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Effect of Fluid Intake Encouragement Program on Moisture Content, Skin Hydration, Urine Tract Infection in the Elderly

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Abstract

To examine the effect of a program to encourage fluid intake in institutionalized elderly people. A non-equivalent control group pre- and post-time series design was used. Data were analyzed with the SPSS program by t-test, chi-square test, and repeated measures ANOVA. Elderly people in the experimental group showed significantly better outcomes in terms of body weight reduction, skin moisture levels, and fluid intake and output compared with elderly people in the control group. Elderly people in the experimental group also showed significantly better outcomes in comparison with elderly people in the control group in relation to urinalysis including odor, pH, specific gravity, osmolality, color, white blood cell count, and bacteriuria. A hydration management program could be one of the most effective nursing strategies to ultimately enhance the quality of life and health of institutionalized elderly people.

Key Words*: Elderly, Fluid intake, Skin Moisture*

1. Introduction

According to a study by the Korean National Statistical Office in 2009 [1], Korea entered an aging society with 10.7 percent of the whole population being 65 years of age or older in 2009, and the proportion is expected to grow to 14.3% in 2018. The entrance into an aging society due to increase in the number of elderly people, along with the occurrence of various complications due to chronic health problems have increased the burden with long-time care for elderly people.

Studies have shown that elderly people admitted to hospitals and nursing facilities with dehydration have a high mortality rate of approximately 45% [2-5]. In addition to that, lack of fluid intake can lead to more serious problems in the elderly than in younger adults. In particular, it could lead to serious health problems in elderly people residing in nursing homes who require basic assistance with the activities of daily living in comparison with elderly people fit enough to stay at home. Though of sufficient fluid intake to the elderly people is of importance, previous studies reported at least 33 to 92 percent of elderly people admitted to care institutions lacked the recommended daily intake (RDI) level of fluid [2] and another study by Oh et al [6] reported that 52.3 percent of subjects lacked fluid.

Elderly dehydration decreases functions of sensory nerves in elderly, reduces desire to fluid intake, recognition and communication difficulty, difficulty in swallowing, chronic diseases, and decrease in motion lead to hard time to overcome hydration issues [4-9]. Also, elders' urination difficulty made urinary incontinence and origo urination triggered to refuse oral fluid intake by themselves [4, 9]. In addition, symptoms such as urinary incontinence and frequent urination commonly occurring as a result of dysuria due to aging become factors for the elderly in refusing fluid [4, 9] and nursing staff shortage due to financial problems becomes a factor in adding lots of difficulties to periodically assess fluid intake and regularly provide hydration to the elderly [9]. This results in urinary tract

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infections, constipation, dry skin, weight loss, and orthostatic hypotension [2, 4, 10] which can lead to hospitalization or can be life-threatening in serious cases. [11]. Therefore, research is needed to test the effects of a fluid intake program based on the intervention of nurses in the management of fluid intake for elderly people in senior facilities, while considering the role of the nurse as a manager for primary health problems of elderly living in the facility. The purpose of this study is to examine the effects of a program to encourage fluid intake in institutionalized elderly people.

2. Methods

2.1 Study Design

This study was conducted based on a non-equivalent control group pre- and post-time series design.

2.2 Setting and Participants

Subjects were elderly people who were admitted to two facilities that agreed to participate in this study. The necessity and purpose of this research was described to the managers of a senior nursing facility located in city A, Korea by e-mail and telephone. The selection criteria were as follows: First, the elderly person is able to swallow food, they have no problems in expressing their opinion, they have been a resident at the elderly care facility over 6 months, they are 65 years of age or older, and both they and their caregivers agreed to participate in the study in writing. Second, the elderly person has been diagnosed repeatedly with urinary tract infection before the start of the study; it was included in the study subject selection criteria because these subjects were determined to be suitable to examine the effects of fluid intake, according to a previous study result that reported lack of fluids is a factor causing urinary problems because it causes slow urinary excretion and prolong retention in urinary bladder that promotes microbial growth in the urinary [12]. Third, elderly persons with daily fluid intake of 1500 mL or less. Fifth, elderly persons who have no problems in expressing personal opinion. Sixth, elderly persons who agreed to participate in this study. Excluded from the criteria are patients who are receiving parenteral nutritional supplement, restricted fluid intake instructed by Doctors' or/and patients with uncontrolled diabetes mellitus. The G*Power 3.1.2 program was used to compute the number of subjects who participated in the experiment. For this, 27 patients per group were needed to conduct repeated measures ANOVA with effect size 0.30, significance level α=.05, statistical power 0.80, and correlation coefficient 0.50. As a result, there were 31 subjects in facility B, 15 subjects in facility C, 23 subjects in facility D, and 4 subjects in facility E who agreed to participate; however, facility E at the same time revealed their intention not to participate, so it was excluded from the study. During the interventional process, 2 subjects from the treatment group and 4 subjects from the control group moved to other institutions and back home, so they were eliminated from the study; therefore, there were 29 subjects in the experimental group and 34 subjects in the control group, total of 63 subjects in the final analysis.

2.3 Measurement

Daily water Intake Records

A system to record each participant's daily fluid intake level was developed by the authors for this study. The water intake recording system was developed based on the literature [4, 9, 11] and the clinical experience of this researcher in relation to the recording of regular fluid intake levels.

Urinalysis: pH, Specific Gravity, Osmolality, Color, White Blood Cell Count, Bacteria, Odor

Samples for urine analysis were taken from the second urination of the day with the first morning urination discarded. Male subjects gave intermediate urine after using a clean towel to wipe the penis without a special disinfectant. Female subjects collected intermediate urine in a sterile container after cleaning the perineal area using primary saline. Urine was collected a total of 5 times per 2 weeks at the Q testing center. pH, specific gravity, color, white blood cell count, bacteria, and odors were assessed using a speculum law stick.

Moisturizing

The diameter of the electron flow generated in a metal plate with two isolated probes of 16 mm was measured, where one of the charges is positive and the other is the electrostatic capacity of the load upon contact after placing the probe against the skin perpendicular to the skin surface and a negative charge generated.

2.4 Research Process

Preparation of Secondary Researchers and Research Environments

The secondary researchers were 4 nurses and 40 nurses' aides. I/O was measured by trained nurses' aides and weight and urine characteristics were measured by trained nurses. In order to minimize the measurement error caused by measuring tools, electronic scales were used to measure food and liquids and separate glasses were supplied to the two facilities by the same company. In order to minimize variability in the measured results, room temperature was maintained at 26-27°C.

Fluid Intake Encourage Program

The specific fluid encourage program were as follows<Table 1>.

2.5 Data Analysis

The collected data were analyzed using SPSS/WIN 21.0 software. First, participants were surveyed and the general characteristics of the elderly people in this study were analyzed by frequency, percentage, mean, and standard margin. In addition, measurement parameters were analyzed using the t-test, χ^2-test, and Fisher's exact test. The effect on time-specific variables was analyzed using a repeated measures analysis of variance (repeated measures ANOVA

3. Results

3.1 Homogeneity Test for General Characteristics between Two Groups

There were no significant differences in general characteristics and dependent variable between two groups<Table 1.2>.

3.2 Comparison of dependent Variables between Two Groups

There was significant difference in the urine analysis, water intake, and skin moisture level between the experimental group and the control group <Table 3-5>.

4. Discussion

Recently in our country, the number of nursing homes has increased rapidly due to

increase in the elderly population, and many studies relevant to nursing home facilities have been conducted out. However, most of these were presenting problems of the nursing homes and their improvements, or nursing quality in the facilities [8], but studies that specifically approached physical symptoms or health problems experienced by the elderly people residing in the nursing homes are lacking.

Table 1. Fluid Intake Encourage Program

Session	Subject	Content
1st (60min)	The truth of water intake	Introduction: research process, researcher, research assistant, participants. Provide minipollen (individual plants)
2nd (60min)	How does the body react when it runs out of water?	Importance of water intake Movies: dry soil and the natural phenomenon of rain Dehydration and health problems Compare with individual pollen grains
3th (60min)	Quiz: Maintaining a healthy body (1st)	Movies: rain on the earth Game: find a picture (dehydration symptoms) Compare with individual pollen grains
4th (60min)	Maintaining a healthy body (1st)	Proper water intake and exercise Timing of water intake Protection from warm environments
5th (60min)	Healthy food	What kinds of healthy food? Game: find a picture (watery food) Compare with individual pollen grains
6th (60min)	When should we drink water?	Find a picture: when should we drink water? Group discussion: experiences of difficulty in relation to water intake and stories about overcoming these difficulties
7th (60min)	Find healthy ivy	Contest: Healthy plant, sticker game Traditional Korean song
8th (60min)	I have been changed!!	Queen of water Sharing feelings following adequate fluid intake: good points, things we do not want, sharing information relating to physical changes "Water is the water of life."

Table 2. Homogeneity Test for General Characteristics between Two Groups (N=49)

Characteristics		Exp. (n=23)	Cont. (n=26)	t/χ^2	*p*
		n(%)	n(%)		
Age(yrs)	65~70	1 (4.3)	1 (3.8)	0.67	.506*
	71~80	5 (21.7)	8 (30.8)		
	81~90	14 (60.9)	15 (57.7)		
	91~	3 (13.0)	2 (7.7)		
	M±SD	83.00±6.16	81.12±6.11	1.07	.289
Sex	Female	17 (73.9)	19 (73.1)	0.38	.706
	Male	6 (26.1)	7 (26.9)		
Education level	Illiteracy	12 (52.2)	8 (30.8)	1.06	.295*
	Elementary	7(30.4)	12 (46.2)		

	Junior school	3(8.7)	2 (7.7)		
	Senior school	1(4.3)	3 (11.5)		
	□College	1(4.3)	1 (3.8)		
Religion	Yes	11 (47.8)	12 (46.2)	0.28	.780
	No	12 (52.2)	14 (53.8)		
Past history	<4	12 (52.2)	16 (61.5)	0.44	.572
(numbers)	4≤	11 (47.8)	10 (38.5)		
Present history	<4	12 (52.2)	15 (57.7)		
(numbers)	4≤	11 (47.8)	11 (42.3))		
Length of stay	6-12	4 (17.4)	6 (23.1)	0.15	.967
(yrs)	12-34	6 (26.1)	6 (23.1)		
	25-36	2 (8.7)	2 (7.7)		
	37≤	11 (47.8)	12 (46.2)		
	M±SD	38.65±23.88	29.31±14.83	-1.66	.102

Exp.=Experimental group; Cont.=Control group; *=Fisher's exact test

Table 3. Homogeneity Test for Dependent Variables between Two Groups (N=49)

Variables		Categories	Exp. (n=23)	Cont. (n=26)	t/χ^2	p
			Mean±SD or n(%)	Mean± SD or n(%)		
Body Weight			43.10±5.89	47.83±8.11	1.91	.062
BMI			19.84±4.60	20.97±3.21	1.38	.174
Skin Moisture		Face	29.87±7.20	31.05±5.21	1.034	.306
		Forarm	32.12±4.73	34.49±3.79	1.910	.068
Urine-test	pH		7.30±0.97	7.08±1.21	-1.02	.312
	Color	Straw	6	9	1.63	.264
		Dark orange	10	13		
		Greenish brown	7	4		
	WBC	0-3	6	7	0.93	.819
		4-10	2	3		
		11-30	6	4		
		Many	9	12		
	Bacteria	Yes	1	0	1.15	.469
		No	22	26		
	Odor	Yes	8	6	1.42	.234
		No	15	20		

Water Intake	(mL/24hrs)	862±118.5	872 ±143.6	0.27	.788
Urine output	(mL/24hrs)	710.4±136.9	763.5±206.7	1.044	.291

BMI=body mass index

Table 4. Comparison of Physical Variables between Two Groups (N=49) ; Exp. (n=23); Cont. (n=26)

Variables	Group	Intervention M±SD								Source	*p*
		1wk	2wk	3wk	4wk	5wk	6wk	7wk	8wk		
wt	Exp	43.78±7.87	43.83±7.98	43.90±8.07	43.70±7.98	43.57±7.95	43.59±7.93	43.48±7.84	43.57±7.92	Group	.225
	Cont	47.38±5.21	46.65±5.28	46.08±5.12	45.85±5.08	45.62±5.25	45.38±5.03	45.35±4.92	45.49±5.06	Time	<.001
										G*T	<.001
Face	Exp	30.57±8.29	31.92±5.50	32.58±5.37	33.72±5.38	33.70±5.25	33.97±5.33	34.27±5.18	33.99±5.23	Group	.097
	Cont	32.45±3.96	31.56±3.54	31.43±3.62	30.82±3.45	30.52±3.45	30.47±3.79	29.90±3.59	30.29±3.55	Time	.232
										G*T	<.001
Forearm	Exp	34.72±3.73	35.15±3.93	36.20±4.32	36.79±4.21	37.20±4.01	37.19±3.97	37.36±3.91	34.92±3.19	Group	3.12
	Cont	36.49±2.74	35.87±2.92	35.88±3.06	35.68±3.26	35.13±3.15	34.80±3.23	34.85±3.26	37.25±3.96	Time	<.001
										G*T	<.001
Intake	Exp	1563.54±315.08	1813.32±326.48	1882.29±287.94	1823.20±242.38	1862.54±257.26	1863.70±272.17	1856.37±288.34	1848.94±251.38	Group	<.001
	Cont	879.12±180.28	662.14±140.16	708.19±137.70	710.99±141.78	619.18±139.91	591.29±146.11	650.24±147.51	629.15±129.63	Time	.007
										G*T	<.001
Output	Exp	1821.83±269.50	1847.48±347.25	1881.11±287.91	1827.24±242.22	1829.65±277.73	1846.46±276.82	1833.73±260.17	1757.42±263.39	Group	<.001
	Cont	784.12±180.28	764.56±141.25	758.57±137.92	713.79±144.86	625.00±129.88	600.33±135.96	561.15±135.89	569.37±153.21	Time	<.001
										G*T	<.001

Table 5. Comparison of Physical Variables between Two Groups (N=49); Exp. (n=23); Cont. (n=26))

Variables	Group	Intervention n(%) / M±SD								Source	*p*
		1wk	2wk	3wk	4wk	5wk	6wk	7wk	8wk		
Odor	Exp	7(30.4)	4(17.4)	4(17.4)	4(17.4)	0(0.0)	1(4.3)	3(13.0)	0(0.0)	Group	<.001†
	Cont	5(19.2)	15(57.7)	19(73.1)	19(73.1)	19(73.1)	20(76.9)	21(80.8)	21(80.8)		
Bacteria	Exp	1(4.3)	0(0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (4.3)	0(0.0)	Group	0.003†
	Cont	0(0.0)	11(42.3)	8 (30.8)	3 (11.5)	3 (11.5)	4 (0.0)	2(7.7)	6(23.1)		
Color	Exp	2.04±0.77	1.17±0.39	1.16±0.30	1.00±0.00	1.01±0.01	1.09±0.42	1.26±0.62	1.11±0.31	Group	<.001
	Cont	1.81±0.69	2.08±0.74	2.00±0.75	1.96±0.72	2.04±0.77	2.15±0.68	2.35±0.56	2.17±0.54	Time	<.001
										G*T	<.001
pH	Exp	7.214±0.98	7.157±0.93	7.174±0.89	7.022±0.96	6.939±0.99	7.087±0.95	7.564±0.94	7.091±0.81	Group	.018
	Cont	7.771±1.51	7.715±1.29	7.899±1.15	7.827±1.06	7.904±0.99	7.923±1.03	7.890±1.33	7.906±0.92	Time	.001
										G*T	<.001
WBC	Exp	2.78±1.24	2.43±1.24	2.39±1.97	2.35±1.41	1.87±1.15	2.07±1.28	2.61±1.12	2.19±1.05	Group	.005
	Cont	2.81±1.31	3.46±1.23	3.29±2.96	3.15±1.13	3.22±1.95	3.12±1.17	3.01±1.19	3.08±0.99	Time	.065
										G*T	<.001

The major complains that elderly people residing in the nursing facilities are bodily

falls, dizziness, fatigue, constipation, orthostatic hypotension, urinary tract infection, dysuria, unconsciousness confusion, *etc*. [2, 5, 6] and these health problems are associated with lack of fluid intake or they could result from or worsened with lack of fluid intake [13] And because occurrences of these health problems due to lack of fluid intake extends the stay of the elderly people in the nursing facilities and lower the quality of life [2, 4], development of the fluid intake encouragement program for seniors in the facilities can be important and urgent nursing problem.

Before conducting the intervention of this study's fluid management program, the two groups' daily fluid intake were 9,110mL in the experimental group and 9,016mL in the control group, which reaches the fluid intake targets by only 48.8% and 47.3%, respectively, not even reaching about 50% of the fluid intake targets. When compared to previous researches abroad that are similar to this study [7, 10], daily fluid intake rate and amount were similar or higher than those of the seniors in this study's facilities. This is probably because management guidelines and assessment guidelines about performance degrees on fluid intake are not clearly prescribed domestically [6]. And it was considered that water is mostly provided only during mealtime by care nurses, and specific assessments and measures for lack of fluid prevention and early detection are not properly done.

The results of the two groups' daily fluid intake and target amount is that the experimental group reached the fluid intake targets in both intervention and post-survey periods but the control group did not reach the targets. This result is probably due to the increase of voluntary water intake by the elderly people because their awareness of the importance of fluid intake has changed and their potentials of health management has improved, as the fluid intake management program of this study included explanations of health problems and physical symptoms of lack of water and factors that can cause lack of water in everyday life. Also, the care providers role is considered to have positive influence in improving water intake by the elderly people because the education for training aimed the care providers also provided information about assessments regarding physical symptoms and changes in urine indicators, and delivery methods and recording methods for effective water intake. Therefore, it is considered that education offerings for cultivation for the elderly's self-management capability are required along with active water supply and accurate and careful assessments by care providers.

In comparison between the two groups' frequency rate of urinary tract infection, the experimental group had no infections but there were 5 infections in the second week of intervention, 4 infections in the fourth week, 5 infections in the sixth week, and 1 infection observed during the post-survey period in the control group. In a previous research supporting this study, fluid management with subject seniors from Mentes & I-VANRC [4] facilities reported that there were no elderly subjects' urinary infections during intervention in the experimental group but there were people infected in the control group. This research's results seemed to demonstrate that appropriate water intake to the subjects are effective to prevent urinary infections.

When you see them in groups during the intervention period at the results of this study, no detectable bacteria in urine but the control group has generated bacteriuria during the intervention period, Urine-pH test group also showed a trend to a range of pH decrease during the post-intervention period compared to 688 in advance prior to the post-734.

However, uric acid also was found in the control group had made the increase in the pre-713 to post 784. Therefore, it was confirmed that adequate fluid intake reduces the uric acid in the elderly [14], reduces the bacteria generated by reducing the urinary tract infection [15]. Therefore, the later study, the subjects are classified according to the degree of hydration considered necessary to see more specifically performed researches on the occurrence of a change amount of uric acid and bacteria.

Urine analysis results presented in conjunction with other experiment increases fluid intake is reducing bad smells from urine smells and urine color over the time and

represent almost normal color, but the color becomes lighter in color of straw, as the control group over time urine the urine's odor increased the color was closer to bluish brown. Urine leukocytes in the experimental group decreased in time extent to which increased slightly in the post but the control group showed a trend to increase as time passes. That is much less smells of a higher degree of hydration reaches the target amount of urine, urine color indicates the bright straw colors, there are no leukocytosis, and gradually decreased pH, Also it has been confirmed that there are no bacteria in the urine. Over a period of time, it indicates more skin moisture, better results compared to that of the experimental group as pre-moisturizing of the skin between the two groups was also, in the control group, was the less the moisture. Especially moisturizing face of the elderly in the experimental group was compared with the measurement point, even a statistically significant rise in the six weeks after intervention. It is hard to expect change in elder's skin moisture, which viewed through this short-term study results are expected to change over the water intake, it is time to check that the effects appeared as the fluids intake will prevent dry skin of the elderly. It will be referred to as necessary interventions to alleviate a sense of discomfort and complications

Looking at the characteristics of the elderly who participated in this study, groups are a lot older than that in the control group, more female gender than male gender, less education in female gender and more illness are in female gender. Four or more illness and longer stay in facilities is more in the experimental group. Although in this study, there should be homogeniency between the experimental group and the control group, however, it was not possible to homogenize of the two groups. That may be a limitation in this study. Although, the importance and effectiveness of water management programs conducted in this study, more vulnerable and in spite of some variables in experimental group but, most of the significant results showed and able to prove that results the results are effective. But that the importance and effectiveness of water management programs conducted in this study though some vulnerability and variables are the subjects of this study, most of the significant results that it has appeared from the water intake in the dependent elderly will be able to prove that results effectively. And when you could consider the cost of care for health problems in the elderly, fluid intake related to the health problems of the elderly is that they can stay healthy and cost-effective is significance. In addition to that, we developed a water intake facility management program for our country through this study is that shows its significance.

5. Conclusion

This program led to an increase in fluid intake and a reduction in the significant physiological problems that affects elderly people residing in nursing homes. Therefore, the results of this study suggest that the fluid intake management program should be expanded to even the general elderly population living at home or in the community [16]. Studies assessing the water intake of elderly people should be considered in the development of programs to improve hydration. In addition to that, further research is required to determine the long-term effects of fluid intake management.

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