

Materials and methods

The research was handled by the innovative and development institute of China Association of Senior Scientists and Technologists, and Beijing Anzhen Hospital, Capital Medical University. The investigation was conducted according to the strengthening the reporting of observational studies in epidemiology (STROBE) statement (Von Elm et al., 2007), and had been registered in Chinese Clinical Trial Registry (No. ChiCTR2000029359).

Study design

This was a cross-sectional study.

Setting

The study included scientists and technicians in the representative research institutions, medical institutions, colleges, universities, and companies in China, and the data from July 1, 2019, to March 31, 2021, were collected by online and face-to-face interviews without further follow-up.

Participants

Inclusion criteria were: 1) both men and women; 2) those aged ≥ 18 years; 3) scientists and technicians, including engineers, agro-technicians, scientific researchers, and health technical and natural science teaching staffs; and 4) those who volunteer to participate in the study.

Exclusion criteria were: 1) those with incompletely filled questionnaire; 2) those with overlapping questionnaires; and 3) pregnant women.

The questionnaire included data on age, sex, marital status, educational background, monthly income, sleep hours, sleep problems, smoking, alcohol consumption, work stress, work burnout, cardiovascular diseases (CVD) history was designed as Yes or No choice, CVD involving coronary artery disease (CAD); acute myocardial infarction (AMI), hypertension, atrial fibrillation (AF), heart failure (HF), and supraventricular tachycardia/ventricular tachycardia (SVT/VT); family history; and depressive and anxiety symptoms as follow up.

Questionnaire of this study

Factors	Types	Choices
Gender	Single choice	Male/Female
Age (year)	Blank	/
Educational background	Single choice	Technical secondary school or below/Junior college/ Undergraduate/Postgraduate
Marital status	Single choice	Unmarried/Married/Divorced
Sleep hours	Single choice	≥ 7 h/5–7 h/ < 5 h
Work stress	Single choice	No/Manageable work stress/Overwhelming work stress
Work burnout	Single choice	No/Manageable/Unmanageable
Monthly income (yuan)	Single choice	≥ 10000 / 5000–10000 / ≤ 5000
Smoking	Single choice	None/Current smokers/Former smokers
Drinking	Single choice	None/Drinking at times/Regular drinker/Former drinker
Cardiovascular diseases	Multiple choice	CAD/AMI/Hypertension/AF/HF/SVT/VT/Other kinds of CVD
Other diseases	Multiple choice	Diabetes mellitus/Hyperlipemia/Hyperuricemia/ Cerebrovascular disease
Family history	Multiple choice	Family history of CVD/Family history of depression or anxiety

CVD: cardiovascular disease; CAD: coronary artery disease; AMI: acute myocardial infarction; AF: atrial fibrillation; HF: heart failure; SVT/VT: supraventricular tachycardia/ventricular tachycardia.

Investigational measures

The Patient Health Questionnaire-9 (PHQ-9) was applied to evaluate depressive symptoms in the preceding two weeks. PHQ-9 has been widely used to evaluate depressive symptoms with excellent validity and reliability (Cronbach's α : 0.89) for almost 20 years (Kroenke et al., 2001). PHQ-9 is easy and acceptable by participants. There are nine questions on the PHQ-9 scale, with scores ranging from 0–27. Depressive symptoms were diagnosed when the scale showed ≥ 10 points by PHQ-9 with 88% sensitivity and 88% specificity (Kroenke et al., 2001; Seecheran et al., 2020)

The Generalized Anxiety Disorder-7 (GAD-7) was used to evaluate anxiety symptoms. GAD-7 has been widely used to evaluate anxiety symptoms with excellent validity and reliability (Cronbach's α : 0.93) for more than 15 years (Ahn et al., 2019; Swinson et al., 2006). GAD-7 is easy and acceptable by participants. The GAD-7 scale includes seven questions, and the scoring values range between 0 and 21. Anxiety symptoms were diagnosed when the score was ≥ 10 by GAD-7 with 89% sensitivity and 82% specificity (Ahn et al., 2019; Swinson et al., 2006; Liu et al., 2019).

The Athens Insomnia Scale (AIS) was used for evaluating sleep problems. AIS is based on ICD-10 and has been widely used to evaluate insomnia with excellent reliability and validity

(Cronbach's α : 0.90, validity: 0.9) for more than 20 years (Soldatos et al., 2000). AIS is easy and acceptable by participants. The scale contains eight questions and scores ranging from 0–24. The score of 0–3 was regarded as normal sleep status, 4–5 as having potential sleep problems, and ≥ 6 as insomnia.

Work stress was evaluated by the question “did you feel work stress during the last month?” The responses included: 1) no; 2) yes, manageable work stress; and 3) yes, overwhelming work stress. Work burnout was evaluated by the question “did you feel work burnout in the last month?” The responses included: 1) no; 2) yes, manageable work burnout; and 3) yes, unmanageable work burnout.

Bias

There were some potential biases in this cross-sectional study such as selection, information, recall, and reporting biases. However, steps to reduce bias were adopted via selecting sampling survey, modifying the survey to improve conciseness, and training the investigators.

Quality control

Before the investigation, the investigators were trained to specialize in the survey. The supervisor checked the questionnaires to exclude those who did not fit the inclusion criteria.

Statistical analysis

IBM SPSS24.0 statistics software (Armonk, New York, USA) was used to perform statistical analysis. Measured data were analyzed by a normal distribution test. The normally distributed data was presented as $\bar{X} \pm$ standard deviation (SD) and median and first and third quartiles or median and interquartile range (M (Q₁, Q₃)), and two-group comparisons were conducted by student's *t* test or nonparametric tests. The discrete data was presented as frequency (%), and the two-group comparison was performed by χ^2 test. Univariate logistic regression analysis was conducted on unadjusted odds risks, and multivariable logistic regression analysis on adjusted odds risks. A two-tailed test was performed and $P < 0.05$ was considered as statistically significant.

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