

RESEARCH ARTICLE

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Is Social Support Associated with Colorectal Cancer Care Utilization? A Multilevel Mixed-Effects Model of a Cross-Sectional Cohort Study in Vietnam

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Abstract

Objective: To investigate the relationship between the social support (SS) and colorectal cancer (CRC) care utilization of patients in the central region of Vietnam. **Methods:** This was a cross-sectional cohort study in which the cohort was defined as all residential patients diagnosed with CRC in a tertiary hospital, Hue Central Hospital (HCH), in central Vietnam from 2013 to 2019. Social support was considered the main independent variable and was evaluated using the Medical Outcomes Study Social Support Survey (MOS-SSS), a self-administered 19-item SS survey. MOS-SSS is a widely used scale for assessing social support in CRC patients because it is brief, easy to use, reliable, and valid. In this study, we considered a data framework with a multilevel structure that included the patient level and duration of diagnosis as the second level. We estimated the magnitude of SS and CRC-specific treatment modalities using multilevel mixed-effects (MM) models under a hierarchical approach. **Results:** The findings indicated that CRC care utilization rates were 89.9%, 48.5%, and 30.6% for surgical resection, chemotherapy, and radiation therapy, respectively. The overall trend of SS decreased significantly and affected the CRC care utilization. We found a positive effects of overall SS, as well as emotional and tangible support, on the number of hospitalization admissions and chemotherapy utilization. **Conclusion:** This study suggests that the use of the MOS-SSS should be continued in the long term for CRC patients to enhance medical accessibility and care utilization.

Keywords: Social support- cross-sectional cohort- colorectal cancer- survivors- Vietnam

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Introduction

Colorectal cancer (CRC) is the third most common disease and the second leading cause of cancer-related deaths worldwide, leading to an estimated 1.8 million deaths globally in 2018 (Bray et al., 2018). The prevalence trend of CRC is differently occurring between countries (Arnold et al., 2017; Bray et al., 2018). Low survival rates of CRC patients were observed in many low- and middle-income countries, from 26.5% in Thailand to 45.01% (Siewchaisakul et al., 2016) in Vietnam (Le et al., 2021). CRC is predicted to be the most dominant pattern of cancer for men and the second type of cancer in women by 2025 in our country (Nguyen et al., 2019).

CRC is a chronic condition that affects the physical, psychological, and social aspects of a patient's and their family's life and requires constant and prolonged care. Social support (SS) contributes to recovery and planning

survivorship care (Foster and Fenlon, 2011; Forsythe et al., 2014; Haviland et al., 2017; Beshyah et al., 2020; Çakir et al., 2020). However, it has been observed that the level of SS received by CRC patients decreases following diagnosis (Haviland et al., 2017; Zhang et al., 2017). Cancer survivors received high levels of SS, and family members were the most important source of this support (Fagundes et al., 2012). A perceived lack of SS is associated with delays in receiving necessary medical care that may contribute to the poor health outcomes by those with a lack of SS.

Currently, the experience of SS for patients with CRC has still underestimate, particular in developing countries. Moreover, the present evidence indicates that cross-national and cultural variations exist in this regard (Melchiorre et al., 2013). Thus, this study applied the Medical Outcomes Study Social Support Survey (MOS-SSS) of Sherbourne and Stewart to

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measure the SS received by patients with CRC in Vietnam (Sherbourne and Stewart, 1991). MOS-SSS is a widely used scale for assessing social support in colorectal cancer patients because it is brief, easy to use, reliable, and valid. The MOS-SSS is a suitable evaluation tool to evaluate the level of SS in the community for patients with chronic diseases and has also been validated as a reliable and valid scale for investigating SS for CRC patients in Vietnam (Khuong et al., 2018). Our work is expected to provide knowledge of the relationship between the SS and CRC care utilization of patients in the central region of Vietnam.

Materials and Methods

Study design and setting

This was a cross-sectional cohort study in which the cohort was defined as all residential patients diagnosed with CRC in a tertiary hospital, Hue Central Hospital (HCH), in central Vietnam from 2013 to 2019. The cross-sectional study, which used a community-based survey, was conducted on these patients between 29th July and 30th September 2020 in their local area. The present study was implemented in Thua Thien Hue Province, located in the North Central Coastal region of Vietnam, which had an estimated population of approximately 1.13 million in 2019 (General Statistics Office of Vietnam, 2020).

Participants

The initial selection of patients was obtained from a hospital-based cohort at a single medical center in central Vietnam. The survivors from the same cohort have been reported in a previous publication (Le et al., 2021). Patients were invited to participate in the study and confirmed their participation to the local healthcare staff in their community. The exclusion criteria included acute symptoms, dementia or other mental health problems, absence in the community, and incomplete information.

Measurement

Outcomes

The number of hospital admissions was counted for CRC-specific treatment modalities from 2013 to 2019 at HCH. CRC treatment modalities included surgical resection, radiation therapy, and chemotherapy, which were coded in the survey as 1 for use and 0 for non-use of the therapy.

Baseline characteristics

In this cohort, the baseline characteristics were collected using patient medical records and community-based surveys. They included demographic characteristics, tumor location, disease stage, and comorbidities. Demographic characteristics comprised age at diagnosis, gender, education level, marital status, place of residence, and body mass index. Tumor location was classified into colon or rectal sites (C18-C20). Disease stage was divided into early stage, advanced stage, and unknown stage according to the Tumor-Node-Metastasis (TNM) classification system (Stephen et al., 2010). Comorbidities

included current conditions as well as those described in the patient's medical records. Most baseline characteristics were extracted from the patients' medical records, and the participants' education level and marital status were obtained from a community-based survey.

Hierarchical data structure

Duration of diagnosis is directly related to the utilization of CRC-specific treatment modalities among patients. In our survivor cohort, duration of diagnosis ranged from 6 months to 92 months, defined as the time from the date of surgery or beginning of CRC-specific treatment to the date of interview. In this study, we considered a data framework with a multilevel structure that included the patient level and duration of diagnosis as the second level.

Social support

SS was considered the main independent variable and was evaluated using the MOS-SSS, a self-administered 19-item SS survey (Sherbourne and Stewart, 1991; Moser et al., 2012). The MOS-SSS is one of the most accurate scales for evaluating SS for chronically ill patients in a community and is considered universally applicable (Soares et al., 2012; Wang et al., 2013; Holden et al., 2014; Dafaalla et al., 2016; Khuong et al., 2018; Margolis et al., 2019; Zucoloto et al., 2019). The MOS-SSS uses a 5-point Likert rating scale ranging from 1 (none of the time) to 5 (all of the time). According to validated works published in Vietnam (Khuong et al., 2018), the MOS-SSS is divided into four dimensions: 1) Tangible (items 2, 5, 12, and 15); 2) Emotional information (items 3, 4, 8, 9, 13, 16, 17, and 19); 3) Positive social interaction (items 7, 11, 14, and 18); and 4) Affectionate (items: 6, 10, 20). Overall SS was assessed with a total of 19 items, and the scoring scale was transformed into a scale of 100. A higher score indicated that patients received greater SS.

Statistical analysis

Descriptive statistics were presented using numbers and percentages for categorical data and means with standard deviation for continuous data. We estimated the magnitude of SS and CRC-specific treatment modalities using multilevel mixed-effects (MM) models. We used the MM logistic regression model for the binary outcome (CRC treatments) and the MM Poisson regression model for hospital admissions. The statistical significance threshold was set at 0.05.

Ethics Statement

The study protocol was approved by the Ethical Committee of the University of Medicine and Pharmacy, Hue University, Vietnam (no. H2019/430). All patient information was kept confidential. The database was used purely for research, with no conflicts of interest. The current study was also approved by the Provincial Health Department and the Directorial Board of the HCH, Vietnam.

Table 1. Baseline Characteristics of Participants (n=258)

Variables	Number (%)
Age at diagnosis (year) mean \pm SD	61.39 \pm 14.50
Gender	
Male	147 (57.0%)
Female	111 (43.0%)
Education level	
Illiteracy/Elementary/Secondary	164 (63.6%)
High school and above	94 (36.4%)
Marital status	
Widowed/Divorced/Single	19 (7.7%)
Married	229 (92.3%)
Residence	
Hue city	111 (43.0%)
Other districts	147 (57.0%)
Co-morbidities	
Hypertension	77 (29.8%)
Diabetes	29 (11.2%)
Cardiovascular diseases	21 (8.1%)
Others	26 (10.1%)
Body mass index (kg/m ²) mean \pm SD	20.92 \pm 2.99
Tumour sites	
Colon	134 (51.9%)
Rectum	124 (48.1%)
Disease stages	
Early stage (I+II)	93 (36.1%)
Late stage (III+IV)	78 (30.2%)
Unknown stage	87 (33.7%)
Duration of diagnosis (months) median (min - max)	33 (6 - 92)
First year	78 (30.2%)
Second year	46 (17.8%)
Third year	47 (18.2%)
Fourth year	18 (7.0%)
Fifth year	21 (8.2%)
Sixth year	23 (8.9%)
Seventh year	25 (9.7%)

Results

The baseline characteristics of the participants are presented in Table 1. The mean participant age was 61.39 years, 57.0% were men, 63.6% had a low education level (illiterate, elementary or secondary education), 92.3% were married, and 43.0% lived in Hue city. Comorbidities

included hypertension (29.8%), diabetes (11.2%), cardiovascular diseases (8.1%), and others (10.1%). 51.9% of cases occurred in colon sites. Only 66.3% of the cases completed the diagnostic classification according to TNM staging, including the early stage (36.1%) and advanced stage (30.2%). Most survivors were diagnosed during the first year (30.2%), and only 26.8% of patients survived for 5 years or longer post-diagnosis. Figure 1 illustrates the trend of the mean scores for total SS and the sub-dimensions following the duration of CRC diagnosis of survivors. Most total scores and dimensions of the MOS-SSS showed a decreasing trend, particularly after 5 years of CRC diagnosis. The mixed-effect models showed a significant association between the duration of CRC diagnosis and total scale and two dimensions: 'emotional' and 'positive social interaction' ($p < 0.05$).

The patterns of treatment modality utilization for CRC patients are presented in Table 2. A total of 891 hospital admissions were recorded, with a median value of 2 times (range: 1 to 24 times). The CRC care utilization were 89.9%, 48.5%, and 30.6% for surgical resection, chemotherapy, and radiation therapy, respectively. The association between the SS and CRC care utilization of survivors is illustrated in Table 3. Upon adjusting for the baseline characteristics, the total scale showed a significant association with hospital admissions (IRR=1.005 [1.001–1.009]; $p=0.021$) and chemotherapy (OR=1.018 [1.001–1.034]; $p=0.038$). Regarding the sub-dimensions of the MOS-SSS, emotional support was related to the chemotherapeutic care of survivors (1.015 [1.000–1.030]; 0.047), and tangible support was associated with hospital admissions (IRR=1.010 [1.006–1.014]; $p < 0.001$) and chemotherapy (OR= 1.017 [1.002–1.034]; $p=0.023$). We did not find a significant association between social interaction and affectionate with CRC care utilization among survivors.

Table 2. Hospital Admissions and CRC Care Utilization of Survivors

Outcomes	n (%)	Median (min - max), sum
Hospital admissions (times)		2 (1–24), 891
Surgical	232 (89.9%)	
Chemotherapy	125 (48.5%)	
Radiation therapy	79 (30.6%)	

Table 3. Association between Social Support and Colorectal Care Utilization of Survivors

Explanatory Variables	No. of Hospitalisation ¹	Multilevel mixed-effects model (Exp(coef.); (95% CI); p)		
		Surgical resection ²	Chemotherapy ²	Radiation therapy ²
Overall score	1.005 (1.001–1.009); 0.021	0.979 (0.951–1.009); 0.168	1.018 (1.001–1.034); 0.038	0.977 (0.950–1.005); 0.113
Emotional score	1.003 (0.999–1.007); 0.139	0.984 (0.959–1.010); 0.233	1.015 (1.000–1.030); 0.047	0.979 (0.954–1.004); 0.105
Tangible	1.010 (1.006–1.014); <0.001	0.983 (0.955–1.011); 0.221	1.017 (1.002–1.034); 0.023	0.974 (0.949–1.001); 0.059
Social interaction	1.003 (0.999–1.007); 0.113	0.983 (0.959–1.009); 0.199	1.014 (0.999–1.029); 0.052	0.987 (0.964–1.011); 0.293
Affectionate	1.002 (0.998–1.006); 0.228	0.982 (0.956–1.009); 0.197	1.008 (0.992–1.024); 0.328	0.987 (0.962–1.013); 0.333

¹, Poisson regression for count outcome; ², logistic regression for binary outcome; *All models were performed for each explanatory variable with adjustment for age, sex, education, comorbidities, tumour location, residential area, and stages of diagnosis.

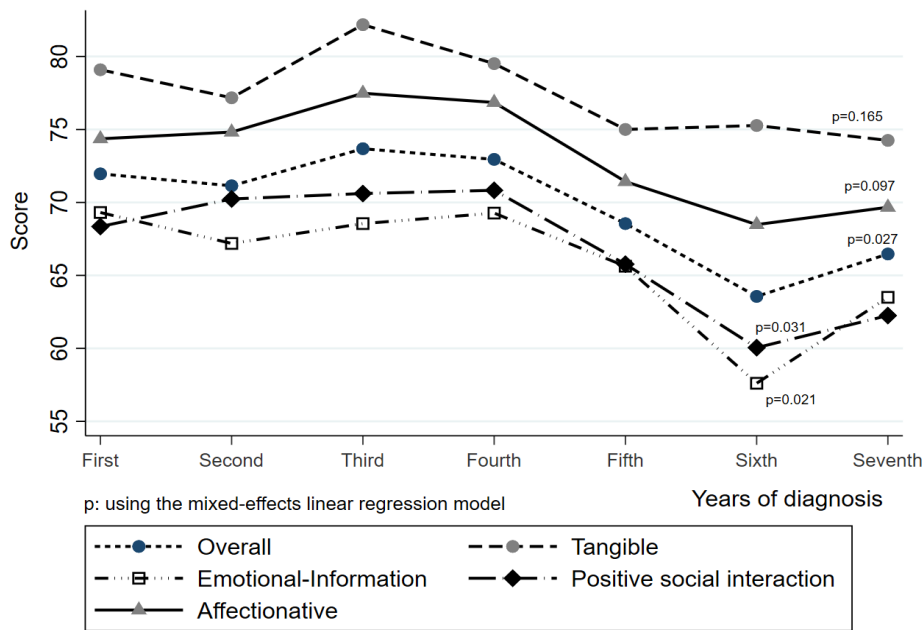


Figure 1. Mean Score of MOS-SSS and duration of Diagnosis

Discussion

Social support for CRC survivors

Our findings revealed an overall decreasing trend for the overall SS scale and all sub-dimensions. The mean scores for all the MOS-SSS following the duration of diagnosis are presented in supplementary Table S1. The mixed-effects linear regression model showed that the emotional and positive social interaction dimensions were statistically significantly related to the duration of diagnosis among CRC survivors. The mean score of the MOS-SSS varied from the first year to the seventh year of diagnosis with CRC, with the highest scores observed for the tangible support dimension (78.33 ± 18.01) and the lowest for emotional support (66.04 ± 19.21) (Table S1). This finding was similar to a study in the UK (Haviland et al., 2017), which also indicated that emotional support had the lowest score among the four dimensions of the MOS-SSS. The significance of tangible support such as financial assistance, material goods, or services was revealed by a meta-analysis, which suggested that tangible support was more influenced on treatment adherence than other dimensions, comprising emotional support or social network size (DiMatteo, 2004; Heaney and Israel, 2008). Chantler M et al. indicated that emotional support influenced an individual patient, such as feeling better, more secure, and/or better understood (Chantler et al., 2005). Like almost all cancer types, colorectal cancer requires long-term care, and emotional support will contribute as a critical factor during their illness (Slevin et al., 1996).

In general, we found that the total scale and sub-dimension of SS witnessed a gradual decrease in support from the first year to the seventh year of diagnosis, although the change in score was small for some dimensions. A lacking of SS for cancer patients was reported in Korea (Eom et al., 2013). The recently published work suggested that the reduction of SS for

cancer patients was influenced by the burden of long-term care and the expectation of patients' recovery according to their treatment progress (Eom et al., 2013). Moreover, the supporters may not notice the types of support needed or if it is still required as time progresses post-treatment, suggesting that caregivers themselves might need guidance on how best to provide support over time. In addition, the variants of follow-up changing to earlier discharge and the limitation in contact with physicians can also be influenced by patient or caregiver perception of the SS levels.

Association between the MOS-SSS and CRC care utilization

Social support has an important role in the treatment and recovery of patients, particularly cancer survivors. Based on the MM model analysis after adjusting for the baseline characteristics, our findings showed a significant association between the total SS and the utilization of CRC-specific treatment modalities of survivors, including hospital admissions and chemotherapy. Incidentally, we also found that the model with tangible dimensions of perceived SS (MOS-SSS) as an explanatory factor was significantly related to the number of hospitalizations and chemotherapeutic treatments compared with surgical resection and radiation therapy outcome models. Based on the existing literature, it seems impossible to draw a definitive conclusion regarding the influence of SS on treatment processes; however, previous studies have demonstrated that a perceived lack of SS is associated with delays in receiving necessary medical care (Pedersen et al., 2011; Reisinger et al., 2018), which contributes to the poor health outcomes of patients.

As a proxy for factors such as comorbidities, tumor location, residential area, stage of diagnosis, and personal characteristics that influence the type of treatment and healthcare utilization, SS has been proposed as an important aspect of adherence to treatment after the

primary treatment and recovery process as well as in supportive care utilization (Foster and Fenlon, 2011; Forsythe et al., 2014). A previous cohort study found that levels of SS declined following CRC diagnosis, and it is related to the quality of life (Haviland et al., 2017). Other results in South Korea suggested that perceived SS is related to mental health and quality of life in cancer patients through a direct effect rather than a stress-buffering effect (Eom et al., 2013). The other literature also confirmed the role of SS in contributing to cancer patients' recovery progress for both early and follow-up (Haviland et al., 2017).

The current study may contain several limitations that need to be considered and mentioned. Firstly, our cohort only included the survivors that can be direct to the studied outcomes because survivors may be more likely to have a higher using CRC care utilization than dead patients. Second, this study was implemented in a single center of Central Vietnam, which may be limited to reflect and represent Vietnamese patients. Thirdly, health-seeking behaviour is normally influenced by various factors, such as quality of health care services, infrastructure, socio-economic, and patients' knowledge. Despite of these gaps, we believe that the present study is one of the first works to investigate the association between SS and CRC care utilization among patients with CRC in a developing country. Cancer patients need long-term and cost-effective care. Therefore, the community-based intervention model will ensure continuous care and community reintegration with the support of the patient, family, and community.

In conclusion, our findings indicated a significant decrease in overall SS, particularly the emotional and positive social interaction dimensions, following the time of diagnosis among survivors with CRC. We found a positive effects of overall SS, as well as emotional and tangible support, on the number of hospitalization admissions and chemotherapy utilization. This study suggests that the use of the MOS-SSS should be continued in the long term for CRC patients to enhance medical accessibility and care utilization.

Author Contribution Statement

Conceptualization: DDL, TVV, PS. Data curation: BTT, TGN, MTN, XMTT, TTND. Methodology/formal analysis/validation: DDL, MTN, HTLN, TVV, PS. Writing—original draft: DDL, BBT, TGN, MTN, XMTT, HTLN, TTND. Writing—review & editing: DDL, XMTT, HTLN, TTND, TVV, PS. All authors have read and approved the final manuscript.

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Availability of data (if apply to your research)

Data is available upon request to corresponding author.

Ethical issue

The study protocol was approved by the Ethical Committee of the University of Medicine and Pharmacy, Hue University, Vietnam (no. H2019/430).

Conflict of interest

The authors declare that there is no conflict of interest.

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