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A study on semen profile in bicycle cyclists

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Abstract

The main impetus of the current study is to evaluate the semen analysis of bicycle cyclists and healthy controls in Bijapur.

Methods: After 2-3 days of sexual abstinence, semen samples were collected from young bicycle operators. Semen samples were also collected from the control group, consisting of young men who were not bicycle operators. After the liquefaction of semen sample (after 30 minutes) measurements of volume, concentration, total motility, and progressive motility were done, sperm analysis was done under light microscope.

Results: Semen parameters: volume (1.65±0.17 mL vs. 3.60±0.16 mL; p = 0.0001), concentration (26.31±4.29 x 106/mL vs. 53.95±5.93 x 104/ mL; p = 0.02), total motility (54.98%±8.22% vs. 82.43%±6.97%; p = 0.03), progressive motility (21.57%±3.35% vs. 58.69%±4.82%; p = 0.004), morphology (6.98%±3.23% vs. 18.73%±2.32%; p = 0.006) were notably reduced in the bicycle cyclists in contrast to the healthy controls.

Conclusion: Bicycle cyclists had reduced semen volume, concentration, total motility, progressive motility and high concentration of anamolous shaped spermatocytes in comparison to healthy controls.

Keywords: Semen parameters, Bicycle cyclists, Sperm motility, Sperm morphology, Semen volume

Introduction

Exercise has numerous health benefits like reduced risk of obesity, diabetes mellitus, cardiovascular disease and even some cancers[2]. There is no elusive study regarding the association between exercise and male fertility. There is an aassociation between bicycle riding and genitourinary problems[7,8]. Bicycle riding results in poor semen quality in accordance to reduced fertility[2]. Male factors contribute around thirty percentage and female factors contribute to about thirty percentage of infertility causes and remaining thirty percentage from both the partners and ten percentage from the unknown causes[5]. Deficient sperm production is seen in 40-90% cases due to factors related to life style, occupation and environment and occupation. Weekly amount of cycling is inversly correlated with sperm morphology[10]. Strenous cycling causes high increase in body temperature which effects sperm production and semen quality. Cyclists are exposed to mechanical compression and irritation of the testes during cycling. Thus, the effects of different modes of exercise on spermatogenesis may differ (Gebreegziabher et al, 2004). It has been clearly documented that some factors associated with the stress of intense exercise might alter spermatogenesis, such as decrease in body weight and body fat content (Saris et al, 1989), inadequate caloric intake (Blank and Desjardins, 1984), and increases in intrascrotal temperature and testicular microtrauma during exercise (Dewasness et al, 1991). The main impetus of current study is to find the interrelation between the cycling and status of sperm among bicycle cyclists.

Materials and Methods

38 young men aged 18-42 years who had been bicycle cyclists for greater than two years in Bijapur District were recruited. Non cyclists control groups includes 22 healthy volunteers aged 18- 42 years Informed consent were taken from all the participants providing semen samples.

All participants signed an informed consent approved by the Ethics Committee.

Inclusion criteria: To be eligible to participate in the study, subjects were required to meet the following criteria: 1) 18–42 yr of age; 2) in good health, as determined by a normal physical examination and routine laboratory tests within the previous year; 3) no history of chronic disease, including reproductive disorders; 4) no history of use of medications that could alter the H-P-G axis, such as anabolic steroids; 5) regular eating patterns and no history of depressive illness.

Even the baseline questionnaire included questions about medical history, lifestyle, behavioral factors, and exercise questions phrased as follows: 1) Do you regularly do cycling? 2) If so, as an adult, how many years have you engaged in regular cycling? 3) How many hours per week do you cycling? 4) How many months per year do you do cycling?

Exclusion criteria: Men of age lesser than 18 years of age and elder than 42 years of age.

- Obese
- Diabetics
- Smokers

Table 1: Energy and nutrient intake of the participants

	Controls Mean±SD	Cyclists Mean±SD	P
Energy intake (kcal)	2,295.04±1,552.13	2,320.38±995.51	0.426
Resting energy expenditure (kcal)	1,681.31±251.77	1,547.05±122.88	0.042
Total energy expenditure (kcal)	2,100.97±334.21	2,382.47±231.46	0.004
Carbohydr-ates[a] (g)	250.09±236.81	194.95±67.02	0.854
Simple sugars[a] (g)	147.56±223.85	100.89±36.85	0.200
Polysaccharides (g)	97.64±60.13	93.01±49.71	0.760
Polysacch-arides (g)	97.64±60.13	93.01±49.71	0.760
Total fiber[a] (g)	21.69±27.35	14.06±11.55	0.647
Lipids (g)	96.16±69.16	112.47±82.15	0.360
Monounsaturated fatty acids (g)	37.03±27.65	43.48±34.01	0.464
Polyunsaturated fatty acids (g)	16.15±12.73	18.07±10.81	0.502
Saturated fatty acids (g)	33.02±27.06	43.14±36.04	0.285
Cholesterol (mg)	468.56±333.76	461.89±263.75	0.848
Proteins (g)	102.32±65.19	127.18±57.34	0.197
Animal Protein (g)	122.88±150.63	104.49±56.98	0.482
Vegetable Protein [a] (g)	22.83±14.95	25.95±25.39	1.001
Water (ml)	1,983.09±718.29	2,018.64±639.82	0.442
Calcium (g)	680.88±453.16	750.10±393.65	0.368
Phosphorus (mg)	1,104.17±642.27	1,690.91±678.69	0.011
Sodium (mg)	3,354.34±2,312.68	3,441.95±2,405.43	0.975
Potassium[a] (mg)	3,363.24±2,612.51	2,763.89±913.49	0.713
Iron[a] (mg)	40.64±81.73	15.97±12.42	0.736
Zinc (mg)	11.46±10.37	11.48±4.88	0.258
Magnesium (mg)	251.05±177.65	312.54±155.75	0.160
Vitamin B1 (mg)	1.35±0.91	1.75±0.72	0.040
Vitamin B2[a] (mg)	2.16±2.43	2.15±1.16	0.112
Vitamin B3 (mg)	42.61±46.88	30.01±15.08	0.806
Vitamin B6 (mg)	2.36±1.88	2.66±0.98	0.092
Vitamin B9[a] (µg)	265.72±334.46	245.24±114.78	0.258
Vitamin B12 (µg)	7.14±10.04	7.23±8.61	0.570
Vitamin C (mg)	95.51±80.63	80.28±92.06	0.314
Vitamin A (µg)	625.16±528.06	550.93±494.86	0.523
Retinoids (µg)	252.85±199.93	276.83±277.44	0.968
Carotenoids[a] (µg)	1,576.32±1,625.72	1,642.58±2,047.72	0.410
Vitamin D[a] (µg)	2.56±2.43	3.90±7.13	0.948
Vitamin E[a] (µg)	9.76±13.50	7.56±6.52	0.714

Collection of semen sample

After 2-3 days of sexual abstinence, semen samples were collected from participants through manstrubation. Semen sample analysis was done in conformity to the method described by the World Health Organization (WHO)[3]. Seminal volume was measured by graduate pipette, accurate to within 0.1mL. Sperm concentration was determined after appropriate dilution by haemocytometer i.e. improved Neubauer counting chamber. Direct observation under microscope (400X) used to assess sperm total motility and the same to estimate progressive motility. Clean slides consisting of smears, air dried and staining was done with Hemacolor (Merck, Darmstadt, Germany). In accordance with Tygerberg strict criteria, morphology under light microscope (oil immersion) was assessed.

Statistical analysis: Prism 4 statistical programme (GraphPad, USA) to analyse the data.
All data expressed as mean±SEM.
Student's t-test and one-way ANOVA for statistical analysis.
Distinction made statistically significant if $p < 0.05$.

Results

Participant characteristics

Bicycle cyclists: mean age: 23±0.6 years,
Non cyclists controls: 21±0.7 years (Table 1);

Table 1: Characteristics of Cyclists and Non-Cyclists

Characteristic	Non-cyclists	Cyclists
Age (years)	21±0.7	23±0.6
Number of participants	22	38
Number of years cycled	0	2.6
Body mass index (kg/m2)	20.71±2.45	19.65±1.86

Semen analysis: Semen parameters (volume, concentration, total motility, progressive motility, percent normal morphology) were significantly reduced in the cyclist group compared to the non-cyclist group ($p < 0.05$), as indicated in Table 2.

Tables 2: Semen Parameters of Cyclists and Non-Cyclists

Semen parameter	Non-cyclists	Cyclists	p-value
Volume (mL)	3.60±0.16	1.65±0.17	0.0001
Concentration (106/mL)	53.95±5.93	26.31±4.33	0.02
Total motility	82.43%±6.97%	54.98%±8.22%	0.03
Progressive motility	58.69%±4.82%	21.57%±3.35%	0.004
Normal morphology	18.73%±2.32%	6.89%±3.23%	0.006

Discussion

Few studies have analysed the effect of exercise with semen quality and these studies have limited to one or two varities of activity. Operating a bicycle reduces the semen volume, its concentration, progressive motility, total motility and percentage of normal morphology (i.e. in cycling groups). This effect is mainly because of increased scrotal temperature[10]. Impairment in the function of prostate, seminal vesicles and bulbourethral glands is seen in cycling groups. Reactive oxygen species influences adversely the seminal plasma and spermatozoa. These assessments are mandatory to prevent their generation mitigating their effects through antioxidant supplementation, etc.[9,10]. The current study has not examined the hormonal assay of the involved cyclists which is the limitation of the study. The various complex process involving the regulation of follicle stimulating hormone, luteinizing hormone, testosterone, thyroid hormones have not yet adequately studied to know the involvement of these in alteration of semen quality. There is a negative effect on reproductive health and this must be informed to bicycle operators.

Conclusion

Operating a bicycle taxi results in reduction of semen volume, concentration, total motility, progressive motility, and percent normal morphology. Cycling causes increased scrotal temperature with time and results in impaired semen quality. They should be informed about cycling and its negative effects on their reproductive health.

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