1.856 (0.963, 3.578) P - 0.18	91 (71.1%) OR-0.832 (0.496,1.411) P - 0.496	20 (15.6%) OR-1.044 (0.993, 1,097) P - 0.083	128 (15.5%)
71-75	25 (27.5%) OR - 0.751 (0.405,1.393) P - 0.362	60 (65.9%) OR - 1.057 (0.611, 1.863) P - 0.487	6 (6.6%) OR-1.359 (0.512, 3.610) P- 0.573	91 (10.9%)
> 75	18 (24.3%) OR - 1.248 (0.647, 2.408) P - 0.509	37 (50%) OR - 1.262 (0.729, 2.184) P - 0.405	19 (25.7%) R - 0.438 (0.213, 0.898) P-0.021*	74 (8.9%)

*Statistical significance $P < 0.05$, Pearson Chi-square test

age increased with statistical significances in this study. Elderly in age group of 71-80 and > 80 years had hearing disabilities about 2 (OR - 2.18, $P < 0.001$) and 6 (OR 6, $P < 0.001$) times more or less than those in age group of 60 -70 years, Table 2. The most common underlying disease in this study was HT, which was related to hearing disability about 1.9 times (OR- 1.192, 3.197) more or less than others. Common severity of hearing loss in study population was mild (~40-50%) and moderate (~25%) by the audiometric evaluation, Table 3. Nevertheless, old people reported their hearing loss when the severity of hearing loss became severe or profound more or less than those who had no hearing loss, Table 3 (Crude OR ~2-8, $P < 0.05$ both ears). Elderly in Thailand seem likely to refuse hearing aids when they had hearing problems. They believed it was the stigmata of the handicapped and dependent elderly, so their guardians would bring them when they had difficulties in communication with them. Although Thai government have offered free hearing

aids to whom register for the handicapped certification, some get it, but do not use it.

Balance disorders: dizziness and vertigo; were found to be common complaints in all age groups, but more common in elderly.¹⁶ More than one third of adults over 65 years old had reported falls secondary to dizziness and vertigo each year according to the Center of Disease Control and Prevention.¹⁷ Thailand has become an aging society, so Thai government has planned to extend the retired age from 60 to 65 years old. This study tried to clarify the age-related balance problems which would disturb their daily activities and work life. From the reason above, this study classified 5 years for each age group. Although there were no statistical differences in report of dizziness and vertigo in all age groups, the elderly age group of > 75 years old had reported falls more than other age groups with a statistical significance ($P = 0.021$). An international consensus statement defined a fall as “an unexpected event in which the participant

TABLE 5. History of vertigo or dizziness correlated with falls.

History	Number (%)		Crude OR (95% CI)	P-value
	Fallers	Non-fallers		
Vertigo				
Yes	0 (0%)	299 (77.1%)		
No	59 (38.9%)	89 (22.9%)	1.663 (1.458,1.896)	<0.001*
Dizziness				
Yes	0 (0%)	89 (22.9%)		
No	59 (100%)	299 (77.1%)	1.197 (1.143,1.254)	<0.001*
Underlying diseases				
Diabetes	5 (8.5%)	158 (20.5%)	0.358 (0.141, 0.910)	0.025*
Dyslipidemia	34 (57.6%)	335 (43.6%)	1.762 (1.031,0.010)	0.036*
Hypertension	6 (27.3%)	113 (30%)	0.876 (0.334,2.297)	0.788
Hypertension with co-morbidity (DM, DLP, CRF)	26 (61.9%)	288 (52.2%)	1.49 (0.782,2.838)	0.223

Abbreviations: DM = diabetes mellitus, DLP = dyslipidemia, CRF = chronic renal failure

*Statistical significance $P < 0.05$, Pearson Chi-square test

comes to rest on the ground, floor or lower level".¹⁸ Those who reported dizziness and vertigo in this study were not the fallers comparing to those who did not report with a statistical significance (OR – 1.2-1.6, $P < 0.001$). This meant participants who did not have symptoms of dizziness nor vertigo, might not concern about falling problems. Prior studies found a marked reduction of hair cell counts within the cristae of semicircular canals as early as 50-60 years of age and a significant reduction of vestibular ganglion cells as early as 60 years of age.¹⁷ Thus, the deterioration of peripheral vestibular functions and central compensation can no longer be compensated at some critical points.¹⁹ The rate of falls in the well-defined general older population is about 10.4-18.7% in Thailand.²⁰ Prasansuk S, et al., and Downton J.,^{16,21} reported percentage of falling in the elderly each year about 28-35%, 35% and 32-42% in 65+, 70+ and 75+ years. Our study elderly reported falls 10.7%, 15.6%, 6.6% and 25.7% at age of 60-65, 66-70, 71-75 and >75 years,

respectively. The percentage of our study was about half of the previous studies, because of the less number of study population. Nevertheless, the peak incidence of falls in our study was over 75 years (25.7%), which was nearly the same as previous reports.²¹

Dizziness, vertigo and falls may be secondary to comorbid conditions other than aging. Comorbid conditions (Intrinsic factors) that we considered in this study were underlying diseases, which showed statistical significances in DM and DLP between fallers and non-fallers. Nicholson M, et al., and Walley M, et al.,^{22,23} showed the deficits of vestibulo-ocular reflex and proprioceptive loss in diabetic patients which caused the high percentage of fall in these patients. Dyslipidemia could lead to atherosclerosis. Prior study reported the small vascular diseases related to brain changes impacted on gait and speed in healthy elderly.^{16,24} The extrinsic factors was environmental area of their dwellings that was not a part of our study. Many interventions have

been proposed to prevent falls which are exercise which was found to be a benefit of performance of head and neck exercise as Prasansuk S, et al., reported¹⁶, medication (both supplement and treatment), surgery for correction (e.g. cataract extraction), fluid/nutrition supplement, psychological support, environment/assistive technology and knowledge/ educational interventions.¹⁸ However, there are many factors that cause balance problems individually. Old Thai people usually spend their retired life at home with their families, who take care of them. Thus, family may be the one who notice their problems as well as providing environmental area for primary prevention of falls.

CONCLUSION

Hearing and balance problems unusually cause negative impact effects in elderly daily's life. Hearing rehabilitations will resolve their communications, social and psychological problems. Prevention of falls include individual and environmental adjustments, and decreasing the complications of chronic diseases in older people. Our hearing and balance questionnaires may be used as a tool for screening at a primary care for an elderly > 70 year especially in those with underlying diseases. The primary care and elderly social associations should be alerted by giving them education about hearing and balance problems. This study supports the information to the health policy decision for elderly in central region, and all of Thailand which is growing to become an aging society in the near future.

ACKNOWLEDGMENTS

This study was conducted as part of strengthening networking of the Otological Center: Bangkok Unit. We thanks all of our residents who graduated in, 2014.

Conflicts of interest: The authors have no conflicts of interest and did not receive any funding from profited funders.

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Appendix

Hearing and Balance Questionnaires

Otolological Center: Bangkok Unit, Faculty of Medicine Siriraj Hospital, Mahidol University

Record NO.....

Sex.....

Date.....

-
1. Occupations: work at least 20 years

<input type="checkbox"/> Office worker.....years	<input type="checkbox"/> Noisy area worker e.g. Factoryyears
<input type="checkbox"/> Policeman.....years	<input type="checkbox"/> Solider.....years
<input type="checkbox"/> House worker.....years	<input type="checkbox"/> Others.....
 2. Do you have hearing loss?

2.1 Right	<input type="checkbox"/> No	<input type="checkbox"/> Yes.....years
2.2 Left	<input type="checkbox"/> No	<input type="checkbox"/> Yes..... years
2.3 Hearing loss in family history	<input type="checkbox"/> No	<input type="checkbox"/> Yes
 3. Have you ever expose to loud noise?

<input type="checkbox"/> No	<input type="checkbox"/> Yes
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 4. Noise in ears (tinnitus)

Right	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Left	<input type="checkbox"/> No	<input type="checkbox"/> Yes
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 5. Otagia

Right	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Left	<input type="checkbox"/> No	<input type="checkbox"/> Yes
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 6. Ear discharge

Right	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Left	<input type="checkbox"/> No	<input type="checkbox"/> Yes
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 7. Previous ear surgery

Right	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Left	<input type="checkbox"/> No	<input type="checkbox"/> Yes
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 8. Ear itching

Right	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Left	<input type="checkbox"/> No	<input type="checkbox"/> Yes
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 9. Ear trauma e.g. severe head trauma, beating or slapping at ears

Right	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Left	<input type="checkbox"/> No	<input type="checkbox"/> Yes
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 10. Ototoxic drugs

<input type="checkbox"/> No	<input type="checkbox"/> Yes
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 11. Often get a cold

<input type="checkbox"/> No	<input type="checkbox"/> Yes
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 12. Have you ever had spinning sensation? (Vertigo)

<input type="checkbox"/> No	<input type="checkbox"/> Yes
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 13. Have you ever had dizziness?

<input type="checkbox"/> No	<input type="checkbox"/> Yes
-----------------------------	------------------------------
 14. Have you ever fallen? (Faller/Nonfaller)

<input type="checkbox"/> No	<input type="checkbox"/> Yes
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 15. How often you feel dizziness or spinning sensation?

<input type="checkbox"/> No	<input type="checkbox"/> Sometime	<input type="checkbox"/> Off and on	<input type="checkbox"/> Usually
-----------------------------	-----------------------------------	-------------------------------------	----------------------------------
 16. Do you have these following diseases?

1. Diabetes	<input type="checkbox"/> No	<input type="checkbox"/> Yes
2. High blood pressure (Hypertension)	<input type="checkbox"/> No	<input type="checkbox"/> Yes
3. High blood lipid profile (Dyslipidemia)	<input type="checkbox"/> No	<input type="checkbox"/> Yes
4. Anemia	<input type="checkbox"/> No	<input type="checkbox"/> Yes
5. Kidney diseases	<input type="checkbox"/> No	<input type="checkbox"/> Yes
-

Ear Examination form

Record no.....

Date.....

Examiner.....

Otoscopic examination

	Right ear		Left ear	
Auricle Malformation	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes
Otitis externa	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes
Ear Wax	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes
Foreign body	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes
Otorrhea	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes
Fungi	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes
Eardrum perforation	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes
Red and Bulging	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes
Retraction>moderate	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes
Effusion	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes
Other: specify.....	<input type="checkbox"/>		<input type="checkbox"/>	
Normal Findings	<input type="checkbox"/>		<input type="checkbox"/>	

Audiological testing

Record no.....

Date.....

Audiometric no _____

Ambient _____ dB _____

Air conduction threshold

Right ear	AC/(BC)	Left ear
_____	500 Hz	_____
_____	1000 Hz	_____
_____	2000 Hz	_____
_____	4000 Hz	_____

Tester _____

Tympanometry

Right ear		Left ear
<input type="checkbox"/>	Compliance	<input type="checkbox"/>
<input type="checkbox"/>	Negative middle ear pressure	<input type="checkbox"/>
<input type="checkbox"/>	Flat	<input type="checkbox"/>
<input type="checkbox"/>	Stapedial reflex Positive	<input type="checkbox"/>

Remark _____

Treatment:

- 1. No treatment
- 2. Action needed
 - 2.1 Medication
 - 2.2 Suction
 - 2.3 Hearing aids
 - 2.4 Removal earwax/foreign body/ _____
 - 2.5 Surgery Referral Urgent Non-Urgent
 - 2.6 Other c Specify _____

Follow up: _____

Refer to: _____

Referred form

Otological Center: Bangkok Unit, Faculty of Medicine Siriraj Hospital, Mahidol University

And Ear Disease Foundation (Thailand)

Date _____

Name of patient _____

Result	Right		Left
1. External ear	_____		_____
2. Middle ear	_____		_____
3. Ear drum	_____		_____
4. Hearing		Hz	
	_____	500	_____
	_____	1000	_____
	_____	2000	_____
	_____	4000	_____

Diagnosis _____

Treatment provided

1. _____

2. _____

Referred for

Doctor _____