**Table 1.** Search strategy for English databases

|  |  |
| --- | --- |
| Subject term number | Search term |
| 1 | prevalence |
| 2 | tinnit\*s OR tinnitus OR (ringing AND ear\*) OR (buzzing AND ear\*) OR (noise AND ear\*) |
| 3 | (observational OR epidemiolog\* OR epidemiology OR case control OR case control studies OR cohort stud\* OR prospective studies OR cohort analy\* OR cross section\* OR cross-sectional studies OR population) |
| 4 | China |
| 5 | 1 AND 2 AND 3 AND 4 |

**Table 2.** Study characteristics of the included studies

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Study | Year | Study purpose | Age group (range (mean ± SD); years) | Study location | Population (*n*) | Gender (female:male (*n*)） | Population category | Study method |
| Huang *et al*.13 | 2003 | Hearing loss and tinnitus | 60–98 (69.6 ± 7.2) | Beijing and adjacent rural areas | 1434 | 873:561 | General (elderly) | Random cluster sampling |
| Zhu14 | 2005 | Tinnitus | 9–80 | Northern Shaanxi region | 28 000 | 12 635:15 365 | General | Random cluster sampling |
| Xu *et al*.15 | 2006 | Tinnitus | 60–93 (68.2 ± 6.5) | Jiangsu | 1149 | 601:548 | General (elderly) | Probability proportionate to size sampling |
| Xu16 | 2006 | Tinnitus and dizziness | 10–93 | Jiangsu | 6333 | 3298:3035 | General | Probability proportionate to size sampling |
| Liu *et al*.17 | 2011 | Tinnitus and hearing loss with different diseases | 15–76 (41.2 ± 23.5) | Guangzhou, Guangdong | 376 | 175:201 | Otological patients | Convenient sampling |
| Gao *et al*.18 | 2011 | Noise-induced hearing impairment |  | Xinxiang, Henan | 3826 |  | University students | Stratified random sampling |
| Zhang & li19 | 2012 | Tinnitus | (15.5 ± 1.3) | Yinchuan, Ningxia | 2009 | 986:1023 | Middle-school pupils | Stratified random cluster sampling |
| Li *et al*.20 | 2012 | Tinnitus | (15.7 ± 1.4) | Xian, Shaanxi | 1567 | 774:793 | Middle-school pupils | Stratified random cluster sampling |
| Liang *et al*.21 | 2012 | Tinnitus and hearing loss | 15–64 (44.8) | Beijing | 223 | 124:99 | Chronic kidney disease patients | Cross-sectional sampling |
| Liy *et al*.22 | 2013 | Tinnitus | ≥60 | Foshan, Guangdong | 2035 | 1046:989 | General (elderly) | Home visit in 1 community district |
| He *et al*.23 | 2014 | Tinnitus | 18–93 | Kaifeng, Henan | 10 102 | 4828:5274 | General | Local population who attended health checks |
| Yin *et al*.24 | 2015 | Tinnitus | ≥20 | Zhengzhou and adjacent rural counties | 2526 | 1246:1280 | General | Stratified multistage cluster, probability proportionate to size sampling |
| Hong *et al*.25 | 2016 | Tinnitus | 14–88 (48 ± 16) | Dalian, Liaoning | 1596 | 848:748 | General | Convenient sampling (health check centre) |
| Hong *et al*.26 | 2017 | Tinnitus | 20–88 (48.0 ± 15.6) | Dalian, Liaoning | 1748 | 942:806 | General | Convenient sampling (health check centre) |
| Lu *et al*.27 | 2017 | Tinnitus | ≥9 | Urumqi, Xinjiang | 620 | 328:292 | General | Convenient sampling (health check centre) |
| Lu *et al*.28 | 2017 | Tinnitus |  | Urumqi, Xinjiang | 1574 | 866:708 | General | Nine community districts visited by resident/family inspector door to door |
| Liu *et al*.29 | 2018 | Auditory characteristics | 45–88 (71) | Beijing | 157 | 59:98 | General（middle and elderly） | Random sampling |
| Han *et al*.30 | 2018 | Tinnitus and risk factors | 60–93 (71.4 ± 8.26) | Beijing | 150 | 84:66 | General (elderly) | Recruited volunteers |
| Ding31 | 2018 | Tinnitus and headphones | 15–37 (22.85 ± 3.076) | Guangzhou, Guangdong | 1909 | 1078:831 | University student | Convenient sampling |
| Chen32 | 2018 | Hypertension, diabetes and tinnitus | 19–80 (60.4 ± 4.8) | Zigong Sichuan | 952 | 413:539 | Hospital in-patients | In-patients for high blood pressure and diabetes |
| Liu *et al*.33 | 2018 | Diabetes and tinnitus |  | Beijing | 255 | 120:135 | Diabetic patients | Diabetic patients |
| Yang *et al*.34 | 2018 | Tinnitus and risk factors | ≥18 | Guangdong | 3705 |  | General | Four stage Probability proportionate to size sampling |
| Liu *et al*.35 | 2018 | Tinnitus and OSAHS | 24–83 (58.2 ± 14.8) | Nagoya, Japan | 115 | 34:81 | OSAHS patients | OSAHS patients |

SD = standard deviation; OSAHS = obstructive sleep apnoea hypopnea syndrome

**Table 3.** Age groups of overall prevalence figures for 15 studies

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Study | Age (range; years) | Sample size (*n*) | Current tinnitus female (%) | Current tinnitus male (%) | Current tinnitus overall (%) | Bothersome tinnitus overall (%) | *P-*value |
| Huang *et al*.13 | 60–69 | 259/765 |  |  | 33.8 |  |  |
|  | 70*–*79 | 176/503 |  |  | 34.9 |  |  |
|  | 80*–*89 | 53/166 |  |  | 31.9 |  |  |
| Zhu14 | 0*–*9 | 80/\* |  |  | 3.7 |  |  |
|  | 10*–*19 | 380 |  |  | 17.4 |  |  |
|  | 20*–*29 | 480 |  |  | 21.9 |  |  |
|  | 30*–*39 | 363 |  |  | 16.6 |  |  |
|  | 40*–*49 | 308 |  |  | 14.1 |  |  |
|  | 50*–*59 | 250 |  |  | 11.4 |  |  |
|  | 60*–*80 | 325 |  |  | 14.9 |  |  |
| Xu *et al*.15 | 60*–*69 | 197/703 |  |  | 28 | 2.4 |  |
|  | 70*–*79 | 117/369 |  |  | 31.7 | 3 |  |
|  | 80*–*93 | 26/77 |  |  | 33.8 | 1.3 |  |
| Xu16 | 10*–*19 | 13/958 |  |  | 1.4 | 0.1 | <0.05 |
|  | 20*–*29 | 33/646 |  |  | 5.1 | 0.5 |  |
|  | 30*–*39 | 123/1381 |  |  | 8.9 | 0.3 |  |
|  | 40*–*49 | 164/1102 |  |  | 14.9 | 0.8 |  |
|  | 50*–*59 | 245/1097 |  |  | 22.3 | 1.7 |  |
|  | 60*–*69 | 197/703 |  |  | 28 | 2.4 |  |
|  | 70*–*79 | 117/369 |  |  | 31.7 | 3 |  |
|  | 80*–*93 | 26/77 |  |  | 33.8 | 1.3 |  |
| Li *et al*.22 | 60*–*69 | 332/1175 |  |  | 28.3 | 3.1 |  |
|  | 70*–*79 | 190/655 |  |  | 29 | 3.7 |  |
|  | >80 | 62/205 |  |  | 30.2 | 2.4 |  |
| He *et al*.23 | 18*–*35 | 482/1576 |  |  | 30.6 |  | <0.05 |
|  | 35*–*44 | 634/2404 |  |  | 26.4 |  |  |
|  | 45*–*59 | 1209/3495 |  |  | 34.6 |  |  |
|  | 60*–*93 | 750/2627 |  |  | 28.6 |  |  |
| Yin *et al*.24 | 20*–*40 | 10/481 |  |  | 2.08 |  | <0.001 |
|  | 41*–*59 | 35/354 |  |  | 9.89 |  |  |
|  | >59 | 243/1691 |  |  | 14.37 |  |  |
| Hong *et al*.25 | 14*–*19 | 1/21 | 14.3 | 0 | 4.8 |  | <0.05 |
|  | 20*–*29 | 13/184 | 9.8 | 4.3 | 7.1 |  |  |
|  | 30*–*39 | 36/342 | 7.3 | 13 | 10.5 |  |  |
|  | 40*–*49 | 40/308 | 12.7 | 13.2 | 13 |  |  |
|  | 50*–*59 | 82/335 | 26.2 | 22.3 | 24.5 |  |  |
|  | 60*–*69 | 62/229 | 27.3 | 26.6 | 27.1 |  |  |
|  | 70*–*79 | 51/137 | 37.6 | 36.1 | 37.2 |  |  |
|  | 80*–*89 | 15/40 | 33.3 | 46.2 | 37.5 |  |  |
| Hong *et al*.26 | 20*–*29 | 15/213 | 8.3 | 5.7 | 7 |  | <0.001 |
|  | 30*–*39 | 40/384 | 7.6 | 12.7 | 10.4 |  |  |
|  | 40*–*49 | 44/351 | 12.7 | 12.4 | 12.5 |  |  |
|  | 50*–*59 | 89/369 | 26.4 | 21 | 24.1 |  |  |
|  | 60*–*69 | 65/250 | 26.4 | 25.3 | 26 |  |  |
|  | 70*–*79 | 52/141 | 37.3 | 35.9 | 36.9 |  |  |
|  | 80*–*89 | 15/40 | 33.3 | 46.2 | 37.5 |  |  |
| Lu *et al*.27 | 9*–*18 | 1/3 |  |  | 33.3 |  |  |
|  | 19*–*39 | 56/312 |  |  | 19.2 |  |  |
|  | 40*–*60 | 50/286 |  |  | 17.5 |  |  |
|  | >60 | 3/19 |  |  | 15.7 |  |  |
| Liu *et al*.29 | 45*–*59 | 9/86 |  |  | 10.5 |  |  |
|  | 60*–*69 | 15/98 |  |  | 15.3 |  |  |
|  | 70*–*79 | 8/88 |  |  | 9.1 |  |  |
|  | 80*–*89 | 5/42 |  |  | 11.9 |  |  |
| Ding *et al*.31 | 15*–*20 | 28/423 |  |  | 6.6 |  |  |
|  | 21*–*25 | 100/1154 |  |  | 8.7 |  |  |
|  | 26*–*30 | 30/320 |  |  | 9.3 |  |  |
|  | 31*–*35 | 1/11 |  |  | 9.0 |  |  |
|  | 36*–*40 | 0/1 |  |  | 0.0 |  |  |
| Liu *et al*.33 | <31 | 4/10 |  |  | 40 |  | 0.001 |
|  | 31*–*40 | 3/12 |  |  | 25 |  |  |
|  | 41*–*50 | 13/48 |  |  | 27.1 |  |  |
|  | 51*–*60 | 36/83 |  |  | 43.3 |  |  |
|  | >60 | 56/102 |  |  | 54.9 |  |  |
| Yang *et al*.34 | 18*–*30 |  | 11.3 | 6.6 | 9.1 |  | 0.001 |
|  | 30*–*39 |  | 9.3 | 6.7 | 8.1 |  |  |
|  | 40*–*49 |  | 11.0 | 6.0 | 8.7 |  |  |
|  | 50*–*59 |  | 10.4 | 10.4 | 10.4 |  |  |
|  | 60*–*69 |  | 13.7 | 8.9 | 11.3 |  |  |
|  | >69 |  | 12.6 | 19.2 | 16.0 |  |  |
| Liu *et al*.35 | 24*–*30 | 0/3 |  |  |  | 0 | <0.01 |
|  | 31*–*40 | 4/18 |  |  |  | 9.1 |  |
|  | 41*–*50 | 3/16 |  |  |  | 6.8 |  |
|  | 51*–*60 | 5/21 |  |  |  | 11.4 |  |
|  | 61*–*70 | 17/29 |  |  |  | 38.4 |  |
|  | 71*–*80 | 13/27 |  |  |  | 29.6 |  |
|  | >80 | 0/5 |  |  |  | 0 |  |

\*no data available about the total number of people in each group

**Table 4.** Definitions of tinnitus prevalence and severity

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Study | Year | Method | Question used about tinnitus | Diagnosis about tinnitus |
| Huang *et al*.13 | 2003 | Survey medical history |  | Tinnitus lasts for 5 minutes or more40 |
| Zhu14 | 2005 | Survey questionnaire41 conducted by trained medical students |  | Tinnitus lasts for 5 minutes or more40 |
| Xu *et al*.15 | 2006 | Questionnaire; ENT doctors trained to administer the same questionnaire: otological diseases; noise exposure; tinnitus | In the past 12 months, have you been bothered by ringing, roaring, or buzzing in your ears or head that lasts for 5 minutes or more? | Tinnitus lasts for 5 minutes or more in the past 12 months, excluding transient tinnitus after noise exposure |
| Xu16 | 2006 | Questionnaire; ENT doctors trained to administer the same questionnaire: otological diseases; noise exposure; tinnitus | In the past 12 months, have you been bothered by ringing, roaring, or buzzing in your ears or head that lasts for 5 minutes or more? | Tinnitus lasts for 5 minutes or more |
| Liu *et al*.17 | 2011 | Questionnaire | Presence of tinnitus, exclusion of perception of middle-ear fluid/cerumen movements/external sounds | Perceived in ear/skull, non-pulsative sound which is distinguishable from external sounds, lasting longer than 5 minutes |
| Gao *et al*.18 | 2011 | Self-questionnaire and returning on site |  | Self-report, ‘chronic’ |
| Zhang & Li19 | 2012 | Chinese middle-school pupils psychological health measurements, Athens insomnia scale self-assessment |  | Tinnitus lasts for 5 minutes or more40 |
| Li *et al*.20 | 2012 |  |  |  |
| Liang *et al*.21 | 2012 |  |  |  |
| Li *et al*.22 | 2013 | Questionnaire |  | Tinnitus classification questionnaire40 |
| He *et al*.23 | 2014 | Questionnaire |  | Tinnitus lasts for 5 minutes or more |
| Yin *et al*.24 | 2015 |  |  |  |
| Hong *et al*.25 | 2016 |  |  | Lasting ≥5 minutes |
| Hong *et al*.26 | 2017 | Self-questionnaire |  | >5 minutes. Continuous tinnitus <5 mins. Transient tinnitus |
| Lu *et al*.27 | 2017 | Clinicians in health check centre randomly distributed self-designed questionnaire, postal return |  | Tinnitus lasts for 5 minutes or more |
| Lu *et al*.28 | 2017 | 2000 copies of questionnaire distributed and collected |  | Tinnitus lasts for 5 minutes or more40 |
| Liu *et al*.29 | 2018 | Tinnitus classification questionnaire |  | Tinnitus classification questionnaire |
| Han *et al*.30 | 2018 | Three ENT doctors perform face-to-face interview using self-designed questionnaire |  |  |
| Ding31 | 2018 | Self-designed questionnaire | In the past 12 months, have you been bothered by ringing, roaring, or buzzing in your ears or head that lasts for 5 minutes or more? | Answer ‘yes’ to tinnitus question and each time tinnitus occurs, it lasts >5 mins. Tinnitus >6 months, chronic; tinnitus <6 months, acute. |
| Chen32 | 2018 | Questionnaire |  | Inside ear or skull/head, there appears cicada sounds or chirping, humming and other different sounds, continuous or intermittent, lasting for more than 1 minute. |
| Liu *et al*.33 | 2018 | Survey questionnaire |  |  |
| Yang *et al*.34 | 2018 | Structured questionnaire | In the past one year, have you been experiencing any ringing, buzzing or other sounds in your ears? | Intermittent and persistent tinnitus are included |
| Liu *et al*.35 | 2018 |  |  |  |

**Table 5.** The risk factors related to tinnitus in 18 studies

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Study | Age group or p-value | Gender or p-value | Job (p-value) | Otological & vestibular disorders (p-value or odds ratio) | Hearing loss (p-value or odds ratio) | Noise (p-value or odds ratio) | Urban or rural (p-value) | Systemic disease (p-value) | Sleep (p-value) | Education |
| Zhu14 |  | Male (<0.05） | Manual workers (<0.05) | >0.05 | >0.05 | >0.05 |  |  |  |  |
| Xu et al.15 | >0.05 | >0.05 |  |  |  |  | Rural (<0.05） |  |  |  |
| Xu16 | Elder, <0.05 |  |  | Odds ratio: 5.902 | Odds ratio: 6.718 | Odds ratio: 2.743 | Rural (<0.05） |  |  |  |
| Zhang & Li19 | >0.05 | Female (<0.05） |  | <0.05 |  | Time of headset (<0.05) |  |  | Insomnia (<0.05) |  |
| Li et al.20 |  | Female (<0.05） |  |  |  |  |  |  |  |  |
| Li et al.22 | >0.05 | >0.05 |  |  | >0.05 |  |  |  |  |  |
| He et al.23 | 45–59 (<0.05） | Female (<0.05） | Telephonist and manual workers (<0.05) | >0.05 | >0.05 | >0.05 |  |  |  |  |
| Yin et al.24 | >60 (<0.05） | Female (<0.05） |  |  |  |  | Urban (<0.05) |  |  |  |
| Hong et al.25 | >80 (<0.05） | Female (<0.05） |  |  |  |  |  | Hypertension, diabetes, Hyperlipidaemia, overweight (<0.05) |  |  |
| Hong et al.26 | <0.05 | Female (<0.05） |  |  |  |  |  |  |  |  |
| Lu et al.27 | >0.05 | >0.05 | >0.05 |  |  | Time of headset (<0.05) |  |  | <0.05 |  |
| Lu et al.28 |  | >0.05 |  |  |  |  |  |  |  |  |
| Han et al.30 | <70 (<0.05) |  |  |  | >60 dB (<0.05) |  |  |  |  |  |
| Ding31 | >0.05 |  |  |  |  |  |  |  |  |  |
| Chen32 |  |  |  |  |  |  |  | Hypertension, diabetes (<0.05) |  |  |
| Liu et al.33 | >60 (<0.05) | >0.05 |  |  | <0.05 |  |  |  |  | >0.05 |
| Yang et al.34 | <0.05 | >0.05 |  | <0.05 | <0.05 |  | Urban (<0.05) | <0.05 |  | <0.05 |
| Liu et al.35 | <0.01 | >0.05 |  |  | 0.044 |  |  |  |  |  |