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Relationship between Nutritional Status, Physical Activity and Quality of Life among Gastrointestinal Cancer Survivors

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ABSTRACT

Introduction: The objective of this study was to determine the relationship between nutritional status, physical activity and quality of life among gastrointestinal cancer survivors. **Methods:** A cross-sectional study was conducted among gastrointestinal cancer survivors attending the oncology outpatient clinic in Hospital Selayang, Malaysia. **Results:** A total of 70 gastrointestinal cancer survivors with a mean age of 52.54 ± 14.59 years (95% CI: 47.48 – 57.60) were included in this study. Results showed that 40% of the patients were classified as having low physical activity. The mean Patient Generated Subjective Global Assessment (PGSGA) score was 10.27 ± 7.36 (95% CI: 8.23 – 12.31) and nearly half the patients (48.6%) were identified as severely malnourished (Stage C). Mean Gastrointestinal Quality of Life Index (GQLFI) score was 103.57 ± 23.85 (95% CI: 92.94 -114.20), and about 24.3% of the patients were classified as having a low quality of life. Pearson's correlation test showed a highly significant negative relationship between nutritional status and quality of life (r=-0.661, p<0.001) indicating the better the nutritional status (low total mean score of PGSGA), the better the quality of life of the survivors (high total mean score of GQLFI). There was a significant negative relationship between physical activity level and nutritional status score (r=-0.309, p<0.01), indicating the higher the physical activity level of the patients (high MET-min / week), the better their nutritional status (low total mean score of PGSGA). **Conclusion:** This study shows a significant relationship between nutritional status, physical activity and quality of life among gastrointestinal cancer survivors. Those low in nutritional status have a low quality of life while survivors with higher nutritional status have a better quality of life.

Keywords: Physical activity, quality of life, nutritional status, gastrointestinal cancer survivors

INTRODUCTION

Gastrointestinal (GI) cancer encompasses a group of cancers that affects the GI tract including oesophageal cancer, stomach cancer, pancreatic cancer, liver cancer, cancer of biliary tree and other uncommon cancers (Kelson *et al.*, 2008). In Europe and

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the United States (US), cancers of the gastrointestinal tract are the most common cancers. More than half of GI cancer cases arise from the colon (Milosavljevic *et al*., 2010). In addition, GI cancers account for 20% of estimated new cancer cases and 15% of estimated deaths worldwide (Jemal *et al*., 2009).

The term 'cancer survivor' has a varied number of definitions and has been used to describe those diagnosed with cancer who are alive and / or disease-free after five years, diagnosed patients who have completed primary treatment, as well as patients at any point from diagnosis (Twombly, 2004). There are an estimated 22 million cancer survivors worldwide of which more than 11 million cancer survivors are in the United States. It is expected that the numbers will continue to rise significantly and rapidly, given trends toward ageing with improvements in early detection and effective treatment (Stephenson *et al*., 2009).

Although the rapid increase in cancer survivorship is significantly encouraging, the long-term health consequences of cancer and its treatment is a matter of concern (Mosher *et al.*, 2009). Studies indicate that cancer survivors are more likely to develop progressive, recurrent, and secondary cancers, cardiovascular disease, and other chronic diseases (Jemal *et al.*, 2009) as well as death from non-cancer causes (Baade, Fritschi & Eakin, 2006) compared to individuals who do not have a history of cancer.

The area of long-term cancer survivorship issues of exercise, nutritional status and quality of life (QOL) have been receiving considerable research attention. Physical activity has been associated with improved QOL in patients with cancer (Schmitz *et al*., 2005) and QOL may contribute towards reducing the risk of cancer recurrence and mortality among colorectal and breast cancer survivors (Meyerhardt *et al.*, 2006a; Holmes *et al*., 2005). Studies show a significant relationship between QOL and nutritional status among cancer survivors where depletion of nutritional reserves and significant weight loss subsequently leads to decreased QOL (Kwang & Kandiah, 2009; Caro, Laviano & Pichard, 2007).

Previous studies suggest that diet and exercise interventions may be of benefit in improving the nutritional status of cancer survivors (Demark-Wahnefried *et al*., 2005; Hewitt, Greenfield & Stovall, 2005). Therefore, assessment of nutritional status is important to identifying the presence of malnutrition and sustaining a good nutritional status with a diet and lifestyle that will help to improve QOL and prevent cancer recurrence in the future.

The purpose of the present study is to determine the prevalence of malnutrition among GI cancer survivors, and to examine the association between physical activity, nutritional status and QOL. We also hypothesise that nutritional status would be negatively associated with physical activity and QOL among gastrointestinal cancer survivors.

METHODS

Study design and setting

This cross-sectional study using purposive sampling was carried out at the Oncology out-patient clinic, Hospital Selayang, Selangor, Malaysia. This study was registered with The National Medical Research Registry (NMRR). Ethical approval for the study was obtained from the Medical Research Ethics Committee of the Faculty of Medicine & Health Sciences, Universiti Putra Malaysia and the Medical Research Ethics Committee (MREC), Ministry of Health Malaysia. Permission to conduct the study was obtained from the Director, Hospital Selayang, Selangor, Malaysia.

Sample criteria, selection, and recruitment

This article adopts the definition from Twombly (2004) where cancer survivors are patients who have completed primary

treatments for cancer. The inclusion criteria were as follows: diagnosed with GI cancer and completed primary treatments (chemotherapy, radiotherapy and / or surgery) and 21 years of age or older. Patients were excluded from this study if they were involved in another research project. The study procedure was explained to the patients, after which their agreement to participate was obtained. The questionnaire was interviewer-administered by the researcher to the patients during the clinic visit using pre-tested questionnaire in one of three languages, based on the preference of the patients.

Measures

Socio-demographic and cancer characteristics: The following data on socio-demographic and cancer characteristics were collected: age, gender, ethnicity / race, marital status, education level and annual household income. For cancer characteristics, GI cancer type, stage of cancer and treatment received were reported.

Physical activity: Physical activity level was assessed using the International Physical Activity Questionnaire-Short form (IPAQ, 2005). The IPAQ short form consists of three specific types of activity which are walking, moderate intensity activities and vigorous intensity activities. The IPAQ incorporates a scoring mechanism whereby each activity is assigned an intensity code expressed in terms of Metabolic Equivalent (METs). The MET is the ratio of metabolic rate during the activity as compared to the metabolic rate during rest. For each type of activity, the weighted MET minute per week is calculated as follows (IPAQ, 2005):

1. Walking MET-minute / week = 3.3 x walking minutes x walking days.
2. Moderate MET-minute / week = 4.0 x moderate intensity activity minutes x moderate activity days.
3. Vigorous MET-minute / week = 8.0 x vigorous intensity activity minutes x vigorous activity days.

The total physical activity MET-minute / week value was then computed by summing the walking, moderate and vigorous MET minute / week scores. The scores were then categorised into low, moderate and vigorous physical activity level according to the IPAQ categorical classification (IPAQ, 2005).

Nutritional Status: Nutritional assessment was performed by using the Scored Patient Generated Subjective Global Assessment (PG-SGA), a validated nutritional assessment tool for patients with cancer (Leuenberger, Kurmann & Stanga, 2010). The scored PG-SGA has been accepted by the Oncology Nutrition Dietetic Practice Group of the American Dietetic Association as the standard for nutrition assessment for patients with cancer. The scored PG-SGA was adapted from the SGA and developed specifically for patients with cancer (Ottery, 1996). The first section includes additional questions regarding the presence of nutritional symptoms and short-term weight loss. It is designed so that components of medical history can be completed by the patient using a check box format. The second section was the physical examination and it was performed by a medical doctor. The patient is subjectively categorised as well-nourished (PG-SGA category A), moderately or suspected of being malnourished (PG-SGA category B) or severely malnourished (PG-SGA category C) on completion of the assessment. The scored PG-SGA is a further development of the PG-SGA concept that incorporates a numerical score. For each component of the scored PG-SGA, points (0 – 4) were awarded depending on the impact of symptom on nutritional status. A total score was then summed and this provided a guideline for the level of nutrition intervention required, as well as facilitated quantitative outcome data collection (Ottery, 2000). The scored PG-SGA, unlike SGA, which is categorical, is a continuous measure. A high score indicates a lower nutritional status of the patients.

Quality of Life (QOL): This was assessed by the Gastrointestinal Quality of Life Index

(GIQLI); it is a validated and reliable tool to assess the impact of gastrointestinal disturbances as well as generic influence on QOL. The GIQLI is best used in clinical practice and research (Eypasch *et al*., 1995). The GIQLI consists of 36 multiple choice items with each item being scored from 0 (least desirable option) to 4 (most desirable option). The GIQLI covers five domains: gastrointestinal symptoms – core and disease specific (19 items), physical function (7 items), social function (4 items), emotional function (5 items), and medical treatment effects (1 item). Summing the points, the GIQLI score theoretically ranges from 0 to 144 with higher scores indicating better QOL and health status.

Statistical analysis

Data were analysed using Statistical Package for Social Sciences (SPSS) programme version 17.0. Descriptive statistics included frequencies, percentages, means and standard deviation for all socio-demo graphic, cancer characteristics, physical activity, nutritional status and QOL. Correlations and Pearson' correlation were used to examine the relationship between physical activity, nutritional status and QOL among GI cancer survivors. A statistical probability of $p<0.05$ and confidence interval of 95% were considered as significant.

RESULTS

The socio-demographics and cancer characteristics are provided in Tables 1 and 2. A total of 70 subjects (39 males and 31 females) participated in this study. Mean age of the subjects was 62.54 + 14.59 years. The majority of the subjects was Chinese (68.6%) and married (86.4%). Only (38.6%) of the subjects had education until primary school level. More than half of the subjects (62.9%) were unemployed. The majority of the subjects (72.8%) had household incomes that were lower than RM 1,000 and 27.2% more than RM1000 per month.

The majority of the subjects had lower GI cancer (colorectal cancer) (88.6%) while the rest (11.5%) were upper GI cancer. Most of the subjects had been diagnosed with Stage III cancer (47.1%) and had undergone surgery (91.4%), with some of them having received chemotherapy (47.1%) and radiotherapy (20.0%), and all (100%) being currently on follow-up treatment.

Mean GIQL score of the subjects was 103.57 on a scale of 0 to 144. Figure 1 shows the QOL of subjects according to gender based on quartile distribution of the score. More male survivors (33.3%) than females (16.1%) were in the highest quartile of GIQLI scores distribution while more females (32.3%) than males (17.9%) were in the lowest quartile. Half of both male (48.7%) and female (51.6%) subjects were on the moderate quartile respectively.

Figure 2 shows the physical activity level of the subjects by gender. Overall, more than one-third (40%) of the subjects were classified as having low physical activity level of which 41% were males and 38.7% females. On the other hand, more females (41.9%) were physically active (high physical activity level) than males (20.5%).

Table 3 shows the incidence of malnutrition based on the scored PGSGA among subjects according to gender. Only 25.7% the subjects were classified by PGSGA as well-nourished, with the remaining classified as malnourished. There was no significant difference in the incidence of malnutrition between males and males, $p=0.172$ and $p=0.833$.

Table 4 shows the relationship between nutritional status, physical activity level and QOL among subjects. Both physical activity level and QOL showed a negative correlation with nutritional status. In addition, there was a strong significant negative relationship between nutritional status and QOL ($r=-0.661$, $p<0.001$) indicating better nutritional status (low total mean score of PG-SGA), with better QOL of the respondents (high mean score of GIQLI).

Table 1. Baseline characteristics of the subjects (n=70)

Characteristics	*n (%)*
Sex	
Male	39 (55.7)
Female	31 (44.3)
Age Group (years)	
< 65	35 (50.0)
> 65	35 (50.0)
Ethnic Group	
Malay	12 (17.1)
Chinese	48 (68.6)
Indian	9 (12.9)
Other	1 (1.4)
Education Level	
No schooling	14 (20.0)
Primary school	27 (38.6)
Secondary school	23 (32.9)
Tertiary	6 (8.6)
Occupation	
Government	4 (5.7)
Private	6 (8.6)
Jobless	44 (62.9)
Retired	11 (15.7)
Self-employed	5 (7.1)
Marital Status	
Single / divorced	9 (11.1)
Married	70 (86.4)
Widow / widower	2 (2.5)
Income (RM)	
< 1000	51 (72.8)
> 1000	19 (27.2)

Table 2. Clinical characteristics of the subjects (n=70)

Cancer Characteristics	*n (%)*
GI cancer type	
Upper GI cancer	8 (11.5)
Lower GI cancer	62 (88.6)
Stage of Cancer	
Stage I	18 (25.7)
Stage II	15 (21.4)
Stage III	33 (47.1)
Stage IV	4 (5.7)
Treatment Received	
Surgery	64 (91.4)
Chemotherapy	33 (47.1)
Radiotherapy	14 (20.0)
Follow-up	70 (100.0)

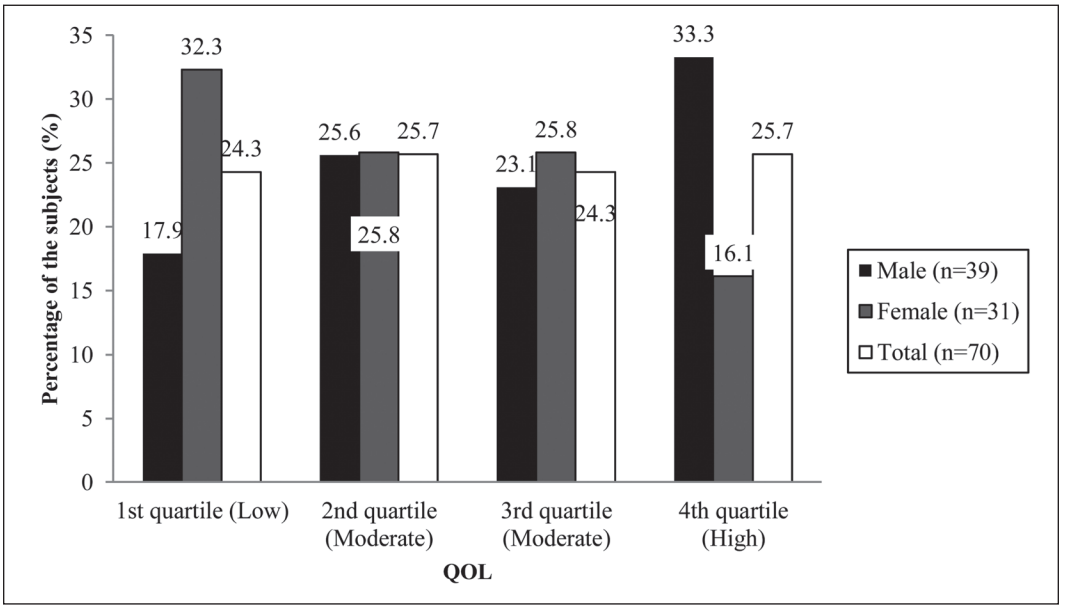

Figure 1. QOL of patients based on quartile distribution of the score (n=70)

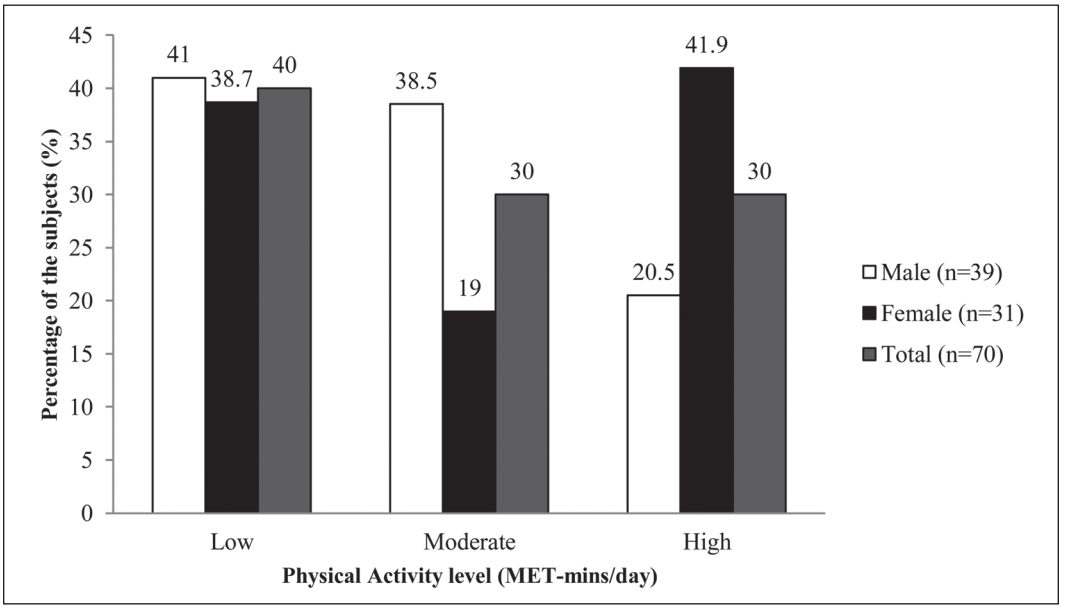

Figure 2. Physical activity level of the subjects based on gender (n=70)

Table 3. PG-SGA nutritional status categories of the subjects (n=70)

Categories	*Male (n=39)*		*Female (n=31)*		*Total (n=70)*		*t*	*p*
	n (%)	*Mean ± SD*	*n (%)*	*Mean ± SD*	*n (%)*	*Mean ± SD*		
Stage A (well-nourished)	11 (28.2)	2.82 ± 0.982	7 (22.6)	2.86 ± 0.690	18 (25.7)	2.83 ± 0.857	-0.091	0.928
Stage B (moderately malnourished)	13 (33.3)	6.77 ± 1.235	5 (16.1)	7.60 ± 0.548	18 (25.7)	7.00 ± 1.138	-1.430	0.172
Stage C (severely malnourished)	15 (38.5)	15.67 ± 6.737	19 (61.3)	16.16 ± 6.635	34 (48.6)	15.94 ± 6.583	-0.213	0.833

Independent *t*-test analysis showed that the baseline results were comparable for each mean nutritional status categories between gender ($p > 0.05$).

Table 4. Relationship between mean score of physical activity and quality of life with PG-SGA total mean score (n=70)

Mean score	*Relationship (r)*	*Significance (p)**
Physical Activity, MET-minutes/ week	-0.309	0.009**
GIQLI total score	-0.661	0.000***

* Pearson correlation test
** Significant ($p<0.01$)
*** Signficant ($p<0.001$)

There was a weak but significant negative relationship between physical activity level and nutritional status score (r=-0.309, $p<0.01$); the higher the physical activity level of the patients (high MET-minute / week), the better the nutritional status of the patients (low total mean score of PG-SGA).

DISCUSSION

This study is the first to examine the association between physical activity, nutritional status and QOL among gastrointestinal cancer survivors at Hospital Selayang, Malaysia. Our study is consistent with reports from National Cancer Registry (2006), which indicated that Chinese have the highest incidence of lower GI cancer (colon and rectal cancers) compared to other ethnic groups. Colorectal cancer is the most common GI cancer regardless of sex in Malaysia (NCR, 2008).

Prevalence of malnutrition in patients with GI cancer ranged from 42 - 87% (Ryan *et al*., 2007). The present study showed that 74.3% of patients were malnourished (Table 3). Although the present study was only able to conduct nutritional assessment on a small number of patients, similar malnutrition prevalence estimates have been found in previous studies. Results also showed that both males (38.5%) and females (61.3%) were severely malnourished (Stage C). However, most of the female survivors were severely malnourished (61.3%). About one-third (33.3%) of the male survivors in the study had better QOL than females (Figure 1). This study is similar to Hill *et al.* (2011) where GI cancer survivors who scored higher in PG-SGA experienced greater weight loss and malnutrition leading to lower QOL.

The majority of study participants were not performing enough physical activity to accrue important health benefits, with males having lower physical activity compared to females. This is likely due to a long duration of household work and moderate physical activity, as most of the female subjects were housewives. Copland *et al.* (2010) found that GI cancer survivors lowered their physical activity after major upper GI surgery; this was particularly so for men who showed a significant reduction trend in physical activity, six months post-operatively.

Although physical activity provides benefits for cancer survivors, they exercised less after being diagnosed with cancer. Decreased physical activity level during cancer treatment is most likely due to the side effects that survivors experience during their treatment (e.g. pain, fatigue, stiffness, nausea). Moreover, a lower physical activity level could also be explained by psychological, socio-economic, and domestic changes as a consequence of being diagnosed with cancer, which may be overwhelming to the patient (Milne *et al*., 2007).

This study found that there was a significant relationship between nutritional status, physical activity and QOL. Our study is consistent with those of other cancer survivor studies with other cancers which found that malnutrition was significantly associated with a poorer QOL (Ravasco *et al.*, 2004; Gupta *et al*., 2006) and decline in overall physical activity level (Milne *et al.* 2007). Untreated malnutrition has been associated with reduced response to treatment, poor survival and a diminished quality of life. Therefore, it is important to maintain an optimal nutritional status for patients with cancer during their oncological treatment and it is generally recommended to promote better patient outcomes (van de Berg *et al.*, 2010). All these point to the need for prompt intervention and research for effective management.

To the best of our knowledge, our study is the first to examine the association between physical activity, nutritional status and QOL in GI cancer patients. The relatively small sample size may not allow generalisability of the results to the association between nutritional status, physical activity level and QOL of GI cancer

survivors to other cancers. The cause-effect relationship was not determined with certainty if exercise improves QOL, or if participants with higher levels of QOL are more likely to exercise. The administered-interviewer questionnaire measure on physical activity and QOL, may have resulted in an over-reporting of exercise and QOL. Nevertheless, our study provides important preliminary data suggesting that randomised controlled trials of exercise and QOL in GI cancer survivors are warranted.

CONCLUSION

In summary, this study has shown a relationship between nutritional status, QOL and physical activity level among GI cancer survivors. Those with low nutritional status have low QOL as well and survivors with higher physical activity have better nutritional status.

Future research into the most effective diet and lifestyle intervention is recommended to improve nutritional status, physical activity and QOL which may reduce risk of cancer recurrence.

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