Study of semen quality by SQA (QwikCheck Gold)

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Abstract

Introduction: Infertility is defined as failure of a couple to conceive after twelve months of regular intercourse without the use of contraception in women <35 years of age and after 6 months of regular intercourse without the use of contraception in women ≥35 years. According to WHO statistics primary infertility rate in India varies between 3.9%-16.8%. The "male factor infertility is defined as an alteration in sperm concentration and/or motility and/or morphology in at least one of the two semen samples analyzed and collected one and four weeks apart. According to WHO statistics primary infertility rate in India varies between 3.9%-16.8%. It is mainly due to deficiency in semen quality.

Objective: The present study was undertaken to evaluate the semen quality of men coming to our diagnostic clinic for semen analysis by sperm quality analyzer SQA (QwikCheck Gold).

Materials and Methods: A total of 200 fresh semen samples from infertile men coming to our diagnostic center between July to September 2017 were included in the study. Each ejaculate was analyzed on SQA (QwikCheck Gold) (medical electronic system) by strictly following manufacturer instructions.

Results: Azoospermia was observed in 6.5% of men. 79.5% men had optimum sperm concentration of >15 million/ml.34% men had less than 4% normal morphology of sperms. 39.5% patients had >40% motility. Teratospermia was observed in 60.5%patients. Poor sperm motility (asthenospemia) was observed in 61.5% patients

Conclusion: Semen analysis remains the main fool for evaluating male infertility. SQA (QwikCheck Gold) is a unique, compact desktop instrument which is rapid, runs on low cost, is easy to use and provides standardized quantitation of semen parameters. It can be used as a screening tool for semen quality determination and management of male infertility.

Keywords: Semen, SQA (QwikCheck Gold), Azoospermia, Teratospermia.

Introduction

Infertility is defined as failure of a couple to conceive after twelve months of regular intercourse without the use of contraception in women <35 years of age and after 6 months of regular intercourse without the use of contraception in women ≥35 years.[1] It impacts the couple with psychological stress, economic burden and medical complications. WHO international committee for monitoring assisted reproductive techniques defines infertility as a disease of reproductive system due to failure to achieve clinical pregnancy after 12 months of regular unprotected intercourse.[2]

It is estimated that nearly 72.4 million couples experience fertility related issues globally and WHO estimates that 60-80 million couples currently face fertility issues.[3,4] It affects nearly 8-12% of the couples globally.[5,6]

According to WHO statistics primary infertility rate in India varies between 3.9%-16.8%.[4] There is a wide variation in incidence of infertility state wise with 3.7% incidence in Uttar Pradesh, Himachal Pradesh and Maharashtra to 5% in Andhra Pradesh and is as high as 15% in Kashmir.[7-9] It is reported that 40% of infertility cases are related to male counterparts, 40% to female and 20% is found in both sexes[10] In India male factor infertility has been estimated to be present in about 23% cases.[9] A recent study states male disorders and abnormalities to be present in nearly 50% patients while 25% cases had unexplained infertility.[11] The "male factor infertility is defined as an alteration in sperm concentration and/or motility and/or morphology in at least one of the two semen samples analyzed and collected one and four weeks apart.[12] It is mainly due to deficiency in semen quality.[13]

Traditionally semen analysis has been the mainstay in diagnosis of male infertility. WHO has set certain guidelines for assessment of sperm quality and recently WHO 5th guideline has led to certain amount of standardization in reporting of semen parameters. Methods of semen analysis are isubjected to interobserver and inter laboratory variation and these parameters do not always corelate with the fertility potential.[14] All these factors have led to an absolute need for standardization of semen analysis which has resulted in development of several semi computerized and fully computerized semen analysers.[15] The present study was undertaken to evaluate SQA (QwikCheck Gold) and assess the semen quality of men coming to our diagnostic clinic for semen analysis by sperm quality analyzer SQA (QwikCheck Gold) which is a compact instrument combining optical detection with an internal computer.

Materials and Methods

A total of 200 fresh semen samples from infertile men coming to our diagnostic center between July to September 2017 were included in the study. All the samples were collected in a quiet room under full privacy by masturbation. Each ejaculate was analyzed on SQA (QwikCheck Gold) (medical electronic system) by strictly following manufacturer instructions. The morphology was evaluated by air dried diff-quick stained smears. A 0.6ml of semen sample was aspirated into the capillary and inserted in electro optical chamber of the instrument. All semen was removed from the exterior of the capillary by cotton before inserting into the chamber to prevent its spillage in the SQA (QwikCheck Gold) chamber. SQA digitally displays the total sperm concentration, percentage of motile sperms, percentage of normal morphology and average sperm velocity of the progressively motile sperms. The assessment of semen quality was based on WHO 5th criteria for optimum fertility which includes,

1. Volume-1.5ml (1.4–1.7 ml)
2. Sperm concentration-15 millions/ml (12 – 16 millions/ml)
3. Total sperm number-39 millions/ejaculate (33-46)
4. Progressive motile sperms - 32% (31 – 34%)
5. Total motility-40% (38–42%)
6. Live sperms-58% (55 – 63%)
7. Normal morphology - 4% threshold for normal morphology (3 – 4 %)
8. pH- ≥7.2
9. Leucocytes- <1.0

Sperm analysis including sperm concentration, total sperm number, percentage of progressive motility (PR), percentage of non-progressive motility (NP), total motility (PR+NP), motile sperm concentration (MSC), progressively motile sperm concentration (PMSC) & normal morphology (WHO 5th manual criteria of 4% threshold) was performed on SQA (QwikCheck Gold)

Untreated semen samples with volume >2.5ml and collected by masturbation in the laboratory after 2-7 days of sexual abstinence and brought within 15 minutes of collection were included in the study. After complete liquification within 30-45 minutes at room temperature, viscosity, WBCs and pH were noted and the volume of the ejaculate was measured.

The men were divided into 20-30, 31-40, 41-50, and >50 years of age group.

Results

A total of 200 semen samples were analyzed out of these maximum 59.5% (119/200) were in the age group of 20-30 years, 38% (76/200) in 31-40 years, 2% (4/200) in 41-50 years and only one patient above 50 years of age. Azoospermia was observed in 12(6%) patients in 20-30 years of age group and in 1 (0.5%) patients in 31-40 years of age group. Sperm concentration ≥90 million/ml was maximum in 20-30years age group in 33 (16.5%) patients followed by 31 patients (15.5%) in 31-40 years age group. (Table 1)

Out of 200 patients 159 (79.5%) patients had sperm concentration ≥15 million /ml and 41 (20.5%) had less than 15 million/ml sperm concentration.

65 (32.5%) patients had a sperm count of >9 million/ml followed by 29 (14.5%) between 31-50 million/ml and, 21 (10.5%) in range of 71-90 million/ml and 19 (9.5%) in 51-70 millions/ml range. 13 patients (6.5%) had azoospermia while 28 (14%) had sperm count between 2-15 million/ml. (Table 2).

According to WHO 5th criteria total motility of 40% with 95% confidence interval in the range of 38-42 is considered optimal for fertility with progressive motility of 32 %(range 31-34) In this study we observed that 79 (39.5%) patients had total motility >40%.(Table 3). Morphology of < 4% was observed in 68 patients (34%) while 66% patients were above the threshold of >4% morphology according to WHO 5th criteria. 28% patients had morphology between 4-10 %. 31.5% between 11-20%, 4% between 21-30% and 2.5%between 31-40 %(table 4)

67 patients (33.5%) had functional sperms between 0-0.9, followed by >9 in 57 (28.5%)patients, 28 (14%)patients between 1.0-3.0, 22(11%) between 5.1-7.1, 14(7%) patients between 7.0-9.0 and 12(6%) patients between 3.1- 5.0.(table 5) Average sperm velocity between 10-15 was observed in 88(44%) patients followed by 25.5% in 6-10 range and 19.5% (39) patient had zero average sperm velocity. (Table 6)

Sperm motility index (SMI) of ≥150 was observed in 36% patients, and was zero in 18.5% patients. (Table 7)

Table 1: Showing demographic data of patients

Age	Total	Percentage
20 to 30	119	59.5
31 to 40	76	38
41 to 50	4	2
>50	1	0.5
Total	200	

Table 2: Showing sperm concentration in different age groups

Concentration	20 to 30	31 to 40	41 to 50	Total	Percentage
0	12	1	0	13	6.5
2 to 15	19	9	0	28	14
16 to 30	14	8	3	25	12.5

31 to 50	19	10	0	29	14.5
51 to 70	13	6	0	19	9.5
71 to 90	14	7	0	21	10.5
>90	33	31	1	65	32.5
Total	124	72	4		

Table 3: Showing distribution of morphology

Morphology	Total	Percentage
<4	68	34
4 to 10	56	28
11 to 20	63	31.5
21 to 30	8	4
31 to 40	5	2.5
41 to 50	0	0
>50	0	0
Total	200	

Table 4: Showing distribution of functional sperms

Functional Sperm	Total	Percentage
0 to 0.9	67	33.5
1.0 to 3.0	28	14
3.1 to 5.0	12	6
5.1 to 7.0	22	11
7.0 to 9.0	14	7
>9.0	57	28.5
Total	200	

Table 5: Showing motility

Motility	Progressive	Non progressive
2 to 10	54	120
11 to 20	18	76
21 to 30	14	4
31 to 40	35	0
41 to 50	4	0
>50	31	0
Total	200	200

Table 6: Showing velocity

Velocity	Total	Percentage
0	39	19.5
1 to 5	12	6
6 to 10	51	25.5
11 to 15	88	44
16 to 20	10	5
>20	0	0
Total	200	

Table 7: Showing sperm motility index

SMI	Total
0	37
1 to 30	31
31 to 60	16
61 to 90	14
91 to 120	11
121 to 150	19
>150	72
Total	200

Discussion

Although there is no strong relationship between sperm quality assessment and predicting male infertility and conception, still semen analysis remains the first line of diagnostic tool to determine the contribution of male factors in infertile couples. Manual semen analysis which includes sperm concentration, motility and morphology lacks standardization and repeatability and has great inter observer and interlaboratory variability.[16] To standardize the semen analysis reports, WHO came up with its 5th edition of semen analysis criteria.[17]

SQA-V is a self testing and self calibrating instrument and passes the self test before analyzing samples. It is simple and inexpensive device and provides a quantitative estimation of motility & morphology of sperm according to WHO 5th criteria. In SQA (QwikCheck Gold) light passes through a small volume of semen introduced into the SQA (QwikCheck Gold) chamber and the variation in the optical density resulting from moving sperm particles are then detected by the analyzer. The fluctuations in the samples are recorded by the photometric cell and the electronic signals generated by the cell are converted into a digital signal to provide a numeric output and thus different sperm parameters are analysed.[18]

In our study the maximum infertile men were between 20-30 years of age (59.5%) followed by 38% in 31-40 years of age group. Azoospermia was observed in 6.5% of men. 79.5% men had optimum sperm concentration of >15 million/ml.34% men had less than 4% normal morphology of sperms. 39.5% patients had >40% motility. Teratospermia was observed in 60.5%patients. Poor sperm motility (asthenospemia) was observed in 61.5% patients. According to study conducted in South India, it was observed that sperm count declined by about 30.31% while sperm motility and morphology were reduced by 22.92% and 51.25% respectively.[19] They concluded that the increase in the incidence of sperm morphology abnormalities and low sperm count indicates the qualitative impairment of spermatogenesis and Sertoli cells.[20]A study conducted by AIIMS reported an average sperm count of 20 million/ml.[21] Sengupta et al concluded that 40% men in the reproductive age group have poor quality and quantity of semen.[22]

A study was carried out in Calcutta between 1981-85 and 2000-2006 and they observed a significant decline in sperm motility and volume in the later study.[23] The exact reason for the decline in semen quality in the recent years is still unclear but several environmental, nutritional, socio economic and lifestyle factors are the major contributing factor. Use of tight clothes, laptops, heat generated from electronic devices and fast food, all play a role in determining semen quality. It is estimated that a 1% elevation in testicular temperature causes 14% decline in spermatogenesis.[24]

Conclusion

Semen analysis remains the main fool for evaluating male infertility. SQA (QwikCheck Gold) is a unique, compact desktop instrument which is rapid, runs on low cost, is easy to use and provides standardized quantitation of semen parameters. It can be used as a screening tool for semen quality determination and management of male infertility.

Conflict of Interest: none

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