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ORIGINAL ARTICLE

Is There A Correlation Between Testicular Torsion in Children and the Climate Factors?

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Abstract

Introduction: Although the diagnosis and treatment of testicular torsion has been standardized today, its etiology is still controversial. There are various opinions regarding the challenges and risk factors of testicular torsion. Of these views, the seasons and climates are controversial on testicular torsion. In our study, we have aimed to understand whether climatic factors such as air temperature, relative humidity and atmospheric pressure change during the development of testicular torsion in our study.

Methods: Patients aged 0–18 years who were diagnosed with testicular torsion who were operated on between January 1, 2010 and December 31, 2019 in Ümraniye Training and Research Hospital were included in the study. While evaluating the study data, the conformity of the parameters to the normal distribution was evaluated with the Shapiro–Wilks test, and the comparison of the quantitative data showing normal distribution as well as descriptive statistical methods was evaluated with the Paired Samples t-test.

Results: A total of 200 children were operated for testicular torsion. 27% of the children were diagnosed with testicular torsion in spring, 20.5% in summer, 27% in autumn, and 25.5% in winter. There is no statistically significant difference between the air temperature, relative humidity and atmospheric pressure values on the day of admission to the hospital and the values of the 3 days and monthly average before the admission.

Discussion and Conclusion: Although there are contradictory publications on the development of testicular torsion on climatic factors and seasons, it is thought that the change in meteorological data is not a risk factor for the development of testicular torsion.

Keywords: Child; climate; spermatic cord torsion; testis.

Testicular torsion is a pathology that requires urgent intervention, in which the testicular and spermatic cords rotate abnormally around their axis, and the venous and then arterial blood flow of the testicles is impaired. Disruption of the arterial flow of the testicles can cause testicular ischemia. If testicular ischemia is not treated in time, it may result in necrosis[1].

The annual incidence of testicular torsion in males under 18 years old is 3.8/100.000, and it constitutes approximately 10–15% of the acute scrotum in children. In addition, the

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rate of orchiectomy in children operated for testicular torsion is 42%[2-4]. The age distribution of testicular torsion has two peaks: Neonatal and adolescence. Extravaginal torsion in which the processus vaginalis is torsioned together with the testicles, the cord and its elements occurs in the neonatal period, while intravaginal torsion is mostly seen in the tunica vaginalis in the adult and adolescence period[5,6].

Although the diagnosis and treatment of testicular torsion has been already standardized, its etiology is still controversial. There are various opinions about the occurrence and risk factors of testicular torsion. Testicular torsion usually occurs because of bell-clapper testicular deformity, in which the testicle can move freely within the tunica vaginalis[7]. In addition, increased testicular volume associated with puberty, a history of cryptorchidism, the presence of testicular tumors, the presence of testes with larger horizontal axis and long intrascrotal spermatic cords, intense exercise, testicular trauma and even sexual dreams in patients increase the risk of testicular torsion[8-10]. On the other hand, the effects of seasons and climatic factors on the development of testicular torsion are controversial[11]. We have aimed to understand whether climatic factors such as air temperature, relative humidity, and atmospheric pressure change during the development of testicular torsion in our study.

Materials and Methods

Patients aged 0–18 years who had an operation in Ümraniye Training and Research Hospital (ÜEAH) between January 1, 2010 and December 31, 2019 and diagnosed with testicular torsion were included in the study. The demographic characteristics of the patients were taken from the hospital automation system and analyzed retrospectively. The distribution of the patients was evaluated according to the seasons and months.

Meteorological data were obtained from the Istanbul Meteorology 1st Regional Directorate. Meteorological data of each case on admission to the hospital (G0), 3 days before admission (G1, G2, G3), average of the past 3 days before admission (GM) and monthly average (M) were recorded. Then, these data were marked and recorded as CG0, CG1, CG2, CG3, CGM, and CM for air temperature; HG0, HG1, HG2, HG3, HGM, and HM for relative humidity; PG0, PG1, PG2, PG3, PGM, and PM for atmospheric pressure. In meteorological data, temperature was recorded in celsius (°C), humidity in percent (%), atmospheric pressure in hectopascal.

The recorded temperature CG0 data on the day of admission to the hospital were compared with the CG1, CG2, CG3, CGM, and CM data. In addition, the CG1, CG2, CG3 temperature data were compared with the CM data. The recorded relative humidity HG0 data on the day of admission to the hospital were compared with the HG1, HG2, HG3, HGM, and HM data. In addition, the HG1, HG2, and HG3 relative humidity data were compared with the HM data.

The recorded atmospheric pressure PG0 data recorded on the day of admission to the hospital were compared with the PG1, PG2, PG3, PGM, and PM data. In addition, PG1, PG2, and PG3 atmospheric pressure data were compared with the PM data. IBM SPSS Statistics 22 (IBM SPSS, Turkey) program was used for statistical analysis, while evaluating the findings obtained in the study. The conformity of the parameters to the normal distribution was evaluated with the Shapiro–Wilks test in evaluating the study data. Furthermore, while evaluating the study data, Paired Samples t-test was used to compare the quantitative data with normal distribution as well as descriptive statistical methods (mean, standard deviation, frequency). Significance was evaluated at the $p<0.05$ level.

Our study was accepted by the ÜEAH ethics committee and was conducted in accordance with the Declaration of Helsinki.

Findings

The study was conducted between January 1, 2010 and December 31, 2019 with a total of 200 children under the age of 18. 7.5% of the children in January, 7% in February, 11% in March, 11.5% in April, 4.5% in May, 10.5% in June, 4% in July, 6% in August, 9% in September, 8.5% in October, 9.5% in November, and 11% in December were diagnosed with testicular torsion (Fig. 1).

Testicular torsion was diagnosed in 27% of the children in spring, 20.5% in summer, 27% in autumn, and 25.5% in winter (Fig. 2).

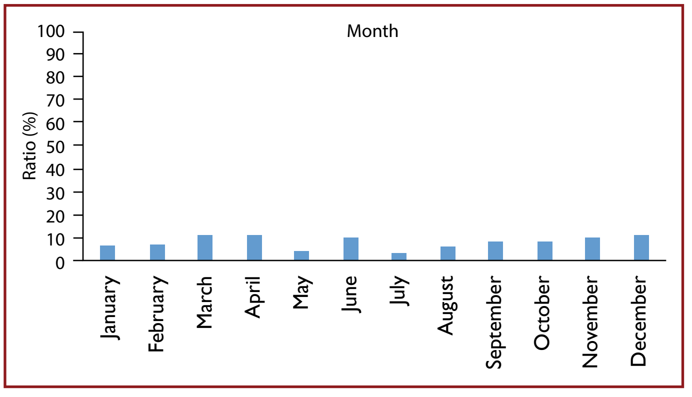

Figure 1. Distribution of patients by months.

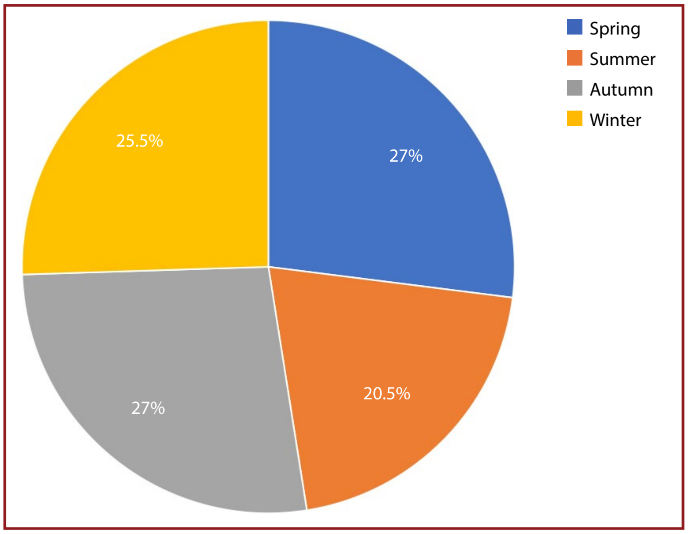

Figure 2. Distribution of patients by seasons.

There was no statistically significant difference between CG0 and CG1, CG2, CG3, CGM, and CM air temperature values on the day of admission to the hospital (p>0.05). In addition, there is no statistically significant difference between the monthly average air temperature CM and CG1, CG2, CG3 values (p>0.05) (Table 1). There was no statistically significant difference between the relative humidity values of HG0 and HG1, HG2, HG3, HGM, and HM on the day of admission to the hospital (p>0.05). In addition, there is no statistically significant difference between monthly relative humidity average HM and HG1, HG2, HG3 values (p>0.05) (Table 2).

Table 1. Evaluation of the relationship between the air temperature levels on the day of admission to the hospital, 1 day before, 2 days before, 3 days before, average air temperature level of last 3 days and monthly average air temperature level

Temperature	Min-Max	Average±SD
Admission (CG0)	2.8–28.4	15.45±6.9
1 day before (CG1)	0.3–27.9	15.57±6.96
2 day before (CG2)	−1.1–27.6	15.64±7.02
3 day before (CG3)	−2.5–28	15.68±7.13
Last 3 days (CGM)	−1.03–27.47	15.63±6.91
Monthly (CM)	4.2–26.9	15.48±6.56
CG0-CG1p		0.400
CG0-CG2p		0.334
CG0-CG3p		0.324
CG0-CGMp		0.286
CG0-CMp		0.874
CM-CG1p		0.636
CM-CG2p		0.407
CM-CG3p		0.310

Paired samples t-test.

There was no statistically significant difference between the atmospheric pressure value PG0 and PG1, PG2, PG3, PGM, and PM atmospheric pressure values on the day of admission to the hospital (p>0.05). In addition, there is no statistically significant difference between monthly average atmospheric pressure PM and PG1, PG2, PG3 values (p>0.05) (Table 3).

Table 2. Evaluation of the relationship between the relative humidity levels on the day of admission to the hospital, 1 day before, 2 days before, 3 days before, average relative humidity level of last 3 days and monthly average air temperature level

Humidity	Min-Max	Average±SD
Admission (HG0)	41.4–93.6	69.65±10.86
1 day before (HG1)	43.8–94	70.14±10.94
2 days before (HG2)	48.1–94.5	70.95±10.04
3 days before (HG3)	42.5–95.5	70.12±10.18
Last 3 days (HGM)	50.13–94.27	70.4±8.68
Monthly (HM)	57.9–92.9	70.89±6.04
HG0-HG1p		0.440
HG0-HG2p		0.089
HG0-HG2p		0.595
HG0-HGMp		0.250
HG0-HMp		0.069
HM-HG1p		0.273
HM-HG2p		0.918
HM-HG3p		0.220

Paired samples t-test.

Table 3. Evaluation of the relationship between the atmospheric pressure levels on the day of admission to the hospital, 1 day before, 2 days before, 3 days before, average atmospheric pressure level of last 3 days and monthly atmospheric pressure level

Pressure	Min-Max	Average±SD
Admission (PG0)	996–1029.2	1013.94±5.84
1 day before (PG1)	999.2–1027.8	1013.69±6.27
2 days before (PG2)	999.4–1028.6	1013.53±5.92
3 days before (PG3)	998.9–1029.7	1013.43±6.16
Last 3 days (PGM)	1000.53–1027.1	1013.55±5.33
Monthly (PM)	1006.9–1026.9	1013.85±3.54
PG0-PG1p		0.422
PG0-PG2p		0.343
PG0-PG3p		0.317
PG0-PGM p		0.289
PG0-PMp		0.797
PM-P1p		0.685
PM-P2p		0.389
PM-P3p		0.269

Paired samples t-test.

Discussion

Testicular torsion is a condition that, if not treated urgently, can lead to testicular loss and therefore a decrease in hormonal function and sperm count. The most important factor determining this morbidity is the time until surgical intervention and the degree of torsion[12,13].

Although the diagnosis and treatment are usually simple, its etiology is still controversial[14]. Although risk factors such as Bell-clapper deformity, trauma, cryptorchidism, tumor, and cold weather have been defined, many cases occur in the absence of these risk factors[15]. Similarly, in some studies, it has been shown that only 4%-8% of testicular torsion cases occur due to trauma, and the remaining majority occur without any defined factor[8,16]. Although testicular torsion usually occurs in the absence of defined risk factors, studies on the etiology continue. There are publications showing that environmental factors, especially seasonal changes and air temperature, are both effective and ineffective on testicular torsion[11,17].

Studies have generally focused on temperature. As is known, daily evaluations in the atmosphere are made over heat, humidity and pressure. In our literature review, there is no study that deals with these parameters together. We evaluated the climate effect on torsion from a wider perspective by including relative humidity and atmospheric pressure in addition to air temperature in our study.

Again, the studies were conducted with the values of the day when testicular torsion developed. It has been suggested that there may be differences in meteorological data between the day that developed torsion and the previous days, and this difference, such as other climate factors, may be a risk factor for the development of torsion. Based on this idea, the meteorological data of the patient on the day of admission to the hospital were compared with the data of 3 days before the admission and of the month of admission, and it was evaluated whether there was a difference between the data in the development of testicular torsion.

Karakan et al.[18] suggested that the prevalence of testicular torsion does not change according to the seasons, but they reported that it might be directly proportional to the air temperature and the incidence of torsion increases especially below 15°C. Ekici et al.,[19] on the other hand, suggested that seasonal weather changes may be an initiating factor for testicular torsion. In addition, many studies show that the incidence of testicular torsion is significantly related to seasonality and ambient temperature[15,17,20-26]. However, researchers who do not think that meteorological data and seasons are risk factors for torsion in their studies have opposed this relationship[27]. All of the studies that associate air temperature and seasons with torsion; the study suggests that cold air initiates torsion by causing reflex contraction of the testicular capsule, dartos and cremaster muscles. In fact, supporting this, Bingöl et al.[28] reported that cold air in vitro might be a risk factor for testicular torsion with hyperactive cremesteric reflex theory. However, in our study, no relationship was found between the seasons and testicular torsion, and there was no statistical data showing that torsion is more common in cold seasons. Tt was reported that torsion did not differ according to seasons and air temperature in four studies similar to our finding[7,8,15,29].

In our study, there was no statistically significant difference between the air temperature on the day of admission to the hospital, the air temperatures of the 3 days before the admission and the monthly average air temperature. Although we think that temperature changes may affect testicular torsion rather than the temperature being below a certain level when the study was planned, our study did not find a statistically significant result in this direction. Therefore, we think that testicular torsion occurs without air temperature change and that the different results of the publications on the effect of air temperature on testicular torsion cannot be explained by temperature change.

Srinivasan et al.[17] stated that decreasing atmospheric temperature and humidity increase the incidence of testicular torsion. It has also been suggested by some authors that not only temperature but also other climatic factors such as humidity may play a role in the development of torsion[25]. Due to the low relative humidity in the body, evaporative water loss increases and causes heat loss. This lost latent heat may cause tremor in the muscles by causing a feeling of coldness, and it is suggested that tremor in the muscles may initiate torsion by causing reflex retraction of the testicle[21]. Although there are many publications on low temperature, there are few studies suggesting that low relative humidity can cause torsion. In these studies, it is suggested that low relative humidity, similar to temperature, may be a risk factor for torsion[17,21]. In our study, we evaluated whether moisture changes have an effect on the development of torsion. In our study, there was no statistically significant difference between the relative humidity of the patient on the day of admission to the hospital, the relative humidity of the 3 days before the admission, and the monthly average relative humidity, similar to the temperature. In addition, there was no significant difference between the relative humidity values of the 3 days before the application and the monthly average relative humidity value. In our study, we observed that there was no moisture change while testicular torsion developed. Therefore, we think that testicular torsion occurs without a change in relative humidity.

Apart from temperature and humidity, one of the climatic factors is atmospheric pressure. There are studies on the effects of temperature and humidity on torsion. However, there is no study in the literature on atmospheric pressure. Conflicting publications about the effect of seasonal changes on testicular torsion made us think that this atmospheric pressure change, which has not been studied before, may cause different results. In our study, no statistically significant difference was found between the patient's atmospheric pressure value on the day of admission to the hospital and the atmospheric pressure values of the 3 days before admission and the monthly mean atmospheric pressure value. In addition, there was no significant difference between the atmospheric pressure values of the 3 days before the application and the monthly average atmospheric pressure value. Thus, we think that there is no atmospheric pressure change during the development of testicular torsion and that the difference in their publications about seasonal changes is not due to atmospheric pressure changes.

Conclusion

As a result, no change was detected in temperature, relative humidity and atmospheric pressure values from meteorological data during the development of testicular torsion. Although there are conflicting publications on the development of testicular torsion by climatic factors and seasons, we think that the change in meteorological data is not a risk factor for the development of testicular torsion.

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Conflict of Interest: None declared.

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