



A 5-year analysis of semen parameters in Saudi Arabian men attending infertility clinics

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Abstract

Objective: To evaluate semen parameters in infertile Saudi Arabian men.

Methods: In this retrospective study, semen analysis and other clinical data were extracted from medical records of men attending an infertility clinic. Patients were stratified according to smoking status and presence or absence of varicocele.

Results: The study included 425 patients. Nonsmokers ($n = 322$) had significantly higher serum testosterone and sperm motility than smokers ($n = 194$). Serum testosterone, semen volume, motility, morphology, sperm/ejaculation and sperm count were significantly higher in patients without varicocele ($n = 328$) than in those with varicocele ($n = 188$).

Conclusions: In this study, smoking and the presence of varicocele had negative effects on semen parameters in infertile men.

Keywords

Sperm count, infertility, Saudi Arabia, male

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Introduction

It is estimated that 8–12% of couples worldwide experience some form of infertility.^{1,2} In the UK, infertility is due to the male partner in around 25% of infertile couples.³ Male infertility results from issues related to sperm count (sperm/ml) and function. The World Health Organization (WHO) published reference values for semen parameters in 2010,⁴ but semen analysis alone cannot distinguish between fertile and infertile men unless the patient is azoospermic.⁵

Routine semen analysis is an initial investigation in couples with suspected infertility, and male infertility is usually defined by abnormal semen analysis findings.^{6,7}

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As there is little information regarding normal semen parameters in Saudi Arabia, a comparison is always made based on the semen parameters of western men. Only four English-language studies regarding male infertility in Saudi Arabia have been published in the past 25 years, all of which were carried out in patients who had undergone testicular biopsies.^{8–11} Of these studies, only one evaluated semen parameters.¹¹ The objective of the present study was to evaluate semen parameters in patients who attended our infertility clinic during a 5-year period.

Patients and methods

Study population

This retrospective study included all Saudi Arabian male patients who attended or consulted for infertility and underwent semen analysis at King Fahd Hospital of the University, University of Dammam, Al Khobar, Saudi Arabia, between June 2008 and May 2013. Hospital-based patient medical record numbers were identified from the computerized medical records system, and outpatient records of infertile couples in whom male infertility was suspected and who underwent semen analysis were requested. Patients with azoospermia were excluded. Data regarding age, type of infertility (primary or secondary), laboratory tests (serum testosterone, follicle stimulating hormone [FSH], luteinizing hormone [LH], prolactin), semen analysis (sperm count, motility, morphology) were extracted from medical records. Mean semen parameters of each patient were compared to WHO normal reference values (sperm count $\geq 15 \times 10^6/\text{ml}$; volume $\geq 1.5 \text{ ml}$; $\geq 4\%$ normal morphology; $\geq 40\%$ motility).⁴

The Institutional Review Board of the University of Dammam approved the study, and both members of all couples provided oral informed consent.

Statistical analyses

Data were presented as mean \pm SD (range) or n (%) patients and were compared using Student's *t*-test. Statistical analyses were performed using SPSS[®] version 14.0 (SPSS Inc., Chicago, IL, USA) for Windows[®]. *P*-values < 0.05 were considered statistically significant.

Results

A total of 516 patients underwent semen analysis; 91 were excluded due to azoospermia. The final analysis therefore included 425 patients (mean age, 35.3 ± 7.0 years; age range, 21–54 years). Demographic and clinical data of the study population are given in Table 1. Overall, 47% of the men had abnormal semen parameters.

Data regarding semen parameters in patients stratified by smoking status are shown in Table 2. Nonsmokers had significantly higher serum testosterone and sperm motility than smokers ($P = 0.001$ and $P = 0.004$, respectively). There were no other between-group differences in semen parameters.

Serum testosterone and FSH levels were significantly higher in men with primary infertility than in those with secondary infertility (testosterone 334.74 ± 195.51 vs $207.98 \pm 227.09 \text{ ng/dl}$, $P < 0.001$; FSH 6.19 ± 2.38 vs $5.39 \pm 3.08 \text{ IU/ml}$, $P < 0.05$).

Data regarding semen parameters in patients stratified according to the presence or absence of varicocele are shown in Table 3. Serum testosterone, semen volume, motility, morphology, sperm/ejaculation and sperm count were significantly higher in patients without than those with varicocele ($P < 0.05$ for each comparison).

Discussion

There are well known geographical variations in the prevalence of male infertility

Table 1. Demographic and clinical data of patients included in a study investigating semen parameters in infertile Saudi Arabian men.

Age, years	35.3 ± 7.0 (21–54)
Primary infertility ^a	377 (88.7)
Secondary infertility ^a	48 (11.3)
Serum testosterone, ng/dl	293.0 ± 175.3 (10.9–1300.0)
Serum FSH, IU/ml	5.6 ± 2.2 (0.5–47.6)
Serum LH, IU/l	4.1 ± 4.1 (0.3–17.9)
Serum prolactin, ng/ml	17.0 ± 10.0 (0.7–118.7)
Semen volume, ml	2.7 ± 1.1
Semen volume <1.5ml ^b	95 (18.4)
Sperm count, × 10 ⁶ /ml	120.5 ± 138.1
Sperm count ≤ 15 × 10 ⁶ /ml ^b	132 (25.58)
Sperm motility, %	37.2 ± 20.4
Sperm motility <40% ^b	243 (47.1)
Abnormal sperm morphology ^b	224 (43.4)
Nonsmokers ^b	322 (62.4)
Alcohol use ^b	
No	451 (87.4)
Yes	43 (8.3)
Not stated	22 (4.25)
Varicocele ^b	188 (36.4)

Data presented as mean ± SD (range) or *n* (%) patients.

^a*n* = 425 (91 patients were excluded from final analysis due to azoospermia).

^b*n* = 516.

FSH, follicle stimulating hormone; LH, luteinizing hormone.

that can be largely explained by environmental, cultural and socioeconomic influences.¹¹ In accordance with others,¹² our study found a high prevalence of abnormal semen parameters among infertile Saudi Arabian men.

The male partner is the main cause of infertility in 25–40% of infertile couples,^{3,13} and this is usually due to abnormal semen parameters. Semen analysis has therefore

become mandatory for the assessment of male fertility.^{6,7} There is known to be a positive correlation between sperm count and pregnancy.¹⁴ Although routine semen analysis would provide useful epidemiological data, cultural and religious considerations complicate the collection of samples from the general population in some countries, including Saudi Arabia.

Studies have shown no significant differences in hormone levels between men with primary and those with secondary infertility.¹⁵ This is in contrast to the present finding that serum testosterone and FSH levels were significantly higher in men with primary infertility compared with those with secondary infertility.

Cigarette smoking has long been recognized as a general health risk. In spite of this, many smokers are young and in their prime reproductive years. Smoking is known to have significant negative effects on sperm quantity, quality and morphology.^{16–19} An extensive review found a mean reduction of 13% in sperm concentration, 10% in sperm motility and 3% in morphologically normal sperm in smokers compared with nonsmokers.²⁰ Both serum testosterone and sperm motility were significantly lower in smokers than nonsmokers in the present study. Our findings are in accordance with those of others, who showed that smoking dramatically reduced hormone levels and semen parameters.^{21,22}

The effect of varicocele on infertility is unclear. Varicocele has been shown to be two to three times more common in infertile patients than the general population^{23,24} suggesting that it may decrease sperm parameters and cause male infertility.²⁵ Patients with varicocele have been shown to have significantly lower sperm motility and viability than healthy volunteers.²⁶ This is in accordance with the findings of the present study, where patients with varicocele had significantly worse semen parameters than those without varicocele.

Table 2. Semen parameters in infertile Saudi Arabian men stratified according to smoking status.

Parameter	Smokers <i>n</i> = 194	Nonsmokers <i>n</i> = 322	Statistical significance ^a
Age, years	34.6 ± 8.3	34.3 ± 7.7	NS
Serum testosterone, ng/dl	277.4 ± 189.3	409.1 ± 381.0	<i>P</i> = 0.001
Semen volume, ml	2.8 ± 1.4	3.1 ± 0.7	NS
Semen pH	7.4 ± 0.4	7.4 ± 0.2	NS
Sperm motility, %	30.7 ± 25.2	39.9 ± 27.4	<i>P</i> = 0.004
Sperm/ejaculation, × 10 ⁶	39.9 ± 30.0	46.4 ± 66.8	NS
Sperm count, × 10 ⁶ /ml	110.7 ± 104.8	124.9 ± 142.5	NS

Data presented as mean ± SD.

NS, not statistically significant (*P* ≥ 0.05).

^aStudent's *t*-test.

Table 3. Semen parameters in infertile Saudi Arabian men stratified according to presence or absence of varicocele.

Parameter	Without varicocele <i>n</i> = 328	With varicocele <i>n</i> = 188	Statistical significance ^a
Age, years	35.7 ± 9.0	33.7 ± 7.2	<i>P</i> = 0.04
Serum testosterone, ng/dl	472.5 ± 155.1	413.2 ± 185.3	<i>P</i> = 0.002
Semen volume, ml	3.1 ± 1.6	2.7 ± 1.1	<i>P</i> = 0.01
Semen pH	7.4 ± 0.4	7.4 ± 0.2	NS
Sperm motility, %	39.4 ± 28.8	33.9 ± 20.4	<i>P</i> = 0.01
Sperm morphology, %	9.6 ± 3.7	3.6 ± 4.9	<i>P</i> = 0.001
Sperm/ejaculation, × 10 ⁶	47.8 ± 37.5	39.5 ± 49.6	<i>P</i> = 0.04
Sperm count, × 10 ⁶ /ml	134.5 ± 187.1	99.0 ± 138.1	<i>P</i> = 0.01

Data presented as mean ± SD.

NS, not statistically significant (*P* ≥ 0.05).

^aStudent's *t*-test.

The present study has several limitations, including its retrospective nature, the small sample size and the absence of a fertile control group. Nevertheless, this study provides valuable information regarding semen parameters in infertile Saudi Arabian men and confirms the negative influence of smoking on fertility.

In conclusion, 47% of men attending our infertility clinic had abnormal semen parameters. Furthermore, smoking and the presence of varicocele had negative effects on semen. Additional studies are required to

fully classify semen parameters in this population.

Declaration of conflicting interest

The author declares that there is no conflict of interest.

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References

1. Reproductive Health Outlook. *Infertility: overview/lessons learned*. Online (1997–2005). Available: <http://www.who.org> (Accessed 20th November 2011).
2. Inhorn MC. Global infertility and the globalization of new reproductive technologies: illustration from Egypt. *Soc Sci Med* 2003; 56: 1837–1851.
3. Khan K, Gupta JK and Mires G. *Core clinical cases in obstetrics and gynaecology: a problem-solving approach*. London: Hodder Arnold, 2005, p.152.z.
4. World Health Organization. *WHO laboratory manual for the examination and processing of human semen*, 5th ed. Geneva: World Health Organization, 2010 <http://www.who.int/reproductivehealth/publications/infertility/9789241547789/en/>
5. Guzik DS, Overstreet JW, Factor-Litvak P, et al. Sperm morphology, motility, and concentration in fertile and infertile men. *N Engl J Med* 2001; 345: 1388–1393.
6. Zinaman MJ, Brown CC, Selevan SG, et al. Semen quality and human fertility: a prospective study with healthy couples. *J Androl* 2000; 21: 145–153.
7. Menkveld R, Wong WY, Lombard CJ, et al. Semen parameters, including WHO and strict criteria morphology, in a fertile and subfertile population: an effort towards standardization of in-vivo thresholds. *Hum Reprod* 2001; 16: 1165–1171.
8. AlEnezi H, Isa AM, Abu-Rafea B, et al. Pattern of semen fluid abnormalities in male partners of infertile couples in Riyadh, Saudi Arabia. *Can J Urol* 2014; 21: 7322–7325.
9. Abdullah L and Bondagji N. Histopathological patterns of testicular biopsy in male infertility: a retrospective study from a tertiary care center in the western part of Saudi Arabia. *Urol Ann* 2011; 3: 19–23.
10. Al-Rayess MM and Al-Rikabi AC. Morphologic patterns of male infertility in Saudi patients. *Neurosciences(Riyadh)* 2000; 5: 170–173.
11. Leke RJ, Oduma JA, Bassol-Mayagoitia S, et al. Regional and geographical variations in infertility: effects of environmental, cultural, and socioeconomic factors. *Environ Health Perspect* 1993; 101(Suppl 2): 73–78.
12. Jamal A, Abo Melha MS, El and Otaibi K. Male Infertility: 155 consecutive case. *Ann Saudi Med* 1990; 10: 45–50.
13. Thonneau P, Marchand S, Tallec A, et al. Incidence and main causes of infertility in a resident population (1 850 000) of three French regions (1988–1989). *Hum Reprod* 1991; 6: 811–816.
14. Ombelet W, Bosnians E, Janssen M, et al. Semen parameters in a fertile versus subfertile population: a need for change in the interpretation of semen testing. *Hum Reprod* 1997; 12: 987–993.
15. Gowri V, Venkiteswaran KP, Al-Zakwani I, et al. Comparison of the demographics, semen parameters and hormone profiles in men with primary and secondary infertility. *Sultan Qaboos Univ Med J* 2010; 10: 350–353.
16. Ozgur K, Isikoglu M, Seleker M, et al. Semen quality of smoking and non-smoking men in infertile couples in a Turkish population. *Arch Gynecol Obstet* 2005; 271: 109–112.
17. Guo H, Zhang HG, Xue BG, et al. Effects of cigarette, alcohol consumption and sauna on sperm morphology. *Zhonghua Nan Ke Xue* 2006; 12: 215–217221. [in Chinese, English Abstract].
18. Pasqualotto FF, Sobreiro BP, Hallak J, et al. Cigarette smoking is related to a decrease in semen volume in a population of fertile men. *BJU Int* 2006; 97: 324–326.
19. Ramlau-Hansen CH, Thulstrup AM, Storgaard L, et al. Is prenatal exposure to tobacco smoking a cause of poor semen quality? A follow-up study. *Am J Epidemiol* 2007; 165: 1372–1379.
20. Vine MF. Smoking and male reproduction: a review. *Int J Androl* 1996; 19: 323–337.
21. Redmon JB, Carey P and Pryor JL. Varicocele—the most common cause of male factor infertility? *Hum Reprod Update* 2002; 8: 53–58.
22. Al-Turki HA. Effect of smoking on reproductive hormones and semen parameters of

- infertile Saudi Arabians. *Urol Ann* 2015; 7: 63–66.
23. Meri ZB, Irshid IB, Migdadi M, et al. Does cigarette smoking affect seminal fluid parameters? A comparative study. *Oman Med J* 2013; 28: 12–15.
24. Pryor JL and Howards SS. Varicocele. *Urol Clin North Am* 1987; 14: 499–513.
25. The influence of varicocele on parameters of fertility in a large group of men presenting to infertility clinics World health Organisation. *Fertil Steril* 1992; 57: 1289–1293.
26. Xue J, Yang J, Yan J, et al. Abnormalities of the testes and semen parameters in clinical varicocele. *Nan Fang Yi Ke Da Xue Xue Bao* 2012; 32: 439–442.