A Study of Sperm Morphology in Tobacco and Alcohol Users presenting with Infertility

Dushyant Singh Gaur1, Shambhavi Tripathi2, Anuradha Kusum1, Meena Harsh1 (Affiliation: 1Professor, 2Junior Resident)
Department of Pathology, Himalayan Institute of Medical Sciences, Dehradun 248016, India E-mail: dugaur2@gmail.com

Introduction
Male infertility plays a key role in conception difficulties of up to 40% infertile couples.[1] In majority, no apparent reason could be found. Impact of lifestyle and environmental factors, on reproductive health of such men has generated a lot of interest.[2] Cigarette smoking and alcohol consumption, both largely avoidable, have been observed to have a negative impact on male fertility.[2-5] Study aims to evaluate the impact of Tobacco and Alcohol use on sperm morphology of infertile male partners.

Material and Method
Prospective Observational study. Subjects: Male partners of infertile couples with Primary Infertility. Stringent selection criteria used to exclude as many known co-existing factors as possible.
The Three Study Groups, each of 100 males:
- Group A: Tobacco Smokers, who were strict non-alcohol-consumers
- Group B: Alcohol consumers, who were strict non-smokers
- Group C: Controls who were strict non-alcohol consumers and non-smokers
Informed consent was taken, as a routine, from all the cases.

Results
1. Asthenozoospermia: most frequently observed in study groups as well as controls.(Figure 1)
2. Azoospermia dominated Tobacco smokers (Group A). Teratozoospermia frequent in Alcohol consumers (Group B).(Figure1)
3. Group A (Tobacco smokers): Defects of Mid-piece and Tail: Bent & Thick Mid-piece and deformities of Tail like Coiled, Short Bent and Tail with Cytoplasmic droplet showed P-value<0.05 (Significant), Group B (Alcohol consumers): Defects of Head: Pyriform, Round, Small, Amorphous and Vacuolated Heads and Thick mid-piece showed P-value < 0.05 (Significant). (Figure 2 & 3)
4. Sperm Deformity Index of study groups A & B was statistically significant.(Fig. 4)

Discussion
- Expert opinion largely divided on whether high Teratozoospermia inversely reflects on the fertility potential of an individual. WHO now cites reference range of morphologically normal spermatozoa as low as just 4%, reflecting a declining trend in number of morphologically normal spermatozoa in general population [6]
- In Group A (Tobacco smokers), morphological deformities of Mid-piece and Tail were statistically significant (P-value < 0.05). This may translate as physical interference in active sperm motility [2, 4, 7] Toxins and reactive oxygen species (ROS) in cigarette smoke reach male reproductive system via blood and interact with seminal fluid components, causing increased viscosity, reduced seminal volume and delayed liquefaction time. This reduces sperm motility & negatively impacts sperm morphology [1-5]
- In Group B (Alcohol consumers), defects of Sperm Head showed P-value<0.05. Alcohol metabolites circulating in blood affect Leydig cells, hence reduce Testosterone levels; and interfere in hypothalamus-pituitary-gonadal (HPG) axis feedback. This reduces adequate secretion/ quantity/ potency, of luteinizing hormone & follicle stimulating hormone, hampering normal development & maturation of sperm. [4, 7]
- Sperm Deformity Index (SDI) is a sensitive tool for in vivo assessment of Teratozoospermia [10] SDI for both study groups A and B, when compared with controls (C) was <0.05 (statistically significant)(Figure 4) highlighting the negative impact of Tobacco and Alcohol consumption on sperm morphology.[1-4, 7]

Conclusion
- Lifestyle factors, Tobacco smoking and Alcohol consumption, appear to produce significant negative impact on semen quality, as compared to Non-addict population
- More defects of Sperm Tail and Mid-piece in Tobacco smokers can reduce proper motility of sperm.
- Morphological defects of Sperm Head, and probably nuclear DNA, may reduce its fertility potential.
- High Teratozoospermia may reduce fertility potential of an individual. Hence, infertile males should abstain from Tobacco and Alcohol use. Higher research needed to refine our observations

References
1. Nallier K, Sharma R, Aziz N. S Agarwal A. Significance of sperm characteristics in the evaluation of male infertility. Fertility and Sterility. 2006; 85, 629-34.

Sample Processing
Routine semen analysis as per WHO guidelines.[6] Semen Quality variables, viz. Asthenozoospermia (A), Oligozoospermia (O) and Teratozoospermia (T), were noted. Pap-stained semen smear studied for 200 spermatozoa in 100× magnification. The frequency of Morphological defects of Head, Mid-piece, Tail and Cytoplasmic droplet were tabulated. Sperm Deformity Index calculated. Data analysed for statistical significance. P-value < 0.05 = significant.
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Department of Pathology, Himalayan Institute of Medical Sciences, Dehradun 248016, India E-mail: dugaur@hims.ac.in)
Introduction Male infertility
1. Asthenozo