The Journal of Laryngology & Otology (2014), ***128***, *660–664*.

doi:10.1017/S0022215114001030

REVIEW ARTICLE

Tinnitus and its association with psychiatric disorders: systematic review

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Abstract

Objectives: To systematically review the literature on the occurrence of psychiatric diagnoses in a tinnitus-affected population, and correlate the presence of psychiatric disorders with tinnitus-related annoyance and severity.

Method: A systematic review of the literature published between January 2000 and December 2012 was performed using PubMed, ISI Web of Science and SciELO databases. Original articles in English and Portuguese that focused on the diagnosis of mental disorders associated with tinnitus, especially anxiety and depression, were identified.

Results: A total of 153 articles were found and 16 were selected. Fifteen articles showed a high prevalence of psychiatric disorders in tinnitus-affected patients, and nine showed a high correlation between the presence of a psychiatric disorder and tinnitus-related annoyance and severity.

Conclusion: The prevalence of psychiatric disorders, especially anxiety and depression, is high in tinnitus patients, and the presence of these disorders correlates with tinnitus-related annoyance and severity.

Key words: Tinnitus; Mental Disorders; Psychology

Introduction

Tinnitus is a symptom defined as the perception of sound in the ears or head when no outside sound is present. It can be divided into subjective and objective types. Tinnitus is considered objective when it is audible to another person besides the patient; this type is much less common than subjective tinnitus. The symptom affects approximately 15 per cent of the population worldwide.[1] Although tinnitus may occur at any time in life, most patients are aged between 40 and 80 years, and prevalence rises to 33 per cent in patients aged over 60 years.[2]

Tinnitus has been associated with a variety of psychological and psychiatric disorders.[3–6] Studies show that 48–60 per cent of patients with chronic tinnitus who are annoyed by the symptom have an associated diagnosis of major depression.[7,8] Simpson *et al.* observed psychiatric diseases in 46 per cent of patients with tinnitus.[9] In a study by Zoger *et al.*, 45 per cent of tinnitus patients were found to have anxiety disorders.[10]

Many other studies show a strong correlation between tinnitus severity and psychological and psychiatric problems such as mood disorders, reduced concentration, irritability and loss of control.[10–17] Most studies indicate a relationship between tinnitus annoyance and the presence of certain psychiatric diagnoses and specific personality traits.[4,11,18–20] Unterrainer *et al.* described depression and tinnitus intensity as the best predictors of the perception of tinnitus severity and of consequent annoyance.[4]

Langguth *et al.* confirmed the importance of anxiety and depression as predictors of tinnitus severity using the Tinnitus Handicap Inventory.[20] The relationship between certain personality traits, depressive mood and tinnitus severity is highly relevant to the diagnosis of tinnitus and to the prognosis in terms of the degree of handicap related to tinnitus.[20,21] Depression frequently occurs with tinnitus[8] and usually increases the functional handicap of affected patients.[22]

It is important to identify and adequately treat the mental disorders associated with tinnitus because these disorders might greatly affect a patient's quality of life. The present study aimed to systematically review the literature on the occurrence of psychiatric diagnoses in the tinnitus-affected population, and to correlate the presence of a psychiatric disorder with tinnitus-related annoyance and severity.

Accepted for publication 13 October 2013 First published online 17 July 2014

Materials and methods

In order to select articles for this review, electronic searches of PubMed, ISI Web of Science and SciELO databases were performed. Only those studies published between January 2000 and December 2012, and which utilised the most common psychiatric diagnosis criteria and tinnitus annoyance measurements, were included. The search revealed a total of 153 articles. The terms used as keywords were 'tinnitus', 'psychiatric', 'mental disorders' and 'psychological'. The terms were matched to generate a more specific search.

The main requirement for article inclusion was the presentation of original research on psychiatric disorders and tinnitus, with a focus on the diagnosis of anxiety and/or mood disorders. The research participants had to be aged over 18 years and tinnitus had to be present for at least 3 months. Only articles evaluating patients with subjective tinnitus were included. Studies that included psychosis cases, or patients with personality or somatoform disorders, were excluded. Other exclusion criteria were: patients who presented with tinnitus related to acute and chronic otitis media, outer-ear diseases, or conductive or mixed hearing losses; patients who had undergone ear surgery; patients with Ménière's disease, somatosensory tinnitus or tinnitus related to metabolic diseases; and studies that evaluated only psychological aspects rather than psychiatric diagnoses or symptoms.

Only papers written in English or Portuguese were included in the final selection. Review articles, book chapters, dissertations and letters to the editor were excluded.

Manual searches of the selected articles were performed. Ultimately, 16 papers were chosen for inclusion in this review.

Results

For psychiatric evaluation, many studies ($n = 9$) used more than one scale to define the symptoms and diagnose the patients. The most common questionnaires used were: the Structured Clinical Interview for the Diagnostic and Statistical Manual for Mental Disorders ('DSM') edition III or IV ($n = 5$); the Hospital Anxiety and Depression Scale ($n = 5$); the Beck Depression Inventory ($n = 5$); or the Mini International Neuropsychiatric Interview ($n = 2$). Only one article used the Beck Anxiety Inventory. Other instruments used were: the Hopkins Symptoms Checklist, the Comprehensive Psychopathological Rating Scale, the Toronto Alexithymia Scale, the State–Trait Anxiety Inventory, the Symptom Checklist 90 Revised, the Anxiety Sensitivity Index, the Composite International Diagnostic Interview Short Form, the Maudsley Obsessional Compulsive Inventory and a self-rating depression scale.[6,10–17,23–29]

When evaluating tinnitus severity and impact on quality of life, six studies used the Tinnitus Handicap Inventory, two used the Tinnitus Severity Questionnaire and two used the Tinnitus Reaction Questionnaire. The other scales used were the Nottingham Health Profile and the Tinnitus Severity Index. Several studies simply evaluated the prevalence of psychiatric disorders in patients with tinnitus versus those with no tinnitus. Some studies devised a specific self-completion questionnaire or used a semi-structured interview technique.

Fifteen of the 16 reviewed studies indicated a high prevalence of psychiatric diagnoses in patients with tinnitus. Nine of the studies showed a significant correlation between the presence and severity of these psychiatric disorders and the severity and annoyance of tinnitus; that is, the presence of co-morbid psychiatric disorders worsened the prognosis of tinnitus-related disability.

Bartels *et al*. evaluated 265 tinnitus patients using the Hospital Anxiety and Depression Scale, and found that 41 per cent had no psychiatric symptoms.[23] Of the patients with psychiatric symptoms, 10.2 per cent had anxiety only, 9.8 per cent had depression only, and 39.2 per cent had depression plus anxiety. The researchers concluded that concurrent anxiety and depression have an additive effect, which reduces patients' general and tinnitus-specific health-related quality of life and increases maladaptive coping mechanisms.

Malakouti *et al*. found a high prevalence of at least one axis I lifetime psychiatric diagnosis (of the Diagnostic and Statistical Manual of Mental Disorders) in tinnitus patients (56 per cent prevalence in male patients *vs* 69 per cent in female patients; $p = 0.01$).[6] The most prevalent disorders were anxiety and major depression. The frequency of major depression, anxiety and somatoform disorders was significantly higher in females than in males ($p < 0.01$). In total, 75 per cent of women received a severe score on the Tinnitus Handicap Inventory compared with 63.9 per cent of men. With regard to psychiatric diagnoses or symptoms, the study showed no significant association between Tinnitus Handicap Inventory scores and the presence of mental disorders.

A study by Salonen *et al*. was the only one to examine alexithymia in tinnitus patients.[14] The researchers observed that those participants with tinnitus who were not annoyed by it were most commonly alexithymic (odds ratio = 2.2, 95 per cent confidence interval (CI) = 1.3–3.6) with a high Toronto Alexithymia Scale score. The patients who were annoyed by their tinnitus were also commonly alexithymic when compared with the patients without tinnitus (odds ratio = 1.7, 95 per cent CI = 1.0–2.9), and had a high Toronto Alexithymia Scale score, although the score was lower than for the non-annoyed group. Depression was associated with severe tinnitus among women in a pairwise analysis, but this association disappeared in a multivariate analysis. Overall, there was an association between alexithymia and tinnitus, but a detailed analysis showed

https://doi.org/10.1017/S0022215114001030 Published online by Cambridge University Press

that alexithymia was not helpful in explaining tinnitus annoyance.

A study by Ooms *et al.*, in which136 patients were evaluated using the Beck Depression Inventory and Tinnitus Handicap Inventory, found depressive symptoms in 16.9 per cent of patients with mild tinnitus, in 10.3 per cent of those with moderate tinnitus and in 5.9 per cent of severe tinnitus patients.[24] Of the patients with severe tinnitus, 17.2 per cent reported severe depressive symptoms. No patients with catastrophic tinnitus reported severe depressive symptoms. The Tinnitus Handicap Inventory and Beck Depression Inventory scores were significantly correlated. To check whether the correlation could be explained by content overlap, a linear regression was performed with Tinnitus Handicap Inventory scores as the dependent variable and scores on the three subscales of the Beck Depression Inventory II as the independent variables. Only the somatic depression subscale significantly predicted subjective tinnitus severity. The authors suggested that the relationship between depression and tinnitus is far less obvious than is currently assumed. It is important to distinguish between somatic symptoms that are a consequence of tinnitus and somatic symptoms that are indicators of depression.

One study by Folmer *et al*. specifically evaluated the influence of obsessive-compulsive disorder on tinnitus patients. The authors found that a high Maudsley Obsessional Compulsive Inventory score correlated with high values for tinnitus loudness and high scores on the Tinnitus Severity Index.[16] A study by Andersson *et al*. found a very high prevalence of psychiatric disorders in tinnitus patients, particularly obsessive-compulsive disorder, which was present in 83 per cent of tinnitus patients.[26]

A Brazilian study by Mathias *et al*. also found a very high prevalence of at least one psychiatric diagnosis in tinnitus patients (82 per cent of the patients fulfilled the criteria).[25] Forty per cent of the patients had panic disorder, 40 per cent had depression and 34 per cent had generalised anxiety disorder.

A summary of the articles included in this review is presented in Table I.

Discussion

In this study, only auditory tinnitus related to sensorineural hearing loss was considered, and not tinnitus associated with specific ear disease, to make the sample homogeneous with respect to the cause of tinnitus and behaviour of affected patients. Our review focused on the diagnosis (not the symptoms) of axis I psychiatric disorders, according to the Diagnostic and Statistical Manual for Mental Disorders edition III or IV and the International Classification of Diseases version 10. Our exclusion criteria were based on these specifications.

Most of the studies included in this review revealed a clear correlation between tinnitus severity and the presence of psychiatric disorders; there was a high prevalence of such disorders and symptoms in tinnitus patients.[10–17] Most patients were affected by mood disorders, especially depression and anxiety disorders.[6,10–15,17,23,25–29] However, many other psychiatric disorders and symptoms may be present, and these may significantly affect tinnitus severity. Thus, there may be a cause-and-effect relationship between tinnitus and psychiatric disorders. However, despite the high rate for tinnitus coinciding with mental disorders, especially depression and anxiety, a cause cannot be directly established. Severe tinnitus may cause psychological discomfort; alternatively, the presence of depression and anxiety may reduce an individual's tolerance of tinnitus, leading to exaggeration of the symptoms.[6]

Tinnitus is a significant cause of stress, and those affected by tinnitus may react differently depending on their vulnerability to stress. Tinnitus sufferers may have a particular vulnerability to the stress impact of the tinnitus sound.[6] Vulnerability to stress could be genetic, and there could be a shared neurobiological pathway influencing the development of both depression and tinnitus.[6,10] Co-morbid mental disorders are likely to be the most important factors affecting the disability and suffering of tinnitus patients, as indicated by the articles described in this review.[10] Besides coexisting psychiatric disorders, only tinnitus intensity seems to significantly contribute to tinnitus-related annoyance. Degree of hearing loss does not seem to correlate with tinnitus severity, as evaluated by the Tinnitus Handicap Inventory.[30] A vicious cycle is usually established in tinnitus patients: tinnitus causes and exacerbates stress, and stress causes and worsens tinnitus. Tinnitus may not always be the starting point of this cycle. Many tinnitus patients have experienced a certain degree of anxiety and depression prior to the onset of the symptom. However, tinnitus can increase the severity of existing psychological disorders or tendencies.[16] Hence, tinnitus can cause or be caused by psychiatric disorders, and it is often difficult to know what came first. When tinnitus and psychiatric disorders coexist, both conditions should be treated in order to achieve the best results in terms of patients' quality of life.

Placebos appear to have a strong effect on tinnitus; nearly 40 per cent of tinnitus patients treated with a placebo showed improvement in tinnitus-related quality of life.[31] This supports the important modulatory role that psychological factors have in shaping perceptions of tinnitus and increasing the associated distress.

In the early 1990s, Jastreboff and Hazell reported on the major role of abnormal activation in the limbic system and autonomic nervous system in patients who were annoyed and often completely handicapped by tinnitus.[2] This role reflects the mechanism underlying the difference between the 80 per cent of patients who only experience tinnitus and the 20 per cent who suffer from tinnitus. Again, the relationship between tinnitus and emotions is well described.

https://doi.org/10.1017/S0022215114001030 Published online by Cambridge University Press

TABLE I
SUMMARY OF STUDIES INCLUDED IN THE REVIEW

Author (year)	Patients (*n*)	Tinnitus evaluation	Psychiatric evaluation	Results
Hérbert *et al.*[12] (2012)	6215	Self-completion questions	Hopkins Symptoms Checklist	Depression co-varied with tinnitus prevalence & severity over time
Ooms *et al.*[24] (2011)	136	THI	BDI	17.2% of patients with severe tinnitus had severe depressive symptoms; only somatic depression subscale predicted subjective tinnitus severity
Oishi *et al.*[17] (2011)	285	THI	SDS, STAI	High depressive symptoms, high trait & state anxiety in tinnitus patients; correlation between THI & depressive symptoms
Malakouti *et al.*[6] (2011)	400	THI	SCID for DSM III	High prevalence of lifetime psychiatric diagnoses in tinnitus patients (major depression & anxiety); no correlation between psychiatric diagnosis & THI
Mathias *et al.*[25] (2011)	50	THI	MINI 5.0	82% of tinnitus patients fulfilled criteria for at least 1 psychiatric diagnosis; 40% had panic disorder & 40% had major depression
Crocetti *et al.*[15] (2009)	108	THI, VAS	STAI (trait assessment only), BDI	Patients with at least moderate tinnitus had more significant anxiety symptoms; significant correlation between THI & BDI
Belli *et al.*[27] (2008)	180	Presence or absence of tinnitus	DSM III, BDI, BAI, SCL-90-R	Significantly higher anxiety & depression in tinnitus patients; anxiety disorders were most prevalent, followed by major depression
Folmer *et al.*[16] (2008)	196	TSI	MOCI, abbreviated BDI, SAI	High correlation between tinnitus severity & SAI & abbreviated BDI scores; high MOCI scores were associated with high values for tinnitus loudness & TSI
Bartels *et al.*[23] (2008)	265	TRQ, THI	HADS	41% of tinnitus patients had no psychiatric symptoms, 39% had anxiety + depression, 10.2% had anxiety only & 9.8% had depression only; depression + anxiety affected tinnitus severity
Adoga *et al.*[29] (2008)	92	Presence of tinnitus	HADS	17.4% of tinnitus patients had depression & 22.8% had anxiety; considered important to evaluate mental health in tinnitus treatment
Salonen *et al.*[14] (2007)	583	No tinnitus, tinnitus without annoyance or tinnitus with annoyance	TAS-20, BDI	High alexithymia, less tinnitus annoyance; high depression associated with high tinnitus annoyance
Zoger *et al.*[10] (2006)	224	Nottingham Health Profile, TSQ	DSM III, HADS, CPRSA	High risk for disabling tinnitus, high presence of current major & minor depression
Holgers *et al.*[11] (2005)	127	TSQ	SCID (patient edn)	Severe tinnitus sufferers presented with high anxiety
Reynolds *et al.*[13] (2004)	55	TQ	HADS	High prevalence of anxiety in tinnitus patients; direct correlation between severity of tinnitus & anxiety
Andersson *et al.*[26] (2004)	48	TRQ	HADS, ASI, CIDI-SF	High prevalence of psychiatric disorders in tinnitus patients, mostly OCD (83%), depression (69%) & social phobia (64%)
Marciano *et al.*[28] (2003)	75	Semi-structured questionnaire	DSM IV, MINI	71% of tinnitus patients had psychiatric disorders, mostly depression & anxiety

THI = Tinnitus Handicap Inventory; BDI = Beck Depression Inventory; SDS = self-rating depression scale; STAI = State–Trait Anxiety Inventory; SCID = Structured Clinical Interview for DSM Disorders; DSM = Diagnostic and Statistical Manual for Mental Disorders; MINI = Mini International Neuropsychiatric Interview; VAS = visual analogue scale; BAI = Beck Anxiety Inventory; SCL-90-R = Symptom Checklist 90 Revised; TSI = Tinnitus Severity Index; MOCI = Maudsley Obsessional Compulsive Inventory; SAI = State Anxiety Inventory; TRQ = Tinnitus Reaction Questionnaire; HADS = Hospital Anxiety and Depression Scale; TAS-20 = Toronto Alexithymia Scale; TSQ = Tinnitus Severity Questionnaire; CPRSA = Comprehensive Psychopathological Rating Scale; edn = edition; TQ = Tinnitus Questionnaire; ASI = Anxiety Sensitivity Index; CIDI-SF = Composite International Diagnostic Interview Short Form; OCD = obsessive-compulsive disorder

Currently, most work with tinnitus patients is based on a multidisciplinary approach, with collaboration between the otolaryngologist, the audiologist and mental health professionals.

The studies described vary greatly in terms of the instruments used to assess the impact that tinnitus has on patients' lives and to evaluate psychiatric diagnoses and symptoms. This variation could interfere with comparisons between the studies. Moreover, certain instruments used in psychiatric evaluation can determine a psychiatric diagnosis, whereas others demonstrate only the presence of psychiatric symptoms. In our opinion, although the Structured Clinical Interview is the 'gold standard', the Mini International Neuropsychiatric Interview could be a good tool as this instrument determines a psychiatric diagnosis and is an easy scale to be trained on. When evaluating the impact that tinnitus has on a patient's life, the Tinnitus Handicap Inventory is the questionnaire recommended by the Tinnitus Research Initiative because this instrument has been translated into the greatest number of languages.

Conclusion

After evaluating the reviewed articles, we conclude that the prevalence of psychiatric disorders, especially anxiety and depression, is high in tinnitus patients. Furthermore, the presence of these disorders correlates with tinnitus severity and tinnitus-related annoyance, impacting further on patients' quality of life.

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Dr P C L Pinto takes responsibility for the integrity of the content of the paper
Competing interests: None declared