Profile of patients with Noise Induced Hearing Loss (NIHL) at Neurotology Clinic, Dr Soetomo General Academic Hospital, Surabaya, Indonesia

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Profile of patients with Noise Induced Hearing Loss (NIHL) at Neurotology Clinic, Dr Soetomo General Academic Hospital, Surabaya, Indonesia

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ABSTRACT

Noise-induced hearing loss (NIHL) is a hearing loss that develops gradually due to prolonged exposure to excessive intensity noise and usually comes from the work environment. This study was a retrospective descriptive study using medical record data at Neurotology Clinic, Dr. Soetomo Hospital, Surabaya, Indonesia, from January 2016 to December 2020. Male patients with NIHL were more than female patients. The ratio of male to female patients was 1.92 :1. Most NIHL patients were in 41-50 years age group, as many as 12 patients (31.58%). NIHL patients as many as 18 patients (47.37%) had a chief complaint of tinnitus, while 20 patients (52.63%) had complaints of hearing loss. Most of the patients' occupations were traders of 8 patients (21.05%). The length of work of NIHL patients showed that those who worked for less than 10 years were 12 patients (31.58%). The mean notch frequency typical of NIHL patients was found in 15 patients (39.47%) with a frequency of 4000 Hz, and 23 patients (60.53%) with a frequency of 6000 Hz, with a decrease in intensity of 59.50 dB and 65.54 dB. The chief complaint was tinnitus, which was more common than hearing loss. Most of the patients' occupations was traders, with the majority of patients had been working more than 10 years. Most hearing loss was mild with a characteristic notch frequency occurring more at 6000 Hz than 4000 Hz.

1. Introduction

Noise-induced hearing loss (NIHL) is a hearing loss that develops gradually due to prolonged exposure to excessive intensity noise and usually comes from the work environment [1] Noise-induced hearing loss is the most common type of sensorineural hearing loss after presbycusis [1], [2]. The response of the auditory organ to noise is influenced by several factors, including duration of exposure, frequency, noise intensity, individual sensitivity, and other factors [1]. Signs and symptoms of NIHL according to the American College of Occupational Medicine Noise and Hearing Conservation Committee, are sensorineural, generally bilateral and symmetrical in both ears [3]. Noise-Induced Hearing loss (NIHL) is a global health problem,

often underestimated and leads to permanent hearing loss [4].

Worldwide, 12% or more of the global population is at risk of NIHL, the equivalent of more than 600 million people [5], [6]. A total of 360 million people worldwide have hearing loss, 180 million of whom are in Southeast Asia [7]. Indonesia is one of four countries in Southeast Asia with a fairly high prevalence of hearing loss [8].

Changes in hearing threshold due to noise exposure depend on the sound frequency, intensity and duration of exposure. Persistent increase in hearing threshold occurs due to exposure to very high intensity noise that causes damage to various cochlear structures, including damage to the organ of Corti, hair cells and stria vascularis [1], [3]. This process occurs because excessive sound stimulation for a long time can result in metabolic and vascular changes, resulting in degenerative damage to the structure of the hair cells of the organ [5]. The heaviest damage occurs at a frequency of 4000 Hz so that the pure tone audiogram shows a notch at a frequency of 3000-6000 Hz and the most common is at 4000 Hz which is called the Boiller maker's notch [1], [2], [5].

NIHL control is a strategic plan from the World Health Organization (WHO) to achieve the goal of Sound Hearing 2030, which is to prevent hearing loss by 50% by 2015 and 90% by 2030 [8]. Noise-induced hearing loss has a significant impact on quality, such as communication disorders, psychological status, social functioning and productivity at work. Prevention efforts need to be carried out, including controlling risk factors, early case finding, disease management, and disease rehabilitation [1], [2], [8].

The general objective of this study was to determine the profile of patients with noise-induced hearing loss at the Neurotology Clinic, Dr. Soetomo Hospital, Surabaya, Indonesia, from January 2016 to December 2020. The specific objective of this study was to obtain data on gender, age, chief complaint, occupation, length of work, average hearing threshold, degree of impairment, and frequency of hearing loss (notch).) in patients at the Neurotology Clinic, Dr. Soetomo Hospital, Surabaya, Indonesia, in the period from January 2016 to December 2020.

2. METHODS

This study was a retrospective descriptive study using medical record data at Neurotology Clinic, Dr. Soetomo Hospital, Surabaya, Indonesia, from January 2016 to December 2020 (5 years). The study sample was all patients diagnosed with NIHL who met the inclusion and exclusion criteria. Inclusion criteria were exposure to noise, sensorineural hearing loss with audiogram showing the frequency of hearing loss (notch) with hearing threshold >25dB, and productive age of 15-70 years. Exclusion criteria included family history of hearing loss (hereditary), outer and middle ear disorders, history of ototoxic drug use, and incomplete medical record data. All data collected in medical records were arranged into tables based on gender, age, chief complaint, occupation, length of work, average hearing threshold, degree of impairment, and frequency of hearing loss (notch).

3. RESULTS

A total of 38 patients diagnosed with NIHL met the inclusion and exclusion criteria at Neurotology Clinic, Dr. Soetomo Hospital, Surabaya, Indonesia.

Table 1. Gender and Age distribution

	N	Percentage (%)
Gender		

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Male	25	65.79
Female	13	34.21
Total	38	100.00
Age group (years)		
15-20	1	2.63
>21-30	7	18.42
>31-40	10	26.32
>41-50	12	31.58
>51-60	6	15.79
≥60-70	2	5.26
Total	38	100.00

Male patients with NIHL were more than female patients. Male patients were 25 (65.79%) while female patients were 13 (34.21%). The ratio of male to female patients was 1.92: 1 (Table 1). Most NIHL patients were in 41-50 years age group, as many as 12 patients (31.58%), while the least was that in 15-20 years consisting only of 1 patient (2.63%). The youngest age of NIHL patients was 15 years old while the oldest was 70 years old (Table 2).

Table 2. Distribution of chief complaints

Chief complaints	N	Percentage (%)
Tinnitus	18	47.37
Hearingn Loss	20	52.63
Total	38	100.00

NIHL patients as many as 18 patients (47.37%) had a chief complaint of tinnitus, while 20 patients (52.63%) had complaints of hearing loss (Table 3).

Table 3. Type of work

Type of work	N	Percentage (%)
Traders	8	21.05
Salespersons	7	18.42
Doctors	6	15.79
Technicians	4	10.53
Laborers	4	10.53
Construction workers	3	7.89
Music teachers	3	7.89
Housewives	2	5.26
Journalists	1	2.63
Total	38	100.00

Most of the patients' occupations were traders of 8 patients (21.05%), followed by salespersons 7 patients (18.42%), doctors 6 patients (15.79%), laborers 4 patients (10.53%), technicians 4 patients (10.53%), music teacher 3 patients (7.89%), construction worker 3 patients (7.89%), housewife 2 patients (5.26%) and, the least, journalist, 1 patient (10.53%) (Table 4)

Table 4. Length of work

Length of work	N	Percentage (%)
≤10 years	12	31.58
≥10 years	26	68.42
Total	38	100.00

The length of work of NIHL patients showed that those who worked for less than 10 years were 12 patients (31.58%) and those who worked more than 10 years were 26 patients (68.42%) (Table 5).

Table 5. Hearing threshold value

Intensity	Frequency							
	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	6000 Hz	8000 Hz	Mean
AD (dB)	33.95	35.66	37.89	39.08	55.66	90.26	55.26	36.64
AS (dB)	33.95	34.21	34.21	31.97	50.92	62.63	53.89	34.01

Hearing thresholds for each frequency were 250 Hz, 500 Hz, 1000 Hz, 2000, 4000 Hz, 6000 Hz and 8000 Hz in the right and left ears. The lowest right ear hearing threshold was at the frequency of 250 Hz at 33.95 dB, the highest at the frequency of 6000 Hz at 90.26 dB. The lowest left ear hearing threshold was at the frequency of 2000 Hz at 31.97 dB, the highest at the frequency of 6000 Hz at 62.63 dB. The average hearing thresholds of right ear and left ear in this study was 36.64 dB and 34.01 dB (Table 6).

Table 6. Degree of hearing loss in right and left ears

		Left ears						Total
		Normal	Mild	Moderate	Moderately severe	Severe	Very severe	
Right ears	Normal	3	2	0	0	0	0	5(13.16%)
	Mild	0	19	1	1	1	0	22(57.89%)
	Moderate	0	1	1	0	0	0	2(5.26%)
	Moderately severe	0	1	2	3	0	0	6(15.79%)
	Severe	0	0	0	0	2	0	2(5.26%)
	Very severe	0	0	0	0	0	1	1(2.63%)
Total		3(7.89%)	23(60.53%)	4(10.53%)	4(10.53%)	3(7.89%)	1(2.63%)	38(100%)

Regarding the severity of NIHL in left ears, there were 3 patients with normal hearing, 23 patients with mild degree, 4 patients with moderate degree, 4 patients with moderately severe degree, 3 patients with severe degree and 1 patient with very severe degree. The severity of NIHL in right ears showed that there were 5 patients with normal hearing, 22 patients with mild degree, 2 moderate degree, 6 with moderately severe degree, 2 with severe degree, and 1 very severe degree (Table 7).

Table 7. Mean intensity at frequencies of 4000 Hz and 6000 Hz

Frequencies	Intensity	Number
4000 Hz	59.50 dB	15 (39.47%)
6000 Hz	65.54 dB	23 (60.53%)
	Total	38 (100.00%)

The mean notch frequency typical of NIHL patients was found in 15 patients (39.47%) with a frequency of 4000 Hz, and 23 patients (60.53%) with a frequency of 6000 Hz, with a decrease in intensity of 59.50 dB

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and 65.54 dB (Table 8), respectively.

4. DISCUSSION

In this study, 38 patients (5.14%) of 739 productive age patients complained of hearing loss at the Neurotology Clinic, Dr. Soetomo Hospital, Surabaya, Indonesia, between January 2016 and December 2020 were diagnosed with NIHL. This was in contrast to another study where the incidence of NIHL was 20% of outpatients with hearing loss [8]. This was because public awareness in Indonesia about NIHL was still low [9]. Excessive noise exposure could increase the production of reactive oxygen species in the cochlea, thus causing the risk of noise-induced hearing loss (NIHL) [10].

In this study, there were 25 male patients (65.79%) and 13 female patients (34.21%) (Table 1). This was in accordance with previous studies where the majority of NIHL patients were male because the majority of jobs with noise risk were carried out by males (miners, mechanics, workshops) [2], [11].

Most NIHL patients were found in 41-50 year age group, comprising 12 patients (31.58%), while the least was found in 15-20 years, only 1 patient (2.63%). The youngest age of the NIHL patient was 15 years, while the oldest was 70 years (Table 2). Another study also found a low risk at age less than 30 years (estimated exposure to noise in the workplace for 5-10 years), and an increasing risk at age over 30 years (estimated exposure to noise more than 10 years) [10]. The decline in hearing ability in elderly is also caused by degenerative factors of the auditory organ which generally begin at the age of 40 years and over with the hearing threshold falling by about 0.5 dB per year [12], [13]. There is a relationship between compliance with the use of ear protectors and Noise Induce Hearing Loss [14].

The chief complaint of as many as 18 NIHL patients (47.37%) was tinnitus, while the other 20 patients (52.63%) had complaints of hearing loss (Table 3). In a previous study, the incidence of tinnitus in chronic noise exposure ranged from 50% to 90% [15]. The tinnitus experienced was usually high-pitched (according to the disturbed frequency) and as many as 20% responded to Tinnitus Rehabiliation Therapy [16].

Patient occupation data showed that field workers (traders, salesmen, technicians, laborers and journalists) were 71.05% (Table 4). Previous research stated that 61% of NIHL patients were field workers, 12% were police, 23% were indoor workers with noisy environments, and the remaining 4% were in diverse occupations. This showed that noise exposure did not only occur in the field but also indoors which was obtained from habits such as wearing a headset when listening to music at a loud volume even though the surrounding environment was not noisy. Ears that are exposed to noise at first will feel disturbed by the noise, but then the ears adapt so they do not feel disturbed anymore because the sound is not as loud as at the beginning of the exposure [13].

This study found that there were 12 patients (31.58%) with working duration of less than 10 years and 26 patients (68.42%) with more than or equal to 10 years (Table 5). This was not much different from the results of other studies which found that hearing loss was experienced by workers with less than 10 years of work as many as 7 patients (17.1%) and 34 patients (82.9%) [14].

In this study, PTA values of the right and left ears were 38.99 and 39.03 dB, respectively (Table 6). The severity of NIHL patients in this study showed that the left ear in as many as 3 patients had normal hearing, 23 patients had mild, 4 patients had moderate, 4 patients had moderately severe, 3 patients had severe and 1 patient had very severe hearing loss [17]. Right ear with normal hearing was found in 5 patients, mild

degree in 22 patients, moderate degree in 2 patients, moderately severe degree in 6 patients, severe degree in 2 patients, and very severe degree in 1 patient. This was in accordance with a previous study in which hearing loss in NIHL belonged to SNHL with a mild degree (PTA 25-40 dB) [18].

Regarding the severity of NIHL in the left ears, as many as 3 patients showed normal hearing, 23 patients had mild degree, 4 patients had moderate degree, 4 patients had moderately severe degree, 3 patients had severe degree and 1 patient had very severe degree. The severity of the right ears showed normal hearing in 5 patients, mild in 22 patients, moderate in 2 patients, moderately severe in 6 patients, severe in 2 patients, and very severe in 1 patient (Table 7). This was consistent with another study in which the majority of patients had mild bilateral NIHL [19], [20].

This study found a characteristic notch frequency in 15 NIHL patients (39.47%) at 4000 Hz, and 23 NIHL patients (60.53%) at 6000 Hz. (Table 8). Another investigator found NIHL patients with a notch frequency of 3000 Hz in 7 patients (8.3%), 4000 Hz in 39 patients (46.4%), and 6000 Hz in 38 patients (45.3%). This was in accordance with the theory that generally, the frequency of hearing with decreasing intensity is between 3000 – 6000 Hz and the heaviest damage to the organ of Corti for sound receptors occurs at the frequency of 4000 Hz (4 K notches) [1].

5. CONCLUSION

Profile of patients with noise-induced hearing loss at Neurotology Clinic, Dr. Soetomo Hospital, Surabaya, Indonesia, from January 2016 to December 2020 showed that there were as many as 38 patients, the majority were males, with the most age group 41-50 years. The chief complaint was tinnitus, which was more common than hearing loss. Most of the patients' occupations was traders, with the majority of patients had been working more than 10 years. Most hearing loss was mild with a characteristic notch frequency occurring more at 6000 Hz than 4000 Hz.

6. REFERENCES

[1] Tu NC, Dogaru GLB, Friedman RA. Noise induced hearing loss: an update.International Medicine Review 2017;3(7):1-10.

[2] Husam M, Hameed. Assessment of noise induced hearing loss (NIHL) in Wasit, Iraq. Journal of Health, Medicine, and Nursing 2015;15:80-7.

[3] Royster JD. Preventing noise-induced hearing loss. J Otolaryngol - Head Neck Surg 2017;78(2):113-7.

[4] Kusumagani, Hamam, Purnami, Nyilo. Newborns Hearing Screening with Otoacoustics Emissions and auditory brainstem response. Journal of Community Medicine and Public Health Research, 2020; 1 (1)

[5] Le TN, Straatman LV, Lea J, Westerberg B. Current insights in noise-induced hearing loss: a literature review of the underlying mechanism, pathophysiology, asymmetry, and management options. J Otolaryngol - Head Neck Surg 2017;46(1):1-15.

[6] Neitzel R, Fligor B. Determination of risk of noise-induced hearing loss due to recreational sound: Review. WHO Make Listening Safe: Risk Assessment and Definition Group 2017;2:1-24.

[7] Lie A, Skogstad M, Johannessen HA, Tynes T, Mehlum IS, Nordby KC, et al. Occupational noise

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exposure and hearing: a systematic review. Int Arch Occup Environ Health 2016;89:351–72.

[8] Departemen Kesehatan. rencana strategis kemenkes tanggulangi gangguan pendengaran, Depkes, 2017. Available from: https://www.kemkes.go.id/article/view/17030300004/rencana-strategis-kemenkes-tanggulangi-gangguan-pendengaran.html. Accessed December 3, 2020.

[9] Nyilo, Purnami, Serafika P P. The Association of Reactive Oxygen Species Levels on Noise Induced Hearing Loss of High Risk Workers in Dr. Soetomo General Hospital Surabaya, Indonesia. Indian Journal of Otolaryngology and Head and Neck Surgery, 2019 , 71 (86-89)

[10] Khan N, Khan AR, Khan A, Khan S. Frequency of hearing loss in noisy occupational settings. N Engl J Med 2012;20(4):192-5.

[11] Pultznerova A, Eva P, Kucharova D., Argalasova L. Nature Hippocampal abnormalities in amnesic patients revealed by high-resolution magnetic resonance imaging. Am J Ind Med 2018;19(87):90-100.

[12] Nelson DI, Nelson RY, Concha-Barrientos M, Fingerhut M. The global burden of occupational noise-induced hearing loss. Am J Ind Med 2005;48(6):446-58.

[13] Bhatt IS, Guthrie O. Analysis of audiometric notch as a noise-induced hearing loss phenotype in us youth: data from the national health and nutrition examination survey, 2005–2010. Int J Audiol 2017;56(6):392-9.

[14] Rosydiah, R, Nyilo, P, Makmudyah I, C. Analysis of Compliance of Ear Protector Usage on The Prevention of Noise Induce Hearing Loss at Sterilization Installation. Journal of Community Medicine and Public Health Research. 2021, (2): 1

[15] Rizqi SN, Widowati. Gangguan pendengaran akibat bising. Higeia 2017;1(1):73-82.

[16] Prayogo I, Widajati N. Perbedaan gangguan pendengaran akibat bising antara operator central control room PLTU dan PLTGU di PT PJB unit pembangkitan gresik. Indones J Occup Safety and Health 2017;4(2):103.

[17] Novastuti, C, D, Affianti N, Purnami Nyilo. Noise Induced Hearing Loss in Ground handling Workers at Juanda Airport Surabaya. Korean Journal of Otorhinolaryngology-Head and Neck Surgery, 2020 (63): 59-63

[18] Vohra Maggon N, Sethi A, Gupta A. Noise induced hearing loss with tinnitus: does TRT help? Bengal J Otolaryngol Head Neck Surg 2017;25(1):39-45.

[19] Axelsson A, Sandh A. Tinnitus in noise-induced hearing loss. Br J Audiol 2009;19(4):271-6.

[20] Alberta W, Medicine E, Statement G. A clinician's guide to noise-induced hearing loss. WCB 2017;(3):1-3

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