**Article**

**Dietary Factors and Tinnitus among Adolescents**

Milena Tomanic 1,*, Goran Belojevic 1, Ana Jovanovic 1, Nadja Vasiljevic 1, Dragana Davidovic 1 and Katarina Maksimovic 2

1 Institute of Hygiene and Medical Ecology, Faculty of Medicine, University of Belgrade, 11000 Belgrade, Serbia; goran.belojevic@med.bg.ac.rs (G.B.); ana.s.jovanovic@med.bg.ac.rs (A.J.); nadja.vasiljevic@med.bg.ac.rs (N.V.); dragana.davidovic@med.bg.ac.rs (D.D.)

2 Faculty of Medicine, University of Belgrade, 11000 Belgrade, Serbia; katarinamaksimovic00@gmail.com

* Correspondence: milena.tomanic@med.bg.ac.rs; Tel.: +381-011-361-2762

Received: 5 October 2020; Accepted: 22 October 2020; Published: 27 October 2020

**Abstract:** The number of people suffering from constant tinnitus is ever-increasing and has spread to all age groups, including adolescents. The etiology of tinnitus is multifactorial, but dietary factors have been rarely investigated. The purpose of this study is to examine the relationship between dietary factors and constant tinnitus among adolescents from an urban environment. A population-oriented cross-sectional study was carried out during the 2019/2020 school year in 12 Belgrade secondary schools. There were 1287 school children aged from 15 to 19 years who participated in the study. There were 1003 respondents who completed a questionnaire on tinnitus (response rate 77.9%; 31% male). We used the standardized Tinnitus Screener questionnaire and a food frequency questionnaire specially designed for this study and adapted to Serbian adolescents. A logistic regression analysis revealed a strong negative correlation between fresh vegetables and fruits and tinnitus presence. On the other hand, the risk of constant tinnitus increased with the increased intake of white bread, carbonated beverages, and fast food. In conclusion, we show that fresh fruit and vegetable intakes may be negatively related to tinnitus frequency, while sweetened sodas, fast food, and white bread may raise the odds for tinnitus.

**Keywords:** adolescents; dietary factors; tinnitus

---

1. **Introduction**

Tinnitus is a conscious perception of sound in the absence of an appropriate external sound stimulus [1]. It is classified under the code H93 in the International Classification of Diseases, Tenth Revision, Clinical Modification Diagnosis Code classification [2]. Tinnitus can be perceived as constant (always heard in a quiet environment), intermittent = vacillates between “present” and “not present” on a regular basis, e.g., daily or weekly), occasional (tinnitus that is experienced on an irregular basis, e.g., “monthly or yearly”), and temporary (linked to some event (e.g., noise or ototoxicity) and lasts a period of time following the event and then subsides [3]. There is no consensus on the period of time that defines chronic tinnitus; according to some authors [3], it should last at least six months.

In earlier years, tinnitus was usually regarded as a side effect of hearing impairment, typically among the elderly [4]. However, the percentage of people facing the problem of phantom sound has increased and spread to all age groups, including adolescents.

Tinnitus occurs at least once in a lifetime in a third of people, but in 10–15% of the adult population, it is chronic [5]. In children and adolescents, at the age of 5–19 years, the range of tinnitus prevalence is much wider (from 5% to 75%) depending on how the term tinnitus is defined in a study [6].

Different studies have shown different attitudes of children towards tinnitus. On the one hand, it has been found that children see tinnitus as something normal or not as a serious health problem [7].
but other studies have shown that tinnitus in children creates fear, tension, and anxiety at this age [8–11]. Although children and adolescents know how to accurately describe tinnitus, they rarely spontaneously complain of it [12].

Despite the growing number of studies on tinnitus, its etiology is still vague, and its occurrence has been associated with a large number of personal and environmental factors (hearing impairment, Meniere’s disease, otosclerosis, noise, ototoxic drugs, etc.) [13].

There is a lack of scientific data on the possible relationship between diet and tinnitus. To our knowledge, only four population-based studies have been published in this field, and all of them were performed on an adult and/or elderly population [14–17]. In the first population study on diet–tinnitus association that was performed among UK adults, it was found that the odds of tinnitus were increased with a higher intake of fruits and vegetables, whole grain bread, and dairy avoidance. On the other hand, tinnitus was reduced with egg avoidance, fish consumption and caffeinated coffee consumption [14]. In another study on a British adult population, a negative relationship with the frequency of tinnitus was found for vitamin B12, while calcium, iron, and fat raised the odds for the onset of tinnitus [15]. Spankovich et al. performed a population study of diet and tinnitus in the United States using the healthy eating index. They found that, with a healthier diet (a number of servings of meat, dairy, fruit, vegetables and grains close to the recommended number) the odds of persistent tinnitus were decreased [16]. Lee and Kim conducted a population-oriented study of tinnitus in Korean adults. They revealed that the risk factors for tinnitus were a reduced intake of water, protein, riboflavin and niacin [17]. In a single study that only partially investigated a diet-tinnitus relationship within other risk factors among adolescents, the authors used neither a standardized tinnitus questionnaire nor a detailed food frequency questionnaire [18].

In our opinion, there is a need to investigate constant tinnitus, as it is the most serious form of tinnitus. We also support using standardized questionnaires such as the Tinnitus Screener questionnaire [3]. The scientific challenge is that, unlike adults, adolescents often ignore tinnitus and find it difficult to decide to visit a doctor [19].

The aim of this study is to examine the relationship between dietary factors and constant tinnitus among urban adolescents. We hypothesize that the intake of some food items is significantly related to the onset of tinnitus.

2. Materials and Methods

The Ethics Committee of the Faculty of Medicine University of Belgrade approved this study (Decision No. 1550/XI-38 on 11/28/2019). An informed consent was signed by all participants, and additional parental informed consent was obtained for children younger than 18 years.

2.1. Study Design

We performed a population-oriented cross-sectional study during the 2019/2020 school year in 12 Belgrade high schools. The respondents completed questionnaires during a class.

2.2. Study Sample

There were 1287 students who participated in the study (37.4% male). A questionnaire was completed by 1003 students (31.4% male). The response rate was 77.9%. No significant difference in gender, socioeconomic status, and parental education was found between respondents and nonrespondents.

2.3. Questionnaires

The first set of questions (Supplementary File S1) was related to gender, age, socioeconomic status, parental education, noise annoyance, sleep, listening to music through earphones, going out to noisy places, coffee, smoking, drug use, sedation, head injury, and associated diseases.
2.4. Data Were Collected on Gender and Age

2.4.1. Socioeconomic Status

Respondents were asked to answer whether their material needs were fulfilled. The offered answers were “No” and “Yes”.

2.4.2. Parental Education

The offered answers were “High school” and “College”.

2.4.3. Noise Annoyance

Respondents were asked to answer how much noise had bothered, disturbed or hindered them in the previous 12 months, while they had been at home and/or at school. The offered answers were “Little”, “Moderate” and “Much”.

2.4.4. Sleep

Respondents were asked to answer how many hours on average they slept at night. The offered answers were: “Less than six hours”, “Between six and eight hours” and “More than eight hours”.

2.4.5. Music Through Earphones

Respondents were asked how many hours they used earphones to listen to the music and other loud sounds. The offered answers were “Less than one hour”, “From one to three hours” and “More than three hours”.

2.4.6. Going Out to Noisy Places

Participants were asked how often they went out to places with loud music. The offered answers were “Three times a month or less” and “Once a week or more”.

2.4.7. Smoking

Smoking habits were investigated with the question “Do you smoke, or have you ever smoked?” The offered answers were “No” and “Yes”.

2.4.8. Drug Use

Respondents were asked if they use drugs, with the offered answers “No” and “Yes”.

2.4.9. Sedatives

Respondents were asked “Are you taking tranquilizers?”, and the offered answers were “No” and “Yes”.

2.4.10. Head Injury

Respondents were asked if they had ever experienced a severe head injury. Possible answers were “No” and “Yes”.

2.4.11. Associated Diseases

Data on comorbidities were obtained through the following separate questions: “Have you ever had: an ear infection, anxiety or depression, high blood pressure, thyroid problems, sinusitis, or anemia?” Possible answers were “No” and “Yes”.
2.5. Tinnitus Screener

The second part of questionnaire that respondents answered was the standardized Tinnitus Screener questionnaire [3]. For the purposes of this study, only constant tinnitus was taken as a binary health outcome.

2.6. Dietary Assessment

In the third part of the questionnaire, there was a food frequency inventory that we designed following the basic framework from the 2012 Youth Adolescent Food Frequency Questionnaire [20] and adapted for Serbian adolescents. The questions on food intake were semi-quantitative (e.g., number of tablespoons or portions). We asked about the intake of fruits; vegetables; fish; eggs; milk; bread; French fries; fast food; supplements rich in sugars; salts; and fats (ketchup, mustard, mayonnaise, butter and margarine); snacks; sodas; energy drinks; beer; wine; spirits; artificial sweeteners; food salting; and multivitamin supplements.

2.7. Statistical Analysis

In a descriptive statistic, we used a percentage calculation. In an inferential statistic, the distribution of tinnitus by gender was examined with the chi-square test. The association between personal and dietary factors as independent variables and constant tinnitus as a dependent variable was investigated with a univariate logistic regression.

The results were analyzed statistically using IBM SPSS ver. 21.0 (IBM North America, New York, NY 10022, USA).

3. Results

We found that 134 (13.4%) respondents had tinnitus; it was more frequent among boys (16.8%) (53/315) than among girls (11.8%) (81/688) (chi-square test, \( p < 0.029 \)) (Table 1). Tinnitus increased with age and socioeconomic status. On the other hand, a higher parental education was negatively related to tinnitus frequency. However, these relationships were not statistically significant (Table 1).

| Table 1. Sociodemographic characteristics of the investigated children. |
|-----------------------------|-------------|-------------|-------------|-------------|
| **Constant Tinnitus**       | **No**      | **Yes**     | **Missing** |
| **Valid n**                 | Count       | Count       |            | \( p ^ * \) |
| Gender                      | % within specific group | % of Total | % within specific group | % of Total |
| Male                         | 315 (31.4%) | 262         | 53          |            | 0.029       |
| Female                       | 688 (68.6%) | 607         | 81          |            |            |
| Age                         | 1003 (77.9%) | 34          | 3           |            |            |
| 15                           | 37 (3.7%)   | 91.9%       | 3.4%        | 8.1%       | 0.3%        |
| 16                           | 203 (20.2%) | 180         | 88.7%       | 17.9%      | 11.3%       | 2.3%        |
| 17                           | 258 (25.7%) | 222         | 86.0%       | 22.1%      | 14.0%       | 3.6%        |
| 18                           | 193 (19.2%) | 166         | 86.0%       | 16.6%      | 14.0%       | 2.7%        |
| 19                           | 312 (31.1%) | 267         | 85.6%       | 26.6%      | 14.4%       | 4.5%        |
### Table 1. Cont.

| Perception of Family Income | No | Yes | % Within Specific Group | % of Total | % Within Specific Group | % of Total | Missing | p * |
|----------------------------|----|-----|-------------------------|-----------|------------------------|-----------|---------|-----|
| **Valid n**                | 1000 (77.7%) | 287 (22.3%) | 287 (22.3%) | 0.251|
| **Fulfilled needs**        | 922 (92.2%) | 797 | 125 | 0.251|
|                           | 86.4% | 79.7% | 13.6% | 12.5% |
| **Unfulfilled needs**      | 78 (7.8%) | 71 | 7 | 0.251|
|                           | 91.0% | 7.1% | 9.0% | 0.7% |

| Parental education         | No | Yes | % Within Specific Group | % of Total | % Within Specific Group | % of Total | Missing | p * |
|----------------------------|----|-----|-------------------------|-----------|------------------------|-----------|---------|-----|
| **Father (High school)**   | 991 (77.0%) | 384 | 68 | 0.251|
|                           | 85.0% | 38.7% | 15.0% | 6.9% |
| **Father (College)**       | 991 (77.0%) | 474 | 65 | 0.251|
|                           | 87.9% | 47.8% | 12.1% | 6.6% |
| **Mother (High school)**   | 994 (77.2%) | 424 | 74 | 0.251|
|                           | 85.1% | 42.7% | 14.9% | 7.4% |
| **Mother (College)**       | 994 (77.2%) | 437 | 59 | 0.251|
|                           | 88.1% | 44.0% | 11.9% | 5.9% |

* Pearson chi-square.

Concerning personal confounding variables, female gender and ear infections showed a significant negative association with tinnitus.

We found a positive relationship between tinnitus and drug use, going out to noisy places, hypertension, using earphones, head injury, anxiety or depression, thyroid gland disorder, and smoking. Tinnitus was negatively related to sedatives use, anemia, sinus infection, exposure to noise at home, night sleep duration and exposure to noise at school, but these relationships were statistically insignificant (Table 2).

### Table 2. The univariate logistic regression between personal factors and tinnitus among adolescents (n = 1003).

| Potential confounders | Constant Tinnitus |
|-----------------------|-------------------|
|                       | Odds Ratio | 95% Confidence Interval | p-Value |
| Gender (Male = 1; Female = 2) | 0.660 | (0.453-0.960) | 0.030 |
| Exposure to noise at home (1 = Little; 2 = Moderate; 3 = Much) | 0.860 | (0.629-1.177) | 0.346 |
| Exposure to noise at school (1 = Little; 2 = Moderate; 3 = Much) | 0.892 | (0.708-1.123) | 0.331 |
| Night sleep duration (per hour) (1 = ≤6 h; 2 = 6-8 h; 3 = ≥8 h) | 0.874 | (0.636-1.200) | 0.405 |
| Using earphones (per hour) (1 = ≤1 h; 2 = 1-3 h; 3 = ≥3 h) | 1.182 | (0.904-1.545) | 0.222 |
| Going out to noisy places (1 = 3 times a month or less; 2 = once a week or more) | 1.489 | (0.963-2.301) | 0.073 |
| Smoking status (0 = No; 1 = Yes) | 1.044 | (0.658-1.657) | 0.854 |
| Drugs use (0 = No; 1 = Yes) | 2.461 | (0.964-6.402) | 0.065 |
| Sedatives use (0 = No; 1 = Yes) | 0.768 | (0.343-1.720) | 0.520 |
| Head injury (0 = No; 1 = Yes) | 1.141 | (0.789-1.651) | 0.484 |
| Ear infections (0 = No; 1 = Yes) | 0.626 | (0.406-0.964) | 0.034 |
| Anxiety or depression (0 = No; 1 = Yes) | 1.077 | (0.682-1.702) | 0.750 |
| Hypertension (0 = No; 1 = Yes) | 1.234 | (0.586-2.689) | 0.596 |
| Thyroid gland disorder (0 = No; 1 = Yes) | 1.051 | (0.779-1.418) | 0.747 |
| Sinus infection (0 = No; 1 = Yes) | 0.846 | (0.537-1.331) | 0.469 |
| Anemia (0 = No; 1 = Yes) | 0.776 | (0.177-3.400) | 0.737 |
Concerning the diet–tinnitus relation, a strong negative correlation was found for fresh vegetables and fruits. On the other hand, the risk for onset of constant tinnitus increased with the increased intake of white bread, carbonated beverages and fast food (Table 3).

Table 3. The univariate logistic regression between dietary factors and constant tinnitus among adolescents (n = 1003).

| Food Type Intake                                                                 | Odds Ratio | 95% Confidence Interval | p-Value |
|---------------------------------------------------------------------------------|------------|-------------------------|---------|
| Supplements in the form of multivitamin complexes (0 = No; 1 = Yes)             | 1.023      | (0.664–1.574)           | 0.919   |
| Sodas (0 = Never; 1 = Weekly; 2 = Every day; 3 = Few times daily)              | 1.249      | (1.014–1.538)           | 0.036   |
| Energy drinks (0 = Never; 1 = Weekly; 2 = Every day; 3 = Few times daily)      | 0.906      | (0.636–1.290)           | 0.583   |
| Daily coffee intake (0 = None; 1 = One or two; 2 = Three or more)              | 1.373      | (0.944–1.998)           | 0.097   |
| Daily water intake (1 = <1 L; 2 = Between 1–2 L; 3 = ≥More than 2 L)           | 1.206      | (0.947–1.542)           | 0.128   |
| Beer (0 = Never; 1 = <1 L; 2 = More than 1 L)                                  | 0.923      | (0.700–1.216)           | 0.568   |
| Wine (0 = Never; 1 = <1/2 L; 2 = More than 1/2 L)                              | 0.898      | (0.672–1.200)           | 0.467   |
| Spirits (0 = Never; 1 = <1/2 L; 2 = More than 1/2 L)                           | 0.985      | (0.762–1.274)           | 0.911   |
| Milk (0 = Don’t drink a milk; 1 = Drink milk with <1% m. fat; 2 = Drink milk with ≥1% m. fat) | 0.897      | (0.730–1.102)           | 0.301   |
| Margarine (0 = Monthly or less; 1 = Weekly; 2 = Every day)                     | 1.204      | (0.889–1.631)           | 0.230   |
| Fast food (1 = Monthly or less; 2 = Weekly; 3 = Every day)                     | 1.355      | (1.011–1.816)           | 0.042   |
| Fish (1 = Monthly or less; 2 = Weekly; 3 = Every day)                          | 1.004      | (0.699–1.442)           | 0.984   |
| Eggs (1 = Monthly or less; 2 = Weekly; 3 = Every day)                          | 0.733      | (0.525–1.023)           | 0.067   |
| Ketchup, mustard, mayonnaise (1 = Monthly or less; 2 = Weekly; 3 = Every day)  | 1.043      | (0.815–1.355)           | 0.757   |
| Artificial sweeteners (1 = Monthly or less; 2 = Weekly; 3 = Every day)         | 0.920      | (0.667–1.270)           | 0.614   |
| Type of bread (1 = Whole grain bread; 2 = White bread)                         | 1.715      | (1.115–2.638)           | 0.014   |
| Pastries from the bakery (1 = Monthly or less; 2 = Weekly; 3 = Every day)      | 1.051      | (0.779–1.418)           | 0.747   |
| French fries (1 = Monthly or less; 2 = Weekly; 3 = Every day)                  | 1.380      | (0.989–1.926)           | 0.058   |
| Fresh fruits (1 = Monthly or less; 2 = Weekly; 3 = Every day)                  | 0.637      | (0.462–0.879)           | 0.006   |
| Fresh vegetables (1 = Monthly or less; 2 = Weekly; 3 = Every day)              | 0.244      | (0.173–0.343)           | <0.001  |
| Snacks (1 = Monthly or less; 2 = Weekly; 3 = Every day)                        | 1.124      | (0.806–1.576)           | 0.490   |
| Salting food (0 = No; 1 = Yes)                                                  | 1.399      | (0.874–2.240)           | 0.162   |

A statistically insignificant positive relationship was found between tinnitus and salting food, the intake of French fries, coffee, water, margarine, snacks, pastries from the bakery, ketchup, mustard, mayonnaise, supplements in the form of multivitamin complexes and fish. On the contrary, tinnitus was insignificantly and negatively related to the intake of eggs, milk, wine, energy drinks, artificial sweeteners, beer and spirits (Table 3).

4. Discussion

We show that a higher intake of fresh fruits and vegetables is negatively related to the onset of constant tinnitus among adolescents. Fruits, vegetables, and legumes are major sources of minerals, vitamins and antioxidants (vitamins C, vitamin A, chlorophyll, potassium, flavonoids, dietary fiber carotenoids, folate, curcumin) that stop the spread of chain reactions and free radicals damage [21–23].

Free radicals and reactive oxygen species are molecules that may disturb the homeostasis of the organism. The imbalance of the endogenous antioxidant system and free radicals and reactive oxygen species levels can cause damage to cell membranes, cytosols and mitochondria [24, 25]. The excessive accumulation of free radicals in the sensory epithelium of the cochlea spiral ganglion neurons and cells of stria vascularis plays an important role in the development of damage to auditory cells [25] and the subsequent development of symptoms, including tinnitus. Therefore, a diet rich in antioxidants may be a potential protective factor against tinnitus.

Our findings related to fruits and vegetables are in accordance with the results of previous studies on the relationship between diet and constant tinnitus in adults [14,17,26]. Contrary to this view, in a
study by McCormack et al. (2014) in adults [15], it was found that increasing fruit and vegetable intakes moderately increased the odds for persistent tinnitus but was not related to transient tinnitus.

On the other hand, we show that white bread, fast food, and sweetened sodas raise the odds for tinnitus among adolescents. Similar to our study, whole grain bread was found to be protective against tinnitus in adults in a large British study by McCormack et al. (2014) [15]. Spankovich et al. (2017) [16] found that a healthy diet (indexed by a Healthy Eating Index (HEI) score, United States Department of Agriculture 1995 [27]) was associated with a reduced risk of developing persistent tinnitus among adults. The term “healthier HEI scores” referred to the intake of larger quantities of fruits and vegetables, as well as whole grain cereals and lower sugar intakes. White bread, fast food, and sweetened sodas may be risk factors for tinnitus due to their high glycemic index; consequent hyperinsulinemia might cause microvascular complications and inner ear diseases and tinnitus [28].

Our finding of more frequent tinnitus in boys compared to girls is not in agreement with the results of previous studies, in which tinnitus was about two times more frequent among girls (compared to boys) [29,30]. However, our gender distribution of tinnitus is similar to the findings of studies among adult populations [31].

A possible explanation for our findings may be significantly more frequent nights out at places with loud music (chi-square, \( p = 0.005 \)), more frequent head injuries (\( p < 0.001 \)) and frequent exposure to explosions near ears (\( p < 0.001 \)). Additionally, in our study, we found a higher frequency of narcotics use (\( p = 0.031 \)) and alcohol consumption (\( p = 0.009 \)) among boys compared to girls, as well as the tendency to play games of chance (\( p < 0.001 \)), which can be related to great stress, which is also considered as an important factor for the development of tinnitus in general.

Our finding on the negative association of ear infections with tinnitus is also not in agreement with the results of other studies [32,33]. Maybe the explanation for this outcome is in fact that those who had ear infections in childhood in later life tend to avoid exposure to noise, alcohol, active and second-hand smoke, and other risk factors for tinnitus [34,35].

Strengths and Limitations of the Study

The strength of this study is that we used a standardized questionnaire for tinnitus and focused exclusively on a constant tinnitus, thus minimizing a selection bias.

The weakness of the study is that we did not perform a laboratory food analysis. Second, neither clinical examinations nor hearing tests were performed. Third, we did not conduct anthropometric measurements (body weight, height, body fat, and waist circumference). Fourth, we focused on the children of an urban setting; it is questionable whether the risk factors for tinnitus in suburban and rural areas would be the same.

5. Conclusions

We show that the intake of fresh fruits and vegetables might be an independent dietary factor that is negatively related to the onset of tinnitus among adolescents. Food that may raise the odds for tinnitus among young people are sweetened sodas, fast food and white bread. For causal interpretations of these relationships, we suggest interventional studies.

Supplementary Materials: The following are available online at http://www.mdpi.com/2072-6643/12/11/3291/s1, Supplementary File S1: Questionnaires.

Author Contributions: Conceptualization, M.T. and G.B.; methodology, M.T. and G.B.; investigation, M.T. and A.J.; statistical analysis, M.T. and G.B.; writing—first draft, M.T. and G.B.; writing—review and editing, M.T., G.B., A.J., N.V., D.D. and K.M.; and final draft preparation M.T. and G.B. All authors have read and approved the final version of the manuscript.

Funding: This work was funded by the Serbian Ministry of Education, Science and Technological Development, Contract No. 175078/2011–2020.

Acknowledgments: The authors are grateful to the numerous students who participated in this study and the principals of the high schools in Belgrade where this study was carried out.
**Conflicts of Interest:** The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

**References**

1. Levine, R.A.; Oron, Y. Tinnitus. In *Neurology of Sexual and Bladder Disorders*; Elsevier BV: Amsterdam, The Netherlands, 2015; Volume 150, pp. 409–431.

2. International Classification of Diseases, Tenth Revision (ICD–10). Available online: https://www.cdc.gov/nchs/icd/icd10.htm (accessed on 5 September 2020).

3. Henry, J.A.; Griest, S.; Austin, D.; Helt, W.; Gordon, J.; Thielman, E.; Theodoroff, S.M.; Lewis, M.S.; Blankenship, C.; Zaugg, T.L.; et al. Tinnitus Screener: Results from the First 100 Participants in an Epidemiology Study. *Am. J. Audiol.* **2016**, *25*, 153–160. [CrossRef] [PubMed]

4. Ahmad, N.; Seidman, M. Tinnitus in the Older Adult. *Drugs Aging* **2004**, *21*, 297–305. [CrossRef] [PubMed]

5. Heller, A.J. Classification and epidemiology of tinnitus. *Otolaryngol. Clin. N. Am.* **2003**, *36*, 239–248. [CrossRef]

6. Rosing, S.N.; Schmidt, J.H.; Wedderkopp, N.; Baguley, D.M. Prevalence of tinnitus and hyperacusis in children and adolescents: A systematic review. *BMJ Open* **2016**, *6*, e010596. [CrossRef]

7. Mills, R.P.; Albert, D.; Brain, C. Tinnitus in childhood. *Clin. Otolaryngol.* **1986**, *11*, 431–434. [CrossRef] [PubMed]

8. Kentish, R.; Benton, C.; Kennedy, V.; Munro, C.; Phillips, J.; Rogers, C.; Rosenberg, J.; Salvage, S. Tinnitus in Children and Teenagers: Practice Guidance. 2014. Available online: https://www.thebsa.org.uk/wp-content/uploads/2014/06/Paed-Tin-Guide-Pub-Consul-Compressed.pdf (accessed on 14 October 2020).

9. Kentish, R.C.; Crocker, S.R.; McKenna, L. Children’s Experience of Tinnitus: A Preliminary Survey of Children Presenting to a Psychology Department. *Br. J. Audiol.* **2000**, *34*, 335–340. [CrossRef]

10. Kentish, R.; Crocker, S. Scary Monsters and Waterfalls: Tinnitus Narrative Therapy for Children. Ento Key. 2016. Available online: https://entokey.com/scary-monsters-and-waterfalls-tinnitus-narrative-therapy-for-children/ (accessed on 14 October 2020).

11. Kentish, R. Drawing Pictures and Telling Stories: Treating Tinnitus in Childhood. Entandaudiologynews.Com. 2014. Available online: https://www.entandaudiologynews.com/media/3087/entjf4-audiology-kentish-new.pdf (accessed on 14 October 2020).

12. Savastano, M.; Marioni, G.; De Filippis, C. Tinnitus in children without hearing impairment. *Int. J. Pediatr. Otorhinolaryngol.* **2009**, *73*, S13–S15. [CrossRef]

13. Baguley, D.; McFerran, D.; Hall, D. Tinnitus. *Lancet* **2013**, *382*, 1600–1607. [CrossRef]

14. McCormack, A.; Edmondson-Jones, M.; Mellor, D.; Dawes, P.; Munro, K.J.; Moore, D.R.; Fortnum, H. Association of Dietary Factors with Presence and Severity of Tinnitus in a Middle–Aged UK Population. *PLoS ONE* **2014**, *9*, e14711. [CrossRef]

15. Dawes, P.; Cruickshanks, K.J.; Marsden, A.; Moore, D.R.; Munro, K.J. Relationship Between Diet, Tinnitus, and Hearing Difficulties. *Ear Hear.* **2020**, *41*, 289–299. [CrossRef]

16. Spankovich, C.; Bishop, C.; Johnson, M.F.; Elkins, A.; Su, D.; Lobarkinas, E.; Le Prell, C.G. Relationship between dietary quality, tinnitus and hearing level: data from the national health and nutrition examination survey, 1999–2002. *Int. J. Audiol.* **2017**, *56*, 716–722. [CrossRef] [PubMed]

17. Lee, H.Y.; Kim, Y.H. Relationship Between Diet and Tinnitus: Korea National Health and Nutrition Examination Survey. *Clin. Exp. Otorhinolaryngol.* **2018**, *11*, 158–165. [CrossRef] [PubMed]

18. Rhee, J.; Lee, D.; Suh, M.W.; Lee, J.H.; Hong, Y.-C.; Oh, S.H.; Park, Y.-C. Prevalence, associated factors, and comorbidities of tinnitus in adolescents. *PLoS ONE* **2020**, *15*, e0236723. [CrossRef]

19. Gupta, A.; Gupta, A.; Jain, K.; Gupta, S. Noise Pollution and Impact on Children Health. *Indian J. Peditr.* **2018**, *85*, 300–306. [CrossRef]

20. Harvard, T.H. Chan School of Public Health Nutrition Department’s File Download Site: Youth Adolescent Food Frequency Questionnaire. 2012. Available online: https://regepi.bwh.harvard.edu/health/KIDS/files/02.%202012%20YOUTH%20ADOLESCENT%20FOOD%20FREQUENCY%20QUESTIONNAIRE.pdf (accessed on 17 October 2020).

21. Stavric, B. Antimutagens and anticarcinogens in foods. *Food Chem. Toxicol.* **1994**, *32*, 79–90. [CrossRef]
22. Fotis, T.; Pepper, M.S.; Aktas, E.; Breit, S.; Rasku, S.; Adlercreutz, H.; Wäähä, K.; Montesano, R.; Schweigerer, L. Flavonoids, dietary–derived inhibitors of cell proliferation and in vitro angiogenesis. *Cancer Res.* 1997, 57, 2916–2921.

23. Lee, J.; Koo, N.; Min, D.B. Reactive Oxygen Species, Aging, and Antioxidative Nutraceuticals. *Compr. Rev. Food Sci. Food Saf.* 2004, 3, 21–33. [CrossRef]

24. Gopinath, B.; Flood, V.M.; McMahon, C.M.; Burlutsky, G.; Spankovich, C.; Hood, L.J.; Mitchell, P. Dietary antioxidant intake is associated with the prevalence but not incidence of age–related hearing loss. *J. Nutr. Health Aging* 2011, 15, 896–900. [CrossRef]

25. Spankovich, C.; Hood, L.J.; Silver, H.J.; Lambert, W.; Flood, V.M.; Mitchell, P. Associations between Diet and Both High and Low Pure Tone Averages and Transient Evoked Otoacoustic Emissions in an Older Adult Population–Based Study. *J. Am. Acad. Audiol.* 2011, 22, 49–58. [CrossRef]

26. Hofmeister, M. Do dietary factors significantly influence tinnitus? *Aust. J. Gen. Pr.* 2019, 48, 153–157. [CrossRef]

27. Bowman, S.A.; Lino, M.; Gerrior, S.A.; Basiotis, P.P. *The Healthy Eating Index: 1994–1996*; CNPP Reports 257277; U.S. Department of Agriculture, Center for Nutrition Policy and Promotion: Washington, DC, USA, 1998.

28. Basut, O.; Ozdilek, T.; Co¸skun, H.; Eri¸sen, L.; Tezel, I.; Onart, S.; Hizalan, I. The incidence of hyperinsulinemia in patients with tinnitus and the effect of a diabetic diet on tinnitus. *Turk. J. Ear Nose Throat* 2003, 10.

29. Savastano, M. A protocol of study for tinnitus in childhood. *Int. J. Pediatr. Otorhinolaryngol.* 2002, 64, 23–27. [CrossRef]

30. Widéen, S.E.O.; I Erlandsson, S. Self–reported tinnitus and noise sensitivity among adolescents in Sweden. *Noise Health* 2005, 7, 29–40.

31. McCormack, A.; Edmondson–Jones, M.; Somerset, S.; Hall, D. A systematic review of the reporting of tinnitus prevalence and severity. *Hear. Res.* 2016, 337, 70–79. [CrossRef]

32. Aarhus, L.; Engdahl, B.; Tamb, K.; Kvestad, E.; Hoffman, H.J. Association Between Childhood Hearing Disorders and Tinnitus in Adulthood. *JAMA Otolaryngol. Neck Surg.* 2015, 141, 983–989. [CrossRef]

33. Aarhus, L.; Tamb, K.; Hoffman, H.J.; Engdahl, B. Childhood otitis media is associated with dizziness in adulthood: the HUNT cohort study. *Eur. Arch. Oto–Rhino–Laryngol.* 2015, 273, 2047–2054. [CrossRef]

34. Health Effects of Secondhand Smoke—CDC. Available online: https://www.cdc.gov/tobacco/data_statistics/fact_sheets/secondhand_smoke/health_effects/index.htm (accessed on 3 September 2020).

35. Carreras, G.; Lugo, A.; Gallus, S.; Cortini, B.; Fernández, E.; López, M.J.; Soriano, J.B.; López–Nicolás, A.; Semple, S.; Gorini, G.; et al. Burden of disease attributable to second–hand smoke exposure: A systematic review. *Prev. Med.* 2019, 129, 105833. [CrossRef]

**Publisher’s Note:** MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.