

Nephrolithiasis Treatment Costs among Patients at a Vietnamese Public Hospital

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Abstract

Introduction: Nephrolithiasis has been rising in prevalence worldwide, imposing a significant cost burden on both patients and society in general. *Desmodium styracifolium* extract (DSE) and Rowatinex[®] are the two stone-eroding pharmaceuticals most commonly used to treat nephrolithiasis in Vietnam. This study aimed to compare the treatment costs and durations between Rowatinex[®] and DSE in Vietnamese patients with nephrolithiasis. **Materials and Methods:** This was a retrospective cost-of-illness analysis of the information extracted from a public hospital's electronic database. This study was based on the prevalence approach, and it focused on the health-care provider perspective. All ambulatory patients who were diagnosed with nephrolithiasis from January 2015 to December 2017 were filtered using specific inclusion and exclusion criteria. **Results and Discussion:** A total of 1,001 patients who were prescribed Rowatinex[®] and 882 patients who were prescribed DSE were included in this research. The majority were 30–59 years old and had no health insurance. The pharmaceutical expenses accounted for the highest percentage of the total cost (59.8% for Rowatinex[®] and 67.9% for DSE). Overall, the Rowatinex[®] treatment had a higher average cost per patient than the DSE (290.5 vs. 264.3 US dollars); however, it was used over a shorter duration of time (10.8 weeks vs. 19.6 weeks). **Conclusion:** Based on the results of this study, Rowatinex[®] is a more ideal choice for patients with kidney stone disease.

Key words: Cost, *Desmodium styracifolium*, kidney stone, nephrolithiasis, Rowatinex[®], Vietnam

INTRODUCTION

Nephrolithiasis is the third most common disorder encountered in primary care practice, just after urinary tract infections and prostate disease, and it is usually diagnosed based on the clinical symptoms, physical examination, and imaging studies (computed tomography scan and ultrasonography). Ureteral stones can form calcium stones (18%), most of which are composed primarily of calcium oxalate or calcium phosphate. The other main types include uric acid, struvite, and cystine stones.^[1-3] Kidney stones have been rising in prevalence worldwide, creating a significant cost burden for patients as well as society in general (direct procedures, hospitalization, indirect costs associated with a loss of worker productivity, and additional costs for prevention, and medical management). Worldwide, the overall prevalence of kidney stones is 5–10% and this proportion is about 8.8% in the United States (US) and 7.54% in China.^[4] Many studies

evaluating the nephrolithiasis costs have been published. In the US, a significant economic burden is associated with kidney stones, with annual estimates exceeding 5 billion US dollars (USD), including indirect costs of approximately 775 million USD per year.^[5,6]

Due to their complex nature, the treatment of kidney stones depends on the size and location of the stones, as well as the pain and the patient's ability to keep fluids down. Approximately 10–20% of all kidney stones require surgical

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Received: 15-01-2018

Revised: 04-05-2018

Accepted: 07-05-2018

removal. However, considerable progress has been made in the medical and surgical management of nephrolithiasis over the past 20 years. Three minimally invasive surgical techniques that significantly reduce the morbidity of stone removal have been developed and are currently available: Shock wave lithotripsy (SWL), percutaneous nephrolithotomy, and ureteroscopy. Apart from medical procedures, medical therapies also play key roles in the prevention of new stone formation and the facilitation of stone passage. Specifically, *Desmodium styracifolium* extract (DSE) and Rowatinex® are usually used to treat nephrolithiasis in Vietnam.

The herbal medicine namely Kim Tien Thao contains triterpenoids extracted from *D. styracifolium* (Osbeck) Merr., and it has been proven to be effective in treating kidney stones. Rowatinex® (Rowa Pharmaceuticals Ltd., Bantry, Co. Cork, Ireland) is a combination of seven naturally available terpenes (31 mg of pinene [$\alpha+\beta$], 15 mg of camphene, 3 mg of cineol, 4 mg of fenchone, 10 mg of borneol, 4 mg of anethol, and 33 mg of olive oil) that help to dissolve/break down and remove kidney and urinary tract stones, as well as relieve muscle spasms, thus reducing the pain. It also increases the blood flow and reduces inflammation, which can be associated with the presence of kidney stones. Based on the results of one study, Rowatinex® had no significant effect on the clearance rate of kidney calculi after SWL, but it did accelerate the passage of calculi after 2 weeks without any significant adverse effects.^[7] Another study designed to investigate the safety and efficacy of a special terpene combination in the treatment of patients with urolithiasis after extracorporeal SWL (ESWL) revealed that it was a well-tolerated, safe, and efficacious therapy for eliminating calculi fragments generated by ESWL when compared to a placebo treatment.^[8]

Undoubtedly, it is crucial to optimize health care for nephrolithiasis by choosing an ideal treatment that is economical for patients, but still safe and effective. Therefore, the objective of this study was to compare the treatment costs and treatment durations between Rowatinex® and DSE in patients suffering from nephrolithiasis in Vietnam.

SUBJECTS AND METHODS

Study design

A retrospective database analysis was conducted using a hospital electronic records database to determine the direct medical costs of nephrolithiasis cases during the 3 fiscal years from January 2015 to December 2017. This study was based on the prevalence approach, and it focused on the health-care perspective.

Study site

This study was conducted at a public hospital (Binh-Dan Hospital) located in Ho Chi Minh City, which is the largest

city in the southeastern region and the economic center of Vietnam. This central-level hospital plays a key role in the health-care system, especially in urology, with a capacity of 700 beds. Approximately 13 thousand urological surgeries are conducted annually, with 400,000 outpatient visits per year.

Study population

The patient characteristics and cost data were collected from the hospital's electronic database. These patient characteristics included an identified code, gender, year of birth, address, health insurance status (coverage percentage), and kidney stone diameter. The cost data included the physician consultation, diagnostic examination, laboratory tests, imaging technique, medical procedure, pharmaceuticals, medical supplies, and other expenditures.

Inclusion and exclusion criteria

All the ambulatory patients who were diagnosed with nephrolithiasis using code N20.0 of the 10th revision of the International Statistical Classification of Diseases and Related Health Problems (ICD-10)^[9] were eligible to participate in this study if they met the following requirements: (1) prescribed Rowatinex® or DSE by a physician, (2) complied with the treatment protocol and follow-up appointments, and (3) exhibited treatment success during the study period (no stones). Those patients with missing information, errors in the information entered into the electronic database, or who voluntarily discontinued treatment were excluded.

Cost of illness measurements

The treatment cost was investigated by calculating the resource utilization, including the diagnosis (physician consultation and diagnostic examinations), laboratory testing, imaging technique, pharmaceuticals, medical supplies, and other costs. The costs from previous years were converted to 2017 USD using the consumer price index, with an exchange rate of one USD for 22,698.4 Vietnamese Dong.^[10]

Data analysis and presentation

The data were managed and analyzed using the Microsoft Excel 2013 statistical software for Windows®. Descriptive statistics (frequency, percentage, mean, median, min, max, standard deviation, and 25–75 percentiles) were used to summarize the data describing the demographic characteristics, clinical status, and cost components.

Ethical approval

The study protocols were approved by the hospital to ensure that all the information was used only for research purposes.

Because the study information was obtained from the hospital's electronic record database without patient contact, written informed consent from the patients was waived. The data related to the resources used were de-identified to minimize the risk of the unintended disclosure of the individuals' identities and the information about them. During the data collection, each patient was identified anonymously by creating an alphanumeric code.

RESULTS

Table 1 depict the general characteristics of the patients being treated for nephrolithiasis using Rowatinex® and DSE at Binh-Dan Hospital between 2015 and 2017. The average

ages of the patients in the 2 treatment groups were roughly similar to one another, while the age range of the DSE patients was somewhat wider than its counterpart (30–66 years old vs. 36–61 years old, respectively). In both the Rowatinex® and DSE groups, the age group with the largest number of patients was 31–59 years old, with a total of 1,069 out of 1,883 recorded patients. While those patients who were treated with Rowatinex® had little insurance to cover their fees (704 out of 1,001 had to use their personal funds), the DSE group was more well covered (308 out of 882 patients had full coverage for their hospital costs). However, the duration of hospitalization for the DSE treatment group was significantly longer than that of the Rowatinex® group, with an average of 19.6 days compared to only 10.8 days for the Rowatinex® group.

Table 1: Demographic characteristics of included patients in Binh-Dan hospital [n (%)]

Characteristics	Rowatinex®				DSE			
	2015 (n=338)	2016 (n=320)	2017 (n=343)	2015–2017 (n=1001)	2015 (n=284)	2016 (n=301)	2017 (n=297)	2015–2017 (n=882)
Age (years)								
Mean±SD	49.4±12.6	51.2±10.3	48.0±9.6	50.1±10.9	52.6±10.3	49.2±12.0	54.0±19.1	51.8±13.8
Range (min – max)	23–81	21–80	19–79	19–81	23–79	21–88	20–90	20–90
Median (IQR [25–75])	49 (40–60)	50 (35–58)	46 (32–63)	49 (36–61)	51 (33–68)	50 (27–65)	54 (39–67)	49 (30–66)
Age group								
≤30	27 (8.0)	17 (5.3)	34 (9.9)	78 (7.8)	48 (16.9)	50 (16.6)	42 (14.1)	140 (15.9)
31–59	224 (66.5)	203 (63.4)	218 (63.8)	645 (64.4)	137 (48.2)	143 (47.5)	144 (48.5)	424 (48.1)
≥60	87 (25.5)	100 (31.3)	91 (26.3)	278 (27.8)	99 (34.9)	108 (35.9)	111 (37.4)	318 (36.0)
Gender								
Female	185 (54.8)	179 (55.9)	196 (57.1)	560 (55.9)	132 (46.5)	160 (53.2)	145 (48.8)	437 (49.5)
Male	153 (45.2)	141 (44.1)	147 (42.9)	441 (44.1)	152 (53.5)	141 (46.8)	152 (51.2)	445 (50.5)
Health insurance(%)								
0*	255 (75.4)	213 (66.6)	236 (68.8)	704 (70.3)	98 (34.5)	119 (39.5)	101 (34.0)	318 (36.1)
48	43 (12.7)	28 (8.8)	67 (19.5)	138 (13.8)	35 (12.3)	56 (18.6)	45 (15.2)	136 (15.4)
80	10 (3.0)	17 (5.3)	18 (5.2)	45 (4.5)	9 (3.2)	12 (4.0)	29 (9.8)	50 (5.7)
95	5 (1.5)	12 (3.8)	10 (2.9)	27 (2.7)	47 (16.5)	13 (4.3)	10 (33.3)	70 (7.9)
100	25 (7.4)	50 (15.5)	12 (3.5)	87 (8.7)	95 (33.5)	101 (33.6)	112 (37.7)	308 (34.9)
Location								
Rural	192 (56.9)	210 (65.6)	199 (58.0)	601 (60.0)	99 (34.9)	159 (52.8)	139 (46.8)	397 (45.0)
Urban	146 (43.1)	110 (34.4)	144 (41.9)	400 (40.0)	185 (65.1)	142 (47.2)	158 (53.2)	485 (55.0)
Treatment duration (weeks)								
Mean±SD	11.0±7.5	10.2±4.7	11.4±3.8	10.8±5.2	18.7±4.8	20.1±3.7	20.2±3.9	19.6±4.4
Range (Min – Max)	1–31	2–33	2–32	1–32	10–39	14–40	9–36	9–40
Median [IQR (25–75)]	10 (5–15)	9 (5–14)	9 (4–16)	9 (5–15)	18 (12–30)	24 (18–34)	20 (17–23)	21 (15–28)

DSE: *Desmodium styracifolium* extract, IQR: Interquartile 25%–75%, SD: Standard deviation

Regarding the average annual expense for the nephrolithiasis treatment, it was shown that most of the two groups' expenses dropped slightly in 2016 before increasing again in 2017, with the exception of antibiotics and other drugs expenditures, which declined continuously from 2015 to 2017. The Rowatinex® group had an overall economic burden between 2015 and 2017 of 290,759.4 USD, which was slightly higher than the 233,086 USD for DSE. A closer look revealed that most of the Rowatinex® group's burden came directly from Rowatinex® itself as part of the pharmaceutical expenditure (contributing 37.9% for a total of 59.8% of the share of pharmaceuticals in the average cost per year for the patients). However, antibiotics were the biggest contributor toward the pharmaceutical expenditure (158,323.7 USD of the total economic burden on the patients) in the DSE group. The annual cost of the medical supplies and other related costs were the smallest among all the sectors; the DSE

group's annual cost for medical supplies was only 1,704.4 USD, which was the smallest, while the sum of the medical supplies' cost and the other costs was only slightly more than 2,700 USD [Table 2].

When dividing up the annual costs based on the gender and age, we were able to determine how each individual expense can affect these characteristics differently. As shown in Table 3, the economic burden affected patients between 31 and 59 years old the most, with Rowatinex®'s total cost on the male patients having the highest recorded mean cost at over 309 USD (the total economic burden suffered by the male patients from 2015 to 2017 was staggering at 170,625.5 USD). However, the treatment of the male patients cost slightly more than the females, regardless of age, with a mean cost of treatment for male patients at all ages in the Rowatinex® group of 304.7 USD, compared to only 272.4

Table 2: Average cost per year on patients with nephrolithiasis (2017 USD)

Cost components	Mean cost±SD			Economic burden 2015–2017 (%)
	2015	2016	2017	
Rowatinex® (n=1001)				
Diagnosis	10.0±3.0	9.5±2.1	12.4±3.1	10,673.2 (3.7)
Laboratory tests	23.6±2.1	18.4±1.9	30.4±2.5	24,292 (8.4)
Image techniques	45.9±3.2	46.8±2.2	39.6±4.1	44,073 (15.2)
Medical procedures	31.4±8.1	29.9±7.5	42.0±6.3	34,587.2 (11.9)
Pharmaceuticals	166.6±24.9	172.4±23.0	183.4±20.9	17,4385 (59.8)
Antibiotics	14.4±3.3	13.2±3.4	12.8±3.7	13,481.6 (4.6)
Analgesics, anti-inflammatory	10.6±2.2	9.2±1.7	13.7±1.5	11,225.9 (3.9)
Vitamin supplements	3.0±1.1	2.2±0.6	3.1±1.4	2,781.3 (1.0)
Rowatinex	100.3±9.0	107.2±11.1	124.6±10.9	1,10,943.2 (37.9)
Other drugs	38.3±7.7	40.6±8.2	29.2±10.5	35,953 (12.4)
Medical supplies	2.1±0.3	1.5±0.2	2.9±0.3	2,184.5 (0.8)
Other costs	0.5±0.1	0.7±0.1	0.5±0.3	564.5 (0.2)
Total cost	280.1±32.9	279.2±31.3	311.2±35.6	29,0759.4 (100.0)
DSE (n=882)				
Diagnosis	10.3±3.4	9.4±3.1	12.2±3	9,378 (4.0)
Laboratory tests	13.8±6.5	10.7±5.1	18.3±6.3	14,365.3 (6.2)
Image techniques	34±10.1	36±14.7	37.5±12.9	35,874.5 (15.4)
Medical procedures	12.5±3.8	10.0±2.5	9.2±3.0	10,580.6 (4.5)
Pharmaceuticals	164.3±17.8	153.9±18.2	156.1±20.1	1,58,323.7 (67.9)
Antibiotics	92.3±12.2	89.4±10.2	72.3±13.0	84,604.3 (36.3)
Analgesics, anti-inflammatory	4.1±0.3	3.6±0.5	4.7±0.6	4,149.9 (1.8)
Vitamin supplements	3.0±0.8	3.2±0.7	4.6±0.2	3,615.8 (1.6)
DSE	51.3±9.9	45.7±4.2	60.3±7.8	52,646.3 (22.6)
Other drugs	13.6±5.0	12.0±3.7	14.2±6.0	13,307.4 (5.7)
Medical supplies	1.8±0.2	1.3±0.4	2.0±0.2	17,10.4 (0.7)
Other costs	2.7±0.8	3.6±1.0	2.3±1.3	2,853.5 (1.2)
Total cost	239.4±40.5	224.9±36.2	237.6±35.4	2,33,086 (100.0)

DSE: *Desmodium styracifolium* extract, IQR: Interquartile 25%–75%, SD: Standard deviation

Table 3: Costing analysis on patients suffered from nephrolithiasis with different genders and age groups (2017 USD)

Cost components	Mean cost±SD				Economic burden 2015–2017 (%)
	≤30 y/o	31–59 y/o	≥ 60 y/o	All ages	
Rowatinex® (n=1001)					
Male (n=560)					
Diagnosis	9.6±1.8	10.3±5.1	11.5±1.2	10.5±4.0	5,871.4 (3.4)
Laboratory tests	23.1±0.4	25.3±1.4	21.6±5.3	24.4±4.3	13,640.4 (8)
Image techniques	46.1±6.8	52.6±9.0	39.5±3.5	49.4±7	27,656.9 (16.2)
Medical procedures	31.9±11.7	37.4±14.1	34.3±9.0	36.3±10.1	20,349.7 (11.9)
Pharmaceuticals	179.5±49.5	180.4±21.4	185.4±43.6	181.4±33.5	1,01,568.3 (59.5)
Antibiotics	12.6±5.3	13.7±2.2	14±1.2	13.7±3.1	7,657.8 (4.5)
Analgesics, Anti-inflammatories	10.8±1.5	11.5±3.1	8.8±3.2	10.9±2.7	6,091 (3.6)
Vitamin Supplements	1.3±0.8	3.1±0.5	1.1±1.5	2.6±0.7	1,429.2 (0.8)
Rowatinex	118.7±5.3	109.3±10.8	121.0±12.3	112.5±7.6	62,976.5 (36.9)
Other drugs	36.1±7.8	42.8±10.3	40.5±2.1	41.8±5.7	23,413.8 (13.7)
Medical supplies	2.1±1.1	2.4±1.4	1.5±1.3	2.2±1.2	1,232.3 (0.7)
Other costs	0.2±0.2	0.7±0.3	0.1±0.2	0.5±0.2	306.5 (0.2)
Total cost	292.5±143.4	309.1±111.5	293.9±108.3	304.7±139	1,70,625.5 (100.0)
Female (n=441)					
Diagnosis	10.1±0.9	12.2±0.6	9.1±0.2	10.9±0.9	4,801.8 (4)
Laboratory tests	22.8±2.8	23.4±11.7	25.6±3.6	24.2±10.2	10,651.6 (8.9)
Image techniques	34.0±18.0	44.2±12.4	27.4±17.7	37.2±14.6	16,416.1 (13.7)
Medical procedures	37.0±4.9	32.5±10.8	30.9±7.4	32.3±5.6	14,237.5 (11.9)
Pharmaceuticals	183.2±31.9	167.3±68.7	157.9±64.7	165.1±50.3	72,816.7 (60.6)
Antibiotics	9.7±0.8	15.2±2.3	11.0±2.8	13.2±1.9	5,823.8 (4.8)
Analgesics, Anti-inflammatories	10.7±0.8	13.1±0.7	9.7±1.1	11.6±0.8	5,134.9 (4.3)
Vitamin Supplements	3.0±1.3	3.2±1.2	2.9±0.6	3.1±1.1	1,352.1 (1.1)
Rowatinex	120.6±47.1	101.4±20.2	117.3±18.2	108.8±24.5	47,966.7 (39.9)
Other drugs	39.2±1.4	34.4±9.1	17.1±7.9	28.4±8.2	12,539.2 (10.4)
Medical supplies	1.8±1.6	2.6±0.6	1.6±0.7	2.2±1.0	952.2 (0.8)
Other costs	0.1±0.2	0.8±0.4	0.4±0.2	0.6±0.3	258 (0.2)
Total cost	289.0±170.8	283.0±100.3	252.9±66.8	272.4±71.7	1,20,133.9 (100.0)
DSE (n=882)					
Male (n=437)					
Diagnosis	9.6±3.3	10.3±4.6	13.9±1.3	11.6±2.4	5,061.9 (4.3)
Laboratory tests	16.7±5.8	18.1±7.6	18.6±8.0	18.1±6.1	7,892.9 (6.7)
Image techniques	46.1±8.0	42.7±6.8	48.7±2.1	45.5±4.6	19,889.9 (16.9)
Medical procedures	12.9±2.6	13.5±3.2	13.8±4.3	13.5±4.5	5,907.7 (5.0)
Pharmaceuticals	173.4±50.5	183.3±43.4	160.9±67.5	173.2±55.9	75,700.8 (64.5)
Antibiotics	90.1±22.2	86.2±31.8	92.2±14.4	89.1±20.6	38,933.8 (33.2)
Analgesics, Anti-inflammatories	4.1±1.7	4.8±0.4	3.1±1.4	4.1±0.4	1,771.5 (1.5)
Vitamin Supplements	4.6±0.6	4.8±1.3	4.3±1.2	4.6±1.5	2,006.9 (1.7)
DSE	62.3±19.2	70±19.9	50.9±11.0	61.5±14.9	26,879.8 (22.9)

(Contd...)

Table 3: (Continued...)

Cost components	Mean cost±SD				Economic burden 2015–2017 (%)
	≤30 y/o	31–59 y/o	≥ 60 y/o	All ages	
Other drugs	12.3±7.5	17.5±3.4	10.4±2.0	14±4.4	6,108.7 (5.2)
Medical supplies	2.1±0.4	2.4±0.5	1.6±0.5	2±0.2	892.8 (0.8)
Other costs	4.3±0.3	4.7±0.9	4.7±0.6	4.6±0.7	2,029.2 (1.7)
Total cost	265.1±23.6	275±65.3	262.2±42.7	268.6±24.2	1,17,375.2 (100.0)
Female (n=445)					
Diagnosis	10.1±6.7	9.7±4.0	9.5±6.3	9.7±4.3	4,316.1 (3.7)
Laboratory tests	13.9±0.3	14.5±5.3	14.9±5.5	14.5±4.8	6,472.4 (5.6)
Image techniques	33.9±14.4	33.2±13.9	40.9±13.3	35.9±14.4	15,984.6 (13.8)
Medical procedures	10.5±1.2	12.5±3.8	7.6±0.4	10.5±0.9	4,672.9 (4.0)
Pharmaceuticals	186.4±64.0	187±33.7	183.4±85.1	185.7±35.7	82,622.9 (71.4)
Antibiotics	100.9±25.8	103.6±19.5	102±28.2	102.6±22.2	45,670.5 (39.5)
Analgesics, Anti-inflammatories	5.3±1.4	5.6±1.3	5±2.2	5.3±1.3	2,378.4 (2.1)
Vitamin Supplements	3.9±1.5	4.0±1.6	2.9±1.9	3.6±0.9	1,608.9 (1.4)
DSE	57.2±25.6	60.3±24.7	54.7±25.9	57.9±25.5	25,766.5 (22.3)
Other drugs	19.1±2.8	13.5±4.2	18.7±3.2	16.2±3.4	7,198.7 (6.2)
Medical supplies	1.8±1.9	2.3±0.7	1.2±0.2	1.8±0.1	817.6 (0.7)
Other costs	1.2±0.5	1.7±1.2	2.4±1.0	1.9±0.3	824.3 (0.7)
Total cost	257.8±76.3	260.9±95.5	259.8±88.0	260±89.7	1,15,710.8 (100.0)

DES: *Desmodium styracifolium extract*, SD: Standard deviation, y/o: Years old

USD for the female patients. The difference between the costs in the DSE group was 8.6 USD [Table 3].

Looking closer into the cost components that formed the total economic burden of nephrolithiasis from 2015 to 2017, it can be seen that the most evident factor affecting the cost was the pharmaceutical expenditure, which took up more than 60% of the treatment costs for both the Rowatinex® and DSE groups. Among these, as stated previously, most of the cost in the Rowatinex® group was derived from the medicine itself (38.1%), while the DSE only accounted for 22.6% of the total cost for its group. Vitamin supplements contributed the least toward the pharmaceutical burden, with only 1.0% in Rowatinex® the group and 1.6% in the DSE group. Moreover, while the antibiotic cost percentage in the Rowatinex® group was only 4.6%, the DSE group’s antibiotic expenditure was 36.3% of the total pharmaceutical cost. Overall, while the distributions of the proportions in terms of the treatment costs in both groups were alike, the individual cost for each medication showed the greatest difference between the 2 groups [Figure 1].

When comparing the economic burden of the two nephrolithiasis treatment methods directly, the data collected throughout the study led us to believe that the average treatment costs for both methods were relatively high in 2017, with a recorded mean cost of 290.5 USD for Rowatinex® and a DSE cost of 264.3

USD per capita. Despite the 26.2 USD gap between them, the DSE treatment plan took a significant amount of time, with an average of 19.6 weeks, which was nearly double that of the Rowatinex® at only 10.8 weeks [Figure 2].

DISCUSSION

This study was conducted to quantify the effects that nephrolithiasis, or kidney stone disease, had on patients by investigating the treatment costs. In addition, this study attempted to determine the most efficient nephrolithiasis treatment method between the two most common kidney stone medications, Rowatinex® and DSE.

The sociodemographic details of the patients who underwent treatment between 2015 and 2017 were recorded for this investigation. The average age at hospitalization for the nephrolithiasis patients at Binh-Dan Hospital was approximate 51 years old, and the 31 to 59 years old age group had the most recorded patients (1,069 patients). It is also worth noting that most of the Rowatinex® patients were not covered by health insurance (70.3%) while the DSE patients were more well-supported. Perhaps the rural dwellers (60%) were more familiar with the Rowatinex® treatment, while the DSE was more well-known in the urban population (55%).

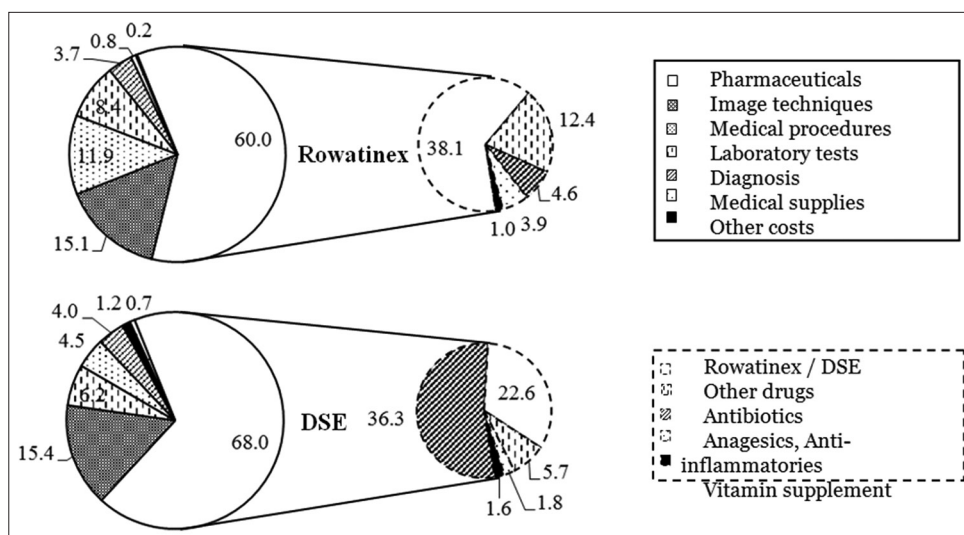


Figure 1: Cost components of nephrolithiasis treatment from 2015 to 2017 (% of total cost)

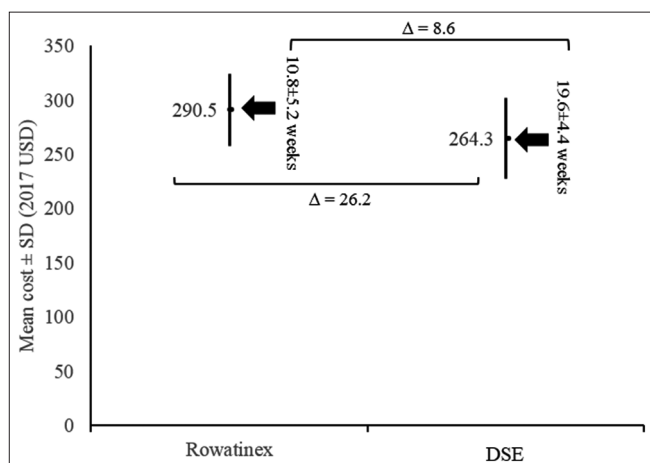


Figure 2: Differences in the average costs and treatment durations between Rowatinex® and *Desmodium styracifolium* extract

Gender was also a crucial element to be considered, and the results suggested that the male patients had significantly higher treatment cost per case than their female counterparts, likely due to the 119-patient gap between the males and females in the Rowatinex® group. However, the DSE treatment costs of the male patients were still higher than the females, even though there were only 437 male patients compared to 445 female patients recorded in the study.

When analyzing the components contributing toward the economic burden, this study determined that the Rowatinex® medication itself took up most of the expense (37.9%) when treating nephrolithiasis using this drug. However, the costliest element included in the DSE treatment was antibiotics (36.3%), with the DSE medication expenditure coming in second (22.6%). As a result, the economic burden of the pharmaceutical expenditures proved to be the most concerning aspect, because more than half of the total treatment cost was for medication in general.

This was the first attempt to evaluate the efficiency of the two most common nephrolithiasis treatment plans based on their impacts on the economic burden. The results of this study showed that there was a slight difference of 26.2 USD between the average costs of the individual treatments, with the Rowatinex® being more costly. However, when considering the length of treatment, the DSE duration was nearly double that of the Rowatinex® (19.6 weeks vs. 10.8 weeks, respectively). Therefore, the authors believe that of the two most commonly used treatments, Rowatinex® is a more ideal choice for treating patients with kidney stone disease.

The presented results can be used in further studies regarding the economic burden of nephrolithiasis. They can also be used to evaluate the differences between patients with various backgrounds. This examination of the treatment methods will be useful in aiding patients in determining the most efficient treatment plan. However, this requires further testing because there may be differences in the outcomes in other regions and nations.

CONCLUSION

This study was the first conducted in Vietnam to compare the two most common herbal medicines used for nephrolithiasis treatment. The results showed that the Rowatinex® accounted for a higher expense but earlier treatment success than the DSE. Therefore, Rowatinex® is a more ideal choice for treating patients with kidney stone disease.

ACKNOWLEDGMENT

The authors honestly say thanks to President Council of Binh-Dan Hospital for the protocol approval as well as their support for the data collection.

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Source of Support: Nil. **Conflict of Interest:** None declared.