

# Correlation between Pickled Food Consumption and Colorectal Cancer: A Randomized Controlled Trials in Semi-Urban Thailand

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**Abstract:-** Colorectal cancer kills over 600,000 people per year worldwide and still represents one of the most common malignancies. Colorectal cancer (CRC) is unclear especially in term of Thai pickled food. This study aims to determine the relationship between pickled food consumption in the family history of cancer group and colorectal cancer. The CRC using Immunochemical Fecal Occult Blood Test (FIT) to screen colorectal cancer and confirm by colonoscopy in Thai population aged 45-74 years old. A multiple logistic regression is applied to analyze the factors associated with CRC. The risk of pickled food consumption in family history cancer group having CRC remained highly significant compared with no family history cancer and not consume fermented food (OR adj= 3.01; 95% CI: 1.50 - 6.43).

**Keywords:-** Colorectal cancer, Family history cancer, Pickled food consumption.

## I. INTRODUCTION

Colorectal cancer (CRC) killed over 600,000 people per year worldwide and still represents one of most common[1].The global burden of CRC is expected to increase by 60% to more than 2.2 million new cases and 1.1 million deaths by 2030[2]. There is an increasing trend of colorectal cancer incidence in Asia and nearly 45% of CRC cases worldwide occur in Asia[3]. CRC related with family history of cancer [4, 5], alcohol consumption[6-8]and both of men and women worldwide, colorectal cancer is among the leading causes of cancer-related death [9, 10].

The colon and rectum are common sites of food-related cancer[11] The previous studies represents CRC associated with red meat and processed meat consumption[10-13]. High intake of fermented soy foods was significantly associated with an increased risk of gastric cancer[14]However; no result of study about association between fermented food consumption in family history cancer group and colorectal cancer.

## II. MATERIALS AND METHODS

### A. Study design

This paper is part ongoing of the randomized controlled trial CRC screening in Semi-Urban Thailand that using Fecal Immunochemical Test (FIT) to screen colorectal cancer and confirm by colonoscopy in risk group of Thai population

aged 45-74 years old that study with 20,000 participants in six years. This study was cross sectional study. The subject was experimental group of the main RCT study that who got FIT to screen. The CRC was diagnosis by colonoscopy in positive iFOBT screening group subjects who have inflammatory bowel and gastritis disease were excluded. A total of 18,913subjects were included in the analysis.

### B. Study outcome and factors of interest

CRC in this study was screening by FIT risk group, the sensitivity, specificity and positive predictive value of the FIT were 75%, 94% and 60%, respectively[15]. A pilot study of FIT (OC-Light, Nagase, Singapore) screening in Semi-Urban Thailand reported that the sensitivity, specificity, positive predictive value and negative predictive value of the FIT were 91.0%, 93.8%, 95.8% and 87.0%, respectively[16]. The positive screening subjects were confirmed by colonoscopy that the outcome in this study can classify in disease and non- disease.

The main interest was pickled food consumption in the family history cancer group in four types, including 1) no family history cancer and not consuming pickled food, 2) no family history cancer but consuming fermented food. 3) have a cancer family history but do not consume pickled food; and 4) have a cancer family history but consume pickled food.

Factors used to characterize the subjects.

Demographic characteristics of the subjects were gender, age, body mass index (BMI), household income, marital status, education level, occupation level, alcohol consumption, smoking and exercise.

### Statistical analysis

Demographic characteristics of the subjects were described using frequency and percentage for categorical data, including gender, BMI classification into four groups, marital status, education level, occupation level, alcohol consumption, smoking, and exercise. To describe continuous data, including age, BMI, and household income, mean, standard deviation, median, minimum, and maximum were used.

To investigate factors that affect CRC, odds ratios (ORs) and their 95% confidence intervals (95% CIs) were estimated using multiple logistic regression for survey

sampling. This analysis adjusted for factors relevant to showing a univariate relationship with outcomes, including BMI, alcohol consumption, and age.

All analyses were performed using Stata version 10.0 (StataCorp, College Station, TX). All test statistics were two-sided and a p-value of less than 0.05 was considered statistical significant. This project was approved by Khon Kaen University Ethics Committee.

**III. RESULTS**

A total of 18,913 subjects who were aged between 45 and 74 years old in Northeastern Thailand. From the 20,000 subjects who were randomly selected in the experimental group of the main RCT study and agreed to participate as members (Fig 1).

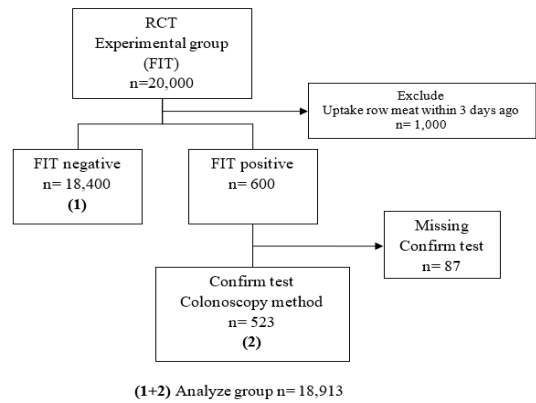


Fig. 1: Sample Selection Process

*A. Demographic Characteristics*

Majority of the samples were female (68.5%) with a mean age of 54.9±7.4 years old (ranged: 45-70). They were mainly married (84.5%), about 89.3 percent were first primary school (P.4) complete. Most of them are agriculture (84.1%), and consume alcohol 7,541 people (39.9%); moreover, they have family history cancer 11,359 people (60.1%). (Table 1)

Characteristics	Number	Percentage
<b>Gender</b>		
Male	5,963	31.5
Female	12,950	68.5
<b>Age</b>		
45-55	10,775	57.0
56-65	4,910	25.9
66-74	3,228	17.1
Mean(SD)		54.9 (7.4)
Median (Min:Max)		54 (45:70)
<b>BMI</b> 14,890(		
Lower standard	985	6.7
Normal	5,720	38.7
Over weight	2,847	19.3
Obesity	5,213	35.3
Mean(SD)		23.8 )3.9(
Median (Min:Max)		23.4 )13.0: 46.4(
<b>Income (baht) )n=13,177(</b>		
< 5,000	10,988	58.1
5,000-10,000	1,289	6.8
>10,000	6,636	35.1
Mean(SD)		3107 (5227.81)
Median (Min:Max)		2000 (0:20,000)
<b>Marital status )n=17,173(</b>		
Single	400	2.3
Married	14,512	84.5
Separate	610	3.6
Divorced / Widow	1,651	9.6
<b>Education level )n=18,416(</b>		

Characteristics	Number	Percentage
None	486	2.7
First primary school(P.4)complete	16,449	89.3
Second primary (P6 or P7)complete	638	3.5
Secondary completed	393	2.1
High School completed	203	1.1
Diploma or equal	73	0.4
Bachelor and higher	174	0.9
<b>Occupation</b> )n=14,672(		
Agriculture	12,336	84.1
Merchant	368	2.5
Labor	285	1.9
Government officer	441	3.0
Employee	957	6.6
Unemployed	285	1.9
<b>Alcohol consumption</b>		
No	11,372	60.1
Yes, current or previous	7,541	39.9
<b>Smoke</b> )n=17,344(		
No	12,913	74.4
Yes, current or previous	4,431	25.6
<b>Exercise</b>		
None	10,906	56.7
Less than 3 times per week	2,679	14.1
At least 3 times per week	5,337	28.2
<b>Red meat consumption</b>		
Not consume	10,746	56.8
Consume	8,167	43.2
<b>Family history cancer</b> )Mother/Father/Brother/Sister(		
Yes	11,359	60.1
No	7,554	39.9
<b>Pickled food consumption</b>		
Consume	8,120	42.9
Not consume	10,793	57.1
<b>Family historycancer and fermented food consumption</b>		
No family history and not consume	4,878	25.8
No family history but consume	6,481	34.3
Family history but not consume	3,242	17.1
Family history and consume	4,312	22.8

Table 1: Demographic characteristics presented as percentage.)n=18,913(

**B. Factors that was related with CRC (Univariate analysis)**

In the univariate analysis, factors found to be significantly related to an increased risk for CRC were people who had a family history of cancer and consumed pickled food (OR = 2.93; 95% CI: 1.50–5.72) compared with people who had no family history of cancer and did not consume fermented foods (Table 2).

Factors		No.	% of CRC	Crude OR	95% CI	p-value
< 0.001						
No family history and not consume		4,878	0.3	1		
No family history but consume		6,481	0.3	1.07	0.51 to 2.23	
Family history but not consume		3,242	0.5	2.01	0.95 to 4.26	
Family history and consume		4,312	0.7	2.93	1.50 to 5.72	
<b>Pickled food consumption</b>						0.278
Consume		8,120	0.3	1		
Not consume		10,793	0.4	1.29	0.81 to 2.06	
<b>Red meat consumption</b>						0.019
Not consume		10,746	0.3	1		
Consume		8,167	0.5	1.72	1.01 to 2.71	
< 0.001						
Yes		11,359	0.3	1		
No		7,554	0.6	2.45	1.54 to 3.89	
<b>BMI</b> )14828(						0.598
Normal		5,720	0.4	1		
Lower standard		985	0.3	0.73	0.22 to 2.41	
Over weight		2,847	0.3	0.75	0.35 to 1.62	
Obesity		5,213	0.5	1.19	0.68 to 2.07	
<b>Gender</b> )18837(						0.220
Male		5,963	0.5	1		
Female		12,950	0.4	0.74	0.47 to 1.18	
<b>Age</b>						<0.001
45-55		10,775	0.3	1		
56-65		4,910	0.8	2.89	1.78 to 4.69	
66-74		3,228	0.3	1.04	0.49 to 2.19	
<b>Alcohol consumption</b>						0.003
No		11,372	0.3	1		
Yes, current or previous		7,541	0.6	1.97	1.25 to 3.10	
<b>Smoke</b> )17344(						0.252
No		12,913	0.4	1		
Yes, current or previous		4,431	0.5	1.34	0.82 to 2.20	
<b>Exercise</b>						0.933
None		10,906	0.4	1		
Less than 3 times per week		2,670	0.4	0.90	0.54 to 1.54	
At least 3 times per week		5,337	0.4	0.99	0.52 to 1.93	

Table 2: Using Simple Logistic Regression, The Odds Ratio (Or) Of Factors That Were Related To Crc And Their 95% Confidence intervals (CI) for each factor were calculated.

Other factors showing a significant relationship were red meat consumption, family history of cancer, alcohol consumption, and being aged between 66-74 years old compared with being aged between 45-55 years old.

*C. Factors that were related with CRC (multiple logistic regressions)*

Using multiple logistic regressions, the relationship between pickled food consumption in the family history cancer group and CRC was adjusted for all other factors,

including age, alcohol consumption, BMI, and red meat consumption. The risk of pickled food consumption in the family history cancer group having CRC remained highly significant compared with no family history cancer and not consuming pickled food (ORadj = 3.01; 95% CI: 1.50-6.43) (Table 3).

Factors	Number	% of CRC	Crude OR	Adjusted OR	95% CI	p-value
<b>Family history cancer /pickled food consumption</b>						0.001
No family history and not consume	4,878	0.3	1	1		
No family history but consume	6,481	0.3	1.07	0.98	0.43 to 2.25	
Family history but not consume	3,242	0.5	2.01	1.83	0.79 to 4.25	
Family history and consume	4,312	0.7	2.93	3.01	1.50 to 6.43	
<b>Red meat consumption</b>						0.094
Not consume	10,746	0.3	1	1		
Consume	8,167	0.5	1.72	1.53	0.92 to 2.53	
<b>BMI(14828)</b>						< 0.001
Normal	5720	0.4	1	1		
Lower standard	985	0.3	0.73	0.67	0.20 to 2.24	
Over weight	2847	0.3	0.75	0.78	0.36 to 1.68	
Obesity	5213	0.5	1.19	1.26	0.72 to 2.20	
<b>Alcohol (17344)</b>						0.031
No	11372	0.3	1	1		
Yes, current or previous	7541	0.6	1.97	1.73	1.05 to 2.87	
<b>Age</b>						0.003
45-55 year old	10775	0.3	1	1		
56-65 year old	4910	0.8	2.89	2.53	1.48 to 4.34	
66-74 year old	3228	0.3	1.04	1.17	0.52 to 2.59	

Table 3: Adjusted odds ratio (adj. OR) of factors that were arelated with CRC and their 95% confidence interval (CI) for each factor adjusted for all other factors using multiple logistic regression

The other factors that remained significant are age between 66-74 years old compared with age between 45-55 years old (ORadj = 2.53; 95% CI: 1.48-4.34) and alcohol consumption (OR adj = 1.73; 95% CI: 1.05-2.87).

**D. Factors related with CRC**

The family history cancer and consume pickled food group related with CRC remained highly significant compared with the not consumption (ORadj= 3.01; 95% CI: 1.50 - 6.43) (Table 3). The other factors remained significant are age between 66-74 years old compare with age between 45-55 years old and alcohol consumption (Fig. 2).

**V. DISCUSSION**

For the factors that were related with CRC. We found that the risk of pickled food consumption in family history cancer group having CRC was highly significant (ORadj= 3.01; 95% CI: 1.50 - 6.43).This is similar to study risk of colorectal cancer in Semi-Urban, Thailand found that, family history cancer be significantly associated with an increased risk for CRC [4, 17].However, the result is in contrast with previous studies which report no strong evidence that intake of fermented foods, particularly pickled dairy foods, is associated with mortality of cancer[18].

It is noticeable from the result that, the factors remained significant related with CRC included alcohol consumption is a risk factor. This is consistent with some other studies. For instance; alcohol intake was related with a modest increase in risk for CRC [7] and the study of risk factors for colon cancer in Semi-Urban Thailand shown increased risk of colon cancer was related with alcohol consumption [19] : Moreover, the study risk of colorectal cancer among men in Canada found that daily consumption of alcohol of any type was related with increased risks of cancer of the distal colon [8].The subjects who have age between 66-74 years old increasing risk of CRC insignificant level that compare with age between 45-55 years old. This is similar to study found aged 40 years or older were more risk of colorectal cancer than younger [20].

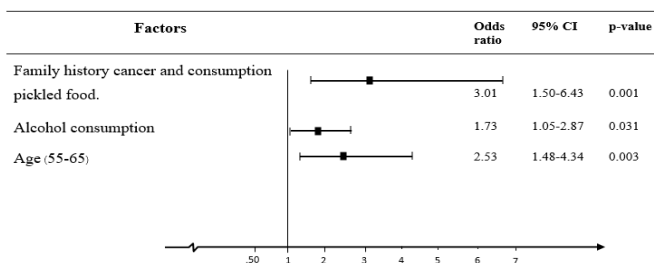


Fig. 2: Factors associated with CRC.

**IV. CONCLUSION**

Pickled food consumption in family history cancer group significantly related with an increased risk of CRC. People who have family history cancer should be careful to up take pickled food.

Red meat consumption had no relationship with CRC. It contrasts with previous studies which report a study which examined the CRC related with red meat and processed consumption [10, 11]. And BMI also not significant which is not consistent with a previous study risk factors for colorectal cancer in Semi-Urban Thailand which showed that higher BMI unexpectedly had a lower risk of colorectal cancer[5].

#### A. Strength of the study

The data collected from ongoing randomized controlled CRCS/ FIT. There possibility confounding bias or covariate factors that affect to CRC was reduced by inclusion and exclusion criteria.

#### B. Limitation of the study

There are few events of CRC patients in the study. In Experimental group who are negative test FIT and in control group doesn't have colonoscopy method.

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