



Tinnitus prevalence and care experience among population of Almaty city

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ABSTRACT

The prevalence of tinnitus is increasing worldwide along with the aging population. The absence of a gold standard for diagnosis and treatment makes it difficult to assess the health status of a patient with tinnitus.

The aim was to determine the prevalence of tinnitus among older adults in Almaty city and to evaluate the healthcare experience among the respondents who received treatment for tinnitus.

Methods: A cross-sectional study was conducted among people aged 18 years and above in Almaty city. The data were collected using a questionnaire sent via a Google form and/or as a printed version. Fully completed responses were received from 851 respondents. The questionnaire consists of 31 questions. Simple and multiple logistic regression analyses were performed to identify the risk factors of tinnitus.

Results: The prevalence of tinnitus in Almaty was 23.3%. The data showed that smoking and sleep regimen were associated with tinnitus. Older respondents indicated more symptoms associated with tinnitus than younger respondents did. Additional consultation was needed as part of the treatment of tinnitus. In addition, 49.4% of the respondents indicated a need of a support group for people with tinnitus. The respondents also indicated that the access to appropriate resources for the treatment of tinnitus was poor.

Conclusion: Similar to other studies, this analysis confirmed that tinnitus is prevalent in the adult population of Almaty city. Future activities should include measures for the improvement of public awareness of the risk factors of tinnitus, and multidisciplinary teamwork among healthcare specialists should be improved.

1. Introduction

Tinnitus is a symptom characterized by the presence of acoustic sensations in patients in the absence of an internal or external source of sound (Levine and Oron, 2015). Dirk De Ridder and co-authors noted that chronic tinnitus could be considered an independent primary disorder (De Ridder et al., 2021).

Various sources report different etiologies of tinnitus, which may be associated with otologic and neurological disorders such as hearing loss, otitis media, head trauma, etc. Another cause may be associated with excessive use of drugs as well as anatomical problems (e.g., obstruction of the Eustachian tube, etc.) (Folmer et al., 2004). Moreover, the identified main risk factors of tinnitus are age, sleeping time, and psychological disorders (Tang et al., 2019; Park et al., 2014). Noise exposure, either short- or long-term, also contributes to the occurrence of tinnitus (Park et al., 2014).

Over the last decade, an increase in research related to tinnitus has been noted, particularly on its prevalence. However, there are few studies on tinnitus done in developing countries (McCormack et al., 2016). The gGlobal prevalence of tinnitus in the adult population was found to be around 4.1%–37.2%, and the pooled incidence rate of any tinnitus was 1164 cases per 100,000 person-years (Jarach et al., 2022). Such a large difference in the prevalence of tinnitus is related to the different approaches used by the authors.

The complexity of managing the health of patients with tinnitus is due to the absence of a unified gold standard for diagnosis and treatment (Henry, 2016). Currently, several guidelines for the treatment of tinnitus developed by international experts are used (Cima et al., 2019; Ogawa et al., 2020; Tunkel et al., 2014). Cognitive behavioral therapy was found to be a proven method of treatment (Cima et al., 2019; Ogawa et al., 2020; Tunkel et al., 2014; Langguth et al., 2023). When feeling constant ringing in the ears, people with this symptom begin to

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experience psychological discomfort or depression (Seo et al., 2016). Consequently, these people's quality of life is reduced (Seo et al., 2016). In addition, guidelines suggest using different types of questionnaires for patients with tinnitus, such as the Tinnitus Functional Index or the Tinnitus Sample Case History Questionnaire. These questionnaires help to study the effectiveness of treatment and the quality of life, and also assist in detecting anxiety or depression (Maldonado Fernández et al., 2017).

Knowledge of the prevalence of tinnitus will allow healthcare workers to revise strategies to identify and provide care to patients with tinnitus, as well as to develop activities to work with risk factors. The management and treatment of patients with tinnitus requires a multidisciplinary approach. It is important that general practitioners and otolaryngologists, as well as neurologists, pay attention to data on the prevalence of tinnitus in order to identify the symptoms of a patient timely. According to the data provided by studies, so far there have been no studies on the prevalence of tinnitus in Kazakhstan. The aim of our study was to determine the prevalence of tinnitus of Almaty city population aged 18 years and above and to evaluate the healthcare experience among the respondents who received treatment for tinnitus.

2. Materials and methods

2.1. Study population and data collection

A cross-sectional study was conducted among people over 18 years of age in Almaty city. The data were collected using a questionnaire sent via a Google form and/or by providing a printed version, depending on the preference of the respondents. The mailing was carried out through WhatsApp, which is a commonly used communication channel in Almaty city. Data collection was carried out at primary health care (PHC) facilities located in seven territorial districts of Almaty city in person (individually). The distribution of the number of respondents for data collection from each district in Almaty was unified, based on the registered number of the districts' population. The survey was conducted randomly among residents above 18 years of age.

In 2021, the number of residents over 18 years of age in Almaty city was 1,324,721. The sample size was calculated from the population with 5% accuracy, 95% confidence interval, and 40% increase in potential loss. Initially, the sample size was estimated at 883 people. After processing the data, complete responses from 851 respondents were included in the study, of which 199 (23.3%) experienced tinnitus symptoms most or all the time.

The questionnaire consisted of 31 questions, including the demographic section (age, level of education, social status, and marital status), the presence of risk factors (smoking, alcohol use, and sleep regimen), and possible tinnitus. In compiling the survey, we relied on previous studies conducted by other researchers (Biswas et al., 2021; Rademaker et al., 2021; Chamouton and Nakamura, 2021; Kim et al., 2015; Husain et al., 2018). The questionnaire was developed by otolaryngologists and public health specialists. The questionnaire was assessed by two independent clinical experts. Subsequently, the questionnaire was presented to 10 respondents of different age to determine the readability and clarity of the questions. Based on the results, minor adjustments were made to the questionnaire. In the second stage, the questionnaire was submitted to another group of 10 respondents, from whom no comments were received. The questionnaire was developed in both the Kazakh and the Russian languages. In addition, the questionnaire was reviewed by the Local Ethical Commission and was approved for the study. The questionnaire also included contact details of the researcher, so that the respondent could communicate with him if questions arose.

All participants were first asked if they had experienced tinnitus during the past year. Tinnitus was described as the following: ringing in the ears is a ringing, buzzing, roaring, or hissing sound without an external sound source. This can last for a very short time or the whole

day. If the participants answered yes to this question, they continued to answer the following questions, which included the duration of the noise, the period, the cause of the tinnitus, the symptoms, and the experience with receiving health care.

In order to study the presence of tinnitus symptoms in respondents, three response options were presented (yes, no, did not notice), although Table 3 includes only the "yes" answers of the respondents.

The importance of consultation, participation in a support group, resources for treatment, and treatment effectiveness were assessed on a 5-point Likert scale. The results are presented in Table 4.

2.2. Research variables

The measure of occurrence was assessed by the ratio of the number of people with complaints of tinnitus to the total number of the respondents. The main predictor variables were sex, age, education, social status, sleep duration, smoking and alcohol consumption and their relationship with tinnitus, and tinnitus characteristics (yes/no) defined as qualitative variables.

2.3. Statistical analysis

The variables investigated were subjected to descriptive analysis. The significance of the association between qualitative variables and the measure of occurrence and the presence or absence of tinnitus was determined by the chi-square (χ^2) test. The variables showing a significant association with the measure of occurrence ($p < 0.05$) were subjected to a logistic regression model to identify possible confounders of the association and also to identify the factors that were most strongly associated with the presence and degree of annoyance caused by tinnitus. Confidence intervals of 95% were also calculated for the estimates produced (e.g., the prevalence of tinnitus).

3. Results

3.1. Prevalence of tinnitus in Almaty city population

Among the 851 participants over 18 years of age, 199 (23.3%) had experienced tinnitus the previous year. The presence of tinnitus most of the time or sometimes prevailed in respondents over the age of 55 years. Respondents with tinnitus smoked every day or rarely, and also consumed alcohol ($p < 0.001$). The duration of sleep for all was within the normal range of 7–8 h (Table 1).

3.2. Simple logistic regression analysis of risk factors of tinnitus

Sex was significantly associated with tinnitus (OR = 1.49, $p = 0.008$). According to our data, young people were more likely to develop tinnitus in the future. Smoking was also associated with tinnitus (quit (>1year), OR = 1.52; smoking rarely, OR = 3.51; and smoking every day, OR = 18.64). Alcohol consumption was inversely associated with tinnitus (drinking four or more times per week, OR = 0.3; drinking 2–3 times per week, OR = 0.04; drinking 2–4 times per month, OR = 0.07; drinking once per month, OR = 0.14; drinking less than once per month, OR = 0.28). Compared to respondents who slept ≤ 6 h, those who slept 7–8 h had a higher risk of tinnitus (OR = 2.12). Compared to respondents with higher levels of education, the lowest level of education was inversely associated with tinnitus (unfinished school, OR = 0.37; university, OR = 0.1; trade school, OR = 0.06). Tinnitus was more common among employed people than among housewives (OR = 0.18) or retired individuals (OR = 0.52) (Table 2).

3.3. Multiple logistic regression analysis of risk factors of tinnitus

Neither sex nor occupation were associated with tinnitus. Compared to nonsmokers, study participants who quit smoking more than 1 year

Table 1
Prevalence and severity of tinnitus.

Have you heard any ringing, buzzing, or other sounds without an external or internal source during the last year?		Yes, most of or all the time	Yes, sometimes	Do not know/no, never at all	Total	P =
		199 (23.3%)	194 (22.7%)	458 (53.8%)	851 (100.0%)	
Sex	Male	114 (58.5%)	101 (52.3%)	211 (46.2%)	426 (50.0%)	0.013
	Female	81 (41.5%)	92 (47.7%)	246 (53.8%)	419 (49.2%)	
	No data	–	–	–	6 (0.8%)	
Age (years)	18–44	6 (3.0%)	51 (26.3%)	93 (20.3%)	150 (17.6%)	<0.001
	45–54	32 (16.1%)	39(20.1%)	110 (24.0%)	181 (21.3%)	
	55–64	90 (45.2%)	66 (34.0%)	193 (42.1%)	349 (41.0%)	
	over 65	71 (35.7%)	38 (19.6%)	62 (13.5%)	171 (20.1%)	
	Quit smoking (>1 year)	39 (19.6%)	34 (17.8%)	21 (4.6%)	94 (11.1%)	
Smoke rarely	71 (35.7%)	85 (44.5%)	68 (14.9%)	224 (26.5%)		
Smoke every day	82 (41.2%)	32 (16.8%)	115 (25.2%)	229 (27.1%)		
Do not smoke	7 (3.5%)	40 (20.9%)	252 (55.3%)	299 (35.3%)		
Alcohol consumption	Less than 1 time per month	18(9.0%)	26(13.5%)	30(6.6%)	74(8.7%)	<0.001
	1 time per month	25 (12.6%)	28 (14.5%)	18 (3.9%)	71 (8.4%)	
	2-4 times a month	44 (22.1%)	27 (14.0%)	12 (2.6%)	83 (9.8%)	
	2-3 times a week	51 (25.6%)	4 (2.1%)	5 (1.1%)	60 (7.1%)	
	More than 4 times a week	9 (4.5%)	2 (1.0%)	8 (1.7%)	19 (2.2%)	
	Do not use	52 (26.1%)	106 (54.9%)	385 (84.1%)	543 (63.9%)	
Sleep duration	Less than 6 h	34 (17.7%)	49 (28.0%)	59 (13.3%)	142 (17.5%)	<0.001
	7–8 h	133 (69.3%)	109 (62.3%)	364 (82.0%)	606 (74.7%)	
	More than 9 h	25 (13.0%)	17 (9.7%)	21 (4.7%)	63 (7.8%)	
Level of education	Incomplete secondary	15 (7.6%)	19 (9.9%)	4 (0.9%)	38 (4.5%)	<0.001
	Complete secondary	59 (29.9%)	46 (24.1%)	22 (4.8%)	127 (15.0%)	
	Secondary special (trade school, etc.)	28 (14.2%)	36 (18.8%)	49 (10.7%)	113 (13.4%)	
	Higher (university)	95 (48.2%)	90 (47.1%)	381 (83.6%)	566 (67.1%)	
Social status	Employed	105 (53.0%)	107 (55.4%)	334 (73.1%)	546 (64.4%)	
	Housewife	16 (8.1%)	36 (18.7%)	15 (3.3%)	67 (7.9%)	
	Retired	76 (38.4%)	38 (19.7%)	94 (20.6%)	208 (24.5%)	
	Student(s)	1 (0.5%)	12 (6.2%)	14 (3.1%)	27 (3.2%)	

before, those who smoked rarely, and every day smokers had higher AORs (1.48, 3.52, 13.62, respectively). Compared with participants who slept ≤6 h, participants who slept 7–8 h had higher AORs (1.50). Education level was also associated with tinnitus (Table 2).

3.4. Tinnitus symptoms and care: experience of Almaty city respondents

Respondents aged 55–64 years most often had all five symptoms associated with tinnitus (headache, sleep disturbance and difficulty in sleeping, deterioration of social performance, disruption of habitual lifestyle, and deterioration of professional activity), while younger (45–54 years of age) respondents indicated the presence of headache and disruption of habitual lifestyle. Sleep disturbance and difficulty sleeping as well as a deterioration of social activities were observed among people over 55 years of age (Table 3). Moreover, respondents over 55 years of age experienced worry due to hearing loss (p < 0.001), anxiety (p < 0.001), hyperacusis (p < 0.001), insomnia (p < 0.001), and depression (p < 0.001).

Patients over 55 years of age defined success of tinnitus treatment as a reduction of the volume of tinnitus or its elimination, partial relief, a decreased awareness or dependence on the condition, and also stress/anxiety relief. In the group of the participants aged 55–64 years, success was marked by getting used to the noise and confirming that tinnitus was not a threat, while among patients over 65 years of age, temporary relief from tinnitus and change in sound quality with tinnitus was noted as a success marker (Table 3).

The largest number of the respondents noted the importance of consultation as part of the treatment of tinnitus (64.2% of them answered “good” or “best”). In addition, 49.4% of the respondents considered that participation in a support group for people with tinnitus was useful, while 30.2% of them chose the “average” answer, which is possibly due to the uncertainty of the function of this group (Table 4).

A low score was given to access to appropriate resources for the treatment of tinnitus. The largest number of the respondents evaluated the treatment and management of the tinnitus by healthcare professionals as “average”, although a higher score was given, in contrast,

to the previous question regarding satisfaction of the medical staff with the results of the treatment and the provision of sufficient time to the patient. Finally, 59.3% of the respondents rated the treatment outcome as “good”, while the remaining 23.6% rated it as “satisfactory” (Table 4).

4. Discussion

The prevalence of tinnitus in Almaty city was higher than in the USA, where it was found to be 9.6% (Bhatt et al., 2016). In European countries, it was 14.7% (Biswas et al., 2021), in South Korea, 19.7% (Park, Lee et al., 2014), and in New Zealand, 6.0% (Wu et al., 2015). Nevertheless, the prevalence of tinnitus in Almaty city was lower than in Bulgaria, where it was found to be 28.3% (Biswas et al., 2021).

Our data showed a higher prevalence of any tinnitus in women than in men, which is similar to the results of other studies (Park, Lee et al., 2014; Arnold et al., 2022). However, there is no consensus regarding sex: for example, other studies have shown the opposite results, where the prevalence of tinnitus was higher in men (Bhatt et al., 2016; Wu et al., 2015).

Similar to other research, our results showed that smokers (particularly smokers who used to smoke) were more likely to have tinnitus (Biswas et al., 2021; Park, Lee et al., 2014; Shargorodsky et al., 2010). Tinnitus in young people was affected by factors such as frequent exposure to leisure noise (Park et al., 2014; Degeest et al., 2014; Weilhhammer et al., 2022; Degeest et al., 2022) and the likelihood of frequent wearing of headphones (Choi et al., 2021). Dillard and co-authors suggested prioritizing the policy focused on safe listening. Our study based on multiple logistic regression analysis notes the likelihood of an increase in the cases of tinnitus among young people in the future.

In addition, the respondents noted a disruption of their usual lifestyle and a decrease in social activity, as well as the presence of anxiety, hyperacusis, insomnia, and depression (Thompson et al., 2017). All of the conditions presented have been described in previous studies. In the future, it is important to study the quality of life of patients with tinnitus in Kazakhstan, possibly using tools such as the Tinnitus Functional Index or SF 36, which would allow for more in-depth understanding of their

Table 2
Simple and multiple logistic regression analysis with complex sampling for tinnitus.

Related Factors	Simple OR (95% CI)	P-value	Multiple AOR (95% CI)	P-value
Sex				
Male	1		1	
Female	1.49 (1.10; 1.90)	0.008	1.49(1.00; 2.24)	0.053
Age group (years)				
18–44	1		1	
45–54	0.95(0.61; 1.48)	0.82	0.32 (0.63; 0.64)	0.001
55–64	0.76(0.51; 1.12)	0.166	0.19(0.10; 0.38)	<0.001
≥65	0.35(0.22; 0.55)	<0.001	0.08(0.04; 0.19)	<0.001
Current smoking status				
No smoking	1		1	
Quit (>1year)	1.52 (0.86; 2.66)	0.148	1.48 (0.65; 3.35)	0.348
Smoking rarely	3.51 (2.03; 6.08)	<0.001	3.52(1.53; 8.13)	<0.001
Smoking everyday	18.64(10.47; 33.18)	<0.001	13.62(5.48; 33.87)	<0.001
Alcohol consumption				
Never	1		1	
<1 time a month	0.28(0.17; 0.46)	<0.001	0.29(0.15; 0.58)	0.005
1 time a month	0.14(0.08; 0.25)	<0.001	0.17(0.08; 0.36)	<0.001
2–4 times a month	0.07(0.04; 0.13)	<0.001	0.06 (0.03; 0.15)	<0.001
2–3 times a week	0.04(0.01; 0.09)	<0.001	0.06(0.02; 0.18)	<0.001
≥4 times a week	0.3(0.12; 0.76)	0.011	0.55(0.17; 1.77)	0.551
Sleep time				
≤6 h	1		1	
7–8 h	2.12(1.46; 3.07)	<0.001	1.50 (0.88; 2.55)	0.132
≥9 h	0.7(0.38; 1.31)	0.267	0.90 (0.40; 2.05)	0.803
Education level				
Secondary school	1		1	
Trade school	0.06(0.02; 0.16)	<0.001	7.18 (1.95; 26.48)	0.003
University	0.1(0.06; 0.17)	<0.001	18.80(5.11; 69.14)	<0.001
Unfinished school	0.37(0.25; 0.56)	<0.001	25.97(8.01; 84.21)	<0.001
Occupation				
Employed	1		1	
Housewife	0.18(0.1; 0.33)	<0.001	0.58(0.26; 1.31)	0.187
Retired	0.52(0.38; 0.72)	<0.001	2.47(1.32; 4.64)	0.005
Student(s)	0.68(0.32; 1.48)	0.336	0.84 (0.27; 2.66)	0.769

*AOR Adjusted odds ratio; *OR - Odds ratio.

condition and for developing a plan for effective care (Fackrell et al., 2018; Muluk, 2009).

Establishing patient tinnitus support groups is important to share

Table 3
Tinnitus symptoms and care: experience of the respondents in Kazakhstan (only “yes” answers are included in the Table).

Age group (years)	18–44	45–54	55–64	≥65	Total	p
Symptoms and signs associated with tinnitus						
Headache	61 (10.3%)	146 (24.6%)	278 (46.8%)	109 (18.3%)	594 (100.0%)	<0.001
Sleep disturbance and difficulty sleeping	76 (18.1%)	54 (12.9%)	191 (45.6%)	98 (23.3%)	419 (100.0%)	<0.001
Deterioration of social performance	16 (5.5%)	36 (12.4%)	171 (58.8%)	68 (23.3%)	291 (100.0%)	<0.001
Disruption of habitual lifestyle	34 (6.9%)	127 (25.8%)	257 (52.2%)	74 (15.0%)	492 (100.0%)	<0.001
Deterioration of professional activity	22 (8.0%)	34 (12.4%)	160 (58.4%)	58 (21.2%)	274 (100.0%)	<0.001
What are you currently worried about						
Hearing loss	12 (4.1%)	36 (12.2%)	170 (57.4%)	78 (26.4%)	296 (100.0%)	<0.001
Anxiety	30 (9.2%)	46 (14.1%)	179 (54.9%)	71 (21.8%)	326 (100.0%)	<0.001
Hyperacusis (increased sensitivity to noise)	7 (7.5%)	28 (30.1%)	17 (18.3%)	41 (44.1%)	93 (100.0%)	<0.001
Insomnia	38 (11.8%)	28 (8.7%)	179 (55.4%)	78 (24.1%)	323 (100.0%)	<0.001
Depression	8 (3.6%)	16 (7.1%)	156 (69.6%)	44 (19.6%)	224 (100.0%)	<0.001
What do you think the success of tinnitus treatment should be?						
Reducing the volume of tinnitus	3 (1.1%)	16 (5.9%)	170 (63.0%)	81 (30.0%)	270 (100.0%)	<0.001
Complete elimination of tinnitus	2 (0.7%)	30 (11.1%)	167 (61.9%)	71 (26.3%)	270 (100.0%)	<0.001
Partial relief of tinnitus	2 (0.9%)	11 (4.8%)	159 (69.4%)	57 (24.9%)	229 (100.0%)	<0.001
Decreased awareness or dependence on the condition	1 (0.6%)	1 (0.6%)	130 (77.4%)	37 (22.0%)	168 (100.0%)	<0.001
Relief of stress/anxiety	6 (3.2%)	6 (3.2%)	138 (73.0%)	45 (23.8%)	189 (100.0%)	<0.001
Advanced knowledge about tinnitus	1 (2.4%)	1 (2.4%)	24 (58.5%)	16 (39.0%)	41 (100.0%)	0.140
Getting used to tinnitus	8 (20.5%)	8 (20.5%)	13 (33.3%)	18 (46.2%)	39 (100.0%)	0.014
Temporary relief from tinnitus	2 (0.9%)	6 (2.7%)	160 (71.7%)	55 (24.7%)	22 (100.0%)	<0.001
Change in sound quality with tinnitus	1 (0.5%)	1 (0.5%)	140 (76.9%)	41 (22.5%)	182 (100.0%)	<0.001
Confirmation that tinnitus is not a threat	3 (11.1%)	3 (11.1%)	9 (33.3%)	15 (55.6%)	27 (100.0%)	0.039

experience and information (Pryce et al., 2019; Marks et al., 2022). However, despite the development of online platforms in Kazakhstan, support groups for patients with tinnitus are still non-existent. Nevertheless, the majority of the respondents noted the usefulness of participating in such groups and that perhaps in the future, the establishment of such groups will contribute to the expansion of their geography within the country and the rapid dissemination of evidence-based

Table 4
Evaluation of treatment on a five-point scale.

	1 (worst)	2 (bad)	3 (average)	4 (good)	5 (best)
How important is consultation as part of your tinnitus treatment?	17 (2.6%)	180 (27.3%)	39 (5.9%)	43 (6.5%)	381 (57.7%)
How useful would it be to join a support group for people with tinnitus?	85 (13.6%)	42 (6.7%)	189 (30.2%)	47 (7.5%)	262 (41.9%)
How much do you think you have access to appropriate resources for tinnitus treatment?	235 (37.0%)	42 (6.6%)	252 (39.7%)	54 (8.5%)	52 (8.2%)
How effectively can your healthcare professional treat or manage your tinnitus?	12 (1.9%)	69 (11.0%)	449 (71.6%)	46 (7.3%)	51 (8.1%)
How satisfied do you think your doctor would be with the results of the treatment or with the treatment of your tinnitus?	17 (2.8%)	34 (5.5%)	144 (23.3%)	364 (58.9%)	59 (9.5%)
During your regular appointment, does your healthcare provider spend enough time with you regarding your tinnitus?	16 (2.6%)	51 (8.3%)	286 (46.3%)	209 (33.8%)	56 (9.1%)
Evaluate the results of your treatment	15 (2.5%)	34 (5.6%)	144 (23.6%)	362 (59.3%)	55 (9.0%)

information on effective methods of treatment and support in conditions where there are no adequate resources for noise treatment.

In Kazakhstan, primary health care (polyclinics) includes services to improve public awareness of risk factors. Therefore, it is important to educate the primary care workers on the risk factors of tinnitus and to raise awareness among the young population about the risks leading to tinnitus such as listening to loud music, using headphones, smoking, and staying in noisy places. In addition, it is important to provide guidelines to general practitioners on tinnitus management and its algorithm. The development of clinical guidelines will minimize the trips of patients with tinnitus to other specialists, since the existing practice in Kazakhstan shows that, before they are diagnosed with tinnitus, patients often turn to neurologists, otolaryngologists, neurosurgeons, and other specialists with suspicion of another pathology. It will also allow PHC psychologists to start cognitive behavioral therapy on time to determine the level of anxiety and stress.

However, in order for primary health care (PHC) workers to start working on the awareness of the population on tinnitus and its risk factors, it is necessary to provide training for PHC specialists, in particular nurses. Another important issue is to provide training for psychologists. Currently, many primary care psychologists lack the skills and training in cognitive behavioral therapy. Accordingly, to ensure the quality of medical care, managers of PHC have to provide training for this group of specialists. The PHC sector in Kazakhstan has resources to improve the skills of medical personnel as part of the incentive component of the per capita standard. Thus, managers should be responsible for increasing the capacity of the employees of a PHC unit as well as for developing the training topics for their effective work.

5. Conclusion

The analysis confirms that tinnitus is prevalent in the general population over 18 years of age. The current practice shows ambiguity in the effectiveness of the treatment of people with tinnitus, which is most likely due to the lack of guidelines for physicians. Future strategies should aim to improve public awareness of the risk factors of tinnitus, particularly among young people, who frequently wear headphones, as well as among medical professionals, which should facilitate the provision of multidisciplinary teamwork.

Ethical approval

The study was conducted according to the guidelines of the Declaration of Helsinki and was approved by the Ethics Committee of Kazakh National Medical University (N^o13(119) from 09/20/2021), Almaty city, Kazakhstan.

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Declaration of competing interest

The authors declare they have no competing interests.

References

Arnold, M.L., Dhar, S., Lee, D.J., Perreira, K.M., Pupo, D., Tsalatsanis, A., Sanchez, V.A., 2022. Sex-specific prevalence, demographic characteristics, and risk factors of tinnitus in the hispanic community health study/study of latinos. *Am. J. Audiol.* 31 (1), 78–90. https://doi.org/10.1044/2021_AJA-21-00138.

Bhatt, J.M., Lin, H.W., Bhattacharyya, N., 2016. Prevalence, severity, exposures, and treatment patterns of tinnitus in the United States. *JAMA Otolaryngol Head Neck Surg* 142 (10), 959–965. <https://doi.org/10.1001/jamaoto.2016.1700>.

Biswas, R., Lugo, A., Akeroyd, M.A., Schlee, W., Gallus, S., Hall, D.A., 2021. Tinnitus prevalence in Europe: a multi-country cross-sectional population study. *Lancet Reg Health Eur* 12, 100250. <https://doi.org/10.1016/j.lanep.2021.100250>.

Chamouton, C.S., Nakamura, H.Y., 2021. Profile and prevalence of people with tinnitus: a health survey. *Perfil e prevalência de pessoas com zumbido: inquérito em serviço de saúde*. *CoDAS* 33 (6), e20200293. <https://doi.org/10.1590/2317-1782/20202020293>.

Choi, J.H., Park, S.S., Kim, S.Y., 2021. Associations of earphone use with tinnitus and anxiety/depression. *Noise Health* 23 (111), 108–116. <https://doi.org/10.4103/nah.NAH.48.20>.

Cima, R.F.F., Mazurek, B., Haider, H., Kikidis, D., Lapira, A., Noreña, A., Hoare, D.J., 2019. A multidisciplinary European guideline for tinnitus: diagnostics, assessment, and treatment. *HNO* 67 (Suppl. 1), 10–42. <https://doi.org/10.1007/s00106-019-0633-7>. English.

De Ridder, D., Schlee, W., Vanneste, S., et al., 2021. Tinnitus and tinnitus disorder: theoretical and operational definitions (an international multidisciplinary proposal). *Prog. Brain Res.* 260, 1–25. <https://doi.org/10.1016/bs.pbr.2020.12.002>.

Degeest, S., Corthals, P., Vinck, B., Keppler, H., 2014. Prevalence and characteristics of tinnitus after leisure noise exposure in young adults. *Noise Health* 16 (68), 26–33. <https://doi.org/10.4103/1463-1741.127850>.

Degeest, S., Corthals, P., Keppler, H., 2022. Evolution of hearing in young adults: effects of leisure noise exposure, attitudes, and beliefs toward noise, hearing loss, and hearing protection devices. *Noise Health* 24 (113), 61–74. <https://doi.org/10.4103/nah.nah.7.21>.

Fackrell, K., Hall, D.A., Barry, J.G., Hoare, D.J., 2018. Performance of the Tinnitus Functional Index as a diagnostic instrument in a UK clinical population. *Hear. Res.* 358, 74–85. <https://doi.org/10.1016/j.heares.2017.10.016>.

Folmer, R.L., Martin, W.H., Shi, Y., 2004. Tinnitus: questions to reveal the cause, answers to provide relief. *J. Fam. Pract.* 53, 532–540.

Henry, J.A., 2016. "Measurement" of tinnitus. *Otol. Neurotol.* 37 (8), e276–e285. <https://doi.org/10.1097/MAO.0000000000001070>.

Husain, F.T., Gander, P.E., Jansen, J.N., Shen, S., 2018. Expectations for tinnitus treatment and outcomes: a survey study of audiologists and patients. *J. Am. Acad. Audiol.* 29 (4), 313–336. <https://doi.org/10.3766/jaaa.16154>.

Jarach, C.M., Lugo, A., Scala, M., van den Brandt, P.A., Cederroth, C.R., Odone, A., Garavello, W., Schlee, W., Langguth, B., Gallus, S., 2022. Global prevalence and incidence of tinnitus: a systematic review and meta-analysis. *JAMA Neurol.* 79 (9), 888–900. <https://doi.org/10.1001/jamaneurol.2022.2189>.

Kim, H.J., Lee, H.J., An, S.Y., Sim, S., Park, B., Kim, S.W., Lee, J.S., Hong, S.K., Choi, H. G., 2015. Analysis of the prevalence and associated risk factors of tinnitus in adults. *PLoS One* 10 (5), e0127578. <https://doi.org/10.1371/journal.pone.0127578>.

Langguth, B., Kleinjung, T., Schlee, W., Vanneste, S., De Ridder, D., 2023. Tinnitus guidelines and their evidence base. *J. Clin. Med.* 12 (9), 3087. <https://doi.org/10.3390/jcm12093087>.

Levine, R.A., Oron, Y., 2015. Tinnitus. *Handb. Clin. Neurol.* 129, 409–431. <https://doi.org/10.1016/B978-0-444-62630-1.00023-8>.

Maldonado Fernández, M., Shin, J., Scherer, R.W., Murdin, L., 2017. Interventions for tinnitus in adults: an overview of systematic reviews. *Cochrane Database Syst. Rev.* 2017 (1), CD011795. <https://doi.org/10.1002/14651858>.

Marks, E., Handscomb, L., Remskar, M., 2022. "I can see a path forward now": a qualitative investigation of online groups for tinnitus in the time of Covid-19. *Int. J. Audiol.* 1–8. <https://doi.org/10.1080/14992027.2022.2063195>.

McCormack, A., Edmondson-Jones, M., Somerset, S., Hall, D., 2016. A systematic review of the reporting of tinnitus prevalence and severity. *Hear. Res.* 337, 70–79. <https://doi.org/10.1016/j.heares.2016.05.009>.

Muluk, N.B., 2009. The SF-36 Health Survey in tinnitus patients with a high jugular bulb. *J Otolaryngol Head Neck Surg* 38 (2), 166–171.

Ogawa, K., Sato, H., Takahashi, M., Wada, T., Naito, Y., Kawase, T., Murakami, S., Hara, A., Kanzaki, S., 2020. Clinical practice guidelines for diagnosis and treatment of chronic tinnitus in Japan. *Auris Nasus Larynx* 47 (1), 1–6. <https://doi.org/10.1016/j.anl.2019.09.007>.

Park, B., Choi, H.G., Lee, H.J., An, S.Y., Kim, S.W., Lee, J.S., Hong, S.K., Kim, H.J., 2014a. Analysis of the prevalence of and risk factors for tinnitus in a young population. *Otol. Neurotol.* 35 (7), 1218–1222. <https://doi.org/10.1097/MAO.0000000000000472>.

Park, K.H., Lee, S.H., Koo, J.W., Park, H.Y., Lee, K.Y., Choi, Y.S., Oh, K.W., Lee, A., Yang, J.E., Woo, S.Y., Kim, S.W., Cho, Y.S., 2014b. Prevalence and associated factors of tinnitus: data from the Korean national health and nutrition examination survey 2009–2011. *J. Epidemiol.* 24 (5), 417–426. <https://doi.org/10.2188/jea.je20140024>.

Pryce, H., Moutela, T., Bunker, C., Shaw, R., 2019. Tinnitus groups: a model of social support and social connectedness from peer interaction. *Br. J. Health Psychol.* 24 (4), 913–930. <https://doi.org/10.1111/bjhp.12386>. Epub 2019 Aug 26.

Rademaker, M.M., Smit, A.L., Brabers, A.E.M., de Jong, J.D., Stokroos, R.J., Stegeman, I., 2021. Using different cutoffs to define tinnitus and assess its prevalence—A survey in the Dutch general population. *Front. Neurol.* 12, 690192. <https://doi.org/10.3389/fneur.2021.690192>.

Seo, J.H., Kang, J.M., Hwang, S.H., Han, K.D., Joo, Y.H., 2016. Relationship between tinnitus and suicidal behaviour in Korean men and women: a cross-sectional study. *Clin. Otolaryngol.* 41, 222–227.

Shargorodsky, J., Curhan, G.C., Farwell, W.R., 2010. Prevalence and characteristics of tinnitus among US adults. *Am. J. Med.* 123 (8), 711–718. <https://doi.org/10.1016/j.amjmed.2010.02.015>.

Tang, D., Li, H., Chen, L., 2019. Advances in understanding, diagnosis, and treatment of tinnitus. *Adv. Exp. Med. Biol.* 1130, 109–128. https://doi.org/10.1007/978-981-13-6123-4_7.

Thompson, D.M., Hall, D.A., Walker, D.M., Hoare, D.J., 2017. Psychological therapy for people with tinnitus: a scoping review of treatment components. *Ear Hear.* 38 (2), 149–158. <https://doi.org/10.1097/AUD.0000000000000363>.

- Tunkel, D.E., Bauer, C.A., Sun, G.H., Rosenfeld, R.M., Chandrasekhar, S.S., Cunningham Jr., E.R., Archer, S.M., Blakley, B.W., Carter, J.M., Granieri, E.C., Henry, J.A., Hollingsworth, D., Khan, F.A., Mitchell, S., Monfared, A., Newman, C. W., Omole, F.S., Phillips, C.D., Robinson, S.K., Taw, M.B., Tyler, R.S., Waguespack, R., Whamond, E.J., 2014. Clinical practice guideline: tinnitus. *Otolaryngol. Head Neck Surg.* 151 (2 Suppl. 1), S1–S40. <https://doi.org/10.1177/0194599814545325>.
- Weilhammer, V., Gerstner, D., Huß, J., Schreiber, F., Alvarez, C., Steffens, T., Herr, C., Heinze, S., 2022. Exposure to leisure noise and intermittent tinnitus among young adults in Bavaria: longitudinal data from a prospective cohort study. *Int. J. Audiol.* 61 (2), 89–96. <https://doi.org/10.1080/14992027.2021.1899312>.
- Wu, B.P., Searchfield, G., Exeter, D.J., Lee, A., 2015. Tinnitus prevalence in New Zealand. *N. Z. Med. J.* 128 (1423), 24–34.