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INFLUENCE OF KHAT ON SEMINAL FLUID AMONG PRESUMED INFERTILE COUPLES
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ABSTRACT

Objective: **To evaluate the influence of khat, alone and in combination with other drugs, on the qualitative characteristics of seminal fluid analysis of the male partners of allegedly infertile Ethiopian couples.**
Design: **A prospective cross-sectional study.**
Setting: **Infertility clinics at the Gandhi Memorial Women's hospital and Brook Medical Services from September 1992 to April 1995.**
Patients: **A total of 214 male patients with history of infertility and substance use of khat alone or in combination with tobacco smoking, coffee drinking and alcohol intake of over one year. All patients with no ejaculate, urologic and medical disorders and never used khat were excluded from the study.**
Results: **Abnormal values were obtained for relatively older patients who also showed a higher frequency of marriage, prolonged duration of infertility and greater number of children ever fathered ($p<0.05$). The normal and abnormal results for khat and other drug consumers accounted for 97 (53%) and 86 (47%) in contrast to 22 (71%) and 9 (29%) for the control group, respectively. The study revealed decreased volume, sperm count, motility and morphological changes in khat chewers compared to non-drug users although the differences were not statistically significant ($p>0.05$).**
Conclusion: **The study highlights the possible association of long-term use of khat and abnormal seminal fluid analysis profiles.**
Recommendation: **Community-based clinical and epidemiological studies should be undertaken in regions where khat is widely consumed.**

INTRODUCTION

Infertility is a well-established multi-disciplinary, socio-medical and biblical phenomenon. Failure to have a viable child despite regular and normal sexual intercourse within the stipulated period of one year and without antecedent impairment of frequency, libido, erection and use of contraception in the male initiates a considerable psychosexual distress(1). Involuntary infertility accounts for 10-15% of couples of fertile age(2,3). Conception rate is 10-15% per cycle in fertile couples as compared to 5-6% per cycle for infertile couples(4). The average time that is required for pregnancy to occur in fertile couples not using contraception is 5.3 months(2). Masculine, feminine and combined causes of infertility vary enormously and account for 35-40%, 50% and 10-15%, respectively(5,6).

In the male, the causes are multifactorial and include endocrine, organic, familial and occupational determinants(7). Social and dietary habits like ethanol consumption, tobacco smoking and coffee drinking may affect the semen quality(8,9). Khat *(Edulis cathis* Forsk) is a bioactive non-narcotic but habituating compound with amphetamine like central nervous system effects(10,11). It is consumed by a fair segment of the Ethiopian population and is socially and economically one of the most important plants in eastern, southern Africa and the Middle-east and is usually associated with polydrug abuse despite varied controversies regarding its use and abuse(12-15). The predominant features of interest of the khat syndrome include hypothermia, reduced appetite, depressed overall sexual potency and clinical spermatorrhoea which is occasionally accompanied by testicular pain(10,11, 13,16,17). The overall potency and effect of khat is dependent on the region of production, amount and duration of consumption and the colour of khat which is designated as "red" or "white"(17,18). Spermatorrhoea is commonly attributed to the latter even though the pharmacological basis of the spontaneous flow of spermatic fluid is not understood(11). The effect of khat on seminal fluid characteristics has not been studied by researchers in Ethiopia despite popular usage of the substance by the population.

Therefore, this article attempts to explore the influence of khat, alone and in combination with other drugs, on the quality of seminal fluid analysis of the male partners of allegedly infertile couples attending the infertility clinics

allegedly infertile couples attending the infertility clinics at the Gandhi Memorial Women's hospital and Brook Medical Services and lay down the base line for launching a community-based study in the future.

MATERIALS AND METHODS

This is a prospective cross-sectional study of a total of 214 consecutive male partners of infertile couples attending the infertility clinics at the Gandhi Memorial Hospital (GMH) and Brook Medical Services (BMS). Of these, 31 control patients were made up of those who gave no history of habitual intake of any of the considered drugs. They were interviewed according to the predesigned questionnaire. The study was conducted from September 1992 to April 1995. Thorough history and physical examinations were conducted and documented. The variables considered included socio-demographic characteristics and history of khat chewing, tobacco smoking, coffee drinking and alcohol consumption for over one year's duration. In this study, khat as commonly pronounced here in Ethiopia, is preferred to other spellings and associated pronunciations like khat, qat, kat, cat, cath, *Catha edulis* and miraa.

The patients were referred to the National Research Institute of Health for seminal fluid analysis after explicitly advising them to observe abstinence for 4 - 6 days. The patients used masturbation as a method for collection of semen. Other methods like sexual intercourse, post-orgasm urine and prostatic expression are not practised. The institute was completely blinded with regard to the study objective and number of repeat tests. The possibility of inaccurate seminal fluid collection techniques was entertained and all abnormal results were subjected for renewed investigations although in the preliminary analysis, no statistically significant variations were observed($p>0.05$). Bacteriological studies were carried out whenever there were obvious indications and patients were treated accordingly. The determination of the hormone profile (serum testosterone, FSH, LH) was attempted and aborted because of inconsistencies in the availability of pertinent laboratory kits.

The biopsying of the testes by fine needle aspiration for histopathology was invariably rejected by all patients. Orchidometer was not available during the study period. Sonography, thermography, x-ray of sella turcica, mixed antiglobulin-tests (MAR-tests), sperm cervical mucus contact-sperm immobilisation-tests (SIT), sperm cervical mucus contact-tests (SCMC-tests), anti-sperm antibody coating (ASA), sperm penetration Metertests (SPM-test) and other penetration tests are not performed in our setup. The patients were not followed up for their subsequent fecundating capacity nor were the analysis of contributing variables of the female partners incorporated in the present study.

All patients with aspermatism, urologic and medical disorders including those who only smoked, consumed ethanol or drank coffee without khat chewing were excluded from the study population and statistical analysis. Hence, multivariate analysis was not performed and was deemed not necessary as it was not the objective of this study to look into the effects of each of the possible confounding drugs in isolation. No formal signed consent was obtained besides informing the patients that the results may be used for research purposes and assuring them that their identities shall be kept confidential.

The CIDA - Spermiogramme Nomenclature (appendix 1) has been used for the purpose of this study(5). EPI 5 - Info computer programme has been utilised for data entry, cleaning and statistical analysis for Chi-square test, Chi-square linear trend, correlation tests, relative risk and odds ratio determinations.

RESULTS

Patient characteristics of the total study population in relation to the status of the seminal fluid analysis are illustrated in Table 1. Abnormal values have been obtained for relatively older patients who also had a higher frequency of marriage, prolonged duration of infertility and higher numbers of children ever fathered ($p<0.05$). Most of the patients were of urban residence and occupationally better off. Religion and nationalities based frequencies are also included in the Table 1.

Table 1

Patient characteristics and status of spermiogramme (GMH, BMS 1992-1995)

Characteristics	Status of spermiogramme		
	Normal	Abnormal	P-value
Age (years)			
Mean	32.9 ± 4.9	36.4 ± 4.9	
Median	34	37	χ^2 23.2
Mode	37	40	df=1
Range	24-44	24-45	P<0.05
Frequency of marriage			
Mean	1.2 ± 0.4	1.4 ± 0.5	
Median	1.0	1.0	χ^2 10.4
Mode	1.0	1.0	df=1
Range	1-2	1-3	P<0.05
Duration of infertility			
Mean	3.0 ± 1.6	3.9 ± 1.7	
Median	2.0	4.0	χ^2 17.5
Mode	2.0	3.0	df=1
Range	1-2	1-3	P<0.05
Children ever fathered			
Mean	0.5 ± 0.9	0.9 ± 1.0	
Median	0 0	1.0	χ^2 11.2
Mode	0.0	0.0	df= 1
Range	0-5	0-4	P<0.05
Occupation			
Govt, NGO	54 (45.4%)	20 (21.1%)	
Self-employed	42 (35.3%)	50 (52.6%)	
Farmer	9 (7.6%)	12 (12.6%)	
Unemployed	5 (4.2%)	1 (1.1%)	
Daily labourer	1 (0.8%)	—	
Unclassified	8 (6.7%)	12 (12.6%)	
Address			
Urban	110 (92.4%)	78 (82.1%)	
Rural	9 (7.6%)	17 (17.9%)	
Nationalities			
Amhara	32 (26.9%)	11 (11.6%)	
Oromo	36 (30.3%)	18 (18.9%)	
Guraghe	37 (31.1%)	36 (37.9%)	
Kambata	2 (1.7%)	4 (4.2%)	
Tigrean	3 (2.5%)	—	
Others*	9 (7.6%)	26 (27.4%)	
Religion			
Christian	62 (52.1 %)	28 (29.5%)	
Moslem	53 (44.5%)	67 (70.5%)	
Others	4 (3.2%)	—	

* (Gambelans, Hararis, Welayta. Somalis, Arabs etc.)

The consumption of khat alone or in combination with other drugs including those who did not have any habit is depicted on Table 2. It was shown that 97/193 (53.0%) and 86/183 (43%) of the khat and other drug consumers showed normal and abnormal results in contrast

Table 2

Drug consumption and status of seminal fluid analysis (GMH, BMS, 1992-1995)

No	Drug consumed	Status of seminal fluid analysis: Normal No	Normal %	Abnormal No	Abnormal %	Total No	Total %
1.	Control group	22	18.4	9	9.5	31	14.5
2.	Khat	12	10.1	15	15.8	27	12.6
3.	Khat + smoking	11	9.2	11	11.6	22	10.3
4.	Khat + alcohol	19	16.0	5	5.3	24	11.2
5.	Khat + coffee	14	11.8	20	21.0	34	15.9
6.	Khat + alcohol + smoking	14	11.8	2	2.0	16	7.5
7.	Khat + smoking + coffee	10	8.4	15	15.8	25	11.7
8.	Khat + alcohol + coffee	5	4.2	7	7.4	12	5.6
9.	Khat + alcohol + coffee + smoking	12	10.1	11	11.6	23	10.7
	Total	119	100	95	100	214	100

$\chi 2 = 3.46$, df 1, $p>0.05$; OR = 0.89 < 2.17 < 5.40; RR = 0.91 < 1.62 < 2.87

Table 3

Drug consumption and age group (GMH, BMS, 1992-1995)

No.	Drug consumed	Age group (years): 20-24 No	20-24 %	25-29 No	25-29 %	30-34 No	30-34 %	35-39 No	35-39 %	40-44 No	40-44 %	45 No	45 %	Total No	Total %
1	Control group	1	50	13	28.3	2	4.0	13	17.1	2	5.1	–	–	31	14.5
2	Khat	–		10	21.7	7	14.0	7	9.2	3	7.7	–	–	27	12.6
3	Khat + smoking	–		2	4.3	7	14.0	5	6.6	8	20.5	–	–	22	10.3
4	Khat + alcohol	–		–	–	6	12.0	12	15.8	6	15.4	–	–	24	11.2
5	Khat + coffee	1	50	8	17.4	7	14.0	10	13.2	8	20.5	–	–	34	15.9
6	Khat + alcohol + smoking	–		8	17.4	3	6.0	3	3.9	2	5.1	–	–	16	7.5
7	Khat + smoking	–		2	4.3	7	14.0	11	14.5	5	12.8	–	–	25	11.7
8	Khat + alcohol + coffee	–		–	–	5	10.0	6	7.9	–	–	1	100	12	5.6
9	Khat + alcohol + coffee + smoking	–		3	6.5	6	12.0	9	11.8	5	12 8	–	–	23	10.7
Total		2	100	46	100	50	100	76	100	39	100	1	100	214	100

	Drug users	*Control group*
Mean:	34 8 ± 5.1 years	32.3±5.6 years
Median:	35 years	34 years
Mode:	40 years	38 years
Range:	24-45 years	24-43 years

to 22/31 (71.0%) and 9/31 (29%) of the control group, respectively. Of the study population, 183 (19.1%) chewed khat on daily, 142 (77.6%) on weekly and six (3.3%) on casual bases, respectively. Concomitantly taken drugs included alcohol six (8.0%) on daily, 52 (69.3%) weekly and 17 (22.7%) on casual events respectively. In addition, daily intake of coffee and cigarette smoking accounted for 94 (43.9%) and 86 (40.2%), respectively. Statistically significant differences are observed for categories consuming khat only ($p<0.05$), khat and coffee ($p<0.05$) and khat, smoking plus coffee ($p<0.05$) in comparison with the control group.

The peak age range is found to be 35-39 years with a mean age of 34.8 ± 5.1 years and age range of 24-45 years for drug users while the mean age for the control group was 32.3 ± 5.6 years with a range of 24 - 43 years (Table 3).

The frequency of the sperm volume distribution is presented in Table 4. The khat consuming population revealed that 48 (26.2%), 134 (73.2%) and 1 (0.6%) had hypospermia, normospermia and hyperspermia,

Table 4

Drug consumption and semen volume
(GMH, BMS, 1992-1995)

No.	Drug consumed	Semen volume (ml) 0-2 No.	%	2-6 No.	%	>6 No.	%	Total No.	%
1.	Control group	6	11.1	25	15.7	–	–	31	14.5
2.	Khat	4	7.4	23	14.5	–	–	27	12.6
3.	Khat+ smoking	3	5.6	19	11.9	–	–	22	10.3
4.	Khat + alcohol	4	7.4	19	11.9	1	100	24	11.2
5.	Khat + coffee	14	25.9	20	12.6	–	–	34	15.9
6.	Khat + alcohol + smoking	2	3.7	14	8.8	–	–	16	7.5
7.	Khat + smoking + coffee	10	18.5	15	9.4	–	–	25	11.7
8.	Khat + alcohol + coffee	4	7.4	8	5.0	–	–	12	5.6
9.	Khat + alcohol + coffee + smoking	7	13.0	16	10.1	–	–	23	10.7
		54	100	159	100	1	100	214	100

Drug users		*Control group*
Mean: 2.7±0.9ml	$\chi 2 = 0.66$, df1, $p>0.05$	3.1 ± 0.9 ml
Median: 3 ml	OR = 0.53<1.48<4.31	3 ml
Mode: 3 ml	RR = 0.63<1.36<2.89	3 ml
Range 1-9 ml		1-5 ml

Table 5

Drug consumption and sperm count
(GMH, BMS, 1992-1995)

Drug consumed	Sperm count (millions) 0-0 No	%	Upto 10 No	%	10-20 No	%	20-40 No	%	40- 50 No	%	Total No	%
1. Control group	3	30	–	–	–	–	1	4.2	27	15.8	31	14.5
2. Khat	2	20	–	–	2	22.2	5	20.8	18	10.5	27	12.6
3. Khat + smoking	–	–	–	–	–	–	3	12.5	19	11.1	22	10.3
4. Khat + alcohol	1	10	–	–	–	–	1	4.2	22	12.9	24	11.2
5. Khat + coffee	2	20	–	–	3	33.3	6	25.0	23	13.5	34	15.9
6. Khat + alcohol + smoking	–	–	–	–	–	–	–	–	16	9.4	16	7.5
7. Khat + smoking + coffee	2	20	–	–	2	22.2	2	8.3	19	11.1	25	11.7
8. Khat + alcohol + coffee	–	–	–	–	1	11.1	2	8.3	9	5.3	12	5.6
9. Khat + alcohol + coffee + smoking	–	–	–	–	1	11.1	4	16.7	18	10.5	23	10.7
Total	10	100	–	–	9	100	24	100	171	100	214	100

Drug users		*Control group*
Mean: 69.4 ± 20.2 ml	$\chi 2 = 0.70$, df1, $p>0.05$	81.4 ± 35.3 ml
Median: 70 ml	OR = 0.56<1.83 < 6.57	86 ml
Mode: 90 ml	RR = 0.63<1.65<4.30	90 ml
Range: 0-145 ml		0-146 ml

respectively. Of the abnormal group, 48/86 (55.8%) were hypospermic while 38/86 (44.2%) were normospermic. The individual with a volume of 9ml was a tej (local brew) seller who has been consuming quite a large amount of it and also has been taking khat regularly. There was no statistical difference in the seminal volume of the khat and non-khat consumers ($p>0.05$) although the difference could be clinically significant (OR=0.53<1.48<4.31, RR=0.63<1.36<2.89).

It was observed that 144/183 (78.7%) and 39/183 (21.3%) khat chewers had normal and abnormal sperm counts as opposed to 27/31 (87.1%) and 4/31 (12.9%) of the control group, respectively (Table 5). The Table 5 further demonstrates that 7/86 (8.1%), 9/86 (10.5%), 23/86 (26.7%) abnormal seminal fluid analysis of the khat-chewing group had azoospermia, oligozoospermia of moderate and mild degrees respectively and 47/86(54.7%) had normozoospermia. No statistically significant differences were observed for sperm counts of khat and non-khat consumers ($p>0.05$). However, the difference could be clinically significant (OR=0.56<1.83<6.57, RR=0.63<1.65<4.30).

Table 6

Drug consumption and sperm motility (GMH, BMS, 1992-1995)

	Drug consumed	Sperm motility (%) < 60% No	%	> 60% No	%	Total No	%
1.	Control group	8	10.5	23	16.7	31	14.5
2.	Khat	12	15.8	15	10.9	27	12.6
3.	Khat + smoking	6	7.9	16	11.6	22	10.3
4.	Khat + alcohol	5	6.6	19	13.8	24	11.2
5.	Khat + coffee	14	18.4	20	14.5	34	15.9
6.	Khat + alcohol + smoking	2	2.6	14	10.1	16	7.5
7.	Khat + smoking + coffee	12	15.8	13	9.4	25	11.7
8.	Khat + alcohol + coffee	7	9.2	5	3.6	12	5.6
9.	Khat + alcohol + coffee + smoking	10	13.2	13	9.4	23	10.7
	Total	76	100	138	100	214	100

Drug users		*Control group*
Mean: 65.5 ± 20.7%	$\chi 2 = 1.49$, df1, $p>0.05$	67.7±28.0%
Median: 70%	OR = 0.68 < 1.70 < 4.40	80%
Mode: 70%	RR = 0.77<1.44<2.69	80%
Range: 0-90%		0-90%

Table 7

Drug consumption and sperm morphology (GMH, BMS, 1992-1995)

	Drug consumed	Sperm morphology (%) < 60% No	%	>60% No	%	Total No	%
1.	Control group	6	10.3	25	16.0	31	14.5
2.	Khat	6	10.3	21	13.5	27	12.6
3.	Khat smoking	7	12.1	15	9.6	22	10.3
4.	Khat + alcohol	5	8.6	19	12.2	24	11.2
5.	Khat + coffee	11	19.0	23	14.7	34	15.9
6.	Khat + alcohol + smoking	1	1.7	15	9.6	16	7.5
7.	Khat + smoking + coffee	10	17.2	15	9.6	25	11.7
8.	Khat + alcohol + coffee	5	8.6	7	4.5	12	5.6
9.	Khat + alcohol + coffee + smoking	7	12.1	16	10.3	23	10.7
	Total	58	100	156	100	214	100

Drug users		*Control group*
Mean: 71.6 ± 19.9%	$\chi 2 = 1.10$, df1, $p>0.05$	72.3 ± 26.3%
Median: 75%	OR = 0.60<1.65<4.79	80%
Mode: 90%	RR = 0.69<1.47<3.12	90%
Range: 0-90%		0-90%

The frequency of sperm motility is shown on Table 6 and the mean value obtained was 65.5 ± 20.7% for drug users and 67.7 ± 28.0 for control patients with a range of 0-90% for both groups. In the khat chewing group, 115/183 (62.8%) had normal motility and 68/183 (37.2%) had abnormal results while the control group revealed 23/31 (74.2%) normal and 8/31 (25.8%) abnormal motility percentages. Of the abnormal group 68/86 (79.1%) has less than 60% motility as opposed to only 18/86 (20.9%) normal motility. Overall computation revealed no statistical difference between the consumers and control group ($p>0.05$) although this may be clinically significant (OR=0.68<1.70<4.40, RR=0.77<1.44<2.69).

The percentage of sperm morphology is presented on Table 7 and 52/86 (60.5%) were found to have less than 60% normality in comparison with 34/86 (39.5%) normal values of the abnormal khat chewing group. However, the overall morphological picture yielded 131/183 (71.6%) normal and 51/183 (28.4%) abnormal results as compared to 25/31 (80.6%) and 6/31 (19.4%) respectively for the control group. The mean morphology were 71.6 ± 19.9% and 72.3 ± 26.3% for khat consuming and the control group, respectively. Coincidentally both categories had a range of 0-90%. The statistical difference with regard to morphology in the two categories showed no difference ($p>0.05$) although it could still be clinically significant (OR=0.60 < 1.65 < 4.79, RR=0.69 < 1.47 < 3.12).

DISCUSSION

This study was conducted in a heterogeneous population. None of them is labelled as sub-fertile or low fertility group nor does Ethiopia belong to the sub-Saharan infertility zone with a fertility rate of about 7%, which is one of the highest in the world. Khat is consumed by a fair segment of the study population and mostly so in conjunction with other drugs. The cumulative effect on seminal fluid analysis profile is relative reduction in volume, count, motility and normal morphology in comparison to non-chewers although the differences were not statistically significant ($p>0.05$) but still clinically significant. Statistically significant differences were observed for khat and coffee; khat, smoking and coffee; khat, alcohol, coffee and smoking categories in comparison within the groups and non-khat consumers ($p<0.05$).

Spermatogenesis is affected by age and the potential to impregnate a fertile woman may dwindle with the duration of infertility. The results of this study also revealled that the mean duration of infertility was higher for the abnormal (3.9±1.7 years) as compared to the normal (3.0±1.6 years); and this was further confounded by the mean ages of 36.4±4.9 years and 32.9±4.9 years for the abnormal and normal group respectively. It is worthy to note that the interaction of these factors with khat chewing and other drug ingestions may be purely additive or synergistic and pose difficulties in deducing causal inferences about their relationships.

Semen quality is known to depend on antecedent frequency of coitus and the mode of collection of the ejaculated specimen. Khat has been repeatedly associated with spermatorrhoea and anaphrodesia. The spermatorrhoea is referred to as Solass in Yemen(18) and as *khat-shahwa* or *Mezi* among eastern Ethiopian Moslem population. Although the pharmacological basis is not understood, cathionine isomers enhanced electrically stimulated constriction of the rat and guinea pig vas deferentia and also caused a high frequency of spermatorrhoea and impotence(11). Furthermore, khat induces pronounced anorexia in addition to constipation, gastritis and insomnia; and consumers tend to divert their funds from food to khat. Thus the generally observed malnutrition, although the blood glucose level is unaffected, may interfere with spermatogenesis and result in abnormal seminal fluid analysis profile.

The mutagenic potential of khat has been studied in an animal model and is found to cause reduced nucleic acid synthesis in brain and liver and produce chromosomal abnormalities in bone marrow(19). The morphological changes, though not statistically but clinically significant may be secondary to long-term adverse effects of possible teratogenic properties of the drug. Furthermore, hypothermia is a feature of khat chewing and for optimal spermatogenesis proper thermoregulatory mechanism should be maintained. Prolonged sitting in a doubled up position which is the case among khat chewers and the hypothermia may henceforth have deleterious effects on normal spermatogenesis. Hence, the interplay of these contingent facts which are attributed to the sympathomimetic syndrome and environmental factors associated with khat chewing is not known although the results in this study may be demonstrative of causal and effect relationships.

The information obtained from seminal fluid analysis reveal that 60% of the fluid originates from the seminal vesicles, 30% from the prostate, 5-10% from the epididymus and a small amount from the ampullae, bulbourethral and urethral glands. Seminal prostaglandin concentrations have a role in promoting human fertility and are found to be lower than in men with proven fertility(20). Therefore, the ultimate impact of chronic spermatorrhoea on fertility and on volume, count, motility and morphology of seminal fluid characteristics, as also observed in this study, must be immense and possibly more markedly so in association with the above facts.

Published literature have demonstrated, among smokers, the presence of greater number of abnormal sperm forms and decreased ejaculate volume(8,9). The association of khat chewing and smoking as confounding factors is well noted(10,13,14). In this study, the picture of the spermiogramme is not markedly affected, although it is possible that smoking could have on its own an untoward effect.

There is an historic relationship between coffee and khat and the former is believed to have a potentiating effect. Coffee enhances sperm cell motility and in high doses causes increase in sperm density and percentage of abnormal forms(9). The combined effect of khat and coffee in this study is quite contrary to the above observation and rather seems to have a detrimental effect ($p<0.05$).

Ethanol is shown to have no effect on semen characteristics(9). In this analysis too, it seemed to have a protective effect and the combined effects were rather favourable. Otherwise, interestingly enough, the individual who has hyperspermia was consuming a large amount of *tej* which is a popular national alcoholic beverage made out of honey and especial leaves.

The study shows that simultaneous use of coffee, cigarettes and/or alcohol along with khat in various combinations to be widespread across different faiths, nationalities, income brackets, social levels and age groups. It also illustrates that khat does have certain detrimental effects on seminal fluid characteristics. Semen quality, however is further more dependent on frequency of coitus and the ejaculate and its behaviour reveals marked intra - and inter-subject physiological fluctuations with monthly values of sperm counts varying from one analysis to the next. Moreover, seminal fluid analysis does not distinguish between fertile and infertile men except in the extreme cases of azoospermia or oligozoospermia gravis.

For conclusive differentiation one is forced to analytically determine the composition of the seminal fluid qualitatively and quantitatively, conduct histopathological studies of the testicular biopsies, study the autoimmune profile, serological and bacteriological

aspects of the semen and perform discriminatory postocoital penetration or zona-free hamster egg penetration tests(1). Nevertheless, in a developing country like ours, conventional seminological examination which is simple, inexpensive and less traumatic remains a reliable predictor in the study of the fecundating potency of sperms of allegedly infertile patients. There is, however, a need for further community-based randomised clinical and epidemiological studies of khat and its effect on seminal fluid characteristics and the fertility behaviour of the population.

Appendix 1

The CIDA - Spermiogramme Nomenclature has been used for the purpose of this study (5) and the following definitions have been adopted.

Normal spermiogramme		
Volume	:	2.0 - 6.0ml
PH	:	7.2 - 7.8
Count	:	40 - 250 million
Motility	:	Over 60% actively motile
Morphology	:	Over 60% normal in shape
Volume Variations		
2.0 - 6.0	=	normospermia
Less than 2.0 ml	=	hypospermia
More than 6.0 ml	=	hyperspermia
No ejaculate	=	aspermia; aspermatism
Sperm Count Variations		
40 - 250 million	=	normozoospermia
more than 250 mil.	=	polyzoospermia
40 million	=	oligozoospermia
20 - 40 million	=	oligozoospermia of mild degree
10 - 20 million	=	oligozoospermia of moderate degree
10 million	=	oligozoospermia of severe degree
No sperm cells	=	azoospermia
Motility		
More than 60%	=	normal
Less than 60%	=	asthenozoospermia
Morphology		
More than 60%	=	normal
Less than 60%	=	necrozoospermia

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