



STUDY OF SPERM MOTILITY AND MORPHOLOGY IN SMOKERS

Anatomy

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ABSTRACT

Previous studies show that the contents of cigarette smoke negatively affect sperm parameters including sperm motility and morphology. The actual effect of smoking on male fertility is not clear but the relationship between smoking and infertility has been studied for decades. The effect of smoking on semen parameters is based on the well established biological finding that the smoking increases the presence of reactive oxygen species, thereby resulting in oxidative stress. Oxidative stress has devastating effects on sperm parameters such as viability and morphology, and impairs sperm function, hence reducing male fertility.

KEYWORDS

Motility, Morphology, semen, Smoking ,spermatozoa.

INTRODUCTION—

The WHO reported that approximately 8% of couples worldwide and 10% to 15% of those in industrialized nations experience infertility[1] and male infertility is involved in 30% to 35% of all cases[2]. To identify possible associations between smoking and male infertility, numerous studies have been conducted. Studies have reported a negative impact of smoking on semen analysis parameters and male infertility[3,4,5,6], others have found no such effects and in some cases have found positive effects on sperm motility[7] and the extent of nuclear DNA damage in sperm[8]

The composition of cigarette smoke is gases, vaporized liquid and particles, about 4000 compounds are released through the chemical process of hydrogenation, pyrolysis, oxidation, decarboxylation and dehydration. The smoke release is biphasic (Gaseous and particulate). In the gaseous phase carbon monoxide is released[9], and in the particulate phase nicotine and Tar are released. Cigarette smoke contains several toxic chemicals, mutagenic substances and carcinogens including nicotine and its metabolites cotinine, radioactive polonium, benzopyrene, dimethylbenzanthracene, naphthalene, methylnaphthalene, polycyclic aromatic hydrocarbon and cadmium[10,11]. The primary content of tobacco is nicotine. Nicotine is active element responsible for tobacco addiction. The nicotine in human is metabolized to cotinine and cotinine is further metabolized to 3-hydroxycotinine (3HC)[12]. In cigarette smokers, seminal and serum levels of cotinine and 3HC appear to be similar, where as seminal cotinine levels are generally higher than serum levels[13]. While total sperm motility is negatively correlated with seminal cotinine and 3HC levels, forward sperm motility is correlated with seminal cotinine level.[13]

were excluded if there was a history of varicocele ligation, undescended testicles, drug treatment for infertility, exposure to chemical agents during the last 12 months or exposure to radiation. Sample were excluded if on Doppler examination of the scrotal testicular veins there was evidence of any reflux of blood. Note was made of cigarette smoking habits, and patients were classified as either fertile or infertile. The motility and morphology of spermatozoa were assessed according to WHO criteria

RESULTS:-

Personal Data of the study population

Personal character	Control n=81	Cases n=81
Age (year)	42	47
20-30	42	47
31-40	30	27
41-50	09	07

Have children

YES	66	30
NO	15	51

Frequency of smoking per day among cases

No. of cigarette per day	Cases	Percentage
> 10	18	22.2
10-20	27	33.3
< 20	36	44.5

Duration of smoking among cases (in year)

Year	Cases	Percentage
> 5	51	25.92%
5-15	42	51.85%
< 15	18	22.2%

MATERIAL AND METHOD:-

Sperm samples were collected from men smokers and non-smokers by masturbation in sterile container after sexual abstinence of 3-5 days at NIMS Medical college and Hospital and Evaa Hospital Jaipur. Sample

Sperm Motility and Morphology of the study population

Semen parameter	controls	cases	% difference	t value	p value
MOTILITY					
Active (million/ml)	43.3 ± 11.2	22.0 ± 16.3		9.69	p < 0.001 (H.S)
Range (min-max)	20.0-65.0	0.0-65.0			
Sluggish (million/ml)	21.0 ± 3.5	21.6 ± 9.0		0.56	p = .57 (N.S)
Range (min-max)	10.0-25.0	10.0-40.0		10.38	p < 0.001 (H.S)
Dead (million/ml)	35.8 ± 10.2	57.9 ± 16.2		10.38	p < 0.001 (H.S)
Range (min-max)	15.0-55.0	25.0-85.0			
Abnormalities	10.9 ± 6	23 ± 9.9		9.40	p < 0.0001 (H.S)
Range (min-max)	(3.0-30.0)	(12.0-40.0)			

Number of cigarette per day in relation to sperm Motility and Morphology of the cases.

Below table show that there is a successive significant decrease in

the mean number of active sperms with increasing number of smoked cigarette/ day sperm abnormalities were increased whereas sluggish sperm were decreased with the increased number of cigarette/day.

Semen parameter	Number of smoked cigarettes/day				
	>10	10-20	<20	f	p
MOTILITY					
Active(million/ml)	40.0+-18.7	20.6+-10.8	16.8+-13.3	17.66	<0.001(H.S)
Sluggish(million/ml)	23.8+-12.1	25.3+-4.8	17.8+-6.4	8.42	<0.001(H.S)
Dead(million/ml)	44.2+-18.5	54.1+-8.7	66.4+-15.7	15.079	0.001(H.S)
MORPHOLOGY					
(Abnormalities)	19.6+-5.5	29.0+-13.7	21.7+-8.6,	5.88	0.004(H.S)
All values are expressed as mean+-SD					

Duration of smoking in relation to sperm motility and morphology among cases.

Semen parameter	Duration of cigarette smoking(year)				
	>5	5-15	<15	f	p value
Motility					
Active(million/ml)	30.1+-20.5	24.3+-13.6	7.2+-5.1	13.156	P< 0.001
Sluggish(million/ml)	20.7+-8.0	23.4+-8.2	18.3+-12.1	2.086	P=0.131
Dead(million/ml)	49.1+-14.7	55.2+-13.9	74.5+-11.8	18.398	P< 0.001
Morphology					
Abnormalities	18.5+- 4.2	24.5+-11.0	24.4+-11.4	2.875	0.06

DISCUSSION :-

Smoking is an eminent risk factor for reproductive health(Kumar et al.,2014) Smoking causes reproductive hormone disorders, impairment in spermatogenesis and maturation of sperm, and compromised functioning of spermatozoa(saleh et al .,2002.) This study has shown a significant decrease in active sperm whereas the mean levels of abnormalities and dead sperm were markedly increased in cases compare to controls. These findings on semen quality are in agreement with that documented by wong et al.,(2000),kunzel et al (2007) and Hussein et al.,(2011).Nicotine in tobacco and its metabolite cotinine may lead to poor semen function and resultant infertility (Arabi and Shareghi.,2005). Cigarette smoke contains also carbon monoxide which may affect male reproduction via direct effect on the testicular function and spermatogenesis (Hanrahan et al 1996.)

On the basis of number of smoked cigarette/ day and duration of smoking, the present results showed a significant decrease in the mean number of active sperms where as the mean of dead sperms was significantly increased with increasing number of smoked cigarette/ day and smoking duration.such results were in concurrent with that address by Zhang et al.,(2000) who found significant negative correlation between sperm density, viability and forward progression with the amount and duration of cigarette smoking. Additionally, Collodel et al (2009) pointed out that the sperm motility sperm concentration and fertility index decreased and the percentage of sperm pathologic features increased as the number of cigarettes smoked daily increased.

Conclusions and Recommendations:-

Smoking has significant effect on fertility, specially sperm motility and morphology. This effect might be due to oxidative stress produced by smoking,which has devastating effects on semen parameters, thusreducing male fertility.the number of cases who had children was significantly lower than controls.Relation of semen parameters to the number of smoked cigarette/day and duration of smoking showed a significant decrease in the number of active sperms where as dead sperm was significantly increased with increasing number of smoked cigarette/day and smoking duration.Health programs should be launched on the devastating effect of smoking and benefits of quitting smoking and its positive impact on male fertility in the term of improving semen parameters.Risk of cigarette smoking on male fertility should be explained to couples interested for IVF to optimize the success rate. Exposure to passive smoking must be avoidable.therefore smokers should quit smoking for their next generation.

REFERENCES:-

- World Health Organization. Infections, pregnancies, andfertility: perspective sofpventions.Fertil steril.1987;47:964-968.[PubMed]
- Odisho AY,NangiaAK,KatzPP,SmithJF.Temporal and geospatial trendsin male factor infertility with assisted reproductive technology in the united states from 1999-2010. FertilSteril. 2014;102:469-475.[PubMed]
- Zinaman MJ,BrownCC,SelevanSG,Clegg ED. Semen quality and human fertility: a prospective study with healthy couples.J Androl.2000;21:145-153.[PubMed]
- Lewin A,GonenO,OrvietorR,SchenkerJG.Effect of smoking on concentration,motility and zona free hamster test on human sperm.Arch Androl1991;27:51-54

- ChiaSE,Lim ST, TaySK,LimST.Factor associated with male infertility: acase control study of 218 infertile and 240 fertile male. BJOG.2000;107:51-54.[PubMed]
- Kunzle R,MuellerMD,HanggiW,Birkhauser MH, Drescher H, Bersinger NA. semen quality of male smokers and non smokers in infertile couples. Fertil steril.2003;79:287-291[PubMed]
- Adelusi B,al-TwajjiriMH,alMeshariA,KangaveD,alNuaimLA,Younnus B. Correlation of smoking and coffee drinking with sperm progressive motility in infertile males.Afr J Med.MED Sci. 1998;27:47-50[PubMed]
- Sergier M,OuhilalS,Bissonnette F, BrodureJ,BleauG.Lack of association between smoking and DNA fragmentation in the spermatozoa of normal men. Hum Reprod.2000;15:1314-1321[PubMed]
- Hammond D,FongGT,Cummings KM,O' Connor RJ,GiovinoGA,McNeill A. cigarette yields and human exposure: a comparison of alternative testing regimens. Cancer epidemiol Biomarkers prev.2006;15:1495-1501.[PubMed]
- ColagarAH,JorsaraeeGA,Marzony ET. Cigarette smoking and therisk of male infertility Bio Sci.2007;10:3870-3874.[PubMed]
- Richthoff J,Elzanaty S, Rylander L, Giwerzman A. Association between tobacco exposure and reproductive parameter in adolescent males.Inj J Androl.2008;31: 31-39[PubMed]
- Zhu AZ, Zhou Q,CoxLS,AhluwaliaJS,Binowitz NL, Tyndale RF.Variation in trans-3-hydroxycytinine gluconidation does not alter the nicotine metabolite ratio or nicotine intake. PLoS one.2013;8:e70938[PMC free article][PubMed]
- PacificiR,AlteriGandiniL,Lenzi A, Pichini S, Rosa M et.al.Nicotine, cotinine and trans-3-hydroxycytinine levels in seminal plasma of smokers:effects on sperm parameters. The Drug Monit 1993;15:358-363.[PubMed]
- Kumar S; MurarkaS;Mishra V; Gautam A(2014). Environmental and lifestyle factor in deterioration of male reproductive health.Indian J Med. Res 140(suppl.1) S29-S35[PMC free articles][PubMed] [Google Scholar]
- Saleh R.A; Agrawal A; Sharma R.K; Nelson D. R; Thomas A.J; Jr(2002). Effect of cigarette smoking on level of seminal oxidative stress in infertile men: aprospectivestudy. Fertilsteril 78 491 -499 .10.1016/s0015-0282(02)03294-6[Pub Med] [CrossRef] [Google Scholar]