

Evaluation and Comparison of Renal Function in Children with Different Types of Scoliosis

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Abstract : A retrospective observational study was conducted at the scoliosis unit of Dr. Benzerdjeb Hospital in the Wilaya of Ain Temouchent on 100 children with scoliosis to assess renal function and compare it with normal reference values. Data analysis was performed using SPSS version 26, with quantitative variables expressed as means and standard deviations. Comparisons were made using a parametric test. Plasma urea levels remained within the normal range across all scoliosis types. Creatinine levels in patients with idiopathic scoliosis (IS) were close to normal, whereas they were lower in patients with congenital scoliosis (CS), syndromic scoliosis (SS), and neuromuscular scoliosis (NMS). Statistical analysis revealed a significant difference in plasma urea levels ($P = 0.0022$) and a highly significant difference in plasma creatinine levels ($P = 0.00011$) among the different scoliosis types. **Keywords :** Renal function, Creatinine, Urea, Idiopathic scoliosis, Congenital scoliosis, neuromuscular scoliosis.

ملخص :

أجريت دراسة رصدية استيعادية في وحدة الجنف بمستشفى الدكتور بن زرجب في ولاية عين تموشنت على 100 طفل مصاب بالجنف، بهدف تقييم وظيفة الكلى ومقارنتها بالقيم المرجعية الطبيعية. تم تحليل البيانات باستخدام برنامج SPSS الإصدار 26، حيث تم التعبير عن المتغيرات الكمية بمتوسطاتها وانحرافاتها المعيارية، وأجريت المقارنات باستخدام اختبار معلمي. أظهرت نتائج مستويات اليوريا في البلازما بقائها ضمن المعدلات الطبيعية لدى جميع أنواع الجنف. أما مستويات الكرياتينين، فقد كانت قريبة من المعدل الطبيعي لدى مرضى الجنف مجهول السبب (IS)، لكنها كانت أقل لدى مرضى الجنف الخلقي (CS)، والجنف المتلازمي (SS)، والجنف العصبي العضلي (NMS). كشف التحليل الإحصائي عن اختلاف ذي دلالة إحصائية في مستويات اليوريا في البلازما ($P = 0.0022$) واختلاف شديد الدلالة في مستويات الكرياتينين في البلازما ($P = 0.00011$) بين أنواع الجنف المختلفة.

الكلمات المفتاحية:

وظائف الكلى، الكرياتينين، اليوريا، الجنف مجهول السبب، الجنف الخلقي، الجنف العصبي العضلي، الجنف المتلازمي.

Introduction

Scoliosis is a three-dimensional spinal deformity characterized by lateral curvature and vertebral rotation, which can lead to thoracic deformities, chronic back pain, and respiratory impairments¹. In severe cases, scoliosis can affect multiple physiological systems, including the musculoskeletal, nervous, and cardiovascular systems, ultimately reducing overall health and quality of life².

Scoliosis is classified into four main types: idiopathic, neuromuscular, congenital, and syndromic. Idiopathic scoliosis, the most common form, accounts for approximately 80% of all scoliosis cases, while neuromuscular, congenital, and syndromic scoliosis are often associated with underlying neuromuscular or connective tissue disorders^{3,4}.

The prevalence of scoliosis varies across populations and geographical regions. For instance, it has been reported as 0.47% in Turkey, 5.2% in Germany, and 3.3% in Korea⁵. In Algeria, the prevalence is estimated at 2.38%⁶. However, most epidemiological studies have primarily focused on idiopathic scoliosis, leaving other forms underrepresented in clinical research.

Given this gap in the literature, our study aimed to investigate scoliosis in its various forms—idiopathic, neuromuscular, congenital, and syndromic—among patients receiving treatment at the scoliosis unit of Dr. Benzerdjeb Hospital in the Wilaya of Ain Temouchent, U.S.B.A.T, in western Algeria. Specifically, we sought to evaluate the potential impact of scoliosis on renal function in affected patients.

1. Materials and Methods

2.1. Study Population

This study included 100 patients, aged between 5 and 17 years, who were treated at U.S.B.A.T. over an eight-year period (2014–2021). Participants came from various wilayas across Algeria. Clinical data were collected from patient records available at U.S.B.A.T.

All patients and their guardians were informed about the purpose of the study, and strict measures were taken to ensure anonymity and confidentiality.

2.2. Data Collection

Information on renal function, including plasma creatinine and urea levels, was recorded for each patient using a structured technical sheet.

2.3. Statistical Analysis

Data analysis was conducted using SPSS software (version 26). Quantitative variables are expressed as means $\pm$ standard deviations (SD). Comparisons between groups were performed using one-way analysis of variance (ANOVA), with statistical significance set at $P < 0.05$.

2. Results

3.1. Baseline Characteristics

This is a retrospective observational study. It took place at the scoliosis unit of Dr. Benzerdjeb Hospital Establishment in the wilaya of Ain Temouchent (U.S.B.A.T.), located in western Algeria, over a one-month period (June to July 2021).

The distribution of scoliosis types within the study population was as follows: 27 neuromuscular, 25 congenital, 10 syndromic, and 38 idiopathic scoliosis.

3.2. Inclusion criteria for study participants

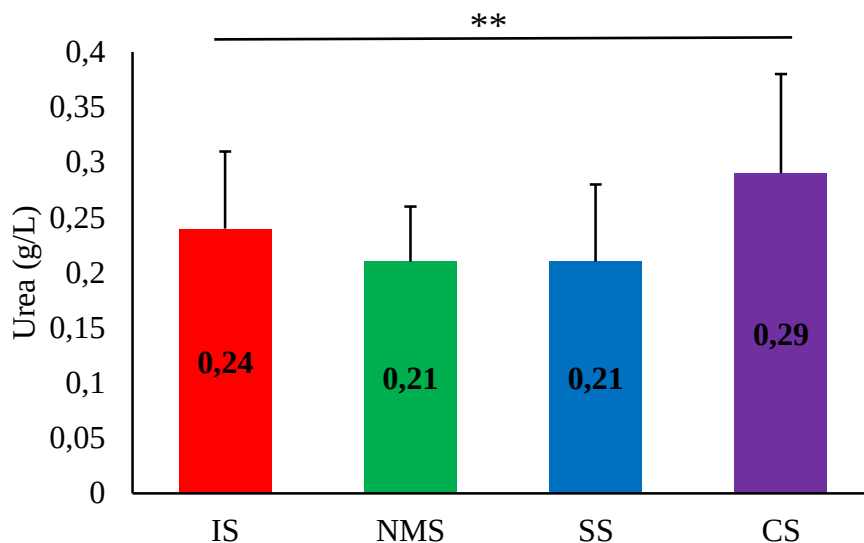
All patients with IS (Idiopathic Scoliosis), CS (Congenital Scoliosis), SS (Syndromic Scoliosis), or NMS (Neuromuscular Scoliosis).

All patients with complete and usable patient records.

3.3. Plasma Urea Levels

The results of plasma urea levels show a statistically significant difference between the different types of scoliosis ($P = 0.0022$). Specifically, urea levels in patients with syndromic and neuromuscular scoliosis were identical (0.21 g/L), and the levels in cases of congenital scoliosis were the highest (0.29 g/L) (**Figure 1**).

Figure 1. Comparison of blood urea levels across different types of scoliosis.

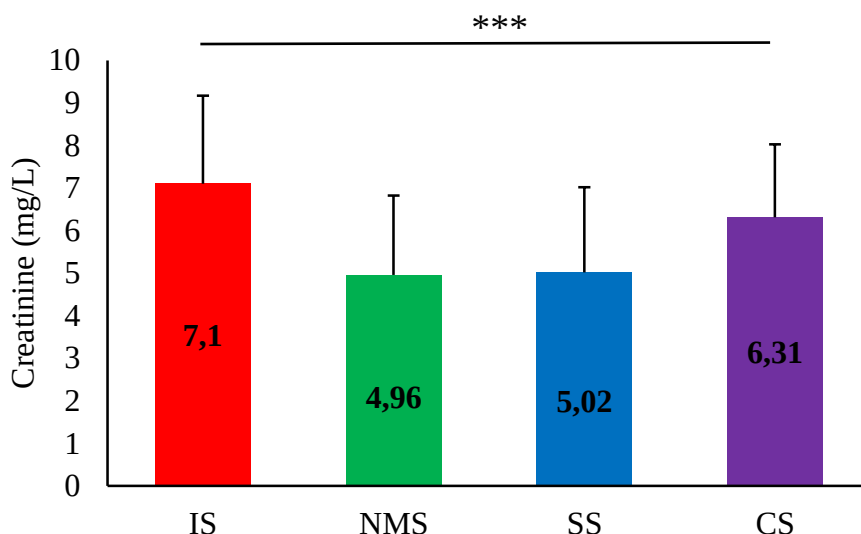


Note. Each value is expressed as the mean $\pm$ standard deviation. Mean comparisons among the different types of scoliosis were conducted using a one-way ANOVA test. * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

3.4. Plasma Creatinine Levels

The results of plasma creatinine levels show a highly significant difference between the different types of scoliosis ($P = 0.00011$). Creatinine levels in patients with neuromuscular and syndromic scoliosis are nearly identical, approximately 5 mg/L. The level in idiopathic scoliosis is higher, estimated at 7.1 mg/L (**Figure 2**).

Figure 2. Comparison of blood creatinine levels across different types of scoliosis.



Note. Each value is expressed as the mean $\pm$ standard deviation. Mean comparisons among the different types of scoliosis were conducted using a one-way ANOVA test. * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

3. Discussion

Regarding renal assessment parameters, we noted a statistically significant difference in plasma urea levels between the different types of scoliosis ($P = 0.0022$), and a highly significant difference in plasma creatinine levels ($P = 0.00011$). However, upon reviewing the literature, we found no studies comparing plasma creatinine and urea levels among the four types of scoliosis.

Although all patients with the different types of scoliosis had urea levels within the normal range, this result is consistent with several previous studies^{7,8}.

Regarding creatinine levels, we recorded normal values in patients with idiopathic scoliosis (IS), which represented 38% of our population. This result is similar to several previous studies^{9,10,11}.

Conversely, creatinine values remained lower in patients with secondary scoliosis (NMS, SS, CS), which represented approximately 62% of our population. These results align with a study that found 5 mg/L in both preoperative and postoperative blood samples¹².

The lower creatinine values can be explained by the patient's thinness and the prevalence of female children in our population. This is supported by a study that showed creatinine levels are higher in men than in women and lower in children¹³.

4. Conclusions

Our study revealed a highly significant difference in plasma urea levels among the different types of scoliosis ($P = 0.0022$), as well as a similarly significant difference in plasma creatinine levels ($P = 0.00011$). Despite these variations, urea levels remained within the normal physiological range across all scoliosis types. Additionally, while creatinine levels were within the normal range in patients with idiopathic scoliosis (7.1 mg/L), they tended to be lower in patients with congenital, syndromic, and neuromuscular scoliosis.

These findings suggest that the observed biochemical differences are more likely related to variations in muscle mass rather than any direct impairment of renal function. Overall, our results indicate that scoliosis, irrespective of its type, does not have a direct impact on renal function in our study population. However, further research with larger cohorts and longitudinal

follow-ups is recommended to validate these findings and explore potential metabolic differences associated with scoliosis.

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