

A Study on the Health Management of Polypharmacy Use in the Elderly

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Abstract

The purpose of this study is to identify the level of polypharmacy use, drug knowledge, and drug misuse behavior in the elderly, and to understand the correlation between them and their effect on drug misuse behavior. The study design was a descriptive survey study, and the participants of the study were 215 elderly people from the local community center. The research tool used drug knowledge, drug misuse behavior, and the data collection period was from February 8 to 19, 2021. The data analysis were descriptive statistics, t-test, one-way ANOVA, Pearson's correlation coefficient, and regression analysis. As a result of the study, a significant correlation variable for the drug knowledge of the elderly showed a significant correlation with prescription and non-prescription, $r=.145$ ($p<0.05$), and $r=-.136$, which showed a negative significant correlation ($p<0.05$). As for the significant correlation variable in the drug misuse behavior of the elderly, when prescription and non-prescription were combined, there was a significant correlation with $r=.256$ ($p<0.01$), and when not using drugs, $r=-.225$ was negative. showed a significant correlation ($p<0.01$). In terms of the effect on drug misuse behavior, chronic disease = .145, prescription and non-prescription use = .233, which had a positive effect, and non-prescription = -.328, indicating a negative and significant effect. The provision of education on the safe use of drugs by the elderly should first be provided in the community. In addition, we need systematic education and social support for the transmission of correct knowledge on multi-drug use by the elderly and for health management.

Keywords: Polypharmacy, Knowledge, Drug Misuse, Health, Elderly

1. Introduction

An increase in the elderly population using drugs due to aging is a priority task for stabilizing the health care system. Polypharmacy use in the elderly is an important health management option for symptom relief or disease prevention due to chronic diseases, but negative issues arising from this are always raised [1]. The health care problem related to the use of polypharmacy in the elderly is a global concern, not only in Korea, but also in the elderly population. Korea is an aged society with 16.5% of the population aged 65 and over in the proportion of the population as of 2021, and a super-aged society is expected in 5 years [2].

In terms of quality of life in old age, successful aging is a state of physical, mental, social and spiritual health. The elderly with high physical, mental, and social satisfaction use smart media as one of the active health management methods to acquire and cope with chronic diseases and multiple drugs [3]. It is desirable to have a strategy system that utilizes health-related information and communication technology to properly manage health before health deteriorates through various media access. In Western developed countries such as the

United States and Europe, and in Japan, an advanced system model that can share health information for the elderly has been established and operated, but in Korea, it is insufficient [4]. Korea also needs smart and individualized health management through high-level medical services combined with digital technologies such as big data and artificial intelligence, which have emerged as a result of the 4th industrial revolution [5].

Polypharmacy, in which multiple drugs are used by individuals, are one of the most common health care in the elderly to solve health problems caused by aging or to prevent chronic diseases. However, taking polypharmacy in the elderly affects the absorption, distribution, metabolism, and excretion mechanisms of drugs due to changes in pharmacokinetics due to aging, which can increase hospital admission and mortality due to drug side effects or drug interactions [6]. In addition, it is also a problem in causing an increase in dementia, which in turn leads to an increase in medical expenses, extending from individuals to social problems [7]. Therefore, efforts to improve the quality of life of the elderly should be continued through analysis of health-related information and literature on health-related polypharmacy intake to maintain independence, dementia, and prevention of disease and disability.

Concerns about polypharmacy use in the elderly include increased drug side effects, lack of drug knowledge, misuse of drugs, and lack of adherence to correct drug use. Major variables affecting the drug knowledge and drug misuse behavior of the elderly are related to cognitive function, family members, medication assistants, social support networks, and information delivery media, it is reported that the higher the drug knowledge level, the lower the drug misuse behavior and the higher the drug use adherence [1, 8-11]. Therefore, it is essential to provide correct and accurate drug use in the socially structured health care system. For this purpose, elderly care professionals need to approach the polypharmacy management of the elderly with caution.

In the elderly, depending on the physiological, psychological and social characteristics of each individual, inappropriate drug use may affect the level of health care. The elderly with low drug knowledge are more likely to misuse drugs, and as they take multiple drugs, the inappropriate use of drugs also increases, and the level of drug adherence according to the drug use principle is also low [1, 9, 12]. In the end, in the sluggish system of active intervention of multi-drugs for the elderly, the use of medical care has no choice but to increase to improve health, and the social and economic cost loss repeats a vicious cycle from the individual to the nation [11, 12]. Therefore, the vision of the National Health Promotion Comprehensive Plan HP 2030, 'a society where everyone enjoys lifelong health', and 'extension of healthy lifespan, improvement of health equity' as a general goal are not just campaigns, but realistic goals [13]. A thorough analysis and strategy of the stakeholders is very important.

If we look at previous studies related to polypharmacy in the elderly within the last 5 years, descriptive research studies [3, 4], model validation [8, 11], intervention studies [14, 15], meta-analysis [1, 7], qualitative research [12], etc. However, studies focusing on polypharmacy for the elderly and investigating the causes and related variables from the perspective of nursing are very insufficient. In addition, although similar studies related to drug use in the elderly have been reported in various fields of health care, they have not yet advanced to the level of problems caused by multi-drugs in the elderly. Therefore, it is necessary to study by a nursing expert who is a major care professional for the elderly and is expected to have a high practical diffusion effect on health management strategies and education based on the results of polypharmacy research.

Therefore, in this study, we tried to first identify the actual situation of polypharmacy use in the elderly, which can be an important variable in improving the health management and quality of life of the elderly. In addition, this study was attempted to provide basic data necessary for the development of polypharmacy prevention education programs for the elderly by identifying the drugs used, drug knowledge, drug misuse behavior level, relationship, and influence of the elderly through this study.

2. Research Methods

This study design is a descriptive research study. The participants of this study were the elderly who were registered and visited at the local community center located in G city. In order to refine the selection of study

participants, those who understood the purpose of this study and agreed to participate in data collection were selected as participants. The appropriate number of samples was 199 participants using the G*Power 3.1.9 program, with a significance level of .05, a power of .95, and a median effect size of .15. However, considering the dropout rate, 240 questionnaires were included. Among the elderly who agreed to participate in the study, 215 questionnaires judged appropriate for data analysis were selected as the final study participants.

As research tools, drug knowledge [15, 16], and drug misuse behavior tools [17] were used. The reliability of the drug knowledge tool in this study was Kuder-Richardson(K-R) $20=0.81$. The reliability of the drug misuse behavior tool in this study was K-R $20 =0.73$.

The data collection period of this study was conducted by the researcher and research assistants from February 8 to 19, 2021. The research questionnaire was filled out by a self-filling method, and the research assistant reads and answers the questionnaire to the participants and fills out the questionnaire for participants who are difficult to fill out due to the characteristics of the individual elderly, and it takes about 20 to 30 minutes.

For research participants' autonomy and ethical considerations, research permission was first obtained from the head of the relevant institution, and the research purpose, method, contents, and participant confidentiality were explained to the subjects prior to data collection, and the possibility of withdrawal at any time during the study was also announced. After confirming sufficient understanding, the research participants were asked to obtain written consent and participate in data collection.

The collected data were analyzed using SPSS/WIN 25.0 program. The participants' general characteristics, drugs used, drug knowledge, and drug misuse behavior were analyzed by frequency, percentage, mean, and standard deviation. Differences in drug knowledge and drug misuse behavior according to the participants' general characteristics were analyzed using t-test and one-way ANOVA. The correlation between the participants drug use, drug knowledge, and drug misuse behavior was analyzed by Pearson's correlation analysis. The factors that the subject's drug use and drug knowledge had on drug misuse behavior were analyzed by stepwise multiple regression. All empirical analyzes of this study were verified at the significance level $p<.05$, and statistical processing was analyzed using the SPSSWIN 25.0 program.

3. Results

3.1 General Characteristics of Participants

As shown in Table 1 in general, age was followed by 144 people in their 70s (67.0%), 61 people in their 60s (28.4%), and 10 people in their 80s (4.7%). By gender, there were 120 males (55.8%) and 95 females (44.2%). As for educational background, 78 people (36.3%) graduated from high school, and 44 (20.5%) and 43 (20.0%) graduated from elementary and middle school, respectively.

Marital status was 164 married (76.3%), widowed and other 51 (23.7%). Religion: Catholic 50 (23.3%), Christian 46 (21.4%), Buddhist 46 (21.4%), none 63 (29.3%). There were 37 (17.2%) had occupation. Economic status was 119 middle-aged (55.3%), 82-lower (38.1%), and three upper-class (1.4%). In the case of chronic disease, 148 patients (68.8%) had the disease. As for the drug used, 146 people (67.9%) took the highest number of drugs prescribed by a doctor, 3-8 drugs 115 people (53.5%), and 1 or 2 drugs 75 (34.9%) were investigated in that order.

Table 1. General characteristics of participants (N=215)

Characteristics	Categories	N(%) or Mean \pm SD
Age	60's	61(28.4)
	70's	144(67.0)
	80's	10(4.7)
Gender	Male	120(55.8)
	Female	95(44.2)
Education background	No education	16(7.4)
	Elementary school	44(20.5)
	Junior high school	43(20.0)
	High school	78(36.3)
	College graduate	34(15.8)
Marital status	Married	164(76.3)
	Bereaved & Others	51(23.1)
Religion	Christian	46(21.4)
	Catholic	50(23.3)
	Buddhist	46(21.4)
	Atheist	63(29.3)
	Others	10(4.7)
Occupation	Yes	37(17.2)
	No	178(82.8)
Economic status	High	3(1.4)
	Medium	119(55.3)
	Low	89(38.7)
	Unknown	11(4.8)
Chronic disease	Yes	148(68.8)
	No	67(31.2)
Currently used drugs	Prescription drug	146(67.9)
	OTC drug	12(5.6)
	Prescription+OTC drug	445(20.5)
	none	13(6.0)
Number of Drug	1~2	75(34.9)
	3~8	115(53.5)
	Over 9	9(4.2)
	none ...	16(7.4)

3.2 Differences in Drug Knowledge and Drug Misuse Behavior according to General Characteristics

As shown in Table 2, the difference in drug knowledge and drug misuse behavior according to general characteristics showed a significant difference in the case of drug knowledge by educational background ($p < 0.001$). As a result of the post-hoc test, college graduation or higher was relatively high, and uneducated education was low, showing a significant difference. It can be seen that the higher the educational level, the higher the knowledge about drugs.

When looking at the difference in drug knowledge by economic status, there was a significant difference ($p < 0.001$). By drug type, there were significant differences in drug knowledge ($p < 0.01$) and drug misuse behavior ($p < 0.001$) ($p < .01$). According to the number of drugs, there was a significant difference in the case of drug misuse behavior ($p < 0.001$). As a result of the post-test, in the case of drug misuse behavior, 3~8 drugs were relatively high, and in the case of no drug misuse behavior, it was shown as 2 points, showing a relatively low value ($p < 0.001$).

Table 2. Differences in drug knowledge and drug misuse behavior according to the general characteristics of participants

(N=215)						
Characteristics	Categories	N	Drug knowledge	F (p)	Drug misuse behavior	F (p)
Age	60's	61	14.20±5.69	.324	3.41±2.69	.527
	70's	144	14.37±5.02	(0.723)	3.68±2.55	(0.591)
	80's	10	13.21±4.98		4.14±2.60	
Gender	Male	120	14.12±5.47	.473	3.76±2.62	.845
	Female	95	14.45±4.78	(0.637)	3.47±2.53	(0.399)
Education background	No education	16	10.69±5.08d		3.69±2.91	
	Elementary school	44	13.02±5.19c		3.33±2.72	
	Junior high school	43	14.07±5.02ab	4.743***	3.39±2.53	.656
	High school	78	14.65±4.97ab	(0.001)	3.68±2.52	(0.623)
	College graduate	34	16.45±4.95a		4.15±2.55	
Marital status	Married	179	14.57±5.20	1.723	3.58±2.61	.638
	Bereaved & Others	51	13.16±5.03	(0.086)	3.84±2.50	(0.524)
Religion	Christian	46	13.24±4.85		3.61±2.41	
	Catholic	50	15.47±5.44		3.60±2.76	
	Buddhist	46	13.81±4.56	1.396	3.17±2.49	.781
	Atheist	63	14.38±5.73	(0.236)	4.03±2.65	(0.539)
	Others	10	13.90±3.84		3.80±2.57	
Occupation	Yes	164	14.21±5.97	.068	4.03±2.71	1.024
	No	51	14.27±5.03	(0.946)	3.56±2.56	(0.307)
Economic status	High	3	15.60±4.93a		5.00±3.24	
	Medium	119	15.58±4.72a	10.690***	3.78±2.68	1.256
	Low	82	13.09±4.98b	(0.000)	3.48±2.45	(0.290)
	Unknown	11	8.09±5.94c		2.64±2.20	
Chronic disease	Yes	148	14.44±4.79	.751	3.57±2.55	.546
	No	67	13.90±5.91	(0.453)	3.77±2.67	(0.586)
Currently used drugs	Prescription drug	146	13.86±5.10c		3.49±2.39b	
	OTC drug	12	17.00±4.99a	4.202**	3.25±2.60bc	8.722***
	Prescription+OTC	44	15.78±4.68ab	(0.006)	4.98±5.972.93a	(0.000)
	none	13	11.50±5.976.19d		1.36±5.971.22c	
Number of Drug	1~2	75	14.71±5.13		3.44±2.25bc	
	3~8	115	14.32±5.04	1.395	3.74±2.38ad	4.8572***
	Over 9	9	13.00±5.74	(0.227)	4.33±3.24ab	(0.000)
	none ...	16	11.81±6.28		2.00±2.28d	

p<0.05, ** p<0.01, *** p<0.001

3.3 Correlation between the Participants used Drug, Number of Drugs, Drug Knowledge, and Drug Misuse Behavior

As shown in Table 3, as a result of correlation analysis of drug used (doctor's prescription drugs, non-prescription drugs, prescription-non-prescription, not used), number of drugs, drug knowledge, and drug misuse behavior, the correlation with drug misuse behavior showed that prescription and non-prescription were the same in the drug use method. In the case of $r=.256$, there was a significant positive correlation ($p<0.01$). In the case of not using the drug used, there was a negative significant correlation with $r=-.225$ ($p<0.01$). In the correlation of drug knowledge, when prescription and non-prescription were used together in the drug method, $r=.145$ showed a significant positive correlation ($p<0.05$). In the case of not using the drug used, there was a negative significant correlation with $r=-.136$ ($p<0.05$). In the case of the number of drugs, there was a

negative significant correlation with $r=-.147$ ($p<0.05$). There was no significant correlation between drug knowledge and drug misuse behavior.

Table 3. Correlation between subjects' drug use, number of drugs, drug knowledge, and drug misuse behavior

(N=215)

Categories		Used drugs				Number of Drug	Drug knowledge	Drug misuse behavior
		Prescripti on drug	OTC drug	Prescrip. + OTC	none			
Used drugs	Prescription	1						
	OTC	-.351**	1					
	Prescription+_OTC	-.738**	-.116	1				
	none	-.381**	-.060	-.126	1			
Number of Drug		-.195**	-.064	-.091	.587**	1		
Drug knowledge		-.114	.124	.145*	-.136*	-.147*	1	
Drug misuse behavior		-.086	-.035	.256**	-.225**	-.073	.053	1

* $p<0.05$, ** $p<0.01$, *** $p<0.001$

3.4 Affects of Participants Drug Use, Number of Drugs, and Drug Knowledge on Drug Misuse Behavior

As shown in Table 4, in this study, a hierarchical regression analysis was used with the dependent variable factors affecting drug misuse behavior as control variables. In the effects of drugs used (doctor's prescription drugs, over-the-counter drugs, prescription-non-prescription, not used), number of drugs, and drug knowledge on drug misuse behavior, chronic diseases ($p<0.05$), prescription and non-prescription together ($p <0.001$), it can be seen that the absence of a drug ($p<0.001$) had a significant effect. If we look closely, it can be seen that chronic disease =.145, when used together with prescription and non-prescription =.233, has a positive effect, and when drug is not prescribed = -.328, it has a negative and significant effect. In other words, it can be seen that there is drug misuse behavior when there is a chronic disease and the prescribed and non-prescription drugs are used together. In the case of drug knowledge, there was no effect on drug misuse behavior.

Table 4. Affects of participants drug use, number of drugs, and drug knowledge on drug misuse behavior

(N=215)

Factors	Used drugs			t	p	VIF	
	B	SE	β				
(Constant)	2.232	1.068		2.090	0.038	1.226	
Health status	-.112	.259	-.030	-.434	0.665		
Chronic disease	.790	.393	.145	2.013*	0.045	1.326	
Used drugs	OTC	-.439	.748	-.038	-.586	0.558	1.063
	Prescription+_OTC	1.514	.418	.233	3.621***	0.000	1.056
	none	-3.541	.910	-.328	-3.890***	0.000	1.818
Number of Drug	.209	.124	.135	1.690	0.093	1.634	
Drug knowledge	.002	.032	.004	0.069	0.945	1.071	

Adjusted R2=.131(0.104), F(p)=4.782***(0.000)

* $p<0.05$, ** $p<0.01$, *** $p<0.001$

4. Discussion

This study was an attempt to help the elderly to use drugs safely and correctly by identifying factors that can be considered when using polypharmacy in the elderly, and to help develop polypharmacy use-related education programs. As a result of this study, the drug knowledge according to the general characteristics of the participants showed that the higher the participants' educational background, the higher the economic status group. In addition, it was found that the drug knowledge about non-prescription drugs among the drugs used was high.

In the case of drug misuse behavior was found to be high in the polypharmacy use group, in which prescription and non-prescription drugs were used together and the number of drugs was 3 to 8. Based on this, it can be seen that it is necessary to establish an information delivery and education system to cope with effective health management according to the status of polypharmacy use [18]. In the correlation analysis of the participant drug use, drug knowledge, and drug misuse behavior, first, the drug used showed a positive correlation when prescription and non-prescription were used together, and a negative correlation when the drug was not used. Second, drug knowledge showed a positive correlation when prescription and non-prescription were used together, and a negative correlation when drug was not used. Third, there was no significant correlation between drug knowledge and drug misuse behavior.

Looking at the difference in the drug misuse behavior of the elderly, the average score was 3.64 out of 13. Looking at each item, 'I forgot to use my medicine and forgot to take my medicine' was the highest score of .75 out of 1, followed by 'I have stopped without reporting to a doctor or pharmacist because my symptoms have disappeared' was highest in the order of .51 points. This result affects the drug misuse behavior of the elderly, and it is thought that as the number of drug use increases, that is, the use of multiple drugs increases, and as they age, they feel confused about taking drugs due to cognitive decline and affect the behavior. As variables to be given, the health status, number of drugs, and cognitive ability of the elderly were reported, which have many similarities with the results of this study. In view of this, it is necessary to provide education on the appropriate use of drugs according to the aging characteristics of the elderly. Therefore, for drug abuse prevention education, it will be necessary to proactively review drugs and develop appropriate manuals related to drug use by nurses who are in charge of medication administration.

In this study, the difference between drug knowledge and drug misuse behavior showed a statistically significant difference as a result of the post-test when drug knowledge showed academic background and economic status of moderate or higher, and drug misuse behavior showed that prescription and non-prescription drugs were taken together or the number of drugs increased. From this, it can be seen that the intellectual level or cognitive ability of the elderly is important for correct drug use as an important factor in the use of multiple drugs in the elderly, and that they are active in drug use according to their health status. Therefore, it is essential to provide active health management information or education through the use of mass media customized for the elderly to manage chronic diseases or prevent the use of multiple drugs in accordance with the increase of the elderly population in Korea. Recently, attempts have been made to improve lifestyles, prevent chronic diseases, and provide management services to the elderly at risk of chronic diseases through mobile health care services at public health centers, but they are not yet active, and active promotion and development should be made in the future.

In this study, the significant correlation between drug use and drug knowledge in the elderly showed a statistically significant correlation when prescription and non-prescription were used together and when no drug was used. However, there was no significant correlation between drug knowledge and drug misuse behavior. In health characteristics, when prescription and non-prescription were used together, there was a significant positive effect, and when not used, there was a negative significant effect, but in the case of drug knowledge, there was no significant correlation with drug misuse behavior. Considering that the drug adherence is low in subjects with poor health, it is necessary to systematically establish and activate the provision of services for the elderly through the creation of human and material infrastructure in the health care system in the local community, prioritizing health care for the elderly or through health assessment.

In the affects of polypharmacy use and drug knowledge on drug misuse behavior of the elderly, which is the hypothesis test of this study, it had a statistically significant effect in the case of chronic disease, prescription and non-prescription, and negatively in the case of not prescribing the drug. In other words, it can be seen that there is drug misuse behavior when a participant with a chronic disease and a prescribed and non-prescription are used together. The explanatory power of the effect was low at 13%, but a related follow-up study is needed based on this study. In overseas studies, it was suggested that the term 'polypharmacy' needs to be redefined through an extensive literature review protocol [19] related to polypharmacy and drug adherence, and that continuous research by an international expert group is necessary. In response to this, the possibility of realization will be high only when appropriate administrative and financial support is provided in Korea for the optimal health management of the elderly, who are weak in health, amid the recent pandemic caused by the spread of infectious diseases.

5. Conclusion

This study was attempted to determine the actual conditions of polypharmacy use, drug knowledge, and level of drug misuse behavior in the elderly in Korea, and to understand the correlation between them and their affects on drug misuse behavior. Through this study, it was confirmed that chronic diseases, prescription and over-the-counter drugs had a significant effect on drug misuse behavior. Therefore, it is necessary to reorganize the negative effects of polypharmacy by identifying the flow and variables of polypharmacy use in the elderly from the expert's point of view through these results. Through the results of this study, it is expected that positive effects on the health management and quality of life of the elderly will be provided as practical basic data necessary for the development of an education program to prevent polypharmacy use in the elderly. Through this study, we can see that there is a need for correct guidelines for the use of multiple drugs in the elderly. In order to improve the quality of life of the elderly in the community, health management is very important. To this end, the efforts of health care professionals and the policy and systematic support of health care institutions are required.

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