

Original Paper

Effect of Fluid Intake on Bowel Habits in the Elderly

Kiyoko FUKAI¹⁾, Hiroe HITOMI¹⁾ and Takako TSUKAHARA²⁾

Department of Nursing, Faculty of Medical Welfare

Kawasaki University of Medical Welfare¹⁾

Kurashiki, 701-01, Japan

Department of Nursing

Kawasaki College of Allied Health Professions²⁾

Kurashiki, 701-01, Japan

(Accepted October 30, 1995)

Key words : bowel habits, fluid intake, the elderly, constipation

Abstract

The study focuses on the effect of additional fluid intake (AFI) on bowel movements in the elderly. Thirty persons (74.7 ± 10.8 years) consented to participate in the fourteen day research program. Although 18 were healthy, twelve were partially or completely bedridden and somewhat disabled. During the first 3 or 4 days, subjects drank fluid as usual. For the next seven days, they took at least 400ml per day of additional water or tea. Subjects recorded the forms of their stools using a scale *Form of Feces* (Davies, et al., 1986). The *Constipation Assessment Scale* (CAS), which was translated and modified by Fukai, et al. (1995), was used to ascertain the severity of constipation. The average volume of AFI was 370ml, and total intake was 1,450ml. The CAS scores decreased in 30% of the subjects, and the number of bowel movements increased in 53%. Feces turned significantly softer in the bedridden with AFI as measured by the rank sum test ($p < 0.05$). Fifty-seven percent of the subjects reported their bowel habits had improved somewhat. These results indicate that AFI can be somewhat effective in improving constipation.

Introduction

The problem of constipation, its prevention and treatment, is ubiquitous among human beings. Reports often stated that elderly more than younger persons tend to get constipated¹⁾⁻⁴⁾. However, our research group reported recently that there was no significant correlation between age and tendency of constipation⁵⁾. The decline in physi-

cal activity might better explain increased constipation in the elderly^{3),5)}.

As for the prevention and management of constipation, many researchers emphasized that dietary fiber reduced gastro-intestinal transit time and lessened constipation somewhat⁶⁾⁻⁸⁾. Although it is generally known that adequate liquid intake facilitates daily bowel movement, few studies have been reported^{6),9)}. Severe constipation of the bed-

ridden elderly has been an important factor in managing care at home. *Therefore, an investigation was conducted on whether additional fluid intake affects bowel movements in the elderly.*

Method

Subjects. Thirty elderly persons, 10 males and 20 females, signed an informed consent to participate in the research program. Ages ranged from 60 to 92 with a mean age of 74.7 years. They lived with their families at home, in quiet residential areas. Eighteen subjects were healthy; they played ball games, danced, and so on. Twelve were partially or completely bedridden and somewhat disabled, but not seriously ill. All subjects had neither gastro-intestinal diseases nor constipation as side-effects of medications.

The Ministry of Public Welfare established a standardized rank of *Activities of Daily Living* (ADL) for the elderly in 1993 (Table 1), which was used in the study. The rank A1 represents persons who can ambulate outdoors with assistance, and rank A2, those who are partially bedridden. The rank B1 represents persons who are bedridden and can use a wheel chair without help, and rank B2, those who are also bedridden and need

help with the wheelchair. Rank C are persons who are completely bedridden, and require total assistance in ADL. No subject qualified for rank A1 in this study. The researchers visited and interviewed bedridden subjects, assessed their ADL and classified them into the above-described categories.

Design. This study was conducted on one-group, using a pretest-posttest design. Ideally an experimental study should have at least two randomized groups, experimental and control. It was impossible to find more subjects for the control group, who were not demented and could give consent.

Data collection. Two scales were used in this experiment to assess the subjects' bowel habits. One was the *Constipation Assessment Scale* (CAS), which was first developed by McMillan and Williams in 1989¹⁰. The scale was translated into Japanese requiring some language modification^{5,11}. The CAS has eight items which relate to abdominal symptoms of constipation. As each item has three possible responses (scored from 0 to 2 on the Likert scale), the total CAS score may range from 0 to 16. When the subjects completed the CAS, they were to assess their problem of constipation within approximately 72 hours. Because of the short term assessment, the scale was named "*The Short-term Constipa-*

Table 1 Characteristics of the subjects.

The rank of Activities of Daily Living (ADL) corresponds to the standard by Ministry of Public Welfare.

| Characteristics | Healthy | Rank of ADL Bedridden | | | Total | |
|-------------------------------------|-----------------|--------------------------|---------|-----------------|----------|-----------------|
| | | A2 | B1 | B2 | | C |
| Number (%) | 18 (60.0) | 1 (3.3) | 2 (6.7) | 6 (20.0) | 3 (10.0) | 30 (100.0) |
| Age: Mean \pm SD** | 69.6 \pm 7.9 | | | 82.4 \pm 10.6 | | 74.7 \pm 10.8 |
| Bowel habits: Mean \pm SD | | | | | | |
| ST-CAS* | 0.84 \pm 1.57 | | | 3.75 \pm 3.36 | | 2.00 \pm 2.80 |
| Number of bowel movements/day*** | 0.96 \pm 0.21 | | | 0.41 \pm 0.30 | | 0.73 \pm 0.37 |

level of significance by *t* test: *, $p < 0.05$; **, $p < 0.01$; ***, $p < 0.001$

tion Assessment Scale (ST-CAS)^{5,11)}. The severity of constipation could be determined using the scale.

The other instrument was the linear scale of the *Form of Feces* by Davies, et al.⁷⁾. It described eight forms of feces graded from soft to hard stools. For example, number one was severe diarrhea, and number eight was severe constipation. The subjects or family judged each defecation, and matched it with the most similar form on the scale.

Data were recorded and abstracted from pre-categorized forms provided to all subjects. Categories included contents of intake, time and number of bowel movements and form of feces by the scale. The subjects themselves or one of their family members filled out the forms for two consecutive weeks. They also completed ST-CAS and described self-reports on abdominal or other symptoms every night before sleeping. After completion of the entire protocol, the elderly were asked to describe their subjective assessment on additional intake of fluids.

Seven subjects were regular users of laxatives, which were peristaltic stimulators, senoside. Habitual laxative users were allowed to continue using them for the duration of the study. They used the laxatives and recorded them daily unless they got diarrhea. Of course, non-users took neither laxatives nor enemas throughout the experimental period.

The experimental period was divided into three terms: the first term of 3 or 4 days, subjects took fluid as they usually do. The fluid consisted of water, tea, coffee, juice and soup. They used a special cup or a graduated glass whenever they took any fluid. The second term, which was the following seven days, they were to take daily at least an additional 400ml of water or tea. The third term of 3 or 4 days, they were allowed to return to their customary fluid intake. Other-

wise, they lived their usual daily lives during the period of research. Prior to the research, permission was obtained from subjects' family doctors to take more fluid.

Results

Characteristics of the subjects. The mean age of the healthy group was 69.6, and that of the bedridden group was 82.4 (Table 1). There was a significant difference between the ages of these two groups ($t=3.80$, $p<0.01$). However, age in itself was not an important variable, since there was no correlation between age and the severity of constipation in surveying of the bowel habits of 313 healthy elderly people in 1993⁵⁾.

Sixteen subjects reported they were constipated. Seven belonged to the healthy group, and they defecated more than twice per week. Seven subjects of the bedridden group, who stated they were not constipated, used laxatives regularly. Since they could not defecate easily without laxatives, they in fact were constipated. This would suggest that constipation cannot be assessed only by self-reports. However, the subjects could be conveniently sorted into two groups, the healthy and the bedridden. The healthy group corresponded to non-constipated subjects, and the bedridden group to constipated. The effects of the additional fluid intake were compared between these two groups.

Table 1 also shows the bowel habits, and Table 2 the volume of usual fluid intake of the subjects before loading. The significant difference between the scores of ST-CAS ($t=2.80$, $p<0.05$) was caused by the activity level rather than age as described above. The ST-CAS scores ranged from 0 to 12. Only one subject with the highest score of 12 belonged to the bedridden group. Eighteen subjects scored 0 or 1, three of which belonged to the bedridden.

The numbers of bowel movements of the bedridden group were significantly less than that of the healthy ($t=5.88$, $p<0.001$). Three of the bedridden defecated less than twice weekly, but two of them more than once a day. On the other hand, 15 of the healthy defecated more than once daily.

Before fluid loading. During the first 3 to 4 days of the two consecutive weeks' study, the healthy group took an average of 1,182 ml of fluid, and the bedridden took significantly less, 811 ml (Table 2). Mean volume of daily fluid intake in the healthy group was significantly more than that in the bedridden ($t=2.56$, $p<0.05$). The volume ranged from 200 to 1,950 ml.

All of the above data were compared for significant difference among healthy and four ADL rank groups (Table 1). Significant differences were found using analysis of variance in the numbers of bowel movements ($F=10.64$, $p<0.0001$), and in the scores of ST-CAS ($F=9.29$, $p<0.001$).

Effect of additional fluid intake. In the second term, subjects took *additional* fluid. They reported that drinking 400ml or more for seven successive days was difficult, so that the period of fluid loading varied from

two to 13 days (mean 7.3 days). The average volume of additional fluid intake was 372 ml, with a range of 150 to 680 ml (Table 2). The mean of total fluid intake per subject was about 1,450 ml.

The objective data were shown in Table 3. There was no significant decrease of the average score of the Short-term CAS, that is, from 0.84 to 0.81 in the healthy group and from 3.75 to 2.05 in the bedridden. Although there was no significance in the CAS scores, nine subjects decreased their scores during the fluid loading term. Moreover, three subjects in the bedridden group with high CAS scores, more than 5 before loading, decreased their scores remarkably after loading, that is,

Table 2 Volumes of additional fluid intake

| Group | Before Mean \pm SD(ml) | Additional volume Mean \pm SD(ml) |
|---------------------|-----------------------------|--|
| Healthy (n=18) | 1,182 \pm 392 | 365 \pm 154 |
| Bedridden (n=12) | 811 \pm 384 | 384 \pm 124 |
| Total (n=30) | 1,034 \pm 417 | 372 \pm 138 |

level of significance by *t* test: *, $p<0.05$

Table 3 Effects of additional fluid intake on bowel habits

| Bowel habits | Group | Before Mean \pm SD | Additional volume Mean \pm SD |
|--------------------------------------|------------|-------------------------|------------------------------------|
| Score of Short-Term CAS | Healthy | 0.84 \pm 1.57 | 0.81 \pm 1.54 |
| | Bedridden | 3.75 \pm 3.36 | 2.05 \pm 2.29 |
| | Total | 2.00 \pm 2.80 | 1.28 \pm 1.92 |
| Number of bowel movements per day | Healthy | 0.96 \pm 0.21 | 1.08 \pm 0.46 |
| | Bedridden | 0.41 \pm 0.30 | 0.78 \pm 0.38 |
| | Total | 0.73 \pm 0.37 | 0.96 \pm 0.45 |
| Forms of feces | Healthy | 5.04 \pm 0.81 | 4.83 \pm 1.02 |
| | Bedridden* | 6.17 \pm 1.40 | 4.61 \pm 1.31 |
| | Total | 5.51 \pm 1.23 | 4.74 \pm 1.15 |

level of significance by rank sum test: *, $p<0.05$

from 6 to 2.5, from 6 to 1 and from 12 to 4.

The average number of daily bowel movements in the healthy group showed almost no change. On the other hand, the bedridden group increased them by almost twice. Nine in the bedridden group and seven in the healthy increased their number of bowel movements.

In the bedridden group, form of feces decreased significantly by Wilcoxon's rank sum test ($p < 0.05$). Feces turned softer in 19, (nine in the bedridden and 10 in the healthy groups), harder in only one, and no change in 10.

Some subjects reported negative effects of the additional fluid intake; seven subjects (23 %) had frequency of urination, and three (10 %) had abdominal bloating (see Table 4). However, most felt some improvement in their bowel habits, that is, nine subjects (30%) reported increased frequency, and 15 (50%) found easier evacuation. Two of the regular laxatives users reported they needed no laxatives during the second term, the period that required additional fluid intake.

After fluid loading. During the third term, the subjects were allowed to return to their customary fluid intake. However, it generally seemed difficult for them to stop the additional fluid loading. Only five of them could revert to their original intakes.

Data in the third term were also computed, but no significant difference was found among variables in the *three terms* using analysis of variance.

Discussion

This study suggests that the tendency towards constipation relates to ADL in the elderly. The authors had previously verified no significant correlation between age and CAS score in healthy elderly people⁵). Raphael³) also reported that constipation in the elderly, especially in the permanently bedfast, could be due to degree of debility and immobility. Others reported that laxatives users increased in the elderly over sixty years of age^{1,2}). The retired elderly have more time and opportunities than younger persons to obtain medications including laxatives from physicians. For the assessment of constipation the effect of laxatives should not be neglected.

This study was the first experiment that confirmed some effect of additional fluid intake on constipation in the elderly using the CAS. Since some of the subjects, who were constipated, used laxatives regularly throughout the experiment, the true effect of fluid intake as well as severity of constipation could not be assessed. (The CAS was devel-

Table 4 Subjective reports after the experiment

| Physical changes by self-report | Group | | Total (n=30) (%) |
|------------------------------------|---------------|-----------------|---------------------|
| | healthy(n=18) | Bedridden(n=12) | |
| Negative changes | | | |
| Frequent micturition | 3 | 4 | 7 (23) |
| Abdominal bloating | 2 | 1 | 3 (10) |
| Positive changes | | | |
| Frequent defecation | 6 | 3 | 9 (30) |
| Softened stool | 8 | 7 | 15 (50) |
| Laxative discontinued | — | 2 | 2 (29)* |

*: total users, 7

oped initially to assess and improve *severe* constipation which is a common side-effect of morphine administered to cancer patients¹⁰.) Ideal research subjects would be those who are severely constipated and do not use laxatives.

The more one takes fluid, the more one urinates. That is a simple and common physiological phenomenon. More than 8,000ml of water per day is absorbed by the small intestine and about 400ml, by the colon. The additional 370ml of fluid presumably would be absorbed by the gastro-intestinal tract and unavailable to soften stools. Nevertheless, the small load of fluid is effective in lessening constipation.

The empirical effect of fluid intake is often reported. Sloan, a primary care geriatrician, also described that "a large fluid intake of 4-6 glasses with increases in summer heat, is essential"⁹). Miller (1985)⁶) stated that an adequate fluid intake was one of the important factors in alleviating constipation in the clinical setting, and that the laxatives are most effective when taken with adequate fluid and fiber. In our study, three bedridden subjects, who took constant additional fluid during the experimental period, (the total fluid intake of 910 - 1,350ml for seven to 10 days), markedly decreased their CAS scores. Moreover, bowel habits of all the laxative users improved to some extent, which is a finding consistent with other reports^{6),9}). The ideal management of constipation consists of

adequate intake of dietary fiber and fluid, physical exercise, and well-controlled use of laxatives or enemas.

Subjective data provided an important information for nursing and research, and should not be overlooked. More than 50% of the subjects reported that additional fluid intake had positive effect on their bowel movements. To encourage cooperation in the research, subjects were informed that the additional fluid intake could help their constipation. The data might be contaminated by the subjects having this prior knowledge. However, the objective data indicated that even modest intake could facilitate bowel movements. These results suggest that adequate fluid intake can lessen constipation in the elderly.

Further studies with conventional experimental design—where food intake is controlled and the experiment is conducted blindly—are necessary to clarify the true effect of fluid intake on constipation.

Acknowledgment

This work was supported in part by a research grant from the Sasagawa Health Science Foundation in 1993. The authors acknowledge the cooperation of the subjects, their families and nurses, who made this research possible, and Professors Betty S. Furuta and Yutaka Hirano for editing the manuscript.

References

- 1) Milne JS and Williamson J. (1972) Bowel habit in older people. *Gerontologia clinica*, **14**, 56—60.
- 2) Connell AM, Hilton C, Irvine G, Lennard-Jones JE and Misiewicz JJ (1965) Variation of bowel habit in two population samples. *British Medical Journal*, **6**, 1095—1099.
- 3) Raphael JH (1966) Constipation in the elderly - a new treatment. *Gerontologia clinica*, **8**, 160—163.
- 4) Harari D, Gurwitz JH, Avorn J, Choodnovsky, I and Minaker KL (1994) Constipation: Assessment and management in an institutionalized elderly population. *Journal of the American Geriatrics*

- Society*, **42**, 947–952.
- 5) Fukai K, Tsukahara T and Hitomi H (1995) A study of bowel habit in the elderly by the Japanese version of the constipation assessment scale. *The Japanese Journal of Nursing Research*, **28**(3), 209–216 (in Japanese).
 - 6) Miller J (1985) Helping the aged manage bowel function. *Journal of Gerontological Nursing*, **11**(2), 37–41.
 - 7) Davies GJ, Crowder M, and Dickerson JWT (1986) Bowel function measurements of individuals with different eating patterns. *Gut*, **27**, 164–169.
 - 8) Ishii C and Azuma R (1992) Effect of dietary fiber on defecation. *Journal of Japan Academy of Nursing Science*, **12**(1), 16–22 (in Japanese).
 - 9) Sloan JP (1991) *Protocols in primary care geriatrics*. Springer-Verlag, New York, pp 61–64.
 - 10) McMillan SC and Williams FA (1989) Validity and reliability of the constipation assessment scale. *Cancer Nursing*, **12**(3), 183–188.
 - 11) Fukai K, Sugita A and Tanaka M (1995) A developmental study of the Japanese version of the constipation assessment scale. *The Japanese Journal of Nursing Research*, **28**(3), 201–208 (in Japanese).