

HOSPITAL MORBIDITY AND FINANCIAL IMPACTS FOR UROLITHIASIS IN BAHIA, BRAZIL

Morbidade hospitalar e impactos financeiros por urolitíase na Bahia, Brasil

Morbilidad hospitalaria y impactos financieros por urolitiasis en Bahía, Brasil

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ABSTRACT

Objective: to describe the cases of hospital morbidity and financial impacts for urolithiasis in the state of Bahia, Brazil, 2012-2016. **Methods:** this was an epidemiological, cross-sectional and descriptive study based on secondary data from the Information Technology Department of the Unified Health System. The variables collected were: sex, age groups, costs and race notified in the cited period. **Results:** it were registered 15.171 cases of hospital morbidity for urolithiasis, which corresponds to 0,46% of all hospitalizations. The greatest prevalence occurred in the east macro region (n=6.920), among males (n=7.815), aged between 35 and 39 years old (n=1.877) and ignored color/race (n=8.031). The urolithiasis generated a financial impact superior to 5,5 millions of reais to the Single Health System. **Conclusion:** according to the results, there is the need to make the east macro region as priority for actions of control and prevention of the pathology.

Descriptors: Epidemiology; Hospitalization; Nephrology; Urolithiasis; Health care costs.

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RESUMO

Objetivo: descrever os casos de morbidade hospitalar e impactos financeiros por urolitíase no estado da Bahia, Brasil no período de 2012 a 2016. **Métodos:** trata-se de um estudo epidemiológico, descritivo e transversal baseado no banco de dados secundários do Departamento de Informática do Sistema Único de Saúde. As variáveis coletadas foram: sexo, faixa etária, custos e raça/cor notificados no período citado. **Resultados:** foram registrados 15.171 casos de morbidade hospitalar por urolitíase, o que corresponde a 0,46% do total das internações. A maior prevalência ocorreu na macrorregião leste (n=6.920), entre o sexo masculino (n=7.815), em idade entre 35 e 39 anos (n=1.877) e cor/raça ignorada (n=8.031). A urolitíase gerou um impacto financeiro superior a 5,5 milhões de reais ao Sistema Único de Saúde. **Conclusão:** de acordo com os resultados, observa-se a necessidade de tornar a macrorregião leste como prioritária para as ações de controle e prevenção da patologia.

Descritores: Epidemiologia; Hospitalização; Nefrologia; Urolitíase; Custos de cuidados de saúde.

RESUMEN

Objetivo: describir los casos de morbilidad hospitalaria por urolitiasis en el estado de Bahía, Brasil, 2012-2016. **Método:** estudio epidemiológico, descriptivo y transversal, utilizando los datos obtenidos en lo Departamento de Informática del Sistema Único de Salud. Las variables recolectadas fueron: sexo, grupo de edad, gastos y raza notificados en el período citado. **Resultados:** se han registrados 15.171 casos de hospitalizaciones por urolitiasis, que corresponde a 0,46% del total de las hospitalizaciones. La mayor prevalencia ocurrió en la macrorregión leste (n=6.920), entre lo sexo masculino (n=7.815), de grupo etario entre 35 y 39 años (n=1.877) y color/raza ignorada (n=8.031). La urolitiasis ha generado un impacto financiero superior a 5,5 millones de reales al Sistema Único de Salud. **Conclusión:** de acuerdo con los resultados constata la necesidad de volver la macrorregión leste como prioritaria para las acciones de control y prevención de la patología.

DESCRITORES: Epidemiología; Hospitalización; Nefrología; Urolitiasis; Costos de la atención en salud.

INTRODUCTION

Urolithiasis (UL), also known as renal lithiasis, is defined as the formation of kidney stones¹ and is considered one of the most frequent pathologies that affect the Urinary Tract (UT) worldwide.²

The stones are classified according to their composition and location. Concerning the composition, UL is classified according the following stones: pure calcium oxalate; calcium oxalate and phosphate; pure calcium phosphate; struvite (formed from magnesian ammonia phosphate); uric acid; and cystine.³

In regard to the location, they are classified as pyelocaliceal, coralliform (can be subdivided in either partial or complete), ureteral (depending on their location in the ureter: proximal, medial and distal), vesical and urethral.³

The exact mechanism of calculus formation is still unknown. Nevertheless, the urinary increase in precipitating substances that promote crystallization and aggregation,⁴ in addition to any changes in urinary pH are part of the genesis of UL.⁵

It is a disease that occupies the third position among other conditions that affect UT, second only to urinary infections and prostratic conditions.⁶ The incidence of UL has been increasing over the years. Nowadays, it is estimated that about 10 to 15% of the world population is facing calculogenesis processes of the UT,¹ mainly in industrialized countries.²

The predisposing factors of the pathology are multi-causal, involving gender, ethnicity, age, nutritional and dietary behaviors, climate, work occupation, and physical activity, in addition to comorbidities such as Diabetes Mellitus, Systemic Arterial Hypertension (SAH) and Obesity.^{2,4}

In Brazil, few studies address UL epidemiological data. Nonetheless, the peak incidence generally occurs in people within the age group from 20 to 50 years old, and white people have a threefold chance of developing the pathology to the detriment of black ones.² Regarding the gender, men have an incidence and prevalence of 3 to 4 times higher than women.⁴

Nevertheless, the treatment of UL generates a great financial impact on Health Services. In 2012, the cost of care provision and hospitalizations due to UL in Brazil was higher than R\$ 32.5 million.² In 2000 in the United States of America, expenses with treatment were over 2 billion dollars.⁷

Bearing in mind that UL is a pathology with large magnitude and financial impact and that the publication of epidemiological information is essential for planning disease control actions, the present study aims to describe the cases of hospital morbidity and financial impacts for urolithiasis over the period from 2012 to 2016 in the *Bahia* State, Brazil.

METHODS

It is a descriptive and cross-sectional study with an epidemiological approach, which was performed using data from the UL hospitalizations and hospital costs reported over the period from 2012 to 2016 in the *Bahia* State, Brazil.

The *Bahia* State is one of the federative units of Brazil, consisting of 417 municipalities⁸ and 9 health macro-regions: Central-East, Central-North, Far South, East, Northeast, North, West, Southwest, and South. According to the *Instituto Brasileiro de Geografia e Estatística (IBGE)* [Brazilian Institute of Geography and Statistics],⁹ The *Bahia* State has a demographic density of 24.82 inhabitants/km² and an estimated population of 15,344,447 inhabitants distributed over a territorial area of 564,732.45 km².

Data collection took place through the *Departamento de Informática do Sistema Único de Saúde (DATASUS)* [Information Technology Department of the Brazilian Unified Health System]. To outline the collection, the following variables were considered: gender, age group, race/skin color, and hospital costs notified over the period from January 1st, 2012 to December 31st, 2016.

The data were selected according to Chapter XIV - Diseases of the genitourinary system (N20-N23) of the 10th International Classification of Diseases and Related Health Problems, 10th Revision (ICD-10),¹⁰ comprising the category N20.0 to N22.⁸

Data collection and tabulation were done in March 2017. The tabulation was performed using the Microsoft Office Excel software (Microsoft®, 2010). Due to the epidemiological nature of the secondary analysis of the study, there was no need for approval by the Research Ethics Committee, according to the Resolution No. 466/2012 from the National Health Council.

RESULTS

When assessing hospital morbidity stratified by year and macro-region, a larger number of hospitalizations in

2012 (n=3,913) stands out and during the five-year period studied. As shown in **Table 1**, the East macro-region leads with 6,920, hospitalizations, which corresponds to 45.6% of the registered morbidities.

Considering the gender, the male population was the most affected by the pathology, representing 51.5% of the total hospitalizations, as shown in **Table 2**. Only in the Central-North and Northeast macro-regions, it was observed that the female gender surpassed the male by 0.3% in both macro-regions.

With regard to race/skin color, the criterion with 'no information' stood out with 8,031 users. Then, the brown skin color stood out with 5,191, corresponding to 34.21% of the people who were hospitalized in five years, according to **Table 3**.

Table 1 – Hospital admission by health macro-region and processing year, Bahia State, Brazil, 2012-2016.

Health macro-region	2012	2013	2014	2015	2016	Total	%
Central-East	450	360	285	298	297	1,699	11.2
Central-North	279	257	203	141	149	1,041	6.9
Far South	52	56	47	77	78	314	2.1
East	1,995	1,405	1,159	1,163	1,139	6,920	45.6
Northeast	87	81	96	93	64	438	2.9
North	189	114	129	108	100	656	4.3
West	181	204	221	267	307	1,187	7.8
Southwest	344	333	329	374	349	1,742	11.5
South	336	242	208	232	148	1,174	7.7
Total	3,913	3,052	2,677	2,753	2,631	15,171	100

Source: Brazilian Ministry of Health - Hospital Information System from the SUS.

Table 2 – Hospital admission by health macro-region and gender, Bahia State, Brazil, 2012-2016.

Health macro-region	Male	%	Female	%	Total
Central-East	855	5.6	844	5.6	1,699
Central-North	495	3.3	546	3.6	1,041
Far South	186	1.2	128	0.8	314
East	3,545	23.4	3,375	22.2	6,920
Northeast	199	1.3	239	1.6	438
North	355	2.3	301	2.0	656
West	616	4.1	571	3.8	1,187
Southwest	953	6.3	789	5.2	1,742
South	611	4.0	563	3.7	1,174
Total	7,815	51.5	7,356	48.5	15,171

Source: Brazilian Ministry of Health - Hospital Information System from the SUS.

Table 3 – Hospital admission by health macro-region and race/skin color, Bahia State, Brazil, 2012-2016.

Health macro-region	White	Black	Brown	Yellow	Indian	No information	Total
Central-East	90	37	967	12	-	593	1,699
Central-North	34	17	468	3	-	519	1,041
Far South	62	11	172	14	-	55	314
East	227	359	1,293	32	-	5,009	6,920

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Health macro-region	White	Black	Brown	Yellow	Indian	No information	Total
Northeast	46	13	266	24	-	89	438
North	38	3	281	2	-	332	656
West	106	18	434	10	-	619	1,187
Southwest	329	90	747	10	-	566	1,742
South	321	37	563	2	2	249	1,174
Total	1,253	585	5,191	109	2	8,031	15,171

Source: Brazilian Ministry of Health - Hospital Information System from the SUS.

Note: Numeric data equal to 0 not resulting from rounding (-).

Table 4 shows the distribution by age group and macro-region during the period studied. It is observed that people from 35 to 39 years old had higher morbidity (n=1,877), corresponding to 12.4% of the total number of hospitalizations by UL.

When analyzing the costs, it is noted that the morbidity by UL generates a great financial impact on Health Services. In 5 years, the *Sistema Único de Saúde (SUS)* [Brazilian Unified Health System] spent the equivalent of R\$ 5,507,096.08 on hospitalizations of users, as shown in **Table 5**.

Table 4 – Hospital admission by health macro-region and age group, Bahia State, Brazil, 2012-2016.

Age group (years old)	Central-East	Central-North	Far South	East	Northeast	North	West	Southwest	South	Total	%
≤1	1	-	-	6	-	-	-	1	-	8	0.1
1 to 4	15	3	-	21	1	2	15	4	5	66	0.4
5 to 9	13	8	4	48	2	8	15	21	5	124	0.8
10 to 14	46	38	8	68	10	11	31	53	16	281	1.9
15 to 19	99	95	21	178	36	38	73	93	69	702	4.6
20 to 24	138	82	17	372	36	48	86	139	80	998	6.6
25 to 29	161	103	26	545	49	57	138	203	107	1,389	9.2
30 to 34	193	120	36	781	52	112	155	218	154	1,821	12.0
35 to 39	199	105	38	904	45	88	144	204	150	1,877	12.4
40 to 44	191	98	29	806	43	66	121	166	114	1,634	10.8
45 to 49	147	91	40	751	40	58	110	161	104	1,502	9.9
50 to 54	139	77	25	728	23	42	93	140	90	1,357	8.9
55 to 59	77	47	23	567	34	28	66	77	78	997	6.6
60 to 64	81	63	14	462	24	31	42	55	62	834	5.5
65 to 69	58	37	10	304	15	31	32	70	36	593	3.9
70 to 74	55	20	11	197	6	15	25	59	45	433	2.9
75 to 79	35	20	7	96	10	9	16	33	23	249	1.6
≥ 80	51	34	5	86	12	12	25	45	36	306	2.0
Total	1,699	1,041	314	6,920	438	656	1,187	1,742	1,174	15,171	100

Source: Brazilian Ministry of Health - Hospital Information System from the SUS.

Note: Numeric data equal to 0 not resulting from rounding (-).

Table 5 – Value in Brazilian Real by health macro-region and year of care provision, Bahia State, Brazil, 2012-2016.

Health macro-region	2012	2013	2014	2015	2016	Total (R\$)	%
Central-East	1,802.14	107,467.57	79,963.55	75,621.30	75,988.89	340,843.45	6.2
Central-North	744.00	51,968.77	39,562.91	26,733.92	31,165.33	150,174.93	2.7
Far South	743.88	21,488.65	16,455.06	38,046.50	392,281.40	115,962.23	2.1
East	132,360.93	1,008,251.24	866,131.15	861,480.55	944,675.55	3,812,899.42	69.2
Northeast	1,639.73	14,352.66	17,365.30	17,639.50	12,007.87	63,005.06	1.1
North	928.44	37,356.24	45,111.35	29,467.21	38,925.83	151,789.07	2.8

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Health macro-region	2012	2013	2014	2015	2016	Total (R\$)	%
West	933.86	59,970.57	64,891.55	65,733.48	68,634.15	260,163.61	4.7
Southwest	3,593.68	79,342.85	77,300.87	92,085.63	102,166.34	354,489.37	6.4
South	3,282.53	70,059.26	58,452.46	74,398.95	51,575.74	257,768.94	4.7
Total	146,029.2	1,450,257.81	1,265,234.20	1,281,207.04	1,364,367.84	5,507,096.08	100

Source: Brazilian Ministry of Health - Hospital Information System from the SUS.

DISCUSSION

Renal lithiasis is a relatively common pathological condition in urological clinical practice, becoming a serious public health problem for today's society,¹¹⁻¹³ since, its incidence has increased behavior over the years, significantly impacting not only on population health but in the costs of health care.¹²⁻¹⁴ Therefore, when analyzing the results obtained with this study, it is essential to discuss some factors recognized as important, since this analysis allowed to describe the cases of hospital morbidity by UL in the *Bahia* State over the period from 2012 to 2016, as well as its prevalence by gender, age group, hospital costs, and race/skin color.

Studies suggest that the incidence of symptomatic UL increases both in summer and in warmer regions, as is the case in Bahia, which, due to its latitude, the tropical climate prevails throughout the state, presenting theoretically high temperatures all year round.^{2,14} For this reason, in general, annual temperature averages exceed 27 degrees Celsius. In the summer, there is an increase of up to 30% in the number of people bearing kidney stones.^{2,14,15}

The increase in room temperature and greater exposure to sunlight, appears as the main risk factors for renal lithiasis, as it favors greater risk of dehydration.^{2,4,11} This happens because people sweat more frequently and not always are concerned with fluid replacement, resulting in intense urinary concentration and a greater possibility of formation of urinary calculus and its clinical manifestation.^{14,16}

The disease affects any person, regardless of age, race or gender.¹² It is noteworthy that, traditionally, the prevalence of UL occurs more among males,^{2,4,16} and can reach proportions of up to 4 times higher compared to female gender.¹⁷

The prevalence of UL in the *Bahia* State is similar to those found in other studies, with almost always a higher prevalence in males.² However, only in the Central-North and Northeast macro-regions were higher morbidity among females, as shown in **Table 2**.

Given the specific factors of both genders related to UL, a study¹⁸ addressed that urinary osmolarity in males is usually higher compared to females. Furthermore, it was identified that the antidiuretic response to vasopressin is uneven between the genders, being higher in the male, which can influence the urinary concentration and, thus, have a higher probability of urinary stone formation.¹⁸

In regard to race, there are not many studies in the literature that address its relationship with the development

of UL. Brazil is a miscegenated country whose majority of the population belongs to the black ethnic group, mainly in the *Bahia* State.¹⁷

The black population has the highest prevalence of SAH, considered factors closely linked to the development of kidney stones.^{19,20} In a recent population-based study²¹ carried out with *Quilombola* people in the *Vitória da Conquista* city, *Bahia* State, Brazil, there was a prevalence of 45.4% SAH, showing to be superior to those evidenced in surveys of the general population.

Herein, there was larger morbidity in people classified as without information in the race/skin color variable (n=8,031), as shown in **Table 3**. This result can be explained due to a possible underreporting of the system and even, the criterion adopted for classification ethnicity, which is self-declaration, since users may refuse to answer.

The self-declared browns had the second-highest occurrence of morbidity with 5,191 hospitalizations, which corresponds to 34.21% of the total. Due to miscegenation, self-declared brown users may have more strongly inherited the genetic characteristics of the black race that predispose them to cardiovascular and, consequently, renal issues.

As it mainly affects people in the economically active range, UL is an important cause of absenteeism, causing impacts on the patient's professional productivity,² corroborating with the present study, in which the highest morbidity was observed in individuals between 35 and 39 years old (n=1,877), corresponding to 12.4% of the total number. Such results are similar to other studies in which the average age was 39.7 years²² and greater involvement in the age group between 30 and 39 years old, with 23.1% of the total.²

Studies show that adults over the age of 30 are more likely to develop kidney stones compared to younger people. However, the problem can occur at any age.^{16,4} Therefore, some researchers assert that currently 10% of boys and 5% of girls who are born, will have kidney stones if they reach 70 or 80.^{4,16,23}

In the United States of America, the male/female ratio has changed over the past 25 years from 3:1 to less than 2:1.^{24,25} Nonetheless, the reasons for such a change are still uncertain. Some authors suggest that changes in lifestyle and increased obesity among women may be associated.²⁶

Despite low mortality, kidney stones have high morbidity. Given the aforementioned, the chance of a person being affected by a kidney crisis for the second time in 1 year is

15%. In five years, it increases to 30% and, in 10 years, it increases to 40%.^{4,23} Consequently, the expenses of the SUS with UL are considerable, although there are few studies to assess the costs associated with lithiasis in Brazil.^{4,27}

During the period studied, UL generated a financial impact of more than R\$ 5.5 million to public budget, as shown in **Table 5** and the largest expense was recorded in the East macro-region, corresponding to 69.23%.

Investigations related to UL allow identifying the path taken from the identification of the clinical case to the choice of the most appropriate treatment. Furthermore, they allow directing the construction of increasingly less invasive methods that reduce the recurrence of kidney stones, since statistical data proves that UL has shown an increasing morbidity index.^{13,14} Therefore, efforts must be directed towards to reduce the formation and growth of urinary stones in the population.^{4,14,16}

Renal lithiasis is associated with a painful clinical status. In the case of suspected kidney stones, immediate referral to the nephrologist becomes essential, as it allows early diagnosis, reducing the recurrence rate, hospitalization costs, and, above all, the discomfort of repeated episodes of nephritic colic.^{4,14} Hence, it allows the development of pre-dialysis education, so that the person acquires knowledge of the available techniques for the treatment of the pathology, since the implementation of preventive measures decreases the initial morbidity and mortality.^{14,23}

CONCLUSIONS

Herein, the results showed that over the period from 2012 to 2016, the Bahia State has registered 15,171 hospitalizations due to UL, suffering a financial impact of R\$ 5,507,096.08.

The East macro-region represented 45.61% of the total number of hospitalizations, and it can be inferred that the territory is composed of a greater number of people who present risky behaviors. According to the results, it is required to address UL control and prevention actions as priority.

It is noteworthy that this study has limitations due to the source of data collection. The morbidity records are filled out by professionals working in the health services and sent to DATASUS. As a result, there may be underreporting and, consequently, inaccuracy of recorded data. Nonetheless, it is an effective information system for directing public policies to promote and protect the health of the Brazilian population.

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