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# FACTORS AFFECTING THE FORMATION OF UNDESCENDED TESTIS INCLUDING MATERNAL NUTRITIONAL HABITS

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## ABSTRACT

**Aim:** The reasons affecting the development of undescended testicles remain unclear.We aimed to investigate the factors affecting the formation of undescended testis and especially the relationship between maternal nutrition and undescended testis formation.

**Methods:** This was a descriptive study. Mothers of term newborns with cryptorchidism and mothers who gave birth to a healthy male baby in the same period were visited in the obstetrics units of the hospital and were surveyed with questions a patient form and a diet form. Fifty-one types of foods that mothers consume during pregnancy were questioned.

**Results:** Cryptorchidism was more common in babies born to young mothers and/or fathers (p= 0.013 and p= 0.029 respectively). Cryptorchidism was more common in babies with low birth weight. A higher rate of cryptorchidism was observed in infants with high body temperature measurements (p<0.001). The rate of giving birth to babies with cryptorchidism was lower in mothers who consumed more dried foods (p=0.001).

**Conclusion:** Increased temperature of the infants was an important risk for cryptorchidism. The reasons that will cause fever changes in the infants should be carefully considered in the pregnancy and the necessary interventions should be made. Consumption of dried foods and higher child birth weight may be protective against cryptorchidism. It suggests that high nutritional and caloric values in dried foods may contribute positively to the development of the intrauterine fetus and show that it can be a useful tool in preventing low birth weight, which is one of the risk factors. Maternal nutrition may be one of the effective causes of cryptorchidism development in infants.

**Keywords:**Driedfood, low birth weight,paternalage, temperature, undescended testis

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## INTRODUCTION

Cryptorchidism is a common disease among childhood diseases. While cryptorchidism is seen at a rate of 1.0-4.6% in term babies, it can be observed in a wide range of rates such as 1.1-45% in preterm babies. After spontaneous descent in the first months of life, the incidence of undescended testes in one-year-old term babies regresses to 1%[1].

The key factors involved in the formation of cryptorchidism still remain elusive. It is assumed that the descent of the testicles occurs in two phases controlled by hormones. However, the reasons and mechanisms in the formation of the cryptorchidism are still not clearly explained[2].

Today, the causes and risk factors contributing to the development of cryptorchidism and the effects of maternal nutrition, lifestyle, and occupational and environmental exposures on this development are discussed as important issues in research[3-5]. In this study, we aimed to investigate the factors affecting the formation of cryptorchidism and especially the relationship between maternal nutrition and cryptorchidism formation.

## Methods

### Study Design andStudypopulation

ThestudyprotocolwasapprovedbytheUniversity of HealthSicences Bursa YuksekIhtisas Training andResearchHospital'sClinicalResearchEthicsCommitteewithapprovalnumber 2011-KAEK-25 2018/07-14. The study was conducted in Bursa between November 2018 and June 2020.Newborn babies were examined in the obstetrics clinic between the study periods. Newborns with cryptorchidism and their mothers were included in the study as the case group.The healthy infants who were born just after the cryptorchidism infantand their mothers were included in the control group.

### Data collectionandassessment

This was a descriptive study. A face-to-face survey technique was used in the study. Consentformswereobtainedfromallvolunteersforparticipation in thestudy.Mothers of newborns were visited in the obstetrics units of Bursa Yuksek Ihtisas Training and Research Hospital and were surveyed with questions using a patient form, diet form.

The patient form, in which the demographic and clinical characteristics of the mothers and babies in the groups were questioned, and the nutritional pattern form, which questioned the diet of the mothers, were filled in by the researcher through face-to-face interviews and noted. Cryptorchidism examination was also evaluated by a pediatric surgeon. Mother's age, height, weight, number of live births, weight gained during pregnancy, history of birth with the anomaly, father's age, birth week of the baby, APGAR score, birth weight, presence of concomitant external genital anomaly were questioned.Body temperatures of mothersandchildrenweremeasured at theclinicswherethebabiesexaminedforcryptorchidi

sm in 24 hours after the birth. The armpit method was used to measure the temperature of the babies and the mothers.

The nutritional level form is based on the principle that mothers indicate their food or beverage consumption at every meal, every day, 3-5 times a week, once every 15 days, and once in a month. The forms were filled in by the researcher by interviewing the mothers one-on-one.

**Statistical analysis**

The data obtained were analyzed using the SPSS Statistical Package® 21.0 package program. With all statistical analyses, $p<0.05$ was accepted as the level of significance, and the relationships were evaluated within the 95% confidence interval. The relationship between categorical dependent and independent variables was evaluated with Fisher Freeman-Halton tests and the relationship between numerically dependent and categorical independent variables was evaluated with Mann-Whitney U tests.

**Results**

During the study period, 4994 newborn babies were examined and 51 of them were found to have cryptorchidism. One hundred and two mothers participated in the study, including mothers of infants with cryptorchidism(n=51) and the control group (n=51). The mean maternal age was 28.02(±4.93) in the patient group and 30.37(±5.11) in the controls; the mean age of the father was found to be 32.18(±5.10) in the patient group and 34.10(±5.91) in the controls group. Cryptorchidism was more common in babies born to young mothers and/or fathers ($p= 0.013$ and $p= 0.029$ respectively). There was no difference between the groups in terms of the mother's height, weight, father's age.The mean temperature of the mother's 36.78(±0.92) in the patient group and 36.68(±0.31) in controls group ($p=0.059$). The mean temperature of the infants 36.94(±0.27) in the patient group and 36.55(±0.40) in controls group ($p<0.001$). A relationship was found between the cryptorchidism and the measured temperature of the infants (Table 1).

The mean birth weight was 2852.20(±901.30) grams in the patient group and 3199.53(±732.99) grams in the controls ($p=0.035$). Accordingly, the cryptorchidism is more common in babies with low birth weight. There was no difference between the groups in terms of APGAR score, week of birth, and accompanying external genital anomalies (Table 1).

The relationship between maternal dietary habits and cryptorchidism is shown in Table 2. Accordingly, the rate of giving birth to babies with cryptorchidism was lower in mothers who consumed more dried foods ($p=0.001$).

According to Multivariate Binary Logistic Regression Analysis, it was found that an increase in temperature of the infants increased the risk of cryptorchidism by 57.40 times ($p<0.001$), and an increase in maternal dried food consumption (OR=0.749, $p=0.037$) and child birth weight (OR=0.999, $p=0.008$) values decreased the risk of cryptorchidism (Table 3).

## Table1. General characteristics of theparticipants (babiesandmothers)

| | Control Group (mean±SD) | Case Group (mean±SD) | p-value |
|---|---|---|---|
| Mother age (years) | 30.37(±5.11) | 28.02(±4.93) | 0.013 |
| Mother height (cm) | 159.94(±5.45) | 161.61(±6.16) | 0.148 |
| Mother weight (kg) | 75.28(±11.17) | 76.63(±15.83) | 0.944 |
| Weight gained of mothers during pregnancy (kg) | 11.24(±5.21) | 11.61(±6.35) | 0.760 |
| Mother Body Mass Index (kg/m$^2$) | 26.28(±4,929 | 24.89(±5.59) | 0.081 |
| Number of live births | 2.20(±1.11) | 2.08(±0.89) | 0.828 |
| Father's age (years) | 34.10(±5.91) | 32.18(±5.10) | 0.029 |
| Temperature of the mothers (°C) | 36.68(±0.31) | 36.78(±0.92) | 0.059 |
| Temperature of the infants (°C) | 36.55(±0.40) | 36.94(±0.27) | <0.001 |
| Apgar 1$^{st}$ minute | 9.90(±0.30) | 9.66(±0.92) | 0.302 |
| Apgar 5$^{th}$ minute | 8.82(±0.63) | 8.72(±0.73) | 0.265 |
| Birth weight of the baby (kg) | 3199.53(±732.99) | 2852.20(±901.30) | 0.035 |
| Birth week of the baby | 37.47(±2.81) | 36.67(±3.34) | 0.245 |

## Table 2: Food group consumption of mothers of infants with and without cryptorchidism

| Food | Control Group (mean±SD) | Case Group (mean±SD) | p-value |
|---|---|---|---|
| Milk | 3.35±2.43 | 2.92±2.19 | 0.309 |
| Yoghurt | 4.86±1.65 | 4.90±1.46 | 0.890 |
| Cheese | 5.37±1.57 | 5.49±1.17 | 0.757 |
| Meat | 2.90±1.71 | 2.43±1.76 | 0.187 |
| Chicken | 2.43±1.65 | 2.43±1.57 | 0.782 |
| Offal | 0.25±0.69 | 0.37±1.06 | 0.761 |
| Prepared meat products | 0.92±1.25 | 1.06±1.42 | 0.741 |

| | | | |
|---|---|---|---|
| Homemade meat and meat products | 0.33±0.93 | 0.72±1.64 | 0.322 |
| Egg | 4.96±1.55 | 4.88±1.73 | 0.957 |
| Legumes (beans, chickpeas, lentils, etc.) | 3.02±1.19 | 2.84±1.16 | 0.378 |
| Hazel nut | 3.98±1.97 | 3.49±2.00 | 0.219 |
| Green leafy vegetables | 4.29±1.75 | 4.22±1.54 | 0.651 |
| Potatoes | 4.04±1.23 | 3.51±1.33 | 0.071 |
| Other fresh vegetables | 4.29±1.59 | 3.94±1.39 | 0.153 |
| Dried fruits and vegetables (Figs, apricots, grapes) | 2.57±2.17 | 1.20±1.59 | 0.001 |
| White bread | 5.33±1.63 | 5.35±1.49 | 0.992 |
| Whole grain | 1.24±2.23 | 1.51±2.27 | 0.370 |
| Rice | 4.12±1.24 | 3.73±0.94 | 0.075 |
| Tarhana (traditional soap) | 1.48±1.72 | 2.06±2.04 | 0.261 |
| Biscuits | 2.53±2.18 | 3.06±2.01 | 0.192 |
| Food for breakfast | 0.49±1.30 | 0.80±1.59 | 0.174 |
| Simit | 1.98±1.44 | 1.51±1.57 | 0.055 |
| Prepared foods | 1.38±1.81 | 1.43±1.71 | 0.572 |
| Carbonated drinks | 0.98±1.57 | 0.82±1.03 | 0.678 |
| Mineral water | 2.16±2.44 | 2.27±2.27 | 0.614 |
| Coffee | 2.80±2.51 | 2.24±2.21 | 0.220 |
| Tea | 4.69±2.34 | 4.37±2.29 | 0.337 |
| Herbal tea | 0.75±1.48 | 0.63±1.41 | 0.567 |
| Alcoholic beverages | 0.12±0.84 | 0.00±0.00 | 0.317 |
| Olive oil | 2.80±2.66 | 3.25±2.55 | 0.269 |
| Hazel nut oil | 0.08±0.44 | 0.00±0.00 | 0.155 |
| Sunflower oil | 4.90±1.94 | 5.08±1.87 | 0.433 |
| Corn oil | 0.20±1.00 | 0.32±1.22 | 0.244 |
| Soy Oil | 0.00±0.00 | 0.02±0.14 | 0.317 |

| | | | |
|---|---|---|---|
| Canola Oil | 0.12±0.84 | 0.02±0.14 | 0.989 |
| Hard margarine | 0.86±1.76 | 1.31±1.96 | 0.147 |
| Soft margarine | 0.86±1.78 | 1.06±1.89 | 0.496 |
| Butter | 3.65±2.26 | 3.49±2.57 | 0.919 |
| Lard | 0.37±1.08 | 0.33±1.13 | 0.432 |
| Sugar, honey, jam, molasses | 3.63±2.39 | 3.41±2.39 | 0.598 |
| Confectionery, Turkish delight, chocolate | 2.65±2.05 | 2.76±2.37 | 0.881 |
| Packaged soup | 0.60±1.26 | 0.71±1.59 | 0.871 |
| Convenience food | 0.12±0.52 | 0.53±1.25 | 0.035 |
| Pita, lahmacun (Turkish pizza), pizza, etc. | 0.82±0.93 | 1.12±1.03 | 0.122 |
| Doner, kebab, etc. (traditional meat) | 0.92±1.00 | 0.94±1.05 | 0.977 |
| Hamburger, fried chicken pieces | 0.39±0.96 | 0.35±0.80 | 0.602 |
| Chips | 0.78±1.38 | 1.20±1.60 | 0.158 |
| Frozen food | 0.37±1.13 | 0.41±0.88 | 0.263 |
| Pastry dessert | 1.92±1.72 | 1.78±1.64 | 0.661 |
| Milk dessert, ice cream | 2.16±1.97 | 2.22±1.78 | 0.751 |

## Tablo 3 Factors that increase the risk of cryptorchidism

| | B | se | Wald | df | p | OR | 95% CI | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Lower | Upper |
| Age | -.177 | .098 | 3.236 | 1 | 0.072 | 0.838 | .691 | 1.016 |
| Father age | .083 | .087 | .906 | 1 | 0.341 | 1.086 | .916 | 1.287 |
| Temperature of the infants | 4.050 | 1.002 | 16.347 | 1 | <0.001 | 57.403 | 8.059 | 408.885 |
| Child birth weight | -.001 | .000 | 6.947 | 1 | 0.008 | 0.999 | .998 | 1.000 |
| Dried food | -.289 | .138 | 4.355 | 1 | 0.037 | 0.749 | .571 | .983 |
| Convenience food | .462 | .366 | 1.590 | 1 | 0.207 | 1.586 | .774 | 3.251 |

NR2=0.41, X2=53.30, p<0.001, Multivariate BinaryLogistic Regression Analysis.

## Discussion

In the present study, younger mothers, younger father, and low birth weight were found to be associated with cryptorchidism. Increased temperature of the infants was a risk for cryptorchidism. Consumption of dried foods and higher child birth weight decreased the risk of cryptorchidism.

A higher rate of cryptorchidism cases was seen in the children of younger mothers. In this regard, we encounter studies that present different results in the literature. For example, Jones [6] and McGlynn [7] observed that young age (<20 years) has a protective effect against the development of cryptorchidism. Wagner-Mahler et al., on the other hand, could not detect any relationship between maternal age and cryptorchidism in newborn children[8]. Considering these findings, it is difficult to come to a clear conclusion on the relationship between maternal age and the development of cryptorchidism , but considering the whole of the studies, they provide more valuable information on finding an ideal age range where the development of cryptorchidism is less. Being young for maternal age can affect intrauterine fetal development in various ways such as anatomical, hormonal, environmental, psychological, socio-economic, and educational levels.

Paternal effects in terms of reproductive health receive a lot of attention. In recent years, extensive studies have been conducted on the effect of advanced maternal and paternal age on the frequency of genetic chromosomal anomalies[9-11]. Various researchers have attempted to find a relationship between increasing paternal age and semen quality, but they could not obtain results showing a linear relationship with increasing age[12-15]. Studies generally establish a strong relationship between advanced paternal age and chromosomal anomalies and the syndromes caused by these anomalies. Stillbirth rates seem to be associated with advanced paternal age. For example, in a study conducted in 2017, stillbirth rates were found to be highest for fathers with older age, while it was observed to be higher in fathers with younger age[16]. In the present study, we observed higher rates of cryptorchidism in children of younger fathers. When this finding is evaluated together with other studies, a relationship can be established between paternal cigarette consumption at young ages and cryptorchidism development [17-19]. Cigarette consumption levels in young individuals may be under-reported for social reasons. The lack of a clear consensus on the definition of advanced paternal age also makes it difficult to draw clear conclusions.

As is known, the testicles are in a lower temperature environment than the intra-abdominal organs due to their scrotal location and provide an ideal environment for sperm development. In our study, we observed a higher rate of cryptorchidism in children with high body temperature measurements. There can be many reasons such as immunological causes, infectious diseases and

other febrile conditions may cause this situation. But, since the number of cases was low in the present study, the results must be interpreted with caution.

Many researchers blame some of the food products consumed and the potentially dangerous chemicals in these products for many of the diseases seen frequently today[20-22].Giordano et al.[23] observed that the development of cryptorchidism was higher in the children of mothers with high consumption of smoked food products, and suggested that potentially toxic products to be found in foods may cause various urogenital anomalies. Brantsæteret al.[24]conducted some studies to examine the role of organic food consumption during pregnancy in the development of hypospadias and cryptorchidism in children in a study conducted in Norway in 2015 with the participation of 35 thousand mothers. According to the results of this study, it was observed that the risk of cryptorchidism development decreased in the group that consumed vegetables, milk, and dairy products among the questioned organic foods, but it could not find a strong relationship in terms of organic food consumption and the development of cryptorchidism.We observed significant findings in terms of low risk of development of cryptorchidism with consumption of dried food (apricot, fig, grape). Basically, this finding makes us think that high nutritional and caloric values in dried foods may have positive contributions to intrauterine fetal development and shows that it can be a useful tool in preventing low birth weight, which is one of the most important risk factors. However, it needs to be explained how the low liquid ratio in the nutritional character contributes to the prevention of cryptorchidism.

Cryptorchidism has been strongly associated with low birth weight, gestational age, and size for gestational age[25].One of the most prominent risk factors associated with the development of cryptorchidism is low birth weight, which is also considered an important risk factor in many other congenital anomalies (26-29). In our study, we observed a higher rate of cryptorchidism in infants with low birth weight, consistent with other studies in the literature.

**Conclusions**

Increased temperature of the infants was an important risk for cryptorchidism. The reasons that will cause fever changes in the infants should be carefully considered in the pregnancy and the necessary interventions should be made. Consumption of dried foods and higher child birth weight may be protective against cryptorchidism. It suggests that high nutritional and caloric values in dried foods may contribute positively to the development of the intrauterine fetus and show that it can be a useful tool in preventing low birth weight, which is one of the risk factors. Maternal nutrition may be one of the effective causes of cryptorchidism development in infants.

**Competing interests:**Therearenoconflicts of interest

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