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Socioeconomic Costs of Overactive Bladder and Stress Urinary Incontinence in Korea

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Purpose: We quantified and described the economic burden of overactive bladder and stress urinary incontinence in Korea. We calculated direct costs by identifying public and private data sources that contain population-based data on resource utilization by patients with stress urinary incontinence and overactive bladder.
Methods: For estimating indirect costs (productivity loss), the human capital approach was applied. Data were collected from several institutes, including the Health Insurance Review Agency.
Results: The estimated total economic cost in treating overactive bladder was 117 billion Korean Won (KRW, the currency of South Koea) in 2006 and 145 billion KRW in 2007. The estimated total cost in treating stress urinary incontinence was 122 billion KRW in 2006 and 59 billion KRW in 2007.
Conclusions: By quantifying the total economic costs of overactive bladder and stress urinary incontinence, this study provides an important perspective in Korea. Because the average age of the Korean population is rapidly increasing, this study provides important information on the direct and indirect costs of overactive bladder and stress urinary incontinence for an aging society.

Keywords: Stress urinary incontinence; Overactive urinary bladder; Costs and cost analysis

INTRODUCTION

Overactive bladder (OAB) and stress urinary incontinence (SUI) are two of the most common voiding related disorders. Urinary incontinence (UI) is defined as involuntary urinary leakage without reference to the causes of incontinence, and SUI is urinary incontinence which is induced by increasing abdominal pressure [1]. The prevalence of UI is 24.3% in Korean women. OAB represents 48.8% of urinary incontinence patients, and is the most common disabling condition among urinary incontinence patients [2].

OAB is characterized by urgency–a sudden compelling desire to pass urine that is difficult to defer. It is usually accompanied by frequency and nocturia, and it may occur with urge incontinence [1]. OAB affects 12.2% of the adult population in Korea, or approximately 3.5 million individuals, and the prevalence increases with advancing age [3].

When the population aged 65 or over accounts for 7% of the total population, the country is defined as an aging society; when the elderly account for 14%, the nation is regarded as an aged society, and when the elderly account for 20%, the nation is regarded as a super-aged society. Korea will become an aged society by 2018, after first being identified as an aging society in 2000. Moreover, Korea is expected to be a super-aged society in 2026. Korea has been aging at one of the world's fastest rates [4].

The prevalences of OAB and SUI increase with advancing age, and the rapid increase of an aged population is associated with tremendous costs [2,3]. The purpose of this study is to estimate the economic costs of OAB and SUI by taking into account the direct costs and value of productivity loss in the Ko-

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rean population. By quantifying the total economic burden of OAB and SUI on a society, healthcare resources can be allocated appropriately.

MATERIALS AND METHODS

We calculated the costs by identifying public and private data sources that contain population-based data on resource utilization by patients with SUI and OAB. Data sources were collected from several institutions, including the Health Insurance Review Agency.

Estimation Framework

To determine the economic costs of any illness, three types of costs should be considered: direct costs, indirect costs (productivity loss), and intangible costs.

The direct costs include medical expenditures (physician visit cost, admission cost, surgery, behavioral therapy, and pharmacologic therapy) and traffic costs. The direct medical cost is the annual cost required to treat SUI and OAB. Data from the 2006, 2007 Medical Aid Statistical Yearbook and 2006, 2007 National Health Insurance Statistical Yearbook were used for the estimation of outpatient and inpatient medical expenditures [5-8].

Traffic cost belongs to direct non-medical cost. The average round-trip traffic cost which was 8,350 Korean Won (KRW, the currency of South Koea) for outpatient visit and 21,200 KRW for admission in 2005 [9]. These estimations were adjusted by 2006, 2007 traffic price index, and the average round-trip traffic cost for outpatient visit was 8,768 KRW in 2006 and 9,018 KRW in 2007. And the average round-trip traffic cost for admission was 22,260 KRW in 2006 and 22,896 KRW in 2007. The resulting average traffic cost was estimated in this way.

In summary, Direct cost was estimated by following equation;

$$\text{Direct costs} = \sum_a (E^a + OE^a) + \sum_a \{(O^a \times MO) + (N^a \times M)\} \ldots \text{(equation 1)}$$

$a = 0,1$ disease (OAB and SUI),
E^a: inpatient medical expenditures,
OE^a: outpatient medical expenditures,
O^a: outpatient visit number,
MO: average traffic costs of outpatient visits,
N^a: inpatient number,
M: average traffic costs of inpatient visits

Indirect costs represent productivity loss resulting from either a decrease in the probability of working or in the number of hours worked. Indirect costs of disease often constitute a substantial part of the estimated costs or savings in economic evaluations of healthcare programs. The human capital approach is almost unanimously used for estimating indirect costs, and is defined as productivity loss due to disease [10]. Therefore, we applied the human capital approach in this article among several potential methods (contingent valuation method and friction cost approach).

Productivity loss cost is the cost of work day loss due to hospitalization for treating illness and work time loss due to visiting the hospital [11]. For estimating productivity loss cost, we calculated the work day loss by adding the number of hospitalization days and one-third of the hospital visiting days. This method is based on the assumption that the productivity for one day of hospitalization is similar to that of three cases of outpatient visits [12].

In this way, we derived the work day loss and then modified it by labor participation rate, which considers employment rate and average daily allowance [13,14]. The value of housework was also included using the household participation rate and average household daily allowance [15].

In summary, indirect cost was estimated following;

$$\text{Indirect costs} = \sum_a \sum_i \{(D^a{}_i + \delta \times O^a{}_i) \times p_i \times e_i \times y_i + (D^a{}_i + \delta \times O^a{}_i) \times h_i \times z_i\} \ldots \text{(equation 2)}$$

$i = 0,1,\ldots,$n age,
$a = 0,1$ disease (OAB and SUI),
$D^a{}_i$: admission day number,
δ: productivity loss ratio of outpatient visit to admission,
$O^a{}_i$: outpatient visit number,
p_i: labor participation rate,
e_i: employment rate,
y_i: average daily allowance,
h_i: household participation rate,
z_i: average household daily allowance

Intangible costs include the monetary value of pain or suffering. Although OAB and SUI affect a patient's quality of life [16,17], most economic evaluations avoid estimating intangible costs because it is difficult to calculate the value of pain or suffering [18]. Therefore, we only quantified the direct and indirect costs.

Cost Estimation Methods

In overactive bladder patients, direct cost included the subsequent physician visit costs, treatment fees, pharmacologic costs and traffic costs, while indirect cost included productivity loss

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cost. Physician visit cost represented the total cost requested to the National Health Insurance Cooperation and was calculated by using data from the National Health Insurance Review and Assessment Service Statistic Team for the patients who were diagnosed with OAB (N31, N30, N39.4 of ICD-10). The treatment fee included conservative management costs such as electrostimulation therapy, biofeedback therapy, and sacral nerve stimulation therapy. Pharmacologic cost was the cost of buying anticholinergics in Korea (tolteridine, propiverine, oxybutinine, spagerine, etc.), which was estimated by using the total sales of a pharmaceutical company. However, among the pharmacologic cost, preparation cost was excluded because of the difficulty of estimation.

In SUI patients, direct cost consists of physician visit cost, admission cost, surgery cost, and treatment fees and traffic cost, while indirect cost includes productivity loss cost. All of these costs were calculated by using data from the National Health Insurance Review and Assessment Service Statistic Team in patients who were diagnosed with SUI (N393 of ICD-10) and underwent corrective surgery (R3561, R3562, R3563 in National Health Insurance Cooperation request code).

RESULTS

Cost of OAB

The total cost of OAB was 117,452,492,567 KRW during 2006. Among the direct costs, the physician visit cost and treatment cost totaled 34,811,736,350 KRW, while the pharmacologic cost was estimated at 29,700,000,000 KRW and traffic cost was 11,236,954,050 KRW (Table 1). The indirect costs (productivity loss cost) was 41,703,802,167 KRW (Tables 1, 2).

The total cost of OAB was 145,438,817,568 KRW during 2007. Among the direct costs, the physician visit cost and treatment cost totaled 46,781,663,000 KRW, while the pharmacologic cost was estimated at 33,306,597,507 KRW and traffic cost was 23,653,636,848 KRW (Table 1). The indirect costs (productivity loss cost) was 41,696,920,213 KRW (Tables 1, 2).

Cost of SUI

The total cost of SUI was 122,005,726,757 KRW during 2006. Physician visit cost and treatment cost in the outpatient department was 225,021,870 KRW, and admission cost, including surgery cost, was estimated at 101,262,394,900 KRW and traffic cost was 2,009,247,818 KRW (Table 1). The indirect costs (productivity loss cost) was 18,509,063,069 KRW during 2006 (Tables 1, 3).

The total cost of SUI was 58,850,214,705 KRW during 2007. Physician visit cost and treatment cost in the outpatient department was 217,594,700 KRW, and admission cost, including surgery cost, was estimated at 50,475,822,280 KRW and traffic cost was 1,532,254,968 KRW (Table 1). The indirect costs (productivity loss cost) was 6,624,542,757 KRW during 2007 (Tables 1, 3).

Patient Visits According to Medical Institute Types

The data shows that 79% of OAB patients visited private clinic in 2006, and 75% in 2007. Also, 50% of SUI patients visited at private clinic in 2006, and 48% in 2007 (Table 4).

Table 1. Total social costs of OAB and SUI (2006, 2007)

Factors	OAB		SUI	
	2006	2007	2006	2007
Direct cost				
Medical cost				
Medical expeditures	34,811,736,350	46,781,663,000	101,487,415,870	50,693,416,980
Pharmacologic costs	29,700,000,000	33,306,597,507		
Non-medical cost				
Traffic expenses	11,236,954,050	23,653,636,848	2,009,247,818	1,532,254,968
Indirect costs				
Labor productivity loss	41,703,802,167	41,696,920,213	18,509,063,069	6,624,542,757
Total costs	117,452,492,567	145,438,817,568	122,005,726,757	58,850,214,705

Values are presented as Korean Won (the currency of South Korea) for 2006, 2007.
OAB, overactive bladder including urge incontinence; SUI, stress urinary incontinence.

Table 2. Calculation of the labor productivity loss in patients with OAB (2006, 2007)

	Workday loss	Economic participation rate	Employment rate	Employment allowance	Houseworking participation rate	Houseworking allowance
2006 (yr)						
Age						
-20	24,209	0.075	0.896	86,027,553	0	-
20-29	51,665	0.653	0.923	2,186,926,165	0.347	711,134,282
30-39	98,205	0.755	0.97	7,546,740,022	0.245	1,339,352,525
40-49	137,121	0.795	0.98	12,812,312,465	0.205	1,086,915,102
50-59	117,918	0.701	0.978	9,037,282,682	0.299	1,081,226,392
60-69	139,661	0.379	0.986	4,081,295,359	0.621	1,734,589,620
Total				35,750,584,246		5,953,217,921
2007 (yr)						
Age						
-20	25,093	0.073	0.907	90,981,259	0	-
20-29	50,272	0.646	0.929	2,162,947,477	0.354	705,924,105
30-39	96,667	0.753	0.968	7,619,737,230	0.247	1,329,143,611
40-49	146,191	0.799	0.98	14,411,477,515	0.201	1,136,196,452
50-59	144,395	0.712	0.979	12,026,944,367	0.288	1,275,293,696
60-69	177,360	0.386	0.986	5,475,813,623	0.614	2,177,984,893
Total				41,696,920,213		6,624,542,757

Values are presented as Korean Won (the currency of South Korea) for 2006, 2007.
OAB, overactive bladder including urge incontinence.

DISCUSSION

The prevalences of OAB and SUI increase with advancing age, and the rapid increase of an aged population is associated with tremendous costs. The annual socioeconomic cost of OAB increased from 117 billion KRW in 2006 to 145 billion KRW in 2007; SUI on the other hand decreased from 122 billion KRW in 2006 to 59 billion KRW in 2007. Over 75% of OAB patients visiting private clinic show the increase of OAB costs which may be related to promotional activities such as advertisements and awareness campaigns carried out by various academic societies and pharmaceutical companies for patients and primary care physicians. The cost of SUI decreasing in 2007 might be linked to the National Health Insurance Review Agency's raised standards for approving patients for SUI surgery. However, to find the exact reason for the cost of SUI decreasing in 2007, further comparison between 2007 data and subsequent data is needed.

In the United States (US), the socioeconomic cost for OAB and SUI was 24 billion Dollars (USD, United States Dollar) in 2004 [19]. That figure changed to 2,400 billion KRW according to one dollar equal to 1,000 KRW, which is ten times larger than the 240 billion KRW in 2005. The causes of this difference are noted below. First, differences in the population size and proportion of population aged 65 and over can cause such cost discrepancies. From the Organization for Economic Cooperation and Development (OECD) fact book, the total number of people in the US was 294,056,000 and that of Korea was 48,138,000 in 2005. The US population is six times larger than that of Korea. Moreover, the ratio of people who are older than 65 in US is higher than that of Korea (12.4% vs. 9.1%), which makes the socioeconomic cost of OAB and SUI different [20]. Second, another considerable cause of differing socioeconomic costs is a difference between the two economic scales. According to OECD fact book, the gross domestic growth (GDP) of the US was 12,376 billion USD and that of Korea was 1,027 billion USD in 2005. Thus, GDP of the US was approximately twelve times larger than that of Korea. Third, the differences in study design were also responsible for differences in measured cost. For example, complications of OAB and SUI (UTI, fracture, dermato-

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Table 3. Calculation of the productivity loss in patients with SUI (2006, 2007)

	Workday loss	Economic participation rate	Employment rate	Employment allowance	Houseworking participation rates	Houseworking allowance
2006 (yr)						
Age						
-20	159	0.075	0.896	565,012	0	-
20-29	1,070	0.653	0.923	45,306,106	0.347	14,732,425
30-39	29,088	0.755	0.97	2,235,294,111	0.245	396,707,294
40-49	100,348	0.795	0.98	9,376,262,827	0.205	795,422,504
50-59	57,201	0.701	0.978	4,383,945,457	0.299	524,498,092
60-69	17,682	0.379	0.986	516,718,801	0.621	219,610,440
Total				16,558,092,314		1,950,970,755
2007 (yr)						
Age						
-20	89	0.073	0.907	867,754	0	-
20-29	240	0.646	0.929	19,318,049	0.354	1,646,206
30-39	7,110	0.753	0.968	1,308,221,035	0.247	36,645,459
40-49	25,233	0.799	0.98	6,501,041,156	0.201	59,530,388
50-59	16,287	0.712	0.979	3,612,853,175	0.288	33,548,168
60-69	5,251	0.386	0.986	431,720,699	0.614	6,571,333
Total				11,874,021,870		137,941,555

Values are presented as Korean Won (the currency of South Korea) for 2006, 2007.
SUI, stress urinary incontinence.

Table 4. Direct costs of OAB and SUI according to types of the medical institutes

Types of the medical institutes	OAB		SUI	
	2006	2007	2006	2007
General hospital (specialized)	33,781 (5)	55,157 (6)	4,938 (8)	3,735 (8)
General hospital	65,441 (9)	113,017 (12)	12,198 (19)	9,572 (20)
Hospital	42,687 (6)	63,141 (7)	15,525 (24)	11,487 (24)
Private clinic	543,745 (79)	695,258 (75)	32,090 (50)	23,164 (48)
Health care institute	3,768 (1)	6,111 (1)	6 (0)	54 (0)
Total	689,422 (100)	932,684 (100)	64,757 (100)	48,012 (100)

Values are represented as Korean Won (%).
OAB, overactive bladder; SUI, stress urinary incontinence.

logic problem, etc.), the cost of incontinence pads, and the cost other UI types result in a cost difference between the two countries. When comparing incidences of OAB and SUI in Korean women, the prevalence was 24.3% and SUI was most common among the UI patients (48.8%); the prevalence of OAB was 12.2% in Korea. In the US study, the prevalence of SUI and OAB were 10 to 15% and 16.4%, respectively, which is not very different from that of Korea. In this study, the cost of OAB and SUI was estimated. However, future studies should include other types of UI (overflow incontinence, etc.), as well as the cost of complications from urinary incontinence, and the cost of laundry and incontinence pads (or diapers).

In 2000, Korea became an "aging society" because 7.2% of the population were considered elderly. In 2005, the ratio of old people increased to 9.1%, and is forecast to be 14.3% by 2018, making Korea an "aged society". Korea is projected to be a su-

per-aged society in 2026 because the ratio of elderly people will be greater than 20% [4]. According to a study of the US in 1995, the direct cost of UI was 16 billion USD. It was more than double 10 billion USD in 1987, 7 billion USD in 1984, despite price rising for ten years. The increase in the ratio of the elderly population, which was more rapid than ever in history, will make the prevalence of SUI and OAB also increase; eventually, the rate of the cost increase will be greater than that of the US.

In the US, the prevalence of OAB was 16.9% in women and 16% in men according to the National Overactive Bladder Evaluation program [21]. Furthermore, the OAB cost estimated in this study was 12 billion USD, which is comparable to the estimated costs of other illnesses, such as 13.8 billion USD for osteoporosis and 11.1 billion USD for gynecologic and breast cancer [22].

Subak et al. [23] reported that women with severe incontinence pay about 900 USD out-of-pocket per year for routine incontinence care. Costs increased with incontinence severity. Costs were 65% higher for women with urge incontinence compared with those having stress incontinence. Incontinence is associated with a clinically significant treatment for health-related quality of life. Hence, an effective incontinence treatment may decrease routine care costs and improve quality of life.

In the study of OAB complication, male aged OAB patients associated with UI are twice as likely to be hospitalized, and women are three times as likely. Urge incontinence results in anxiety, negative self-recognition, social isolation, and is associated with depression, other chronic diseases, and risk of suicide [24,25]. Old patients are more susceptible to fracture than young patients; 50% of patients have a history of fall, and 8.5% of patients had fracture history upon three year follow-up [26]. UTI and skin ulcer were also common.

However, only 25% of those with OAB visited their doctor for bladder reasons in the past years. Also, of the two groups with OAB (those with and without incontinence), only 40% of those with incontinence visited their doctor for bladder reasons during the past year. Furthermore, of those that used incontinence pads, only 45% visited their doctor for bladder problems, leaving 55% who probably relied on self-treatment [21]. More seriously, 12.6% of those with UI visited their doctor, yet only 0.8% of those had surgery for incontinence [2]. In Korea, although the consequences associated with OAB and SUI result in adverse effects on quality of life and increasing medical cost, a very small number patients used medications because of a lack of social recognition.

As country's economy develops, quality of life is getting important to people. Therefore, a demand for incontinence treatment will increase as the number of OAB and SUI patients grows. OAB and SUI will generate tremendous expenses, and the prevalence of OAB and SUI will continue to increase. In the future, the cost of OAB and SUI will also increase, and a significant socioeconomic problem may result. Therefore, a social counter plan must be designed for decreasing the cost of OAB and SUI, as well as a method for efficiently distributing this cost.

OAB and SUI result in an adverse effect on the quality of life. The prevalence and socioeconomic costs are higher than osteoporosis, chronic obstructive pulmonary disease, cerebrovascular accident, and diabetes mellitus. Moreover, since Korea is entering rapidly into an aged society, the cost of treating OAB and SUI is predicted to increase. An effective rescue or policy might be considered for these future socioeconomic costs.

This study was based on data of the Health Insurance Review Agency. So Non-insurance covered was not included according to types of the medical institutes. It is a research limitation of this study.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this study was reported.

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