

# Prevalence and risk factors of erectile dysfunction in men of infertile couples: A cross-sectional study from an in vitro fertility center in the northern Vietnam

**Son Trinh The**

Vietnam Military Medical University

**Su Hoang Xuan**

Vietnam Military Medical University

**Ai Hoang Van**

Vietnam Military Medical University

**Trinh Nguyen Ba**

Military Central Hospital 108

**Hoang Le**

Tam Anh General Hospital

**Trang Quan Van**

Vietnam Military Medical university

**Minh Pham Duc**

Vietnam Military Medical University

**Dung Dang Vinh**

Military Central Hospital 108

**Cuc Le Thi**

Military Central Hospital 108

**Tung Nguyen Thanh**

Vietnam Military Medical University

**Tuan Ngo Anh**

Vietnam Military Medical University

**Trang Vu Thi Thu**

Hung Yen Obstetrics and Pediatrics Hospital

**De Doan Van**

Military Hospital 103

**Binh Do Nhu** (✉ [nhubinh.do@vmmu.edu.vn](mailto:nhubinh.do@vmmu.edu.vn))

Military Hospital 103 <https://orcid.org/0000-0002-1377-3921>

**Quyet Do**

Vietnam Military Medical University

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## Research article

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# Abstract

**Purpose:** The aim of this study was to investigate the prevalence and risk factors of erectile dysfunction (ED) in men of infertile couples from an in vitro fertility center in the northern Vietnam.

**Methods:** A total of 138 men of infertility couples were enrolled in this study from January to May, 2018. The International Index of Erectile Function questionnaire scale was used to assess the severity of ED and several related factors were also collected to determine risk factors.

**Results:** The prevalence of ED among men of infertile couples was 18.1%, including 13 mild ED (9.4%), 7 mild to moderate ED (5.1%), 2 moderate ED (1.4%) and 1 severe ED (0.7%). Using logistic regression analysis, we showed that risk factors associated ED were smoking above 5 pack/years with OR = 3.16, CI = 0.98 – 10.18,  $p = 0.05$ ; not graduating junior high school, OR = 5.11, CI = 1.11 – 23.8,  $p = 0.03$ , and azoospermia, OR = 7.55, CI = 2.18 – 26.16,  $p = 0.001$ . We observed relatively high OR in men with smoking under 5 pack/years (OR = 2.51), abnormal semen analysis (hypospermia, oligozoospermia, asthenozoospermia, or teratozoospermia) (OR=2.36), but there was not significant differences compared with reference group.

**Conclusion:** The prevalence of ED among men of infertile couples in this study was higher than infertile men. Low level of education, smoking in a long period, and azoospermia were the main risk factors of ED in men. Further large-scale studies are needed to extend the results.

## Introduction

Erectile dysfunction (ED) is common sexual disorders in men of reproductive age with an estimated prevalence ranges from 1 to 10% in men younger than 40 years and increasing incidence with age. It has been predicted that 322 million men have ED by the year 2025 (1). Erectile dysfunction (ED) along with infertility are important health issues, which affects negatively the quality of life, couple's relationship and emerging as an early marker for evaluation of decreased general health status (2). There are evidence show that ED was associated with aging, metabolic disorder, mental health disorders and unhealthy lifestyle (3, 4). Whether or not cell phone or other electronic device usage related to ED is still uncertain because of limited data. Marcin Słojewski shared a big concern about radiofrequency could pose a negative effect on erectile dysfunction (5). Badereddin et al conducted a research in 20 ED men and 10 healthy men show that ED men had significantly longer smartphone carrying time(6).

The increasing number of patients with ED is seeking medical care at clinics of andrology and infertility treatment. It has been shown that ED and infertility had a complex link associated with both male factors and their partners(2). Of note, men with infertility can cause ED and other sexual problems (7). Particularly, infertile men had a higher prevalence of ED than those without fertility problems and general population (8, 9). In addition, ED associated with severity of impaired semen quality(10). Thus, an early diagnosis and identification of potential related factors of ED occurrence could help for counseling and therapeutic interventions of infertile couples.

In Vietnam, Sexual problems, particularly erectile dysfunction is lack of appropriate concern because of cultural influences. Sexual function problem is sensitive subject, the suffered men usually embarrassed to tell this problem even to the specialists. Besides, the andrology clinic was not fully developed. Therefore, there are a few reports about erectile dysfunction in Vietnam. Van Vo conducted a research in 746 men from 20 to 60 (mean age 44.3) in Hue city (central region of Vietnam) showing that the ED prevalence is 66.9% (11). This rate was significantly higher than other reports. There is no study investigated the prevalence of ED and associated factors in men of infertile couple in Vietnam so far.

Within a context of Eastern culture, men in Vietnam still take more responsibility than women in some social aspect. The principle of male primogeniture is popular. In term of having descendants, the first-born man in a family (the biggest brother) get pressure from his family and his clan. The first-born man suffered from infertility may get more pressure. These pressures might be a contributed factor of ED, but there were no conducted researches about this hypothesis.

This study was conducted to investigate the prevalence of ED in men of of infertile couples, the relationship of several sociological lifestyle and medical factors with ED.

## **Materials And Methods**

### **Study design and population**

A cross – sectional study was included male patients who presented at Military Institute of Clinical Embryology and Histology of Vietnam Military Medical University for seeking medical treatment of infertility from Jan 2018 to May 2018.

Sample size was calculated by using formula (se Formula in the Supplemental Files)

According to Lotti et al, the prevalence of ED in men of infertile family was 17.8% (12), therefore,  $n = 100$ . Total 138 men were agreed to involved the study.

The inclusion criteria were: over 18 years old, heterosexual tendency, stable relationship. All the males of couple infertility underwent demographic and physical examination with a standard diagnostic protocol.

### **Method of collecting data**

These patients were guided to complete a Vietnamese version of International Index of Sexual Function-15- Erectile dysfunction domain (IIEF-15-ED). According to the IIEF-15-ED, the severity of ED was classified into following groups: no ED (EF score  $\geq 26$ ); mild ED (EF score 22 – 25); mild to moderate (EF score 17 – 21); moderate (EF score 11 – 16); and severe (EF score 1 – 10) (13).

In addition, some sociological and lifestyle variables such as sleeping hours per day (hours), time spent on smartphone (hours), total time spent on electronic devices (hours), smoking (pack per years: by

multiplying the number of daily cigarette's packs (20 cigarettes per pack) using by the number of year smoking), regular alcohol consumption, regular physical exercise, residence (rural or urban), occupation, working hours per week, monthly income, education level, number of siblings, being first-born (yes/no) were also collected.

Furthermore, medical variables were measured by physicians and medical staffs including: age, height, weight, Waist-to-Hip Ratio, body mass index (BMI). All patients also underwent semen analysis (SA), according to WHO criteria (2010)(14), and hormones evaluation: FSH, LH, PRL, Testosterone were measured by Roche's Access chemiluminescent immunoassay Elecsys 2010 (Roche Diagnostics). Patients semen parameters were divided into: Azoospermia group (No spermatozoa was observed after at least 2 SA, using 500g-centrifuged sediment microscopic inspection); main abnormal semen quality: H, O, A, T group (hypospermia, oligozoospermia, asthenozoospermia, or teratozoospermia) and Normozoospermia group.

**Ethics statement:** This study was approved by the Ethical Committee of Vietnam Military Medical University (No.1150/2017/VMMU-IRB). All patients provided written informed consent, and that this study was conducted in accordance with the Declaration of Helsinki.

## Statistical analysis

Statistical analysis was done by using STATA 14.0 (STATA Corp, Texas, USA.). Continuous variables are expressed as mean  $\pm$  standard deviation (SD). Chi-square test, Fisher's exact tests, Student's T tests and Mann - Whitney U test were used to analyze the data, as appropriate. Univariate and multivariate binary logistic regression analysis was conducted to disclose odds ratios (ORs) for factors associated with ED. A p-value  $< 0.05$  was considered as statistical significance.

## Results

### Demographic of participants and prevalence of ED in male of infertile couple using IIEF-15 (ED domain).

Among 138 participants, the mean age was  $33.07 \pm 5.77$  (range from 22 to 52), the wife's age was  $30.04 \pm 5.65$  (range from 20 to 48), with the year of infertility was  $4.37 \pm 3.76$  (range from 1 to 18).

The ED was observed in 25 participants (18.1%) with mean IIEF-15 (ED domain) scores were 19.52 (compared to 28.50 in 113 participants (89.9%) of non-ED group), including: 13 mild (9.4%), 7 (5.1%) mild to moderate, 2 (1.4%) moderate and 3 (2.2%) severe ED men (Table 1)

Table 1  
Prevalence of ED in male of infertile couple using IIEF-15 (ED domain)

Variables	Mean ± SD	n (%)	Range (min-max)
Age (y), mean ± SD	33.07 ± 5.77	138	22–52
Wife's age (y), mean ± SD	30.04 ± 5.65		20–48
Duration of infertility (y), mean ± SD	4.37 ± 3.76		1–18
Erectile dysfunction, n (%)		25 (18.12%)	
<i>Mild, n (%)</i>		3 (2.2%)	
<i>Mild to Moderate, n (%)</i>		2 (1.4%)	
<i>Moderate, n (%)</i>		7 (5.1%)	
<i>Severe, n (%)</i>		13 (9.4%)	

## Risk Factors Associated With Erectile Dysfunction

We divided into two subgroups: ED and non-ED, the mean age of ED and non-ED groups are  $31.92 \pm 6.32$ ;  $33.32 \pm 5.64$ , respectively. 80% of participants in ED group were primary infertility compared to 64% participants in non-ED groups. There were not statistically significant in age, wife's age, duration, type of infertility in 2 groups.

Regarding sociological aspect, the number of participants in ED groups that live in city was 9 (36%), compared to 48 (42%) in non-ED group, but the statistical difference was not observed. A number of 3 (12%), 13 (52%), 9 (36%) participants in ED groups reports that his/her occupation was office work, manual labor, or mixed, respectively. This number was not significantly difference compared to non-ED groups. The monthly income and working hours per week were not significant difference in 2 groups. However, the education is significant difference in 2 groups. The proportion of participants did not complete junior high-school, completed junior high-school, or university (graduated or post-graduated) in ED group was 32%, 16%, 52%, compared to non-ED groups these proportion were 9.73%, 28.32%, 61.95%, respectively. We witnessed the similarity in the mean number of siblings and being the first-born proportion in both groups. All of the detailed data was described in Table 2.

Table 2  
Risk factors related to erectile dysfunction.

Variables	ED group	Non ED group
	25 (18.12%)	113 (81.88%)
<b>Lifestyle factors</b>		
Sleeping hours per day (hour), mean $\pm$ SD	7.08 $\pm$ 1.26	7.45 $\pm$ 1.07
Time spent on electronic devices (hours/day), mean $\pm$ SD	3.28 $\pm$ 4.01	4.75 $\pm$ 3.96
Time spent on smartphone (hours) (hours/day), mean $\pm$ SD	2.48 $\pm$ 0.62	2.61 $\pm$ 0.20
Smoking, n (%)		
<i>No</i>	11 (44%)	76 (67.26%)
<i>&lt; 5 pack.years</i>	6 (24%)	20 (17.70%)
<i><math>\geq</math> 5 pack.years</i>	8 (32%)	17 (15.04%)
Regular alcohol consumption, n (%)	7 (28%)	41 (36%)
Regular physical exercise, n (%)	7 (28.00%)	53 (46.90%)
<b>Sociological factors</b>		
Residence n (%)		
<i>Urban</i>	9 (36.00%)	48 (42.48%)
<i>Rural</i>	16 (64.00%)	65 (57.52%)
Working hours per week	47.96 $\pm$ 16.53	48.13 $\pm$ 16.95
Occupation, n (%)		
<i>Office work</i>	3 (12%)	34 (30.09%)
<i>Manual Labor</i>	13 (52%)	48 (42.28%)
<i>Mixed</i>	9 (36%)	31 (27.43%)
Monthly income (Million VND)	12.88 $\pm$ 9.39	13.24 $\pm$ 7.88
Education level **		
<i>Not completed junior high-school</i>	8 (32.00%)	11 (9.73%)
<i>High school</i>	4 (16.00%)	32 (28.32%)
<i>University, graduated, post-graduated</i>	13 (52.00%)	70 (61.95%)
First-born	15 (60%)	67 (59%)
Number of siblings	3.56 $\pm$ 1.04	3.48 $\pm$ 1.59

Variables	ED group	Non ED group
<b>Medical factors</b>		
Age (y), mean $\pm$ SD	31.92 $\pm$ 6.32	33.32 $\pm$ 5.64
Duration of infertility (y), mean $\pm$ SD	4.9 $\pm$ 3.68	4.2 $\pm$ 3.80
Type of infertility, n (%)		
<i>Primary</i>	20 (80%)	73 (64%)
<i>Secondary</i>	5 (20%)	40 (35.40%)
Physical measures		
<i>BMI (kg/m<sup>2</sup>), mean <math>\pm</math> SD</i>	22.36 $\pm$ 3.46	22.75 $\pm$ 2.75
<i>WHR, mean <math>\pm</math> SD</i>	0.83 $\pm$ 0.05	0.84 $\pm$ 0.06
Hormonal profile		
<i>FSH, mIU/mL, mean <math>\pm</math> SD</i>	10.76 $\pm$ 12.40	7.29 $\pm$ 9.19
<i>LH, mIU/mL, mean <math>\pm</math> SD</i>	7.33 $\pm$ 7.61	5.45 $\pm$ 4.63
<i>Prolactin, ng/mL, mean <math>\pm</math> SD</i>	16.31 $\pm$ 15.83	14.06 $\pm$ 10.16
<i>Testosterone, ng/mL, mean <math>\pm</math> SD</i>	4.26 $\pm$ 2.92	5.03 $\pm$ 2.21
Semen analysis *		
<i>Azoospermia</i>	12 (48%)	21 (18.58%)
<i>HOAT</i>	7 (28%)	36 (31.86%)
<i>Normozoospermia</i>	6 (24%)	56 (49.56%)

In several medical aspects, the semen quality is related to ED. Other medical factors (physical measurements, hormonal profiles) were not significant difference (Table 2).

Factors associated with ED occurrence by univariate and multivariate analysis are presented in Table 3.



Table 3  
Univariate and multivariate regression analyses for predictors of erectile dysfunction

Variables	Univariate analysis		Multivariate analysis	
	OR (95% CI)	p	OR (95% CI)	p
<b>Lifestyle factors</b>				
Sleeping hours per day (hour)	0.74 (0.51;1.09)	0.13		
Time spent on electronic devices (hours)	0.90 (0.79;1.02)	0.10		
Time spent on smartphone (hours)	0.98 (0.80;1.18)	0.80		
Smoking				
<i>No</i>	1.00 (Reference)		1.00 (Reference)	
<i>&lt; 5 pack.years</i>	2.07 (0.68;6.29)	0.20	2.51 (0.70;9.07)	0.16
<i>≥ 5 pack.years</i>	3.25 (1.14;9.31)	0.03	3.16 (0.98;10.18)	0.05
Regular alcohol use				
<i>Yes</i>	0.57 (0.18;1.82)	0.35		
<i>No</i>	1.00 (Reference)			
Regular physical exercise				
<i>Yes</i>	1.00 (Reference)			
<i>No</i>	2.27 (0.88; 5.86)	0.09		
<b>Sociological factors</b>				
Residence				
<i>Urban</i>	1.00 (Reference)			
<i>Rural</i>	1.31 (0.53;3.22)	0.55		
Working hours per week	1 (0.97;1.03)	0.97		
Occupation				
<i>Office work</i>	1.00 (Reference)			
<i>Manual Labor</i>	3.07 (0.81;11.60)	0.1		
<i>Mixed</i>	3.29 (0.82;13.27)	0.09		
Monthly income (Million VND)	0.99 (0.94;1.05)	0.84		
Education level				
<i>Not completed junior high-school</i>	5.82 (1.46;23.17)	0.01	5.11 (1.10; 23.77)	0.03

<b>Variables</b>	<b>Univariate analysis</b>		<b>Multivariate analysis</b>	
<i>High school</i>	1.00 (Reference)		1.00 (Reference)	
<i>University, graduated, post-graduated</i>	1.49 (0.45;4.91)	0.52	1.43 (0.40;5.07)	0.58
<b>First-born</b>				
<i>Yes</i>	1.03 (0.42;2.49)	0.95		
<i>No</i>	1.00 (Reference)			
Number of siblings	1.04 (0.78;1.38)	0.80		
<b>Medical factors</b>				
Age (years)	0.95 (0.93;1.16)	0.27		
Duration of infertility (years)	1.04 (0.93; 11.16)	0.42		
<b>Type of infertility</b>				
<i>Primary</i>	1.00 (Reference)			
<i>Secondary</i>	0.46 (0.16;1.31)	0.14		
<b>Physical measures</b>				
<i>BMI, kg/m<sup>2</sup></i>	0.95 (0.81;1.11)	0.54		
<i>WHR (0.1)</i>	0.56 (0.24;1.27)	0.16		
<b>Hormonal profile</b>				
<i>FSH, mIU/mL</i>	1.03 (0.99;1.07)	0.12		
<i>LH, mIU/mL</i>	1.06 (0.98;1.13)	0.13		
<i>Prolactin, ng/mL</i>	0.85 (0.69;1.05)	0.14		
<i>Testosterone, ng/mL</i>	1.02 (0.98;1.05)	0.37		
<b>Semen analysis</b>				
<i>Normozoospermia</i>	1.00 (Reference)		1.00 (Reference)	
<i>HOAT</i>	1.81 (0.56;5.84)	0.32	2.36 (0.66;8.40)	0.19
<i>Azoospermia</i>	5.33 (1.77;16.04)	0.003	7.55 (2.18;26.16)	0.001

By using univariate analysis, we found that educational levels, duration of smoking and semen analysis associated with presence of ED. All other analyzed factors were not associated with ED occurrence. Then, all variables with p values < 0.05 included into multivariate regression analysis by using backward step-wise elimination approach for determining related factors of ED. In final logistic regression model, we

showed that risk factors associated ED were smoking above 5 pack/years with OR = 3.16, CI = 0.98–10.18,  $p = 0.05$ ; not graduating junior high school, OR = 5.11, CI = 1.11–23.8,  $p = 0.03$ , and azoospermia, OR = 7.55, CI = 2.18–26.16,  $p = 0.001$ . We observed relatively high OR in men with smoking under 5 pack/years (OR = 2.51), abnormal semen analysis (hypospermia, oligozoospermia, asthenozoospermia, or teratozoospermia) (OR = 2.36), but there was not significant differences compared with reference group.

## Discussion

Infertility is recognized as a major health problem by the WHO, affecting up to 15% of all couples. Among these couples, a male factor contributed up to 50% of infertile cases (15). In diagnostic workup of infertile couples, male sexual dysfunction is one of the common complaints. Specifically, erectile dysfunction (ED) is a frustrating condition, has impact not only on individual health status, but also on sociological, psychological burden. ED shares a complex relationship with infertility. There are several evidences that the prevalence of ED is higher in men of infertile couple than in the general population. In the present study, we reported the rate of ED in men of infertile couples was 18.1%, equivalent to prevalence of ED in many previous studies reported (12, 16). However, this is significantly lower than to the rate reported by Satkunasivam R et al and Yang B et al (18.1% vs. 30.5% and 18.1% vs. 57.8%, respectively) (17, 18). Van Vo et al reported 66.9% male had ED symptom, that was significantly high in compared to our study. This difference might be due to sample selection, Van Vo's research has the mean age of participant is 44.3, our study conducted in a cohort of notable younger participants, the mean age is 33.06. However, Van Vo also reported that the rate among men's age from 20 to 29, from 30 to 39, and over 40 were 5.5%, 24.7%, over 30%, respectively (11), which was quite similar with our study. The prevalence of severe ED observed in agreement with other studies, but the overall rate of ED in male infertility is higher than that of men in normal couples at a similar reproductive age. This can be explained due to diagnosis and treatment of the infertile male may cause sexual dysfunctions. In addition, cultural and religious differences between various patient populations, different diagnostic criteria and validated instruments of sexual disorders are factors contributing to the of ED rate in published studies (2).

Several sociological risk factors were examined. However, our data shown only low education level (not completed junior highschool) was the risk factor of ED with OR = 5.13, compared with reference values (completed junior highschool). Low level education is considered as the risk factor of ED, according to Fourth International Consultation on Sexual Medicine (FICSM) (19). According to Yang et al, high educational levels (highschool and above) was a risk factors associated with ED. The difference between our study and Yang may be due to different socioeconomic status (18). Our study did not find that other variables (residence, occupation, working hours per week, monthly income, number of siblings, first-born) were a significant risk factor for ED. In Vietnamese culture, the first-born man in a family (the biggest brother) had pressure from his family and his clan. The first-born man suffered from infertility may get more pressure. We hypothesized that the pressure might be a contributed factor of ED, but no statically differences was observed.

It is well known that smoking is the common risk factors associated with ED in both general male population and men of infertility (18, 20). In the present study, we confirmed more than 5 pack/years smoking were considered as significant risk factor of ED, Odd ratio = 3.16.

In the basic diagnostic workup of male infertility, semen analysis is the first diagnostic test (21, 22). In this study, we analyzed a possible association of ED with semen parameters, indicating that azoospermia is the risk factor of ED with OR = 7.55. The patient with at least main abnormal semen quality (including hypospermia, oligozoospermia, asthenozoospermia, or teratozoospermia) had higher rate of ED, with OR = 2.36 but there was not statically difference. Similar results have been previously reported by others (10). This reflects the occurrence of ED associated closely with sperm production in infertile male. In addition, diagnosis and treatment process of men undergoing infertile evaluation with azoospermia had a negative impact on hypoactive sexual desire due to psychological burden and their aware of sexual act cannot lead to pregnancy(16). Therefore, an early diagnosis of ED may allow andrologists and therapists make an interventional decision for men of infertile couples before they use assisted reproductive technology.

As far as we know, this is the first report to determine related factors associated with ED in males of infertile couple in northern region of Vietnam.

FSH, LH and T profiles may play important roles in spermatogenesis and pregnancy rates (23, 24). Some articles showed the T affected male sexual behavior and function (25). There are some reports showing that a notable proportion of men of infertile couples had T deficiency syndrome (TDS: 38%) and ED (28%) (7). However, the measurement of T is varying upon the type of T. The FICSM concluded that testosterone (free, total, or albumin bound) levels had the weak relation with ED (19). Erectile dysfunction in infertile men seem to be unrelated to hormone changes. Raj Satkunasivam indicated that T and bioavailable T serum levels were not associated with ED significantly, only LH level was a risk factor of ED (17). Exogenous T therapy proven improvement of male sexual function has not been clear(19), but it is known as a cause of infertility of men. Thus, T therapy is not recommended in men of infertility.

This study had some limitations including small sample size, not a multicenter study, the results might be not representative so a large-scale study is needed to enhance the results.

## **Conclusion**

This study showed ED in men of infertile couples was more frequent than in men of non-infertile. Low level of education, smoking in a long period, and azoospermia were the main risk factors of ED in men of infertile couples. However, further large-scale researches are needed to enhance the results.

## **Declarations**

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**Ethics statement:** This study was approved by the Ethical Committee of Vietnam Military Medical University (No.1150/2017/VMMU-IRB). All patients provided written informed consent, and that this study was conducted in accordance with the Declaration of Helsinki.

**Consent to participate:** All participants completed a written consent to participate to this study.

**Consent for publication:** All participants agree to use their data for publication.

**Conflicts of interest:** All authors declare that they have no conflict of interest.

**Availability of data and material:** This study's data are available from the corresponding author on request.

**Authors' contributions:**

*Study concept and design:* Su HX, Son TT.

*Data collecting:* Trinh NB, Trang QV, Tung NT, Trang VTT

*Analysis and interpretation of data:* Su HX, Ai HV, Tung NT.

*Resources:* Quyet D; Tuan NA

*Drafting of the manuscript:* Trinh NB, Ai HV, Trang QV, De DV.

*Revision:* Dung DV, Ai HV, Cuc LT, Binh DN, Quyet D, Hoang L.

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