

## USE OF CHINESE MEDICINE AMONG COLORECTAL CANCER PATIENTS: A NATIONWIDE POPULATION-BASED STUDY.

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## Abstract

**Background:** Traditional Chinese medicine (CM) appears to be used worldwide, especially by cancer patients. The aim of the present study was to explore CM uses and CM non-users by patients with colorectal cancer (CRC).

**Materials and methods:** A retrospective study was conducted using registration and claims data sets for 2007 from the National Health Insurance Research Database. Patients with colorectal cancer were identified from the Registry for Catastrophic illness Patients. Binary logistic regression was used to estimate odds ratios as the measure of association with the use of CM.

**Results:** A total of 61,211 CRC patients diagnosed in 2007 were analysis. Most CM users preferred to visit private clinics (46.9%) with 306,599 visits. In contrast, the majority of CM non-users preferred to visit private hospitals (42.2%) with 538,769 visits. Among all 176,707 cancer-specific CM visit, there were 66.6% visits to CM outpatient department (OPD) of private hospitals, while in 477,612 non-cancer-specific CM visits, 62.0% was for private clinics. The proportion of expenses for diagnostic fees for CM user in CM visits was much less than that for WM visits and CM non-users (US\$4.6 vs. 29.3 vs. 33.5). The average cost for CM user in CM was less than that for WM visits and CM non-users (US\$6.3 vs. 25.9 vs. 30.3). Female patients, younger age, and patients not living in the northern region, with higher EC or more comorbidities were more likely to receive CM treatment.

**Conclusion:** The prevalence and costs of insurance-covered CM among CRC patients were low. Further longer longitudinal study is needed to follow up this trend.

**Key words:** Chinese Medicine, Digestive System Neoplasms, Health Insurance

## Introduction

Colorectal cancer (CRC) is one of the most frequently diagnosed cancers and a leading cause of cancer deaths worldwide. The incidence of CRC is increasing and remains the leading cause of death from cancer in Taiwan. The incidence of CRC after age adjustment was 19.6 cases per one hundred thousand people in Taiwan in 2009 (Huang et al., 2012). Conventional cancer treatments with chemotherapy and radiation therapy have been shown to be effective in reducing or eradicating cancers; however, they can produce unpleasant side effects. Traditional Chinese medicine (CM) is increasingly used as an adjunctive treatment option for cancer patients as a way to reduce or manage the side effects of conventional cancer treatment (Dundee et al., 1989; Liu et al., 1995; Wu et al., 1994). However, little information exists regarding prevalence, patterns, and costs of CM use among colorectal cancer patients.

CM is one of the most popular complementary and alternative medicine (CAM) modalities. According to an estimation by the World Health Organization, the use of complementary and alternative medicine (CAM) ranges from 9 to 65% in different countries (Ernst, 1999). The proportion of responders reporting use of at least one CAM therapy increased from 25.7% in 2002 to 29.4% in 2007, a relative increase of 14.2%

<http://dx.doi.org/10.4314/ajtcam.v11i2.20>

(Su et al., 2011). CAM is also very popular in Asia, Europe, Canada, and Australia (Fisher et al., 1994; Lim et al., 2005; MacLennan et al., 1996; Millar, 1997). The utilization of CAM appears to be widespread worldwide, especially among oncology patients (Molassiotis et al., 2005). Most clinical studies showed that CAM intervention focused on symptom management, in particular, on the management of chemotherapy induced nausea and vomiting (Aglietti et al., 1990; Shen et al., 2000). However, the contributing factors which push oncology patients to seeking CAM were not well studied yet.

National Health insurance (NHI) was implemented in Taiwan in 1995, and covers more than 99% of Taiwan's 23-million population and 93% of medical institutes. The NHI research Database (NHIRD) provides all registration data sets and claim data sets for research. The NHIRD covered both Western medicine (WM) and CM except claims of CM inpatient services were not included as NHI did not cover it.

In this study, we used NHIRD to explore prevalence, patterns, and cost of insurance-covered CM among colorectal cancer patients. Use of Western medicine (WM) was also surveyed for comparison.

## Materials and methods

### Data Source

A retrospective cross-sectional study was conducted using registration and claims data sets for 2007 from the National Health Insurance Research Database (NHIRD). Taiwan had National Health Insurance program from 1995. As of 2007, 97% of the population was enrolled in this program. The database of this program contains registration files and original claim data, including outpatient claims (CD), registry for patients with catastrophic illness (HV) and files of the registry for beneficiaries (ID). Chinese medicine original claim data, which is a sub-file in the CD data file, is provided by the Bureau of National Health Insurance, Taiwan. These databases are provided to scientists in Taiwan for research purposes.

### Study Sample

The participants in this study were identified from the 2007 NHIRD by a diagnosis of colorectal cancer (ICD-9CM codes : 153-154) in the Registry for Patients with Catastrophic Illnesses. The diagnosis required confirmation by a physician, pathological confirmation, or other supporting medical information. A total of 61,211 colorectal cancer patients were diagnosed in 2007. Among them, CM users were defined as patients who ever used CM outpatient services at least once that year. There were total 16,487 (26.9%) CM users. Under NHI regulation, each claim for reimbursement is required to record up to three items of diagnosis code in International Classification of Disease (ICD-9-CM), Ninth Revision Clinical modification format. Claims recorded with diagnosis codes of colorectal cancer were defined as cancer-specific visits.

### Variables

The modified health service model of Anderson and Newman was used for analysis. Anderson and Newman's model of health service utilization views an individual's use of health service as a function of predisposing, enabling factors and need factor. Predisposing factors included age and gender : age was stratified by two groups, younger than 65, and older than 65. Gender was male and female. Enabling factors included four geographic regions (northern, central, southern and eastern) and three levels of urbanization (urban, suburban and rural) (Engstrom et al., 2001). This study also used enrollee category (EC) as a proxy measure of socioeconomic status (Chen et al., 2007). Need factors were comorbidities (hypertension, diabetes and hyperlipidemia). The dependent variables were factors associated whether or not to use CM. The prevalence, patterns, and cost of insurance-covered by CM users and CM non-users of colorectal cancer patients was analysis.

**Statistics**

The statistical software packages SAS (version 9.2; SAS Institute, Inc., Cary, NC, USA) and SPSS (version 17; SPSS Inc., Chicago, IL, USA) were used for data analysis. The distribution and frequency of each variable were assessed with chi-square tests. Binary logistic regression was used to estimate the odds ratio (OR) as the measure of association with CM use.  $P < 0.05$  was defined as statistically significant.

**Results****User demographics**

The demographics are presented in Table 1. The mean age was 67.1 years old. The proportion of older patients was higher than that <65 (61.1% vs. 38.9%). The proportion of male and female patients was 54.6% and 45.4%, respectively. With regard to geographic region, the most proportion registered in Northern and the less proportion in Eastern. The proportion of patients living in suburban with CM users and CM non-users was higher than urban or rural areas. In terms of enrollee category, the proportion of patients in EC 4 among colorectal cancer patients was higher than that the others.

**Table 1:** Patient characteristics

Characteristic	Total	%
Number of patients	61,211	100.0
Predisposing factor		
Age		
Mean (years)	67.1	
< 65	23,820	38.9
> 65	37,391	61.1
Gender		
Female	27,814	45.4
Male	33,397	54.6
Enabling factors		
Geographic region		
Northern	28,072	45.9
Central	15,783	25.8
Southern	16,061	26.2
Eastern	1,295	2.1
Urbanization level		
Urban	17,538	28.7
Suburban	24,546	40.1
Rural	19,127	31.2
EC		
EC 1, 2	7,636	12.5
EC 3	21,037	34.4
EC 4	32,538	53.2
Need factors		
Morbidities		
Yes	26,098	42.6
No	35,113	57.4

**Expenditures**

There were total 16,487 CM users with 654,319 visits. Most CM users preferred to visit private clinics (46.9%) with 306,599 visits. In contrast, the majority of CM non-users preferred to visit private hospitals (42.2%) with 538,769 visits. Among all 176,707 cancer-specific CM visit, there were 66.6% visits to CM outpatient department (OPD) of private hospitals, while in 477,612 non-cancer-specific CM visits, 62.0% was for private clinics. Table 2 revealed the details of visits.

**Table 2:** Services providers for CM users and CM non-users

Medical institutes	CM users				CM non-users			
	Total		Cancer-specific		Non-cancer-specific		Total	
	Visits	%	Visits	%	Visits	%	Visits	%
Public hospitals	100,176	15.3					256,603	20.1
Private hospitals	233,411	35.7					538,769	42.2
CM OPD of public hospitals			48,451	27.4	55,584	11.6		
CM OPD of private hospitals			117,686	66.6	113,007	23.7		
Public clinics	13,677	2.1	621	0.4	13,056	2.7	37,509	2.9
Private clinics	306,599	46.9	9,949	5.6	295,965	62.0	439,491	34.4
Other	456	0.1					4,542	0.4
Total	654,319	100.0	176,707	100.0	477,612	100.0	1,276,914	100.0

OPD: outpatient department

The details of expenditure were provided in Table 3. Total costs were converted to US Dollars (US\$) using an exchange rate of US\$1 = New Taiwan Dollar (NTD) \$29.9. The total expenditure was about 12 million US in 2007, for CM users was 3 million US and CM non-users was 9 million US. Expenditure for CM users in CM was 2,051,935, the average expenditure was US\$19.6; in Western medicine was 35,066,640 and the average expenditure was US\$63.8. CM non-users total amount was 92,430,743 and the average expenditure was US\$72.4. The proportion of expenses for diagnostic fees for CM user in CM visits was much less than that for WM visits and CM non-users (US\$4.6 vs. 29.3 vs. 33.5). The average cost for CM user in CM was less than that for WM visits and CM non-users (US\$6.3 vs. 25.9 vs. 30.3).

Factors associated with CM user

Table 4 shows the relationship between patient demographics and CM users. Overall, patients younger than 65 (OR=0.64, 95% CI : 0.62-0.67,  $p<0.001$ ), female (OR=0.69, 95% CI : 0.67-0.72,  $p<0.001$ ), registered in regions other than Northern Taiwan (OR=1.49, 95% CI : 1.42-1.56,  $p<0.001$ ), high EC or have comorbidities (OR=1.12, 95% CI : 1.08-1.17,  $p<0.001$ ) were more likely to be CM users.

**Discussion**

New technologies have improved the survival rate for CRC, but CRC survivors commonly live with illness (Yang et al., 2008a). Previous studies had been reported CAM could improve quality of life in cancer patients (Zhang et al., 2009; Zhou et al., 2009). Liu's study showed 64% cancer patients used CM after the diagnosis of cancer (Liu et al., 1997). Other studies reported that 11.9% to 64% of cancer patients in Taiwan used CM (Pu et al., 2008; Yang et al., 2008b). Our study reported the prevalence, patterns, and cost by CM users and CM non-users of colorectal cancer patients. Furthermore, almost all previous studies of CAM used interview-based questionnaires. As a result, low response rates and high dropout rates were problems in many of these follow-up studies. With NHIRD, claims for each insured could track across time. This could avoid the bias of patient dropout in most longitudinal studies and avoid recall bias.

The use of CAM varied in accordance with patients' cultural, religious, ethnic, gender, and geographic distributions. Compared with CM

<http://dx.doi.org/10.4314/ajtcam.v11i2.20>

non-users, CM users were often observed to be younger, female living in the central and southern regions, and of higher socioeconomic status. Younger survivors (aged < 65 years at diagnosis) were more likely to seek information from sources other than their physicians and to use many different sources for that information, when compared to older survivors (Lawsin et al., 2007). Information seekers were 5.9 times more likely to use CAM than those who did not seek cancer information (Bennett et al., 2009). Females usually took more time to care about their health than did males when they faced the disease at the same time (Lawsin et al., 2007). In Taiwan, Chinese medicine hospitals were better known in the central southern and eastern regions than in the north. Patients in those regions preferred to see CM doctors because their culture was different from that in the northern region. There are many Western medicine hospitals in the north, and patients there have more choices for care. Patients younger than 65, with higher income, and employed by the government, schools, enterprises or institutions were more likely to be CM users (Huang et al., 2012). We also found a higher portion of CM users in regions other than Northern Taiwan. This was consistent with previous studies.

**Table 4:** Adjusted odds ratios for factors associated with the use of Chinese medicine

Characteristic	Odds ratio	95% confidence interval		<i>p</i> value
		Lower	Upper	
Predisposing factor				
Age				
< 65 (ref.)	1.00			
> 65	0.64	0.62	0.67	<0.001
Gender				
Female (ref.)	1.00			
Male	0.69	0.67	0.72	<0.001
Enabling factors				
Geographic region				
Northern (ref.)	1.00			
Central	1.49	1.42	1.56	<0.001
Southern	1.19	1.13	1.25	<0.001
Eastern	1.20	1.06	1.37	0.005
Urbanization level				
Urban (ref.)	1.00			
Suburban	0.90	0.85	0.94	<0.001
Rural	0.82	0.78	0.87	<0.001
EC				
EC 1, 2 (ref.)	1.00			
EC 3	0.94	0.88	1.00	0.06
EC 4	0.91	0.86	0.96	0.003
Need factors				
Comorbidity				
No (ref.)	1.00			
Yes	1.12	1.08	1.17	<0.001

The utilization patterns of cancer-specific and non-cancer-specific visits were then further analysis. Previous study surveyed female breast cancer patients and found that 35.6% received CM. The majority of CM users (87.6%) also used WM ambulatory services. CM users were more likely to be younger than 60, employed, with higher income, and not living in Northern Taiwan (Lin et al., 2011a). Another study surveyed prostate cancer patients and also reported the majority (90.5%) of CM users also used WM ambulatory services (Lin et al., 2010). Furthermore,

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most CM visits (92.7%) were non-cancer-specific (Lin et al., 2011b). In this study, the utilization patterns of CM were similar. CRC patients used CM for non-cancer-specific reasons more than for cancer-specific reasons. Most CM users with non-cancer-specific were provided by the private clinics. The majority of CM users (84%) also used WM ambulatory services. Our results reflected the patients' need for integration of CM and WM. CM appeared to play a complementary rather than an alternative role in cancer treatment. The prevalence of CAM in this study was lower (26.9%) when compared with previous studies. This may have been because the definition of CAM varied in different studies. Lam et al. reported on a total of 786 participants, 42.9% of whom used only Western medicine, 57.1% used at least one form of CM, and 5 participants used only CM. Nearly two-thirds of the participants did not tell their physicians about using CM. Over two-thirds of all participants (68.2%) believed that integrated CM and WM was effective (Lam et al., 2009). Given the high prevalence of CAM use by cancer patients, more research is needed to determine the impact of CAM's effectiveness and safety and its interaction with conventional cancer treatments.

Several limitations of this study should be mentioned. The NHIRD is used primarily for administrative purposes and does not provide data on clinical characteristics such as staging, disease severity, and biochemical data; consequently, these data were not available for analysis in this study. Out-of-pocket and non-contracted clinics were not included. Some cancer patients needed rare and expensive Chinese herbal medicines which were not covered in NHIRD; therefore, the use of CM might have been underestimated.

In conclusion, we found that CM user preferred private hospitals for cancer-specific CM visit and preferred private clinics for non-cancer-specific CM visits. The average costs of CM drugs in CM users were less than in western medicine and CM non-users. Female patients, younger age, and patients not living in the northern region, with higher EC or more comorbidities were more likely to receive CM treatment. Further longer longitudinal study is needed to follow up this trend.

## Acknowledgment

This work was supported by the Buddhist Dalin Tzu Chi General Hospital (DTCRD100(2)-I-11). This study utilized data from the National Health Insurance Research Database provided by the Bureau of National Health Insurance, Department of Health, and managed by the National Health Research Institutes (registry number 99029). The interpretation and conclusions contained herein are not those of the Bureau of National Health Insurance, Department of Health, or National Health Research Institutes.

**Conflict of Interest:** The authors declare no conflicts of interest.

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