



ORIGINAL ARTICLE

# The Impact of Emergency Room Utilization by Depression Patients on Medical Treatment Expense in Korea

Hyun Sook Lee

Department of Health Administration, Yonsei University, Wonju, Korea.

Received: July 22, 2013  
Revised: September 2, 2013  
Accepted: September 3, 2013

**KEYWORDS:**

depression disorder,  
emergency room  
utilization,  
inpatient,  
medical treatment  
expense

**Abstract**

**Objectives:** To investigate the determinants of total medical expense for depression patients admitted through the emergency room (ER).

**Methods:** Data were selected from the Korean National Health Insurance sample data for 2009. SPSS version 18 was used for the statistical analysis such as descriptive analysis, correlation analysis, and multiple regression analysis. Data included 1203 cases admitted through the ER with ICD-10 codes (F31–F39).

**Results:** In the multiple regression analysis, significant variables affecting total payment were gender ( $p < 0.001$ ), age ( $p < 0.001$ ), main illness ( $p < 0.001$ ), course of admission to the ER ( $p < 0.05$ ), and length of stay ( $p < 0.001$ ).

**Conclusion:** It is necessary to build a long-term program and system for high-risk depression groups.

## 1. Introduction

Worldwide, among the 10 main factors causing severe disabilities, five of them—depression, schizophrenia, compulsive disorder, psychasthenia, and alcohol abuse—are commonly known mental illnesses [1]. Furthermore, a study by Stoudemire et al [2] showed that 60% of committed suicides in America were due to depression, and in addition, such depression has the third highest disease burden of all severe diseases. The World Health Organization predicts that by 2030, depression may surpass cardiovascular diseases as the number one most common disease [3].

The Korean national audit in 2011 states that the Korea Health Insurance Review and Assessment Service found that patients diagnosed with depression increased by 38.9% from 2,480,000 cases in 2007 to 3,440,000 cases in 2011 and the medical consultation fee rose from 1631 billion KRW in 2007 to 1986 billion KRW in 2011 by 56.3% [4]. It is prospecting that depression will be a greater burden on the National Health Insurance (NHI) budget as well as a burden on the individual's future medical expenses [4].

According to the Korean Academy of Medical Sciences [5], depression is a brain disease that may lead to many severe consequences that include: continuous

E-mail: llhss1018@hanmail.net

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/3.0>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

melancholic moods as well as loss of energy and interest in doing certain things; insomnia or hypersomnia; fatigue; pessimistic thinking; feelings of worthlessness and guilt; attention difficulties; suicidal attempts; and, even worse, suicide or serious crimes, which is why depression is a pathological state that needs medical treatment.

An epidemiological survey on mental disorders in 2011 [6] showed that about 10% of female adults experienced mood disorders including depression and bipolar disorders. Notably, the lifetime prevalence rate of depression of female and male adults increased from 6.2% in 2006 to 9.1% in 2011 and from 2.0% in 2006 to 4.3% in 2011, respectively. In addition, from the national health nutrition investigation of 2011 [7], a survey of adults older than 19 years on “The rate of experiencing continuous daily-life-affecting despair or sadness for more than 2 weeks over the last year” showed that female adults aged 50–59 years (22.0%), 60–69 years (20.5%), and over 70 years (20.1%), and male adults ages 50–59 years (11.7%), 60–69 years (10.0%), and over 70 years (11.8%) experienced such episodes. Moreover, they also surveyed “The rate of experiencing suicidal thinking over the last year” and showed that female adults aged 60–69 years (24.9%) and over 70 years (34.3%), and male adults aged 60–69 years (11.7%) and over 70 years (17.5%) experienced suicidal thinking.

According to data from the Organization for Economic Co-operation and Development in 2011 [8], The Republic of Korea’s suicide rate is 31.2/100,000 and is ranked first among nations of this organization and this rate is expected to rise continuously.

The existing research results indicate that early diagnosis is possible for depression, so that it can not only be treated effectively, but can also be managed through follow-up care [9]. However, approximately 65–75% of those who suffer from depression do not seek specialized care and only a few depression patients visit specialized hospitals [10]. In Korea, the severity of problems for prevention and diagnosis of depression is highlighted, due to the relatively low status of medical care service utilization for mental illnesses, because only 24% of patients diagnosed with depression receive continuous treatments for more than 3 months, and only 15% of patients receive more than 6 months of continuous treatments [11].

According to the investigation of the Health Insurance Review and Assessment Service in 2009 [12], the total treatment and hospitalization payment of depression patients increased by 21.76% from 12.584 billion KRW in 2004 to 15.322 billion KRW in 2007. This indicates that the total payment for depression patients will continuously rise, so that it will not only be the burden for the individuals but also for the NHI, which will gradually lead to a significant financial burden for depression patients admitted through the emergency room (ER) in urgent situations.

Thus, efforts should be made in identifying and diagnosing patients with depression early in order to alleviate the symptoms and to increase treatment such that the patient’s treatment duration is shortened and not be elevated to emergency situations where the possibility of suicide is greater. For this to happen, it is important to understand the health science of depression patients. Also, in order to establish medium-term and long-term plans for the development of the mental health services, a national investigation of the medical care service utilization is necessary. Nevertheless, there are few, if any, studies on the medical care service utilization of depression patients admitted through the ER.

Therefore, the aims of this study were: (1) to find the characteristics of emergency care patients with depression; (2) to identify the age group and gender of patients with depression that use emergency care; and (3) to identify the influence on total medical expense. Thus, through the objectified figures above based on empirical data on the use of the emergency department, patients’ medical characteristics should be utilized in making long-term and short-term health policy decisions and in the quality of medical services available to depression patients.

## 2. Materials and Methods

### 2.1. Data sources

This study used the delivery claims data of the NHI program of Korea from January 2009 to December 2009. This analysis included mood (affective) disorders classified as ICD-10 (F30–39) for the definition of depression. The main illness codes used were F30 (manic episode), F31 (bipolar affective disorder), F32 (depressive episode), F33 (recurrent depressive disorder), F34 [persistent mood (affective) disorders], F38 [other mood (affective) disorders], and F39 [unspecified mood (affective) disorder] [13].

This study included: (1) 1244 cases of patients aged 12–92 years with health insurance or medical aid; (2) the diagnosis result type that had continuously admitted and discharged patients from analysis; and (3) each length of stay and medical expense during the period of admission.

The study excluded: (1) cases with code F30 due to the small number ( $n = 16$ ); (2) patients who were transferred ( $n = 5$ ) or referred ( $n = 7$ ); (3) patients who died ( $n = 3$ ); (4) individuals who were admitted for  $< 1$  day ( $n = 6$ ); and (5) other persistent mood [affective] disorder ( $n = 4$ ). After the exclusion of these 41 cases, 1203 cases were used as the study.

### 2.2. Measurement of variables

According to the Diagnostic and Statistical Manual of Mental Disorders, DSM-IV of the American Psychiatric Association (1994), mood disorders are represented

by depression during a period of mood disorder [14]. Mood disorders include major depression, bipolar affective disorder, recurrent depressive disorder, and persistent mood (affective) disorder.

Variables were selected from the Health Insurance Review Agency (HIRA) [12] annual report and selected patient sample data. Also, variables were collected from the healthcare organization data sets of the National Evidence-based Healthcare Collaborating Agency in 2011 [15]. The seven variables selected were: sex, age, insurance type, main illness, admission course type, length of stay, and total medical expense.

These factors were defined by the International Classification of Disease (ICD-10) [12,15] and were identified with the procedure codes of the HIRA of Korea (F31, F31.0, F31.1, F31.2, F31.3, F31.4, F31.5, F31.6, F31.7, F31.8, F31.9, F32, F32.0, F32.1, F32.2, F32.3, F32.4, F32.5, F32.6, F32.7, F32.8, F32.9, F33, F33.0, F33.1, F33.2, F33.3, F33.4, F33.5, F33.5, F33.6, F33.7, F33.8, F33.9, F34, F34.0, F34.1, F34.9, F38.0, and F39).

HIRA is a quasi-government organization that reviews the entire claims of the NHI program. Independent variables included: sex, age, insurance type, main illness, admission course type, and length of stay. Sex, insurance type, and admission course type were represented by dummy variables, male (coded 0) or female (coded 1), health insurance (coded 0) or medical aid (coded 1), and other admission type (coded 0) or other hospitals or paramedics (coded 1). Three dummy variables were used: bipolar affective disorder, depressive episode and recurrent depressive disorder, and persistent mood (affective) disorder. Also, dependent variables included total medical expense during the admission period.

### 2.3. Statistical analysis

Data were analyzed using SPSS version 18 (SPSS Inc., Chicago, IL, USA). First, descriptive analysis with patient level data were applied to the general characteristics of respondents. Second, this study used correlation analysis to assess the relations between total medical expense and the general characteristics of depression patients admitted through the ER. Third, the selected variables were included in the multiple regression analysis and were found to be significantly associated with the total medical expense.

## 3. Results

This study population consisted of 1203 cases: 517 (43.0%) males; 686 (57.0%) females; aged 12–92 years (mean, 46.86 years); 856 (71.2%) patients had health insurance; and 347 (28.8%) individuals had medical aid. Of admission course types, 1002 (83.3%) cases were admitted through “others” and 201 (16.7%) cases were admitted via other hospitals or paramedics. Length of

stay was 1–93 days (mean, 20.03 days). Total medical expense was 30,930–10,181,570 KRW (mean, 1,481,000 KRW Table 1).

The depression meant mood (affective) disorders of ICD-10. This analysis used F31 (bipolar affective disorder), F32 (depressive episode), F33 (recurrent depressive disorder), F34 [persistent mood (affective) disorders], F38 [other mood (affective) disorders], F39 [unspecified mood (affective) disorder]. Of these cases, 606 (50.4%) were F31, 509 (42.3%) were F32, 88 (7.3%) were F33, F34, F38, or F39 (Table 2).

Table 3 shows the association between total medical expense of dependent and independent variables. There were significant differences of sex, insurance type, admission path course type, and length of stay. A negative correlation was found with insurance type ( $r = -0.302$ ,  $p < 0.01$ ) and admission course type ( $r = -0.095$ ,  $p < 0.01$ ). However, sex ( $r = 0.061$ ,  $p < 0.05$ ) and length of stay ( $r = 0.737$ ,  $p < 0.01$ ) were positively related to total medical expense.

This study used multiple regression analysis to assess the associations between variables to influence the total medical expense (Table 4). Prior to multiple regression analysis, multicollinearity was used to test sex, age, insurance type, main illness, admission type, length of stay, and total medical expense. Multicollinearity between variables was found to be low and variance inflation factors were small. Therefore, these variables were used for multiple regression analysis.

To assess the associations between variables to influence the total medical expense, there were significant differences of sex, age, insurance type, depressive episode, the national health nutrition investigation of 2010 stay with exception of recurrent depressive disorder and persistent mood (affective) disorder, and total medical expense. After assessing variables it was found that: (1) females ( $p < 0.001$ ) spent 158,955 KRW more than males; (2) depressive episode ( $p < 0.001$ ) cost 189,911 KRW more than bipolar affective disorder; (3) medical aid ( $p < 0.001$ ) spent 991,996 KRW less than health insurance; (4) other hospitals or paramedics ( $p < 0.05$ ) used 127,556 KRW less than other admission type; (5) the longer length of stay ( $p < 0.001$ ), the higher the total medical expense; and (6) older patients spent more expenses. Recurrent depressive disorder and persistent mood (affective) disorder did not show significant differences in total medical expense.

## 4. Discussion

This study utilized sample data on medical care service utilization over 1 year from the Health Insurance Review and Assessment Service [12]. The study reviewed 1203 cases of patients, admitted through the ER, with neurobehavioral disorders among the standard causes of death categories in Korea, and the disease

**Table 1.** General characteristics of depression patients admitted through the emergency room

Characteristics	Categories/Measures	Frequency (%)	Mean $\pm$ standard deviation
Gender	Male	517 (43.0)	
	Female	686 (57.0)	
Age (year)	12–92		46.86 $\pm$ 18.62
Insurance type	Health Insurance	856 (71.2)	
	Medical Aid	347 (28.8)	
Admission type	Other admission	1002 (83.3)	
	Other hospitals or paramedics	201 (16.7)	
Length of stay (d)	1–93		20.03 $\pm$ 13.71
Medical expense (KRW)	30,930–10,181,570		1,481,000 $\pm$ 1,288,782
Total		1203 (100)	

code “mood (affective) disorder (F31, 30)”, for the final analysis. The following are the main results of the study.

First, the data set of the characteristics of the depression patients admitted through the ER, showed that 517 (43.0%) were male, 686 (57.0%) were female, and the average age of the patients was 46.86 years. The insurance types of the patients were health insurance 856 (71.6%) and medical benefit 347 (28.8%), and in addition, the path course of 1002 patients (83.3%) was “other”, whereas 201 patients (16.7%) arrived at the ER through other hospitals or paramedics. The average length of hospitalization was 20 days and the average of the total cost was 1,481,000 KRW. It is necessary to find a variety of methods to reduce the financial burdens on the NHI, through early treatment of depression patients.

Recently, the number of depression patients receiving treatments increased from 0.49 million in 2007, to 0.57 million in 2011, and the consultation fee has gradually increased from 163.1 billion KRW in 2007, to 220.0 billion KRW in 2010 [4]. Insel and Charney have reported that the financial burden of the medical care utilization of depression patients was 50–70% higher than that of patients without depression [16]. Now is the time to eliminate the negative cognitions as well as the prejudice and the discrimination against depression patients. Generalization of prevention and treatment of mental illnesses including depression is a must. In addition, through early diagnosis and treatment for depression patients, significant efforts are required to

improve the cure rate, quality of life, as well as the cost of the medical care, which in turn will contribute to the reorganization of the therapeutic environment for the mental health department.

Second, there were 606 cases (50.4%) of bipolar affective disorder, 509 cases (42.3%) of patients experiencing depressive episodes, and 88 cases (7.3%) of recurrent depressive disorder and persistent mood disorder. It has been indicated that urgent depression patients are exposed to the dangers of decreased psychological quality of life and even to dangers of suicide, which may also lead to increased medical care utilization as well as the comorbidity rate associated with other diseases. Therefore, by the patients’ sex, age, disease, and comorbid group, early treatment and continuous and systematic management of the disease is necessary.

Third, among the factors that influence the total cost, only the recurrent depressive disorder and the persistent mood disorder did not have any statistical significance, whereas other disease factors showed significant differences, which indicates that there is variation among the patients. The total expense for individuals is relatively lower in the cases of the male adults, older patients and in patients with shorter hospitalization. However, in the cases of recurrent depressive disorder patients, the total expense for the individuals is higher. According to the results based on the regression analysis, the epidemiological study on mental diseases in 2011 showed that the lifetime depression prevalence rate of female adults increased rapidly compared to that of male adults [6]. In addition, the Korean Academy of Medical Sciences [5] asserted that depression is a disease with a cure rate of 70–80% within 2 months. However, studies [17] have shown that the major depression patients have lower compliance for taking antidepressants and higher relapse probability, so that, eventually the total costs increases.

Therefore, to reduce the total costs of the depression patients admitted through the ER, the government should establish a policy that will enhance the comprehensive mental health promotion for effective

**Table 2.** Information contained in ICD-10 codes (F31–F39)

Mood (affective) disorders (F31–F39)	ICD-10	Frequency (%)
Bipolar affective disorder	F31	606 (50.4)
Depressive episode	F32	509 (42.3)
Recurrent depressive disorder	F33	88 (7.3)
Persistent mood (affective) disorders	F34	
Total		1203 (100)

**Table 3.** Correlation matrix between variables of depression patients

	Medical expense	Gender	Age	Insurance type	Main illness type	Admission type	Length of stay
Medical expense	1						
Gender	0.061*	1					
Age	0.022	0.010	1				
Insurance type	-0.302 <sup>†</sup>	-0.166 <sup>†</sup>	0.021	1			
Main illness Type	-0.023	0.114 <sup>†</sup>	0.293 <sup>†</sup>	0.022	1		
Admission type	-0.095 <sup>†</sup>	0.015	-0.054	0.300 <sup>†</sup>	0.956	1	
Length of stay	0.737 <sup>†</sup>	-0.081 <sup>†</sup>	0.095 <sup>†</sup>	0.088 <sup>†</sup>	0.008	0.080	1

\* $p < 0.05$ . <sup>†</sup> $p < 0.01$ .

prevention and intensive management of recurrent depressive disorders, including intervention programs for female adults' mental health, clear consultation guidelines related to the mental health department, customized mental treatments, and counseling services.

Now, in 2013, because the government is planning for a revision of the Mental Health Act in accordance with the lifelong mental health summary initiative, as well as the periodical physical examination for mental health throughout one's lifetime as comprehensive countermeasures for the lifetime mental health promotion for the entire nation, it is important to induce active participation of the people.

The limitations of this study and suggestions for future research are as follows. First, the data were collected by identifying patients suspected of having depression who visited the ER, but the sample was limited and thus could not be generalized. Second, because depression is not only physiological but has sociological, psychological, genetic, and biological

factors to be considered, the next study should include quantitative and qualitative analyses in various disciplines. Third, because this research was conducted on face value, the nature of the emergency in patients' depression and its duration was not fully explored and must be cross-sectionalized with other studies that deal with depression and its related diseases.

In conclusion, common negative perceptions, prejudices, and discrimination towards depression and mental illness should be identified early in order to decrease the treatment cost. The prevention of long-term illness can effectively be made as a prerequisite for mental health treatment environment.

Therefore, in order for the government to make a robust and efficient system for the mental wellbeing of the people (such as an effective prevention program and management, mental health interventions, mental health-related care instructions, tailored treatment, counseling services, etc.) long and sustainable programs need to be developed and implemented.

**Table 4.** Standardized regression estimates in multiple regression models

Variables	$\beta$ (standard error)
Sex	
Male (0)	
Female (1)	158,955 (0.061)*
Age	-4481 (-0.065)*
Insurance type	
Health insurance (0)	
Medical aid (1)	-991,996 (-0.349)*
Main sick type (vs. bipolar affective disorder)	
Depressive episode	189,911 (0.073)*
Recurrent depressive disorder and persistent mood (affective) disorder	107,661(-0.022)
Admission type	
Other admission (0)	
Other hospitals or paramedics (1)	-127,556 (-0.037) <sup>†</sup>
Length of stay	74,175 (0.789)*
R <sup>2</sup>	0.69
F	381.933*

\* $p < 0.001$ . <sup>†</sup> $p < 0.05$ .

## References

1. Health Education and Health Promotion Society Station. *The evidence of Health Promotion Effectiveness: Shaping public health in a new Europe: Health Education and Health Promotion Society Station*. Seoul: Gyechuk Publisher; 2003. 60p.
2. Stoudemire AR, Frank R, Hedemark N, Kamlet M, Blazer D. The economic burden of depression. *Gen Hosp Psychiatry* 1986 Nov; 8(6):387-94.
3. WHO. The Global Burden of Disease. Available from, [http://www.who.int/healthinfo/global\\_burden\\_disease/GBD\\_report\\_2004update\\_full.pdf](http://www.who.int/healthinfo/global_burden_disease/GBD_report_2004update_full.pdf); 2008 [accessed 17.09.12].
4. Health Insurance Review and Assessment Service. The National Audit. Health Insurance Review & Assessment Service. Available from, [http://healthcare.joins.com/master/healthmaster\\_article.asp?Total\\_ID=9705431](http://healthcare.joins.com/master/healthmaster_article.asp?Total_ID=9705431); 2011 [accessed 07.09.12].
5. Korean Academy of Medical Sciences. Available from, <http://www.kams.or.kr/newphoto/view>; 2011 [accessed 01.09.12].
6. Ministry of Health & Welfare. The epidemiological survey of mental disorders in Korea. Available from, [http://stat.mw.go.kr/stat/data/cm\\_data](http://stat.mw.go.kr/stat/data/cm_data); 2012 [accessed 17.09.12].
7. Ministry of Health & Welfare. The national health nutrition investigation. Available from, <http://knhanes.cdc.go.kr/knhanes/index.do>; 2011 [accessed 17.09.12].
8. OECD. *Health at a glance: OECD indicators*; 2011. 34-5.
9. IJff MA, Huijbregts KM, van Marwijk HW, et al. Cost-effectiveness of collaborative care including PST and an antidepressant



- treatment algorithm for the treatment of major depressive disorder in primary care: a randomized clinical trial. *BMC Health Serv Res* 2007 Mar;7:34.
10. Lang UE, Hellweg R, Gallinat J. BDNF serum concentrations in healthy volunteers are associated with depression-related personality traits. *Neuropsychopharmacology* 2004 Apr;29(4):795–8.
  11. Dailymedi. Available from, <http://www.dailymedi.com/news/view.html?section=1&category=4&no=720312>; 2010 [accessed 17.09.12].
  12. Health Insurance Review & Assessment Service. The National Audit. Health Insurance Review & Assessment Service. Available from, <http://www.stat.mw.go.kr/.../publicationView.jsp>; 2009 [accessed 15.09.12].
  13. Ann LS. Medical Patients with Depression using Trend Analysis from 2004 to 2008. *Health Insurance Review and Assessment Service* 2009;3(4):56–62.
  14. American Psychiatric Association. Diagnostic and statistical manual of mental disorders. Available from, <http://www.psychiatry.org/practice/dsm/dsm-iv-tr>; 1994 [accessed 01.09.12].
  15. National Evidence-based Healthcare Collaborating Agency. National Burden of Disease and Depression Treatment Status; 2011. 22p.
  16. Insel TR, Charney DS. Research on major depression: strategies and priorities. *JAMA* 2003 Jun;289(23):3167–8.
  17. Akincigil A, Bowblis JR, Levin C, Walkup JT, Jan S, Crystal S. Adherence to antidepressant treatment among privately insured patients diagnosed with depression. *Med Care* 2007 Apr;45(4):363–9.