THE MALE FACTOR IN HUMAN STERILITY

BY

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Only in the last few years the fertility of the husband has been given much consideration in the study and treatment of infertile couples. This shift in emphasis to male factor is due to the increasing knowledge of the physiology of human semen.

Fertilization of an egg by a sperm still remains one of the greatest wonders of Nature, in which microscopically small fragments of animal life are driven by cosmic force towards their appointed end and bring about the growth of a living being. Still research has a very great scope for the study of fertilization.

It is strange to notice that sterility is more common in intelligent and ambitious type of people; one out of ten married couples seek advice for this problem at some time or other.

Mazer and Israel have observed that in 40% of the sterile unions, the male partner is partially or wholly at fault.

Farris found the male to be partially or wholly responsible in 60% of sterile couples.

For practical purposes, easy and accurate method of studying the potential degree of fertility of the male is by semen examination and post-coital test. Findings of normal semen indicate normal spermatogenesis, and presence of active spermatozoa in cervical canal following coitus (Huhner's test table No. IX) denotes proper deposition of semen. Thereby husband is relieved of any responsibility of barren marriage in question.

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Sperm production

Ejaculated semen consists of sperms suspended in seminal plasma, formed of secretion from the accessary organs of reproduction and provides the vehicle for the sperm. Spermatozoa are formed in seminiferrous tubules of the testis and stored in epididymis. During their passage along the epididymis progressive maturation takes place, and the metabolism of the sperms changes from cytochromic to glycolytic (Henle and Zittle 1942). The seminal vesicles work as a store house and are endowed with a characteristic secretory function.

The fertilizing capacity of ejaculated sperm is greater than epididymic sperm. In animals this passage takes seven to fourteen days and in the human about 4 to 5 days.

Farris found that there is rapid and persistent fall in sperm production when daily specimens are ejaculated, and it slowly improves as the interval increases, the optimal interval being 5 days. Prolonged abstinence

produces diminished fertility possibly due to sperm degeneration. Lowering of the temperature of testis is brought about by the mechanism of dartos muscle and precooling of the testicular arterial blood flow by the surrounding veins of the pampiniform plexus. Macleod and Hotchkiss have shown that 75% of the sperms are contained in the first 40% of the ejaculate.

Method

Study of the male was carried out on the lines shown by Hotchkiss and regular follow-up was kept for about 3 to 6 months, semen analysis was carried out in the author's own laboratory. The detailed study of morphology of sperms could not be done because of lack of facilities.

The method of technique of semen analysis as originated by E. J. Farris were followed in determining the potential degree of fertility of male.

Instead of fusing the staining method, as suggested by B. C. Greenberg and his co-workers, the author has used simple Gram's stain to detect the presence of organisms if any. In grading the fertility, the limit has been taken as an average standard with following criteria. (Table No. IX).

Average standard for fertility

Volume, 2.5 c.c. up.
Morphology, 80% or more oval forms.
Motility, 40% active sperms.
Count per c.c., 60 millions.

This does not mean that specimens below the average normal semen specimen are necessarily infertile. (Macleod & Heim and Holt).

Clinical findings

The attitudes of husbands were carefully observed, some showed fastidious antagonism and were very reluctant for examination. Few had masculine ego and did not believe themselves to be responsible. They were over-confident because of extra-marital relations. Some were markedly worried because of their indulgence in masturbation. Many were mildly interested and few were very much interested in their treatment and the expected success.

Collection

After 5 days' abstinence, husband collected his total ejaculate in a sterile wide-mouthed bottle, having produced it manually or by coitus interruptus. The specimen is not examined until one hour after collection.

Semen quality

In animal husbandry, fertile quality of one male can be estimated for a given herd of animals while in human beings the fertility of a man is applicable and estimated only for one particular woman.

Standards of semen quality can be easily judged and utilized for so many female animals. But it becomes very difficult to do the same in human beings. One examination of semen was not taken as final. Before giving a final diagnosis at least four examinations were done. Fallacies were noted, due to an acute attack

of fever, reflex inhibition due to nervousness, faulty container, improper collection, chilling, and lack of interval of abstinence.

Sperm morphology was noted but detailed abnormalities were not differentiated, because of lack of facilities. Oligospermia was often associated with abnormal morphology and diminished activity. But presence of even few actively motile normal sperms (quality of sperm population) sometimes saved the author from giving poor prognosis.

Details of semen analysis

Eighty-two cases of sterile couples have been collected for analysis as shown in table No. X.

Forty-three cases were of normal count. Seventeen cases were with sub-normal count and 21 did not show the presence of sperms. Thus 28% were cases of azoospermia. In Table II it is seen that normal motility could be observed in 36 cases, 19 cases showed subnormal motility, in 5 cases sperms were completely dead. Table III shows morphologically 26 cases to be within normal limit. Thirty-four cases showed abnormal morphology beyond the normal limit. In Table IV the volume of semen was found to be normal for 25 cases and abnormal for 55 cases. Two cases were remarkable in having complete absence of ejaculate. The maximum volume noticed was 9 c.c. (No. 76).

In Table V bacteria were detected only in two cases. Table VI shows semen analysis in terms of fertility. Thirty-six cases were taken as fertile, 19 cases as sub-fertile and 27 cases as non-fertile. These 72.9% were declared as non-fertile after necessary repeated examinations were done to exclude any errors.

Aspermia has been noted in 28% of cases, which is fairly high compared to 5.6% or 10% as observed by McCormick, Macleod and Hotchkiss. The highest count was 500 millions per c.c. (No. 14 Table X) and the lowest was 50,000 per c.c. (No. 80 Table X). The maximum abnormal morphology was noticed as 100% dead and abnormal, and the minimum as nil. In 5 cases all sperms were completely dead (Nos. 5, 22, 32, 41 and 68 Table X). It is very interesting if figures and percentages of semen analysis be compared with a man of known fertility and also with an apparently normal unmarried young man.

Average figures taken as standard from E. J. Farris are useful for the sake of study and comparison but do not indicate true state of affairs.

Twenty-five per cent of a group of men of known fertility had counts much below the average level (60 millions), 22% of a group of unmarried normal young men had counts much below the average level. While 49% of a group of men from sterile marriages had low count (Macleod and Hotchkiss). Fertility index Table VI.

It was also observed that figures of combined low count and abnormal morphology were not the true guides of fertility index. Presence of normal motile sperms, with abilities for proper deposition, brings successful results (Post-coital, Huhner's test) and was of great importance for final confirmation.

Cervical hostility could not be

ruled out without this test. It is interesting that the average volume of ejaculate of sterile male is approximately 33% less than that of the highly fertile male.

Some sub-fertile semens were incompatible with particular partners, but opposite partners could become pregnant after re-marriage.

Azoospermia was noted in 28% of cases. Gonorrhoea was considered in most text books as the common cause. In this series only 2 cases were noted to be due to gonorrhoea (Smear positive). History of exposure and evidence of gonorrhoeal epididymitis were observed in only 2 cases.

Following abnormal outstanding findings in male infertility were found. Table No. VII.

1. *Impotency*

Impotency with normal semen findings was noted in 6 cases.

1. T. was of psychological origin
2. R. was due to physical paralysis
3. Premature ejaculations
4. Premature ejaculations
5. Premature ejaculations
6. Premature ejaculations.

Testicular biopsy was refused in many cases and was done in only four cases.

2. *Hypospadias*

Two cases of hypospadias, both had normal semen findings.

3. *Stricture of Urethra*

Three cases were noted to be due to stricture of urethra. Out of the cases of stricture of the urethra, (i) one was due to chronic repeated infection and fibrosis, (ii) one was after an operation of internal urethrotomy and (iii) one was by repeated application of silver nitrate to verumontenum for increasing the retention power.

4. *Undescended testis*

In two cases of cryptorchidism one was with one undescended testis and normal semen findings, but the other was operated at the age of 11 years and both the testes were fixed to the scrotum but showed complete aspermia.

5. *Inflammation*

In this series only two cases were noted to be due to gonorrhoea (Smear positive). History of exposure and evidence of gonorrhoeal epididymitis was observed in two cases. These two cases showed successful results after treatment, but one case of epididymo-orchitis due to mumps failed to respond to any treatment and artificial insemination was suggested.

6. *Direct bilateral recurrent inguinal Hernia*

Two cases were found to be azoospermic on semen examination. These two cases were operated repeatedly. The cause of aspermia was damage to vas deferens. They were advised artificial insemination.

7. *Varicocele*

Two cases of varicocele showed definite oligospermia. Both cases did not improve, after operation, in

the semen findings. Stimulating hormone therapy was also tried. Adjustment of coital timings during the ovulation period was suggested.

8. *Hydrocele*

Five cases of hydrocele with normal semen findings were noted.

9. *Hypogonadism*

Hypogonadism with abnormal semen findings was noted in 5 cases. Table VII.

By the study of semen analysis it was noted that one defect in a particular specimen was usually accompanied by other defects, and it was very difficult to select any one single factor as a serious cause of male infertility. Marital habits were faulty in several cases, e.g., acid or alkaline douches, strong lubricants, poisonous stimulating drugs, faulty positions, coitus rates, etc.

Family incidence of similar sterility was inquired into, particularly in aspermia cases but no definite similarity could be noted; in only one case the other brother was aspermic.

Roughly, successful pregnancies could be predicted as follows:

(a) 60% would become pregnant if both partners have no fault.
(b) 20% would become pregnant if the wife had no fault but the semen is sub-normal.
(c) 2 to 3% would become pregnant if the wife has poor history and the semen is also subnormal.

Treatment

It was based on following principles.

1. To improve sperm picture if possible.
   (i) General measures indicated for therapy were found to be giving satisfactory results.
      (a) Avoid alcohol, tobacco, caffein and sexual excesses.
      (b) Regular hours of sleep, exercise, and work.
      (c) Adequate protein and vitamin intake.
      (d) Adequate vacation from business and social responsibility.
      (e) Adjustment of local thermal environment.
   (ii) Sex hygiene and coital technique for husbands was advised, intercourse was properly spaced for the period of ovulation.
   (iii) Hormones .. Gonadotropic and testosterone therapy and injections of gonadotropic hormone were also of no value in improving sperm picture. Wheat-germ oil was tried and found to be worthless. 400-1000 units of gonodotropic hormone three times a week for twelve weeks was given. Testosterone 5 to 10 mgm. twice a week was given, but it was never given in large doses. Adequate thyroid intake. Thyroxine sodium was given twice daily for a month, dropping a week every month for three months.
   (iv) Surgical.
      (a) Epididymovasotomy;
      (b) Irrigation of ductus deferens.
      (c) Catheterisation of eja-

culatory ducts. All these methods were not tried. (20% successful results are claimed by Hotchkiss).

2. To make the best possible use of semen which is available by delivering the spermatozoa either by natural intercourse or by artificial insemination as nearly as possible at the time of ovulation.

i. Sex hygiene and coital technique for husbands was advised, intercourse was properly spaced for the period of ovulation.

ii. Homologous artificial insemination was done in five cases out of which one was successful as shown in Table VIII. This was carried out with the aid of hyalase (Morricard).

iii. Heterologous artificial insemination. By this method 12 cases were tried, out of which four were successful as per Table VIII.

In cases which were co-operative, artificial insemination was suggested. Homologous insemination was carried out in five cases and heterologous insemination was attempted in 12 cases. Each one was tried for 3 months and for three occasions every month. Hyalase was mixed with husband's semen for homologous cases. Choice of time in cycle was determined by menstrual interval subtracted by 14. It was carried out on 3 alternate days. One successful pregnancy occurred in homologous cases and 4 were successful in heterologous cases. Out of five successful cases 4 were male and one was a female child. For repeated abortions and giant formations of foetus, 4 couples were selected for semen analysis, Table X, but repeated examinations could not bring any conclusive abnormal findings.

Attendance of the patients or a couple was not prolonged indefinitely. Average length of time for a successful result was taken as 3 to 4 months, after which attempts were stopped to avoid grave psychological damage; adoption was advised in some cases and 2 out of them became pregnant after adoption.

Conclusions

(1) Study of 82 males from cases of sterility has been done and semen analysed.

(2) Azoospermia has been found to be 28% which is more common than what has been reported by others. (McCormick found only 5.6% of males from his group as azoospermic).

(3) Testicular biopsy is of negative value; very few cases of duct atresia can be cured by operations. But in the majority of cases treatment would not be possible. Biopsy will at least save considerable time and unnecessary expenses for the patient. Biopsy would be definitely important from research point of view.

(4) Semen analysis is of great importance, but by itself is not a complete criterion for male fertility. Post-coital test is of great importance and no assessment of male fertility is complete without it.

(5) Hormone administration has a very small place in the treatment of these cases.
(6) Infection in active form or subacute or latent form has been detected only in two cases.
(7) In sub-fertile cases with even oligospermia, poor viability and highly abnormal morphology, conception can take place if the wife becomes normal.

APPENDIX I

Huhner's test

The couple is instructed to have intercourse, immediately after which the wife goes to the physician's office. She is not to take a douche following coitus nor is she to urinate. She is not to insert cotton into the vagina because this will absorb the semen and spoil the test; she should however wear a vulval pad. When she arrives at the physician's office the patient is placed in the lithotomy position, a bivalve speculum is placed in the vagina and the cervix is exposed. A pipette sterilized in boiling water and not by antiseptic solution is placed into the posterior fornix of the vagina and semen is aspirated into the pipette. Another sterile pipette is placed in the cervical canal and some of the contents is drawn up. This is placed immediatly on a glass slide, covered with a cover-slip and examined under a microscope. If numerous motile spermatozoa are seen, one knows that the husband is not sterile and that the wife's cervical secretions are not inimical to spermatozoa.

APPENDIX II

Consent for artificial insemination

I.....residing at ..... of my own free will and volition, have requested Dr.....to inseminate my wife artificially with the sperm of a male selected by Dr.....This request has been made with the full knowledge and consent of my wife, whose authorization is hereto annexed. I am making this request because it is not possible for me to procreate and because both my wife and myself are extremely anxious to have a child and because our mutual happiness and the well-being of my wife will be best served by this artificial insemination..(L. S.).

On this.....day of..... 19.....before me came.....to me known and known to me to be the person described herein and who acknowledged to me that he executed the foregoing consent.....(L. S.).

I.....join in my husband's request above stated and hereby authorise Dr.....to inseminate me artificially with the sperm of a male selected by Dr.....(L. S.).

On this.....day of..... 19.....before me came..... ....to me known and known to me to be the person described herein and who acknowledged to me that she executed the foregoing consent.... .....(L. S.).

Finger prints of both partners.

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SEMEN ANALYSIS IN NUMBERS—TABLE No. I

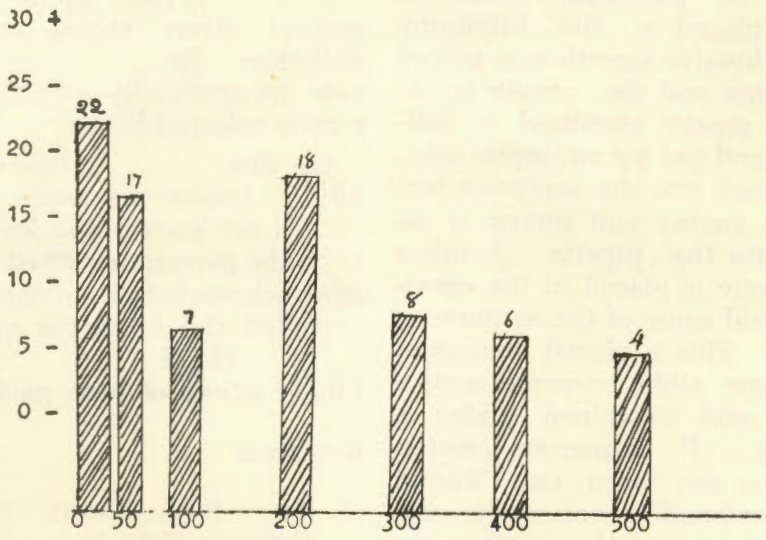
Taking 60 millions per c.c. as normal count. (Out of 82 cases)

Normal	Subnormal	Azoospermia	Per cent.
43	..	..	50.2
..	17	..	20.7
..	..	22	28.0

TABLE No. I

OUT OF 82 CASES

Number of cases 82
Azoospermia cases 22
Cases with a count of less than 60 millions c.c. 39.



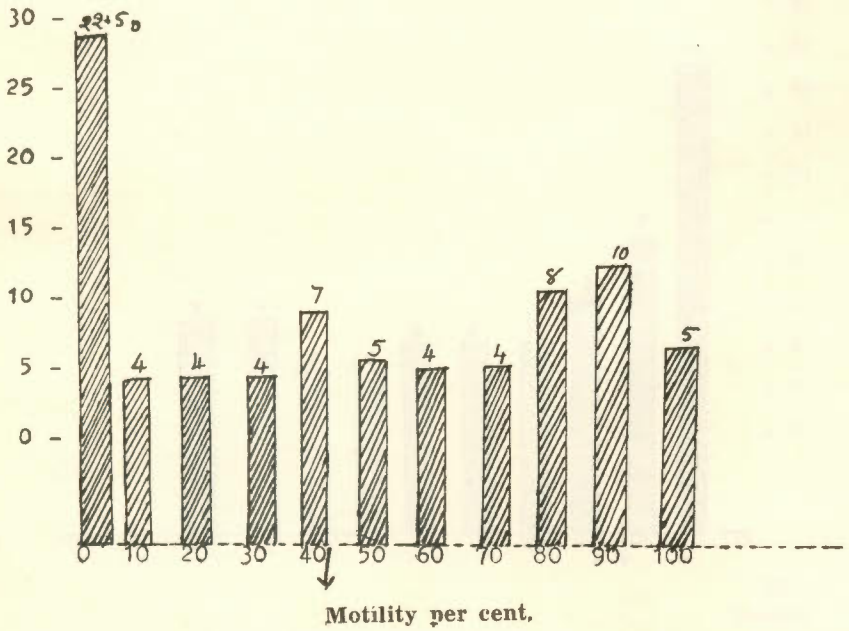
SEMEN ANALYSIS IN TERMS OF MOTILITY—TABLE No. II

Normal limit being 40% Ref. Dr. Ferris (out of 82 cases)

Normal	Sub-normal	Absent	Dead	Per cent.
36	..	..	..	40.8
..	19	..	..	23.1
..	..	22	5	32.9

TABLE No. II

OUT OF 82 CASES



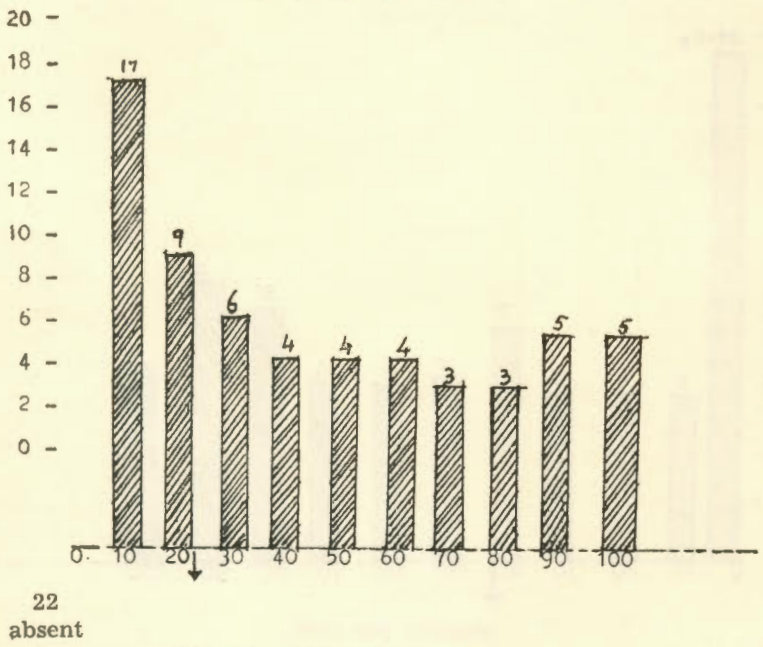
SEMEN ANALYSIS MORPHOLOGICALLY—TABLE No. III

Normal limit of abnormal forms is under 20% (Macleod & Heim)
out of 82 cases.

Normal	Abnormal	Dead or Absent.	Per cent.
26	..	..	31.7
..	34	..	41.4
..	..	22	26.8

TABLE No. III

OUT OF 82 CASES



Per cent of abnormal morphology.

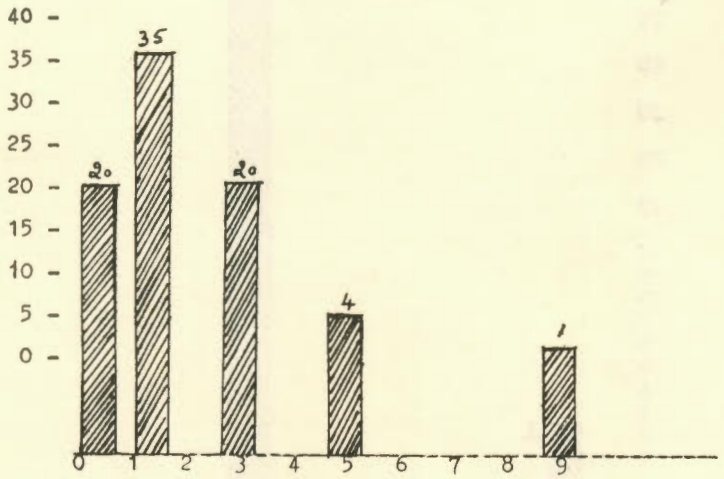
SEMEN ANALYSIS IN TERMS OF VOLUME—TABLE No IV

Normal average volume being 2.5 c.c. for fertility
Ref. Dr. E. J. Ferris (82 cases)

Normal	Abnormal	Per cent.
25	..	29.2
..	57	68.2

TABLE No. IV

OUT OF 82 CASES



2 cases no emission.

Semen volume in c.cs.

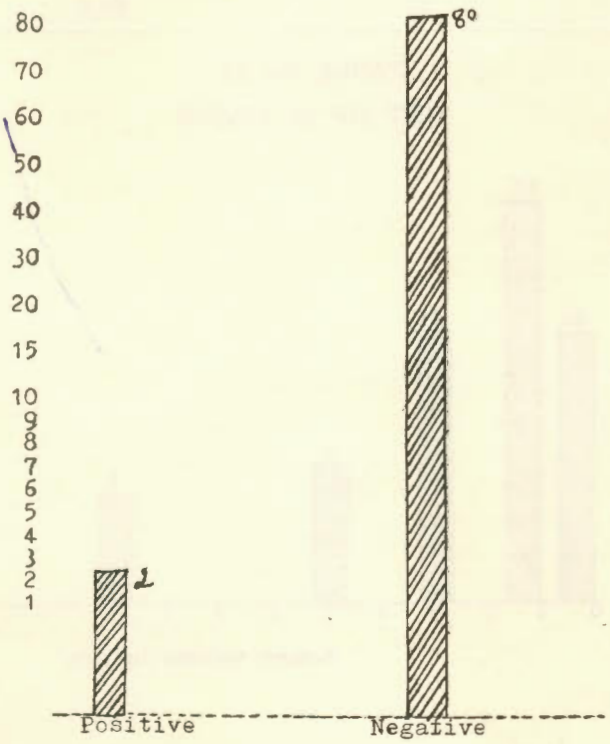
STAINED SMEARS FOR DETECTION OF BACTERIA—TABLE No. V.

out of 82 cases

Present	Absent	Per cent.
2	..	2.4
..	80	97.0

TABLE V

OUT OF 82 CASES



Detection of Bacteria.

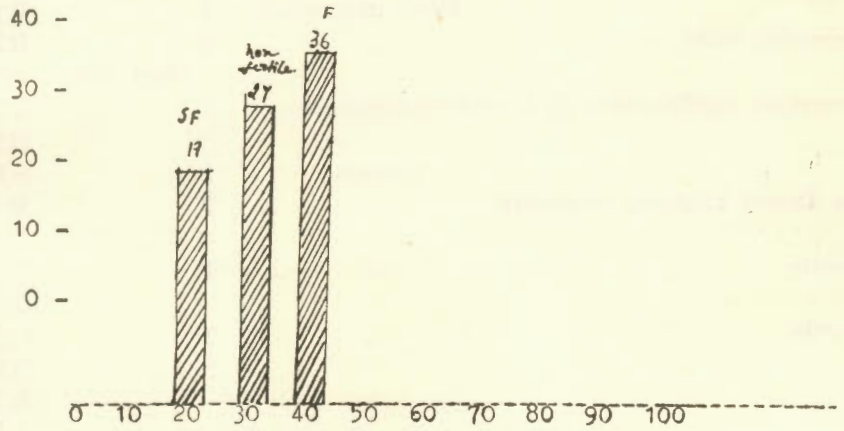
SEMEN ANALYSIS IN TERMS OF FERTILITY—TABLE No. VI

out of 82 cases

Fertility	Sub-fertility	Non-fertile	Per cent.
36	..	..	43.9
..	19	..	23.1
..	..	27	32.9

TABLE VI

OUT OF 82 CASES



Per cent of fertility.

Abnormal outstanding findings in male infertility.—TABLE No. VII

Other than semen abnormalities

Kind of abnormalities	Cases		Name
1. Impotency (a) Psychological	1		P.T.
(b) Paralysis	1		S.R.
(c) Pre-ejaculation	4		G.P.B.
			A.R.A.
			M.S.K.
			N.Y.S.
2. Pypospadias	2		L.V.K.
			R.S.
3. Stricture urethra (a) Infective-gonococcal ..	1		V.P.T.
(b) Post Operative after int. urethrotomy	1		M.M.
(c) Silver nitrate app. on. Veru montenum	1		P.M.
4. Undescended testis	2		R.S.M.
		Oprt. 7702	(Bhav)
5. Inflammatory epididymitis & Orchitis-gonococcal	2		T.T.
			B.B.J.
mumps	1		S.B.
6. Hernia Direct bilateral recurrent	2		M.R.L.
			C.T.
7. Varicocele	2		S.S.
			G.T.I.
8. Hydrocele	5		G.D.U.
			S.M.P.
			B.B.B.
			A.M.K.
			N M.S.
			V.P.
9. Hypogonadism	5		B.K.J.
			N.V.T.
			S.R.
			G.M.S.

TABLE VIII

No.		Cases	Result
1. Homologous artificial insemination		Successful	B.N.T.
With the aid of hyalase (Morricard)	5	Un- „	V.J.T.
		„ „	V.I.C.
		„ „	R.G.P.
		„ „	S.P.S.
2. Heterologous artificial insemination	12	Successful	V.G.T.
		„	S.B.R.
		„	M.V.L.
		„	V.J.P.
		Un- „	L.I.C.
		„ „	N.G.P.
		„ „	S.J.P.
		„ „	L.R.S.
		„ „	R.A.M.
		„ „	D.J.S.
		„ „	V.S.S.
		„ „	J.P.M.
3. Repeated abortions and giant Form.	4	No. 78 tab. X	M.K.A. 993
		No. 79 „	V.M.M. 2603
		No. 80 „	R.A. 1202
		No. 72 „	M.M.S. 9500

(Morricard F.—Gynaec et Obst. 45, 781, 1946).

STANDARD FOR INDEX OF FERTILITY IN MEN.

TABLE IX.

(Based on the method of Dr. Ferris).
Average standard for fertility.

Volume	..	2.5 c.c. up.
Speed	..	0.7 to 1.2 seconds.
Morphology	..	80% or more oval forms.
Motility	..	40% active sperms.
Count per c.c.	..	60 millions.

Index of fertility is based on the number of active sperms in the entire ejaculate in millions (Absolute motility)

Highly fertile	..	185 millions
Relative fertility		80 to 180 millions.
Sub-fertile	..	1 to 80 millions.
Sterile	..	0.

TABLE X

S.N.	R.N.	Volume	Sperm. count per cc. mls.	Motility		Morphology		
				Normal %	Sub-normal	Dead %	Normal %	Abnormal %
1	2775	5 cc.	200	90	..	10	90	10
2	2894	4 cc.	288	100	..	..	100	..
3	3673	2 cc.	160	90	..	10	90	10
4	3718	2 cc.	56	..	5-6 motile	90	10	90
5	3852	3 cc.	100	..	..	100	..	..
6	3962	2 cc.	290	100	..	..	100	..
7	4077	1 cc.	130	90	..	10	90	10
8	4392	1 cc.	250	90	..	10	90	10
9	4489	1 cc.	160	..	2-3 motile	90	10	90
10	4508	1 cc.	150	100	..	..	100	..
11	4666	2 cc.	240	50	..	50	50	50
12	4707	2 cc.	150	50	..	50	50	50
13	4973	3 drops	nil	..	..	..	..	..
14	4997	2 cc.	500	85	..	15	85	15
15	5201	2 cc.	320	80	..	20	80	20
16	5298	1 cc.	nil	..	..	..	..	..
17	5396	1 cc.	nil	..	..	..	..	..
18	5486	3 cc.	355	90	..	10	90	10
19	5539	2 cc.	200	..	30%	60	30	60
20	5702	2 cc.	190	90	..	10	90	10
21	5760	2.5 cc.	250	50	..	30	50	30
22	5764	1 cc.	125	..	..	100	..	100
23	5862	5 cc.	nil	..	..	..	..	..
24	5910	3 cc.	120	50	..	30	50	30
25	6211	1 cc.	nil	..	..	..	..	..
26	6224	1 cc.	nil	..	..	..	..	..
27	6405	3.5 cc.	60000	60	..	40	90	5
28	6474	3 cc.	160	90	..	5	70	20
29	6480	2 cc.	150	70	..	20	..	..
30	6486	1 cc.	nil	..	..	..	20	80
31	6546	2 cc.	200	..	20%	80	..	100
32	6549	2 cc.	6 lacs	..	..	100	80	10
33	6684	2 cc.	233	80	..	10	80	5
34	6749	1 cc.	340	80	..	5	20	80
35	6837	3 cc.	90000	..	5-6 motile	90	70	30
36	6926	3 cc.	230	70	..	30	10	90
37	7049	1 cc.	80000	..	5-6 motile	90	60	20
38	7056	2 cc.	250	60	..	20	20	80
39	7079	2 cc.	140	..	20%	60	10	90
40	7135	5 cc.	90000	..	6-8 motile	90	..	100
41	7200	2 cc.	7.5	..	..	100	80	20

CHAPTER X (Contd.)

S.R.	R.N.	Volume	Sperm. count per cc. mls.	Motility		Morphology		
				Normal %	Sub-normal	Dead %	Normal %	Abnormal %
42	7372	3 cc.	350	80	..	20	10	90
43	7628	1 cc.	25	..	2-4 motile	90	..	100
44	7702	1 cc.	nil	..	..	..	..	..
45	7735	3 cc.	nil	..	..	..	..	..
46	7749	3 cc.	1	..	1-2 motile	90	5	95
47	7755	2 cc.	nil	..	..	..	..	..
48	7767	1 cc.	nil	..	..	..	..	..
49	7876	1 cc.	nil	..	..	..	..	..
50	7986	1 cc.	nil	..	..	..	..	..
51	8022	3 cc.	320	80	..	20	80	20
52	8034	3 cc.	350	80	..	10	80	10
53	8166	2 cc.	80000	..	4-5 motile	90	10	90
54	8243	3 cc.	350	90	..	10	90	10
55	8363	2 cc.	nil	..	..	..	..	..
56	8374	2 cc.	nil	..	..	..	..	..
57	8474	2 cc.	180	50	..	30	60	30
58	8514	3 cc.	420	95	..	5	95	5
59	8521	2 cc.	185	50	..	30	20	80
60	8689	1 cc.	nil	..	..	..	..	..
61	8727	2 cc.	240	50	10%	40	50	40
62	8831	2 cc.	350	50	..	10	50	10
63	8870	2 cc.	4.8	..	5-8 motile	70	10	70
64	9078	2 cc.	265	90	..	10	90	10
65	9090	2 cc.	262	85	..	15	85	15
66	9190	2 cc.	400	90	..	10	90	10
67	9203	1 cc.	nil	..	..	..	..	..
68	9344	2 cc.	54	..	..	100	..	100
69	9359	1 cc.	nil	..	..	..	..	..
70	9366	2 cc.	2.25	..	10%	70	10	90
71	9418	1 cc.	25	..	5%	80	5	95
72	9500	2 cc.	50	..	40%	30	40	30
73	951 H	3 cc.	nil	..	..	..	..	..
74	673 H	nil	nil	..	..	..	..	..
75	795 H	4.5 cc.	240	60	..	..	60	40
76	2180 H	9 cc.	200	80	..	20	80	20
77	2260 H	3 cc.	125	65	..	30	65	30
78	993 H	4 cc.	225	60	..	20	60	40
79	2603 H	1 cc.	80000	..	30%	35	30	40
80	1202 H	2 cc.	50000	..	25%	70	25	70
81	952 H	4 cc.	nil	..	..	..	..	..
82	1342 H	nil	nil	..	..	..	..	..