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Association of Smoking, Alcohol, BMI, and Physical Activity with Colorectal Cancer Risk in North Borneo's Multiethnic Population

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ABSTRACT

The onset of colorectal cancer (CRC) the third most prevalent malignancy worldwide, results from the interactions between inherited and lifestyle factors. Therefore, there is ample opportunity to prevent the incidence of colorectal cancer by addressing the modifiable risk factors, which are still inconsistent in the Asian population. This study aims to determine the association between smoking, alcohol consumption, BMI, and physical activities in North Borneo. This is matched case-control research with a ratio of 1:2, and the sample size was matched to two controls (103:206) regarding age, gender, and ethnicity. Statistical significance was $p<0.05$, which is significant using SPSS. The frequencies, chi-square, and univariate logistic regression were used. The mean age of respondents is 54.47±11.8 years on average. Major indigenous ethnicities contributed more than 20% in the case group, such as Bajau, Kadazan, and Dusun. Other Indigenous ethnicities are less than 20% (Bugis, Brunei, Murut, Sungai, Bisaya, Jawa, Lundayeh, and Rungus). Although there is no correlation between physical activities, alcohol, and smoking, there is evidence that certain factors like smoking have a weaker relationship (OR= 2.209; 95% CI =1.144-4.264) and more significant or enhanced risk of colorectal incidence. We discovered that a strong association exists between BMI and colorectal Cancer. The implication or consideration of this research is that it might

be beneficial in lowering the incidence of colorectal cancer, provided that the public health system devises strategies to engage and empower primary care providers by providing substantial resources or by emphasizing the significance of Indigenous populations for a more significant influence on the incidence and prevention of Cancer.

INTRODUCTION

The onset of colorectal Cancer (CRC), like the Development of other multifactorial diseases, results from a complicated interaction involving lifestyle variables and hereditary factors (Veettil et al., 2017). Vast established research studies' comparability is constrained because they employ distinct lifestyle variables and assessments, define adherence differently, and approach lifestyle research methodologically in unique ways (Botteri et al., 2020; Liang et al., 2009). However, colorectal cancer in Asian populations appears to be inconsistent because the majority of colorectal cancers take 15 years to develop (Akter et al., 2021; Chiu et al., 2017) and progress slowly (Bagnardi et al., 2015; Forde, 2018; Ganapathy et al., 2019; Mutalip et al., 2011; NHMS 2015; WHO, 2019). Meta-analysis research publishes the correlation between smoking and CRC (Terry et al., 2001; Chen et al.,2003; San Joaquin, 2004). Other reviews indicate a 30%–70% greater risk connected with lifestyle and CRC (Frezza, Wachtel & Chiriva, 2006; Bardou; Barkun & Martel, 2013; Morrison et al.,2013; Chen et al., 2015). Therefore, this study aims to determine the association between smoking, alcohol consumption, body mass index (BMI), and physical activities in North Borneo multi-ethnicities.

MATERIALS AND METHODS

Study design

This case-control study applied a multi-level research approach and a 1:2 ratio to minimize bias.

Study setting

All colorectal cases notified from the four tertiary hospitals in Sabah are gathered in the research case group. The control group is from the health clinic in the same district as the hospital cases group.

Population and Sample Size

The study's target population consists of individuals diagnosed with colorectal cancer (CRC) between 2019 and 2021 and applied to any gender. These individuals must have recorded their information in the Sabah Cancer Registry or the National Cancer Registry. Participants in the control group with 206 were matched up with CRC patients (103) in Sabah who were the same age (within five years), gender, and significant Indigenous North Borneo ethnicity, achieving a power of 80% and detect odds ratios more than 2.0 or lower than 0.6. These patients were also from the same district and indigenous group. The size of the sample was decided upon by taking into account the risk of CRC (odds ratio [OR] =1.78, 95% confidence interval [CI], P2= 0.546 based on the study by Ulaganathan, Kandiah & Mohd Shariff 2018.

Data collection procedure

Data collection started from March 2020 until December 2021 in hospitals and communities. Additional assistance from the respective or selected hospitals, clinics, and Sabah State Health Departments to access cancer registry lists, hospital records of diagnoses, and medical records of subject matter or patients. The cases were selected using a technique known as convenience sampling, while the control subjects were selected using a method known as simple random sampling. The control subjects were assigned to mirror the respondents of the community cases and the health clinic chosen. The Medical Review and Ethics Committee (MREC) of the Malaysian Ministry of Health endorsed the study protocol. All qualified participants provided written informed consent before the interview.

Inclusion and exclusion

A confirmed CRC patient diagnosed with HPE in 3 tertiary hospitals within three years (2019 to 2022) registered with the Sabah State and still alive is the subject for the selected cases. The respondent must be over 18 years old, of North Borneo ethnicity) or Malaysian, have lived in the area for five years, and be willing to participate in the study. Control groups indicated to persons with no disease symptoms or family history of cancers and screened for CRC using the fecal immunochemical blood test (iFOBT). The iFOBT is an earlier screening stool-based method used for the initial screening of CRC. Both samples cannot comprehend or respond to the questionnaire without written consent.

Assessment of sociodemographic, risk of tobacco, alcohol, and physical activities

Sociodemographic data

At first, the survey included questionnaires about sociodemographics, such as age, gender, ethnicity (Sabah ethnicity), religion, marital status, educational status (non-formal education, primary school, secondary school, high education level), monthly income (< RM 1000, RM 1000-RM 3000,>RM 3000), occupational status (International Labor Organization).

Smoking Status

The smoking status of individuals was categorized into three distinct groups based on the number of cigarettes they inhaled per day: current or present smokers, ex-smokers (those who had ceased smoking), and non-smokers who had not smoked (Malaysian National Health Morbidity Survey 2015). The information about smoking history or smoking intensity, such as for current smokers, acquired about the age at first smoking (≤16 years old and >16 years old); the specific number of cigarettes smoked daily (1-10/day, 11-20/day, and >20/day): the total number of years of cigarette smoking (1-10 years, 11-30 years and > 30 years); cigarette pack years (20 pack years, 20-39 and 40) (Sasco et al., 2004: America Tobacco Atlas, 2019). For ex-smokers, the smoking duration was calculated by subtracting the age at which they first started smoking regularly (initiation) from the age at which they quit smoking. It is a self-administered adapted questionnaire (Mutalip et al., 2011; Ganapathy et al., 2019). The risk of tobacco is quantified by documenting the number of pack years a person has smoked. It is calculated by taking the average number of cigarettes smoked in a day, dividing that number by 20, and multiplying that result by the number of years that person has smoked cigarettes.

Alcohol status

The term or category for alcohol consumption is "current drinker," which refers to any respondents who have consumed alcohol-containing drinks in the 12 months before the study. The ex-drinker was one of those people who had given up consuming alcoholic beverages during the previous year. Never drinkers are described as people who never have drunk alcoholic beverages (Lim et al.,2018).The prevalence of heavy episodic drinking (HED) for monitoring hazardous alcohol use or weekly consumption of pure alcohol amounting to or exceeding 60 grams to six standard beverages (World Health Organization, 2019). Moderate drinkers engage in binge drinking of 50g or less or consume six or more standard drinks in one sitting. Heavy drinkers are those who consume 50g or more of alcohol daily or consume six or more standard drinks in one sitting at least once a week (Malaysian National Health Morbidity Survey 2015).

Body mass index (BMI)

Body mass index (BMI) is directly measured using various measuring instruments. The subject's body mass was determined using a digital SECA scale (model seca clara 803, seca gmbh & co. kg., Hamburg, Germany) per the protocols generally followed. BMI is a formula that uses a person's weight in kilograms divided by their height in square meters.

This formula determines whether a person is underweight, normal, overweight, or obese. All of the participants were classified into one of four groups according to their body mass index (Asian): BMI between 18.5 and 24.9 kg/m2 (standard), BMI between 25 and 29.9 kg/m2 (overweight), and obesity was defined in this study as BMI >30 kg/m2 (Zainuddin et al., 2011; NHMS 2015).

Physical activities

All participants self-reported their physical activities on the validated, abbreviated International Physical Activity Questionnaire (IPAQ). A well-established questionnaire of IPAQ assesses past physical history activities over the last seven related to vigorous, moderate, walking, sitting, and sleeping activities. (Forde, 2018). The Metabolic Equivalent of Task (MET) computes the intensity of an activity using the MET value derived from the activity's metabolic equivalent. To determine an individual's level of physical activity, the sum of the durations of walking, moderate-intensity, and vigorous-intensity activities performed throughout one week. METs are classified into three categories: vigorous intensity (more than 3,000 MET minutes per week) or walking for at least seven days a week or three thousand metabolic equivalent minutes per week; moderate intensity (600–3,000 MET minutes per week) engaging in intense effort activities for five days or more a week, accruing at least 600 minutes of MET time per week; and low intensity is with less than 600 MET minutes per week (Forde, 2018). Nil activities are called the unsure answer, and there are no MET minutes to count. Sedentary behavior is the cumulative amount of time spent daily in a stationary position except sleep or an individual who spends more than four hours a day in one of the following positions: sitting, lying down, or standing (Sigmundova, 2015: Nunez et al., 2017).

Ethical consideration

The Medical Research Ethics Committee of the Ministry of Health in Malaysia (NMRR: 19-3905-52394) and the University of Malaysia Sabah Research Ethics Committee (UMS/FPSK 6.9/100-6/1/95) cleared the study to be conducted according to ethical standards. The patient's privacy and confidentiality were protected.

Statistical analysis

IBM SPSS statistics version 28.0 was utilized. The sociodemographic data were presented descriptively and frequently (percentage, %), and simple logistic regression or univariable conditional logistic regression was conducted to the association between lifestyle (tobacco, alcohol, physical activities, BMI) and CRC. Variables were included in the analysis if their p-values were less than 0.05. The results were reported with unadjusted and adjusted odds ratios (OR), 95% confidence intervals (CI), and p-values corresponding to each ratio.

RESULT

Characteristics of Study Population

The baseline characteristics of the case-control study are presented in Table 1. The mean age of respondents is 54.47±11.8 years on average. Major indigenous ethnicities contributed more than 20% in the case group, such as Bajau, Kadazan, and Dusun. Other Indigenous ethnicities are less than 20% (Bugis, Brunei, Murut, Sungai, Bisaya, Jawa, Lundayeh, and Rungus). The average age of the participants was 68.7 years. In contrast with females, current smokers' prevalence was around ten times lower among males (28.1%, 95% CI 24.8-31.6 vs 2.9%, 95% CI 1.9-4.4). Furthermore, the percentages of Malays (19.7%, 95% CI 17.1-22.6) and other Bumiputras residing in Sabah and Sarawak (21.3%) who were current smokers were significantly higher than those of Chinese (9.0%, 95% CI 6.9-11.7) and Indians (7.1%, 95% CI 3.8-14.3).

Smoking cigarettes, Alcohol consumption, and Physical activities

As shown in Table 2, no significant difference was found between CRC with the smoking,

ex-smoking, and never-smoking groups (P-value=0.037). However, there is a risk of having CRC when the respondent started smoking <18 years old (OR= 1.288; 95% CI =0.556-2.985) and started smoking>18 years old (OR=0.407; 95% CI=0.134-1232). Respondents who smoked >10 cigarettes per day (OR=1.718; 95% CI=0.641-4.605) had a higher risk than respondent smoke <10 cigarettes per day (OR=0.464; 95% CI=0.184-

Table 1: Demographic characteristics of participants (n=309)

Variables	Case	Control	OR	95% CI		
	(n=103) n (%)	(n=206) n (%)		Lower	Upper	P-value
Age of respondent						0.911
25-44	17(16.5%)	36(17.5%)	0.472	0.061	3.643	
45-65	61(59.2%)	122(59.2%)	0.5	0.69	3.636	
>65	23(22.3%)	46(22.3%)	0.5	0.66	3.78	
18- 24	2 (1.9%)	2(1.0%)	Referent			
Gender						1
Female	66(64.1%)	132(64.1%)	1	0.611	1.637	
Male	37 (35.9%)	74(35.9%)	Referent			
North Borneo Indigenous						1
Kadazan	21 (20/4%)	39(18.9%)	0.977	0.47	2.029	
Dusun	21(21.3%)	43(20.9%)	1	0.371	2.694	
Bajau	22(21.4%)	44(21.4%)	1.077	0.515	2.251	
Brunei	6(5.8%)	14(6.8%)	0.857	0.29	2.585	
*Other North Borneo Indige-nous	16(15.5%)	32(15.5%)	1	0.454	2.536	
**Others Ethnicity	9(8.7%)	18(8.7%)	1	0.384	2.585	
Bugis	8(7.8%)	16(7.8%)				
Marital status						0.465
Divorce	8(7.8%)	10(4.9%)	0.633	0.24	1.668	
Widow	9(8.7%)	16(7.8%)	0.9	0.381	2.13	
Single	8(7.8%)	26(12.6%)	1.646	0.72	3.805	
Married	78(75.7%)	154(74.8%)	Referent			
Education						0.309
Primary	22(21.4%)	41(19.9)	0.47	0.15	1.467	
Secondary	52(50.5%)	105(51.0%)	0.433	0.149	1.26	
Higher	21(20.4%)	53(25.7%)	0.347	0.112	1.077	
None	8(7.8%)	7(3.4%)	Referent			
Income						0.22
RM1000-3000	32(31.1%)	83(40.3%)	0.405	0.258	0.837	
>RM3000	32(31.1%)	76(36.9%)	0.507	0.281	0.917	
<RM 1000	39(37.9%)	47(22.8%)	Referent			
Occupation						0.15
Professional	4(3.9%)	6(2.9%)	0.967	0.256	3.647	
Manager	3 (2.9%)	6(2.9%)	0.725	0.171	3.07	
Technician and associate pro-fessional	10(9.7%)	41(19.9%)	0.354	0.159	0.787	
Clerical support workers	4(3.9%)	11(5.3%)	0.527	0.157	1.774	
Service and Sales worker	5(8.7%)	21(10.2%)	0.345	0.12	0.992	
Skilled in agricultural, forestry, and fishery worker	7(6.8%)	4(1.9%)	2.538	0.697	9.244	
Craft and related trades work-ers	4(3.9%)	4(1.9%)	1.45	0.342	6.14	
Plant and machine operators and assemblers	3(2.9%)	1(0.5%)	4.35	0.437	43.333	
Elementary occupation	2(1.9%)	16(7.8%)	0.181	0.039	0.832	
Armed force	0	2(1.0%)	0	0	0	
Pensioner	39(37.9%)	58(28.2%)	0.846	0.432	1.657	
Not working working	22(21.4%)	36(17.5%)	Referent			

*(Murut, sungai, Bisaya, Jawa, Lundayeh, Rungus,Suluk,Irranun,Cocos, Kegayan, Tidung)

** (Chinese, Malay)

1.172) especially those who smoked 10-20 packs a year with (OR=1.955; 95% CI=0.613-6.237) and smoked > 20 packs (OR=1.676; 95% CI=0.574-5.136).

Smoking cigarettes, Alcohol consumption, and Physical activities

As shown in Table 2, no significant difference was found between CRC with the smoking, ex-smoking, and never-smoking groups (P-value=0.037). However, there is a risk of having CRC when the respondent started smoking <18 years old (OR= 1.288; 95% CI =0.556-2.985) and started smoking>18 years old (OR=0.407; 95% CI=0.134-1232). Respondents who smoked >10 cigarettes per day (OR=1.718; 95% CI=0.641-4.605) had a higher risk than respondent smoke <10 cigarettes per day (OR=0.464; 95% CI=0.184-1.172) especially those who smoked 10-20 packs a year with (OR=1.955; 95% CI=0.613-6.237) and smoked > 20 packs (OR=1.676; 95% CI=0.574-5.136).

Table 3 shows that former drinkers of alcohol have a higher risk of colorectal cancer than drinkers of alcohol (OR=1.361; 95% CI=0.613-4.022). This risk is higher than colorectal Cancer among drinkers of alcohol (OR=1.803; 95% CI=0.900-3.612). Those who began consuming alcohol before the age of 18, at a younger age, have a higher risk of developing colorectal Cancer (OR = 1.947; 95% CI=0.796-4.760) than those who began drinking alcohol after the age of 18 years old (OR = 1.318; 95% CI = 0.526-3.298). Consuming alcohol for 30 years or longer is not exempt from the heightened risk of colorectal Cancer (OR=2.129; 95% CI=0.947-4.791).

The physical activities of the respondent are demonstrated in Table 4. BMI was positively associated with the risks of CRC. Overall, respondents who were overweight had a significantly lower incidence of colorectal Cancer (CRC) than those who were obese (OR=4.444; 95% CI=1.231-16.04; P-value <0.001), even though obese individuals were nearly twice as likely to receive a CRC diagnosis (OR=4.444; 95% CI=1.231-16.04). The physical activity levels indicated that those with high

Table 2: Odds ratio and 95% CI of colorectal cancer risk according to tobacco users (n=309)

Variables	Case (n=103) n (%)	Control (n=206) n (%)	OR	95% CI		P-value
				Lower	Upper	
Smoking status						0.037*
Smoker	14(13.6%)	36(17.5%)	0.859	0.435	1.698	
Ex-smoker	22(21.4%)	22(10.7%)	2.209	1.144	4.264	
Never smoker	67(65.0%)	148(71.8%)	Referent			
Age started smoking						0.202
< 18	10(9.7%)	15(7.3%)	1.288	0.556	2.985	
>18	4(7.7%)	19(9.2%)	0.407	0.134	1.232	
Never smoker	89(86.4%)	172(83.5%)	Referent			
Typical no of cigarettes daily						0.12
<10	6(5.8%)	25(12.1%)	0.464	0.184	1.172	
>10	8(7.8%)	9(4.4%)	1.718	0.641	4.605	
Never smoker	89(86.4%)	172(83.5%)	Referent			
Cigarettes pack a year						0.52
1-9	2(1.9%)	17(8.3%)	0.230	0.052	1.018	
10-20	6(5.8%)	6(2.9%)	1.955	0.613	6.237	
>20	6(5.8%)	7(3.4%)	1.676	0.574	5.136	
Never smoker	89(86.4%)	174(85.3%)	Referent			
Total of years of cigarette smoking						0.502
<30	6(5.8%)	11(5.3%)	0.611	0.265	1.411	
>30	25(12.1%)	8(7.8%)	1.042	0.373	2.910	
Never smoker	89(86.3%)	170(82.5%)	Referent			

*level of significance p<0.05

activity levels had a lower likelihood of being diagnosed with CRC (OR=0.863; 95% CI=0.402-1.850), showing an 18% difference from the case group compared to individuals with no physical activity.

DISCUSSION

CRC in Asian populations is scarce and inconsistent (Ganapathy et al., 2019). Therefore, this study represented the risk factors of modifiable lifestyles of individuals from major Indigenous North Borneo, such as tobacco use, alcohol consumption, and physical activity.

Sociodemographic

Table 3: Odds ratio and 95% CI of colorectal cancer risk about alcohol consumption (n=309)

Variables	Case (n=103) n (%)	Control (n=206) n (%)	OR	95% CI		
				Lower	Upper	P-value
Drinking status						0.213
Drinker	17(16.5%)	21(10.2%)	1.803	0.9	3.612	
Ex-drinker	11(10.7%)	18(8.7%)	1.361	0.613	3.022	
Never drink	75(72.8%)	167(81.1%)	Referent			
Age drink started						0.299
< 18	10(9.7%)	11(5.3%)	1.947	0.299	0.166	
>18	8(7.8%)	13(6.3%)	1.318	0.796	4.76	
Never drink	85(82.5%)	182(88.3%)	Referent			
Drinking duration						0.166
<30	5(4.9%)	12(5.8%)	0.887	0.303	2.599	
>30	13(12.6%)	13(6.3%)	2.129	0.947	4.791	
Never drink	85(82.5%)	181(87.9%)	Referent			
Drinker level						0.616
Moderate	5(4.9%)	6(2.9%)	1.734	0.515	5.838	
Heavy drinker	11(10.7%)	19(9.2%)	1.204	0.549	2.642	
Never drink	87(84.5%	181(87.9%)	Referent			

*level of significance p<0.05

Table 4: Odds ratios and CI of CRC according to BMI, PA levels, and Sedentary Levels

Odds ratio (95% CI)						
BMI						P-value <0.001*
Underweight	Ca/Co (%)	Overweight	Ca/Co (%)	Obese	Ca/Co(%)	
1	55(53.4%)	2.296	45(43.7%)	4.444	3(2.9%)	
(Referent)	66(32.0%)	(1.401-3.765)	124(60.2%)	(1.231-16.049)	16(7.8%)	
Physical activities levels						P-value 0.267
Low	Ca/Co(%)	Moderate	Ca/Co(%)	High	Ca/Co(%)	Nil activity
1	41(39.8%)	0.642	30(29.1%)	0.863	18(17.5%)	1.178
(Referent)	62(30.1%)	(0.306-1.344)	61(29.6%)	(0.402-1.850)	50(24.3%)	(0.516-2.690)
Sedentary activities level						P-value 0.87
Not sure	Ca/CO (%)	<4 hours	Ca/Co(%)	>4 hours	Ca/Co (%)	
1	50(48.5%)	0.624	36(35.0%)	1.295	17(16.5%)	
(Referent)	109(52.9%)	(0.362-1.077)	49(23.8%)	(0.678-2.473)	48(23.3%)	
Ca (case) Co(control)		BMI (Body Mass Index)		PA (Physical activities)		

*level of significance p<0.05

Data indicated that Indigenous ethnic groups reported the most significant incidence of CRC in Sabah. Similar disparities exist in other studies regarding cancer incidence and survival between Indigenous and non-Indigenous people (De Moor et al., 2015; Sigmundova et al., 2015). Females registered as the majority in cases registered as CRC. Similar to the global finding, CRC placed second among women and third among males in 2018 in Asian countries (Jung et al., 2011; Sekeras et al., 2011). The respondent mean age (SD) is 54.47± years, about the same as the mean age found in a study in Pondicherry, India, which was 54.1± years with 11.5 years of difference. Although age has a significant role in how quickly colorectal cancer spreads, males in China have a greater incidence rate than women of all ages (Liang et al., 2009; Siegal et al., 2020).

Smoking

Our research results indicate that those who used to smoke are more likely at risk to develop CRC when respondents started smoking <18 years old with >10 cigarettes per day, especially those who smoked 10-20 packs a year. The meta-analysis risk estimates on the effect of cigarette smoking from 188 research published from 1958-2018 show that smoking increases the risk of CRC incidence with duration and intensity (Botteri et al., 2020). This relationship's strength is weaker than that found for adenomas (OR= 2.209; 95% CI =1.144-4.264) than for current smokers (OR=0.859; 95% CI=0.435-1.698). This study indicates that increased tobacco use among individuals under 18 elevates the risk of CRC (OR=1.288; 95% CI=0.556-2.985), consistent with findings from the National Health Morbidity Survey 2015. Smokers who consume over ten cigarettes daily (OR=1.718; 95% CI=0.641-4.605), 10-20 packs annually (OR=1.955; 95% CI=0.613-6.237), and individuals smoking more than 20 packs per year (OR=1.676; 95% CI=0.574-5.136) exhibit an increased risk for CRC.

The risk of CRC is substantially elevated in individuals who are exposed and smoke over 20 cigarettes daily or for a minimum of 30 years (30 packs/year) (Liang et al.,2009; Myint et al.,2016). This evidence was observed and provides strong support for risk increase with the intensity and duration of smoking by 25%–30% in smokers of 40 cigarettes per day or in those who smoke for 50–60 years (Botteri et al., 2020). However, wide variation in age at initiation and duration of smoking complicates the identification of the warning signs in the association between smoking and CRC (Tsoi et al., 2009).

Alcohol

North Borneo Indigenous people tend to prepare homemade alcoholic beverages (Mutalip et al., 2014), but this study demonstrated that they are not statistically associated with CRC. This is like other case-control studies from Thailand, Canada, and Egypt (Mahfouz et al.,2014). In contrast with other cohort and case studies, there is an association between alcohol consumption and CRC in both genders (Marmot et al., 2007). However, there is a risk of CRC occurrence Drinker (OR=1.803; 95% CI=0.9-3.612) and ex-drinker (OR=1.361; 95% CI=0.613-3.022) increased when started to drink before 18 years old (OR=1.947; 95% CI=0.299-0.166) and less risk when began to drink after 18 years old (OR=1.318; 95% CI=0.796-4.76).

The Morbidity Survey of 2014 indicated that the age of drinking started as late as 21 years old and still, we found that as young as 16 years old or younger, as observed in other nations. predicts lifetime alcohol-related problems and alcohol disorders in later life (Gomez et al., 2011). Lifetime exposure to alcohol is seen as a higher risk with CRC respondents who drink alcohol for more than 30 years (OR=2.129; 95% CI=0.947-4.791). In contrast, it stated there is no strong association between lifetime exposure to alcohol, frequency of drinking, and age at starting to drink alcohol (Loomis et al., 2018). Our finding on alcohol risk to

colorectal cancer is consistent with existing evidence studies, which indicated that there was no correlation between the quantity of alcohol consumed during one's life and the probability of survival (Phipps et al., 2017). The drinker level, whether moderate or heavy drink, shows the risk of CRC (Moderate drinker: OR=1.737; 95% CI=0.515-5.838 and Heavy drinker: OR=1.204; 95% CI=0.549-2.642). CRC mortality rate was found to be positively correlated with excessive alcohol consumption (>50 g/day) (Hamid et al., 2009; Bagnardi et al., 2015; Ben et al.,2015; Abar et al., 2018). Similar to the findings of other studies from India and (Iswarya et al., 2016), Our study did not identify a statistically significant association between smoking habits or alcohol consumption and the likelihood of developing CRC. This could be the possibility of potential underreporting by respondents because the exposure to the risk factors is predictable in the self-report questionnaire, which also introduces a recall bias.

Body Mass Index

Our findings show that regardless of gender, the obese (respondent intends to have a higher risk of CRC (OR= 4.444; 95% CI=1.231-16.049) than the overweight respondent (OR=2.296; 95% CI=1.401-3.765) but both are statistically significant correlation between BMI with the colorectal cancer risk with P-value of 0.001. The results from 13 distinct meta-analytical cohort studies indicated that weight gain or BMI is associated with an increased risk of colon cancer (WCRF & AICR, 2007; Karahalios et al., 2015; Veettil et al., 2017). Excess weight (body mass index (BMI) of 25 kg/m2 or higher) and obesity (BMI of 30 kg/m2 or higher) are two highly changeable risk variables that have consistently been linked to an elevated risk of CRC up to 9% to 19% and have a substantial impact on the occurrence and death rate of CRC in both sexes (Huu et al., 2009). According to a 2017 study on CRC and obesity conducted in Malaysia, Malaysia had a lower population attributable fraction (PAF) for overweight compared to Korea and Brazil. However, the negative impacts it may have on multiracial countries like Malaysia are still not fully understood. Further study into the underlying understanding of biological mechanisms and pathways relating to obesity to CRC is required.

Physical Activities

This case-control study did not find any significant association between the level of physical activity (PA) and CRC with a P-value of 0.267 and support by the odds ratio on high-level PA/vigorous level (≥3.000 MET minutes a week) OR= 0.863;95% CI= 0.402-1.850 and moderate PA level or 600 3.000 MET minutes per week (OR= 0.642;95% CI= 0.306-1.344) but slightly risk to CRC with Not sure answer from the respondent (OR=1.178;95% CI=0.516-2.690) were 13.6% from pre-diagnosis or case group and 16.0 % from the control groups. Consistent with the conclusion reached by the American Institute for Cancer Research and the World Cancer Research Fund, physical activity does not provide any correlation with the risk of developing rectal Cancer (Schmid et al., 2014).

However, emerging evidence reported an association between moderate and higher physical activity levels and CRC risk (Golshiri et al., 2016). The CRC risk of individuals who engaged in moderate to vigorous exercise (16.6 Met-h/week) was found to be 31% lower in a cohort study from Norway Rangul 2018 [95% confidence interval (95% CI), 1.00–1.70] than in those who exercised less than 8.3 Met-h/week (Schmid et al., 2014; Rangul et al., 2018). Vigorous physical activity may have an even more significant beneficial effect, but low physical activity is significantly associated with an increased risk of CRC (Golshiri et al., 2016; Alsheridah et al., 2018).

Subsequently, we also observed that respondents who engaged in sedentary behaviour for more than 4 hours were at a higher risk of colorectal Cancer (OR=1.295; 95% CI=0.678-2.473) than those who practised less than 4 hours (OR=0.624; 95% CI=0.362-1.077).

This outcome was in line with the conclusions of other studies that identify sedentary behaviour as a growingly acknowledged risk element for CRC occurrence and death, regardless of physical activity (Cao et al., 2015; Morris et al., 2018). In this current study, we cannot compare our results with those studies because sedentary behaviour is unable to be explicitly assessed as associated with CRC risk, and it is similar to the study by (Morris et al., 2018). Further research is required in a wide range. Additional studies on the trends linking Indigenous features toward CRC are essential to successfully applying the evidence-based guidelines in Malaysia.

CONCLUSION

Our research has shown that adopting unhealthy lifestyles, such as smoking, drinking alcohol, and engaging in physical activities, differs from other country Indigenous peoples. Proven by Smokers have a weaker risk association to developing CRC started smoking at <18 years old with >10 cigarettes per day, especially those who smoked 10-20 packs a year. On the other hand, we also discovered that a strong association exists between BMI and CRC. Empowerment primary care providers by emphasizing the significance of Indigenous populations for a more significant influence on the incidence and prevention of Cancer.

CONFLICT OF INTEREST

This study was fully self-funded and had no conflicts of interest

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