The prevalence of hyperuricemia in China: a meta-analysis

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Abstract

Background: The prevalence of hyperuricemia varied in different populations and it appeared to be increasing in the past decades. Recent studies suggest that hyperuricemia is an independent risk factor for cardiovascular disease. However, there has not yet been a systematic analysis of the prevalence of hyperuricemia in China.

Methods: Epidemiological investigations on hyperuricemia in China published in journals were identified manually and on-line by using CBMDISC, Chongqing VIP database and CNKI database. Those Reported in English journals were identified using MEDLINE database. Selected studies had to describe an original study defined by strict screening and diagnostic criteria. The fixed effects model or random effects model was employed according to statistical test for homogeneity.

Results: Fifty-nine studies were selected, the statistical information of which was collected for systematic analysis. The results showed that the pooled prevalence of hyperuricemia in male was 21.6% (95% CI: 18.9%-24.6%), but it was only 8.6% (95% CI: 8.2%-10.2%) in female. It was found that thirty years was the risk point age in male and it was fifty years in female.

Conclusions: The prevalence of hyperuricemia is different as the period of age and it increases after 30 years in male and 50 in female. Interventions are necessary to change the risk factors before the key age which is 30 years in male and 50 in female.

Background

Hyperuricemia (HU) is a result of multifactor interactions including gender, age, genetic and environmental factors. Classically, the following conditions are associated with HU: alcoholism, obesity, hypertension, dyslipidemia, hyperglycemia, diabetes mellitus, lithiasis, renal failure, and medication use (diuretics, cyclosporine, low-dose aspirin) [1]. In the past several decades, the prevalence varied greatly and appeared to be increasing. There was lots information that demonstrated the importance of serum uric acid to the clinical prognosis, so the importance of HU is increasing. It reported that 18.8% of the patients with HU developed into gout in a 5 year follow-up [2]. Independent association between HU and cardiovascular disease has been found in many studies [3,4]. Hyperuricemia has been reported to be associated with several components of metabolic syndrome (MetS) and authors have postulated that increased concentrations of uric acid may be another important component of the syndrome [5].

With rapid economic development, possibility of improved nutrition and promotion of successful heath and medical care programs in China, life expectancy has been prolonged and the elderly population has increased; thus prevention and control of chronic diseases have become more important than before. Hyperuricemia may induce many complications, such as chronic gout, distortion of joint and renal failure, which may increase medical care costs. Therefore, it is important to study the hyperuricemia in China, in all developing countries, even in the whole world.

Methods

Search strategy

Studies were identified from the following electronic databases: CBMDISK, Chongqing VIP, CNKI and MEDLINE, using the terms 'hyperuricemia', ‘HU’ and ‘prevalence’. No
attempt was made to retrieve unpublished studies. The study did not include epidemiological studies in the areas of Hong Kong, Macao and Taiwan, because they are different from the Chinese mainland in the cultural activity and socioeconomic status and hence the prevalence of hyperuricemia and gout in those areas would be different from the Chinese mainland.

Inclusion and exclusion criteria
In order to meet the analysis requirements and reduce deviation, selected studies fulfilled the following criteria: (i) case collection based on field survey; (ii) the study based on population samples rather than volunteers; (iii) There should be validated diagnostic criteria and accurate study dates; (iv) If there were many articles based on the same sample, only the one that reported the most detailed data was included. It was confirmed that all articles had the same diagnostic criteria. Studies were excluded if we could not obtain information necessary for the computation of prevalence in different sex and age from the articles or the authors.

Quality of the studies
We accessed the quality of studies using the framework suggested by the Cochrane Collaboration. For the inclusion decision, quality assessment was carried out independently by three reviewers. If two of them or three agreed, the study can be included to the meta-analysis. The data from all included studies were clearly tabulated, and deviations were taken into account and identified during the quality assessment stage.

Data analysis
We used a published systematic analysis technique to calculate the pooled prevalence of hyperuricemia and gout from all eligible studies. Summary of prevalence estimates were obtained using fixed-effects or random-effects meta-analysis which determined by $I^2$. Statistical heterogeneity was assessed through $I^2$ statistic and its values of 25%, 50% and 75% correspond to low, moderate and high heterogeneity. The date which was low heterogeneity was chose the fixed-effects meta-analysis and others were chose random-effects meta-analysis. Subgroup analysis including sexes, ages and areas was also performed.

Results
Figure 1 summarized the process of identifying eligible epidemiological studies. There were 59 [6-64] studies left after the quality assessment. Table 1 showed the characteristics of the studies, which covered 23 provinces in the review. The prevalence of HU and 95%CI in male and female were calculated separately for each study, also the sample size and published years can be found (Figure 2, Figure 3). The male population of 223,315 was investigated, and cases of 52,998 HU were selected. It was 165,620 in female, and cases of 19,586 HU were selected. The pooled prevalence of hyperuricemia in male was 21.6% (95%CI: 18.9%-24.6%) and it was only 8.6% (95%CI: 8.2%-10.2%) in female (Table 2), it was also found that the prevalence in female was lower than that in male in every age group. Table 2 also showed the prevalence of hyperuricemia in different gender and area. Heterogeneity of the analysis was moderate. The prevalence ranged from 8.4% to 8.6% in female, and it ranged from 19.6% to 26.8% in male. Table 3 demonstrated the prevalence of hyperuricemia in different age and area. It was found that thirty was the risk point age in male and it was fifty in female. The prevalence of female in northern and eastern China was 2.6% in ~30 age group, and it was high to 31.2% in western China of male in 51-60 age group.

Discussion
The prevalence of hyperuricemia varies in different populations and areas. In Turkey [65], one study reported that 19% of the men and 5.8% of the women had hyperuricemia and the overall prevalence of hyperuricemia was 12.1% in the urban population. In Nepal [66], 3794 people which were from Chitwan districts were investigated, and the prevalence of hyperuricemia was 21.42%. In Seychelle [67], the cross-sectional health examination survey based on a population random sample which included 1011 subjects aged 25 to 64 years showed that the prevalence of hyperuricemia was 35.2% and 8.7% in men and women, respectively. In Thailand [68], an across-sectional study of
| NO. | First author & year published | Age | Location (Western/Eastern) (Northern/Southern) | Survey date | Diagnostic criterion (umol/L) | Hyperuricemia no.(Male/Female) | Subjects no. (Male/Female) | Prevalence (%) (Male/Female) |
|-----|--------------------------------|-----|-----------------------------------------------|-------------|-------------------------------|-------------------------------|---------------------------|---------------------------|
| 16  | Miao et al.(2006)             | 20-80| Shandong(E) (Western/Eastern)                  | May 1995 - Aug 1996 | >420/>350                    | 435/225                      | 2395/2608                 | 18.16/8.63                |
| 27  | Du et al.(1998)               | ≥15 | Shanghai(E) (Eastern)                         | Nov 1996 - Aug 1997 | >417/>357                    | 62/41                        | 913/1124                  | 6.79/3.65                 |
| 38  | Huang et al.(2006)            | ≥20 | Jiangsu(E) (Eastern)                          | Jan 2000 - Apr 2006 | >416.5/>357                  | 493/80                       | 450/1737                  | 9.96/4.61                 |
| 49  | Li et al.(2002)               | 36-90| Henan(E) (Eastern)                            | May 2000       | >416/>357                    | 210/24                       | 737/142                   | 28.49/16.90               |
| 510 | He et al.(2003)               | ≥20 | Sichuan(W) (Western)                          | 2002          | ≥420/>360                    | 552/75                       | 1378/1108                 | 40.06/6.77                |
| 611 | Shao et al.(2003)             | ≥20 | Jiangsu(E) (Eastern)                          | Dec 2002-Mar 2003 | >417/>357                    | 668/370                      | 3700/3988                 | 17.63/9.28                |
| 712 | Wang et al.(2004)             | ≥40 | Liaoning(E) (Eastern)                         | ———           | ≥416/>357                    | 192                          | 1000                      | 19.2                      |
| 813 | Yu et al.(2005)               | 21-83| Guangdong(E) (Eastern)                        | Jan 2003-Mar 2004 | >417/>357                    | 1655/697                     | 7330/5994                 | 22.59/11.63               |
| 914 | Yu et al.(2005)               | 22-81| Guangdong(E) (Eastern)                        | Jan 2003-Jun 2004 | >417/>357                    | 819/363                      | 4106/3321                 | 19.95/10.93               |
| 1015| Zhang et al.(2006)            | 20-91| Shandong(E) (Eastern)                         | Mar 2003-Dec 2004 | ≥416.36/>356.88              | 424/225                      | 2517/2855                 | 16.85/7.88                |
| 1116| Gu et al.(2006)               | 20-80| Guangdong(E) (Eastern)                        | 2004          | >417/>357                    | 4496/1304                    | 16115/10560               | 27.90/12.41               |
| 1217| Zhang et al.(2007)            | 28-88| Gansu(W) (Western)                            | 2004          | >440/>350                    | 389/68                       | 2372/360                  | 16.40/18.89               |
| 1318| Luan et al.(2007)             | 21-72| Tibet(W) (Western)                            | Oct 2004 - Dec 2004 | >440/>360                    | 454/25                       | 537/159                   | 84.54/15.72               |
| 1419| Yao et al.(2007)              | ≥18 | Shanghais(E) (Eastern)                        | Oct 2004 - June 2005 | >417/>357                    | 273/36                       | 2965/2693                 | 9.21/1.34                 |
| 1520| Li et al.(2007)               | 20-59| Ningxia(W) (Western)                          | Jan 2004 - Dec 2005 | >420/>350                    | 410                          | 9358                      | 4.38                      |
| 1621| Zeng et al.(2005)             | 18-85| Guangxi(W) (Western)                          | Jan 2004 - Aug 2005 | >417/>357                    | 490/170                      | 2800/2400                 | 17.50/7.08                |
| 1722| Mao et al.(2006)              | ≥20 | Zhejiang(E) (Eastern)                         | Apr 2004-Dec 2004 | >416/>357                    | 1214/160                     | 7566/5450                 | 16.05/6.64                |
| 1823| Diao et al.(2005)             | 20-79| Guangdong(E) (Eastern)                        | June 2004-June 2006 | >357                         | 0/853                        | 0/7226                    | 0/11.80                   |
| 1924| Li et al.(2009)               | 22-60| Qinghai(W) (Western)                          | 2004-2007      | >420/>350                    | 134/2                        | 819/275                   | 16.36/0.73                |
| 2025| Wu et al.(2007)               | ≥17 | Zhejiang(E) (Eastern)                         | 2005-2006      | ≥416/>357                    | 250                          | 1492                      | 16.76                     |
| 2126| Sun et al.(2007)              | 20-70| Xinjiang(W) (Western)                         | Jan 2005 - Dec 2005 | >417/>357                    | 104/18                       | 379/315                   | 27.44/5.71                |
| 2227| Xie et al.(2008)              | 18-92| Qinghai(W) (Western)                          | June 2005 - Dec 2005 | >380/>300                    | 1244/83                      | 5962/3566                 | 20.87/13.54               |
| 2328| Fang et al.(2006)             | 20-90| Beijing(E) (Eastern)                          | Sept 2005 - Dec 2005 | ≥416.4/>356.9               | 163/46                       | 1181/762                  | 13.80/6.04                |
| 2429| Cao et al.(2009)              | ≥20 | Zhejiang(E) (Eastern)                         | 2005-2007      | >417/>357                    | 2516/651                     | 9615/7639                 | 26.17/8.52                |
| 2530| Wu et al.(2007)               | 19-87| Guangdong(E) (Eastern)                        | ———           | >417/>357                    | 258/93                       | 911/571                   | 28.32/16.29               |
| 2631| Li et al.(2008)               | >60 | Guangdong(E) (Eastern)                        | 2006          | >420                         | 156/45                       | 519/425                   | 30.06/10.59               |
| 2732| Jin et al.(2007)              | 26-57| Jilin(E) (Eastern)                            | ———           | ≥408/>357                    | 97/2                         | 350/32                    | 27.71/6.25                |
| 2833| Chen et al.(2009)             | ≥20 | Yunnan(W) (Western)                           | Jan 2006 - Dec 2006 | >420/>350                    | 580/343                      | 3593/3912                 | 16.14/8.77                |
| 2934| Wu et al.(2008)               | >16 | Guangdong(E) (Eastern)                        | Nov 2006-Feb 2007 | >417/>357                    | 369/217                      | 1366/1422                 | 27.01/15.26               |
| 3035| Zeng et al.(2008)             | 22-79| Hunan(W) (Western)                            | Dec 2006 - Jan 2007 | >417/>357                    | 405/103                      | 1346/994                  | 30.09/10.36               |
| 3136| Wang et al.(2008)             | 20-78| Heilongjiang(E) (Eastern)                     | Feb 2006 - Jan 2008 | >417/>357                    | 502/125                      | 2390/1824                 | 21.00/6.85                |
| 3237| Tian et al.(2008)             | ≥35 | Shanghais(E) (Eastern)                        | Mar 2006-Sep 2006 | >420/>350                    | 425/451                      | 1887/2943                 | 22.52/15.32               |
| Study          | Age Range | Region     | Dates          | Cases/Controls | Mortality Rate | Reference |
|---------------|-----------|------------|----------------|----------------|----------------|-----------|
| Wei et al. (2008) | 20-70    | Hebei (E)  | May 2006 - Dec 2006 | 197/86         | 1146/859      | 17.19/10.01 |
| Deng et al. (2007) | 41-93    | Liaoning (E) | Sept 2006 - Nov 2006 | 250/45         | 936/218       | 26.71/20.64 |
| Wen et al. (2007)  | 35-64    | Shandong (E) | Sept 2006 - Dec 2006 | 126/44         | 1979/2062     | 6.37/2.13  |
| Zeng et al. (2009) | ≥20      | Zhejiang (E) | 2006-2007  | 1797/520       | 6591/5649     | 27.26/9.21 |
| Zhong et al. (2008) | 22-92   | Hunan (W) | 2007          | 178/34         | 919/497       | 19.37/6.84 |
| Zheng et al. (2008) | 20-92    | Guangdong (E) | 2007          | 4355/1239     | 18589/10526   | 23.43/11.77 |
| Huang et al. (2009) | 60-90    | Shanghai (E) | 2007          | 288/139        | 1423/1466     | 20.24/9.48 |
| Chen et al. (2008)  | 20-90    | Chongqing (W) | 2007         | 4772/951       | 8352/7471     | 57.14/12.73 |
| Liu et al. (2008) | ≥60       | Zhejiang (E) | Oct 2007 - Feb 2008  | 445/213        | 1964/3321     | 22.66/6.41 |
| Jia et al. (2009)  | 19-87    | Beijing (E) | Jan 2007 - Nov 2007 | 802/180        | 6703/1832     | 11.96/9.83 |
| Han et al. (2008)  | 18-94    | Anhui (W)  | Jan 2007 - Dec 2007 | 472/951        | 8152/7471     | 57.14/12.73 |
| Quan et al. (2009) | 23-59    | Guangxi (W) | Jan 2007 - May 2009 | 111/20         | 825/407       | 13.45/4.91 |
| Yang et al. (2009) | 24-67    | Tibet (W) | Jan 2007 - May 2009 | 646/136        | 1874/993      | 34.53/13.70 |
| Wang et al. (2008) | ≥20      | Zhejiang (E) | Oct 2007 - June 2007 | 690/335        | 1976/3341     | 38.42/10.03 |
| Quan et al. (2008) | 32-77    | Jilin (E) | March 2007 | 42/29          | 468/686       | 8.97/4.23  |
| Liu et al. (2009)  | 18-94    | Liaoning (E) | Apr 2007 - Apr 2008 | 220/139        | 1144/923      | 19.23/15.06 |
| Wang et al. (2008) | >16      | Zhejiang (E) | May 2007          | 126/31         | 518/920       | 24.32/3.37 |
| Ding et al. (2009) | 21-61    | Jiangsu (E) | May 2007          | 11/7           | 118/239       | 9.32/2.93  |
| Zhang et al. (2009) | 20-90    | Guangdong (E) | Sept 2007-Aug 2008  | 1147/248       | 6317/2679     | 18.69/9.26 |
| Huang et al. (2009) | 20-80    | Fujian (E) | Jan 2008 - Sept 2008 | 9458/6046      | 24140/20034   | 39.18/30.18 |
| Li et al. (2009)   | 30-69    | Guangdong (E) | Mar 2008 - Oct 2008 | 2043/627       | 9189/7128     | 22.25/8.82 |
| Wang et al. (2009) | 60-98    | Beijing (E) | July 2008 - June 2009 | 416/208        | 2295/2266     | 18.13/9.18 |
| Wang et al. (2009) | 19-65    | Zhejiang (E) | Aug 2008          | 191/76         | 590/702       | 31.89/10.83 |
| Cao et al. (2010)  | ≥20      | Hainan (E) | Sept 2008 - Nov 2008 | 181/23         | 663/150       | 27.30/15.33 |
| Jiang et al. (2010) | 20-93    | Beijing (E) | Mar 2009 - Sept 2009 | 290/96         | 2585/1722     | 11.22/5.57 |
1381 patients who firstly participated in annual health examinations during the period of July 1999 through February 2000 reported that the prevalence of hyperuricemia was 10.6%, but it was 18.4% and 7.8% in men and women, respectively. In Java [69], the prevalence of hyperuricemia was investigated by a survey of a total population of 4683 rural adults and the result was 24.3%. In United States [70], the prevalence rate of asymptomatic
hyperuricemia in the general population was estimated at 2-13%. The prevalence of gout and/or hyperuricemia increased about 2 cases per 1000 enrollees over 10 year (1990-1999) in the overall population. In Japan [71], a total of 9,914 individuals (6,163 men and 3,751 women aged from 18 to 89 years) who were screened at Okinawa General Health Maintenance Association was screened. The result showed that the prevalence of hyperuricemia

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**Figure 3 Forest plot of the studies for the female.**
was 25.8% and it was 34.5%, 11.6% in men and women respectively. In New Zealand [72], hyperuricemia was more common in Maori men (27.1%) than in European men (9.4%) and in Maori women (26.6%) than in European women (10.5%). In Saudi Arabia [73], the prevalence of hyperuricemia was only 8.84%. In Taiwan island of China [74], the prevalence of hyperuricemia was high to 49.4% in Ayatals, but it was only 27.4% in non-aborigines.

From the analysis, it was found that age and sex affected the serum uric acid levels and the prevalence of hyperuricemia:

The factor of age
It was found that the prevalence of hyperuricemia increased with the age in male and female. The prevalence was higher in male who were after 30 years old than that younger. But the point age was 50 in female. The physiologic and economic reasons may explain this difference. After 30 years old, the male would have a stable family and career. In female, the influence of sexual hormones may explain the point age. Young children of both sexes have equally low urate levels, so the prevalence is low. The study of Katrine demonstrated that the 45-64 age group was higher prevalence compared with the 18-44 age group [75]. Vitool’s study showed that the prevalence were 4.3% and 1.3% in men and women, who were younger than 18 years, but it increased to 17.4% and 15.4% in the men and women from 30 to 39 [68]. A study about elderly people in Taiwan reported that Men at age 65 to 69 had the highest proportion of hyperuricemia which was 69.8%, but

Table 2 The prevalence of hyperuricemia in different gender and area

| China          | Gender | Case/Total | Pooled Estimate (%) | 95%CI(%) | Heterogeneity |
|----------------|--------|------------|---------------------|---------|---------------|
|                |        | (No. of Studies) |                     |         |  I² P-value   |
| Northern China | Male   | 8923/59413(n = 21) | 19.6              | 15.7-24.1 | 49.8% 0.00    |
|                | Female | 2393/35231(n = 21) | 8.4               | 6.6-10.5  | 49.2% 0.00    |
| Southern China | Male   | 44075/163902(n = 34) | 22.7              | 19.6-26.1 | 49.9% 0.00    |
|                | Female | 17289/132111(n = 35) | 8.8               | 7.1-10.8  | 49.9% 0.00    |
| Eastern China  | Male   | 40056/166093(n = 41) | 20.1              | 17.8-22.6 | 49.8% 0.00    |
|                | Female | 16645/131127(n = 42) | 8.6               | 7.0-10.6  | 49.8% 0.00    |
| Western China  | Male   | 12942/57222(n = 14) | 26.8              | 17.3-39.0 | 50.0% 0.00    |
|                | Female | 3037/36215(n = 14) | 8.5               | 6.5-11.2  | 49.5% 0.00    |
| Total          | Male   | 52998/223315 (n = 55) | 21.6             | 18.9-24.6 | 49.9% 0.00    |
|                | Female | 19586/165620 (n = 55) | 8.6              | 7.2-10.2  | 49.8% 0.00    |

Note: The I² of all studies in the table ranged from 45% to 50%.

Table 3 The prevalence of hyperuricemia in different age

| China          | Gender | Age |
|----------------|--------|-----|
|                |        | <30 | 31-40 | 41-50 | 51-60 | 61-70 | >70 |
| Northern China | Male   | 11.6(8.8-15.1) | 16.4(12.7-20.9) | 20.9(16.0-26.7) | 21.0(14.2-29.9) | 17.3(14.4-20.6) | 17.9(13.8-23.0) |
|                | Female | 2.6(1.5-4.5) | 3.8(2.4-5.9) | 7.6(5.5-10.2) | 14.3(9.1-21.7) | 13.2(9.5-18.2) | 20.2(14.4-27.6) |
| Southern China | Male   | 16.8(11.4-24.2) | 24.4(16.3-34.9) | 24.9(19.6-31.2) | 23.5(19.5-27.9) | 22.6(19.7-25.7) | 27.2(22.5-32.4) |
|                | Female | 3.1(1.8-5.4) | 3.6(1.7-7.6) | 6.2(3.5-10.7) | 15.1(11.1-20.2) | 19.8(13.6-27.8) | 25.3(17.6-35.0) |
| Eastern China  | Male   | 13.1(9.5-17.7) | 17.4(13.4-22.2) | 20.4(16.7-24.7) | 19.6(16.4-23.2) | 19.9(17.3-22.8) | 24.2(21.0-27.7) |
|                | Female | 2.6(1.5-4.6) | 3.5(2.6-6.7) | 6.8(4.2-10.6) | 12.4(9.4-16.2) | 15.3(10.7-21.6) | 22.4(16.2-30.0) |
| Western China  | Male   | 17.5(6.3-40.1) | 29.9(8.3-67.0) | 31.0(18.8-46.4) | 31.2(18.9-46.9) | 25.6(18.7-27.0) | 24.6(10.3-48.1) |
|                | Female | 4.7(3.4-6.5) | 4.2(2.6-6.7) | 7.5(5.2-10.6) | 22.9(17.3-39.8) | 24.6(16.1-35.6) | 31.1(24.5-38.6) |
| Total          | Male   | 14.2(10.4-19.2) | 20.1(15.3-26.0) | 22.9(18.9-27.5) | 22.3(18.8-26.2) | 23.3(18.0-24.9) | 24.1(20.6-28.0) |
|                | Female | 2.8(1.8-4.5) | 3.5(2.0-6.2) | 6.6(4.5-9.7) | 14.7(11.5-18.6) | 16.8(12.5-22.4) | 23.4(17.7-30.4) |

Note: The I² of all studies in the table ranged from 45% to 50%.
woman at age more than 80 had the higher prevalence which was 50% [76].

The factor of sex
From the previous studies, it was found that serum uric acid levels were higher in men than in women, but it tended to be consistent between man and woman after the age of 50 [77,78]. The study of Gordon explained it that serum uric acid level increased after the menopause in females which attributed to the influence of sexual hormones [79]. The results of the study showed that male subjects had a higher prevalence of hyperuricemia than women, which was in line with findings of many studies from different countries [65-74].

Health Education and life customs
From the result of meta-analysis, it was found that the prevalence in different age of southern China was higher than that in northern China and the prevalence in western was higher than that in eastern, especially in male. The reason for that may be different life customs. In southern China, the mainly food is rice and it is sweat in northern China. In the eastern China, the health service is better than that in western China. More health educations were carried out and the people had more health knowledge in eastern China, which may affect the prevalence of hyperuricemia. The reasons for the difference in prevalence need further research.

Conclusions
In conclusion, aging trend is more and more serious in China, even all the word, and the prevalence of hyperuricemia is higher in elderly. It was found that urate levels correlate with many recognized cardiovascular risk factors, including hypertension, diabetes mellitus, hypertriglyceridemia, obesity and insulin resistance. Multiple Risk Factor Intervention Trial (MRFIT) database showed that hyperuricemia was an independent risk factor for acute myocardial infarction [75]. The Italian Progetto Ipertensione Umbria Monitoraggio Ambulatoriale (PIUMA) study showed that serum urate levels in the highest quartile were associated with increased risk of all cardiovascular events (relative risk [RR] = 1.73) and fatal cardiovascular events (RR = 1.96) compared with urate levels in the second quartile[76]. So it is important to control the prevalence in elderly. Interventions are necessary to change the risk factors before the key age which is 30 years in male and 50 in female. At the same time, intervention to high risk group is urgent.

In China, most of the studies concerned the eastern, especially in the urban areas, but it is necessary to study the western China and rural areas. The cohort study with larger sample is necessary. This article only provides the narrowing window of hyperuricemia in China.

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Authors’ contributions
LB and WT gave the biggest contributions to the passage, JRY gave the point about the passage, ZHHN, YYYW, YHP, LCX, YJ helped to analyze and interpret data; NHV helped to revise the language problems. All authors read and approved the final manuscript.

Competing interests
The authors declare that they have no competing interests.

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