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SHORT COMMUNICATION

Do cigarette and alcohol affect semen analysis?

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Summary ***Objectives: There are a number of studies about the effect of cigarette and alcohol on semen parameters in the literature. There is not a consensus on the relationship between use of cigarette and alchol and semen parameters in those studies. The number of studies in which cigarette and alcohol use are evaluated together is limited. This study was aimed to analyze the effect of cigarette and/or alcohol use on semen parameters.***
Methods: In this prospective study, 762 patients who applied to an hospital urology polyclinic between January 2015 and March 2015 due to infertility, were questioned for alcohol and cigarette use in anamnesis. The remaining 356 patients were included in our study. Then, semen analysis of the patients was performed. The patients were divided into five groups according to cigarette use, into five groups according to alcohol use and into four groups according to cigarette and/or alcohol use. Significant differences were analyzed between the groups in terms of semen volume, semen concentration, total motility, forward motility and morphological (normality, head anomaly, neck anomaly, tail anomaly) values.
Results: According to cigarette use, only in group 4 (who use more than 20 package-years cigarette) semen volume was significantly lower than the control group (Mann-Whitney U, p = 0.009). There was no significant difference in any of the other parameters and groups compared with the control group (Mann-Whitney U, p > 0,05)
Conclusion:According to our study, using more than 20 package-years cigarette decreases semen volume. The reason of this result might be the fact that the threshold value, from which the effect of cigarette and alcohol use on the semen parameters has to be determined.

KEY WORDS: Alcohol, Infertility, Semen analysis, Cigarette.

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INTRODUCTION

Cigarette is a significant health problem, which is a common habit that results in early deaths (1, 2). According to data of *Turkish Anti-Smoking Association*, cigarette use rate is 40% in our country (51% in males, 25% in females) (3). The evidences which show that a number of toxic compounds might disrupt sperm quality, and thus male fertility, in both animals and human are increasing in the last 20 years (4).
According to data of World Health Organization (WHO), 1.8 million people die in a year due to alcohol use (5). Although the effects on especially liver and cardiovascular system are known, its effects on semen parameters is controversial (6-9).

METHODS

In this prospective study, 762 patients, who applied to our hospital urology polyclinic between January 2015 and March 2015 due to infertility, were questioned for alcohol and cigarette use. At least two semen analyses were requested from patients at their first application to the polyclinic as a routine analysis after medical history collection. The patients who were detected with a factor which might affect semen parameters (systemic disease, drug use, inguinal or testicular surgery history, varicocele, undescended testis, hypoplasic testis at physical examination, abnormality in serum gonadotropin, androgen and prolactin levels, and pathology in genetic analysis) were excluded from the study. The remaining 356 patients were included in the study. The patients who had 1 package-year and over cigarette use and the patients who did not ever smoke cigarette were included into the study, the patients who use less than 1 package-year level were excluded from the study. The patients whose alcohol use rate was over 1 units/3 months and the ones who do not drink alcohol were included in the study, the ones who had use rate less than 1 units/3 months were excluded from the study. In our study, all semen analyses were performed after 3-6 days of sexual abstinence. Spermiograms were analyzed by the same embryologist in the spermiogram laboratory in our in vitro fertilization center. Semen analysis were evaluated according to WHO 2010 criteria (semen volume ≥ 1,5 mL; sperm concentration ≥ 15 × 106/mL; total motility ≥ 40%, forward motility ≥ 32% and morphology ≥ 4%) (10). The ethical committee approval of the study was obtained by the Local Ethical Committee of our hospital and registered at number 29/12/2014-21/14 together with the form for informed consent form taken from patients included in the study.

Statistical analysis

The statistical relationship was analyzed by using *IBM Statistical Package for Social Sciences (SPSS, New York, USA)* Version 22.0 software programme: $p < 0,05$ values were accepted as statistically significant.

No conflict of interest declared.

Table 1.
Mean values of datas (n = 356).

	Minimum	Maximum	Mean	Std dev.
Age (year)	20	50	33.04	5.43
Volume (mL)	0.30	11.00	2.96	1.53
Concentration (x106/mL)	0,00	170,00	36.34	36.92
Total motility (%)	0.00	90.00	46.54	24.72
Progressive motility (%)	0.00	80.00	32.61	21.24
normal morphology (%)	0.00	10.00	2.47	2.25
head anomaly (%)	0.00	100	43.82	40.13
neck anomaly (%)	0.00	18	5.18	5.10
tail anomaly (%)	0.00	14	3.69	3.86

Results

When the semen parameter mean values of 356 patients who were included into the study were analyzed, the mean semen volume was determined as 2.96 mL, sperm concentration 36.34 x 106/mL, total motility 47%, forward motility 33%, anomaly of the morphology of the head 2.47%, anomaly of neck 43.82%, anomaly of the tail 3.69% (Table 1).

The patients were divided in 5 groups according to cigarette use. The patients who do not use cigarette were determined as group 0 (control) (n = 172), the patients who use cigarette less than 5 package-years were determined as group 1 (n = 39), the patients who use cigarette 5-10 package-years were determined as group 2 (n = 52), the patients who use cigarette 10-20 package-years were determined as group 3 (n = 79) and the patients who use more than 20 package-years were determined as group 4 (n = 14). The control group was statistically compared with the others respectively. Only in group 4 (who use more than 20 package-years cigarette), semen volume was significantly lower than the control group (Mann-Whitney U, p = 0.009). There was no significant difference in any of the other parameters of the other groups compared with the control group (Mann-Whitney U, p > 0.05) (Table 2).

The patients were divided in to 5 groups according to alcohol use. The patients who do not use alcohol were determined as group 0 (control) (n = 256), the patients who use alcohol 1 unit/3 months were determined as group 1 (n = 62), the patients who use alcohol 1 unit/month were determined as group 2 (n = 16), who patients who use alcohol 1 unit/week were determined as group 3 (n = 3) and the patients who use alcohol 1 unit/day were determined as group 4 (n = 19). There was no significant difference in any of the parameters and groups compared with the control group (Mann-Whitney U, p > 0,05) (Table 3).

The patients were divided in 4 groups according to cigarette and/or alcohol use. The patients who do not use cigarette and alcohol were determined as group 0 (control) (n = 139), the patients who use only cigarette were as group 1 (n = 117), the patients who use only alcohol were as group 2 (n = 33) and the patients who use both cigarette and alcohol were as group 3 (n = 67). There was no statistically significant difference between group 0 and groups 1, 2 and 3 respectively, in terms of semen parameters according to the statistical analysis of semen parameters (Mann-Whitney U, p > 0.05) (Table 4).

Discussion

There are a number of studies about the effect of alcohol on semen parameters in the literature, but there is no consensus on the relationship between the semen parameters in those studies (11-14). A full recovery was reported in

Table 2.
Mean values of semen parameters and p values according to the cigarette use groups.

		Min.	Max.	Mean	Std. dev.	p value
Group 0	Volume (mL)	0,30	11	3,14	1,66	
(n = 172)	Concentration (x106/mL)	0,00	170	38,08	37,81	
	Total motility (%)	0,00	90	46,10	24,99	
	Progressive motility (%)	0,00	80	32,94	21,67	
	Normal morphology (%)	0,00	10	2,40	2,20	
	Head anomaly (%)	0,00	89	42,50	39,99	
	Neck anomaly (%)	0,00	18	5,43	5,44	
	Tail anomaly (%)	0,00	14	3,80	4,13	
Group 1	Volume (mL)	0,50	8	3,05	1,59	0,658
(n = 39)	Concentration (x106/mL)	0,00	168	42,18	42,10	0,683
	Total motility (%)	0,00	85	48,84	25,58	0,531
	Progressive motility (%)	0,00	75	34,87	21,35	0,909
	Normal morphology (%)	0,00	9	2,97	2,61	0,230
	Head anomaly (%)	0,00	100	49,20	42,02	0,511
	Neck anomaly (%)	0,00	12	4,86	4,91	0,705
	Tail anomaly (%)	0,00	8	3,26	3,39	0,674
Group 2	Volume (mL)	0,50	7	2,92	1,32	0,752
(n = 52)	Concentration (x106/mL)	0,00	110	30,84	33,10	0,353
	Total motility (%)	0,00	80	47,65	23,40	0,852
	Progressive motility (%)	0,00	65	30,48	20,47	0,447
	Normal morphology (%)	0,00	7	2,40	2,27	0,997
	Head anomaly (%)	0,00	91	36,30	41,27	0,729
	Neck anomaly (%)	0,00	12	3,85	4,64	0,258
	Tail anomaly (%)	0,00	11	2,90	3,59	0,389
Group 3	Volume (mL)	0,30	7	2,70	1,35	0,068
(n = 79)	Concentration (x106/mL)	0,00	120	32,21	35,05	0,326
	Total motility (%)	0,00	80	45,21	24,84	0,766
	Progressive motility (%)	0,00	70	31,37	20,73	0,548
	Normal morphology (%)	0,00	8	2,22	2,02	0,663
	Head anomaly (%)	0,00	91	43,71	40,79	0,630
	Neck anomaly (%)	0,00	13	4,82	4,72	0,549
	Tail anomaly (%)	0,00	11	3,74	3,79	0,986
Group 4	Volume (mL)	1,1	3,4	2,08	0,79	**0,009**
(n = 14)	Concentration (x106/mL)	0,00	112	42,32	34,03	0,484
	Total motility (%)	0,00	80	48,92	25,88	0,561
	Progressive motility (%)	0,00	65	37,14	22,93	0,416
	Normal morphology (%)	0,00	10	3,50	2,68	0,109
	Head anomaly (%)	0,00	82	67,71	30,01	0,173
	Neck anomaly (%)	0,00	13	9	4,20	0,76
	Tail anomaly (%)	0,00	11	5,57	3,40	0,217

Table 3.
Mean values of semen parameters and p values according to the alcohol use groups.

		Min.	Max.	Mean	Std. dev.	p value
Group 0	Volume (mL)	0,30	11,00	2,94	1,51	
(n = 256)	Concentration (x106/mL)	0,00	170	37,51	38,68	
	Total motility (%)	0,00	90,00	46,26	25,21	
	Progressive motility (%)	0,00	80,00	32,79	21,72	
	Normal morphology (%)	0,00	10,00	2,49	2,32	
	Head anomaly (%)	0,00	100	43,04	40,34	
	Neck anomaly (%)	0,00	18	4,94	5,00	
	Tail anomaly (%)	0,00	14,00	3,60	3,87	
Group 1	Volume (mL)	0,30	8,00	2,96	1,56	0,865
(n = 62)	Concentration (x106/mL)	0,00	110	30,77	31,68	0,400
	Total motility (%)	0,00	85,00	48,14	22,56	0,834
	Progressive motility (%)	0,00	75,00	32,01	19,57	0,748
	Normal morphology (%)	0,00	7,0	2,40	2,16	0,900
	Head anomaly (%)	0,00	91,00	46,58	40,35	0,812
	Neck anomaly (%)	0,00	14,00	5,91	5,53	0,352
	Tail anomaly (%)	0,00	11,00	3,83	3,80	0,769
Group 2	Volume (mL)	1,00	7,50	3,26	1,73	0,427
(n = 16)	Concentration (x106/mL)	0,00	110,00	33,15	30,12	0,971
	Total motility (%)	0,00	85,00	48,43	23,57	0,949
	Progressive motility (%)	0,00	70,00	32,37	21,04	0,890
	Normal morphology (%)	0,00	6,00	2,43	2,15	0,988
	Head anomaly (%)	0,00	86,00	53,50	41,56	0,568
	Neck anomaly (%)	0,00	12,00	6,66	5,35	0,346
	Tail anomaly (%)	0,00	7,00	4,00	3,46	0,727
Group 3	Volume (mL)	2,00	3,50	2,83	0,76	0,867
(n = 3)	Concentration (x106/mL)	0,00	70,00	27,33	37,43	0,622
	Total motility (%)	0,00	75,00	40,00	37,74	0,797
	Progressive motility (%)	0,00	50,00	26,66	25,16	0,618
	Normal morphology (%)	0,00	3,00	1,33	1,52	0,431
	Head anomaly (%)	0,00	0,00	0,00	-	0,331
	Neck anomaly (%)	0,00	0,00	0,00	-	0,337
	Tail anomaly (%)	0,00	0,00	0,00	-	0,337
Group 4	Volume (mL)	1,10	8,50	3,02	1,73	0,948
(n = 19)	Concentration (x106/mL)	0,00	100	38,72	34,72	0,758
	Total motility (%)	0,00	80,00	44,57	26,01	0,788
	Progressive motility (%)	0,00	65,00	33,26	21,72	0,862
	Normal morphology (%)	0,00	5,00	2,63	1,83	0,579
	Head anomaly (%)	0,00	82,00	44,57	41,75	0,799
	Neck anomaly (%)	0,00	13,00	6,00	5,74	0,507
	Tail anomaly (%)	0,00	11,00	4,85	4,91	0,440

sperm parameters in only 3 months after giving up the alcohol in a 44-year old patient who was an alcohol addict in a case study conducted in 2010 (15). We have not detected any statistically significant relationship between the alcohol use and semen parameters in our study.
Li et al. determined that cigarette affects all the sperm parameters negatively in their meta-analysis but effects on semen volume and density display geographical difference (16). *Sergeri et al.* reported that cigarette does not affect semen parameters in their study (17). When the groups who use cigarette and who do not use cigarette were compared in our study, we have found a statistically significant difference between the control group and group 4 (who use more than 20 package-years cigarette) in relation to semen volume, but there was no significant difference in any of the parameters and groups compared with the control group.

Although the number of studies in which cigarette and alcohol use were evaluated together, effect of use of both were not shown on the semen parameters (18, 19). In our study, the patients who do not use cigarette and alcohol were compared to patients who use both of them or only one of them respectively and no statistically significant difference was detected in any of semen parameters among the groups.
In conclusion, a statistical significance was not determined between the ones who do not use neither cigarette nor alcohol and the ones who use cigarette and/or alcohol in terms of semen parameters (semen volume, sperm concentration, total motility, forward motility, morphology). According to our study, using more than 20 package-years cigarette decreases semen volume. The reason of this result might be the threshold value, from which the effect of cigarette and alcohol use on the semen parameters become to be evident.
Although no relationship was determined in our study, except the one between semen volume and chronic smoking, in consideration of the publications about the negative relationship of cigarette and alcohol on the reproductive organs and fertility, young individuals in the reproductive age should be careful about cigarette and alcohol use.

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Table 4.
Mean values of semen parameters and p values according to the cigarette and/or alcohol use groups.

		Min.	Max.	Mean	Std. dev.	p value
Group 0	Volume (mL)	0,30	11,00	3,10	1,67	
(n = 139)	Concentration (x106/mL)	0,00	170,00	38,64	38,90	
	Total motility (%)	0,00	90,00	44,81	25,11	
	Progressive motility (%)	0,00	80,00	31,83	21,99	
	Normal morphology (%)	0,00	10,00	2,41	2,24	
	Head anomaly (%)	0,00	89,00	41,72	40,14	
	Neck anomaly (%)	0,00	18,00	5,18	5,31	
	Tail anomaly (%)	0,00	14,00	3,83	4,25	
Group 1	Volume (mL)	0,30	7,00	2,74	1,27	0,170
(n = 117)	Concentration (x106/mL)	0,00	168,00	36,84	38,57	0,740
	Total motility (%)	0,00	85,00	47,99	25,33	0,228
	Progressive motility (%)	0,00	75,00	33,94	21,43	0,549
	Normal morphology (%)	0,00	10,00	2,58	2,41	0,615
	Head anomaly (%)	0,00	100,00	44,69	40,95	0,536
	Neck anomaly (%)	0,00	12,00	4,65	4,62	0,619
	Tail anomaly (%)	0,00	10,00	3,32	3,36	0,628
Group 2	Volume (mL)	1,00	8,50	3,31	1,65	0,303
(n = 33)	Concentration (x106/mL)	0,00	110,00	35,76	33,32	0,856
	Total motility (%)	0,00	85,00	51,57	24,06	0,127
	Progressive motility (%)	0,00	70,00	37,63	19,89	0,186
	Normal morphology (%)	0,00	7,00	2,36	2,08	0,990
	Head anomaly (%)	0,00	86,00	47,30	40,83	0,855
	Neck anomaly (%)	0,00	14,00	7,00	6,27	0,249
	Tail anomaly (%)	0,00	8,00	3,60	3,47	0,951
Group 3	Volume (mL)	0,30	8,00	2,87	1,54	0,376
(n = 67)	Concentration (x106/mL)	0,00	110,00	30.98	31.21	0,404
	Total motility (%)	0,00	85,00	45,14	23,14	0,854
	Progressive motility (%)	0,00	75,00	29,44	19,74	0,429
	Normal morphology (%)	0,00	7,00	2,44	2,08	0,779
	Head anomaly (%)	0,00	91,00	45,64	40,37	0,655
	Neck anomaly (%)	0,00	13,00	5,50	5,13	0,702
	Tail anomaly (%)	0,00	11,00	4,07	4,08	0,769

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