Investigation on Risk Factors of Cardiovascular Disease in Pilots and Analysis of Related Factors

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Abstract: Objective: To investigate and analyze the risk factors of cardiovascular disease in pilots. Method: Select 170 pilots who underwent a physical examination at the outpatient department of the Aviation Medical Center of Air China's Comprehensive Security Department from February 2019 to July 2021 as the research subjects. Blood pressure, blood lipids, and uric acid were tested to compare and analyze abnormal blood pressure and normal blood pressure. There are differences in age, flight time, blood sugar, weight, and smoking habits among people with abnormal blood lipids and normal blood lipids, as well as those with abnormal uric acid and normal uric acid. Results: The age, flight time, blood glucose level, and average weight of patients with abnormal blood pressure were higher than those with normal blood pressure. The age, flight time, blood glucose level, and average weight of persons with dyslipidemia are higher than those with normal blood lipids. The age, flight time, blood glucose level, and average weight of patients with abnormal uric acid are higher than those with normal uric acid. Conclusion: When the pilot's blood pressure, blood lipids, uric acid and other indicators show abnormal levels, it is mainly affected by factors such as age, flight time, blood sugar, and average weight, which increases the risk of cardiovascular disease.

1. Introduction

Pilots have extremely high requirements for physical health due to the particularity of their profession. In flight work, pilots not only need to have superb aviation driving skills, but also need to maintain health and strengthen disease prevention and control. Cardiovascular disease is a common and frequent disease of pilots, which endangers the health of pilots and at the same time increases the safety hazards of flight work. The occurrence of diseases such as coronary heart disease and hypertension often leads to grounding of pilots and affects their careers [1]. In the daily health management of pilots, we should focus on strengthening the prevention and treatment of cardiovascular diseases, and we need to understand the risk factors that induce cardiovascular diseases. Relevant studies point out that hypertension, dyslipidemia and uric acid are the main factors affecting cardiovascular health [2]. In the prevention and treatment of cardiovascular diseases in pilots, the detection of blood pressure, blood lipids, uric acid and other indicators should be strengthened, and the pilot’s age, occupational characteristics, and living habits should be linked to the specific understanding of the risks of hypertension, dyslipidemia, and uric acid abnormalities. Factors can provide a valuable reference for the prevention and treatment of cardiovascular diseases [3]. In this study, 170 pilots who underwent physical examinations at the outpatient department of the Aviation Health Center of the Air China Comprehensive Security Department from February 2019 to July 2021 were selected as the research subjects to investigate and understand the risk factors of cardiovascular disease in pilots. The report is now as follows.

2. Materials and Methods

2.1 General Information

The subjects of this study were 170 pilots who underwent physical examinations at the outpatient

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department of the Aviation Center of the Air China Comprehensive Security Department from February 2019 to July 2021. They were all male, aged 29 to 45 years old, with an average age of (34.18±4.26) years old.

2.2 Method

A questionnaire survey was used to investigate the personal circumstances of 170 pilots, including age, flight time, and living habits. On this basis, blood pressure, blood lipids, and uric acid were tested. In the blood pressure test, the Omron HBP-1300 electronic sphygmomanometer is used to test the blood pressure level and record the pilot's systolic blood pressure (SBP) and diastolic blood pressure (DBP) levels. After fasting for 8-12 hours, fasting venous blood was collected in the morning. Take 4ml of blood sample, after standing for coagulation (30min at room temperature), centrifugation (3000r/min, 10min), the serum is separated. Use Beckman Coulter Au680 automatic biochemical analyzer and the blood glucose (GLU) test kit, uric acid (UA) test kit, cholesterol (TC) test kit, triglyceride (TG) test kit provided by Beckman Diagnostic Products Co., Ltd.) Test kits, high-density lipoprotein cholesterol (HDL-C) test kits, and low-density lipoprotein cholesterol (LDL-C) test kits to measure blood glucose, uric acid, blood lipids and other indicators.

2.3 Observation Indicators

① Blood pressure: According to the blood pressure test results, when SBP≥140mmHg and DBP≥90mmHg, it is abnormal blood pressure, indicating the occurrence of hypertension [4]. ② Blood lipids: when TC<5.18mmol/L, TG<1.70mmol/L, LDL-C<3.37mmol/L, it belongs to dyslipidemia, suggesting the occurrence of hyperlipidemia [5]. ③Uric acid: According to the results of fasting blood uric acid test, when the blood uric acid level is more than 7mg/dl, it belongs to abnormal uric acid, which indicates the occurrence of hyperuricemia [6].

2.4.1.4 Statistical Processing

SPSS19.0 statistical software was used for data analysis, measurement data was expressed by (±s), t test was used, count data was expressed by (%), $\chi 2$ test was used, and $P<0.05$ indicated that the difference was statistically significant.

3. Results

3.1 Related Factors Affecting Abnormal Blood Pressure

Among 170 pilots, 47 pilots had abnormal blood pressure. A comparative analysis of the differences in age, flight time, blood sugar, weight, and smoking habits between those with abnormal blood pressure and those with normal blood pressure, is shown in Table 1:

Table 1 Analysis of Related Factors Affecting Abnormal Blood Pressure

Items	Abnormal blood pressure(n=47)	Normal blood pressure(n=123)	χ^2/t	P
Age	37.29±3.95	33.14±4.19	5.866	0.000
Fly Time(h)	2984.52±139.67	2155.23±122.92	37.862	0.000
blood sugar(mmol/L)	5.26±1.04	4.81±0.85	2.896	0.004
Weight(kg)	77.91±5.62	71.39±5.31	7.045	0.000
Smoking habit	15(31.25)	21(17.07)	4.175	0.041

3.2 Related Factors Affecting Dyslipidemia

Among the 170 pilots, 42 pilots had dyslipidemia. A comparative analysis of the differences in age, flight time, blood sugar, weight, and smoking habits between those with dyslipidemia and those with normal blood lipids, is shown in Table 2.

Table 2 Analysis of Related Factors Affecting Dyslipidemia

Items	Abnormal blood pressure(n=42)	Normal blood pressure(n=128)	χ^2/t	P

Age	36.95±3.56	33.76±4.27	4.367	0.000
Fly Time(h)	2834.56±144.29	2297.58±119.43	23.975	0.000
blood sugar(mmol/L)	5.19±0.96	4.84±0.84	2.260	0.025
Weight(kg)	76.82±4.93	72.53±5.14	4.740	0.000
Smoking habit	16(38.10)	20(15.63)	9.566	0.002

3.3 Related Factors Affecting Abnormal Uric Acid

Among the 170 pilots, 39 pilots had abnormal uric acid. A comparative analysis of the differences in age, flight time, blood sugar, weight, and smoking habits between those with abnormal uric acid and those with normal uric acid, is shown in Table 3:

Table 3 Analysis of Related Factors Affecting Abnormal Uric Acid

Items	Uric acid abnormalities(n=39)	Normal uric acid(n=131)	χ^2/t	P 值
Age	36.43±3.25	34.16±4.08	3.185	0.002
Fly Time(h)	2794.42±126.84	2368.56±120.54	19.137	0.000
blood sugar(mmol/L)	5.08±0.72	4.79±0.75	2.139	0.034
Weight(kg)	76.60±5.21	72.89±4.93	4.072	0.000
Smoking habit	13(33.33)	23(16.79)	4.181	0.002

4. Discussion

In aviation driving, pilots must have good professional abilities as well as good physical fitness. The physical health problems of pilots will bring certain safety hazards to aviation flight, which should be actively prevented and controlled [7]. Pilots need to undergo regular physical examinations to have a comprehensive understanding of their health conditions, strengthen screening of diseases, and conduct timely prevention and treatment. In a special working environment, the pilots are under tremendous pressure both physically and mentally. During the long-term flight, the pilot's cardiovascular function will be affected to a certain extent, and there is a risk of cardiovascular disease [8]. In addition, the daily habits of pilots also affect cardiovascular health. The occurrence of cardiovascular diseases such as coronary heart disease and hypertension will greatly affect the flight work of pilots, and flight safety is greatly threatened. The prevention and treatment of cardiovascular disease in pilots is not only related to the pilot's own health and safety, but also affects the pilot's professional life. It should be paid enough attention to guard against various risk factors that induce cardiovascular disease [9].

Hypertension, dyslipidemia, and abnormal uric acid are the main characteristics of cardiovascular disease. In the pilot population, some personnel have the above disease characteristics, indicating that the risk of cardiovascular disease is higher. In order to specifically understand the risk factors of cardiovascular disease in pilots, related factors that induce hypertension, dyslipidemia, and abnormal uric acid need to be closely related to the pilot's personal situation, occupational characteristics, and living habits. The results of this group of studies showed that among the 170 pilots who underwent physical examinations, there were 47, 42 and 39 pilots with abnormal blood pressure, dyslipidemia, and uric acid, respectively, and age, flight time, blood sugar, weight, and smoking Habit is the main influencing factor. Compared with pilots with abnormal blood pressure, blood lipids, and uric acid levels, pilots with high blood pressure, blood lipids, and uric acid have higher average age, blood sugar level, average weight, longer flight time, and smoking habits. It can be seen that with the increase of age and flight time, the risk of cardiovascular disease in pilots will also increase significantly. Pilots who are obese and have smoking habits also have a higher risk of cardiovascular disease. Therefore, in the health management of pilots, the monitoring of blood pressure, blood lipids, uric acid and other indicators should be strengthened, and the abnormal performance of various indicators should be guarded. At the same time, strengthening life management and correcting their bad habits have a positive impact on the prevention and treatment of cardiovascular diseases [10].

Due to the particularity of the pilot’s work, high levels of mental stress, low activity levels,

unreasonable dietary structure, high-altitude low-pressure hypoxia, high-altitude radiation, circadian rhythm disturbances, high altitudes, and long-distance night flights, all of which also affect the cardiovascular system. The formation of disease susceptibility factors, so objective indicators used to analyze the causes of cardiovascular disease are also for early detection, prevention, and health supervision. The formation of cardiovascular disease is the result of multiple risk factors. Aviation physicians can initially screen for cardiovascular disease through the results of carotid ultrasound, echocardiography, and submaximal ECG stress test in pilots aged 40 and over. Auxiliary examinations such as coronary multi-slice spiral CT and coronary angiography are performed at that time. Based on its risk factors, comprehensive intervention measures such as health education, management, guidance, and treatment are adopted to fundamentally reduce the occurrence of cardiovascular diseases, so as to ensure that pilots improve flight quality, extend flight life, and ensure flight safety.

In summary, hypertension, dyslipidemia, and uric acid are risk factors for cardiovascular disease in pilots, and they are affected by age, flight time, blood sugar, weight, and smoking habits.

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