

Research Article

Semen Parameter Profile of Infertile Men Visiting Andro-Urology Clinic

Ponco Birowo

Department of Urology, Faculty of Medicine, Universitas Indonesia –
Dr. Cipto Mangunkusumo National Hospital, Jakarta, Indonesia

Corresponding Author: ponco.birowo@gmail.com
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Abstract

Infertility is the inability of a sexually active, non-contracepting couple to achieve spontaneous pregnancy in one year. Male infertility is found in about 7% of couples globally and one of the factors associated with it is impaired semen parameter. This study aimed to understand the semen parameter profile of infertile male patients in andro-urology clinics. This is a retrospective-descriptive study from medical records of patients in Dr. Cipto Mangunkusumo Hospital from 2010 to 2020. About 1656 infertile males went to the clinic and 81 (4.9%) were found to have normal semen parameter, 879 (53%) had azoospermia, and 777 (46%) have at least one impaired parameter (sperm concentration, motility, and morphology). The mean spermatozoa concentration was 16.74 ± 29.17 mil/ml, total motility rate was 27.87 ± 24.3 %, and normal morphology was 13.19 ± 19.50 %. In conclusion, most of the patients came to the clinic with azoospermia, and the percentage was above other studies. Therefore, further research is needed to ascertain the reason for the high percentage of azoospermia patients.

Keyword: semen parameter, spermatozoa, male infertility, andro-urology clinic.

Profil Parameter Semen pada Laki-laki Infertil yang Berkunjung ke Klinik Andro-Urologi

Abstrak

Infertilitas laki-laki merupakan masalah pada 7 % pasangan yang menikah dan melakukan sanggama secara teratur tanpa alat kontrasepsi selama lebih dari satu tahun, namun belum memiliki keturunan. Salah satu penyebab infertilitas laki-laki adalah gangguan pada parameter semen. Penelitian ini bertujuan untuk mengetahui profil parameter semen pada laki-laki infertil yang berkunjung ke klinik andro-urologi. Penelitian retrospektif dan deskriptif ini menggunakan data rekam medis pasien infertilitas laki-laki yang mengunjungi klinik andro-urologi Rumah Sakit dr. Cipto Mangunkusumo (RSCM) tahun 2010 hingga 2020 dan terdapat 1656 pasien infertilitas laki-laki. Sebanyak 81 (4,9%) pasien memiliki parameter semen normal, azoospermia 879 (53%) dan 777(46%) dengan gangguan pada salah satu atau lebih parameter semen (jumlah, gerakan, bentuk spermatozoa). Rerata konsentrasi spermatozoa $16,74 \pm 29,17$ juta/ml; Rerata motilitas spermatozoa $27,87 \pm 24,3\%$ dan rerata morfologi normal $13,19 \pm 19,50\%$. Disimpulkan sebagian besar pasien infertilitas laki-laki yang datang ke klinik andro-urologi RSCM dalam keadaan azoospermia. Pasien infertilitas laki-laki dengan azoospermia jauh lebih tinggi dibandingkan dengan kepustakaan sehingga diperlukan penelitian lebih lanjut untuk mencari penyebab tingginya angka azoospermia.

Kata kunci: parameter semen, spermatozoa, infertilitas laki-laki, klinik andro-urologi.

Introduction

Sperm quality, which is determined by semen parameter, has an important role in pregnancy programs. Infertility is described as the inability of a sexually active, non-contracepting couple to achieve spontaneous pregnancy in one year.¹ These couples are recommended to undergo some tests to determine the cause of their infertility. Therefore, semen parameter is one of the crucial tests to analyze the quality of spermatozoa. This parameter has been shown to be declining over the past few years.² A study in India on 3729 males showed a declining trend in their semen quality³ and in Indonesia (2011) 41.4% of infertile men are azoospermic, while EAU guidelines reported only 10%.^{4,5} Thus, it is necessary to conduct a study to understand the semen parameter profile of infertile male patients. This information will help physicians know what to improve regarding clinic facilities because different facilities are needed for treating azoospermia or oligoasthenoteratozoospermia patients.

Methods

This is a retrospective-descriptive study from medical records of infertile male patients in dr. Cipto Mangunkusumo Hospital from 2010 to 2020. The data collected from medical records include patients and their partner's age, years of marriage, type of infertility (primary/secondary), semen parameter, DNA fragmentation index (DFI), and semen culture test. Patients with primary fertility are those who are married for at least a year, with frequent sexual activity but without pregnancy.⁵ Meanwhile, secondary are those who have had at least one child, but unable to achieve further pregnancy.⁵ Azoospermia is when spermatozoa is absent in semen, oligozoospermia is when it is <15 mil/ml, asthenozoospermia is when <32% has progressive motility, and teratozoospermia is when <4% are normal.⁵ There are differences in progressive motility reported from data in this study depending on the laboratory policy. Some laboratories categorized sperm motility into three (progressive, non-progressive, and immotile), while others into four (rapid or linear progressive, slow or non-linear progressive, non-progressive, and immotile). This is a retrospective study and it does not disclose patients' identity therefore, an ethics approval is not required.

Results

There were 1656 infertile-male patients from 2010 to 2020. Most of them are within the range

of 29-40 years; more primary infertilities 1401 (84.6%) compared to secondary 125 (7.5%). The demographic data of infertile-male patients are presented in Table 1.

Table 1. Characteristic of Infertile-Male Patients in Andro-Urology Clinic

Characteristic	Male	Female Partners
	Mean 36.42 ± 7.24 SD	Mean 32.10 ± 5.01 SD
Age (years)		
< 25	8 (0.5%)	27 (3.8%)
25-30	356 (21.5%)	277 (39.2%)
31-35	521 (31.5%)	226 (32%)
36-40	410 (24.8%)	140 (19.8%)
41-45	213 (12.9%)	36 (5.1%)
46-50	99 (6%)	0
51-55	28 (1.7%)	0
56-60	13(0.8%)	0
> 60	8 (0.5%)	0
Total	1656 (100%)	706 (100%)
Marriage (years)	Mean 5.37 ± 4.17 SD	
< 1	188 (11.4%)	
1.1-2	263 (15.9%)	
2.1-3	188 (11.4%)	
3.1-4	157 (9.5%)	
4.1-5	163 (9.8%)	
5.1-6	96 (5.8%)	
6.1-7	91 (5.5%)	
7.1-8	72 (4.3%)	
8.1-9	66 (4%)	
9.1-10	92 (5.6%)	
> 10	175 (10.6%)	
N/A	105 (6.3%)	
Total	1656 (100%)	
Type of infertility	n (%)	
Primary	1401 (84.6%)	
Secondary	125 (7.5%)	
N/A	130 (7.9%)	
Total	1656 (100%)	

The most common parameter impairment found in this study is azoospermia (879 patients/53%), higher than non-azoospermia impairment (777 patients / 47%) such as oligozoospermia, asthenozoospermia, teratozoospermia, or a combination of two tested parameters. The mean spermatozoa concentration

was 16.74 ± 29.17 mil/ml, with a median of 5.1, and inter quartile range (IQR) of 0.7 – 19. The mean normal

morphology percentage was $13.19 \pm 19.5\%$ (Table 2). Two components of motility are shown in Table

Table 2. Concentration and Morphology of Spermatozoa in Non-Azoospermia Patient (n=777)

Age (years)	Concentration			Morphology		
	Mean \pm SD 10 ⁶ /ml	Median	IQR	Mean \pm SD (%)	Median	IQR
< 25	14.6 \pm 10.11	9.3	8.2 – 25	44 \pm 28.53	29	22 – 67
25-30	18.44 \pm 25.39	7.35	1.2 – 27	15.93 \pm 21.87	4	0 – 25
31-35	17.66 \pm 29.92	5.8	0.82 – 20.2	12.5 \pm 18.92	4	0 – 17.9
36-40	15.22 \pm 30.84	4.8	0.7 – 15.17	12.71 \pm 17.44	5	0 - 20
41-45	15.16 \pm 32.7	2.55	0.34 – 10.85	9.49 \pm 17.98	2	0 - 13
46-50	16.73 \pm 23.25	4.9	0.8 – 27.35	13.84 \pm 20.28	7	0 - 20
51-55	17.64 \pm 41.08	0.1	0.1 – 6.7	10.04 \pm 15.8	1	0 – 18.6
56-60	4.65 \pm 6.88	0.55	0.01 – 11.6	14.2 \pm 28	0	0 – 15.2
> 60	0.35 \pm 0.21	0.35	0.2 – 0.5	7.5 \pm 3.53	7.5	5 - 10
Total	16.74 \pm 29.17	5.1	0.7 – 19	13.19 \pm 19.5	4	0 – 19.9

IQR: inter quartile range

3. The mean total motility was $38.33 \pm 23.14\%$, whereas the mean forward-progressive was 24.35

$\pm 20.58\%$. Total and forward-progressive shown in mean, median and IQR.

Table 3. Motility of Spermatozoa in Semen Parameter Based on Age

Age (years)	Total Motility (n=777)			Forward-Progressive Motility (n=115)			
	Mean \pm SD (%)	Median	IQR	Mean \pm SD (%)	Median	IQR	n (%)
< 25	18.60 \pm 9.45	23	10-25	-	-	-	
25-30	32.54 \pm 26.51	30	6.5 – 51	24.76 \pm 22.02	27	0 - 45	26
31-35	28.76 \pm 23.67	28	4 – 47.5	22.05 \pm 19.83	19	2 – 28	38
36-40	27.66 \pm 24.12	28	2 – 44	19.04 \pm 20.95	14	0 – 33.5	24
41-45	23.11 \pm 22.68	17.2	0 – 42	18.52 \pm 19	13	9 – 22	17
46-50	24.92 \pm 23.04	20	0 – 40	19.75 \pm 18.1	19.5	1 – 26.5	12
51-55	14.01 \pm 17.14	3	0 – 30	8.40 \pm 18.1	0	0 – 0	10
56-60	7.16 \pm 11.37	0.5	0 – 15	N/A	N/A	N/A	3
> 60	25.00 \pm 35.35	25	0 – 50	N/A	N/A	N/A	2
Total	27.87 \pm 24.31	25	2 – 45.9	24.35 \pm 20.58	16	0 – 29.5	132

The mean DFI recorded was $39.24 \pm 19.64\%$. Patients tested for semen culture were 99, with 60 (60.6%) being infection positive. The culture was indicated in those suspected to be infected. The

DFI parameter was analyzed in mean, median, and inter quartile range (IQR). Semen culture parameter was analyzed in positive, negative, or not tested percentage (Table 4).

Table 4. DNA Fragmentation Index and Semen Culture Parameters Based on Age

Age (years)	DFI (n=204)			Semen Culture (n=99)		
	Mean \pm SD (%)	Median	IQR	Positive	Negative	Not Tested
< 25	-	-	-	0 (0%)	0 (0%)	5 (100%)
25-30	33.02 \pm 16.34	28	19 – 28	18 (10.3%)	7 (4%)	150 (85.7%)
31-35	36.43 \pm 20.74	30	21 – 47.5	15 (6%)	12 (4.8%)	221 (89.1%)
36-40	39.39 \pm 18.58	35.5	25 – 50	7 (3.9%)	6 (3.3%)	168 (92.8%)
41-45	33.55 \pm 14.38	32.5	25 – 42	8 (8.5%)	5 (5.3%)	81 (86.2)
46-50	54.53 \pm 23.2	56.5	36 – 76	4 (8.2%)	1 (2%)	44 (89.8%)
51-55	42.33 \pm 19.08	35	31.5 – 49.5	1 (5.9%)	0 (0%)	16 (94.1%)
56-60	N/A	N/A	N/A	1 (16.7%)	0 (0%)	5 (83.3%)
> 60	N/A	N/A	N/A	0 (0%)	0 (0%)	2 (100%)
Total	39.24 \pm 19.64	32	24 – 48	54 (6.9%)	31 (4%)	692 (89.1%)

Discussion

Most infertile male patients in the andro-urology clinic have azoospermia (53%). This result is similar to previous studies in Indonesia (2011), but different from EAU guidelines (2018) that reported only 10% male with azoospermia globally and only 9% in France.⁵ This may result from 2 factors: (1) Non-azoospermia infertile male patients are reluctant to seek medical attention because of high treatment costs.⁶ For example, those with varicocele would need surgery, or those with hypogonadism-hypogonadotropin would need hormonal therapies, which are considerably expensive.⁶ (2) Non-azoospermia patients have another option, which is *in-vitro fertilization* (IVF). Therefore, therapies such as varicocele repair surgery and hormonal intervention are beneficial to patients. It is known that this surgery can increase the concentration of spermatozoa. A meta-analysis by Agarwal et al⁷ showed an increase in concentration up to 9.71 mil/ml after surgery (95% CI 7.34 to 12.08, $p < 0.00001$). Furthermore, there were increases in total motility 9.92% (95% CI 4.9 to 14.95, $p = 0.0001$), normal morphology from 0.72% to 5.6% (95% CI, $p = 0.01$) and ultimately an increase in pregnancy probability after the surgery (varicolectomy). FSH-LH treatment in hypogonadotropine-hypogonadism helps to improve semen parameter.⁸ Nevertheless, it is important to note that spermatogenesis takes at least 3 months. Therefore, these increases can only be seen 3 months after the surgery or therapies.⁸ Other implications from the high percentage of azoospermia patients is the need to recruit competent doctors and improve hospital facilities, to accommodate various surgical procedures. Most patients with this condition are treated by testicular

or epididymal sperm retrieval, followed by IVF. This can be done through various procedures such as percutaneous epididymal sperm aspiration (PESA), which has 80-100% chance of success, testicular sperm extraction (TESE) with a 100% chance under ideal conditions, and testicular fine needle aspiration with 100% in non-obstructive patients.⁹ One of the most recent procedures for sperm retrieval is the micro TESE with a 60% increase in chance of success compared to conventional TESE with 20-45%.¹⁰ One other recent procedure is from Dr Turek, USA, which involves a mapping biopsy of the testis before retrieval; this is called the Turek method¹¹ which can increase the chance of successful sperm retrieval by 95% compared to 40-60% without biopsy.¹²

Mean DFI of 39.24 \pm 19.64 SD (%) is a crucial information in treating male infertility. As high as 8% of infertile males have normal concentration, motility, and morphology, but with a high DFI.¹³ For this group, treating the aetiology can result to a higher chance of pregnancy. It is known that a high DFI is a result of varicocele, or infections, thus varicolectomy or antibiotics therapy are used to lower DFI.

The low percentage of patients tested for sperm culture (10.1%) is due to several factors: (1) only few patients are determined by the leukocyte value from semen parameter, (2) there is limited facility, thus culture test is not included in routine analysis, (3) EAU Guideline stated that there are no specific data showing the negative effects of infection on the success of infertility treatment.⁵ This needs further study to ascertain the relationship between infection and success of infertility treatment.

The limitation of this study is that data were collected from only one andro-urology center,

thus, further study is needed to compare semen parameter profile in andrology laboratory and andro-urology clinics.

Conclusions

Most infertile male patients in andro-urology clinic have azoospermia, therefore, further study is needed to ascertain the reason for high azoospermia percentage in Indonesia than in other countries. The physicians dealing with male infertility need more facilities to optimally treat this condition.

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