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Research Article

Cross-Sectional Study of Factors Associated With Self-Efficacy for Nutritional Planning by Family Caregivers of Patients With Gastrointestinal Cancer

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Objective: To examine factors associated with the self-efficacy for nutritional planning by family caregivers of patients with gastrointestinal (GI) cancer, with a focus on caregiver burden and decision-making related to the consumption of fruits and vegetables (F&V).
Methods: This cross-sectional study examined 378 family caregivers of patients who had GI cancers, mostly in the stomach, colorectum, or liver. Self-efficacy for nutrition planning, caregiver burden, and decision-making regarding the consumption of F&V were measured using the Nutrition Self-Efficacy Scale, the Brief Assessment Scale for Caregivers, and Henry's Decisional Balance Scale for F&V consumption, respectively.
Results: Family caregivers who had greater nutritional self-efficacy had higher perceived "pros" regarding the health benefits of F&V, were married, had higher comorbidity scores, and had longer durations of caregiving. Family caregivers who had decreased nutritional self-efficacy had higher perceived "cons" to consuming F&V and increased perceived burden on other family members.
Conclusion: Our results suggest that increased awareness of the benefits and challenges of consuming F&V, along with strong support systems for family caregivers, can improve the diets of patients with GI cancer.

Keywords: burden; diet; digestive system; family characteristics; health behavior; neoplasm

1. Introduction

Patients with gastrointestinal (GI) cancer who consume nutritious diets have better health outcomes, including decreased functional decline and physical impairment and enhanced quality of life [1]. However, cancer patients often have symptoms that adversely affect their diets, including poor appetite, nausea, vomiting, diarrhea, chewing or swallowing difficulties, and altered sense of taste and smell [2]. Severe malnutrition accounts for approximately 30%–50% of all deaths in patients with GI cancer [3], and nutritional planning is therefore crucial for these patients. However, because it is difficult for these patients to manage their own diets, it is necessary to develop interventions that help them adopt more nutritional diets.

Family members often function as caregivers when a relative has cancer, and they often provide crucial support during the periods of diagnosis, treatment, and follow-up [4]. Caregiving by a family member can significantly influence the health-related behaviors of cancer patients. Family caregivers can help by scheduling medical visits, arranging accommodations, monitoring adherence to treatment, managing symptoms, offering emotional support, preparing meals, performing household tasks, and providing financial assistance [5]. However, family members often have inadequate preparation and training in these areas. Additionally, a family caregiver may lack confidence in the ability to manage the diet of a patient with GI cancer [6, 7].

The participation of family members is crucial for improving the diets of patients with cancer, and family

members often help with nutritional planning because patients depend on them for this task and because families want to actively participate in care [8, 9]. However, family caregivers who face the burden of caring for a sick relative often lack the confidence and experience needed for this task and often face uncertainties when trying to provide a balanced diet. Caregiving may also cause them to neglect their own needs and abandon their usual daily activities [10]. Active involvement of cancer patients and their families in nutritional care is an effective strategy that can improve the diets of high-risk patients.

The active participation of family members in developing diets for cancer patients requires identifying and addressing dietary issues through patient-family interactions. This collaborative approach supports the establishment and maintenance of a balanced diet [11]. Families caring for patients with cancer often lack information and have many uncertainties regarding the management of life-threatening illnesses. Additionally, there are benefits and drawbacks of patients with GI cancer regarding the consumption of fruits and vegetables (F&V), and these can affect the caregiver's self-efficacy and the patient's adherence to a planned diet. Nevertheless, adequate consumption of F&V remains a significant nutritional goal that can help prevent cancer recurrence [12].

To change dietary behavior, a cancer patient needs motivation and must translate this motivation into action [13]. Engaging in nutritional planning can promote behavioral changes that increase the consumption of F&V [14], and the self-efficacy of family caregivers can improve a patient's participation in diet planning. Making plans to consume more F&V and the self-efficacy of nutritional planning by family caregivers can increase the consumption of F&V by patients [13]. Previous studies have identified the self-efficacy and planning of caregivers as key factors that influence the relationship between the intentions and behaviors of patients [15, 16]. However, there is little known about the relationships of the self-efficacy of family caregivers in nutritional planning, caregiver burden, and balancing decision-making regarding the consumption of F&V by patients with GI cancer.

This study investigated the association of different factors with the self-efficacy for nutritional planning by family caregivers of patients with GI cancer, with a specific focus on caregiver burden and decision-making regarding the consumption of F&V.

2. Methods

2.1. Design. This cross-sectional study examined family caregivers of patients with GI cancer and was designed to guide the future development of family-associated dietary programs for the caregivers of these patients.

2.2. Setting and Sample. Study participants were primary family caregivers aged 19 years or more who cared for adult patients with GI cancer. All family caregivers accompanied consecutive patients who received anticancer therapy (surgery, radiotherapy, or chemotherapy) or regular follow-ups from March to June 2022 at two university hospitals in South Korea. The family caregivers were invited to participate in the study, and those who consented were asked to complete written questionnaires. This study exclusively examined family members and did not include friends of the family or the patient. Family caregivers were excluded if they could not complete the questionnaires, communicate with an interviewer, or understand the purpose of the study well enough to provide informed consent.

2.3. Data Collection and Procedures. After obtaining written consent, the self-reported questionnaires were administered in outpatient waiting rooms. Patients usually waited 20–30 min for consultation with a physician. During this time, family caregivers were asked for consent to participate in the study. The questionnaires took approximately 15 min to complete. Participants received digital gift cards as a token of appreciation after completing the survey.

The sample size was calculated using G∗power Version 3.1.9.4 based on the following analytical parameters: significance level, alpha = 0.05; effect size = 0.05; power = 80%; predictors = 15. This indicated the necessary sample size was 436.

Overall, 436 caregivers were contacted, and 430 were primary family caregivers. Among them, 409 consented to participate and completed the questionnaire (response rate: 93.8%). Complete case analysis and listwise deletion were performed under the assumption that missing values occurred at random. Questionnaire data from the 378 family caregivers were included in the final statistical analyses. The high rate of participation could be because data collection was performed following face-to-face interactions while caregivers were in the waiting room (strategies that made participation more convenient), gifts were provided to participants, and the researchers used a friendly approach. The most common reason for nonparticipation was time constraints.

The research staff explained the nature of the study, including the purpose, rights and responsibilities of participants, the risks and benefits of participation, and the voluntary nature of participation. All participants provided written informed consent. The study was conducted with adherence to the guidelines of the Declaration of Helsinki and was approved by the institutional review board (Approval no. 2021-0168).

2.4. Measurements. The data consisted of a caregiver's general characteristics, burdens, decisional balance regarding the consumption of F&V, and self-efficacy for nutritional planning. The general characteristics included age, marital status, religious affiliation, monthly household income, type of national health insurance, duration of caregiving, weekly hours of caregiving, health issues resulting from caregiving, relationship with the patient, comorbidity index, and history of cancer. The family caregiver was also asked about the patient's characteristics, including age, marital status, site of the GI cancer, religious practices, current job, and monthly household income.

2.4.1. Burden of Family Caregiver. The burden of caregiving was assessed using the Brief Assessment Scale for Caregivers (BASC) [17]. This comprehensive tool considers the negative and positive aspects of caregiving and has 14 items in five subscales: five items assess negative personal influence, three items assess positive personal influence, two items address concerns about other family members, two items focus on medical issues, and two items address concerns about the well-being of a loved one. A higher score on each subscale indicates a greater burden.

The original version of the BASC had strong internal consistency, with Cronbach's alpha ranging from 0.71 to 0.88 for each subscale [17]. The version used here was translated into the Korean language and had a Cronbach's alpha of 0.85 for the study data.

2.4.2. Decisional Balance for Consumption of F&V. The decisional balance regarding the consumption of F&V was measured using a scale developed by Henry et al. [18] that considered the perceived "pros" and "cons" associated with the consumption of F&V. The "pros" included perceptions of health benefits (six items), planning (four items), and preparation issues (four items); the "cons" included general barriers (five items) and convenience issues (four items). Based on a content validity test conducted by five experts, which yielded a content validity index below 0.8, and on cultural aspects related to Korean dining and food consumption, the subscales of planning and preparation issues were excluded. Thus, the total decisional balance scale had 15 items, each rated from 1 (*not at all important*) to 5 (*extremely important*) for consumption of F&V. A higher score on the "pros" indicated a stronger perception of advantages, and higher scores on the "cons" indicated a stronger perception of disadvantages. In the original study, Cronbach's alpha ranged from 0.61 to 0.81 for each scale [18]. In the present study, Cronbach's alpha was 0.87 for the pro scale and 0.76 for the con scale.

2.4.3. Self-Efficacy for Nutrition Planning. The self-efficacy for nutrition planning was assessed using the Nutrition Self-Efficacy Scale developed by Schwarzer and Renner [19]. This scale assesses the confidence of a caregiver in being able to overcome different barriers related to maintaining a healthy diet. This scale has five items that measure the certainty of a caregiver to manage different challenges: establishing routines over time, repeated attempts for success, reevaluating dietary approaches, limited initial external support, and the need for detailed planning. Each response was rated on a scale from 1 (*very uncertain*) to 4 (*very certain*), and a higher score indicated greater confidence in nutrition planning. In the original study, Cronbach's alpha was 0.87 [19]; in the present study, Cronbach's alpha was 0.93.

None of these three scales were independently validated for the Korean population. Thus, each scale was translated into the Korean language using a standardized forward–backward translation process by bilingual experts. Discrepancies were resolved using panel discussions to ensure semantic validity. Psychometric experts also reviewed the translated versions for content validity. Although full psychometric validation was not performed, these procedures enhanced the applicability of these tools for Korean caregivers.

2.5. Statistical Analyses. Descriptive statistics were employed to calculate the mean and standard deviation of each subscale of caregiver burden, the "pros" and "cons" related to consumption of F&V, and self-efficacy for nutrition planning. An independent t-test was used to assess the significance of the relationships of caregiver burden, decisional balance regarding F&V consumption, and self-efficacy for nutrition planning with different characteristics of caregivers. Multiple regression analysis with stepwise selection was then conducted to identify factors that were significantly and independently associated with self-efficacy for nutrition planning, and the results were presented as beta coefficients and standard errors. A p value below 0.05 was considered significant. Statistical analysis was performed using SAS Version 9.4 (SAS Institute, Cary, NC, USA).

3. Results

3.1. Characteristics of Participants. We analyzed the characteristics of 378 study participants who worked as caregivers for a family member who had GI cancer (Table 1, top). The average age was 54 years (range: 20–86), 89.7% were female, 82.3% were married, and 51.6% were employed. A total of 69.3% provided care for more than 1 year, and 74.6% spent less than 9 h per week on caregiving. Stress was the most frequently reported health problem (38.6%). Most caregivers were spouses (69.8%), and 91.8% had no personal history of cancer.

The average age of the GI cancer patients was 61 years (range: 20–86), 61.2% of them were younger than 65 years, and 77.8% were married (Table 1, bottom). The most frequent sites of cancer were the colorectum (59.5%), stomach (26.5%), and liver (14.0%). On average, the caregiver interview was administered 10.2 months (range: 0.6–20.8) after the diagnosis of GI cancer in the patient.

3.2. Main Study Variables. We then assessed the main study variables in the study population (Table 2). The overall score for the BASC had a mean of 29.3 and a median of 29.0 (range: 14–56). Analysis of the decisional balance regarding the consumption of F&V had a mean of 24.7 and a median of 25.0 (range: 12–30) for benefits; a mean of 13.7 and a median of 15.0 (range: 5–25) for general barriers; and a mean of 10.5 and a median of 11.0 (range: 4–20) for inconvenience. The score for self-efficacy in nutritional planning had a mean of 14.4 and a median of 15.0 (range: 5–20).

3.3. Univariate Analyses

3.3.1. Effect of the Characteristics of Family Caregivers. We performed a univariate analysis to determine the association of the different characteristics of caregivers with the BASC score, decisional balance regarding the

Table 1: Association of the characteristics of family caregivers (top) and patients (bottom) with caregiver scores on the BASC, decisional balance regarding the consumption of F&V, and self-efficacy for nutrition planning.

Characteristic	$N = 378$ n (%)	Burden of family caregiver (BASC)[a]				Decisional balance on consumption of F&V[b]				
		Negative personal influence	Positive personal influence	Concern about other family members	Medical issues	Concern about loved one	Pro: Health benefit	Con: General barriers	Con: Inconvenience	Self-efficacy for nutrition planning[c]
		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	
Family caregivers										
Age, years, mean (SE)	54.2 (0.67)									
< 65	298 (78.8)	8.8 (3.1)	8.3 (1.8)	4.3 (0.9)	5.1 (2.0)	4.4 (1.5)	24.9 (4.2)	13.5 (3.7)	10.4 (3.6)	14.4 (3.1)
65–86	80 (21.2)	9.2 (3.7)	8.6 (2.0)	4.5 (1.1)	5.6 (2.4)	4.5 (1.8)	24.3 (4.4)	14.5 (3.9)	10.9 (3.8)	14.4 (2.9)
p value		0.315	0.243	**0.034**	**0.046**	0.340	0.291	0.052	0.244	0.860
Sex										
Male	39 (10.3)	8.5 (3.3)	8.7 (2.1)	4.3 (1.0)	4.8 (2.0)	4.8 (1.7)	24.2 (3.9)	14.1 (3.6)	10.7 (3.7)	12.8 (4.3)
Female	339 (89.7)	8.9 (3.2)	8.3 (1.8)	4.3 (1.0)	5.3 (2.1)	4.3 (1.5)	24.8 (4.3)	13.7 (3.8)	10.5 (3.7)	14.5 (2.9)
p value		0.490	0.259	0.929	0.224	0.084	0.380	0.566	0.713	**0.001**
Marital status										
No spouse	67 (17.7)	8.8 (3.4)	8.3 (2.1)	4.1 (1.1)	5.1 (2.3)	4.7 (1.7)	25.1 (3.6)	14.6 (3.7)	11.3 (3.8)	13.4 (3.9)
With spouse	311 (82.3)	8.9 (3.2)	8.4 (1.8)	4.4 (0.9)	5.2 (2.1)	4.3 (1.5)	24.7 (4.3)	13.5 (3.8)	10.4 (3.6)	14.6 (2.9)
p value		0.964	0.884	0.062	0.736	0.069	0.480	**0.028**	0.063	**0.005**
Practice a religion										
No	153 (40.5)	8.5 (3.3)	8.4 (2.0)	4.3 (0.9)	5.1 (2.1)	4.3 (1.5)	24.4 (4.2)	14.0 (3.5)	10.8 (3.7)	14.0 (3.1)
Yes	225 (59.5)	9.1 (3.2)	8.3 (1.8)	4.4 (1.0)	5.3 (2.1)	4.4 (1.6)	25.0 (4.2)	13.5 (3.9)	10.3 (3.6)	14.6 (3.1)
p value		0.078	0.602	0.283	0.224	0.591	0.160	0.249	0.204	**0.046**
Current job										
No	183 (48.4)	9.1 (3.3)	8.3 (1.8)	4.3 (1.0)	5.3 (2.2)	4.5 (1.5)	24.7 (4.3)	13.7 (3.8)	10.2 (3.7)	14.4 (3.1)
Yes	195 (51.6)	8.7 (3.2)	8.4 (2.0)	4.3 (0.9)	5.1 (2.1)	4.3 (1.5)	24.8 (4.2)	13.8 (3.7)	10.8 (3.6)	14.3 (3.1)
p value		0.238	0.588	0.798	0.294	0.247	0.733	0.740	0.110	0.744
Monthly household income (U.S.$)										
< 2000	183 (48.4)	9.2 (3.3)	8.3 (1.9)	4.4 (1.0)	5.5 (2.1)	4.6 (1.5)	24.9 (4.4)	14.0 (4.0)	10.7 (3.9)	14.3 (3.0)
≥ 2000	195 (51.6)	8.5 (3.1)	8.4 (1.9)	4.3 (0.9)	5.0 (2.1)	4.2 (1.5)	24.6 (4.1)	13.4 (3.5)	10.4 (3.4)	14.5 (3.2)
p value		**0.044**	0.788	0.189	**0.016**	**0.042**	0.512	0.103	0.415	0.589
Residence										

Table 1: Continued.

Characteristic	$N = 378$ n (%)	Burden of family caregiver (BASC)[a]				Decisional balance on consumption of F&V[b]				Self-efficacy for nutrition planning[c]
		Negative personal influence	Positive personal influence	Concern about other family members	Medical issues	Concern about loved one	Pro: Health benefit	Con: General barriers	Con: Inconvenience	
		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	
Metropolitan	128 (33.9)	9.0 (3.6)	8.4 (1.9)	4.4 (1.0)	5.4 (2.3)	4.3 (1.6)	24.7 (4.1)	14.1 (4.2)	10.7 (3.7)	14.3 (3.0)
Small city, country	250 (66.1)	8.8 (3.1)	8.3 (1.9)	4.3 (1.0)	5.1 (2.0)	4.4 (1.5)	24.8 (4.3)	13.5 (3.6)	10.4 (3.7)	14.4 (3.1)
p value		0.639	0.454	0.093	0.161	0.355	0.875	0.138	0.509	0.749
National health insurance										
Health insurance	334 (88.4)	8.7 (3.1)	8.4 (1.9)	4.3 (0.9)	5.1 (2.0)	4.3 (1.5)	24.8 (4.2)	13.5 (3.6)	10.3 (3.5)	14.4 (3.1)
Medical aid	44 (11.6)	10.1 (4.0)	8.2 (1.7)	4.4 (1.2)	5.8 (2.7)	4.7 (1.6)	24.5 (4.4)	15.4 (4.6)	11.9 (4.4)	14.1 (3.0)
p value		**0.006**	0.489	0.418	0.055	0.124	0.657	**0.002**	**0.006**	0.503
Caregiving duration										
< 1 year	116 (30.7)	8.8 (3.1)	8.5 (1.9)	4.3 (0.9)	5.0 (2.0)	4.3 (1.6)	25.0 (4.1)	14.3 (3.9)	10.5 (3.7)	14.7 (2.9)
≥ 1 year	262 (69.3)	8.9 (3.3)	8.3 (1.9)	4.3 (1.0)	5.3 (2.2)	4.4 (1.5)	24.6 (4.3)	13.5 (3.7)	10.5 (3.6)	14.3 (3.1)
p value		0.814	0.404	0.483	0.161	0.695	0.360	0.070	0.916	0.226
Caregiving time per week										
≥ 2, < 9 h	282 (74.6)	8.3 (3.2)	8.3 (1.9)	4.2 (1.0)	5.1 (2.2)	4.2 (1.5)	24.6 (4.2)	13.7 (3.8)	10.5 (3.7)	14.2 (3.1)
≥ 9 h	96 (25.4)	10.4 (2.9)	8.6 (1.9)	4.6 (0.9)	5.6 (1.9)	5.0 (1.4)	25.0 (4.3)	13.8 (3.8)	10.4 (3.6)	15.0 (2.8)
p value		**< 0.0001**	0.117	**0.007**	**0.022**	**< 0.0001**	0.440	0.934	0.766	**0.034**
Number of health problems from caregiving										
0–1	272 (72.0)	8.2 (3.0)	8.4 (1.9)	4.2 (1.0)	4.9 (2.0)	4.2 (1.5)	24.7 (4.3)	13.6 (3.8)	10.4 (3.8)	14.3 (3.3)
2–7	106 (28.0)	10.4 (3.2)	8.1 (1.7)	4.5 (0.9)	6.1 (2.3)	4.8 (1.5)	24.8 (3.9)	14.0 (3.7)	10.8 (3.4)	14.6 (2.5)
p value		**< 0.0001**	0.083	**0.018**	**< 0.0001**	**0.001**	0.974	0.310	0.356	0.310
Health problems from caregiving										
Lack of energy										
No	293 (77.5)	8.7 (3.1)	8.3 (1.8)	4.3 (0.9)	5.2 (2.1)	4.4 (1.5)	24.8 (4.2)	13.7 (3.8)	10.4 (3.6)	14.3 (3.2)
Yes	85 (22.5)	9.4 (3.7)	8.4 (2.1)	4.4 (1.1)	5.4 (2.3)	4.4 (1.7)	24.6 (4.3)	14.0 (3.8)	10.9 (3.7)	14.7 (2.7)
p value		0.076	0.612	0.390	0.427	0.706	0.638	0.522	0.222	0.225
Sleep problem										

Table 1: Continued.

Characteristic	$N = 378$ n (%)	Burden of family caregiver (BASC)[a]				Decisional balance on consumption of F&V[b]				Self-efficacy for nutrition planning[c]
		Negative personal influence	Positive personal influence	Concern about other family members	Medical issues	Concern about loved one	Pro: Health benefit	Con: General barriers	Con: Inconvenience	
		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	
No	290 (76.7)	8.6 (3.2)	8.4 (1.9)	4.3 (1.0)	5.1 (2.1)	4.3 (1.6)	24.7 (4.2)	13.6 (3.9)	10.4 (3.8)	14.4 (3.2)
Yes	88 (23.3)	9.6 (3.2)	8.3 (1.9)	4.4 (0.9)	5.6 (2.2)	4.6 (1.5)	24.7 (4.4)	14.1 (3.5)	10.8 (3.4)	14.2 (2.8)
p value		**0.008**	0.734	0.270	**0.034**	0.220	0.968	0.343	0.374	0.615
Stress										
No	232 (61.4)	8.0 (3.0)	8.5 (2.0)	4.3 (1.0)	4.8 (2.0)	4.2 (1.5)	24.8 (4.3)	13.7 (3.8)	10.3 (3.8)	14.3 (3.2)
Yes	146 (38.6)	10.2 (3.2)	8.1 (1.7)	4.3 (1.0)	5.8 (2.2)	4.8 (1.5)	24.6 (4.1)	13.7 (3.8)	10.8 (3.5)	14.5 (2.8)
p value		< **0.0001**	**0.024**	0.644	< **0.0001**	**0.0002**	0.574	0.879	0.194	0.656
Pain										
No	348 (92.1)	8.6 (3.2)	8.4 (1.9)	4.3 (1.0)	5.1 (2.1)	4.3 (1.5)	24.7 (4.2)	13.6 (3.8)	10.5 (3.7)	14.4 (3.1)
Yes	30 (7.9)	11.3 (2.9)	8.1 (1.8)	4.6 (0.9)	6.8 (2.0)	5.1 (1.3)	25.1 (4.8)	14.9 (3.9)	10.9 (3.5)	14.0 (2.3)
p value		< **0.0001**	0.401	**0.045**	< **0.0001**	**0.009**	0.631	0.083	0.514	0.440
Depressive mood										
No	310 (82.0)	8.4 (3.1)	8.4 (1.9)	4.3 (1.0)	5.0 (2.1)	4.3 (1.6)	24.7 (4.3)	13.6 (3.8)	10.5 (3.7)	14.3 (3.2)
Yes	68 (18.0)	10.6 (3.1)	8.0 (1.6)	4.5 (0.8)	6.3 (2.2)	4.9 (1.3)	24.9 (4.0)	14.1 (3.5)	10.5 (3.3)	14.6 (2.6)
p value		< **0.0001**	0.096	0.159	< **0.0001**	**0.004**	0.671	0.417	0.916	0.517
Headache										
No	350 (92.6)	8.8 (3.2)	8.4 (1.9)	4.3 (1.0)	5.2 (2.1)	4.4 (1.5)	24.7 (4.3)	13.6 (3.8)	10.5 (3.7)	14.4 (3.1)
Yes	28 (7.4)	9.6 (3.7)	8.0 (1.9)	4.4 (1.0)	5.6 (2.3)	4.8 (1.6)	24.7 (3.5)	15.0 (3.5)	11.3 (2.6)	14.4 (2.6)
p value		0.179	0.369	0.540	0.270	0.160	0.970	0.062	0.270	0.936
Weight change										
No change	341 (90.2)	8.7 (3.2)	8.4 (1.9)	4.3 (1.0)	5.1 (2.1)	4.3 (1.5)	24.7 (4.2)	13.9 (3.8)	10.5 (3.7)	14.4 (3.1)
Decrease	16 (4.2)	10.0 (2.1)	7.5 (1.5)	4.5 (0.9)	6.2 (2.1)	4.8 (1.0)	23.5 (4.4)	12.6 (4.2)	10.3 (3.3)	13.9 (3.2)
Increase	21 (5.6)	9.9 (3.7)	8.6 (2.1)	4.6 (1.0)	6.3 (2.3)	4.9 (1.7)	26.1 (4.3)	12.1 (2.5)	10.6 (3.5)	15.2 (2.7)
p value		0.095	0.156	0.341	**0.006**	0.142	0.170	0.061	0.968	0.371
Relationship with patient										
Spouse										

Table 1: Continued.

Characteristic	$N = 378$ n (%)	Burden of family caregiver (BASC)[a]				Decisional balance on consumption of F&V[b]				
		Negative personal influence	Positive personal influence	Concern about other family members	Medical issues	Concern about loved one	Pro: Health benefit	Con: General barriers	Con: Inconvenience	Self-efficacy for nutrition planning[c]
		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	
No	114 (30.2)	8.9 (3.0)	8.3 (1.8)	4.2 (1.0)	5.3 (2.1)	4.6 (1.5)	25.3 (3.6)	14.2 (3.9)	10.9 (3.6)	13.8 (3.5)
Yes	264 (69.8)	8.8 (3.3)	8.4 (1.9)	4.4 (1.0)	5.2 (2.2)	4.3 (1.6)	24.5 (4.5)	13.5 (3.7)	10.3 (3.7)	14.6 (2.9)
p value		0.732	0.668	0.186	0.811	0.120	**0.048**	0.118	0.156	**0.015**
Son										
No	340 (90.0)	8.8 (3.2)	8.3 (1.9)	4.3 (1.0)	5.2 (2.1)	4.3 (1.5)	24.7 (4.3)	13.6 (3.8)	10.3 (3.7)	14.5 (3.0)
Yes	38 (10.0)	8.9 (3.3)	8.9 (1.6)	4.5 (1.1)	5.7 (2.3)	4.9 (1.5)	24.9 (3.6)	15.0 (3.7)	12.0 (2.5)	13.2 (3.7)
p value		0.890	**0.035**	0.305	0.177	**0.034**	0.816	**0.031**	**0.007**	**0.013**
Daughter										
No	347 (91.8)	8.8 (3.3)	8.4 (1.9)	4.3 (1.0)	5.2 (2.2)	4.4 (1.5)	24.7 (4.3)	13.7 (3.8)	10.5 (3.7)	14.5 (3.0)
Yes	31 (8.2)	8.7 (2.8)	8.2 (1.9)	4.0 (0.9)	5.0 (1.9)	4.6 (1.7)	25.6 (3.1)	14.0 (3.5)	10.8 (3.7)	13.5 (3.4)
p value		0.844	0.716	0.085	0.560	0.339	0.215	0.633	0.643	0.090
Daughter- or son-in law										
No	370 (97.9)	8.8 (3.2)	8.4 (1.9)	4.3 (1.0)	5.2 (2.1)	4.4 (1.5)	24.7 (4.2)	13.8 (3.8)	10.6 (3.7)	14.4 (3.1)
Yes	8 (2.1)	9.8 (3.5)	7.4 (1.6)	4.0 (0.5)	5.3 (2.0)	4.0 (1.4)	25.0 (4.7)	11.9 (3.1)	8.6 (2.9)	13.6 (3.0)
p value		0.428	0.141	0.347	0.962	0.468	0.862	0.162	0.141	0.482
Father or mother										
No	363 (96.0)	8.9 (3.3)	8.3 (1.9)	4.3 (1.0)	5.2 (2.2)	4.4 (1.6)	24.8 (4.2)	13.7 (3.8)	10.5 (3.6)	14.4 (3.1)
Yes	15 (4.0)	8.3 (2.5)	8.5 (2.1)	4.1 (0.8)	4.5 (1.4)	4.0 (1.1)	24.1 (4.4)	14.1 (4.1)	10.4 (4.3)	14.7 (3.2)
p value		0.527	0.797	0.448	0.167	0.316	0.528	0.667	0.903	0.654
Other (sister, brother, cousin)										
No	356 (94.2)	8.8 (3.3)	8.4 (1.9)	4.3 (1.0)	5.2 (2.1)	4.4 (1.5)	24.6 (4.3)	13.7 (3.7)	10.5 (3.6)	14.4 (3.1)
Yes	22 (5.8)	9.4 (2.9)	7.5 (1.8)	4.2 (1.1)	5.5 (2.3)	4.5 (1.5)	26.7 (2.7)	13.9 (4.9)	10.4 (4.2)	14.7 (3.6)
p value		0.445	0.030	0.493	0.587	0.630	**0.003**	0.811	0.844	0.640
Comorbidity index										

Table 1: Continued.

Characteristic	$N = 378$ n (%)	Burden of family caregiver (BASC)[a]				Decisional balance on consumption of F&V[b]				
		Negative personal influence	Positive personal influence	Concern about other family members	Medical issues	Concern about loved one	Pro: Health benefit	Con: General barriers	Con: Inconvenience	Self-efficacy for nutrition planning[c]
		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	
0	242 (64.0)	8.7 (3.1)	8.3 (1.9)	4.3 (0.9)	5.2 (2.0)	4.3 (1.5)	24.7 (4.2)	13.7 (3.7)	10.4 (3.6)	14.1 (3.1)
≥ 1	136 (36.0)	9.1 (3.5)	8.3 (1.9)	4.3 (1.0)	5.3 (2.3)	4.5 (1.6)	24.9 (4.4)	13.8 (3.9)	10.7 (3.8)	14.9 (3.0)
p value		0.231	0.990	0.786	0.694	0.339	0.687	0.803	0.444	**0.015**
Cancer history										
No	347 (91.8)	8.8 (3.3)	8.3 (1.9)	4.3 (1.0)	5.2 (2.1)	4.4 (1.5)	24.9 (4.2)	13.7 (3.8)	10.5 (3.7)	14.4 (3.0)
Yes	31 (8.2)	9.2 (3.0)	8.7 (1.8)	4.7 (0.9)	5.5 (2.2)	4.4 (1.5)	23.5 (3.9)	13.8 (3.7)	10.2 (3.4)	13.8 (3.5)
p value		0.502	0.259	**0.020**	0.364	0.917	0.092	0.897	0.649	0.277
Patients										
Age, years, mean (SE)	61.2 (0.55)									
< 65	236 (62.4)	8.7 (3.1)	8.2 (1.9)	4.3 (1.0)	5.1 (2.0)	4.3 (1.5)	24.5 (4.4)	13.5 (3.6)	10.3 (3.6)	14.4 (3.1)
65–86	142 (37.6)	9.1 (3.5)	8.5 (1.8)	4.4 (1.0)	5.5 (2.3)	4.5 (1.6)	25.1 (3.9)	14.1 (4.0)	10.9 (3.8)	14.3 (3.1)
p value		0.278	0.156	0.139	**0.049**	0.205	0.188	0.173	0.110	0.668
Marital status										
No spouse	84 (22.2)	8.6 (3.1)	8.3 (1.8)	4.2 (0.9)	5.1 (2.2)	4.2 (1.5)	24.7 (4.2)	13.5 (3.6)	10.4 (3.5)	14.5 (2.7)
With spouse	294 (77.8)	8.9 (3.3)	8.4 (1.9)	4.3 (1.0)	5.2 (2.1)	4.5 (1.5)	24.7 (4.2)	13.8 (3.8)	10.5 (3.7)	14.3 (3.2)
p value		0.502	0.850	0.316	0.644	0.151	0.990	0.520	0.837	0.608
Cancer site										
Colorectum	225 (59.5)	8.7 (3.1)	8.4 (1.9)	4.3 (0.9)	5.2 (2.0)	4.3 (1.6)	24.7 (4.2)	13.2 (3.7)	10.3 (3.6)	14.4 (3.1)
Stomach	100 (26.5)	8.9 (3.2)	8.5 (1.7)	4.4 (1.0)	5.1 (2.2)	4.4 (1.4)	24.7 (4.1)	14.7 (4.0)	10.8 (3.9)	14.3 (3.0)
Liver	53 (14.0)	9.3 (3.6)	7.9 (1.9)	4.2 (1.2)	5.4 (2.5)	4.7 (1.5)	24.8 (4.5)	13.9 (3.3)	10.8 (3.4)	14.6 (3.3)
p value		0.471	0.146	0.748	0.691	0.288	0.981	0.004	0.429	0.840
Practice a religion										
No	147 (38.9)	8.4 (3.1)	8.4 (2.0)	4.2 (0.9)	5.1 (2.2)	4.4 (1.5)	24.9 (4.3)	13.6 (4.0)	10.4 (4.1)	14.3 (2.9)
Yes	231 (61.1)	9.1 (3.3)	8.3 (1.8)	4.4 (1.0)	5.3 (2.1)	4.4 (1.6)	24.6 (4.2)	13.8 (3.6)	10.6 (3.4)	14.5 (3.2)
p value		0.053	0.936	0.191	0.474	0.861	0.571	0.612	0.657	0.507
Current job										

Table 1: Continued.

Characteristic	$N = 378$ n (%)	Burden of family caregiver (BASC)[a]				Decisional balance on consumption of F&V[b]				Self-efficacy for nutrition planning[c]
		Negative personal influence	Positive personal influence	Concern about other family members	Medical issues	Concern about loved one	Pro: Health benefit	Con: General barriers	Con: Inconvenience	
		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	
No	241 (63.8)	9.1 (3.2)	8.3 (1.9)	4.4 (1.0)	5.2 (2.2)	4.5 (1.6)	24.7 (4.4)	13.7 (3.9)	10.5 (3.7)	14.2 (2.9)
Yes	137 (36.2)	8.4 (3.2)	8.4 (1.9)	4.2 (0.8)	5.2 (2.1)	4.2 (1.4)	24.8 (3.9)	13.7 (3.6)	10.5 (3.6)	14.7 (3.3)
p value		0.065	0.915	**0.029**	0.986	**0.039**	0.876	0.954	0.961	0.141
Monthly household income (U.S.$)										
< 2000	210 (55.6)	9.3 (3.4)	8.4 (1.8)	4.5 (1.0)	5.5 (2.2)	4.6 (1.6)	24.8 (4.2)	14.0 (3.9)	10.7 (3.7)	14.3 (3.0)
≥ 2000	168 (44.4)	8.2 (2.8)	8.3 (2.0)	4.1 (0.9)	4.9 (2.0)	4.1 (1.4)	24.6 (4.2)	13.4 (3.6)	10.3 (3.7)	14.5 (3.2)
p value		**0.001**	0.793	**0.002**	**0.007**	**0.0003**	0.662	0.122	0.281	0.470

Note: Bold p values denote statistical significance.

Abbreviations: BASC, Brief Assessment Scale for Caregivers; SD, standard deviation; SE, standard error.

[a]BASC: A higher score in each subscale indicates a greater burden of caregiving.

[b]Decisional balance on F&V consumption: A higher "pro" score indicates a greater perceived advantage of consuming F&V; a higher "con" score indicates a greater perceived disadvantage of consuming F&V.

[c]Self-efficacy of nutrition planning: A higher score indicates greater confidence in nutrition planning.

Table 2: Main study variables of family caregivers.

Variable	Mean (SE)	Median	Range
BASC[a]	29.5 (0.3)	29.0	14.0–56.0
Negative personal influence	9.0 (0.2)	8.8	5.0–20.0
Positive personal influence	8.3 (0.1)	9.0	3.0–12.0
Other family members	4.3 (0.1)	4.0	2.0–8.0
Medical issues	5.2 (0.1)	5.0	3.0–12.0
Concern about loved one	4.4 (0.1)	4.0	2.0–8.0
Decisional balance on consumption of F&V[b]			
Pros: Health benefit	24.7 (0.2)	25.0	12.0–30.0
Cons: General barriers	13.7 (0.2)	14.0	5.0–25.0
Cons: Inconvenience	10.5 (0.2)	11.0	4.0–20.0
Self-efficacy of nutrition planning[c]	14.4 (0.2)	15.0	5.0–20.0

Abbreviations: BASC, Brief Assessment Scale for Caregivers; SE, standard error.
[a]BASC: A higher score in each subscale indicates a greater burden of caregiving.
[b]Decisional balance on F&V consumption: A higher "pro" score indicates a greater perceived advantage of consuming F&V; a higher "con" score indicates a greater perceived disadvantage of consuming F&V.
[c]Self-efficacy of nutrition planning: A higher score indicates greater self-efficacy in nutrition planning.

consumption of F&V, and self-efficacy in nutritional planning (Table 1, top). Family caregivers who reported a greater burden were more likely to be older ($p = 0.034$, $p = 0.046$), have a low monthly income ($p = 0.044$, $p = 0.016$, $p = 0.042$), receive of medical aid ($p = 0.006$), provided more hours of care per week ($p < 0.0001$, $p = 0.007$, $p = 0.022$, $p < 0.0001$), and have more health problems related to caregiving responsibilities ($p < 0.0001$, $p = 0.018$, $p < 0.0001$, $p = 0.001$), especially sleep problems ($p = 0.008$, $p = 0.034$), stress ($p < 0.0001$, $p = 0.024$, $p < 0.0001$, $p = 0.0002$), pain ($p < 0.0001$, $p = 0.045$, $p < 0.0001$, $p = 0.009$), depressive mood ($p < 0.0001$, $p < 0.0001$, $p = 0.004$), and weight change ($p = 0.006$). Being the son of the patient ($p = 0.035$, $p = 0.034$) and having a history of cancer ($p = 0.020$) were also significant factors.

The decisional balance regarding the consumption of F&V was more negative in caregivers without a spouse ($p = 0.028$), those who received medical assistance ($p = 0.002$, $p = 0.006$), and those who were sons of the patient ($p = 0.031$, $p = 0.007$). Conversely, the perception of benefits was greater when the caregiver was not a spouse ($p = 0.048$) and when the caregiver was a sister, brother, or cousin ($p = 0.003$).

The self-efficacy of nutritional planning was greater when the caregiver was female ($p = 0.001$), a spouse ($p = 0.005$), had a religious affiliation ($p = 0.046$), provided more hours of care per week ($p = 0.034$), was not a son ($p = 0.013$), was a spouse ($p = 0.015$), and had more comorbidities ($p = 0.015$).

3.3.2. Effect of the Characteristics of Patients. We also performed a univariate analysis to determine the association of the different characteristics of patients with the BASC score, decisional balance, and self-efficacy of the caregivers (Table 1, bottom). The burden of family caregivers was greater when the cancer patient was older ($p = 0.049$), unemployed ($p = 0.029$, $p = 0.039$), and had a low monthly income ($p = 0.001$, $p = 0.002$, $p = 0.007$, $p = 0.0003$). The perceptions of drawbacks regarding the consumption of F&V were greater when the cancer patient had stomach cancer ($p = 0.004$). The self-efficacy for nutritional planning had no significant associations with any patient characteristics.

3.4. Multivariate Analysis. We then performed a multivariable analysis to identify factors that were independently and significantly associated with self-efficacy for nutritional planning by family caregivers (Table 3). Higher perceived benefits related to the consumption of F&V ($p < 0.0001$), having a spouse ($p = 0.001$), a higher comorbidity score ($p = 0.025$), and caregiving for 9 h or more per week ($p = 0.034$) had positive associations with nutritional self-efficacy. Conversely, a higher burden on other family members ($p = 0.0003$) and more negative aspects related to F&V consumption ($p = 0.026$) had negative associations with nutritional self-efficacy.

4. Discussion

Patients with GI cancer who have poor diets are more likely to experience poor health outcomes [20]. The purpose of the present study was to identify factors associated with the self-efficacy for nutritional planning by family caregivers of patients with GI cancer. We specifically examined the effects of the decisional balance regarding consumption of F&V and the burden experienced by family caregivers while managing the diets of these patients. Our results regarding the self-efficacy for nutritional planning by caregivers led to several novel findings, particularly concerning the decisional balance regarding consumption of F&V and caregiver burden.

We found that family caregivers of patients with GI cancer who perceived a greater health benefit from F&V consumption tended to have greater self-efficacy for nutritional planning than caregivers who did not perceive this benefit. Similarly, family caregivers who perceived greater barriers (evaluated by the BASC score) to consuming F&V had lower self-efficacy for nutritional planning. The specific barriers faced by caregivers include cost, availability, preparation time, and patient resistance to certain foods [21]. These barriers can overwhelm family caregivers and

Table 3: Multivariate analysis of factors associated with self-efficacy for nutritional planning by family caregivers of patients with GI cancer.

Factor	Partial R^2	β coefficient (SE)	F value	p value[a]
Higher "pros" on health benefits of F&V	0.12	0.06 (0.01)	53.97	**< 0.0001**
Greater burden on other family members	0.03	−0.48 (0.15)	10.27	**0.0003**
Having a spouse	0.02	0.99 (0.37)	7.1	**0.001**
Higher comorbidity index, ≥ 1	0.01	0.69 (0.29)	5.56	**0.025**
Higher "cons" on general barriers of F&V	0.01	−0.02 (0.01)	4.75	**0.026**
Caregiving time of (≥ 9 h/week or more)	0.01	0.29 (0.14)	4.51	**0.034**
Model $R^2 = 0.20$, model p value < 0.0001				

Note: Bold p values denote statistical significance.
Abbreviation: SE, standard error.
[a]Adjusted for all subscales of caregiver burden (BASC), decisional balance on F&V consumption, marital status, religious practice, insurance type, caregiving duration, caregiving time, and all health problems related to caregiving.

reduce their confidence in their ability to prepare meals with sufficient F&V. Understanding the benefits of consuming F&V can motivate a caregiver to prioritize and implement better nutritional practices and thereby boost confidence in nutritional planning.

Our results also showed that a greater perceived burden from other family members was linked to lower self-efficacy in nutritional planning by family caregivers. This finding aligns with that of a previous study, which found that a decreased strain on family caregivers correlated with an increased effort to modify the diet of patients [6]. When a family caregiver perceives a burden is being imposed by other family members, this suggests inadequate support and interest by these other family members. Previous research found that family caregivers who perceived more support from others in the family had greater self-efficacy in caregiving [22]. When other family members perceive a high burden, this weakens the overall family support system and can cause the primary caregiver to feel overwhelmed and less confident in managing the nutritional plan of the patient. Moreover, when a caregiver experiences a significant burden from the patient and other family members, this can increase stress and emotional exhaustion and decrease confidence in managing additional tasks, including nutritional planning, and this may negatively affect the health and outcome of the patient [23]. Therefore, psychological support and stress management resources may help family caregivers to better cope with their emotional demands. Reducing stress and emotional exhaustion can improve the overall well-being of family caregivers and make them more resilient and confident in managing the nutrition of patients [24].

Our results showed that being married, having a high comorbidity score, and having a longer duration of caregiving correlated with increased self-efficacy for nutritional planning by caregivers. It is likely that married family caregivers benefit from the support provided by their spouses, and they therefore develop increased confidence and capacity to handle the responsibilities of caregiving [25], such as nutritional planning. Emotional and practical support from a spouse can reduce the overall stress and burden of caregiving and enhance self-efficacy. Previous studies showed that provision of emotional stability and practical assistance is essential for managing the responsibilities of caregiving [25]. Additionally, it is likely that being married and having a family allow an individual to learn the responsibilities of meal preparation and cooking, leading to greater confidence in these tasks.

The present study showed that caregivers with higher comorbidity scores had greater self-efficacy for nutritional planning. This may be because a caregiver with more comorbidities or more serious comorbidities has personal experience in managing the special nutritional needs in the presence of a serious or complex health condition. Additionally, a caregiver with health issues often has more interactions with healthcare providers, thereby gaining insights and skills related to the importance of nutrition [26]. Thus, a caregiver who can manage his or her own illness may have more confidence in managing the nutritional needs of others.

Our results demonstrated that a longer duration of caregiving correlated with greater self-efficacy for nutritional planning by caregivers. This is likely because more experience in caregiving provides a caregiver with greater proficiency and familiarity with the requirements [27] and routines essential for effective nutritional management.

Educational programs that inform family caregivers about the specific health benefits of F&V for patients with GI cancer may improve their self-efficacy for nutritional planning. These educational programs could include information about identifying and overcoming common barriers to providing F&V, cost-effective recipes, time-saving preparation techniques, and methods to enhance the palatability of F&V. Furthermore, reducing perceived barriers can enhance the sense of capability of family caregivers and reduce their stress, thereby improving their self-efficacy for nutritional planning.

The present study has certain limitations. First, because it had a cross-sectional design, we were unable to identify causal relationships of the self-efficacy for nutritional planning with the burden experienced by family caregivers and with the decisional balance regarding the consumption of F&V. Further experimental studies are necessary to assess the effect of family-based interventions that enhance confidence in nutritional planning and the role of the family support system. Moreover, no previous study provided comprehensive evidence regarding the relationships among self-efficacy for nutritional planning, the burden on family caregivers, and decision-making related to consumption of

F&V, and this restricts interpretation of our results. Additional prospective longitudinal studies are needed to examine how different strategies that focus on family caregivers can help them provide healthier diets for patients with GI cancer. Lastly, this study was limited because there was not complete psychometric validation of the BASC, the decisional balance scale on F&V consumption, and the Nutrition Self-Efficacy Scale. Future research should conduct comprehensive validations of these metrics and perform reliability and validity testing to ensure their suitability for Korean caregivers.

5. Conclusions

Our results suggest that increased awareness and understanding of the benefits and challenges of consuming F&V, along with support systems for family caregivers, can improve nutritional care of patients with GI cancer. Furthermore, we found that married family caregivers, those with more comorbidities, and those with more experience in caregiving had higher levels of self-efficacy for nutritional planning. This suggests that the support systems for family caregivers can be improved by providing increased access to nutritionists, support groups, and resources for meal planning and problem-solving [8]. Furthermore, a strong family support network that offers practical assistance is likely to increase the confidence and effectiveness and decrease the burdens related to nutritional management experienced by family caregivers [9, 24].

Data Availability Statement

The data that support the findings of this study are available on request from the corresponding author, M.K.L. The data are not publicly available due to restrictions such as their containing information that could compromise the privacy of research participants.

Ethics Statement

This study was conducted after obtaining approval from the Research Ethics Review Committee of Kyungpook National University (Approval No. 2021-0168). All participants provided written informed consent.

Conflicts of Interest

The authors declare no conflicts of interest.

Author Contributions

Myung Kyung Lee: conceptualization, data curation, formal analysis, funding acquisition, investigation, methodology, project administration, resources, software, supervision, validation, visualization, writing–original draft, and writing–review and editing.

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