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Potential protective role of soluble fiber in mitigating tinnitus symptoms: A case-control study

Masoomeh Ataei Kachooei [a], Majid Kamali [b], Fatemeh Sadat Fahimzad [c], Mohammadtaghi Ghorbani Hesari [d], Malikeh Mohajerani [e], Rezvan Mohammadi [f], Abdolrahman Parhiz [g], Pegah Samani [h], Fatemeh Azaryan [i], Sara Khoshdooz [j], Maryam Gholamalizadeh [k,n], Bojlul Bahar [l], Soheila Shekari [d], Akram Kooshki [m,*], Saeid Doaei [n,**]

[a] Faculty of Medicine, Shahrekord University of Medical Sciences, Shahrekord, Iran
[b] School of Nutrition and Food Sciences, Isfahan University of Medical Sciences, Isfahan, Iran
[c] Department of Clinical Nutrition, School of Nutritional Sciences and Dietetics, Tehran University of Medical Sciences, Tehran, Iran
[d] Mashhad University of Medical Sciences, Mashhad, Iran
[e] Department of Nutrition, Science and Research Branch, Islamic Azad University, Tehran, Iran
[f] Department of Nutrition, SR.C., Islamic Azad University, Tehran, Iran
[g] Educational Measurement and Evaluation, Kish International Campus, University of Tehran, Iran
[h] Nutrition and Food Security Research Center,Shahid Sadoughi University of Medical Science, Yazd, Iran
[i] Department of Physiology, School of Medicine, Zahedan University of Medical Sciences, , Zahedan, Iran
[j] Faculty of Medicine, Guilan University of Medical Sciences, Rasht, Iran
[k] National Nutrition and Food Technology Research Institute, Faculty of Nutrition Sciences and Food Technology, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[l] Nutrition Sciences and Applied Food Safety Studies, Research Centre for Global Development, School of Sport & Health Sciences, University of Central Lancashire, Preston, UK
[m] Non-Communicable Diseases Research Center, Sabzevar University of Medical Sciences, Sabzevar, Iran
[n] Cancer Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran

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ABSTRACT

Background: Tinnitus, the perception of sound without any external source, affects millions of people worldwide and tends to increase with age. Evidence suggested that dietary fiber may play a critical role in mitigating the risk of tinnitus. This study aims to investigate the potential association between dietary fiber intake and the risk of tinnitus.

Methods: This cross-sectional study included a total of 300 Iranian women, with 150 stable tinnitus and 150 controls. Dietary intake was assessed using a validated questionnaire and analyzed using Nutritionist IV software. The association of dietary fiber intake and tinnitus was evaluated employing logistic regression analysis.

Results: Patients with tinnitus had significantly lower levels of daily soluble fiber intake compared to controls ($P < 0.05$). The analysis demonstrated a negative association between tinnitus and the daily soluble fiber intake, with an adjusted odds ratio (OR) of 0.71 (95 % CI: 0.51–0.97, $P = 0.03$). This association remained significant after further adjustment for calorie intake (OR: 0.71, 95 % CI: 0.52–0.98, $P = 0.04$). No significant association was observed between tinnitus and the intake of total, crude, or insoluble fiber.

Conclusion: Our findings indicated that a diet rich in soluble fiber, such as fruits and grains, may help mitigate tinnitus symptoms. Further, longitudinal studies are needed to confirm these findings and explore the potential mechanisms by which dietary fiber impacts tinnitus risk.

* Correspondence to: Department of Community Nutrition, School of Nutrition and Food Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran.
** Corresponding author.
E-mail addresses: kooshki.nutr@gmail.com (A. Kooshki), Doaei@gums.ac.ir (S. Doaei).

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Introduction

Tinnitus, also known as the conscious perception of sound in the ear or head or the conscious awareness of sound in the absence of an external auditory stimulus, ranks among the most prevalent otological symptoms (Esmaili and Renton, 2018). It afflicts millions worldwide, with epidemiological studies estimating its prevalence in the US population to range from 8 % to 25.3 % (KochKin et al., 2011). The pooled prevalence of any tinnitus among adults was 14.4 % and ranged from 4.1 % to 37.2 %. In addition, increased prevalence was associated with age (Jarach et al., 2022). Gallus et al. surveyed participants in 2015 and reported a tinnitus prevalence of 6.2 % in Italy, with comparable rates between men (6.0 %) and women (6.4 %) (Gallus et al., 2015).

Several potential risk factors have been identified, including hearing loss, head injury history, high total serum cholesterol, and otosclerosis (Gopinath et al., 2010). Other factors such as work-related noise exposure, ear or sinus infections, neck injury, migraine, cardiovascular disease (Park et al., 2014), hypertension, high cholesterol, obesity (Gallus et al., 2015; Martines et al., 2015), and smoking (Veile et al., 2018) are also implicated. Research on the relationship between tinnitus and diet remains scarce. Some studies suggest that consuming fish, and other protein sources may offer protective effects against tinnitus. On the other hand, a potential link between tinnitus and vascular health has been proposed, with evidence supporting the protective role of a fiber-rich diet against heart diseases (Curhan et al., 2024). In the US Blue Mountains Hearing Study, Tang et al. discovered a strong correlation between a reduced consumption of fruit and cereal fiber and a 55–65 % greater chance of acquiring tinnitus over ten years (Tang et al., 2021a). The Mediterranean diet, in particular, may play a role in tinnitus prevention, potentially due to its high content of fruits, vegetables, legumes, and whole grains— which could partially explain the relatively lower prevalence of tinnitus in Mediterranean regions (Gallus et al., 2015).

In a longitudinal study of 3135 women, adhering to healthful dietary patterns (higher consumption of fiber and protein, and lower consumption of sodium and saturated fatty acids) exhibited a 25–30 % lower risk of mid- and high-frequency hearing threshold elevation after three years (Curhan et al., 2020a). Similarly, higher fruit, vegetable, vitamin D and protein consumption were associated with decreased odds of hearing difficulties. In contrast, higher fat intake was associated with increased odds of hearing difficulties (Dawes et al., 2020). Considering the high prevalence of tinnitus and its associated complications, along with the limited research conducted on the potential correlation between dietary fiber intake and tinnitus, the present study examines the relationship between the intake of different types of dietary fibers and the risk of tinnitus.

Methods

This is a cross-sectional study comprised of a total of 300 Iranian women with 150 patients with stable tinnitus and 150 controls. The study population consisted of individuals enrolled in the Persian Cohort Study based in Sabzevar, northeastern Iran. The patients were diagnosed with stable tinnitus by their physicians. The control group comprised individuals who did not have stable tinnitus. The sample size for each group was calculated using the Open EPI online software (Sullivan et al., 2014) and the odds ratio obtained from previous similar studies (Jarach et al., 2023).

At the beginning of the study, the participants were provided required information through verbal explanations regarding the objectives, execution procedures, and confidentiality of information. All participants provided a written, signed consent before any data collection. The data on general information, medical history, anthropometric measurements, physical activity data, and dietary information of the participants were collected by trained researchers. The inclusion criteria for the case group are patients aged between 40 and 80, diagnosed with stable tinnitus, defined as experiencing continuous wheezing sounds in one or both ears for at least one week. The inclusion criteria for the control group are individuals aged between 40 and 80 without a history of tinnitus. Exclusion criteria comprised a history of psychiatric disorders, cancer, or malignant diseases. Dropout criteria included incomplete questionnaires and the inability to gather necessary information.

In this study, the weight of each participant was measured with a minimum coverage using a digital scale (Seca) with an accuracy of 0.1 kg. Height was measured in a standing position without shoes using a measuring tape with an accuracy of 1 centimeter. Body Mass Index (BMI) was calculated by dividing weight (in kilograms) by the square of height (in meters). Lifestyle-related information in this section included data on medical history, current health status, medication or specific supplements usage, specific habits such as smoking, and physical activity collected through self-reporting questionaries. Dietary assessment was conducted using a validated food frequency questionnaire (FFQ) (Eghtesad et al., 2023), consisting of 237 questions, measuring food intake frequency and specific food consumption patterns. To assess the intake of different types of dietary fibers, including crude, soluble and insoluble fibers, Nutritionist IV software was utilized.

Statistical analyses

Following data collection and quality control of the questionnaires by trained supervisors, statistical analyses were conducted using SPSS software. A p-value threshold of 0.05 was considered to determine statistical significance. The normality of continuous variables was assessed using the Kolmogorov–Smirnov test. Quantitative data were described using means and standard deviations, while qualitative data were described using numbers and percentages. Logistic regression modeling was employed to analyze and adjust for confounding variables, with tinnitus status as the dependent variable and dietary fiber intake as the independent variable.

Results

The characteristics of the participants are presented in Table 1. Physical activity was partially higher in healthy participants compared to patients with tinnitus (1.53 ± 1.53 vs. 1.17 ± 1.07 hrs/week, P = 0.05). There was no significant difference in terms of age, height, weight, BMI, alcohol drinking, right-hand DBP, and right-hand SBP between the two groups.

The dietary intake of macronutrients among patients with tinnitus and the controls are shown in Table 2. The cases had a lower dietary intake of soluble fiber (19.3 ± 13.4 vs. 15.6 ± 10.9 g/d, $P = 0.04$) compared to the control group. No significant difference was evident in the intake of calories, total fat, cholesterol, protein, total fiber, insoluble fiber, and crude fiber.

The association between tinnitus and fiber intake is presented in Table 3. An inverse association was observed between tinnitus and the intake of soluble fiber after adjusting for age, BMI, physical activity,

Table 1
Baseline characteristics of participants with and without tinnitus.

Measurements	Controls (n = 150)	Cases (n = 150)	*P*
Age (y)	49.29 ± 8.27	50.91 ± 8.75	0.26
Height (cm)	156.01 ± 5.62	157.34 ± 4.41	0.07
Weight (kg)	70.96 ± 11.74	73.68 ± 9.72	0.10
BMI (kg/m^2)	29.11 ± 4.34	29.74 ± 3.64	0.30
Physical activity (hrs/week)	1.53 ± 1.53	1.17 ± 1.07	0.05
Right-hand DBP (mm Hg)	70.50 ± 9.05	69.67 ± 8.5	0.55
Right-hand SBP (mm Hg)	108.17 ± 13.88	109.30 ± 14.08	0.62
Drinking Alcohol (yes, n, %)	2 (1.33)	1 (0.67)	0.32
Smoking (yes, n, %)	2 (1.33)	1 (0.67)	0.32

SBP: Systolic Blood Pressure, DBP: Diastolic Blood Pressure, BMI: Body mass index.

Table 2
Dietary intake among patients with tinnitus and controls.

Dietary components	Controls (n = 150)	Cases (n = 150)	*P*
Calorie (kcal/day)	2595.41 ± 460.17	2541.69 ± 512.88	0.510
Protein (g/day)	84.12 ± 24.11	83.77 ± 24.72	0.930
Cholesterol (mg/day)	371.92 ± 64.54	364.23 ± 70.85	0.500
Total fat (g/day)	93.90 ± 21.72	90.51 ± 22.44	0.350
Total fiber (g/day)	31.36 ± 13.86	29.13 ± 12.67	0.290
Soluble fiber (g/day)	19.3 ± 13.4	15.6 ± 10.9	0.040
Insoluble fiber (g/day)	5.70 ± 5.09	4.91 ± 4.57	0.310
Crude fiber (g/day)	3.25 ± 2.41	3.04 ± 2.29	0.660

smoking and alcohol drinking (OR: 0.71, CI 95 %: 0.51–0.97, $P = 0.03$). The results did not change after further adjustment for calorie intake (OR: 0.71, CI 95 %: 0.52–0.98, $P = 0.04$) (Model 2). There was no significant association between intake of total fiber, crude fiber, insoluble fiber, and tinnitus.

Discussion

The present study examines the relationship between dietary fiber intake and tinnitus in 150 patients with tinnitus and 150 controls. In this study, we explored the connection between tinnitus and the intake of different types of dietary fiber because modifiable risk factors, such as diet, may have a significant impact on the development of tinnitus symptoms (Wadhwa et al., 2024; Curhan et al., 2020b). Our findings indicated that higher consumption of soluble fiber is linked to a reduced risk of tinnitus. However, no relationship was observed between total fiber, crude fiber, and insoluble fiber with tinnitus. The impact of tinnitus on various aspects of a person's life, such as sleep, attention, and overall quality of life, becomes more important as individuals age and the frequency of this condition increases (Han et al., 2009). Therefore, it is crucial to investigate potential strategies for reducing the risk of developing tinnitus and managing its symptoms. Our findings suggest that incorporating more soluble fiber-rich sources such as fruits and cereals into the diet may potentially alleviate the impact of tinnitus.

Several studies have explored the connection between tinnitus and fiber intake (Tang et al., 2021b; Tomanic et al., 2020; Hofmeister, 2019). In line with the present study, a cross-sectional study conducted by Milena Tomanic et al. revealed a significant inverse association between tinnitus and the consumption of fresh fruits and vegetables (Tomanic et al., 2020). Another study conducted by Diana Tang et al. examined the inverse relationship between fiber consumption and tinnitus (Tang et al., 2021b). In contrast to our study, their findings suggest a moderate association between insoluble fiber and tinnitus (Tang et al., 2021b). Moreover, some studies failed to find a connection between consuming more fiber and experiencing tinnitus. For example, Lee et al. reported that the intake of dietary fiber did not have a significant association with tinnitus (Lee and Kim, 2018). This discrepancy may be attributed to differences in dietary patterns, fiber sources, or population characteristics across studies. Also, different results may be related to the etiology of different types of tinnitus. Objective tinnitus may have vascular or mechanical origins. In the case of a vascular origin, it could be caused by a referred bruit resulting from stenosis in the carotid or vertebrobasilar system (Han et al., 2009). A recent meta-analysis published in 2025 reported that higher consumption of fruits, dietary fiber, caffeine, and dairy products was inversely associated with the risk of tinnitus. The estimated reductions in tinnitus incidence were 35.1 % (95 % CI, 20.7 %–46.8 %) for fruit intake, 9.2 % (95 % CI, 1.0 %–14.9 %) for dietary fiber, 17.3 % (95 % CI, 10.8 %–23.4 %) for dairy products, and 10.2 % (95 % CI, 6.5 %–13.8 %) for caffeine intake (Zhang et al., 2025).

In line with the present study, numerous studies have demonstrated that soluble fiber improves vascular health by reducing cholesterol levels (Soliman, 2019; Fu et al., 2022). Growing evidence indicates that the gut microbiota engages in a complex bidirectional communication with the host, particularly with the central nervous system (CNS), a relationship often described as the "gut–brain axis." Disruption of gut microbial balance (dysbiosis) has been shown to influence neurotransmitter synthesis, including γ-aminobutyric acid (GABA) and serotonin (5-HT), while also promoting neuroinflammation through elevated pro-inflammatory cytokines and microglial activation (Megantara et al., 2022; Graham et al., 2023). Notably, Bifidobacterium adolescentis and Bifidobacterium dentium have been identified as capable of enhancing GABA production, an inhibitory neurotransmitter (Wang et al., 2025). These findings suggest that such bacterial species may be implicated in the pathophysiology of tinnitus. Soluble fiber may also help reduce inflammation by supporting beneficial gut bacteria that produce anti-inflammatory short-chain fatty acids like butyrate, potentially alleviating inflammation linked to tinnitus (Fernández et al., 2016). Some researchers indicated that dietary fiber may improve insulin sensitivity. Since hyperinsulinemia resulting from reduced insulin sensitivity can disrupt the inner ear microenvironment, this mechanism may contribute to an elevated risk of tinnitus (Zhang et al., 2025). In addition, tinnitus has been significantly associated with disturbances in lipid metabolism, including alterations in serum levels of total cholesterol, triglycerides, low-density lipoprotein, and high-density lipoprotein. Given the well-established role of dietary fiber in improving dyslipidemia (Megantara et al., 2022), these findings may provide a potential link between fiber intake and reduced tinnitus risk (Wang et al., 2025).

The main limitations of this study include its observational design, which does not allow firm conclusions about causality, and the relatively small sample size that may limit generalizability and reduce the ability to detect modest associations. Moreover, the participants' food consumption was measured using FFQ, which relies on the participant's memory and can also be influenced by variations in the interviewer's behavior, possibly resulting in a low accuracy of reporting. Furthermore, we are aware that there may be unidentified covariates and/or additional dietary factors that could be affecting the results. More research is needed to assess various forms and sources of fiber and their relationship to the risk of developing tinnitus. While our findings suggest a potential association between dietary fiber intake and tinnitus symptoms, further longitudinal and interventional studies are warranted to clarify the directionality and establish causality.

Conclusion

In summary, the findings of this study indicated that the consumption of foods rich in soluble fiber, such as fruits and grains, may reduce the risk of tinnitus. If confirmed in future longitudinal studies, recommending high-fiber diets can be considered in people at risk for tinnitus. More research is warranted to evaluate the effect of different sources of fiber on the risk of developing tinnitus and to discover the underlying mechanisms.

Table 3
The association between tinnitus and fiber intake.

	Total fiber		Soluble fiber		Insoluble fiber		Crude fiber	
	OR (CI95 %)	*P*	OR (CI95 %)	*P*	OR (CI95 %)	*P*	OR (CI95 %)	*P*
Model 1	0.98 (0.96–1.01)	0.220	0.71 (0.51–0.97)	0.030	1.00 (0.99–1.00)	0.430	0.99 (0.98–1.01)	0.650
Model 2	0.98 (0.96–1.01)	0.290	0.71 (0.52–0.98)	0.040	1.00 (0.99–1.00)	0.440	0.99 (0.98–1.01)	0.660

Model 1: Adjusted for age, BMI, physical activity, smoking and alcohol drinking, Model 2: Further adjusted for calorie intake.

CRediT authorship contribution statement

Fatemeh Azaryan: Writing – original draft. **Soheila Shekari:** Software. **Majid Kamali:** Data curation. **Bojlul Bahar:** Validation. **Masoomeh Ataei Kachooei:** Methodology. **Saeid Doaei:** Data curation. **Mohammadtaghi Ghorbani Hesari:** Project administration. **Akram Kooshki:** Writing – review & editing. **Fatemeh Sadat Fahimzad:** Software. **Rezvan Mohammadi:** Software. **Malikeh Mohajerani:** Validation. **Pegah Samani:** Validation, Data curation. **Abdolrahman Parhiz:** Visualization. **Maryam Gholamalizadeh:** Software. **Sara Khoshdooz:** Supervision.

Ethics statement

The ethics committee of Sabzevar university of Medical Sciences, Tehran, Iran approved the study (Ethics Code: IR.MEDSAB.REC.1404.167) in accordance with the Declaration of Helsinki. The study was conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Clinical trial number

Not applicable.

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Conflicts of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest

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Data availability

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

References

Curhan, S.G., Halpin, C., Wang, M., Eavey, R.D., Curhan, G.C., 2020a. Prospective study of dietary patterns and hearing threshold elevation. Am. J. Epidemiol. 189 (3), 204–214.

Curhan, S.G., Halpin, C., Wang, M., Eavey, R.D., Curhan, G.C., 2020b. Prospective study of dietary patterns and hearing threshold elevation. Am. J. Epidemiol. 189 (3), 204–214.

Curhan, S.G., Zeleznik, O.A., Curhan, 2024. GCJTAJoCN. longitudinal study of seafood and fish oil supplement intake and risk of persistent tinnitus, 120 (6), 1409–1418.

Dawes, P., Cruickshanks, K.J., Marsden, A., Moore, D.R., Munro, K.J., 2020. Relationship between diet, tinnitus, and hearing difficulties. Ear Hear. 41 (2), 289–299.

Eghtesad, S., Hekmatdoost, A., Faramarzi, E., Homayounfar, R., Sharafkhah, M., Hakimi, H., et al., 2023. Validity and reproducibility of a food frequency questionnaire assessing food group intake in the Persian cohort study. Front. Nutr. 10, 1059870.

Esmaili, A.A., Renton, J., 2018. A review of tinnitus. Aust. J. Gen. Pract. 47 (4), 205–208.

Fernández, J., Redondo-Blanco, S., Gutiérrez-del-Río, I., Miguélez, E.M., Villar, C.J., Lombo, F., 2016. Colon microbiota fermentation of dietary prebiotics towards short-chain fatty acids and their roles as anti-inflammatory and antitumour agents: a review. J. Funct. Foods 25, 511–522.

Fu, L., Zhang, G., Qian, S., Zhang, Q., Tan, M., 2022. Associations between dietary fiber intake and cardiovascular risk factors: an umbrella review of meta-analyses of randomized controlled trials. Front. Nutr. 9, 972399.

Gallus, S., Lugo, A., Garavello, W., Bosetti, C., Santoro, E., Colombo, P., et al., 2015. Prevalence and determinants of tinnitus in the Italian adult population. Neuroepidemiology 45 (1), 12–19.

Gopinath, B., McMahon, C.M., Rochtchina, E., Karpa, M.J., Mitchell, P., 2010. Risk factors and impacts of incident tinnitus in older adults. Ann. Epidemiol. 20 (2), 129–135.

Graham, A.S., Ben-Azu, B., Tremblay, M.-È., Torre, I.I.I.P., Senekal, M., Laughton, B., et al., 2023. A review of the auditory-gut-brain axis. Front Neurosci. 17, 1183694.

Han, B.I., Lee, H.W., Kim, T.Y., Lim, J.S., Shin, K.S., 2009. Tinnitus: characteristics, causes, mechanisms, and treatments. J. Clin. Neurol. (Seoul. Korea) 5 (1), 11–19.

Hofmeister, M., 2019. Do dietary factors significantly influence tinnitus? Aust. J. Gen. Pr. 48 (3), 153–157.

Jarach, C.M., Lugo, A., Garavello, W., van den Brandt, P.A., Odone, A., Cederroth, C.R., et al., 2023. The role of diet in tinnitus onset: a hospital-based case-control study from Italy. Nutrients 15 (3), 621.

Jarach, C.M., Lugo, A., Scala, M., van den Brandt, P.A., Cederroth, C.R., Odone, A., et al., 2022. Global prevalence and incidence of tinnitus: a systematic review and meta-analysis. JAMA Neurol. 79 (9), 888–900.

KochKin, S., Tyler, R., Born, J., 2011. MarkeTrak VIII: the prevalence of tinnitus in the United States and the self-reported efficacy of various treatments. Hear Rev. 18 (12), 10–27.

Lee, D.Y., Kim, Y.H., 2018. Relationship between diet and tinnitus: korea national health and nutrition examination survey. Clin. Exp. Otorhinolaryngol. 11 (3), 158–165.

Martines, F., Sireci, F., Cannizzaro, E., Costanzo, R., Martines, E., Mucia, M., et al., 2015. Clinical observations and risk factors for tinnitus in a sicilian cohort. Eur. Arch. OtoRhinoLaryngol. 272, 2719–2729.

Megantara, I., Wikargana, G.L., Dewi, Y.A., Permana, A.D., Sylviana, N., 2022. The role of gut dysbiosis in the pathophysiology of tinnitus: a literature review. Int. Tinnitus J. 26 (1), 27–41.

Park, K.H., Lee, S.H., Koo, J.-W., Park, H.Y., Lee, K.Y., Choi, Y.S., et al., 2014. Prevalence and associated factors of tinnitus: data from the Korean national health and nutrition examination survey 2009–2011. J. Epidemiol. 24 (5), 417–426.

Soliman, G.A., 2019. Dietary fiber, atherosclerosis, and cardiovascular disease. Nutrients 11 (5).

Sullivan, K.M., Dean, M., Soe, M.M., Mctm, M., 2014. An introduction to OpenEpi. Introd. Open.

Tang, D., Tran, Y., Shekhawat, G.S., Burlutsky, G., Mitchell, P., Gopinath, B., 2021b. Dietary fibre intake and the 10-Year incidence of tinnitus in older adults. Nutrients 13 (11).

Tang, D., Tran, Y., Shekhawat, G.S., Burlutsky, G., Mitchell, P., Gopinath, B., 2021a. Dietary fibre intake and the 10-Year incidence of tinnitus in older adults. Nutrients 13 (11), 4126.

Tomanic, M., Belojevic, G., Jovanovic, A., Vasiljevic, N., Davidovic, D., Maksimovic, K., 2020. Dietary factors and tinnitus among adolescents. Nutrients 12 (11).

Veile, A., Zimmermann, H., Lorenz, E., Becher, H., 2018. Is smoking a risk factor for tinnitus? A systematic review, meta-analysis and estimation of the population attributable risk in Germany. BMJ Open 8 (2), e016589.

Wadhwa, S., Jain, S., Patil, N., 2024. The role of diet and lifestyle in the tinnitus management: a comprehensive review. Cureus 16 (4), e59344.

Wang, J., Xiang, J.-H., Peng, X.-Y., Liu, M., Sun, L.-J., Zhang, M., et al., 2025. Characteristic alterations of gut microbiota and serum metabolites in patients with chronic tinnitus: a multi-omics analysis. Microbiol. Spectr. 13 (1), e01878-24.

Zhang, M., Wang, X., Zhang, S., He, X., Chen, X., Wang, L., et al., 2025. Association of 15 common dietary factors with tinnitus: a systematic review and meta-analysis of observational studies. BMJ Open 15 (3), e091507.