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Analysis of the factors influencing male infertility of reproductive age in Jinan

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Abstract. – OBJECTIVE: The World Health Organization (WHO) defines infertility as a person failing to achieve a pregnancy after 12 months or more of regular unprotected sexual intercourse. Infertility includes female infertility and male infertility. The aim of this paper is to study the etiology of infertility and related influencing factors in men of reproductive age in Jinan.

PATIENTS AND METHODS: In this study, 172 male infertile patients who attended the Department of Assisted Reproduction of Shandong Provincial Maternal and Child Health Hospital in Shandong, China and the Infertility Clinic of Jinan Central Hospital in Shandong, China from August 2021 to April 2022 are selected as the study population (infertility group). A convenience sampling method is used to select 257 men from couples attending the Obstetrics Department of Qilu Hospital in Shandong, China, the Obstetrics Department of the Second Hospital of Shandong University in Shandong, China, and the Obstetrics Department of Maternal and Child Health Hospital in Shandong, China from October 2021 to February 2022 as the study subjects (control group). A self-designed questionnaire is used to conduct the survey, which includes basic personal information, lifestyle information, marital and family-related information, and one-way and multiway logistic regression analyses are performed.

RESULTS: The average age of the case group and the control group are 34.03±5.13 years old and 33.61±8.18 years old; the average height is 175.80±5.91 cm and 176.78±5.25 cm; the average weight is 80.28±14.70 kg and 83.09±45.36 kg. The differences in age, height, and weight between the case group and the control group are not statistically significant by *t*-test. Moderate oligospermia is the predominant cause of infertility in men of reproductive age in Jinan. A multifactorial logistic regression analysis yields that academic qualifications (OR=2.518, 95% CI: 1.023 to 6.196), coffee consumption (OR=7.692, 95% CI: 1.623 to 36.460), living in a room that had been renovated within a period of time (OR=2.769, 95% CI: 1.104 to 6.949), stress level (OR=47.280, 95% CI: 23.656-94.494), quality of sexual life (OR=3.352, 95% CI: 1.331-8.442), and duration of couple separation (OR=3.851, 95% CI: 1.094-13.557) are the main risk factors for infertility in men of reproductive age in Jinan.

CONCLUSIONS: In this study, a total of 6 risk factors are screened for male infertility in Jinan in the reproductive age, including high academic qualifications, coffee consumption, living in a room that has finished renovation within 3 months, high stress, poor quality of sexual life, and long spousal separation. Three factors can be controlled, avoided, or reduced through personal actions; the factors are coffee consumption, living in a room that has finished renovation within 3 months, and high stress, all of which may reduce the level of male reproductive health.

Key Words:
Infertility, Influencing factors, Case-control study.

Introduction

WHO defines infertility as a person who fails to achieve a pregnancy after 12 months or more of regular unprotected sexual intercourse. Infertility includes female infertility and male infertility[1]. The increasing prevalence of infertility has led to a growing concern for society. Infertility affects approximately 15% of the world's population, and about half of these cases involve the male reproductive system. In the United States, approximately one in 13 couples of reproductive age have a fertility problem[2]. In South Asia, the Middle East, North Africa, Central and Eastern Europe, and

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Central Asia, the prevalence of infertility is even as high as 30%. The literature shows that the worldwide infertility rate is about 25%, among which the male infertility rate is about 8% to 22%, the female infertility rate is about 25% to 37%, and the rate of cases in which both men and women have the problem is about 21% to 38%, which shows that the male factor causes about 50% of infertility[3].

It is worth drawing attention to the fact that even with the rapid development of medical technology, only about 40% of male infertility patients can identify a relevant cause of infertility, while most male infertility patients cannot identify the cause of infertility (unexplained infertility). A study[4] conducted by the WHO showed that about 43% of women of reproductive age and 30.7% of men of reproductive age suffer from secondary infertility, and both have preventable causes.

In recent years, due to environmental pollution, and changes in people's lifestyle and mental state, the incidence of infertility has shown an increasing trend year by year. WHO predicts that infertility will become the third most common disease after tumors and cardiovascular disease in the mid to late 21st century[5]. The "Infertility Status Study Report[6]" released by the Chinese Population Association reported that the proportion of couples suffering from infertility in China increased from 6.89 to 12.5%.

Infertility treatment is very expensive, and the treatment period is usually long[7]. Therefore, it is necessary to analyze the factors influencing male infertility in reproductive age to prevent the occurrence of infertility. Nowadays, most of the domestic studies[8,9] in China focus on the etiology of infertility and related influencing factors in female infertility patients, while there are fewer studies related[10,11] to male infertility patients. The aim of this study is to investigate the basic information, lifestyle, marriage status, and family of male infertility in Jinan City, Shandong Province, China. Moreover, we aimed to compare them with normal males of reproductive age in Jinan City, to explore the relevant influencing factors of infertility, and to provide relevant references basis for the prevention and control of male infertility problems.

Patients and Methods

Study Object

Inclusion criteria

1. Diagnostic criteria for infertility: couples of reproductive ages who have normal sexual intercourse, without any contraceptive measures, and who tried to achieve a pregnancy for more than one year without success.
2. The main living geographic area is Jinan city.
3. Those who voluntarily participated in this study and could complete the questionnaire independently.

Exclusion criteria

1. Those who are over 58 years old.
2. Those who do not want to participate in this study.

Infertility group (Group A)

Male infertile patients attending the Department of Assisted Reproduction of Shandong Provincial Maternal and Child Health Hospital in Shandong, China, and the Infertility Clinic of Jinan Central Hospital in Shandong, China, from August 2021 to April 2022 were selected as study subjects using a convenience sampling method. 172 male infertility patients who meet the above criteria were included.

Control group (Group B)

A convenience sampling method is used to select men from couples attending the Obstetrics Department of Qilu Hospital in Shandong, China, the obstetrics department of the Second Hospital of Shandong University in Shandong, China, and the Obstetrics Department of Shandong Maternal and Child Health Hospital in Shandong, China from October 2021 to February 2022 as study subjects. 257 men with normal reproductive function who met the above criteria were included. Patients' inclusion and exclusion criteria are shown in Table I.

Research Tools

Semen routine examination

Routine semen testing is performed on 172 infertile male patients, and the test results are referenced to relevant literature testing standards.

General Information

Based on a large amount of relevant literature and consultation with experts in related fields, a self-designed questionnaire was used, including basic personal information: age, nationality, height, weight, place of residence, academic qualifications, occupation, etc. Lifestyle information: smoking, alcohol consumption, coffee consump-

Table I. Inclusion and exclusion criteria of the grouped cases.

Inclusion criteria
1. Diagnostic criteria for infertility: couples of normal reproductive ages who have normal sexual intercourse without any contraceptive measures, and who have tried to achieve a pregnancy for more than one year without success. 2. The main living geographic area is Jinan City. 3. Those who voluntarily participated in this study, and could complete the questionnaire independently.
Exclusion criteria
1. Those who are over 58 years old. 2. Those who do not want to participate in this study.

tion, tea consumption, take-out consumption, perm and dye hair, sweets consumption, fried food consumption, living in a house that has been renovated within a period of time, etc. Marital and family-related information: fertility pressure, frequency of sexual life, quality of sexual life, self-assessment of sexual ability, age of first sexual life, time of marriage separation, etc.

Locke-Wallace Marital Adjustment Measurement (Marital Adjustment Test, MAT)

The Locke-Wallace Marital Adjustment Measure is used to assess the marital quality of male infertile patients and men with normal reproductive function. This scale was developed by Locke and Wallace in 1959 and provides an objective and quantitative measure of marital adjustment and marital quality. The scale consists of 15 items (e.g., the extent to which you and your partner agree or disagree on life), each of which is scored on a weighted scale ranging from 0 to 35, with a total score of 2 to 158. And higher scores indicate higher marital quality and scores below 100 indicate marital dysfunction. The Cronbach's alpha coefficient of the questionnaire is 0.759, and the half reliability is 0.90, which has good reliability and validity.

Survey Methodology

The purpose of this study and the content of the survey to be conducted were introduced to the departments in each hospital involved before the administration of the survey. The survey was conducted after obtaining written informed consent from each study participant. The subjects are selected in strict accordance with the inclusion and exclusion criteria, and a unified guideline is used to explain the purpose and significance of this survey to the subjects, with the guarantee that their personal privacy would be strictly protected. Before filling out the questionnaire, the respondents are explained the matters needing attention. When they did not understand, explanations were given to ensure that all patients could correctly understand the questionnaire's content. 15 minutes were given to the participants to complete the survey independently, and the questionnaires were collected on the spot and the completeness of the questionnaires was verified.

Statistical Analysis

Epi-Data version 3.1 (The EpiData Association, Odense, Denmark) is used for two-person questionnaire entry, and all data are analyzed using SPSS 25.0 statistical software (IBM Corp., Armonk, NY, USA). General descriptive analysis is used, and *t*-test and χ^2-test are used for the comparison of factors. And multi-factor analysis of relevant influencing factors is performed using the logistic regression method, and the OR values of the strength of association between relevant influencing factors and infertility and their 95% CI are calculated, and the description and assignment of each variable are detailed in Table II. $p<0.05$ indicates that the difference is statistically significant.

Results

Distribution of Infertility Etiology

Among a total of 172 infertile men in the investigated hospitals in Jinan, excluding cases of unexplained infertility, mild to moderate oligospermia is the predominant etiology, as shown in Table III.

Basic Information

In this investigation, the average age of the patients in the case group is 34.03 years old, the average height is 175.80 cm, and the average weight

Table II. Suspected influencing factors associated with infertility.

Influencing Factors	Factor levels and definitions	
	Group	Infertility group=1, control group=0
Basic Information	Age	≤30=1; >30<40=2; ≥40=3
	Nationality	Han nationality=1, minority groups=2
	Place of residence	City, county=1, rural or township=2
	Occupation	No stable occupation=1, stable occupation=2
	Academic qualifications	Low-academic qualifications group (high school or junior college and below)=1, High-academic qualifications group (college and above)=2
	BMI	<18.5=1, 18.5-24.99=2, ≥25=3
	Obesity	Obesity (BMI≥25=0; BMI<25=1)
Lifestyle factors	Smoking	Do not smoke or have quit smoking=1, smoke=0
	Alcohol consumption	Do not drink or have stopped drink=1, drink=0
	Coffee consumption	Infrequent consumption=1, frequent consumption (average > 2 times per week)=0
	Tea consumption	Infrequent consumption=1; frequent consumption (average>2 times per week)=0
	Perm and dye hair	Infrequent=1, frequent (average>2 times per year)=0
	Take-out food consumption	Infrequent=1, frequent (average>2 times per week)=0
	Dessert consumption	Infrequent=1, frequent (average>2 times per week)=0
	Live in a room that has finished renovation within 3 months	>3 months=1, ≤3 months=0
Marriage and family factors	Pressure level	Less pressure=1; much pressure=0
	Frequency of sexual life	≥2 times per week=1, <2 times per week=0
	Self-assessment of quality of life	Good=1, Poor=0
	Self-assessment of sexual capacity	Good=1, Poor=0
	Age of first sexual life	≥18=1, <18=0
	Duration of separation	<1 month=1, ≥1 month=0
	Marriage Quality	Good=1, Poor=0

is 80.28 kg, the average age of the control group is 33.61 years old, the average height is 176.78 cm, and the average weight is 83.09 kg. The differences in age, height, and weight between the case group and the control group are not statistically significant by *t*-test. See Table IV for details.

Univariate Analysis of Factors Influencing Male Infertility

The univariate analysis of the 23 suspected factors associated with infertility is performed using the χ^2-test. In the basic information, place of residence (χ^2=1.768, p=0.009), occupation (χ^2=4.388, p=0.000), academic qualifications(χ^2=0.000, p=0.000), obesity (χ^2=2.038, p=0.004), the differences between these four suspected factors of infertility and the control group are statistically significant. Coffee consumption in lifestyle factors(χ^2=2.539, p=0.001), perm and dye hair (χ^2=1.672, p=0.010), take-out food consumption (χ^2=12.280, p=0.000), fried food consumption (χ^2=4.234, p=0.000), liv-

Table III. The prevalence of male infertility in Jinan.

Factors	Number of cases	Composition Ratio (%)
Mild to moderate oligozoospermia	55	31.98
Severe oligozoospermia	10	5.81
Azoospermia	19	11.05
Chromosomal or genetic abnormalities	9	5.23
Varicocele	3	1.74
Erectile dysfunction	4	2.33
Ejaculation disorders	4	2.33
Bilateral syringomyelia of the genitals	1	0.58
Unknown factors	67	38.95

Table IV. Comparison of general information between the infertility group and the control group.

Group	Number of cases	Average age (years old)	Average height (cm)	Average weight (kg)
Infertility group	172	34.03±5.13	175.80±5.91	80.28±14.70
Control group	256	33.61±8.18	176.78±5.25	83.09±45.36
t-value		0.593	-1.758	-0.775
p-value		0.805	0.081	0.290

ing in a room that had been renovated within a period of time (χ^2=1.815, p=0.006), the differences between these 5 suspected factors of infertility and the control group are statistically significant. Stress level in marriage and family factors (χ^2=223.554, p=0.000), quality of sexual life (χ^2=21.499, p=0.000), self-assessment of sexual capacity (χ^2=41.095, p=0.000), age of first sexual life (χ^2=4.365, p=0.000), duration of separation (χ^2=1.019, p=0.045), marriage quality (χ^2=4.612, p=0.000), the differences between these six suspected factors of infertility and the control group are statistically significant, as detailed in Table V.

Multifactorial Analysis of Factors Influencing Male Infertility

To exclude interactions between influencing factors and to exclude the effects of confounding factors, the 17 risk factors initially screened in the univariate analysis (p<0.2) are included in the logistic stepwise regression analysis, and the results show that academic qualifications (OR=2.518, 95% CI: 1.023-6.196), coffee consumption (OR=7.692, 95% CI: 1.623-36.460), living in a room that had been renovated within a period of time (OR=2.769, 95% CI: 1.104-6.949), stress level (OR=47.280, 95% CI: 23.656-94.494), quality of sexual life (OR=3.352, 95% CI: 1.331-

Table V. Results of univariate analysis of male infertility.

	Influencing Factors	χ^2-value	*p*-value	OR	95% CI of OR
	Age	3.057	0.604	—[(1)]	—
	Nationality	0.162	0.423	0.669	0.093-4.797
	Place of residence	1.768	0.009[a]	1.351	0.866-2.108
Basic	Occupation	4.388	<0.001[b]	0.650	0.434-0.974
information	Academic qualifications	12.827	<0.001[b]	0.398	0.238-0.666
	BMI	2.309	0.274	—[(1)]	—
	Obesity	2.038	0.004[a]	0.750	0.505-1.114
	Smoking	0.325	0.250	1.132	0.739-1.734
	Alcohol consumption	5.980	0.430	1.624	1.100-2.397
Lifestyle factors	Coffee consumption	2.539	0.001[a]	0.435	0.152-1.244
	Tea consumption	0.991	0.054	0.812	0.539-1.224
	Perm and dye hair	1.672	0.010[a]	0.439	0.122-1.580
	Take-out food consumption	12.280	<0.001[b]	2.549	1.493-4.351
	Fried food consumption	4.234	<0.001[b]	2.150	1.022-4.523
	Dessert consumption	0.841	0.068	0.659	0.268-1.618
	Live in a room that has finished renovation within 3 months	1.815	0.006[a]	0.671	0.374-1.203
	Pressure level	223.554	<0.001[b]	0.025	0.014-0.044
	Frequency of sexual life	0.371	0.230	0.875	0.571-1.343
Marriage and	Self-assessment of quality of life	21.499	<0.001[b]	0.282	0.162-0.492
family factors	Self-assessment of sexual capacity	41.095	<0.001[b]	0.270	0.179-0.406
	Age of first sexual life	4.365	<0.001[b]	0.375	0.145-0.972
	Duration of separation	1.019	0.045[a]	0.656	0.287-1.496
	Marriage Quality	4.612	<0.001[b]	0.642	0.428-0.963

[(1)]Factor level is greater than 2, fail to calculate OR. [a]Compare with the infertility group, p<0.05. [b]Compare with the infertility group, p<0.001.

Table VI. Results of logistic regression analysis of male infertility.

Risk factors	B	SE	Wald χ^2	*p*-value	OR	95% CI of OR
Academic qualifications	0.923	0.459	4.039	0.044	2.518	1.023-6.196
Coffee consumption	2.040	0.794	6.603	0.010	7.692	1.623-36.460
Live in a room that has finished renovation within 3 months	1.019	0.469	4.709	0.030	2.769	1.104-6.949
Pressure level	3.856	0.353	119.126	<0.001	47.280	23.656-94.494
Self-assessment of quality of life	1.210	0.471	6.589	0.010	3.352	1.331-8.442
Duration of separation	1.348	0.642	4.408	0.036	3.851	1.094-13.557
Constants	-3.196	0.616	26.946	<0.001	–	–

8.442), and duration of separation (OR=3.851, 95% CI: 1.094-13.557) are the main risk factors for infertility in men of reproductive age in Jinan, as detailed in Table VI.

Discussion

Nowadays, male infertility became a global problem involving many men of reproductive age. Although some progress[12,13] has been made in this area of research, finding the etiology and risk factors to reduce the incidence of male infertility preventatively is a better way to deal with this problem. Therefore, it is of great importance to investigate the etiology and risk factors associated with male infertility of reproductive age.

Distribution of Male Infertility Causes in Jinan

A total of 172 male infertility patients of reproductive age who meet the requirements are investigated in the male-assisted reproduction clinics of two hospitals in two districts of Jinan, and the analysis of their routine semen examination results reveals that two main causes of infertility are unexplained infertility (38.95% of patients), and mild oligo-weak Teratospermia (31.98% of patients). Wang's research[14] showed that the diagnosis and management of male infertility has its own complexity and specificity, about 70% of male infertility has indeed an unknown etiology, and even in male infertility of known etiology, its pathogenesis may not be fully elucidated yet. The literature suggests that unexplained male infertility may be due to a variety of factors, such as endocrine disruption caused by long-term stressful environmental factors, reactive oxygen species, and genetic defects. It has been documented that men with azoospermia have a higher risk of developing cancer compared to other men. The results of this study show that the number of infertile men of reproductive age with azoospermia accounted for approximately 11.05% of the population of infertile men in Jinan, which also deserves full attention. The results of the study by Minhas et al[15] showed that infertile men are at higher risk for malignancy and other diseases such as cardiovascular disease, reinforcing the importance of investigating and preventing factors associated with male infertility[14].

Relationship Between Academic Qualifications and Male Infertility

The study results show that academic qualifications are risk factors for male infertility (OR=2.518, 95% CI: 1.023-6.196). The risk of infertility in men with high academic qualifications is 2.518 times higher than that of men with low academic qualifications, which may be due to the fact that people with high academic qualifications have more work and mental stress and live in a constant rush than those with low academic qualifications, and the risk of infertility increases with high stress[16]. In addition, the modern lifestyle is postponing the age at which people decide to have kids and the older they are, the lower the quality of semen and physical fitness, which can lead to an increase in the number of infertile people. The literature indicates that the age of 40 is a watershed for male fertility health; men over 40 years old have the highest rate of sperm abnormalities. Probably with age, the decline of physiological functions, and the accumulation of harmful substances in the body the body's testicular sperm function declines, as decline the metabolism[17].

Association Between Coffee Consumption and Male Infertility

The results of this study show that coffee consumption is a risk factor for male infertility (OR=7.692, 95% CI: 1.623-36.460). Men who consume coffee regularly have 7.692 times the risk of infertility than those who consume coffee infre-

quently. A study by Ricci et al[18] showed that the caffeine contained in coffee affects the function of sperm and makes them inactive. Adelusi et al[19] suggested moderate coffee not only does not negatively affect sexual function but also improves sperm vitality[19]. In terms of the nervous system, caffeine stimulates the sympathetic nerves, thus making people excited. However, too much coffee can have an effect on sexual function and affect the vitality of sperm. A related study by Salas-Huetos et al[20] showed that coffee consumption has a detrimental effect on semen quality[20]. In terms of fertility, high coffee intake in men can negatively impact a partner's chances of pregnancy or fertilization rates. Some studies[18,21] suggest that caffeine intake negatively affects male reproduction-related function possibly by damaging sperm DNA. However, the evidence from epidemiological studies[18-21] on semen parameters and fertility is inconsistent and inconclusive.

Association Between Volatile Pollutants in Newly Renovated Houses Within 3 Months and Male Infertility

The results of this study show that living newly renovated house (≤3 months) is a risk factor for male infertility (OR=2.769, 95% CI: 1.104-6.949), 2.769 times higher than that in the control group. It has been documented that indoor renovation volatile pollutants, such as formaldehyde, xylene, and ammonia can significantly affect sperm quality in the epididymis of male mice and affect their reproductive function. Siegel et al[22] showed a correlation between air pollutants and reduced fecundity, including traffic-related air pollution (TRAP), specifically NOx and particulate matter (PM) ≤2.5 μm in diameter, as well as exposure to secondhand smoke (SHS) and formaldehyde[22]. A study by Han et al[23] exposed a group of adult male rats to formaldehyde and found an increase in autophagosomes in spermatogenic cells compared to the unexposed group, and the alterations in auto phagocytes were generally consistent with changes in testicular weight and morphological performance[23]. Their results allowed to conclude that formaldehyde exposure triggers autophagy in spermatogenic cells and that autophagy may be a risk factor for formaldehyde-induced male reproductive disorders. The concentration of volatile pollutants in rooms renovated within 3 months will be higher, which may have an impact on male reproductive function and sperm quality, thus increasing the risk of infertility.

Relationship Between Stress Level and Male Infertility

The results of this study show that stress level was a risk factor for male infertility (OR=47.280, 95% CI: 23.656-94.494). Indeed, the risk of infertility was 47.280 times higher in men with high-stress levels than in men with lower stress levels. Zhang et al[24] showed that men suffering from infertility are at high levels of sexual infertility stress. This stress may come from male role identity or from marriage-family-negative social opinion[24]. Due to various psychological pressures, patients may experience certain psychological problems such as anxiety, depression, and hostility, which, once prolonged, can directly lead to neuroendocrine disorders and reduced fertility. Some findings suggest that there is a negative correlation between self-reported stress levels and semen quality, and if they are causally related, high stress may be a factor contributing to poor men's semen quality. Thus, if men have too much self-rated stress, it may lead to decreased semen quality, followed by infertility. More importantly, men should relieve their psychological stress through psychological dredging and education to improve overall male fertility.

Relationship Between Self-Assessment of Quality of Life and Male Infertility

The results of this study show that poor self-rated quality of life is a risk factor for male infertility (OR=3.352, 95% CI: 1.331-8.442). That is, the risk of infertility in men with poor quality of life was 3.352 times higher than in men with good sexual quality of life. Men who believe in their own mind that they have a poor quality of life may be unsatisfied with the status quo, their hearts will be under more stress, and they may experience certain psychological problems such as anxiety, depression, and hostility, which in turn indirectly contribute to infertility. Ilacqua et al[25] showed that poor quality of life leads to reduced fertility in men, and its impact on future populations makes it an important public health issue[25]. It is necessary to improve their self-assessment of quality of life through education, psychological support, and environmental changes to prevent infertility in reproductive age and reduce the incidence of infertility.

Relationship Between Duration of Separation and Male Infertility

The results of this study show that prolonged separation during the time of planned pregnancy preparation is a risk factor for male infertility

(OR=3.851, 95% CI: 1.094-13.557). That means prolonged separation is also a risk factor for male infertility. Couples may be forced to live apart for long periods of time because of their occupations, such as the military, and have less time to reunite as a couple[26]. In addition, couples who live apart for a long time do not have the opportunity to go to the hospital together for checkups, which is not conducive to infertility treatment. Even if the couple has been suffering from infertility for many years, they may not be able to treat or improve it due to prolonged separation or specific occupational reasons. Furthermore, separation may lead to an increase in the incidence of infertility by affecting the psychological aspect. If couples are separated, the feeling of loneliness and helplessness will increase, and the risk of anxiety and depression may increase. The persistence of psychological problems over a long period of time can directly lead to neuroendocrine disorders and reduce fertility. However, infertility can result from long-term separation due to the limited meeting time of the couple in a year or a few years.

Limitations

There were some limitations to this study. First, the study was a cross-sectional study that could only determine whether variables were correlated, not whether they were cause-and-effect. Second, the questionnaire used in this study was self-reported by the respondents, which may have recall bias. Some sensitive subjects may be reluctant to give correct answers, resulting in report bias. Third, the related influencing factors of male sterility at reproductive age discussed in this study are one-sided, and more related influencing factors, such as psychological factors, need to be discussed in the future. Fourthly, due to the limited research conditions, the sample size of this study is small, so it is necessary to expand the sample size in further studies to analyze the related influencing factors of male infertility at the reproductive age.

Conclusions

In conclusion, this study screens a total of 6 risk factors for male infertility patients of reproductive age in Jinan, Shandong Province, China. Among them, three factors can be controlled, avoided, or reduced by personal actions: coffee consumption, living in a room that has finished renovation within 3 months, and stress level. Therefore, it is recommended that men of reproductive age consume coffee in moderation but not in excess; do not live in newly renovated houses with volatile pollutants; often go out to relax and learn to reduce stress to improve the reproductive health of men in the reproductive age in Jinan and reduce the risk of male infertility.

Conflict of Interest

The Authors declare that they have no conflict of interests.

Informed Consent

Informed consent was obtained from all individual participants included in the study.

Ethics Approval

This study was approved by Shandong University (No. LL20210802).

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Authors' Contribution

S. Li: concept, literature search, design, data collection, analysis, and interpretation, writing the manuscript; X. Shen: concept, literature search, design, data collection; X.-X. Qin: resources, data collection; S. Fang: resources, data collection; J. Chen: concept, design, supervision, literature search, resources, critical review; H.-J. Yan: supervision, resources, data collection, critical review.

Date Availability

Data information can be obtained from the author on request.

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