

The diagnosis and assessment of the quality of life in tinnitus patients: a literature review

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ABSTRACT

Background: Tinnitus is a symptom with many different causes that can interfere with daily life. The diagnosis of tinnitus can be carried out, starting by examining the history, physical examination, audiology examination, and assessing the quality of life of the patient. Assessment of the patient's quality of life and the severity of tinnitus was carried out using a questionnaire.

Objective: This study aimed to explain the frequency of use of several questionnaires to assess the quality of life of patients with tinnitus, including Tinnitus Handicap Inventory (THI), Tinnitus and Hearing Survey (THS), Tinnitus Functional Index (TFI) and Tinnitus Primary Function Questionnaire (TPFQ). **Discussion:** The use of THI as a research tool has been recommended for assessing the severity of tinnitus functional, emotional, and catastrophic responses. THS is used as a screening instrument to evaluate tinnitus complaints because of a hearing problem and how frequently it happens. TFI was used for identifying the functional impact on tinnitus patients, to evaluate how tinnitus affects a person's life, while TPFQ was applied as it is a new questionnaire designed specifically for this objective. **Conclusion:** Many questionnaires can be used as an assessment of the quality of life of patients with tinnitus. Each questionnaire can be used and has its advantages. THI is a questionnaire that has been translated into Indonesian so that it is easier to assess.



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INTRODUCTION

As a common medical condition, tinnitus is defined as the condition when patients hear a stranger noise that is unwanted in the absence of environmental stimuli. Tinnitus is a symptom with several different causes and is not defined as a disease. However, it can be said that discovering the causes of kind of patient's tinnitus is still difficult (Yang & Byun, 2016). Tinnitus is classified by psychoacoustic properties (pitch and loudness) that it has and is about the auditory domain, and by its connection with distress about the psychological domain (Hebert & Fournier, 2017). Even though this disease is not a fatal condition, tinnitus can be the first sign of a dangerous condition that can become more life-threatening if undiagnosed and untreated. Moreover, tinnitus is connected with significant physiological issues, such as distress, anxiety, and others (Langguth, et al., 2011).

As its prevalence rises with increasing age, tinnitus was affecting the general population from 11.9 to 30.3% and its known as a common health condition (Hebert & Fournier, 2017). The National Health Interview Survey of the United States in 1994 estimated the prevalence of tinnitus at the age of 18 to 44 years was about 1.6%, age of 45 to 64 years was 4.6%, and age of 60 years and older was 9.0%. More than 50 million people have been infected by tinnitus, which is estimated about 10% to 15% in adults (Tunkel, et al., 2014). Cipto Mangunkusumo General Hospital, Jakarta, reported data of 256 tinnitus patients came for treatment during the period June 2008 to June 2009 (Bashiruddin, et al., 2015). At Dr. Soetomo General Academic Hospital, Surabaya, Indonesia, from 2016 to 2018 there were 420 tinnitus patients. However, tinnitus is subjective nature, so it is a challenging task. Therefore, it was very essential for deciding an appropriate treatment and predicting the possible effect in the management of tinnitus by integrating a multidimensional (Yang & Byun, 2016).

OBJECTIVE

This literature review was to explain the diagnosis and the assessment of the quality of life in tinnitus patients.

DISCUSSION

Tinnitus

Tinnitus is a common complaint among people and those who experienced bothersome tinnitus can complain of several related problems (Emely, et al., 2018). Without an environmentally sound source, tinnitus becomes an unwanted auditory perception disease (Yang & Byun, 2016). Tinnitus' symptoms were head or ear noise which occurs for 5 minutes and happens more than once a week (Henry et al., 2015). The name of tinnitus originated from 'tinnire' (Latin Word), which means 'to ring'. Even though tinnitus regularly manifests as a ringing, the handicap encompasses any phantom percept and probably expressed as buzzing, roaring, whistling, hissing, or various combinations of these descriptions (Chari & Limb, 2018). There were two classifications of tinnitus which are objective or subjective. A real sound coming from outside the inner ear is called objective tinnitus, which is audible not only for the patient but also for the physician who examines it. However, subjective tinnitus is only heard by the patient and is known as a common symptom (Atik, 2014).

The complicated mechanism of pathophysiology is poorly understood. Tinnitus can also additionally originate from any place alongside the auditory pathway which starts from the outside ear going to the auditory cortex (Chari & Limb, 2018). In most cases, it occurs from the effect of initial cochlear lesions along with hearing loss suddenly, noise trauma, presbycusis, or ototoxic drug administration. Resulting in abnormal neuronal activity in central auditory pathways, these lesions were determined as tinnitus (Langguth, et al., 2013). Most tinnitus patients are less severely affected. However, some patients experience psychological conditions, such as anxiety, depression, and extreme life changes (Chari and Limb, 2018). Some patients also have often experienced difficulty when falling asleep, depression, annoyance, and confusion (Yang & Byun, 2016). Tinnitus combined with severe anxiety or depression requires proper identification and intervention to prevent the incident of suicide; as it has been reported that tinnitus patients with a comorbid psychiatric illness can commit suicide (Bhatt, et al 2017; Chari & Limb, 2018).

Diagnostic evaluation of tinnitus

To arrange the diagnosis, a series of diagnostic procedures are performed that will be examined by physicians. It will start with the anamnesis, physical examination (otoscopy, auscultations), audiology evaluation (audiometry, tinnitus matching, loudness discomfort level, tympanometry), assessment of tinnitus psychoacoustic and psychometric using questionnaire for assessing the patient's quality of life (Figure 1).

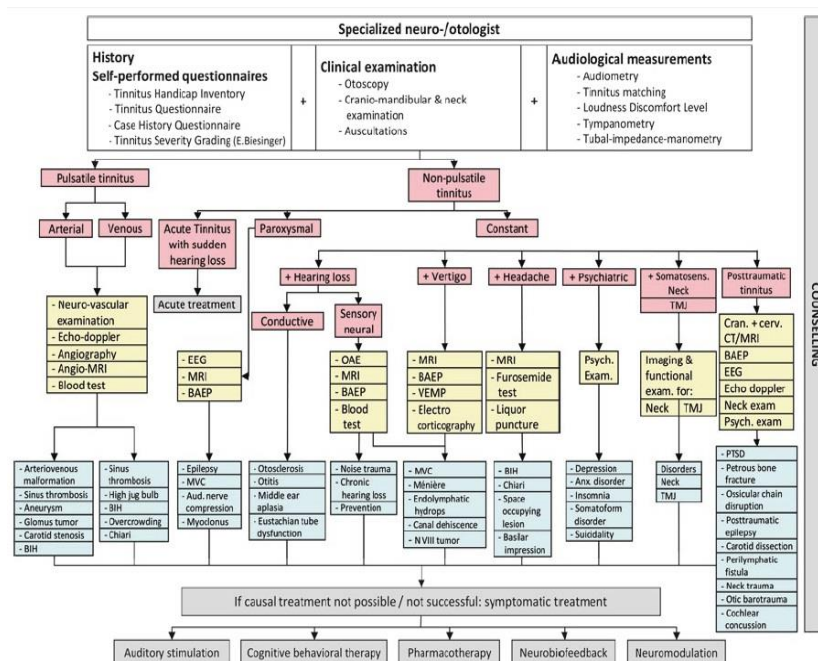


Figure 1. Diagnostic and therapeutic algorithm (Langguth, et al., 2011)

Tinnitus history

Patient anamnesis consists of onset, tinnitus location, pattern, characteristics, and related signs and other symptoms, including loss of hearing, vertigo, hyperacusis, preceding tinnitus testing, illnesses and medications (Yang & Byun, 2016). Several physicians have studied the localization of tinnitus, and expected in each ear or centrally within the head in roughly half of the patients. This symptom highly likely occurs left-side rather than right-side. The reason for this is still unknown and asymmetric hearing loss cannot explain this phenomenon. Possible risk factors have been suggested from the experiences of obesity, smoking, alcohol, preceding head injuries, the record of arthritis, and hypertension (Baguley, McFerran & Hall, 2013). To assess tinnitus severity through screening tools or questionnaires was the way to determine basic diagnostic for gaining an in-depth case history (Langguth, et al., 2011). The severity of tinnitus can be assessed using the chart in Figure 2. If there is annoying tinnitus, a major negative impact on daily life, and the patient cannot do housework and take care of the family, then the patient has a grade 4 severity.

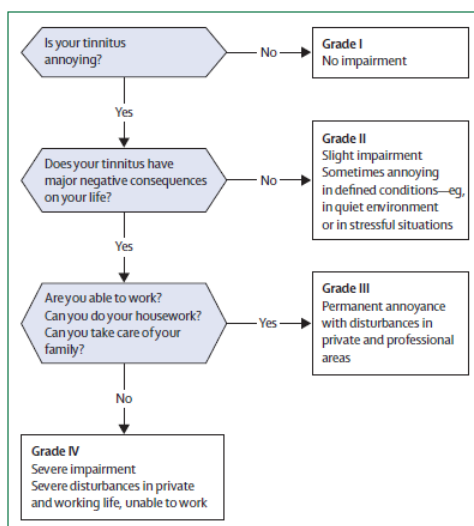


Figure 2. Algorithm quality of life assessment in Tinnitus patients.

Physical examination

A physical examination was used to differentiate whether it is objective tinnitus or subjective tinnitus. An etiologic examination was completed to affirm the infectious presence of impacted cerumen, through inspecting the outside auditory canal and the tympanic membrane. Auscultation over the periauricular vicinity was to decide the pulsatile vascular beginning of objective tinnitus. Meanwhile, a tuning fork test can be delivered to assess sensorineural or conductive hearing loss at a few levels in the Weber and Rinne tests (Langguth et al., 2013).

Objective tinnitus manifests as hearing a sound that is from outside the ear, in which the use of a stethoscope or ear canal microphone can discover it. The synchronous pulse using the auscultation of the neck or head location in a quiet environment may be an affirmation of objective tinnitus (Atik, 2014). The techniques to differentiate between arterial and venous tinnitus were essential. Vascular stenosis, aneurysm, anatomical editions of arteries are consultant of arteries principal causes. In addition, intracranial hypertension, venous malformation, or anatomical variant is venous principal causes. Therefore, extra diagnostic imaging, including brain computed tomography (CT) or magnetic resonance imaging (MRI) must be executed whilst an affected person is suspected of getting objective tinnitus. Magnetic resonance angiography (MRA) is beneficial for imaging arteries that deliver to the brain. For comparing the veins and sinuses, CT angiography additionally may be beneficial.

Audiologic evaluation

Audiologic assessment can help to decide the characteristics of the patient's tinnitus and lesion location. This assessment includes simple audiometric tests, which includes natural tone audiometry, speech audiometry, tympanometry, electrocochleography (ECoG), electronystagmography (ENG), auditory brainstem response (ABR), acoustic reflex, decay exam and tinnitogram. The feature of critiques was to assist in distinguishing between sensory and conduction hearing to lose and to discover the retro-cochlear origin (Yang & Byun, 2016). To measure individual thresholds, an audiometer was used with pure tones of 125, 250, 500, 1,000, 2,000, 3,000, 4,000, 6,000, and 8,000 Hz frequencies more than twice. The condition was diagnosed as hearing loss of any threshold for the respective frequencies was found above 26 dB (Ryu, et al., 2011). The acoustic reflexes and rot examination at the same time as the ABR show whether a lesion is on the 8th nerve or not. Electronystagmography may even pick out problems together with Meniere's sickness or secondary endolymphatic hydrops. Tinnitogram (psychoacoustical measurements) is a test for locating the pitch and loudness levels of the nearest sound to sounds that sufferers with tinnitus feel (Bankstahl & Goertelmeyer, 2013). This test was accomplished through the usage of audiometry as follows: (1) right frequency of tinnitus changed into recognized by frequency matching, (2) the edge frequency of tinnitus changed into assessing through length matching (Lee, et al., 2017). Pure tone and narrowband noise were used based on the range of loudness and frequency. As pure tone, there were 11 kinds of frequencies: 125, 250, 500, 750, 1,000, 1,500, 2,000, 3,000, 4,000, 6,000, and 8,000 Hz (Ryu, et al., 2011).

Psychoacoustic measurements are permitted a tester to pick out and measure subjective tinnitus. Psychoacoustical scores consist of 4 parts which are based on pitch-healthy, loudness-healthy, residual inhibition and masking. The intention is to measure tinnitus with the aid of using viable frequencies in the medium term. The pitch matching system was mostly an-opportunity compelled choice. The patient will hear tones and has to pick out the closest tone to what they hear (tinnitus). About 2/3rd of the patients complain about their tinnitus, which other than pure tones, so it makes the evaluation difficult (Ryu, et al., 2011).

The objective of the loudness-match test was to detect the intention of the sound. This test can value tinnitus in terms of decibels (dB) (Yang & Byun, 2016). The loudness of tinnitus ranged from 0 to 110 dB, which is adjustable at intervals of 1 dB (Ryu, et al., 2011). Matching sounds begin at a degree threshold and grow in depth till the affected person expresses a synchronization. They take a look at the frequency of its miles similar to pitch matching (Yang & Byun, 2016). The loudness stability has confusions in keeping with analysis because there are numerous patients' times complaining approximately louder tinnitus than the actual sound, which may be represented as a 'loudness recruitment phenomenon (Ryu, et al., 2011). The residual inhibition test is used for determining whether the tinnitus masking would be an applicable management course. The test is defined as the suppression of tinnitus during masking. Clinicians should use a tinnitus frequency at 10 dB above the loudness match for one minute. The post-making effect is divided into 4 categories: 1) Positive: whole

absence for more than one minute, 2) Positive-partial: reduced stage of tinnitus for extra than one minute, 3) No extrude in tinnitus, and 4) Rebound: louder after covering.

Quality of life assessment

World Health Organization (WHO) has reviewed how an individual's well-being can be affected by tinnitus. The schema from WHO used to classify the features impaired by tinnitus is grouped into 4: (1) mind and emotions, (2) hearing, (3) sleep, and (4) concentration. Several secondary activities of patients can be impacted if the primary functions are infected by tinnitus. Thus, it is highly likely broadly to impair quality of life (Cima, et al., 2011; Tunkel, et al., 2014). The questionnaire for measuring tinnitus was aimed at assessing the influence of tinnitus on a patient's life (Yang & Byun, 2016). Since tinnitus is often connected with complicated psychological disorders, most questionnaires are concerned with emotions and the challenging thoughts that patients experience (Tunkel, et al., 2014). Several tinnitus questionnaires have been arranged to determine the level and type of abnormalities (Figure 3). The common use of questionnaires was Tinnitus Handicap Inventory (THI), Tinnitus and Hearing Survey (THS), and Tinnitus Functional Index (TFI).

Questionnaire (Author,Year)	Content	Interpretation
Tinnitus Questionnaire and Tinnitus Effects Questionnaire (Hallam et al, 1988) ¹⁰⁵	52 Items <ul style="list-style-type: none"> • sleep disturbance • emotional distress • auditory perceptual difficulties • inappropriate or lack of coping skills 	3 level category scale <ul style="list-style-type: none"> • true • partly true • not true
Tinnitus Handicap Questionnaire (Kuk et al, 1990) ¹⁰¹	27 Items <ul style="list-style-type: none"> • physical, emotional, social consequence (factor 1) • effects on hearing (factor 2) 	0 (strongly disagrees) to 100 (strongly agrees)
Tinnitus Reaction Questionnaire (Wilson et al, 1991) ¹⁰⁰	26 Items: distress consequences including: <ul style="list-style-type: none"> • anger • confusion • annoyance • helplessness • activity avoidance • panic 	5-point scale (0 = not at all; 4 = almost all of the time)
Tinnitus Handicap Inventory (Newman et al, 1996) ⁹⁹	25 Items <ul style="list-style-type: none"> • role limitations in mental, social/occupational, physical functioning • anger, frustration • irritability • depression • catastrophic subscale: desperation, loss of control, inability to cope and escape, fear of grave disease 	3 level category scale <ul style="list-style-type: none"> • yes • sometimes • no
Tinnitus Functional Index (Meikle et al, 2012) ¹⁰²	30 Items with 8 subscales (subscales not validated) <ul style="list-style-type: none"> • intrusive • feeling • thinking • hearing • relaxing • sleeping • managing • quality of life 	11-point scale (0 to 10)

Figure 3. Self-report Tinnitus Questionnaires

Tinnitus Handicap Inventory (THI)

One of the most frequently used tests is the THI which developed by Newman, et al, (1996). The goal was to measure useful and psychosocial results of tinnitus and its effect on everyday life. There were 25 questions along with the evaluation of useful limitations (useful subscale) because of emotional attitudes (emotional subscale) closer to tinnitus, and catastrophic thoughts (catastrophic subscale) that specialize in tinnitus. The THI was consisting of 25 items, each item included with 3 response options 'yes' (4 points), sometimes (2 points), and no (0 points) (Zeman, et al., 2011). Functional, emotional, and catastrophic reactions to tinnitus were the components of the questions. An index of the severity of tinnitus was to value the global score, with a grade between 0 and 100, from a severity symptom score ranging from mild to severe (Zeman, et al., 2011). The severity of the THI was scored four degrees: 0 to 16 for no handicap; 18 to 36 for mild handicap; 38 to 56 for moderate handicap; 58 to 76 for severe handicap; 78 to 100 for catastrophic handicap (Salviati et al., 2012).

As a questionnaire for quantifying tinnitus severity, the THI might be the most considerable verified questionnaire (Salviati, et al., 2012). Apart from its original English version (Figure 4), it has been translated into Danish, Spanish, Korean, Portuguese, German, Italian, and Chinese and published (Zeman, et al., 2011).

TINNITUS HANDICAP INVENTORY

Patient Name: _____ Date: _____

INSTRUCTIONS: The purpose of this questionnaire is to identify difficulties that you may be experiencing because of your tinnitus. Please answer every question. Please do not skip any questions.

1. Because of your tinnitus, is it difficult for you to concentrate?	Yes	Sometimes	No
2. Does the loudness of your tinnitus make it difficult for you to hear people?	Yes	Sometimes	No
3. Does your tinnitus make you angry?	Yes	Sometimes	No
4. Does your tinnitus make you feel confused?	Yes	Sometimes	No
5. Because of your tinnitus, do you feel desperate?	Yes	Sometimes	No
6. Do you complain a great deal about your tinnitus?	Yes	Sometimes	No
7. Because of your tinnitus, do you have trouble falling to sleep at night?	Yes	Sometimes	No
8. Do you feel as though you cannot escape your tinnitus?	Yes	Sometimes	No
9. Does your tinnitus interfere with your ability to enjoy your social activities (such as going out to dinner, to the movies)?	Yes	Sometimes	No
10. Because of your tinnitus, do you feel frustrated?	Yes	Sometimes	No
11. Because of your tinnitus, do you feel that you have a terrible disease?	Yes	Sometimes	No
12. Does your tinnitus make it difficult for you to enjoy life?	Yes	Sometimes	No
13. Does your tinnitus interfere with your job or household responsibilities?	Yes	Sometimes	No
14. Because of your tinnitus, do you find that you are often irritable?	Yes	Sometimes	No
15. Because of your tinnitus, is it difficult for you to read?	Yes	Sometimes	No
16. Does your tinnitus make you upset?	Yes	Sometimes	No
17. Do you feel that your tinnitus problem has placed stress on your relationships with members of your family and friends?	Yes	Sometimes	No
18. Do you find it difficult to focus your attention away from your tinnitus and on other things?	Yes	Sometimes	No
19. Do you feel that you have no control over your tinnitus?	Yes	Sometimes	No
20. Because of your tinnitus, do you often feel tired?	Yes	Sometimes	No
21. Because of your tinnitus, do you feel depressed?	Yes	Sometimes	No
22. Does your tinnitus make you feel anxious?	Yes	Sometimes	No
23. Do you feel that you can no longer cope with your tinnitus?	Yes	Sometimes	No
24. Does your tinnitus get worse when you are under stress?	Yes	Sometimes	No
25. Does your tinnitus make you feel insecure?	Yes	Sometimes	No

FOR CLINICIAN USE ONLY

Total Per Column	<input type="text"/>	<input type="text"/>	<input type="text"/>	
	x4	x2	x0	
Total Score	<input type="text"/>	+	<input type="text"/>	+
			<input type="text"/>	= <input type="text"/>

Newman, C.W., Jacobson, G.P., Spitzer, J.B. (1996). Development of the Tinnitus Handicap Inventory. Arch Otolaryngol Head Neck Surg, 122, 143-8.

To interpret the score please refer to the Tinnitus Handicap Severity Scale shown on the reverse side.

Figure 4. Tinnitus Handicap Inventory (Newman, et al., 1996).

In 2015, this questionnaire was also adapted into Indonesian (Figure 5). The adapted Indonesian model is a psychometric tool of the quality of life of tinnitus sufferers which is legitimate and dependable in line with the transcultural validation ideas with the aid of using WHO.

No	Pertanyaan	Ya	Tidak	Kadang
1	Akibat tinitus anda, sulitkan bagi anda untuk berkonsentrasi?			
2	Apakah kerasnya suara tinitus anda membuat anda sulit mendengar suara orang?			
3	Apakah tinitus anda membuat anda marah?			
4	Apakah tinitus anda membuat anda bingung?			
5	Akibat tinitus anda, apakah anda merasa putus asa*?			
6	Apakah anda sering mengeluh mengenai tinitus yang anda derita?			
7	Akibat tinitus anda, apakah anda sulit untuk tidur di malam hari?			
8	Apakah anda merasa bahwa anda tidak dapat bebas dari tinitus?			
9	Apakah tinitus anda mengganggu kemampuan anda untuk menikmati kegiatan-kegiatan sosial (misalnya pergi keluar untuk makan malam, nonton bioskop)?			
10	Akibat tinitus anda, apakah anda merasa frustrasi?			
11	Akibat tinitus anda, apakah anda merasa bahwa anda menderita suatu penyakit yang mengerikan?			
12	Apakah tinitus anda membuat anda sulit menikmati hidup?			
13	Apakah tinitus anda mengganggu pekerjaan anda atau tanggung jawab rumah tangga anda?			
14	Akibat tinitus anda, apakah anda mendapatkan bahwa anda sering kali mudah tersinggung?			
15	Akibat tinitus anda, sulitkan bagi anda untuk membaca?			
16	Apakah tinitus menyebabkan anda kesal?			
17	Apakah anda merasa penyakit tinitus yang anda derita menimbulkan stress pada hubungan anda dengan keluarga dan teman-teman?			
18	Apakah sukar bagi anda mengalihkan perhatian dari tinitus yang anda derita pada hal lain?			
19	Apakah anda merasa bahwa anda tidak dapat mengontrol tinitus yang anda derita?			
20	Akibat tinitus anda, apakah anda seringkali merasa lelah?			
21	Akibat tinitus anda, apakah anda merasa tertekan?			
22	Apakah tinitus membuat anda merasa cemas?			
23	Apakah anda merasa tidak tahan lagi dengan tinitus yang anda derita?			
24	Apakah tinitus anda menjadi lebih parah bila anda dalam keadaan stress?			
25	Apakah tinitus membuat anda merasa tidak aman?			

*) Putus asa= despair: to lose hope or no more hope (of a cure for illness)

Figure 5. The final Indonesian version of adapted and revised THI "Tinnitus: sound in the ear (buzzing/ringing,roaring/hissing/howling/thundering)"

Tinnitus and Hearing Survey (THS)

Tinnitus and Hearing Survey developed by Henry et al. (2010) is a simple screening tool to determine how much of a patient's complaint about tinnitus is due to hearing loss and how much is specifically due to tinnitus. The THS conceptual design contained two short lists of elements: (a) Commonly tinnitus problems that are not confused with hearing problems and (b) Commonly hearing problems that are not confused with tinnitus complaints. Since sound tolerance problems (hyperacusis) are often reported by patients with tinnitus, two items have been added to the THS to find for tone tolerance problems (Henry et al., 2015). THS consists of 10 items (4 items related to tinnitus problems; 4 items on common hearing problems; and 2 items on questions concerning sound tolerance). The structure is divided into three sections/subscales (A, B, C, see Figure 4).

Section A included 4 objects that cope with common tinnitus problems, together with issues of sleeping, concentrating, relaxing, and focusing interest away from the tinnitus. Section B carries 4 objects that cope with hearing in a background of noise and understanding speech from TV/movies, smooth voices, and group conversations. Section C, which incorporates objects, was designed because of an extreme sound tolerance problem. Responses for sections A and B can range from zero (now no longer a problem) to 4 (a very huge problem). Consequently, the overall rating for every segment can vary from zero to 16. THS is a short questionnaire specifically designed to help patients and clinicians determine how much of a patient's reported problem is due to tinnitus and how much is due to hearing problems. THS implementation takes about 5 minutes on average. The results of the THS questionnaire may reveal the most predominant complaints of tinnitus or hearing loss. (Henry, et al., 2015).

Tinnitus and Hearing Survey					
	No not a problem	Yes: a small problem	Yes: a moderate problem	Yes: a big problem	Yes: a very big problem
A. Tinnitus					
Over the last week, tinnitus kept me from sleeping.	0	1	2	3	4
Over the last week, tinnitus kept me from concentrating on reading.	0	1	2	3	4
Over the last week, tinnitus kept me from relaxing.	0	1	2	3	4
Over the last week, I couldn't get my mind off of my tinnitus.	0	1	2	3	4
	Total of each column				Grand Total
B. Hearing					
Over the last week, I couldn't understand what others were saying in noisy or crowded places.	0	1	2	3	4
Over the last week, I couldn't understand what people were saying on TV or in movies.	0	1	2	3	4
Over the last week, I couldn't understand people with soft voices.	0	1	2	3	4
Over the last week, I couldn't understand what was being said in group conversations.	0	1	2	3	4
	Total of each column				Grand Total
C. Sound Tolerance					
Over the last week, everyday sounds were too loud for me.*	0	1	2	3	4
<i>If you responded 1, 2, 3, or 4 to the statement above:</i>					
Being in a meeting with five to 10 people would be too loud for me.*	0	1	2	3	4
*If sounds are too loud for you when wearing hearing aids, please tell your audiologist.					

Figure 6. Tinnitus and Hearing Survey (Henry, et al., 2015).

Tinnitus Functional Index (TFI)

A diagnostic tool for assessing the tinnitus functional impact based on quantity is the TFI which has been optimized (Fackrell, et al., 2017). Tinnitus Functional Index consists of 25 items, first developed by Meikle et al. in 2012. The final TFI is divided into eight subscales which are Intrusive, Sense of Control, Cognitive, Sleep, Auditory, Relaxation, Quality of Life, and Emotional. Three items are for identifying seven of the subscales and four items are for identifying the quality of life subscale (Meikle, et al., 2012; Conrad, et al., 2015).

For evaluation, patients' responses will be valued on a 10-point scale, which is an overall score ranging from 0-100. The global score indicates the total scores, which are divided into 2.5 to give a global score out of 100. Higher scores indicate a greater impact on daily functions. Due to the TFI development, several questions have been translated into English and other languages (Fackrell, et al., 2017). To suit the two standard pages, the 25 items of the final version of the questionnaire were reformatted (Figure 7).

TINNITUS FUNCTIONAL INDEX		TINNITUS FUNCTIONAL INDEX		PAGE 2
Today's Date _____ Your Name _____				
Month / Day / Year _____ Please Print				
Please read each question below carefully. To answer a question, select ONE of the numbers that is listed for that question, and draw a CIRCLE around it like this: (10%) or (1).				
I	Over the PAST WEEK...	A	Over the PAST WEEK, how much has your tinnitus interfered with...	Did not interfere Completely interfered
1. What percentage of your time awake were you consciously AWARE OF your tinnitus? Never aware ► 0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100% ◀ Always aware		13. Your ability to HEAR CLEARLY? 0 1 2 3 4 5 6 7 8 9 10		
2. How STRONG or LOUD was your tinnitus? Not at all strong or loud ► 0 1 2 3 4 5 6 7 8 9 10 ◀ Extremely strong or loud		14. Your ability to UNDERSTAND PEOPLE who are talking? 0 1 2 3 4 5 6 7 8 9 10		
3. What percentage of your time awake were you ANNOYED by your tinnitus? None of the time ► 0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100% ◀ All of the time		15. Your ability to FOLLOW CONVERSATIONS in a group or at meetings? 0 1 2 3 4 5 6 7 8 9 10		
SC	Over the PAST WEEK...	R	Over the PAST WEEK, how much has your tinnitus interfered with...	Did not interfere Completely interfered
4. Did you feel IN CONTROL in regard to your tinnitus? Very much in control ► 0 1 2 3 4 5 6 7 8 9 10 ◀ Never in control		16. Your QUIET RESTING ACTIVITIES? 0 1 2 3 4 5 6 7 8 9 10		
5. How easy was it for you to COPE with your tinnitus? Very easy to cope ► 0 1 2 3 4 5 6 7 8 9 10 ◀ Impossible to cope		17. Your ability to RELAX? 0 1 2 3 4 5 6 7 8 9 10		
6. How easy was it for you to IGNORE your tinnitus? Very easy to ignore ► 0 1 2 3 4 5 6 7 8 9 10 ◀ Impossible to ignore		18. Your ability to enjoy PEACE AND QUIET? 0 1 2 3 4 5 6 7 8 9 10		
C	Over the PAST WEEK...	Q	Over the PAST WEEK, how much has your tinnitus interfered with...	Did not interfere Completely interfered
7. Your ability to CONCENTRATE? Did not interfere ► 0 1 2 3 4 5 6 7 8 9 10 ◀ Completely interfered		19. Your enjoyment of SOCIAL ACTIVITIES? 0 1 2 3 4 5 6 7 8 9 10		
8. Your ability to THINK CLEARLY? Did not interfere ► 0 1 2 3 4 5 6 7 8 9 10 ◀ Completely interfered		20. Your ENJOYMENT OF LIFE? 0 1 2 3 4 5 6 7 8 9 10		
9. Your ability to FOCUS ATTENTION on other things besides your tinnitus? Did not interfere ► 0 1 2 3 4 5 6 7 8 9 10 ◀ Completely interfered		21. Your RELATIONSHIPS with family, friends and other people? 0 1 2 3 4 5 6 7 8 9 10		
SL	Over the PAST WEEK...	22. How often did your tinnitus cause you to have difficulty performing your WORK OR OTHER TASKS, such as home maintenance, school work, or caring for children or others? Never had difficulty ► 0 1 2 3 4 5 6 7 8 9 10 ◀ Always had difficulty		
10. How often did your tinnitus make it difficult to FALL ASLEEP or STAY ASLEEP? Never had difficulty ► 0 1 2 3 4 5 6 7 8 9 10 ◀ Always had difficulty		E	Over the PAST WEEK...	
11. How often did your tinnitus cause you difficulty in getting AS MUCH SLEEP as you needed? Never had difficulty ► 0 1 2 3 4 5 6 7 8 9 10 ◀ Always had difficulty		23. How ANXIOUS or WORRIED has your tinnitus made you feel? Not at all anxious or ► 0 1 2 3 4 5 6 7 8 9 10 ◀ Extremely anxious or worried		
12. How much of the time did your tinnitus keep you from SLEEPING as DEEPLY or as PEACEFULLY as you would have liked? None of the time ► 0 1 2 3 4 5 6 7 8 9 10 ◀ All of the time		24. How BOTHERED or UPSET have you been because of your tinnitus? Not at all bothered or ► 0 1 2 3 4 5 6 7 8 9 10 ◀ Extremely bothered or upset		
		25. How DEPRESSED were you because of your tinnitus? Not at all depressed ► 0 1 2 3 4 5 6 7 8 9 10 ◀ Extremely depressed		

Figure 7. The Final version of the TFI questionnaire.

Tinnitus Primary Function Questionnaire (TPFQ)

New questionnaire for specifically evaluating the ways tinnitus affect a person's life has been developed by Tyler, et al., (2014). In 2003, the previous version of TPFQ was developed according to the earliest version. This version uses a 0-100 scale to value the questions which are asked the subjects; 0 indicated strongly disagree and 100 indicated agreement.

Please indicate your agreement with each statement on a scale from 0 (completely disagree) to 100 (completely agree).

#	Statement	0-100
Concentration		
1.	I feel like my tinnitus makes it difficult for me to concentrate on some tasks.	
2.	I have difficulty focusing my attention on some important tasks because of tinnitus.	
3.	My inability to think about something undisturbed is one of the worst effects of my tinnitus.	
Emotion		
4.	My emotional peace is one of the worst effects of my tinnitus.	
5.	I am depressed because of my tinnitus.	
6.	I am anxious because of my tinnitus.	
Hearing		
7.	My tinnitus masks some speech sounds.	
8.	In addition to my hearing loss, my tinnitus interferes with my understanding of speech.	
9.	One of the worst things about my tinnitus is its effect on my speech understanding, over and above any effect of my hearing loss.	
Sleep		
10.	I am tired during the day because my tinnitus has disrupted my sleep.	
11.	I lie awake at night because of my tinnitus.	
12.	When I wake up in the night, my tinnitus makes it difficult to get back to sleep.	

Figure 8. Iowa Tinnitus Primary Function Questionnaire (12-item) (Tyler, et al., 2014).

The TPFQ consists of four subscales, including concentration, emotions, hearing, and sleep. Scores from each subscale are added up, then divided by 4 to get a total score. There are two versions of the TPFQ questionnaire: 12 items (Figure 8) and 20 items (Figure 9) versions (Tyler, et al., 2014)

No.	Statement	0-100
Concentration		
1	When there are lots of things happening at once, my tinnitus interferes with my ability to attend to the most important thing.	
2	I feel like my tinnitus makes it difficult for me to concentrate on some tasks.	
3	I have difficulty focusing my attention on some important tasks because of tinnitus.	
4	My inability to think about something undisturbed is one of the worst effects of my tinnitus.	
5	I have trouble concentrating while I am reading in a quiet room because of tinnitus.	
Emotion		
6	My tinnitus is annoying.	
7	My emotional peace is one of the worst effects of my tinnitus.	
8	I am depressed because of my tinnitus.	
9	I am anxious because of my tinnitus.	
10	I just wish my tinnitus would go away. It is so frustrating.	
Hearing		
11	My tinnitus masks some speech sounds.	
12	The effects of tinnitus on my hearing are worse than the effects of my hearing loss.	
13	My tinnitus, not my hearing loss, interferes with my appreciation of music and songs.	
14	In addition to my hearing loss, my tinnitus interferes with my understanding of speech.	
15	One of the worst things about my tinnitus is its effect on my speech understanding, over and above any effect of my hearing loss.	
Sleep		
16	I have difficulty getting to sleep at night because of my tinnitus.	
17	The difficulty I have sleeping is one of the worst effects of my tinnitus.	
18	I am tired during the day because my tinnitus has disrupted my sleep.	
19	I lie awake at night because of my tinnitus.	
20	When I wake up in the night, my tinnitus makes it difficult to get back to sleep.	

Figure 9. Iowa Tinnitus Primary Function Questionnaire (20-Item Version)

CONCLUSION

As a common medical condition, tinnitus is a condition when the patients' exposure to unwanted noise can only be heard by the patient (subjective) or can be heard by the examiner (objective). The diagnostic procedures started from taking the history of the disorder, physical examination, audiology evaluation (pure tone audiometry, speech audiometry, tympanometry, electrocochleography, electronystagmo-graphy, auditory brainstem response, acoustic reflex, decay examination and tinnitogram). Quality of life evaluation in tinnitus patients is carried out using questionnaires. The common use of questionnaires included Tinnitus Handicap Inventory (THI), Tinnitus and Hearing Survey (THS), and Tinnitus Functional Index (TFI), and the recent use of the Tinnitus Primary Function Questionnaire (TPFQ). THI has been adapted into Indonesian and has been validated by WHO so that it is often used in Indonesia to assess the quality of life of tinnitus patients. Diagnosis and quality of life assessment in tinnitus patients are important to determine the appropriate therapy.

REFERENCES

- Atik, A. 2014. Pathophysiology and treatment of tinnitus: an elusive disease. *Indian Journal*, 66(1): 1–5. doi: 10.1007/s12070-011-0374-8.
- Baguley, D., McFerran, D., Hall, D. 2013. Tinnitus. *Lancet*, 382: 1600–7. doi: 10.1016/S0140-6736(13)60142-7.
- Bankstahl, U., Goertelmeyer, R. 2013. Measuring subjective complaints of attention and performance failures: Development and Psychometric. *Health & Quality of Life Outcomes*, 11(83): 86. doi: 10.1186/1477-7525-11-86.
- Bashiruddin, JE., Alviandi W., Reinaldi A., Safitri ED., Pitoyo Y., Ranakusuma RW. 2015. Validity and reliability of the Indonesian version of tinnitus handicap inventory. *Med J Indonesia*, 24(1): 36–42. doi: 10.13181/mji.v24i1.1193.
- Bhatt, J., Bhattacharyya, N., Lin, H. 2017. Relationships between tinnitus and the prevalence of anxiety and depression. *The Laryngoscope*, 127(2): 466–69. doi: 10.1002/lary.26107.
- Chari, D., & Limb, C. 2018. Tinnitus. *Medical Clinics of North America*, 102: 1081–93. doi: 10.1016/j.mcna.2018.06.014.
- Cima, R. F. F., Crombez, G., Vlaeyen, J. W. S. 2011. Catastrophizing and fear of tinnitus predict quality of life in patients with chronic tinnitus. *Ear and Hearing*, 32(5): 634–641. doi: 10.1097/AUD.0b013e31821106dd.
- Conrad, I., Kleinstäuber, M., Jasper, K., Hiller, W., Andersson, G., Weise, C. 2015. The changeability and predictive value of dysfunctional cognitions in cognitive behavior therapy for chronic tinnitus. *International Journal of Behavioral Medicine*, 22(2): 239–250. doi: 10.1007/s12529-014-9425-3.
- Emely, JW., Kathryn, F., Sandra, S., Jacqueline, S., Haula, H., Derek, JH. 2018. Why is tinnitus a problem? A qualitative analysis of problems reported by tinnitus patients. *Trends in hearing*, 22. doi: 10.1177/2331216518812250.
- Fackrell, K., Hall, DA., Barry, JG., Hoare, DJ. 2017. Performance of the tinnitus functional index as a diagnostic instrument in a UK clinical population. *Hearing Research*, 358: 74–85. doi: 10.1016/j.heares.2017.10.016.
- Hebert, S. and Fournier, P. 2017. Clinical validation of a new tinnitus assessment technology. *Frontiers in Neurology*, 8: 38. doi: 10.3389/fneur.2017.00038.
- Henry, JA., Griest, S., Zaugg, TL., Thielman, E., Kaelin, C., Galvez, G. 2015. Tinnitus and hearing survey: a screening tool to differentiate bothersome tinnitus from hearing difficulties. *American Journal of Audiology*, 24: 66–77. doi: 10.1044/2014_AJA-14-0042.
- Langguth, B., Biesinger, E., Del, Bo L, De., Ridder D., Goodey, R., Herraiz, C. 2011. Algorithm for the diagnostic and therapeutic management of tinnitus. *Textbook of Tinnitus*, 46: 381–5. doi: 10.1007/978-1-60761-145-5_46.
- Langguth, B., Kreuzer, PM., Kleinjung, T., De Ridder, D. 2013. Tinnitus: causes and clinical management. *Lancet Neurology*, 12: 920–30. doi: 10.1016/S1474-4422(13)70160-1.
- Lee, D., Lee, J., and Kim, Y. 2017. Management of tinnitus in children: review of literature and effect of counseling. *Auris Nasus Larynx*, 45(4): 667–72. doi: 10.1016/j.anl/2017.09.002.
- Meikle, M., Henry, JA., Griest, SE., Stewart, BJ., Abrams, HB., McArdle, R. 2012. The tinnitus functional index: development of a new clinical measure for chronic, intrusive tinnitus. *Ear & Hearing*, 33: 153–76. doi: 10.1097/AUD.0b013e318222f67c0.
- Newman, C., Jacobson, G. and Spitzer, J. 1996. Development of the tinnitus handicap inventory. *Archives of Otolaryngology – Head and Neck Surgery*, 122(2): 143–8. doi: 10.1001/archotol.1996.01890140029007.
- Ryu, EW., Kwon, C., Park, CE., Byun, JY., Yeo, SG., Park, MS. 2011. Possibility of discriminating the presence of tinnitus through repeated tinnitograms. *Korean Journal Audiology*, 15: 119–23.
- Salviati, M., Macrì, F., Terlizzi, S., Melcore, C., Provenzano, A., Capparelli, E. 2012. The tinnitus handicap inventory (THI) as a screening test for psychiatric comorbidity in patients with tinnitus. *Psychosomatics*, 54: 248–56. doi: 10.1016/j.psych.2012.05.007.
- Tunkel, DE., Bauer, CA., Sun, GH., Rosenfeld, RM., Chandrasekhar, SS., Cunningham, ER. 2014. Clinical practice guideline: tinnitus. *Otolaryngology - Head and Neck Surgery*, 151: 1–40. doi:

- 10.1177/0194599814545325.
- Tyler, R., Ji, H., Perreau, A., Witt, S., Noble, W., Coelho, C. 2014. Development and validation of the tinnitus primary function questionnaire. *American Journal of Audiology*, 23(3): 260–72. doi: 10.1044/2014_AJA-13-0014.
- Yang, C., and Byun, J. 2016. Tinnitus assessment. *Hanyang Medical Reviews*, 36: 109–12. doi: 10.7599/hmr.2016.36.2.109.
- Zeman, F., Koller, M., Figueiredo, R., Aazevedo, A., Rates, M., Coelho, C. 2011. Tinnitus handicap inventory for evaluating treatment effects: which changes are clinically relevant. *Otolaryngology-Head and Neck Surgery*, 145(2): 282–7. doi: 10.1177/0194599811403882.