Research Reports

Factors Associated With Medication Adherence Among Medical-Aid Beneficiaries With Hypertension

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Abstract

The purpose was to examine factors associated with medication adherence among medical-aid beneficiaries with hypertension using the Expanded Behavioral Model of Health Services Utilization. A cross-sectional study was conducted with a convenient sample of 289 patients. The instruments included scales to measure medication adherence, health literacy, general self-efficacy, and pros and cons of chronic disease management. Data collection was performed between February and March 2011. A hierarchical regression analysis was performed. The study found that 25.6% to 34.6% had low motivation and low knowledge regarding medication adherence. Those with higher health literacy and higher self-efficacy scores were more likely to have higher medication adherence, whereas widowed and those who perceived more cons of chronic disease management were more likely to have lower medication adherence than their counterparts ($p < .05$). Interventions incorporating significant factors associated with medication adherence are required to enhance medication adherence and to prevent complications associated with medication non-adherence.

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Adherence to medication therapy is essential to successful management of chronic diseases (Williams, 2002). Adherence is defined as the extent to which a person's behavior (e.g., taking medication) corresponds to recommendations from health care providers (World Health Organization, 2003). Poor adherence to prescribed medications has been associated with significant adverse events, such as fatalities, ineffective management of diseases, and decreased quality of life, and poses additional societal and economic burdens on health care systems (J. S. Kim, Lee, Chang, & Lee, 2011; Zaiken & Zeind, 2008). Previous studies identified that lack of knowledge, low health literacy, side effects, depression, and an increase in the numbers of prescribed drugs are the factors associated with low medication adherence (J. S. Kim et al., 2011; Williams, 2002; Zaiken & Zeind, 2008). Others reported that age, education, comorbidity, cognitive impairment, and a lower time period since diagnosis were all risk factors for poor adherence to prescribed medications (Karakurt & Kaşıkçı, 2012; Knafl & Riegel, 2014). Therefore, based on an understanding of the factors associated with medication adherence, nurses can make a significant difference to improve medication adherence among patients.

Factors Associated With Medication Adherence

Hypertension is one of the most prevalent chronic diseases worldwide with a prevalence ranging from 30% to 71.6% among adults and older individuals (Gillespie & Hurvitz, 2013; Korea Statistical Information Service, 2015). However, adherence to antihypertensive medications ranged from 42.4% to 59.0% in some studies (Y. H. Park, Kim, Jang, & Koh, 2012; Shin et al., 2013), whereas the non-adherence rate was 20.9% among hypertensive patients in another study (Bane, Hughe, & McElnay, 2006). Medical-aid beneficiaries especially are in the high risk groups of medication non-adherence due to low income, low education, and increased severity of diseases with multiple uses of prescribed medications (E. J. Park, 2012). A previous study also reported that medical-aid beneficiaries were 15 times more likely to be admitted to hospitals, and 47.4% had been administered more than five different types of prescribed medications simultaneously (E. J. Park, 2012). Researchers found that females, those with higher education, and those in possession of health insurance were associated with an increased adherence to drug regimens among patients with chronic diseases (H. S. Kim & Kim, 2007).

Aday and Andersen (1974) proposed the Expanded Behavioral Model of Health Services Utilization, and identified three components that affect health care utilization: predisposing, enabling, and need factors. Predisposing factors included age, gender, religion, and values of health. Enabling factors included income, insurance coverage, and rural/urban residence, whereas need factors included illness level. They argued that the characteristics of the health care delivery system and populations at risk affect health care utilization. Medication adherence, also known as the frequency of prescription medicine use, is one of the dimensions that measure health services utilization (O'Hara & Caswell, 2013). Therefore, applying the Expanded Behavioral Model of Health Services Utilization, our study sought to elucidate factors associated with medication adherence among patients with hypertension.

Purpose

The purpose of this study is to examine factors associated with medication adherence applying the Expanded Behavioral Model of Health Services Utilization, whether predisposing (sociodemographic variables, health literacy, and pros and cons of chronic disease management), enabling (place of residence and self-efficacy), and need factors (comorbidities) were significantly associated with medication adherence among medical-aid beneficiaries with hypertension. The specific research questions were as follows:

> **Research Question 1:** What are the levels of medication adherence among hypertensive patients?
> **Research Question 2:** What are the levels of health literacy and self-efficacy among hypertensive patients?
> **Research Question 3:** What are the predisposing, enabling, and need factors associated with medication adherence among hypertensive patients?

Method

This study used a cross-sectional descriptive study design. The study was approved by the institutional review board of the university in which the authors are affiliated.

Sample and Setting

At first, 253 case managers from 253 local offices across South Korea were invited to the study, and we asked them to recruit medical-aid beneficiaries who had at least one chronic disease and to collect data from them.

A total of 253 case managers agreed to participate in this study. They recruited 509 medical-aid beneficiaries with chronic diseases (approximately two beneficiaries per local office) from the list of beneficiaries who registered to the case management program within their district and collected data using an interview method via home visits. Incomplete questionnaires were excluded and data on 448 beneficiaries (88.0%) were included in the study; among them, 289 patients (64.5%) were diagnosed with hypertension. Our study targeted these 289 patients with hypertension. Inclusion criteria included those who were medical-aid beneficiaries enrolled in the case management program provided by the local government, those who were diagnosed with hypertension, and those who understood the purpose of the study. For the multiple regression analysis, a post hoc power analysis was performed using G-Power 3.1.9. With an effect size of $f^2 = .28$, which was calculated from a squared multiple correlation of predictor variables ($\rho^2 = .22$), a 99.9% power was produced with 298 participants and 11 predictors ($\alpha = .05$).

Measures

The study questionnaire included questions on sociodemographic characteristics of the participants, diagnosis of hypertension and other chronic diseases, health literacy, general self-efficacy, pros and cons of behavior change related to chronic disease management, and medication adherence.

Medication adherence. Medication adherence was measured using the Modified Morisky Scale (MMS), which was developed by Morisky et al. (1983) and modified by the Case Management Society of America (2012). The instrument consisted of six items, including three on medication adherence motivation and three on medication knowledge. It was measured using a nominal scale (0 = yes, 1 = no). Total scores with more than two in each category indicated high motivation and appropriate knowledge, respectively. A previous study reported that the Cronbach's alpha of the MMS was .68 and Spearman's rank correlation coefficient was .82, indicating that MMS has an excellent test–retest reliability (Al-Qazaz et al., 2010). Reliability and validity of the instrument for use with Korean patients were verified in a previous study (J. H. Kim et al., 2014). In the current study, the Cronbach's alpha was .59.

Health literacy. Health literacy was measured with a rapid estimate of adult literacy in medicine (REALM-R) developed by Davis et al. (1993) and modified by Bass, Wilson, and Griffith (2003). The REALM-R included eight items, and those who recognized less than five items were determined to have

low health literacy. The Cronbach's alpha was .91 in a previous study (Bass et al., 2003) and .73 in the current study.

General self-efficacy. General self-efficacy was measured with 17 questions developed by Sherer et al. (1982), and translated into Korean in a previous study (Oh, 1993). A 5-point Likert-type scale was used (1 = *strongly disagree* and 5 = *strongly agree*). Using the general self-efficacy instrument, the Cronbach's alpha was .71 in the previous study (Sherer et al., 1982), whereas in the current study, the Cronbach's alpha was .89.

Pros and cons of chronic disease management. Pros and cons of chronic disease management were measured with 12 questions on pros (6) and cons (6) of diet, exercise, and medication adherence, which was developed after a literature review by the research team (K. Kim et al., 1999; Lee & Chang, 2001; Mainvil, Lawson, Horwath, McKenzie, & Hart, 2010) and measured using a 5-point Likert-type scale. Mean scores for the six pros and six cons questions were calculated, and these two mean scores (pros and cons, respectively) were included in the analysis of factors associated with medication adherence. Higher scores indicated that participants perceived more pros and cons of chronic disease management. In the current study, the Cronbach's alpha was .63 to .79.

We received approval from the original authors of the REALM-R for use in the current study. REALM-R and MMS were translated into Korean by a bilingual nursing professor, and another nursing professor back-translated it into English. The committee of experts (four nursing researchers) examined the comprehensiveness, appropriateness, and cultural equivalence of the translation. Content and face validity of the pros and cons of chronic disease management were verified by two nursing professors who are in the field of public health and community health nursing. A pilot test was conducted with 41 medical-aid beneficiaries for an evaluation of comprehensiveness of the questions and appropriateness of expressions of the study instruments. According to the pilot test results, some questions were found to be inappropriate to use with Koreans, and thus, they were modified for use in the current study.

Procedures

To solicit participation of case managers, official letters were sent from the Ministry of Health and Welfare. Case managers also received an email from research team members explaining the purpose of the study, and their participation was voluntary. The email also contained a survey questionnaire and

written consent forms. The case managers who agreed to participate in our study recruited medical-aid beneficiaries from the list of case management service registration who matched our inclusion criteria. Then, case managers visited homes of selected medical-aid beneficiaries and explained the purpose of the study and collected data from the beneficiaries who agreed to participate. Data collection was performed using an interview method after obtaining written consent.

The data collection protocol was developed by the research team and detailed instructions for data collection and obtaining written consent were delivered to case managers with the developed protocol via email. Using email services, completed questionnaires of beneficiaries and consent forms endorsed by beneficiaries were sent back to the research team. Prior to data collection, medical-aid beneficiaries were informed that confidentiality and anonymity of data would be guaranteed and that they could withdraw from the study at any time during data collection without any penalty. Data collection was performed between February and March 2011.

Data Analysis

The Statistical Package for the Social Sciences 21.0 for Windows was used for data analysis (SPSS, Inc., an IBM Company, Chicago, Illinois, USA). Descriptive statics such as means, standard deviation, frequencies, and percents were used for data analysis. Hierarchical regression analysis was performed to examine factors associated with medication adherence, and predisposing (demographic variables, health literacy, and pros and cons of chronic disease management), enabling (place of residence and self-efficacy), and need factors (comorbidities) were entered in blocks in sequential order. Data were screened for data-entry accuracy and to ensure that the assumptions for the statistical tests were met. Statistical significance was determined at $p < .05$.

Results

General Characteristics of the Participants

The mean age was 68.92 years ($SD = 10.65$, range = 23-92), and 77.2% were females. Seventy-two percent of the participants obtained education below or equal to elementary school level, 41.5% were widowed, and 45.3% were living alone (Table 1). Among the comorbidities, 54.0% had arthritis, 30.8% had diabetes mellitus, 15.9% had cardiovascular disease, 10.7% had asthma, and the other 5.9% had stroke.

Table 1. General Characteristics of the Participants (*N* = 289).

	n (%)
Age	
≤59	60 (20.8)
60-69	72 (24.9)
70-79	112 (38.8)
80≤	45 (15.6)
Gender	
Male	66 (22.8)
Female	223 (77.2)
Education	
≤Elementary	209 (72.3)
≥Middle school	80 (27.7)
Marital status	
Married	71 (24.6)
Widowed	120 (41.5)
Divorced	66 (22.8)
Separated/single/ cohabitating	32 (11.1)
Number of family members	
None	131 (45.3)
≥1	158 (54.7)
Place of residence	
Metropolitan	119 (41.2)
Urban	81 (28.0)
Rural	89 (30.8)

Descriptive Analysis on Study Variables

The mean health literacy score was 7.19 (*SD* = 1.31, range = 0-8), and 11.1% (*n* = 32) of the participants were identified as having low health literacy (recognized as less than five correct items). The mean self-efficacy score was 3.20 (*SD* = 0.62, range = 1-5), revealing that these patients had moderate levels of general self-efficacy. Mean scores for the pros and cons of chronic disease management were 3.86 (*SD* = 0.51, range = 1-5) and 2.94 (*SD* = 0.62, range = 1-5), respectively. Medication adherence measured by an MMS showed that 65.4% and 74.4% of the participants exhibited high motivation and high knowledge, respectively, with an MMS mean score of 3.24 (*SD* = 1.48, range = 0-6; Table 2).

Table 2. Mean Scores for Health Literacy, Knowledge, Self-Efficacy, and Medication Adherence (N = 289).

	Range	$M \pm SD$
Health literacy	0-8	7.19 ± 1.31
Self-efficacy	1-5	3.20 ± 0.62
Decisional balance		
Pros	1-5	3.86 ± 0.51
Cons	1-5	2.94 ± 0.62
Medication adherence	0-6	3.24 ± 1.48

Hierarchical Multiple Regression Analysis for Factors Associated With Medication Adherence

Hierarchical multiple regression analysis was performed to examine factors associated with medication adherence, and predisposing (age, gender, education, marital status, health literacy, and pros and cons of chronic disease management), enabling (place of residence and self-efficacy), and need factors (comorbidities) were entered in blocks in sequential order. This procedure allows the effects of each factor to be tested independently on the influence of others (Ham, 2011; Pallant, 2003). In the first step, predisposing factors accounted for 13.1% of the variance in MMS (F = 5.275, p < .001), and marital status (widowed), health literacy, and cons of chronic disease management were significantly associated with MMS in Step 1 (p < .05). In the second step, enabling factors were added, which accordingly increased the explained variance by 1.7% (R^2 = .148, F = 4.832, p < .001). Among the enabling factors, self-efficacy was significantly associated with MMS (p = .019). In the third step, the addition of need factors did not significantly improve explained variance. Variables in the model accounted for 14.9% of the MMS among the hypertensive patients (F = 4.410, p < .001; Table 3).

Discussion

Based on the Expanded Behavioral Model of Health Services Utilization, the current study found that predisposing factors (marital status, health literacy, and cons of chronic disease management) and enabling factors (self-efficacy) were significantly associated with medication adherence among the hypertensive patients. The current study is unique because no other studies were conducted regarding the factors of medication adherence among medical-aid beneficiaries in Korea. According to Aday and Andersen (1974), both

Table 3. Hierarchical Regression Analysis of Factors Associated With Medication Adherence (N = 289).

	Step 1		Step 2		Step 3	
	β	p	β	p	β	p
Predisposing factor						
Age	.120	.078	.124	.065	.121	.076
Gender	−.042	.495	−.031	.613	−.027	.656
Education	.010	.876	.006	.924	.001	.987
Marital status						
Married	−.127	.055	−.102	.124	−.104	.117
Widowed	−.191	.013	−.178	.020	−.181	.019
Health literacy	.137	.021	.120	.044	.119	.047
Pros	.065	.291	.031	.623	.034	.592
Cons	−.232	<.001	−.210	<.001	−.208	.001
Enabling factor						
Place of residence			−.029	.622	−.034	.561
Self-efficacy			.143	.019	.146	.018
Need factor						
Comorbidities					−.033	.573

Note. Gender: 0 = male, 1 = female; education: 0 = equal to or lower than elementary graduates, 1 = at least middle school; place of residence: 0 = urban metropolitan, 1 = rural; comorbidities: 1 = yes, 0 = no.

characteristics of the health care delivery system and population at risk affect health care utilization. In our study, all the participants were beneficiaries of the Korean medical-aid program. Thus, we did not consider characteristics of the health care delivery system in the analysis of factors related to medication adherence.

The current study found that 34.6% and 25.6% of the participants exhibited low motivation and low knowledge on medication adherence, respectively, indicating that they need interventions to promote medication adherence to adequately manage hypertension. Using the MMS, a former study reported that only 22% and 4.5% of the older individuals with hypertension exhibited low motivation and low knowledge, respectively (S. O. Kim, 2011), whereas others reported that 17.0% and 29.4% had low motivation and low knowledge, respectively, among chronic disease patients (Tourkmani et al., 2012). Compared with former studies, medical-aid beneficiaries in our study were prone to medication non-adherence, and were vulnerable to chronic disease management.

Our study suggests that efforts to promote health literacy and self-efficacy will be effective in promoting medication adherence, while emphasizing to overcome barriers to chronic disease management also helps to promote medication adherence. Consistent with our study, a previous study also found that low health literacy was significantly associated with non-adherence to treatment regimens (Kalichman, Benotsch, Suarez, Catz, & Miller, 2000) and illiteracy was a major reason for failure to adhere to prescribed medications and their regimens (Karakurt & Kaşıkçı, 2012). Researchers recommended that color-coded and pictorial medication dispensers offered with clear verbal instructions will enhance medication adherence among those with low health literacy (Kalichman et al., 2000). A previous study contended that physicians often overestimate health literacy levels of the patients, thus communication mismatch is one of the causes of non-adherence to medication (Ngoh, 2009). Efforts to promote health literacy will help to reduce medical costs and promote health and quality of life by promoting treatment adherence and by reducing hospitalization (Kalichman et al., 2000). Korea is one of the countries that has the highest literacy rates, in which 98.3% of the population are literate (Ahn et al., 2011). However, 11.1% of the participants had inadequate health literacy. A significant association between health literacy and medication adherence found in our study indicated that in the development of interventions to promote medication adherence, nurses should include measures to ascertain whether information provided by nurses are comprehensible by the patients using a method such as teach-back.

The current study also found that cons of chronic disease management were significantly associated with medication adherence. Ngoh (2009) argued that patients wanted to know about the benefits of medication and adverse drug reactions to medication. These can be referred to pros and cons of medication administration. Contrastingly, others described that failing to explain the benefits and adverse effects of medication, and ineffective communication with patients, is one of the physician-related factors that can cause poor medication adherence (Brown & Bussell, 2011). Therefore, nurses should assess actual and perceived barriers to medication adherence and consequently develop interventions to minimize those barriers to promote medication adherence.

Konkle-Parker (2001) contended that as individuals become more confident about their ability (self-efficacy), there is more likelihood of medication adherence, which is consistent with our study results. Konkle-Parker suggested that using motivational interviewing (MI), which facilitates resolving ambivalence to behavior change and self-efficacy, health care providers can assist patients in promoting medication adherence. Self-efficacy was reported as a significant predictor of self-care adherence and medication adherence in

previous studies (Bane et al., 2006), thus efforts should be made to improve self-efficacy of patients using multiple strategies (Konkle-Parker, 2001).

Among the sociodemographic characteristics, our study found that widowed participants were more likely to have lower medication adherence than their counterparts (divorced, separated, single, or cohabitating). A former study reported that unmarried patients had lower medication adherence, and contended that older patients often required assistance to adhere to prescribed medication due to physical limitations, cognitive changes, and/or fatigue, and those without a spouse or partner may have had difficulty securing assistance needed for medication adherence (Wu et al., 2012). In our study, widowed participants were significantly older than the other participants (married, divorced, separated, single, or cohabitating; $p < .05$). Accordingly, widows at older ages may have difficulty adhering to prescribed medications due to lack of support needed for medication adherence. Special attention should be given to those high risk groups of patients (without a partner/spouse), especially older patients.

The limitations of the study may include the cross-sectional study design—the relationships between the variables are associational rather than of a causal relationship. Our study was conducted targeting medical-aid beneficiaries in Korea, thus generalizability might be limited. The current study used a proxy measure of an MMS (medication motivation and medication knowledge) to assess medication adherence, whereas direct measure of medication adherence behavior was not performed. If we used the direct measure of medication adherence behavior such as drug count, we might have produced different results. Finally, the MMS scale exhibited moderate reliability with the Cronbach's alpha of .59 in this study. Yes/no questions can lower the value of Cronbach's alpha because of higher measurement error (Yang et al., 2014). In addition, MMS measures medication adherence in general, although it lacks consideration of disease-specific traits of medication adherence.

Using the Expanded Behavioral Model of Health Services Utilization, the current study sought to examine factors associated with medication adherence among medical-aid beneficiaries with hypertension. The study results illustrated that predisposing and enabling factors were significantly associated with medication adherence in this sample. Among the predisposing factors, a higher health literacy was positively associated with medication adherence, whereas the widowed and those with higher perceived cons of chronic disease management were more likely to have a lower medication adherence. Among the enabling factors, those with higher self-efficacy scores were more likely to have higher medication adherence than their counterparts.

The study found that 34.6% and 25.6% of the participants belonged to the low motivation and low knowledge group, respectively. Therefore, based on the study results, development of interventions to promote medication adherence among patients with hypertension is required and should incorporate components of health literacy, self-efficacy, and the cons of chronic disease management. These interventions may need to consider other factors that were associated with medication adherence such as marital status. Future research is required to include characteristics of the health care system (e.g., medical aid, national health insurance, or private health insurance) as an enabling factor, and whether this enabling factor would influence medication adherence. Studies should also include physiological characteristics of the patients such as blood pressure as a need factor that may affect medication adherence among hypertensive patients. The current study was conducted targeting patients with hypertension, yet, most of the medical-aid beneficiaries are diagnosed as having multiple chronic diseases. Accordingly, future research may need to consider medication adherence to multiple drugs targeting patients with multiple chronic diseases.

Author Contributions

Y.H.A., O.K.H. developed the study design; Y.H.A., O.K.H. assisted in data collection and analysis; and Y.H.A., O.K.H were involved in article preparation.

Authors' Note

All listed authors meet the authorship criteria and all authors are in agreement with the content of the article.

Declaration of Conflicting Interests

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