



# Evaluation of Nutritional Anemia Status and Iron Parameters in Cases with Bladder-Bowel Dysfunction

## Mesane Barsak Disfonksiyonu Olan Olgularda Beslenmeye Bağlı Anemi Durumu ve Demir Parametrelerinin Değerlendirilmesi

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### ABSTRACT

**Objective:** Bladder-bowel dysfunction (BBD) is a clinical condition in which both bladder and bowel functions are impaired. Constipation is often associated with BBD. This study aimed to estimate nutritional parameters and anemia in patients with BBD.

**Method:** The study included 189 patients aged between 60 months and 18 years who were admitted to Bakırçay University Çiğli Training and Research Hospital. Their bladder symptom scores, iron parameters, and hemoglobin levels were evaluated.

**Results:** It was determined that levels of blood hemoglobin and iron parameters were deficient in patients with constipation complaints who were particularly consuming unhealthy diets.

**Conclusion:** It is important to evaluate nutritional status, fluid intake, constipation management, anemia, and iron parameters in patients with BBD. With appropriate treatment, we can improve their quality of life and prevent complications.

**Keywords:** Anemia, bladder-bowel dysfunction, iron parameters

### ÖZ

**Amaç:** Mesane-barsak disfonksiyonu (MBD), mesane ve bağırsak fonksiyonlarının birlikte bozulduğu klinik bir durumdur. Kabızlık genellikle mesane-barsak disfonksiyonu ile ilişkilidir. Bu çalışma, MBD'li hastalarda beslenme parametrelerini ve anemiyi değerlendirmeyi amaçlamıştır.

**Yöntem:** Çalışmaya Bakırçay Üniversitesi Çiğli Eğitim ve Araştırma Hastanesi'ne başvuran, 60 ay ile 18 yaş arasında 189 hasta dahil edilmiştir. Bu hastaların mesane semptom skorları, demir parametreleri ve hemoglobin düzeyleri değerlendirilmiştir.

**Bulgular:** Kabızlık şikayeti olan olgularda kan hemoglobin ve demir parametrelerinin düşük olduğu ve özellikle bu olguların sağlıksız beslenmeye eğilimli olduğu görülmüştür.

**Sonuç:** MBD'li hastalarda beslenme durumu, sıvı alımı, kabızlık yönetimi, anemi ve demir parametrelerinin değerlendirilmesi önemlidir. Uygun tedavi ile yaşam kalitesi artırılabilir ve komplikasyonlar önlenir.

**Anahtar kelimeler:** Anemi, mesane-barsak disfonksiyonu, demir parametreleri

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## INTRODUCTION

Bladder-bowel dysfunction (BBD) is a clinical condition in which both bladder and bowel functions are impaired<sup>(1)</sup>. A close interaction exists between the bladder and bowel due to common innervation (sacral nerves) and related pelvic floor muscles. When we look at the pathophysiology of BBD, chronic contraction of the anal sphincter also causes contraction of the pelvic floor muscles, resulting in secondary detrusor sphincter dyssynergia. In addition, rectal distension due to constipation puts pressure on the posterior wall of

the bladder, leading to inadequate bladder emptying and detrusor instability<sup>(2)</sup>. Constipation which has been shown to occur in 30% to 88% of children with bladder dysfunction has been frequently evaluated in the literature as being associated with bladder dysfunction<sup>(3)</sup>. Underlying etiologies include neurological and functional disorders, incorrect and inadequate toilet habits, psychological factors such as stress and trauma, and recurrent urinary tract infections (UTIs). Patients may present to pediatrics, pediatric nephrology, and pediatric urology clinics with frequent urination,



nocturnal and/or daytime urinary incontinence, an urge to urinate, constipation and/or fecal incontinence, and a sense of incomplete bladder emptying<sup>(4)</sup>. Its incidence in children peaks at 5-7 years of age and is more common in girls than in boys<sup>(5)</sup>. In the evaluation of cases with BBD, detailed patient history and physical examination, voiding diary, calculation of bladder-bowel symptom scores, dietary habits that may cause constipation, complete urinalysis and urine culture, lumbosacral radiography, urinary system ultrasonography, estimation of residual urine and uroflowmetry are being used. Treatment methods include behavioral therapy, drug therapy, bowel management, physical therapy for pelvic muscles, and, rarely, surgical intervention<sup>(6,7)</sup>. Increased awareness in the BBD has led to establishment of better diagnostic criteria and treatment methods.<sup>(8)</sup> Evaluating nutritional status, anemia, and iron parameters in patients with BBD is essential. In these patients, detection and appropriate treatment of iron and other mineral deficiencies in particular can improve quality of life and prevent complications in these patients. In this study, we aimed to determine the relationship of these parameters with BBD by evaluating the nutritional and iron parameters, symptoms of constipation, and anemia of these cases.

**MATERIALS and METHODS**

**Ethical Considerations**

The study was carried out with the permission of the İzmir Bakırçay University Clinical Researches Ethics Committee (decision no: 1240, dated: 18.10.2023). All procedures were carried out in accordance with the World Medical Association Declaration of Helsinki: ethical principles for medical research involving human subjects.

**Patient Selection and Evaluation**

The scope of the study included patients who applied to İzmir Bakırçay University Çiğli Training and Research Hospital Pediatric Nephrology Outpatient Clinic due to BBD and incontinence between November 2023 and May 2024. A detailed history of the patients was taken, and bladder-bowel dysfunction symptom scores (BBDSS) were calculated. The BBD scale used is shown in Figure 1 and Table 1. A total of 189 patients older than 60 months with a BBDSS of 13 and above were evaluated. Patients were informed about the study, and consent forms were obtained. Weight, height, body mass index (BMI) percentiles, and standard deviation scores (SDS) were calculated according to age of the

patients. Dietary habits, water consumption, and fiber intake of the patients were questioned. Those with and without constipation and/or fecal incontinence were grouped. Serum creatinine levels, presence of anemia, and iron parameters of the patients were scanned retrospectively from the system. Estimated glomerular filtration rates (eGFRs) of all patients were calculated using the Schwartz formula [glomerular filtration rate (GFR)= 0.41x height in cm/serum creatinine (mg/dL)]. The relationship between symptom scores, laboratory findings, and clinical status of the patients was evaluated.

**Statistical Analysis**

The SPSS package program (IBM SPSS Statistics for Windows, version 25.0. Armonk, NY: IBM Corp, 2017) was used for statistical analyses. Variables with normal distribution were shown as mean values ± standard SDS, variables with abnormal distribution as median (range), values and the rest were expressed as frequencies. The chi-square test was used to compare categorical variables between groups. The Kolmogorov-Smirnov test was used to evaluate the normal distribution of continuous variables between groups. All parameters were distributed abnormally, so they were evaluated using the Mann-Whitney U test. For this study, p<0.05 was considered as level of statistical significance.

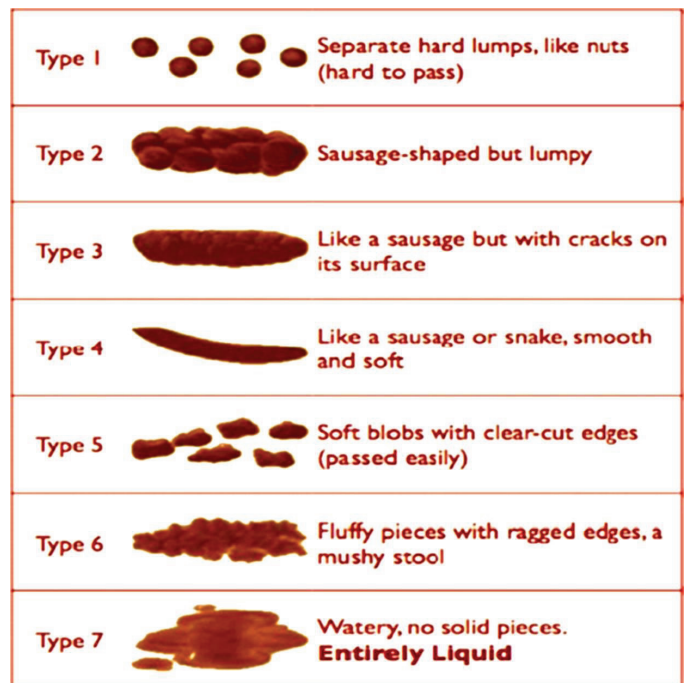


Figure 1. Bladder-bowel symptom scores

Do you wet your underwear during the day?	Never - 0	1 day a week - 1	2-3 times a week - 2	4-5 times a week - 3	Everyday - 4
How much do you wet your underwear?	I don't wet my underwear - 0	Slightly moist - 1	Moist - 2	Wet - 3	Soaking wet - 4
The number of times you go to the toilet during the day.	1-2 times - 4	3-4 times - 2	5-6 times - 0	7-8 times - 2	More than 8 - 4
How many times a day do you feel an urgent need to go to the toilet to pee?	Never - 0	Less than half the time - 1	Half the time - 2	More than half the time - 3	Everyday - 4
How many times a day you hold your pee by crossing your legs or sitting?	Never - 0	Less than half the time - 1	Half the time - 2	More than half the time - 3	Everyday - 4
Do you feel pain while peeing?	Never - 0	Less than half the time - 1	Half the time - 2	More than half the time - 3	Everyday - 4
Do you wet your bed at night?	Never - 0	3-4 times a month - 1	1-2 times a week - 2	4-5 times a week - 3	Everynight - 4
Do you wake up at night to pee?	Never - 0	3-4 times a month - 1	1-2 times a week - 2	4-5 times a week - 3	Everynight - 4
Is your urine flow stops and then starts again during peeing?	Never - 0	Less than half the time - 1	Half the time - 2	More than half the time - 3	Everyday - 4
Do you either force yourself to go to pee, or wait?	Never - 0	Less than half the time - 1	Half the time - 2	More than half the time - 3	Everyday - 4
Frequency of your bowel movements (frequency of defecation).	More than once a day - 0	Everyday - 1	Every 2 days - 2	Every 2 days - 3	Less than 1 in 3 days - 4
My poop is hard-the answer should be given according to the Bristol stool scale criteria.	Never - 0	Less than half the time - 1	Half the time - 2	More than half the time - 3	Everyday - 4
Do you poop in your Underwear?	Never - 0	1-2 times a week - 1	3 times a week - 2	4-5 times a week - 3	Everyday - 4

## RESULTS

Patients who were 60 months and older and applied to pediatric nephrology clinic of our hospital were evaluated. A total of 189 patients with a BBDSS of 13 and above were included in our study. Our study population consisted of 137 (72.5%) female and 52 (27.5%) male patients. The mean (range) ages of our female [11.2 (5-17.6) years], and male [9.8 (5-17.3) years] patients were as indicated. BMI SDS of male and female patients did not differ significantly ( $p=0.92$ ). As the BMI SDS increased in both girls and boys, the BBDSS score also increased in correlation ( $r=0.781$ ). The mean BBDS scores were 15.2 (13-33) in boys and 19.8 (13-34) in girls. When the constipation and fecal incontinence (encopresis) conditions of our patients were evaluated, 114 girls and 46 boys had constipation. In addition, 29 girls and five boys had encopresis. The mean blood creatinine value of the patients was  $0.57 \pm 0.21$  mg/dL, and all patients had normal creatinine values according to age and height. The eGFR of all patients was calculated using the Schwartz formula, and all patients had normal eGFR. There was no evidence of chronic kidney disease in any patient. Cases with neurogenic bladder or spinal dysraphism were not evaluated in the study. According to the World Health Organization criteria, since cases over 60 months of age were also included in our study, the hemoglobin (Hb) levels below 12 mg/dL was accepted as indicative of anemia<sup>(9)</sup>. The mean Hb level of all cases was  $10.4 \pm 2.1$  mg/dL. All of 160 cases with constipation had relatively lower Hb levels. While, 8 of 29 patients without constipation

had anemia, significantly lower levels of Hb (below 10 mg/dL) were detected in 21 cases with encopresis. Mean hematocrit value of all patients was  $37 \pm 3.7\%$ . BBDS scores increased in a positive correlation with the increased red blood cell distribution width ( $r=0.812$ ). The mean (range) serum iron [38 ug/dL (7-63)], ferritin [18 ng/mL (3-51)] values, transferrin saturation (TS) [19.3% (5.3-27.1)], and total iron binding capacity (TIBC) [469.3 ug/dL (379-517)] of the cases were also estimated. BBDS of the cases showed a negative correlation with blood iron, ferritin values, and TS ( $r=-0.641$ ,  $-0.913$ ,  $-0.856$ , respectively) and a positive correlation with TIBC ( $r=0.824$ ). All cases with encopresis had comparatively lower serum iron, ferritin, TS, and higher TIBC values.

When the eating habits of BBD patients were examined regarding consumption of junk food, it was observed that all 189 patients consumed at least two packaged foods per week, 142 patients consumed at least one packaged food almost every day, and their daily water intake was insufficient. All patients with encopresis had moderate anemia, consumed carbonated drinks, and none of them consume vegetables.

## DISCUSSION

BBD is the co-occurrence of bladder problems, especially urinary incontinence and bowel problems (and/or constipation)<sup>(10)</sup>. It is a complex condition that can seriously affect quality of life<sup>(11)</sup>. It should be considered an important public health problem as it will affect the child's life both physically and psychologically, both in the acute period and in the long term. Early diagnosis and treatment with a multidisciplinary approach are critical to prevent complications<sup>(12)</sup>.

Based on literature data, bladder dysfunction is more common in girls<sup>(13)</sup>. In our study, 72.5% of the cases were girls. Overweight, obesity, behavioral eating problems, especially constipation, fecal incontinence and other symptoms are associated with bladder and bowel dysfunction<sup>(14)</sup>. Our study has shown that increases in BMI SDS correlate positively with higher BBDS scores. Although reportedly the development of voiding dysfunction may accelerate the development of UTIs, some studies in the literature have indicated that children with voiding dysfunction are prone to UTI and kidney damage<sup>(15)</sup>. In the long term, BBD can lead to the development of chronic inflammation and anemia. The risk of colonization of the bladder with pathogenic microorganisms and incidence of UTI increases, especially in patients with significant residual urine due

to dysfunctional voiding<sup>(16)</sup>. Recurrent UTIs are becoming a public health problem, especially in developing or underdeveloped countries, as they cause considerable morbidity and mortality when left undiagnosed.

Patients with bowel dysfunction may experience constipation, fecal incontinence, or irregular bowel movements which may prevent nutrients from being adequately absorbed from the intestines, leading to iron deficiency and anemia<sup>(12)</sup>. In our study, all patients with constipation had anemia. In particular, a fiber-free diet and consumption of ready-made foods are seen as the most critical causative factors leading to the development of constipation<sup>(17,18)</sup>.

## Study Limitations

This study has limitations, including its retrospective nature and the advantages of randomized controlled trials. This was a single-center study, and a limited number of patients were analyzed. However, our findings suggest that constipation patients have lower hemoglobin and iron parameters and are particularly prone to unhealthy diets.

## CONCLUSION

In conclusion, evaluation of nutritional status, fluid intake, management of constipation, symptoms of anemia (if any), and iron parameters in patients with BBD carries critical importance. With appropriate treatment, we can improve the quality of life and prevent development of complications in these patients. Therefore, a multidisciplinary approach should be adopted in the management of BBD, and the nutritional status of the patients should be closely monitored.

## Ethics

**Ethics Committee Approval:** The study was carried out with the permission of the İzmir Bakırçay University Clinical Researches Ethics Committee (decision no: 1240, dated: 18.10.2023).

**Informed Consent:** Patients were informed about the study, and consent forms were obtained.

## Footnotes

## Author Contributions

Surgical and Medical Practices: G.G.Ö., Concept: Ö.Ö.Ş., Design: G.G.Ö., Data Collection or Processing: G.G.Ö., Ö.Ö.Ş., Analysis or Interpretation: Ö.Ö.Ş., Literature Search: G.G.Ö., Writing: G.G.Ö.



**Conflict of Interest:** The authors declare no conflict of interest.

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