

ORIGINAL RESEARCH

Sexual dysfunction in men aged 40–60 years old in infertile couples

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Abstract

This study aimed to determine sexual dysfunction (SD) and erectile disorder (ED) prevalence and analyze risk factors in older men of infertile couples. The study was a cross-sectional descriptive study conducted on male partners in infertile couples who were aged between 40–60 years. The study took place at the Hue Center for Reproductive Endocrinology and Infertility, Hue University Hospital, Viet Nam from January 2022 to August 2023. All participants were examined and were privately asked to answer the International Index of Erectile Function (IIEF)-15 questionnaires vietnamese-language version to diagnose sexual dysfunction and erectile disorder. The study sample consisted of 81 qualified men. The prevalence of SD was 51.9% (N = 42), of which the rate of ED accounted for 46.9% (N = 38). Among the 42 cases of SD, 37 were mild cases (45.8%), 1 was moderate (1.2%) and 4 were severe (4.9%). In all five sexual domains, it was found that the severity of SD was associated with lower scores ($p < 0.001$). Cardiovascular disease (CVD) was associated with severity of SD ($p = 0.044$). The decrease in scores of sexual desire and satisfaction could significantly affect sperm vitality and DNA fragmentation index. Age, number of living children and economic income were statistically correlated to SD domains ($p < 0.05$). Sexual dysfunction is a comprehensive disorder that affects each of the four phases of the sexual response cycle in older infertile men. It is a common disorder that could affect semen quality, leading to total sexual dysfunction and erectile disorder. Factors such as age, term births history, number of living children, geography and economic income are demography-sociology risk factors. Additionally, CVD with vascular endothelial damage mechanism has a statistically significant relationship with the severity of sexual dysfunction.

Keywords

Male sexual dysfunction; Erectile disorder; Older men; Infertility; Related factors

1. Introduction

Sexual dysfunction (SD) is a condition characterized by abnormal or absent psychosexual and physiological responses. According to research, the prevalence of male sexual dysfunction (MSD) in those aged 40 to 70 years was approximately 52%, ranging from 9 to 29%, with clinical symptoms including premature ejaculation (PE) and erectile disorder (ED) [1]. The prevalence of these disorders had been reported to vary by race, culture or belief, with Asians having a higher rate than Europeans [2]. Khan J *et al.* [3] conducted a recent study of over 5200 people aged 45 to 74 years, and 48.9% of men reported no problems with sexual health or sexual distress. Men's sexual responses involve complex processes that are regulated by the nervous and endocrine systems. Two important components of men's sexual responses are ejaculation and orgasm [4]. These two processes are related but not the same. The quality of ejaculation is positively related to sexual satisfaction, particularly orgasm, according to male

perceptions. However, there are still many unclear aspects of the physiological mechanisms involved in these processes.

Infertility affects 8–12% of couples in reproductive age, with male infertility accounting for 45% [5]. ED is linked to a variety of infertility factors, including psychological stress, low self-esteem, infertility treatment, impaired sperm quality and azoospermia in young men [6]. In a meta-analysis of 8 types of research, Liu Y *et al.* [7] found that infertile men had a statistically higher proportion of SD than the fertility group (Odds Ratio (OR) = 2.66, 95% Confidence Interval (CI) = 1.69–4.19, $p < 0.001$). The SD frequency varied from 17.8% to 61.6% [7]. In our 2019 study of infertile men aged 22–60, the rates of ED and premature ejaculation were 26.3% and 7.1%, respectively [8]. Many couples have described infertility treatment as a stressful time in their lives. Reduced sexual sensation may be motivated by the desire to conceive. The primary reason was that infertility treatment may have a greater impact on the frequency and duration of sex than emotion [9].

Furthermore, age is thought to be one of the risk factors linked to sexual ability [10]. An Australian study published in 2014 on 170 men aged 35–80 years with normal sexual behavior found that 31.7% developed SD after 5 years [11]. Meissner VH *et al.*'s [12] study of 12,646 men over the age of 45 found that male hypoactive sexual desire disorder was common in the middle age group. Although ED has been shown to increase with age, there is no evidence that premature ejaculation is more common. Hormonal changes, specifically decreased testosterone levels, as well as other aging physiological, psychological and lifestyle factors, may have an impact on sexual interest. Furthermore, lower urinary tract diseases, benign prostatic hyperplasia (BPH) or prostate cancer may increase the risk of painful erections or painful ejaculation [13]. A number of other comorbidities have been shown to be associated with male sexual dysfunction such as: spinal cord injury, iron homeostasis alterations, thyroiditis, Covid infection varicocele and cannabis using [14–18].

Thus, do infertility and related factors affect the sexual function in older infertile men? Based on the previously mentioned scientific theoretical bases, we conducted this study to determine the epidemiological characteristics of SD and ED, as well as to understand the influencing factors in cases of infertile men aged 40 to 60 years.

2. Materials and methods

2.1 Study design

From January 2022 to August 2023, a cross-sectional descriptive study was conducted on male partners in infertile couples aged 40–60 years at the Hue Center for Reproductive Endocrinology and Infertility, Hue University Hospital in Vietnam. All patients were being examined for the first time. Illiteracy, psychiatric disorders or antidepressant use, a surgical history of penile anatomic defects, no intercourse within the previous four weeks of the interview, and over the age of reproduction of wife were all exclusion criteria. A total of 81 qualified men who agreed to participate were recruited for the study. All participants were asked to privately complete the International Index of Erectile Function (IIEF)-15 questionnaires in Vietnamese. All participants in this study provided informed consent. During data collection, all patients' identities were concealed.

The study collected general information such as administrative information, infertile classification and duration, medical history such as diabetes, hypertension, CVD, gout, varicoceles, smoking and alcohol use. Urban areas included urban districts, wards and towns; All remaining basic administrative units (communes) were classified as rural areas.

The study population was divided into two groups based on their IIEF-15 scores: the SD group (IIEF total scores <65; N = 42) and non-SD group (IIEF total scores ≥65; N = 39). Anthropometry measurements such as weight, height, body mass index (BMI), waist circumference, hip circumference and blood pressure were taken for both groups. Men were examined in an upright and lying position to examine the characteristics of the scrotum, testicles, epididymis and penis. Varicocele was detected through observation or palpation of

varicose veins when in a normal state or when doing the Valsalva test. The patient was also indicated the scrotal ultrasound to diagnose varicocele. To evaluate reproductive capacity, all patients underwent semen examinations and biochemical assays. The research data was analyzed to investigate the relationship between sexual dysfunction and risk factors such as: anthropometry, pathology, semen quality and social factors.

2.2 International index of erectile function—IIEF-15

IIEF-15 consists of 15 items assigned to 5 specific areas including erectile function (Q1–5 and Q15); orgasmic function (Q9–10); sexual desire (Q11–12); intercourse satisfaction (Q6–8) and overall satisfaction (Q13–14). Each question has five options scored from 0 to 5, indicating the level of improvement. The sexual function scored from 6 to 75 classified as: severe/medium SD (score 6–30); mild SD (score 31–59) and no SD (score 60–75).

The erectile function domain score ranges from 6 to 30 categorized as severe ED (score 1–10); moderate dysfunction (score 11–16); mild to moderate dysfunction (score 17–21); mild dysfunction (score 22–25) and no dysfunction (score 26–30) [19].

2.3 Reproductive function assessment methods

Total testosterone blood test: The test was conducted in the morning, between 7–10 AM.

Semen parameters: The semen sample was collected through masturbation after abstaining from sexual activity for 2–7 days. The sample was put in a container and transported to the laboratory. Upon arrival, it was liquefied in a warming incubator kept at 37 °C. Within an hour of collection, a microscopic examination was conducted to assess sperm concentration, motility, vitality and morphology based on the World Health Organization (WHO) 2021 standard [20].

DNA fragmentation test: This test was performed on the semen sample using the Halosperm HT-HS10 by Halotech DNA SL, Madrid, Spain. After preparing the semen sample according to the procedure, the sperm slide was observed under a fluorescence microscope to check for the characteristic halo. The level of DNA fragmentation in sperm was inversely proportional to the halo's size. The sperm DNA fragmentation index (DFI) was calculated using the following formula:

$$DFI (\%) = 100 \times \frac{\text{Number of spermatozoa with fragmented DNA}}{\text{Number of spermatozoa counted}}$$

2.4 Metabolic syndrome

Metabolic syndrome diagnosis for Asian men, based on the International Diabetes Federation (IDF) 2005 criteria, requires a waist circumference of 90 cm or more, along with at least two of the following components: hypertension, fasting glucose ≥5.6 mmol/L, triglycerid ≥1.7 mmol/L and high-density lipoprotein cholesterol (HDL-cholesterol) <1.03 mmol/L

[21].

2.5 Hyperuricemia

Hyperuricemia was defined as an elevated uric acid blood level of more than 6.8 mg/dL ($\approx 416.4 \mu\text{IU/mL}$) [22].

2.6 Statistical analysis

The study's statistics were analyzed using SPSS software version 22.0 (SPSS Inc., Chicago, IL, USA). The quantitative variable was presented as Mean \pm Standard Deviation, while the qualitative variable was expressed as Noun (Percentages). The *t*-test and Pearson Chi-square test were used to compare mean values and percentages between groups with sexual disorders. The correlation of productive quality and sexual disorder items was determined by Spearman's correlation coefficient (ρ). Statistically significant results were considered for *p* values < 0.05 .

3. Results

Between January 2022 and August 2023, a study was conducted which included 81 men aged 40–60 years from infertile couples. The study found that 51.9% ($N = 42$) of the men had SD, with 46.9% ($N = 38$) of those cases being ED. In 42 cases of SD, 37 were mild (45.8%), 1 was moderate (1.2%) and 4 were severe (4.9%). **Supplementary Table 1** showed that the mean age was 43.2 ± 3.8 years, the mean infertile duration of infertility was 80.6 ± 53.5 months. There was no statistically difference between age, infertile characteristics, anthropometry index, smoking, using alcohol and SD. However, the prevalence of SD was significantly higher in rural areas (64.1%) than in urban areas (40.5%) ($p = 0.033$).

Supplementary Table 2 showed that in older infertile men, SD affected each of the four phases of the sexual response cycle. There was a statistically significant difference between IIEF-15 scores of sexual disorders domains (erectile function, orgasmic function, sexual desire, intercourse satisfaction and overall satisfaction) and the overall level of SD ($p < 0.001$). In all five sub-domains, the more severe the level of SD, the lower the scores.

Among the medical conditions that were surveyed, hyperuricemia had the highest occurrence rate, followed by varicocelle, metabolic syndrome, hypertension and CVD with the frequency of 33.3%, 27.2%, 23.5%, 18.5% and 13.6%, respectively. Diabetes was found to be the least common disease in the study sample, accounting for only 12.3%. According to **Supplementary Table 3**, only cardiovascular disease showed a significant association with the severity of SD, with a *p*-value of 0.044.

When we looked at the impact of SD on reproductive function using blood testosterone levels, semen parameters and sperm DNA fragmentation index (DFI), we found that sperm vitality was significantly positively correlated with the total score of IIEF-15 ($\rho = 0.269$; $p = 0.015$) and domain scores such as sexual desire ($\rho = 0.259$; $p = 0.020$), intercourse satisfaction ($\rho = 0.368$; $p = 0.001$) and overall satisfaction ($\rho = 0.266$; $p = 0.016$) (**Supplementary Table 4**). Overall sexual function did not affect sperm DNA fragmentation, but

dysfunctional orgasmic function, intercourse satisfaction and overall satisfaction were associated with higher DFI ($p < 0.05$).

Supplementary Table 5 shows a statistically significant correlation ($p < 0.05$) between SD domains and age, number of living children, and couple's economy.

4. Discussions

Male sexual dysfunction is a complex disorder influenced by psychological factors and requires a multidisciplinary approach [23]. When a sexual disorder occurs, all of the component domains, including erectile, orgasmic, sexual desire and satisfaction, are potentially dysfunctional. It is a continuous, closely related cycle that is both cause and effect. The IIEF-15 scores for sexual disorders domains differ significantly from the overall level of SD (**Supplementary Table 2**, $p < 0.001$), supporting this theory.

Our study found that infertile men have a mean age of 43.2 ± 3.8 years, with a prevalence of SD and ED at 51.9% and 46.9%, respectively. This is consistent with previous research on the same age group in other countries [3, 24]. In a study of 708 unexplained infertile men with a younger mean age of 34.2 ± 5.6 years, Coward R *et al.* [25] found that only 9.0% had mild ED or worse, which is significantly lower than our findings. As a result, the aging process has been identified as one of the most significant risk factors for the sexual disorder [26]. **Supplementary Table 5** shows a negative correlation between age and IIEF scores for orgasmic function ($\rho = -0.224$; $p = 0.044$), sexual desire ($\rho = -0.285$; $p = 0.010$) and overall satisfaction ($\rho = -0.310$; $p = 0.005$). MSD risk factors include general health, blood testosterone levels, sexual desire and frequency of sexual activity, all of which decrease with age [10]. Furthermore, the proportion of patients with SD in rural areas was significantly higher than in urban areas (64.1% vs. 40.5%, $p = 0.033$) (**Supplementary Table 1**). Social prejudices, difficult economic circumstances, limited access to sexual health-care services and a lack of opportunities for consultation and examination by sexual health professionals can all contribute to treatment delays for patients in rural areas, potentially exacerbating SD.

Nitric oxide (NO) is a nonadrenergic, and noncholinergic vasodilator produced by endothelial cells. During sexual stimulation, the dopamine-oxytocin-nitric-oxide pathway is activated [27]. NO plays an important role in the erectile mechanism by increasing the concentration of cyclic guanosine monophosphate (cGMP) and increasing blood flow to the penis [1]. Researchers reported that patients with CVD had more vascular endothelial injury, which impairs sexual function. This molecular mechanism contributes to our findings, which show statistically higher prevalences of mild and moderate/severe SD in men with CVD than without CVD (63.6% and 18.2% vs. 42.9% and 4.3%, $p = 0.044$). In recent years, diabetes, obesity, hypertension and metabolic syndrome have been identified as risk factors for MSD [28, 29]. However, this analysis did not reveal any significant association (**Supplementary Table 3**). It is possible that at the age from 40 to 60 years, these pathological symptoms are still mild. Furthermore, due to good treatment control, no SD manifestations have appeared.

Many researchers investigated the long-term effects of infertility on sexual quality. Putative factors in infertile men with SD include psychological burden and somatized anxiety related to male infertility, treatment costs and sexual activity during the conception period independent of sexual desire [30]. This study found no link between type and duration of infertility with SD. However, childbearing history and number of living children have a strong positive correlation with total sexual function ($\rho = 0.274$, $p = 0.013$ and $\rho = 0.256$; $p = 0.021$), erectile function ($\rho = 0.359$, $p = 0.001$ and 0.353 , $p = 0.001$) and intercourse satisfaction ($\rho = 0.265$, $p = 0.017$ and 0.260 , $p = 0.019$). Simultaneously, the more stable the individual and couple's income, the less concerned about living and treatment costs, and the better male orgasmic function. All of this suggests that reducing stress associated with male fertility and economic income has the potential to improve sexual function. Furthermore, we discovered that sexual orgasm, desire and satisfaction can significantly impact sperm vitality and DNA fragmentation (**Supplementary Table 4**, $p < 0.05$).

5. Limitations of the study

This research was currently focusing on evaluating sexual dysfunction and related factors in elderly infertile men. Because in this age group, the number of patients wishing to become pregnant was not high, so the sample size in this study was quite limited. Besides, we did not have data on sexual function characteristics in cases of older men who had children. This will be a direction of our future research to further highlight the relationship between sexual activity characteristics and fertility in older men. Some confounding factors that might affect the research results such as: Phosphodiesterase-5 Inhibitors (PDE5i) drug use, or characteristics of sexual activity of partners... have not yet been exploited.

6. Conclusions

Sexual dysfunction in older infertile men is a comprehensive disorder that affects each of the four phases of the sexual response cycle. Total sexual dysfunction and erectile disorder are common disorders that could also affect semen quality. Age, history of term births, number of living children, geography and economic income are some of the demographic and sociological risk factors. CVD with vascular endothelial damage mechanism has a statistically significant relationship with the severity of sexual dysfunction. The multi-dimensional approach to evaluate of infertility, especially in terms of sexual function is very important to improve the effectiveness of infertility treatment in older man.

AVAILABILITY OF DATA AND MATERIALS

The dataset used and analyzed during the current study are available from the corresponding author upon reasonable request.

AUTHOR CONTRIBUTIONS

NTC, NQTT, NDN, MTL, NMCN and QHNV—developed the study concept and designed the study; NDN and NQTT—collected the data for analysis; NQTT, NDN, NMCN and TNC—performed the statistical analysis and drafted the first manuscript. All authors contributed to the interpretation of the data and provided critical revision for important intellectual content. All authors reviewed and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The Ethics Committee of the University of Medicine and Pharmacy at Hue University (Vietnam) approved this study with number H2022/004. All patients were fully consulted before deciding to participate in the study. Patients have signed a consent form agreeing to participate in the study.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

SUPPLEMENTARY MATERIAL

Supplementary material associated with this article can be found, in the online version, at <https://oss.jomh.org/files/article/1806570128069804032/attachment/Supplemmentary%20material.docx>.

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