

# Epidemiological Characterisation of Chronic Diseases Among Civil Servants in Hebei Province, China: A Cross-Sectional Real-World Study of Approximately 50,000 Adults

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**Background:** The objective of this investigation was to explore the health status and epidemiological features of civil servants working in Hebei Province, China.

**Methods:** Data was collected through a cross-sectional survey that involved 50,039 adult civil servants in Hebei Province. The research was conducted at the Hebei Provincial Medical Examination Centre and included inquiries about demographics, health behaviours, chronic illnesses, and abnormal check-up indicators. Statistical data were used to determine the prevalence of chronic diseases and abnormal health examination indicators. Subgroup analyses by sex were then conducted to calculate the similarities and differences in health status between men and women.

**Results:** The findings of the survey indicate that 14.2% of individuals who work in civil service suffer from obesity. Additionally, a considerable proportion of this group display poor health behaviours, including smoking and alcohol consumption. Hypertension (21.03%), dyslipidaemia (10.88%), and diabetes mellitus (8.56%) were identified as the top three chronic diseases, while cardiovascular diseases were prevalent at 6.27% among civil servants. Ultrasound showed a high prevalence of fatty liver, non-smooth gallbladder and liver cysts (44.61%, 33.24% and 23.26% respectively). The occurrence of pulmonary nodules was alarmingly high at 88.48%, while thyroid nodules were found in as much as 62.65% of patients. Abnormal E/A values  $\leq 1$ , prostate hyperplasia, breast nodules, and carotid plaques were also prevalent, with percentages ranging from 46.76% to 63.04%. In subgroup analyses by gender, the prevalence of chronic diseases and abnormal screening indicators was consistently higher in men than in women, with the exception of thyroid nodules and thyroid surgery.

**Conclusion:** The survey revealed a large proportion of civil servants in Hebei Province, China, suffering from chronic diseases, underscoring the necessity for enhanced attention to chronic disease prevention and management in this group and emphasising the requirement for focused interventions aimed at improving health outcomes.

**Keywords:** civil servants, health status, ultrasound, real-world study, Hebei Province, China

## Introduction

Currently, chronic non-communicable diseases, eg, hypertension, diabetes, and cardiovascular diseases, pose significant threats to human health.<sup>1,2</sup> Despite the rise of human living standards due to the world's continuous economic development, the incidence of diverse chronic health conditions has increased.<sup>3,4</sup> Simultaneously, it has also resulted in a gradual decline in the age of onset of such conditions. The current global expenditures on healthcare for chronic illnesses are considerable, mainly attributed to the high occurrence rates of such conditions compounded by the increase in life expectancy.<sup>5</sup> Despite advancements in medical technology and the development

of new pharmaceuticals prolonging the longevity of chronic disease patients, patients' end-of-life quality of existence steadily falls. Therefore, prompt recognition of chronic conditions and targeted surveillance and screening of diseases with high prevalence rates will markedly decelerate the advancement of chronic illnesses, diminish the occurrence of terminal conditions, curtail healthcare expenses and considerably augment the standard of living of patients.<sup>6,7</sup>

Public health is a field that is constantly developing, with the aim of promoting and safeguarding the health of populations on local, national, and global levels.<sup>8</sup> Its focus is on the prevention and control of diseases, the mitigation of healthcare inequalities, and the addressing of social determinants impacting health. Public health experts utilize both modern and traditional techniques to identify potential health risks, establish policies, and assess the effectiveness and efficiency of interventions. The ultimate aim is to enhance the health and well-being of communities by promoting healthy lifestyles, preventing outbreaks of disease, and lessening the burden of preventable illnesses.<sup>9,10</sup> Epidemiological surveys of chronic diseases and the general population's health status provide insight into a country or city's disease spectrum. This allows for widespread screening and early intervention for high-prevalence diseases, consequently preventing chronic diseases. Physical examinations of individuals with previously undiagnosed chronic diseases can reveal easily overlooked diseases.

The prevalence and risk factors of many chronic diseases have been better elucidated with advances in global epidemiological research and the development of information technology. Currently, chronic cardiovascular and cerebrovascular diseases and their associated complications are the main threats to the health of the population. Thyroid, liver and lung diseases are gaining momentum. Based on our clinical experience, we are concerned that the prevalence of thyroid nodules, fatty liver and lung nodules is much higher than we predicted, but there are no accurate epidemiological data to verify our view. Therefore, this study describes the development of various chronic diseases based on the disease characteristics of our region, and provides focused screening targets for future primary care.

Civil servants are public officials responsible for the overall management of the economic and social order, as well as the public resources of the State. They are expected to uphold the provisions of national law and fulfil relevant obligations. In China, civil servants are individuals who perform public duties in compliance with the law. They are included in the State's administrative establishment and receive their salaries and benefits from the State. Civil servants typically possess a well-founded education and comprehension of illnesses. This enables them to effectively collaborate on epidemiological surveys, improving the accuracy of demographic and chronic disease investigations, which provide greater insight into the overall health status of the population. In this study, the researchers examined the civil servant population across 11 cities in Hebei Province. The collected basic clinical information and relevant examination indicators were used to describe the incidence of various disease states. The results can guide the next steps in healthcare and provide the possibility of early diagnosis and intervention for some diseases. Moreover, the study illustrates the prevalence of various imaging changes.

## Methods

### Study Design and Population

This is a retrospective cross-sectional study based on real data from Hebei Province, China. Hebei is located between 113°27' and 119°50' east longitude and 36°05' and 42°40' north latitude, with an area of 188,800 km<sup>2</sup> and a total population of 74.2 million people, making it an important grain and cotton producing area in China. The study data were obtained from 11 cities in Hebei Province. The study population consisted of civil servants who underwent routine physical examinations from June 2022 to July 2023 at the Hebei Provincial Physical Examination Center. The exclusion criteria were as follows (1) lack of baseline clinical or biochemical information and (2) age <18 years. Based on the above criteria, a total of 50,039 participants were included in this study. Participant consent was not required because this study used de-identified data. The study was approved by the Ethics Association of the Hebei General Hospital (No. 202285) and followed the Declaration of Helsinki.

## Information and Data Collection

Participants' basic information as well as previous medical history were obtained by trained internists according to a standardized questionnaire. Height, weight, hip circumference, waist circumference, systolic blood pressure (SBP), and diastolic blood pressure (DBP) were measured by the same panel according to the same criteria. Fasting overnight venous blood samples were collected. Fasting blood glucose (FBG), glycosylated hemoglobin (HbA1c), triglycerides (TG), total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol (HDL-C), serum uric acid (SUA), and homocysteine (Hcy) were measured by using the same criteria, and body mass index (BMI) was calculated. Normal weight was defined as  $BMI < 24 \text{ kg/m}^2$ ,  $28 \text{ kg/m}^2 > BMI \geq 24 \text{ kg/m}^2$  as overweight, and 28 and above as obese.

## Ultrasound Scan

This study analyzed the results of cardiac ultrasound, prostate ultrasound, abdominal ultrasound, carotid ultrasound, and thyroid ultrasound. All participants had ultrasound examinations performed by the same group of trained physicians according to the same criteria. The analysis of ultrasound data and the reporting of results were performed according to uniform standards. All reports were collected independently by two physicians and summarized at the end, with a third physician making decisions in controversial cases.

## Statistical Analysis

All data were analyzed and visualized using GraphPad 8.01 software. Data that conformed to a normal distribution were expressed as mean  $\pm$  standard deviation and vice versa as median (25th, 75th). Comparison of different indicators between gender groups was carried out using chi-square analysis. A significance level of  $P < 0.05$  was determined as the threshold for statistically significant differences in incidence between groups.

## Results

### Baseline Characteristics

A total of 50,038 civil servants were included in this cross-sectional study, of which 27,934 (55.83%) were males and 22,104 (44.17%) were females. The mean age of all the population was 52.69 years, BMI was  $24.36 \text{ kg/m}^2$ , and the rest of the basic clinical information, serologic indicators and gender subgroups were analyzed in Table 1.

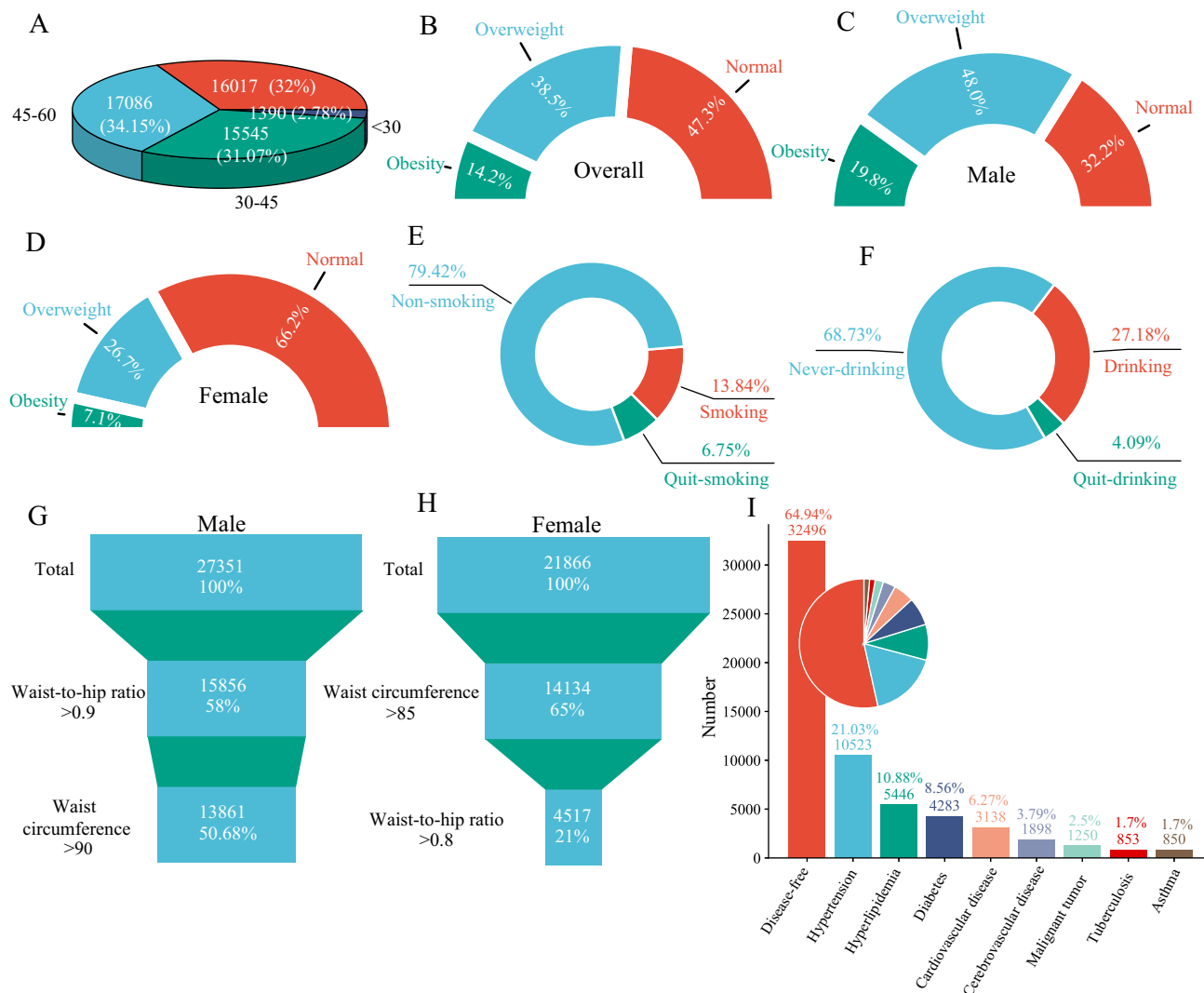
**Table 1** Clinical Characteristics of All Participants

Characteristics/Participants	Overall	Male	Female
Age (y)	52.69 $\pm$ 14.6	53.97 $\pm$ 14.55	51.07 $\pm$ 14.52
Height (cm)	168.4 $\pm$ 8.26	173.6 $\pm$ 6.11	161.9 $\pm$ 5.6
Weight (Kg)	69.55 $\pm$ 13.25	76.92 $\pm$ 11.41	60.33 $\pm$ 8.91
Hip circumference (cm)	96.69 $\pm$ 7.22	99.01 $\pm$ 6.64	93.92 $\pm$ 6.89
Waist circumference (cm)	84.96 $\pm$ 10.89	90.84 $\pm$ 8.76	77.93 $\pm$ 8.82
BMI (kg/m <sup>2</sup> )	24.39 $\pm$ 3.46	25.48 $\pm$ 3.22	23.02 $\pm$ 3.26
SBP (mmHg)	122.6 $\pm$ 17.81	126.5 $\pm$ 16.51	117.6 $\pm$ 18.13
DBP (mmHg)	78.31 $\pm$ 11.3	80.22 $\pm$ 12.08	75.93 $\pm$ 9.74
FBG (mmol/L)	5.77 $\pm$ 1.31	5.97 $\pm$ 1.43	5.53 $\pm$ 1.1
HbA1c (%)	5.92 $\pm$ 0.79	5.99 $\pm$ 0.86	5.82 $\pm$ 0.69
TC (mmol/L)	5.1 $\pm$ 1	4.98 $\pm$ 1.02	5.16 $\pm$ 1
TG (mmol/L)	1.25 (0.89, 1.81)	1.39 (0.99, 2)	1.1 (0.8, 1.58)
HDL-C (mmol/L)	1.35 $\pm$ 0.3	1.25 $\pm$ 0.26	1.48 $\pm$ 0.29
LDL-C (mmol/L)	3.13 $\pm$ 0.74	3.13 $\pm$ 0.74	3.14 $\pm$ 0.74
SUA	350.8 (290.8, 418.2)	395.4 (342.4, 455.2)	397.7 (256.3, 346.9)
Hcy	12.11 (9.85, 15.29)	13.48 (11.27, 17.14)	10.02 (8.4, 12.16)

**Abbreviations:** BMI, body mass index; SBP, systolic blood pressure; DBP, diastolic blood pressure; FBG, fasting blood glucose; HbA1c, glycosylated hemoglobin; TC, total cholesterol; TG, triglyceride; HDL-C, high-density lipoprotein cholesterol; LDL-C, low-density lipoprotein cholesterol; SUA, serum uric acid; Hcy, homocysteine.

A mere 2.78% fell below the age of 30, while 31.07% were aged between 30 and 45. Those aged between 45 and 60 accounted for 34.15%, and 32% were over 60 (Figure 1A). The prevalence of obesity among all participants was 14.2% and overweight was 38.5% (Figure 1B). In the gender subgroups, the prevalence of obesity in males was 19.8% and overweight was 48% both higher than in the female group (7.1% obese and 26.7% overweight) (Figure 1C and D). The prevalence of smoking and alcohol consumption were 13.84% and 27.18% respectively (Figures 1E and F). Waist circumference and waist-to-hip ratio better reflect the accumulation of visceral fat. We defined waist circumference of 90 and waist-to-hip ratio of 0.9 in men and waist circumference of 85 and waist-to-hip ratio of 0.8 in women as normal by Asian standards. The results of the analysis showed that 50.68% and 58% of men and 65% and 21% of women had waist circumference and waist-to-hip ratio above normal, respectively (Figure 1G and H).

Of the entire population, 64.94% had no previous medical conditions. Hypertension was the most common disease in the whole population with a prevalence of 21.03%, followed by hyperlipidaemia with 10.88%, diabetes mellitus with 8.56% and cardiovascular diseases with 6.27% (Figure 1I). The prevalence of cerebrovascular diseases, malignant tumors, tuberculosis, and asthma was relatively low (Figure 1I).



**Figure 1** Baseline characteristics of all populations. (A) Pie chart of age composition ratios (N=50038). (B) Obesity and overweight rates among all populations (N=49217). (C) Obesity and overweight rates among males (N=27351). (D) Obesity and overweight rates among females (N=21866). (E) Percentage of tobacco use (N=50038). (F) Percentage of alcohol use (N=50038). (G) Percentage of waist circumference and waist-to-hip ratio in men (N=27351). (H) Percentage of waist circumference and waist-to-hip ratio in women (N=21866). (I) Prevalence of chronic diseases in all population groups (N=50038).

## Prevalence of Metabolic Abnormalities

This study defined hypertension as SBP $\geq$ 140mmHg and/or DBP $\geq$ 90mmHg. According to this criterion, during the physical examination, 16.42% of the population had elevated SBP and 14.4% had elevated DBP, with the prevalence of hypertension being 22.62% (Figure 2A). A total of 49,422 participants underwent lipid tests, with 13.72% and 12.47% exhibiting elevated levels of TG and TC, respectively (Figure 2B). Up to 34.22% had LDL-C $>$ 3.4mmol/L and 10.38% had HDL-C $<$ 1mmol/L (Figure 2B).

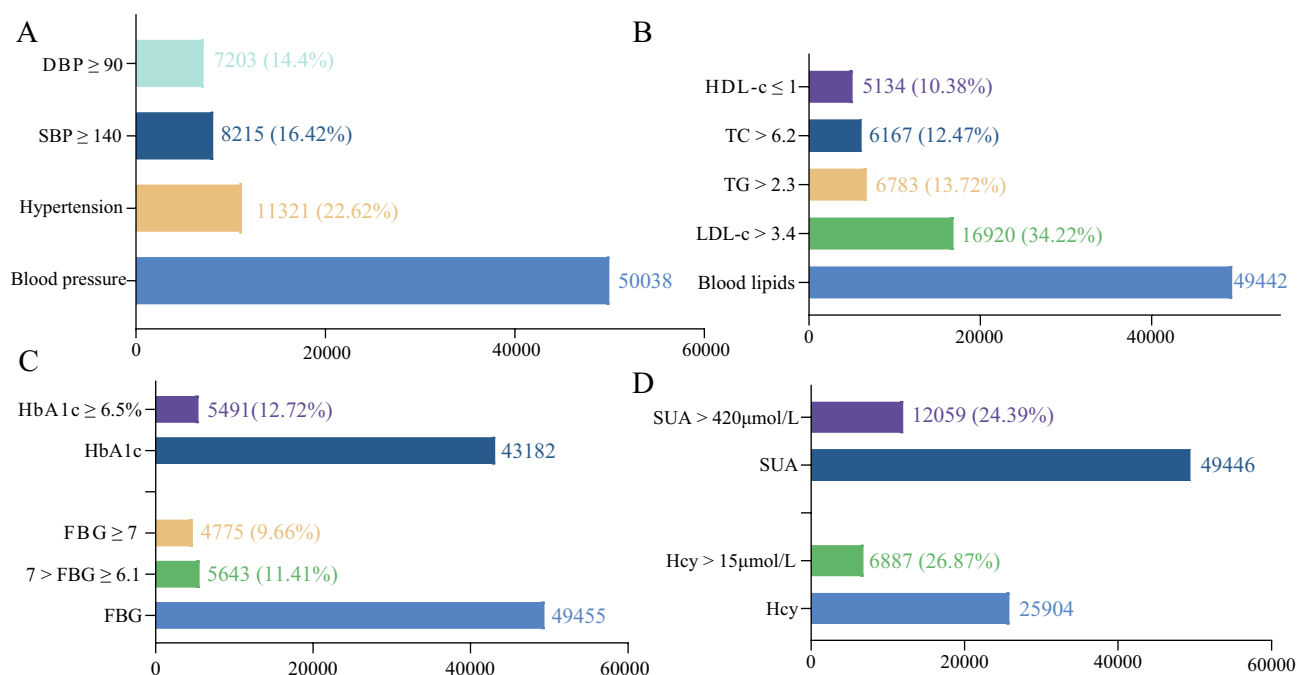
A total of 49,455 individuals underwent testing for FBG, and pre-diabetes and diabetes were defined in this investigation as FBG levels of 6.1mmol/L and 7mmol/L, respectively. Based on FBG levels, 11.41% and 9.66% of participants were classified as pre-diabetic and diabetic, respectively (Figure 2C). When HbA1c $>$ 6.5% was used as the diagnostic criterion for diabetes, 12.72% of participants (a total of 43,182) could potentially receive a diabetes diagnosis (Figure 2C). SUA and Hcy exhibited elevations in around a quarter of the entire population (24.39%, 26.87% respectively) (Figure 2D).

## Prevalence of Metabolic Abnormalities Based on Gender Subgroups

When analysed by gender subgroups, it was found that the male population had noticeably greater occurrence of hypertension, prediabetes and diabetes relative to the female population ( $P<0.001$ ) (Figure 3A and B). In males, the rate of elevation of TG and TC was higher than in females, and the rate of elevation of HDL-C was lower than in females ( $P<0.001$ ), but the rate of elevation of LDL-C was the same in males ( $P>0.05$ ) (Figure 3C). Males also had considerably higher rates of increased SUA and Hcy levels than females ( $P<0.001$ ) (Figure 3D).

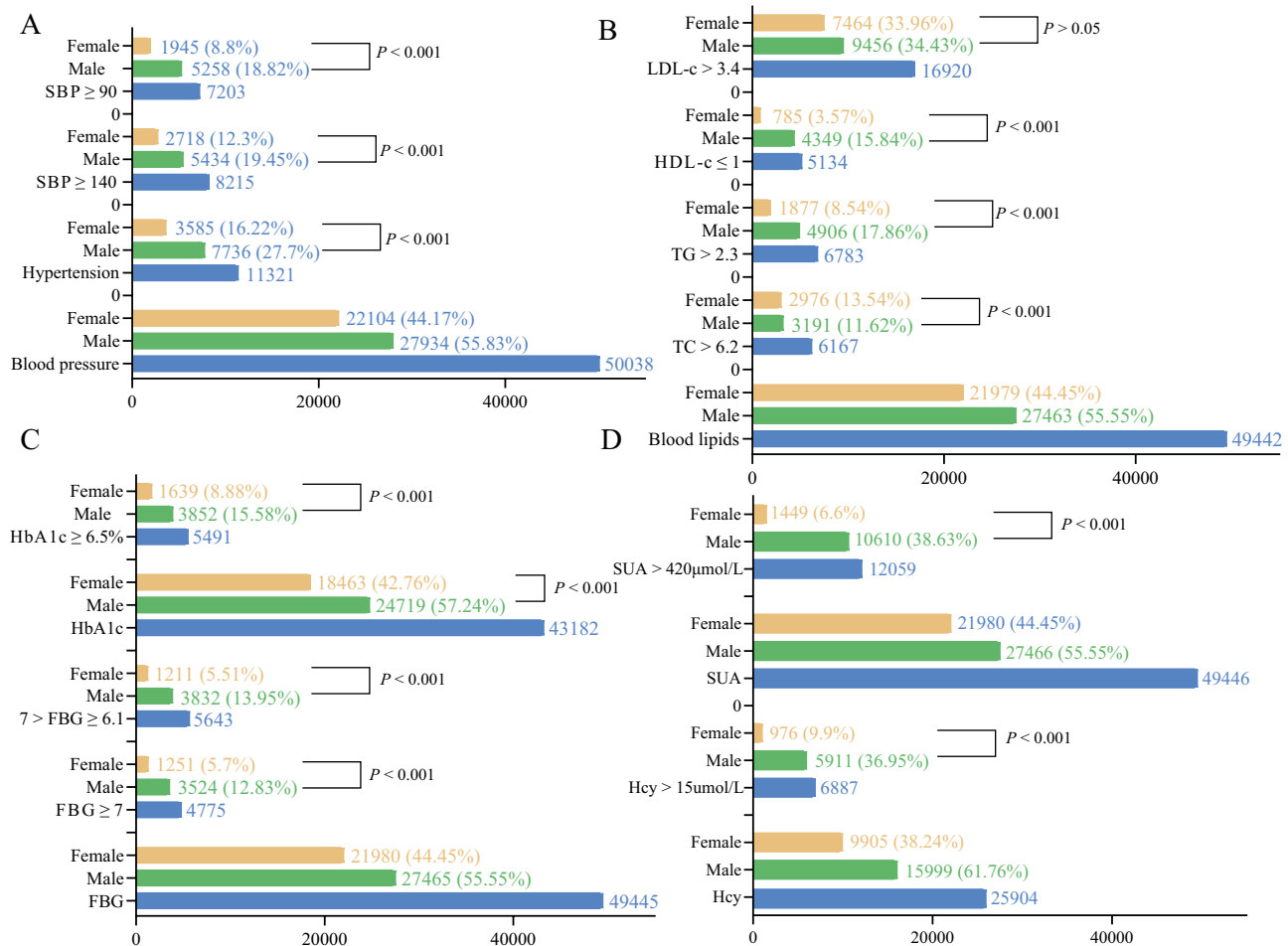
## Prevalence of Abnormal Ultrasound Findings

A total of 49,323 participants underwent abdominal ultrasound, with several imaging-diagnosed conditions included, such as fatty liver, hepatic cysts, and gallbladder lining not smooth, which accounted for the top three (prevalence of 44.67%, 23.26%, and 33.24%, respectively) (Figure 4A). There was also a higher incidence of polyps and stones in the



**Figure 2** Prevalence of metabolic abnormalities. (A) Prevalence of hypertension in all populations. (B) Prevalence of dyslipidaemia in all populations. (C) Prevalence of diabetes in all populations. (D) Prevalence of hyperuricaemia and hyperhomocysteinemia in all populations.

**Abbreviations:** SBP, systolic blood pressure; DBP, diastolic blood pressure; TC, total cholesterol; TG, triglyceride; HDL-C, high-density lipoprotein cholesterol; LDL-C, low-density lipoprotein cholesterol; FBG, fasting blood glucose; HbA1c, glycosylated hemoglobin; SUA, serum uric acid; Hcy, homocysteine.



**Figure 3** Prevalence of metabolic abnormalities based on gender subgroups. **(A)** Prevalence of hypertension in male and female subgroups. **(B)** Prevalence of dyslipidaemia in male and female subgroups. **(C)** Prevalence of diabetes in male and female subgroups. **(D)** Prevalence of hyperuricaemia and hyperhomocysteinemia in male and female subgroups. Comparisons between gender subgroups were made using the chi-squared test.

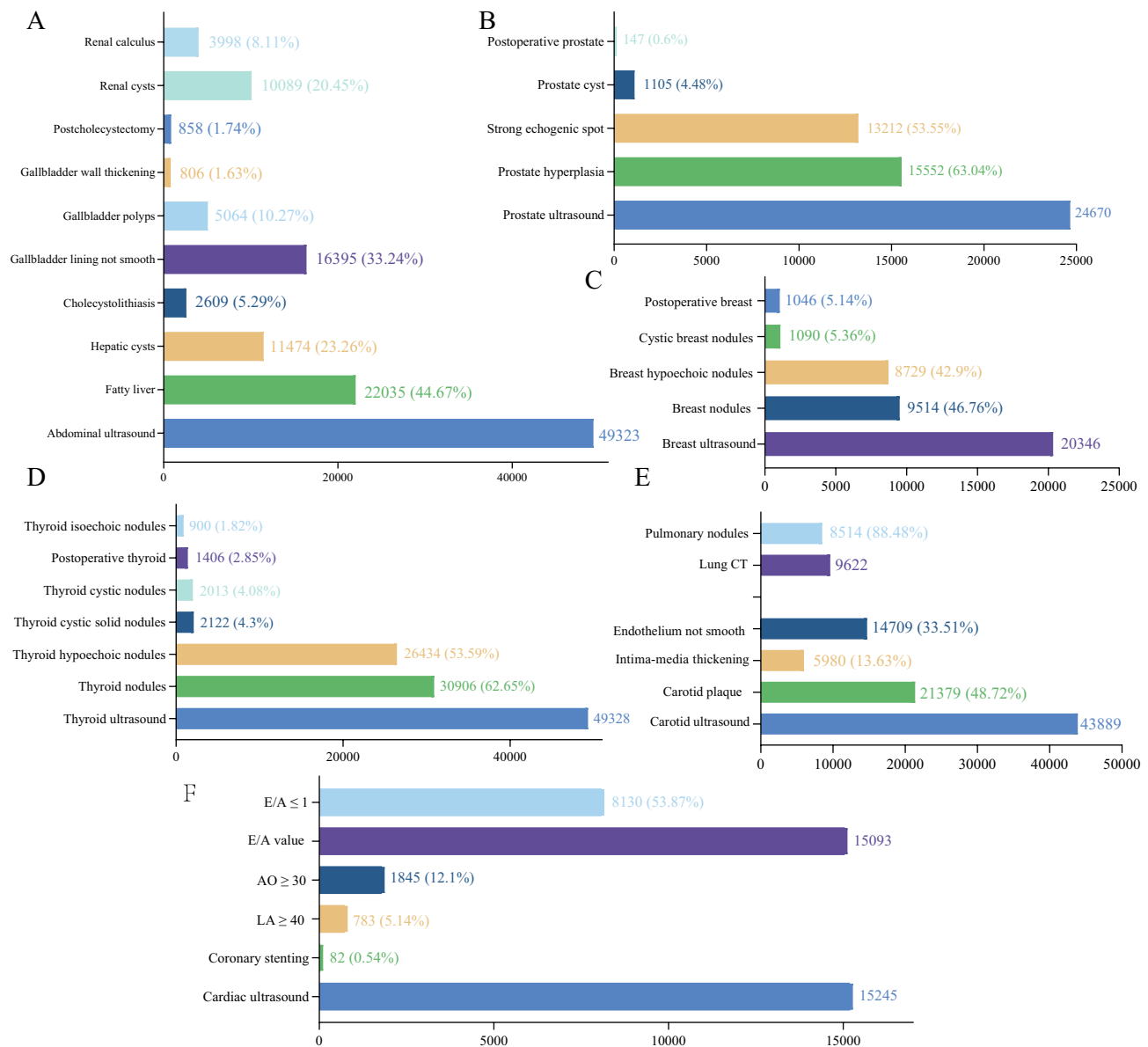
**Abbreviations:** SBP, systolic blood pressure; DBP, diastolic blood pressure; TC, total cholesterol; TG, triglyceride; HDL-C, high-density lipoprotein cholesterol; LDL-C, low-density lipoprotein cholesterol; FBG, fasting blood glucose; HbA1c, glycosylated hemoglobin; SUA, serum uric acid; Hcy, homocysteine.

gall bladder (10.27% and 5.29%, respectively) (Figure 4A). For the kidneys, there was a high occurrence of renal cysts (20.45%) and renal calculus (8.11%) (Figure 4A).

A study of 24,670 men using prostate ultrasound revealed a high incidence of prostate hyperplasia, at 63.04%. Additionally, 53.55% of participants showed strong echogenic spots. Rates of prostate cysts and surgery were relatively low, at 4.48% and 0.6% respectively (Figure 4B). Breast nodules were present in 46.76% of cases, 42.9% were hypochoic and 5.36% were cystic, according to the ultrasound results of 20,346 women (Figure 4C). Breast surgery was carried out on 5.14% of participants (Figure 4C).

Thyroid ultrasound was conducted in 49,328 participants, revealing a thyroid nodule prevalence of 62.65%. Hypochoic thyroid nodules had the most significant prevalence of 53.59%, followed by cystic solid nodules (4.3%) and cystic nodules (4.08%). There was an incidence of 2.85% for thyroid surgery (Figure 4D). Among the 9622 participants, the occurrence rate of pulmonary nodules was a staggering 88.48% (Figure 4E).

The occurrence of carotid plaque was 48.72% among 43,889 participants. The carotid endothelium exhibited non-smoothness in 33.51% of the participants, and the prevalence of intima-media thickening was 13.63% (Figure 4E). Of the 15,245 participants who underwent cardiac ultrasound, the number of participants who had E/A values assessed was 15,093. Aortic dilator and left atrial enlargement were discovered in a relatively high percentage, 12.1% and 5.14%



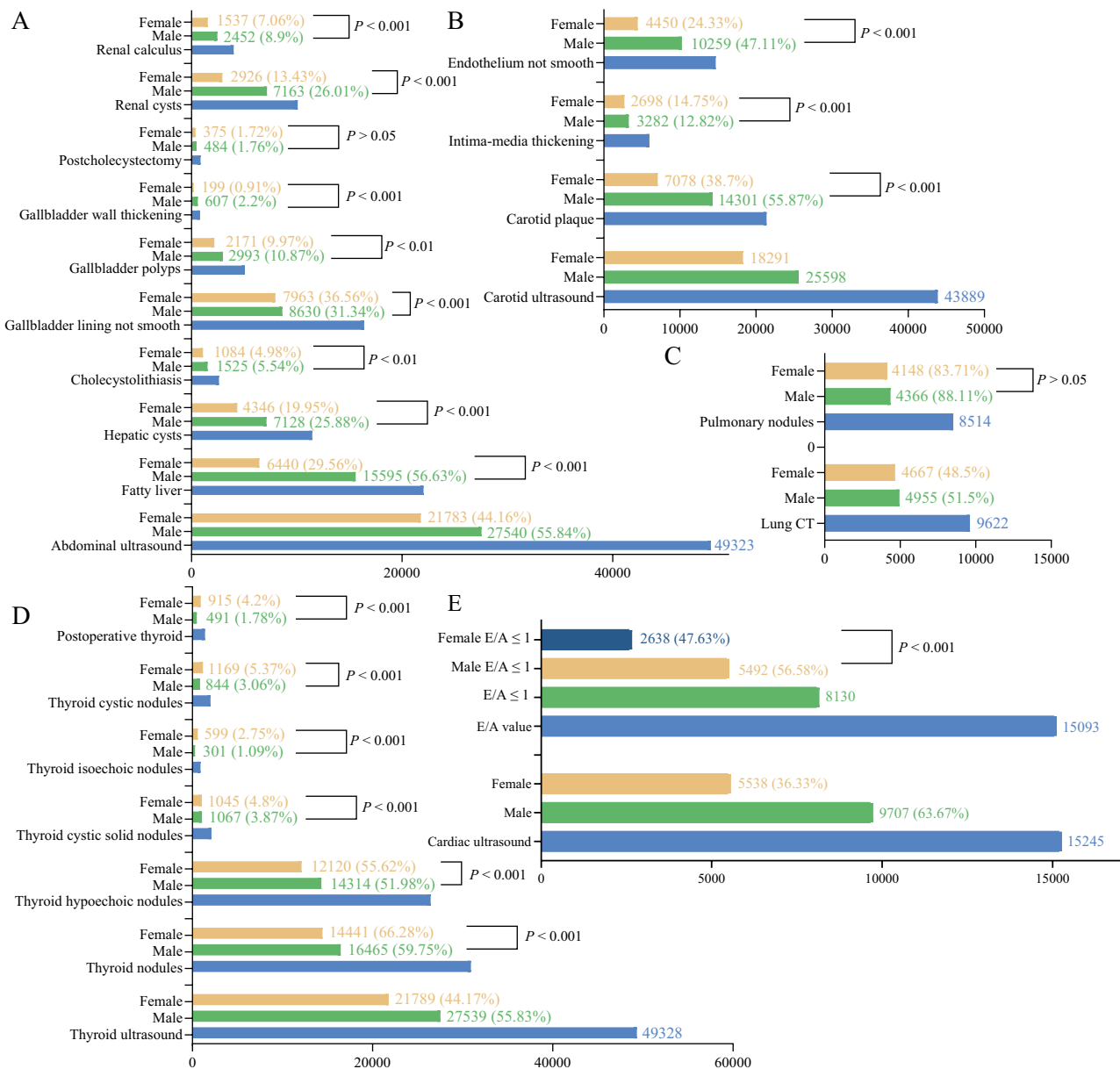
**Figure 4** Prevalence of abnormal ultrasound findings. (A) Abdominal ultrasound. (B) Prostate ultrasound. (C) Breast ultrasound. (D) Thyroid ultrasound. (E) Carotid ultrasound and lung CT. (F) Cardiac ultrasound. **Abbreviations:** AO, aorta; LA, left atrium.

respectively, whereas coronary stenting was found only in 0.54% of the population.  $E/A \leq 1$  was identified in 53.87% of the total population (Figure 4F).

## Prevalence of Abnormal Ultrasound Findings Based on Gender Subgroups

For abdominal ultrasound, males have a greater incidence of fatty liver, liver cysts, kidney cysts, and renal calculus. Similarly, males exhibit significantly higher incidence rates of gallbladder wall thickening and non-smooth gallbladder endothelium. Additionally, prevalence rates of gallbladder polyps and cholecystolithiasis were also higher in males compared to females ( $P < 0.001$ ). However, the rates of cholecystectomy were comparable in both groups ( $P > 0.05$ ) (Figure 5A).

Male participants had significantly higher rates of carotid plaque and endothelial non-smoothness than women, while the opposite was true for intima-media thickening ( $P < 0.001$ ) (Figure 5B). The prevalence of pulmonary nodules when



**Figure 5** Prevalence of abnormal ultrasound findings based on gender subgroups. (A) Abdominal ultrasound. (B) Carotid ultrasound. (C) Lung CT. (D) Thyroid ultrasound. (E) Cardiac ultrasound. Comparisons between gender subgroups were made using the chi-squared test.

subgrouped according to sex was very high in both groups, with no significant differences between the two groups ( $P > 0.05$ ) (Figure 5C). Although the prevalence of thyroid nodules and hypoechoic nodules was significantly higher in men than in women, the rates of cystic nodules, cystic-solid nodules, isoechoic nodules, and thyroid surgery were higher in women than in men ( $P < 0.001$ ) (Figure 5D). On echocardiography, the percentage of male participants with  $E/A \leq 1$  was significantly higher than that of female participants ( $P < 0.001$ ) (Figure 5E).

## Discussion

This cross-sectional study reports on the prevalence of obesity, overweight, metabolic disorders, chronic diseases and examination index abnormalities in approximately 50,000 civil servants, comparing data across male and female populations. High levels of obesity, overweight, metabolic abnormalities, and chronic diseases were discovered, indicating unsatisfactory health levels among the population. The results of ultrasound and imaging tests also showed a very

high prevalence of a variety of diseases. In the gender subgroups, males had a higher incidence of obesity, overweight, metabolic abnormalities and chronic diseases than females, and ultrasound and imaging findings supported these findings, with the exception of thyroid disease.

In recent times, the escalating incidence of obesity and overweight has emerged as a critical public health issue globally. Obesity is now widely recognised as a risk factor for various chronic ailments and is closely linked with an elevated occurrence of diabetes, hypertension, and cardiovascular and cerebrovascular diseases.<sup>11,12</sup> Available data suggest that in 2018, the proportion of individuals suffering from obesity in China had risen by more than two-fold to 8.1% from 3.1% in 2004.<sup>13</sup> A recent study found that 15.8 million Chinese adults have a current prevalence of obesity of 14.1% and overweight of 34.8%.<sup>14</sup> The study also revealed that the prevalence of obesity among civil servants is 14.2% with 38.5% being overweight. The statistics indicate a year on year increase of obesity and overweight rates, with associated health complications also increasing significantly. In a comparison of obesity and overweight prevalence between genders, men exhibited significantly higher rates than women. While previous research has indicated that the prevalence of obesity is higher among women, the present study's results contradicted this finding.<sup>15</sup> The discrepancy may be attributed to the recent increase in body image awareness among women, though the present study's findings resembled those of a recent Chinese study.<sup>14</sup> Waist-to-hip ratio proves more effective in measuring visceral fat content, revealing that a significantly larger proportion of women have an excess waist-to-hip ratio than men. This highlights the higher prevalence of abdominal obesity in women, despite their lower obesity rates. Tobacco and alcohol usage rates were significantly lower compared to prior studies. This could be attributed to the higher education level of civil servants, their awareness of the associated dangers, and the limited scope of this study, which only investigated one province in China, rendering the data non-comprehensive.<sup>16,17</sup>

Hypertension constitutes a risk factor for cardiovascular diseases, and the diagnosis and control rates of hypertension in China are yet to reach satisfactory levels. Past population studies in China have displayed that 23.2% of adults suffer from hypertension, thus surpassing the 21.03% rates of diagnosed hypertension collected in this investigation.<sup>18</sup> However, the prevalence of hypertension rose to 22.62% when calculated using accurate measured blood pressure readings, and this is comparable to previous findings. Furthermore, when accounting for gender differences, the current study aligns with previous results, indicating that hypertension levels were significantly higher in males than in females.<sup>19</sup> Previous studies have shown that lipid metabolism disorders increase the risk of many diseases. In China, hyperlipidaemia has a prevalence of about 40%, which is significantly higher than the 10.88% reported in this study. However, the percentage of hyperlipidaemia in men is higher than in women, which is consistent with previous findings.<sup>20</sup> In this study, the percentage of elevated LDL-C was 34.22%, and the incidence of other lipid metabolism disorders was approximately 12%. It is possible that the limited number of participants or the inclusion of only civil servants may have influenced these results. The prevalence of hyperuricaemia in the present study (data for 2022–2023) was 24.39%, indicating an increase from previous data - 11.1% in 2015–2016 and 14% in 2018–2019.<sup>21</sup> This trend of rising prevalence has been observed in previous studies, thus a high prevalence in the present study was anticipated. It is noteworthy that the incidence of hyperuricaemia continues to be considerably higher in males than in females. In China in 2018, diabetes had a prevalence rate of 12.4% and pre-diabetes had a prevalence rate of 38.1%, with a lower incidence among women than men.<sup>22</sup> The proportion of participants who had previously been diagnosed with diabetes in the survey was 8.56%, rising to 9.66% if FBG was used as a cut-off, and to 12.72% if HbA1c was used instead. In addition to this, 11.41% were classified as prediabetic. The prevalence of diabetes mellitus among civil servants in this study is significantly lower than before. This reduction could be due to changes in dietary and lifestyle habits in recent years, or it could be because the prevalence of diabetes mellitus among civil servants is, in fact, lower than the general population, despite it being higher among men than women. Hyperhomocysteinemia is a significant contributor to cardiovascular and cerebrovascular illnesses, with meta-analysis revealing a rising trend in hyperhomocysteinemia prevalence in China, currently at 37.2%.<sup>23</sup> Previous population-based studies conducted in Guangxi and Hunan have shown that the prevalence of homocysteine was 50.8% and 35.4%, respectively,<sup>24,25</sup> both exceeding the 26.87% reported in the present study. The prevalence of homocysteine might vary due to factors such as region and population. It is possible that northern China may have higher rates of vitamin B and folic acid deficiency supplementation, leading to

a lower prevalence. Additionally, the civil service may show more awareness towards this issue than the general population.

The study found a fatty liver prevalence of 44.67%, higher than the 2018 reported rate of 32.9% in China.<sup>26</sup> This may be due to increasing rates of obesity and overweight each year, a higher incidence of obesity in Hebei Province compared to other regions, and the sedentary habits of civil servants. A survey of 4120 adults in Shanghai, China revealed that the occurrence of liver cysts was 7.68%.<sup>27</sup> This figure was notably lower than the prevalence of 23.26% indicated by the present study. While there is no China-wide data available for comparison, it remains to be seen whether there is a geographical variation in the frequency of liver cysts. However, males exhibit a higher prevalence than females. Similarly, previous research has reported a renal cyst incidence of approximately 10%,<sup>28</sup> which is lower than the 20.45% found in this study. The significant increase in the incidence of hepatic and renal cysts in this study compared to previous reports may be linked to the higher proportion of abdominal ultrasounds conducted, although the gender discrepancy remains consistent with prior research. Gallstones and kidney stones are prevalent conditions. The prevalence of gallstones significantly varies across regions, ranging between 4% and 15%.<sup>29–31</sup> On the other hand, kidney stones have an overall prevalence rate of roughly 7.54%.<sup>32</sup> In this study, the reported prevalence rates of gallstones and kidney stones among civil servants in Hebei province were 5.29% and 8.11%, respectively, which are comparable to those reported in previous studies. The incidence of gallbladder polyps was 10.27%, which was considerably greater than the previously documented figures of 6.64% and 7.3%.<sup>33,34</sup> Gallbladder wall thickening and cholecystectomy were rare occurrences, and there is a lack of relevant large-scale population studies. This study reported the incidence rates to be 1.63% and 1.74%, respectively. In addition, the prevalence of gallbladder lining not being smooth was found to be 33.24%. However, as this is not a definitive diagnosis of the disease, there is no previous relevant data for comparison. Nevertheless, given that it can be an early sign of gallbladder lesion, its high prevalence warrants further attention in the future.

For individuals aged 30–79 years, carotid plaque had a prevalence of 20.15% in the Chinese population in 2018, whereas global figures for carotid plaque and carotid intima-media thickening were 21.1% and 27.6% respectively in 2020.<sup>35,36</sup> In this present study, carotid plaque and carotid intima-media thickening were observed at prevalences of 48.72% and 13.63%. Since approximately 4% of the population included in the current investigation was over the age of 80, it could potentially lead to a rise in the overall incidence of carotid plaques. Additionally, the increased prevalence of obesity and overweight reported in this analysis may also be linked to a higher incidence of carotid plaque. The prevalence of carotid intima-media thickening, whilst significantly smaller than the global figures, can be explained by the higher prevalence of carotid plaque in this study population. It does not indicate better carotid artery health. The prevalence of carotid intima-media non-smoothness was also found to be 33.51%, but as it does not represent a definitive disease diagnosis, there are no previous relevant data available for comparison. However, considering that this could indicate early stages of carotid artery disease, its significant prevalence demands additional investigation in the future. Regarding carotid artery disease, the prevalence rates in males were found to be higher than in females, which is consistent with previous studies. The occurrence of pulmonary nodules was previously reported to be between 20–40%,<sup>37,38</sup> but our study found it to be as high as 88.48%. This significant difference may be due to the high diagnostic rate of pulmonary nodules in our study centre and the poor air quality in Hebei province. In any event, a high frequency of pulmonary nodules warrants significant attention from our healthcare providers. The prevalence of breast nodules and prostate hyperplasia exceeded the rates previously reported as 35.76% and 36.6%,<sup>39,40</sup> respectively. This observation may be attributed to our selection of civil servant subjects but the influence of the region remains unclear. In 2017, the prevalence of thyroid nodule was around 36.9% in China, rising to 47.6% after accounting for region with a significantly higher incidence in women compared to men.<sup>41</sup> The present investigation found a high prevalence of thyroid nodules (62.65%) among civil servants in Hebei province. This is significantly higher than previous data and appears to suggest an increasing trend from year to year, but gender differences were consistent with previous studies. An  $E/A \leq 1$  indicates early cardiac impairment, and the proportion of  $E/A \leq 1$  in our previous and present studies remains comparable, with 53.54% and 53.87%, respectively. The high prevalence of this marker is intertwined with the prevalence of obesity and overweight, resulting in a higher rate among men than women.<sup>42</sup> Aortic dilatation and left atrial enlargement were also incidentally observed and are closely related to the prevailing hypertension. However, it is worth noting that merely

0.54% of the populace had coronary stents fitted - A figure somewhat lower than anticipated, which may correlate to insufficient identification through ultrasound.

This study has some limitations. Firstly, blood pressure and blood glucose were measured only once and were not repeated. Therefore, the estimated prevalence of hypertension and diabetes may differ from the actual prevalence. Secondly, we did not look at the effect of the menopause on different conditions in women. Oestrogen has been reported to have an effect on several diseases, which is a good focus for our next study. In women, classification by menopausal status seems to be a more accurate description of gender-related changes in several health conditions. Furthermore, age is also a risk factor for several conditions, and the lack of age grouping in this study is an area for further refinement. In addition, risk factors associated with multiple chronic diseases were not analysed in this study. Finally, the diagnosis rate of lung nodules was consistently higher in this study than in other studies, which may be due to the fact that some of the population with undiagnosed nodules did not undergo regular screening, whereas those with diagnosed nodules did. Further studies are needed to rule out this possible bias.

## Conclusion

In summary, this study indicates that roughly 40% of the population suffer from various chronic diseases. The most frequently occurring conditions were hypertension, hyperlipidemia, and diabetes mellitus. Imaging results indicated a diagnosis rate exceeding 60% for lung nodules, thyroid nodules, and prostate hyperplasia, and a prevalence rate exceeding 40% for breast nodules, fatty liver, and carotid plaques. The data above offer crucial insights into the present health condition and epidemiological characteristics of civil servants in Hebei Province. They could serve as a foundation for informed decision-making regarding the creation of focused interventions aimed at improving public health outcomes in the region.

## Data Sharing Statement

Data supporting the results of this study are available upon reasonable request from the first author.

## Ethics Approval

This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of Hebei General Hospital (Date March 11, 2022/No. 202285). Written, informed consent was obtained from all individual participants included at the beginning of the study and all the methods was conducted in accordance with the Declaration of Helsinki.

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## Disclosure

All authors declare that there is no conflict of interest in this study.

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