

The Effectiveness of a Gout Education Program

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Objectives. The purpose of this study was to investigate the diet of gouty patients and to evaluate the effectiveness of health education in managing gout.

Methods. The intervention group and the control group each consisted of 58 patients diagnosed as having gout at a medical center in Taichung. Baseline data were established for both groups. All were enrolled in a gout awareness education program. The effectiveness of the program was then evaluated by comparing the uric acid levels of the two groups.

Results. Participants in the intervention group improved greatly in terms of reducing their consumption of alcohol, bean, animal internal organs, and seafood ($p < 0.05$). The intervention group showed more improvement in all items except for amount of exercise than the control group ($p < 0.05$). There was a statistically significant difference in uric acid levels and dietary behavior between the two groups. The improvement of gout was shown by a 5.1 times odds ratio for lower uric acid levels in the intervention group compared with the control group. Episodes of acute gout within six months in the intervention group (17.2%) were about three times lower than those in the control group (50.0%).

Conclusions. Dietary education, adequate assistance and consultation greatly reduced the recurrence of gout. The findings of this study can be used as a reference in developing an individual care plan for gouty patients by medical staff. (*Mid Taiwan J Med* 2003;8:148-56)

Key words

diet behavior, gout, improvement program

INTRODUCTION

Prior to 1970, gout was not a commonly observed disorder in Taiwan [1]. However, there has been a dramatic increase in gout since then, presumably due to socio-cultural changes including a prospering economy, dietary changes with higher protein and fat intake, as well as bulimic behavior and unbalanced diet [2]. In Taiwan, Chen [3] found that the number of gout patients treated at his clinic increased dramatically from 1983 to 1995, particularly among younger patients. From 1983 to 1986,

patient demographics showed that 26% of gout patients were under the age of 40, and that 54% were 41 to 60 years old. However, from 1991 to 1995, these figures were 38% and 42%, respectively [3]. By extrapolating these data, it is clear that gout will become more common among young people than among middle-aged people in the future [4].

Gout is a disorder caused by abnormal purine metabolism. Efficient treatments of gout include the following: limiting dietary purine intake and maintaining an ideal weight, exercising regularly, increasing the amount of water intake (2000 to 3000 mL/day), and controlling the consumption of tea and coffee [5]. There are four typical stages of gout: asymptomatic, acute gout,

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a period of alleviated symptoms, and chronic gout. During the asymptomatic stage, dietary control is the main treatment method. In the later 3 stages, medication is prescribed to complement dietary control [6]. For patients with acute gout, food with a high purine content should be restricted to reduce the formation of uric acid [7]. Effective dietary control not only lowers the risk of complications but also increases the efficacy of prescription drugs, thus reducing the amount of medication required [8]. Continuing education on the awareness of gout-causing factors is very important in the effective treatment of gout [9]. Dietary control allows patients access to their own health, but the key to choosing a proper diet depends largely on whether the patient can locate and interact with a professional for expert dietary suggestions [10]. Therefore, continuing education, complemented by proper diet and medication, is the most effective treatment of the disorder. For patients who have yet to realize the importance of diet in gout prevention, it is even more crucial for medical professionals to actively initiate the education, investigate with follow-ups, and provide readily available support. Because there is relatively little detailed gout-related educational material in Taiwan, this study attempts to establish a dietary guideline for patient education during treatment.

MATERIALS AND METHODS

Subjects

All 124 participants with gout from whom written consent had been obtained were enrolled from a teaching hospital in Taichung. Patients were included if they had previously experienced acute gouty arthritis, had intracellular monosodium urate crystals in synovial fluid neutrophils, or had blood uric acid levels equal to or greater than the critical point (men = 7 mg/dL; women = 6 mg/dL). To keep the two groups separate and to ensure that only the intervention group received health education, control group patients and intervention group patients were recruited on an alternating weekly basis. There were 62 subjects in the intervention group and 62

in the control group at the end of the pre-test period. Participants were surveyed and interviewed at the beginning of the 3-month period. They were then followed-up by another survey and interviewed 6 months after the intervention program. In the post-test period, 3 subjects dropped out of the intervention group after being transferred to another hospital and 1 subject could not be contacted. Four subjects in the control group declined to participate because they felt that their symptoms had improved sufficiently. Therefore, the participation rate was 94% with 58 complete sets of data collected from each group. The two groups were comparable in demographics.

Instruments

The data collection process consisted of structured questionnaires and interviews. The questionnaires were designed using relevant publications [11,12] and the researchers' own practical experience. The questionnaire included four main parts: background information (age, gender, education level, occupation, ethnicity, marital status, etc.), history of disease (previous chronic diseases, condition of previous incidences of gout, previous medication, prevalence of gout among family members within or closer than 3rd-cousins removed), dietary behaviors (consumption of alcohol, tea, coffee and water, delicate vegetables, legumes, sauces containing meat, animal internal organs, seafood, and mushrooms), and lifestyle habits (amount of daily exercise), and finally clinical examination by a physician (acute gout attacks and concentration of uric acid).

Dietary behavior was divided into 5-frequency levels based on the ordinal scale: none, seldom (< once/month), occasionally (< once/week), usually (< 2 to 6 times/week), every day (7 times/week), with 1, 2, 3, 4, and 5 points assigned to each frequency, respectively. Amount of water consumption: > 3001 mL, 2001 to 3000 mL, 1001 to 2000 mL, 501 to 1000 mL, < 500 mL was assigned 1, 2, 3, 4, and 5 points, respectively. A higher score indicated improvement in diet. The uric acid laboratory test

was performed immediately following the pre- and post questionnaires. Pre- and post intervention uric acid levels were compared. Improvement in gout was defined as lower uric acid levels at the end of the intervention program (six weeks after the start of the program) compared with uric acid levels prior to the intervention program.

To ensure validity and reliability, the questionnaire relating to gouty symptoms and subjects' characteristics was tested, rated, and edited by 8 experts in the fields of medicine, public health, diet, and nursing for content using content validity. The revised questionnaire was tested for reliability by 10 out-patients of the target population. The Cronbach's α was 0.82 overall and ranged from 0.78 to 0.92 for all categories (such as dietary behaviors).

Intervention Program

The physicians explained the goals of the study to each patient during the clinical visit. Each patient's blood was analyzed (with signed consent), and the questionnaire was administered. Sixty-two patients were recruited over a 12-week period. Patients surveyed in odd-numbered weeks (weeks 1, 3, 5, etc.) were placed in the intervention group, and patients surveyed on even-numbered weeks (weeks 2, 4, 6, etc.) were placed in the control group. Patients in the intervention group were individually given dietary education advice by the researchers and dietitians. The patients were scheduled to return to the clinic once every other week, thus giving the researchers the opportunity to re-present and further clarify the educational material two weeks after the initial session. Researchers were available to the patients for advice at any time in addition to a minimum of two follow-ups conducted over the phone within the 6-month period after the survey. Follow-up surveys followed the same procedure as the initial survey: the uric acid level in each subject's blood was analyzed before administering the questionnaire. Patients who had participated in the initial survey, but did not return, were contacted by phone and asked to come to the hospital. The

dietary education program included written material, illustrations, posters, projection slides, instructional activity, and take-home informational pamphlets. The intervention group also received educational material which included knowledge of gout, the main causes of gout, risk factors of gout, dietary principles, alternative food (including illustrations) and specifically designed diets for patients with gout important, daily habits, and complications of gout. The control group did not receive any intervention, except for routine advice given to patients by nurses in the outpatient department.

Statistical Analysis

Data from the initial and post-intervention surveys were transcribed, coded, and analyzed by the SAS software for Windows 6.12 version [13]. The demographic information of the two groups was compared by the chi-square test and the *t* test. Paired *t* test and Student's *t* test examined the differences between personal habits, uric acid concentrations and dietary behaviors before and after intervention in the two groups, and the chi-square test compared the frequency of acute symptoms of gout. Analysis of the covariance (ANCOVA) compared the differences of the final scores in the two groups after adjusting for the pre-test scores. We compared the two groups by multiple logistic regression analysis for improvements in uric acid values after adjusting for other confounding factors using.

RESULTS

There were more men than women in both the intervention group (93%) and the control group (78%). Subjects in the intervention group were better educated (57% were senior high school graduates or above) compared with the control group (24%). More subjects in the intervention group were employed (55%) compared with the control group (38%). The majority of the subjects were descendants of Fukienese immigrants in both groups (81% and 76%, respectively). In the intervention group, 85% were married compared with 88% in the control group. According to family history,

Table 1. Demographic data and disease history of intervention and control groups (N = 116)

Items	Intervention group (N = 58) n (%)	Control group (N = 58) n (%)	Total (N = 116) n (%)	<i>p</i>
Gender				0.018
Men	54 (93.1)	45 (77.6)	99 (85.3)	
Women	4 (6.9)	13 (22.4)	17 (14.7)	
Age (mean ± SD)	55.4 ± 13.8	59.4 ± 12.3		0.104
Education level (yr)				0.004
< 6	20 (34.5)	37 (63.8)	57 (49.1)	
7–9	5 (8.6)	7 (12.1)	12 (10.3)	
10–12	13 (22.4)	4 (6.9)	17 (14.7)	
>13	20 (34.5)	10 (17.2)	30 (25.9)	
Occupation				0.063
Yes	32 (55.2)	22 (37.9)	54 (46.6)	
No	26 (44.8)	36 (62.1)	62 (53.4)	
Race				0.730
Fukienese	47 (81.0)	44 (75.9)	91 (78.4)	
Hakka	7 (12.1)	10 (17.2)	17 (14.7)	
Mainland	4 (6.9)	4 (6.9)	8 (6.9)	
Marital status				0.763
Single	5 (8.5)	3 (5.2)	8 (6.9)	
Married	49 (84.5)	51 (87.9)	100 (86.2)	
Other	4 (6.9)	4 (6.9)	8 (6.9)	
Family history (within 3 rd -cousin-removed)				0.246
No	40 (69.0)	34 (58.6)	74 (63.8)	
Yes	18 (31.0)	24 (41.4)	42 (36.2)	
Drug				0.757
Acute gout attack	22 (37.9)	25 (43.1)	47 (40.5)	
Long term medication	36 (62.1)	33 (56.9)	69 (59.5)	
Hypertension				0.577
No	32 (55.2)	29 (50.0)	61 (52.6)	
Yes	26 (44.8)	29 (50.0)	55 (47.4)	
Renal disease				0.802
No	49 (84.5)	48 (82.8)	97 (83.6)	
Yes	9 (15.5)	10 (17.2)	19 (16.4)	
Heart disease				0.590
No	51 (87.9)	49 (84.5)	100 (86.2)	
Yes	7 (12.1)	9 (15.5)	16 (13.8)	
Diabetes				0.067
No	55 (94.8)	49 (84.5)	104 (89.7)	
Yes	3 (5.2)	9 (15.5)	12 (10.3)	

p value was obtained by chi-square test to compare the two groups.

(within 3rd-cousin-removed) the incidence of gout among subjects in the intervention group was (31.0%) lower than in the control group (41.4%). Sixty-five percent of patients in the intervention group were consistent in following the prescribed regimen over the long-term, compared with 60.3% of patients in the control group. There were no significant differences between the two groups in chronic diseases such as, hypertension, renal disease, coronary disease and diabetes (Table 1).

The patients' daily living habits, including consumption of alcoholic beverages, tea, coffee, water, and amount of daily exercise are illustrated in Table 2. In the initial survey patients in both groups reported alcohol consumption as being either "less than once per month" or "less than once per week". Both groups exercised for less than two hours per day and consumed 1001 to 2000 mL of water per day. Overall, there were no significant differences between the two surveyed groups in personal habits before intervention.

Table 2. Life habits and diet behaviors before and after intervention in the intervention and control groups

Items	Pre-test (N = 58)		<i>p</i> *	Post-test (N = 58)		<i>p</i> *	<i>p</i> **
	Intervention group	Control group		Intervention group	Control group		
Life habits (freq.)							
Alcohol	3.6 ± 1.5 [†]	3.4 ± 1.5	0.460	4.4 ± 1.1	3.8 ± 1.3	<0.012	<0.043
Tea	2.8 ± 1.6	3.0 ± 1.6	0.599	3.6 ± 1.6	3.2 ± 1.5	0.168	<0.011
Coffee	4.5 ± 1.0	4.6 ± 0.9	0.696	4.7 ± 0.9	4.6 ± 0.9	0.343	<0.003
Activity	1.7 ± 0.6	1.6 ± 0.9	0.470	1.6 ± 0.8	1.7 ± 1.1	0.684	0.067
Water drinking	4.4 ± 0.9	4.2 ± 1.1	0.160	5.1 ± 0.8	4.2 ± 1.0	<0.001	<0.001
Diet behaviors (freq. of consumption)							
Vegetables	3.1 ± 0.9	3.2 ± 0.9	0.241	3.3 ± 0.6	3.3 ± 0.9	0.550	<0.002
Beans	3.3 ± 0.9	3.5 ± 0.8	0.516	3.7 ± 0.7	3.5 ± 0.8	<0.042	<0.001
Meat	3.2 ± 0.9	3.3 ± 0.9	0.549	3.6 ± 0.7	3.4 ± 0.9	0.080	<0.001
Internal organs	3.8 ± 1.0	3.8 ± 0.9	0.625	4.3 ± 0.8	3.9 ± 0.9	<0.007	<0.001
Seafood	3.4 ± 0.9	3.4 ± 0.9	0.836	3.9 ± 0.7	3.5 ± 0.8	<0.007	<0.002
Mushrooms	3.4 ± 0.9	3.6 ± 0.8	0.282	3.6 ± 0.7	3.6 ± 0.8	0.711	<0.017

p* values were tested by Student's *t* test, *p* value was obtained by ANCOVA to compare the items between the two groups. [†]Mean ± SD.

Table 3. Comparison of serum uric acid levels, life habits and diet behavior before and after intervention in intervention and control groups

Items	Pre-test (N = 58)		<i>p</i> *	Post-test (N = 58)		<i>p</i> *	<i>p</i> **
	Intervention group	Control group		Intervention group	Control group		
Uric acid levels	8.2 ± 1.5 [†]	8.1 ± 1.7	0.242	7.1 ± 1.4	8.35 ± 1.5	<0.001	<0.001
Life habits	17.1 ± 3.0	16.8 ± 2.6	0.600	19.4 ± 2.6	17.4 ± 2.5	<0.001	<0.001
Diet behaviors	20.2 ± 3.3	20.84 ± 3.5	0.280	22.6 ± 2.7	21.1 ± 3.4	<0.009	<0.001

p* values were tested by Student's *t* test to compare the three variables, *p* value was obtained by ANCOVA compare the three variables between the two groups. [†]Mean ± SD.

There was a significant reduction in the frequency of consumption of internal organs, seafood and beans in the intervention group compared with the control group, but there was no significant reduction in the consumption of mushrooms, meat and vegetables. Based on the ANCOVA analysis, there was a significant difference between the two groups, after adjusting for the pre-test scores, in diet, behavior and daily living habits except for activity.

There was no significant difference in uric acid concentration, daily living habits and diet behavior between the intervention and the control groups in the initial survey (Table 3). However, all three categories showed significant differences in the follow-up survey. There was significant improvement in uric acid concentration in the intervention group, daily living habits and diet behaviors between pre- and post intervention.

This was also true for the control group, although the improvements were not statistically significant. The intervention group showed greater improvement in all three categories. There was a significant difference between the two groups in uric acid levels, daily living habits and diet behaviors, after adjusting for the pre-test scores, according to ANCOVA.

Improvement in gout was defined as lower uric acid levels at the end of the intervention program compared with uric acid levels prior to the intervention program. Multiple logistic regression analysis determined the factors affecting the improvement in gout after adjusting for gender, education level, marital status, history of gout in the family (closer than 3rd-cousin-removed), the number of years since initial symptoms, medication, and the concurrence of four chronic diseases (hypertension, renal

Table 4. Factors affecting improvements of acute gout attack using multiple logistic regression

Items	No improvement n (%)	Improvement n (%)	Odds ratio (OR)	Adjust (OR)	95% CI
Group					
Control	20 (50.0)	29 (50.0)	1	1	
Intervention	10 (17.2)	48 (82.8)	4.80**	5.08**	1.92–13.4
Gender					
Women	8 (47.1)	9 (52.9)	1	1	
Men	31 (31.3)	68 (68.7)	1.95	1.08	0.30–3.92
Education level (yr)					
≤ 9	28 (40.6)	41 (59.4)	1	1	
≥ 10	11 (23.4)	36 (76.6)	2.10*	0.65	0.25–1.70
Marital status					
Married	35 (35.0)	65 (65.0)	1	1	
Other	4 (25.0)	12 (75.0)	1.62	1.59	0.39–6.45
Family history (within 3 rd -cousin-removed)					
No	26 (35.1)	48 (64.9)	1	1	
Yes	13 (31.0)	29 (69.0)	1.21	0.67	0.27–1.68
Duration of gout (yr)					
≤ 3	15 (36.6)	26 (63.4)	1	1	
> 3	24 (32.0)	51 (68.0)	1.23	0.45	0.17–1.23
Drug					
Acute gout attack	17 (36.2)	30 (63.8)	1	1	
Long term medication	22 (31.9)	47 (68.1)	1.21	0.77	0.31–1.94
Hypertension					
No	18 (29.5)	43 (70.5)	1	1	
Yes	21 (38.2)	34 (61.8)	1.48	1.35	0.54–3.37
Renal disease					
No	31 (32.0)	66 (68.0)	1	1	
Yes	8 (42.1)	11 (57.9)	1.55	1.73	0.54–5.49
Heart disease					
No	32 (32.0)	68 (68.0)	1	1	
Yes	7 (47.7)	9 (56.3)	1.65	2.12	0.54–8.35
Diabetics					
No	34 (32.7)	70 (67.3)	1	1	
Yes	5 (41.7)	7 (58.3)	1.47	0.65	0.15–2.86

* $p < 0.05$, ** $p < 0.01$. "Improvement" means that there were no acute gout attacks after the pre-test.

diseases, coronary diseases, and diabetes). The results indicated that there was a 5.1-fold improvement in the intervention group. Only half of the control subjects showed any improvement compared with 83% of subjects in the intervention group. Participants with a senior high school education or above showed an improvement 2.1 times that of subjects with a lower level of education, but after adjusting for other factors, this was not significant (Table 4).

Frequency of gout occurrence (number of episodes) in the intervention group was 5.90 times per year compared with 7.08 times per year in the control group before intervention, but this was not statistically significant (Table 5). The

number of patients who experienced at least one episode of gout within six months after treatment was significantly lower in the intervention group (17% of subjects) compared with the control group (50%).

DISCUSSION

Our findings showed that there were significantly more male patients than female patients using block sampling in hospital, irrespective of grouping, a finding consistent with previous studies [14-16]. It is well known that serum uric acid concentration differs between genders and according to age. The highest uric acid concentrations are found in men in their

Table 5. Comparison of reoccurrence of gout before and after intervention in intervention and control groups

Items	Intervention group (N = 58)	Control group (N = 58)	<i>p</i>
Pre-intervention (episodes/year)	5.9 ± 6.3 [†]	7.1 ± 5.6	0.284*
Post-intervention (incidence/within six month)			<0.001**
Yes	10 (17.2)	29 (50.0)	
No	48 (82.8)	29 (50.0)	

p* value was obtained by Student's *t* test to compare the indicator between the two groups, *p* value was obtained by chi-square test. [†]Mean ± SD.

early 20s, while uric acid levels peak in women after menopause. Moreover, sex hormones, obesity, economic status and career success are all related to high levels of uric acid in serum. This explains the gender difference observed in this survey.

Over a third of patients in the intervention group and 41% in the control group had family members closer than 3rd-cousin-removed who also had gout. These data were higher than the 25% reported by Yuan which indicated that there is a strong genetic predisposition to gout in Taiwan [12]. Furthermore, 45% and 50% of gouty patients surveyed in the intervention group and the control group, respectively, also experienced hypertension which was similar to the findings by Chou [17]. Diabetes was diagnosed in 5% of patients in the intervention group and 16% of patients in the control group, respectively, a much higher incidence rate than the 0.1% to 9% reported by other researchers. Numerous studies have found an association between gout and coronary diseases [14,18,19]. Our results support this finding with 12% of the intervention group and 16% of the control group patients reporting coronary diseases. Previous studies have also reported a correlation between renal disease and gout [20-22]. Our data showed that 16% of patients in the intervention group and 17% of patients in the control group had renal disorders.

There were no significant differences between the two groups in consumption of alcohol, tea, coffee, water, and the amount of exercise prior to intervention. However, following educational intervention, the intervention group showed significant differences in the reduction of alcohol and the increase in water consumption. This is consistent with Yamanaka's [23] proposal

that limiting beer consumption reduces the occurrence rate of gout. Alcohol not only blocks uric acid excretion but also increases its production and so it is recommended that patients with gout reduce their consumption of alcohol [3]. Bynum [5] recommended that gouty patients increase their daily water consumption to improve their symptoms. Chen reported that moderate tea and coffee consumption increases water intake, which expedites the excretion of uric acid, and thereby helps to improve gouty symptoms. The frequency of exercise in both groups remained unchanged [3]. Chen indicated that periodic aerobic exercise, such as walking or bicycling enhances the excretion of uric acid. Most patients in this survey reported that they did some form of light exercise (non-strenuous or less than one hour per day). The authors recommend that gouty patients increase the intensity and frequency of exercise. In terms of dietary habits, no significant differences were observed between the intervention group and the control group in the initial survey. The intervention group showed improvement in all areas of personal habits, except exercise, while the control group only showed improvement in consumption of alcohol. The initial survey of uric acid concentration and dietary habits showed no significant differences between the intervention group and the control group. In the post-intervention survey, however, significant differences were observed between the two groups, with the intervention group showing improvement in uric acid concentration and dietary behavior. The control group showed slight improvement in diet in the post-intervention survey, but uric acid concentrations did not improve.

The frequency of acute gout attack in the

intervention group was five times lower than in the control group, after adjusting for the other factors. Our findings demonstrate that the intervention program was effective in reducing the severity of acute gout attacks. The incidence of acute gout in the initial survey was 5.9 and 7.1 episodes per year, in the intervention and control groups, respectively, which was not statistically significant. After intervention, only 10 patients (17%) in the intervention group experienced gout within six months, compared with 29 patients (50%) in the control group, which was statistically significant ($p < 0.01$). This finding indicates that intervention improved patients' gouty symptoms, decreased uric acid levels and contributed to a 3-fold decrease in acute gout episodes in the intervention group.

In summary, there was more improvement in gouty symptoms in the intervention group compared with the control group, which may have been due to the changes in dietary behavior and lifestyle habits of gouty patients. This intervention program should be used by medical professionals to help reduce the severity and number of episodes of gouty symptoms.

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痛風病患經衛生教育介入之成效

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目的 經提供痛風病患介入衛生教育之計畫後，評值此介入計畫之成效。

方法 本研究以中部某醫學中心之內科門診痛風病患總共116人做為研究對象(其中介入組及對照組各58人)，以結構式問卷收集研究對象前測之資料，在執行三個月衛生教育介入計畫後，再電話追蹤和門診提供諮詢六個月，於病患最後回院複診時收集後測資料，以評值痛風病患介入計畫後症狀改善之成效。

結果 衛生教育介入計畫對介入組個人嗜好包括喝酒、喝水及飲食行為之食用豆類、動物內臟及海鮮類食物均有顯著改善($p < 0.05$)，且各細項中除活動量外，介入組均比對照組有改善現象($p < 0.05$)。而痛風病患之尿酸值及飲食行為，經飲食衛生教育介入計畫後，介入組均顯著性比對照組有改善($p < 0.01$)。經多變項邏輯氏迴歸分析得知控制其他變項後，介入組病患較對照組在介入計畫前後尿酸值下降者有5.1倍改善之效果，且介入組之痛風病患在半年內急性發作頻率(17%)較對照組(50%)約減少3倍($p < 0.01$)。

結論 經由完善設計之飲食衛生教育內容，與適切之輔助教材及諮詢人員的指導與追蹤，痛風病患之症狀可獲得顯著性的改善，可作為未來醫護人員臨床控制之參考。(中台灣醫誌 2003;8:148-56)

關鍵詞

飲食行為，痛風，改善計畫

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