MINIMAL NORMAL STANDARDS FOR SEMINAL PARAMETERS IN RELATION TO FERTILITY

by

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Semen analysis is the most important single factor in the evaluation of male fertility potential. As a basic investigation, seminal study rightly influences the course of further fertility work-up to be followed in infertile couples. However, it is difficult and at times impractical to define a 'fertile man' and a 'fertile semen', since capacity to produce offspring is defined as the sum total of the fertility potential of the two partners.

In 1951, MacLeod and Gold suggested that men with sperm counts above 20 million/ml or total sperm counts above 100 million/ejaculate should be considered fertile. Similarly, Amelar and Dubin (1977) have placed the minimal normal value for sperm count around 40 million/ml or a total of 125 million/ejaculate. Rehan *et al* (1975) considered that true oligospermia is represented by counts of under 20 million/ml and that there is a corresponding decrease in the likelihood of conception when sperm counts decrease below 20 million, and when the sperm count is less than 10 million/ml it is unlikely, but not impossible, that pregnancy will occur.

Despite these reports, many investigators have noted conceptions in women whose husbands' sperm counts were consistently below 20 million/ml (Van Zyl *et al* 1975 and Smith *et al* 1977). In 1974 Nelson and Buge remarked that the standards of fertility laid down by MacLeod and Gold were too high and suggested that some unknown factor has adversely affected the fertility of the male population. Yet another report by Zukerman and co-workers (1977) suggests that, unless other parameters are found to be abnormal, sperm counts and total sperm counts above 10 million/ml and 25 million/ejaculate, respectively, probably are not major factors in a couple's fertility. However, all these authors stress the importance of sperm motility, and uniformly agree that more important than the sperm count itself is the activity or motility of the sperm cells.

The present report summarizes the results of sperm counts and other seminal paramesters of 194 husbands of infertile couples who achieved conceptions following investigation and treatment of infertility. During the past 5 years semen analyses have been performed on the male partners of the 1618 infertile couples investigated by the author. The seminal study was conducted under standard conditions:

Semen Analysis: Semen samples were collected after a standard period of abstinence of 2 to 5 days (usually 3 days), and the method of collection advocated was masturbation. After allowing for liquifaction, and within 1 to 2 hours of collection, a preliminary examination was done on a drop of semen placed on a slide and covered with a cover glass. Sperm

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motility, density, presence of aggregates and percentage of oval forms were determined. Sperm motility was evaluated with regard to percentage of motile sperms and the type of motility exhibited by the sperm cells (motility grading described by Amelar *et al* 1973). After the fresh smear study, sperm density was determined by sperm count performed in the red blood cell field of the standard Neubauer counting chamber. If the study showed subnormal semen values, semen analysis was repeated at least 3 times before confirming the results.

Evaluation of the Female Partner: Investigation of the female partner included tests for ovulation (endometrial biopsy in the premenstrual phase, and B.B.T.), determination of tubal patency (by hysterosalpingography) and sperm survival by post-coital test in the ovulatory phase. These investigations were conducted inspite of a subfertile semen report.

Results

Following the preliminary evaluations of both members of the couple the need for further detailed investigation and treatment was determined. If the sperm count was 20 million/ml or more with good progressive motility of sperm cells, and the female investigations revealed no explainable cause for infertility, time was given for spontaneous conception to occur, or ovulation regulation with clomiphene citrate (Fertyl) was tried. If a definite cause was detected in either partners appropriate treatment was instituted, such as varicocelectomy and HCG therapy or clomiphene (Fertyl) therapy for subfertile males, and ovulation induction, tubal corrective surgeries and myomectomies in subfertile females. Among these different groups of patients, 194 couples had reported conception either spontaneously or following some form of treatment regimen of the male or the female partners (Table I). The seminal parameters

TABLE I

Conception Following Infertility Evaluation and Therapeutic Measures

	Method of treatment	No. of couple achieving conception	Percentage
1.	Spontaneous conception following infertility evaluation—without any recognised treatment	99	51.00
2.	Ovulation regulation with clomiphene citrate (Fertyl) for the female partners in couples with no explainable cause for infertility	25	12.90
3.	Anovulatory infertility—treated with clomiphene citrate (Fertyl)	22	11.30
4.	Varicocelectomy—in Oligospermic men with varicocele	19	9.80
5.	Pelvic surgeries in the female—Tuboplasty, myomectomy, wedge resection of ovaries	11	5.70
6.	Idiopathic oligospermic—treated with Human Chorionic Gonadotropin (HCG)	9	4.60
7.	Idiopathic oligospermic—treated with clomiphene citrate (Fertyl)	8	4.10
8.	Post Vasectomy—vasal recanalisation	1	0.60
	TOTAL	194	100.00

were studied repeatedly in this group who achieved conception (especially in those who were treated for oligospermia), and the results of semen analysis are summarized in this report.

Age of the male partners who impregnated their wives ranged from 24 to 45 years, with a mean of 30.77 years. The female partners who conceived were between 18 to 38 years of age, with an average of 25.52 years. These couples were married for 1 to 13 years, with a mean infertility duration of 3.28 years. Investigation-conception or treatment-conception interval in them ranged from 1 to 30 months with the majority achieving the results within one year (mean—5.96 months). The figures for the different treatment groups are given in Table II.

TABLE II

Particulars of the 194 Infertile Couple who were Treated Successfully

Different treatment groups	Mean Values			
	Age of male (year)	Age of female (year)	Infertility duration (year)	Investigation or treatment to pregnancy interval (months)
Spontaneous conception	30.00	25.47	2.65	4.25
Ovulation regulation	30.84	25.28	3.68	4.44
Induction of ovulation	30.60	26.14	3.89	9.36
Varicocelectomy	31.94	25.05	3.50	10.05
Female pelvic surgery	33.40	29.36	5.36	9.09
HCG for oligospermia	33.44	27.11	4.55	8.33
Fertyl for oligospermia	31.25	25.00	3.25	6.12
All the patients	30.77	25.52	3.28	5.96

Sperm Count: Sperm count of the 194 men ranged from 3.6 million to 280 million/ml, and the mean count was 42.25 million/ml. The sperm density was more than 60 million/ml in only 43 men (21.54%), but a major proportion of 69 men (34.80%) had a count ranging from 21 to 40 million/ml. The most impressive finding in this group of couples was the relatively high incidence of 30.35 per cent (56 men), oligospermic men with a sperm count of 20 million or less per ml. Among these oligospermic men, 20 (11.03%) had a sperm density of only 10 million or less per ml. Details of sperm density in the different treatment groups are given in Table III.

Speam Motility: While the majority of subjects had good sperm motility 19 men had (9.85%) had poor sperm motility of 40 per cent or less. Similarly, sperm motility grading was good (2 + and above) in 76.77 per cent of men, but the ramaining 23.23 per cent had poor motility index. (Table IV).

Discussion

The most impressive finding in our analysis of 194 couples is the relatively high percentage of pregnancies in women whose husbands could be considered subfertile. Whereas sperm count of 20 million/ml is considered the lower limit of

TABLE III
Sperm Count in Different Treatment Groups

Treatment groups	Range	Mean	1 to 10 million %	11 to 20 %	Above 20 %
Spontaneous conception	3.6 - 280[6]	42.34[6]	10.90	17.40	71.70
Ovulation regulation	4.6 - 140[6]	52.79[6]	4.20	8.40	87.40
Inducation of ovulation	8 - 112[6]	43.05	5.30	15.80	78.90
Varicocele correction	6 - 120[6]	40.16	16.70	33.30	50.00
Female pelvic surgery	5 - 123[6]	39.36	9.10	36.40	54.50
HCG for oligospermia	4 - 30[6]	32.87	25.00	25.00	50.00
Fertyl for oligospermia	6 - 98[6]	30.25	25.00	12.50	62.50
Total patients	3.6 - 280[6]	42.25	11.03	19.32	69.65

TABLE IV
Sperm Motility in the 194 Successful Men

Motility percentage				
upto 20 per cent	21 to 40 per cent	41 to 60 per cent	61 to 80	81-100
2.11%	7.74%	26.76%	40.14%	23.23%

Motility Index (Grading)					
I	I +	II	II +	III	III +
4.16%	11.90%	7.14%	45.83%	30.35%	0.59%

normal, 30.35 per cent of fertile men in our series had a count 20 million/ml or less, and 11.03 per cent had a sperm density of only 10 million/ml or less. The lowest count in our series at which conception has occurred is 3.6 million/ml, and atleast 8 men (4.41%) have achieved conception with a sperm density of less than 5 million/ml. Thus, the most important observation from this study is that even in the presence of severe limitations of seminal parameters conception does occur.

The fact that both poor sperm counts and poor motilities can be consistent with fertility indicates a need for caution in assessing the fertility potential of the male. Unless other parameters are found to be abnormal, a poor sperm count per se cannot be considered a major factor in a couple's infertility. In that respect, our study emphasizes the importance of considering infertility as a problem of a couple rather than as a specific disorder of one of the partners. Although it is common that one of the partners is the

larger contributor to the problem, the improvement of the fertility potential of either member of the couple may result in conception. Obviously, therapy for the subfertile male with low count is less rewarding when compared to treatment of ovulatory failures and other reproductive dysfunctions in the female, and hence attempt at improving the wives' fertility potential may be the procedure of choice.

MacLeod and Wang (1979) have recently reviewed all available data concerning the sperm counts of fertile and infertile men. They feel that since their earlier work in 1951, over the period of more than 25 years, the mean sperm count of fertile men seems to have decreased. It is also debatable whether there exists a threshold value for hypofertility. Similarly, Zukerman *et al* have published their data in 1977 to suggest that minimum standards of male fertility might have changed. Possibly the advances in the diagnosis and management of the female partners of the infertile couples have resulted in an increase of the fertility potential of the female population. Consequently, since fertility is a relative state that depends on the fertility potential of both partners, (Steinberger and Steinberger, 1972) an increase in the female fertility potential could explain the shift in the frequency distribution of sperm counts of allegedly fertile males, with more pregnancies resulting from men in the lower sperm count ranges.

The present study also substantiates such a possibility, since both members of the infertile couples were thoroughly investigated inspite of poor seminal parameters. This attitude of 'couple oriented' evaluation has resulted in conceptions in the 194 infertile couple, either following investigations, regulation of ovulation with clomiphene citrate (Fertyl) or with appropriate treatment of the defective partner. In all these groups it has been observed that more pregnancies have resulted from men in the lower sperm count ranges. Moreover, in the group where spontaneous conception has occurred following investigations, there were atleast 26 male partners who had a sperm density of less than 20 million/ml and hence could be considered subfertile. This data signifies the possibility of spontaneous cure of male infertility where conception occurs without any form of treatment. Such an entity of spontaneous cure of male infertility has also been described by Glass and Ericsson in 1979.

All the recent reports including ours evidence that fertility can be compatible with compromised semen characteristics, and raise doubts concerning the existence of a threshould value for hypofertility. It is also well known that semen quality can show wide variations and can improve without treatment. From these recent observations it appears rational to investigate the female extensively provided the male partner has atleast few sperms which are actively motile. Moreover, if abnormalities are found in the female, no matter how slight, no diagnostic or therapeutic procedure should be initiated in the male until all has been done to improve female fertility.

Conclusion

After studying the seminal characteristics of 194 infertile couples who achieved conceptions following various therapeutic measures or spontaneously after the investigations, it is observed that we can not lay down the minimum standards for